Preventing Ageing Unequally

OECD

Preventing Ageing Unequally

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document, as well as any data and any map included herein, are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

Please cite this publication as:
OECD (2017), *Preventing Ageing Unequally*, OECD Publishing, Paris.
http://dx.doi.org/10.1787/9789264279087-en

ISBN 978-92-64-27907-0 (print)
ISBN 978-92-64-27908-7 (PDF)

Revised version, November 2017
Details of revisions available at:
http://www.oecd.org/about/publishing/Corrigendum_PreventingAgeingUnequallyNov2017.pdf

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Photo credits: Cover © Adeline Marchal.

Corrigenda to OECD publications may be found on line at: *www.oecd.org/about/publishing/corrigenda.htm*.

© OECD 2017

You can copy, download or print OECD content for your own use, and you can include excerpts from OECD publications, databases and multimedia products in your own documents, presentations, blogs, websites and teaching materials, provided that suitable acknowledgement of OECD as source and copyright owner is given. All requests for public or commercial use and translation rights should be submitted to *rights@oecd.org*. Requests for permission to photocopy portions of this material for public or commercial use shall be addressed directly to the Copyright Clearance Center (CCC) at *info@copyright.com* or the Centre français d'exploitation du droit de copie (CFC) at *contact@cfcopies.com*.

Foreword

The health status and income levels of older people have substantially improved over the last decades in OECD and emerging countries. This *Preventing Ageing Unequally* report shows, however, that risks of increasing inequality among future retirees have been building up. Demographic changes combined with rising inequality trends and tight public finance constraints in many countries are modifying life prospects at older ages. With longer life expectancy, declining family size, higher inequality over the working lives and reforms that have reduced future retirement income and tightened the links between pension contributions and benefits, the experience of old age is going to change dramatically for today's younger generations. Financing of pensions and caring for elderly people in particular might become more difficult, aggravating the burden for the most disadvantaged. The sustained and fairly generalised improvement in the living standards of older people is unlikely to be prolonged in the forthcoming decades.

Inequalities have risen to the top of the international policy agenda. Earnings and household income inequalities have increased over the past three decades in most countries, fuelled by the rising share of non-standard work, difficulties encountered by many young people in securing a foothold in the labour market and high unemployment in some countries (*Divided We Stand*, 2011; *In It Together*, 2015). The *Preventing Ageing Unequally* project is part of a broader policy agenda of the OECD to address inequalities of opportunities and outcomes. In 2011, the introduction of the *OECD Better Life* initiative has led to a better understanding of what drives well-being of people and nations. With the *All on Board for Inclusive Growth* initiative launched in 2012, the OECD has developed a comprehensive framework to help countries design and implement comprehensive, multi-sectoral policies that can deliver stronger growth and greater inclusiveness.

Preventing Ageing Unequally clearly shows that socio-economic outcomes of individuals build up from childhood to adulthood, and inequality of a given cohort later in life largely results from differences in individual experiences accumulated over the life course. Better health early in life tends to be correlated with better educational attainment and they both contribute to better labour market outcomes. In turn, people with stable and well-paid jobs also tend to enjoy good access to health and other services, and are likely to retire with adequate income. These people are also more likely to have insurance or financial assets to cover them in case they need long-term care. By contrast, people who had low-quality jobs, low incomes and unstable careers are likely to be in worse health and face higher risks of poverty and if they need long-term care, what they get is likely to be rather dismal.

Preventing ageing unequally requires a comprehensive policy approach to help individuals overcome disadvantages that could cumulate over their life course and result in bad health, low income and poverty at old age. These policies will need to take account of the new realities people are facing today in their families, in their workplace, in their careers and in their health and disability risks. As OECD analysis shows, education,

health and employment experiences interact and compound inequality. This also means that inequality-reducing policies in one area will spill over into other areas generating additional welfare effects. The report identifies policies that can contain if not fully address the risks of unequal ageing. It suggests a policy agenda to prevent, mitigate and cope with these inequalities, drawing on good practices in OECD countries and emerging economies, which led to the OECD Action Plan on Preventing Ageing Unequally endorsed by the OECD Ministerial Council Meeting in June 2017.*

*. https://www.oecd.org/social/C-MIN-2017-6-EN.pdf.

ACKNOWLEDGEMENTS

The report is the outcome of a collective effort with contributions from a team of economists from different directorates across the OECD: the Directorate for Employment, Labour and Social Affairs (ELS, lead directorate), the Public Governance and Territorial Development Directorate (GOV), the Statistics Directorate (STD) and the Directorate for Science, Technology and Innovation (STI). The overview Chapter 1 was written by Hervé Boulhol (ELS, Social Policy Division), drawing on the analyses carried out in the other chapters, who benefited from in-depth comments by Monika Queisser (Head of the Social Policy Division). Chapter 2 was co-ordinated by Manuel Flores (Social Policy Division) based on written contributions by Barbara Blaylock (ELS, Health Division, currently University of Southern California), Gaetan Lafortune (Health Division), Karolin Killmeier (Social Policy Division) and himself. Chapter 3 was written by Hervé Boulhol. Chapter 4 was co-ordinated by Christian Geppert (Social Policy Division) based on written contributions by Manuel Flores (Social Policy Division), Maciej Lis (Social Policy Division), Fabrice Murtin (STD), Jillian Oderkirk (Health Division) and himself; Section 4 building on the pilot Global Future Elderly Model was developed with Barbara Blaylock (Health Division); Vincenzo Atella, Federico Belotti and Andrea Piano Mortari (University of Rome Tor Vergata); and Dana Goldman and Bryan Tysinger (University of Southern California). Chapter 5 was co-ordinated by Marius Lüske (Social Policy Division) based on written contributions by Boele Bonthuis (Social Policy Division), Christian Geppert, Andrew Reilly (Social Policy Division), Michele Rimini (STI), Anne Saint-Martin (ELS, Skills and Employability Division), Anne Sonnet (Skills and Employability Division) and himself. Chapter 6 was co-ordinated by Boele Bonthuis based on written contributions by Tim Muir (Health Division), Olivier Thévenon (Social Policy Division) and Johannes Weber (GOV). Maxime Ladaique (Social Policy Division) provided extensive support for all the charts in the report. Other contributors to this work include: Carlotta Balestra (STD), Thomas Blanchet (Social Policy Division, currently Paris School of Economics), Romina Boarini (STD), Francesca Colombo (Head of the Health Division), Anna Cristina d'Addio (Social Policy Division, currently Unesco), Marion Devaux (Health Division), Sara Durrleman (Social Policy Division), Marco Fongoni (Social Policy Division, currently University of Strathclyde), Aleksandra Kolndrekaj (Social Policy Division, currently European Foundation), Christine Le Thi (STD), Marco Mira d'Ercole (STD), Eileen Rocard (Health Division) and Elettra Ronchi (STI).

Hervé Boulhol led the team and co-ordinated the project and the publication. Monika Queisser supervised the preparation of this report and provided useful comments on various drafts. Chapters 2 to 6 were edited by Ken Kincaid. Marlène Mohier prepared the manuscript for publication and Kate Lancaster (Public Affairs and Communications Directorate) contributed to the editing of the report. Christelle Cordova and Natalie Lagorce, both from the Social Policy Division, provided useful technical assistance.

We are very grateful to Stefano Scarpetta and Mark Pearson, Director and Deputy Director of Employment, Labour and Social Affairs at the OECD, and Mark Keese (Head

of the Skills and Employability Division) for their useful comments on various versions of the report. We thankfully acknowledge the many suggestions provided or channelled by members of different OECD committees and networks, the Employment, Labour and Social Affairs Committee, the Health Committee, and the Working Party on Social Policy, as well as by experts of the European Commission and of AARP, Inc. We are also grateful to colleagues from the Directorate for Financial and Enterprise Affairs, the Economics Department, the Directorate for Education and Skills, the Office of the Secretary-General and the Statistics Directorate of the OECD for their helpful comments and suggestions. The report also benefited from the work carried out for the project "Identifying ways of raising effective retirement ages" and related work on pension indicators financed by the European Commission (EC) and from discussions with various EC officials, which have helped shape our thinking about old-age inequalities.

Table of contents

Acronyms and conventional signs 13

Executive summary 15

***Chapter 1.* Preventing ageing unequally** 19

1. Preventing ageing unequally – Why policy makers should care 20
2. How disadvantage becomes entrenched: Compounding inequalities over the life course 29
3. When I was your age: How employment and income patterns are changing across generations 34
4. Equal in old age? Income, living standards and well-being in retirement 38
5. Policy implications: Preventing, mitigating, coping 47

Notes 64
References 67

***Chapter 2.* How inequality compounds over the life course** 73

Introduction 74
1. The critical influence of early-life circumstances 75
2. How health status and labour market outcomes interact 76
3. Trends and social disparities in disability among people aged 50 and over 83
4. Compounding inequalities in socio-economic status and health in emerging economies 92

Notes 99
References 102
Annex 2.A1. Additional tables 107

***Chapter 3.* Recent trends toward increased inequality among future retirees** 111

Introduction 112
1. Older people have enjoyed big rises in real income compared with previous cohorts 115
2. Gender gaps have narrowed but are still wide 123
3. There is a rising risk of more unequal ageing 126

Notes 132
References 133

***Chapter 4.* Life course inequality across generations** 135

Introduction 136
1. Gains and differences in life expectancy 137
2. Lifetime earnings by cohort, gender and education 147
3. Impact of lifetime inequality on pensions 156
4. Policy foresight to address unequal ageing 163

Notes 169
References 172
Annex 4.A1. Calculating multi-dimensional living standards 175

Chapter 5. **A closer look at the over-50s** 177

Introduction 178
1. Education-related employment gaps among the elderly 178
2. Digital technologies drive age inequalities at work 181
3. Inclusive labour markets for older workers 186
4. Health-related ability to work at older ages 194
5. Barriers to longer working lives and the retirement decision 201
6. Retirement income adequacy issues 204
Notes 211
References 214

Chapter 6. **Living conditions in later life** 217

Introduction 218
1. Spatial inequalities in ageing populations 219
2. Living conditions and well-being among the over-80s 229
3. Long-term care 238
Notes 249
References 251

Figures

Figure 1.1. The old-age dependency ratio will almost double in the next 35 years on average 22
Figure 1.2. Life expectancy gaps between high- and low-educated groups at ages 25 and 65 are large 22
Figure 1.3. Disability increases with age 24
Figure 1.4. Low-educated people are more exposed to disability risks 25
Figure 1.5. Income inequality at the same age has increased from one generation to the next in most countries 26
Figure 1.6. Income Gini coefficient by cohort and age groups in four selected countries 27
Figure 1.7. High income inequality for youngest cohorts at the start of their working life 28
Figure 1.8. Real income growth was faster for the older age groups 28
Figure 1.9. Relative poverty rates by age group, 2014 or latest year available 29
Figure 1.10. Income inequality reaches a peak at age 55-59 over the life course for the same generation 30
Figure 1.11. People in bad health work less and earn less at all ages 32
Figure 1.12. Impact of health on lifetime labour earnings by education level 33
Figure 1.13. Employment rates of population aged 55-64 by educational group 34
Figure 1.14. Employment rates by gender across cohorts, at ages 20-24 and 50-54 35
Figure 1.15. Substantial income gains at the same age across birth cohorts until recently 36
Figure 1.16. Real average income within cohorts diverge after age 50 across countries 37
Figure 1.17. Mean household net wealth in different age groups 38
Figure 1.18. Income inequality among those older than 65 years varies widely across countries 39
Figure 1.19. Old-age relative poverty rate and poverty depth, 65+ 40
Figure 1.20. Impact of an increase in wage inequality on pension inequality 41
Figure 1.21. Loss in pension benefits due to incomplete careers, average-wage workers 42
Figure 1.22. Regional disparity (TL2) in the number of active physicians per 1 000 older people, 2013 43

Figure 1.23. Poverty rates of the 80+ by family living arrangements....45
Figure 1.24. Disposable income before and after care costs for people receiving home care for moderate needs in OECD countries, as a percentage of the relative poverty threshold....46
Figure 2.1. Health worsens with age....77
Figure 2.2. Employment rates and earnings are lower for individuals in bad health....78
Figure 2.3. Health-related gaps widen in the second half of the career for employment but early for wages....79
Figure 2.4. Health-related employment gaps are larger among the low educated....80
Figure 2.5. Effects of bad health on men's earnings accounting for the risk to employment, by education level....82
Figure 2.6. Extra years of life expectancy have been largely in good health....84
Figure 2.7. The share of healthy life years in remaining life expectancy at the age of 50 has been broadly stable....85
Figure 2.8. Disability rates among 50-to-64 year-olds and the 65-and-over....88
Figure 2.9. Low-educated have a higher risk of disability....89
Figure 2.10. Selected trends in disability by level of education, gender and age group....91
Figure 2.11. Large emerging economies are rapidly ageing at early stages of development....93
Figure 2.12. Income inequality is very large in G20 non-OECD countries....94
Figure 2.13. Disability rates are high in China, especially among those older than 65 years....95
Figure 2.14. Effects of education, wealth, location and employment on health in China, Indonesia and OECD countries by gender....97
Figure 2.15. Effects of gender, location, wealth and employment on health in China, Indonesia and OECD countries by level of education....98
Figure 2.16. Effects of gender, education, wealth and employment on health in China, Indonesia and OECD countries according to rural or urban dwelling places....98
Figure 3.1. A 30% gap between the OECD countries with highest and lowest life expectancy at 65....112
Figure 3.2. The gender gap in life expectancy at 65 has peaked on average....113
Figure 3.3. Population ageing will accelerate sharply....114
Figure 3.4. Real average incomes within birth cohorts as they age....115
Figure 3.5. Substantial income gains at the same age across cohorts, at least until recently....116
Figure 3.6. Real income has increased at the same age across birth cohorts....117
Figure 3.7. Average real income in the 50-54 age bracket, 1960s versus 1950s birth cohorts....118
Figure 3.8. Shifts in income have benefited older people of working age....119
Figure 3.9. On average poverty risks have shifted from the old to the young....120
Figure 3.10. On average across the OECD poverty rates are similar among the 76+ and the 18-25....121
Figure 3.11. Employment peaked for the 1960s-born cohorts on average across countries....122
Figure 3.12. Employment rates by age group in specific cohorts, cross-country averages....123
Figure 3.13. Cohort effects in employment rates by gender, OECD average....124
Figure 3.14. Gender gaps in OECD countries' employment rates among 40-44 year-olds in 1940s versus 1970s birth cohorts....125
Figure 3.15. Gender gap in pensions in OECD countries, 2014 or latest....125
Figure 3.16. Income inequality decreases at older ages in most countries....126
Figure 3.17. How changes in the age composition of populations automatically affect the Theil index of disposable income in selected OECD countries, 2015 and 2050....128
Figure 3.18. Income Gini index by cohort and age group, OECD-wide averages....129
Figure 3.19. Income inequality at the same age has increased from one generation to the next in most countries....130
Figure 4.1. Projected remaining cohort life expectancy by age in 35 OECD countries....138

Figure 4.2. Multi-dimensional living standards by cohort in 2010 139
Figure 4.3. Differences in components of multi-dimensional living standards between educational groups 140
Figure 4.4. Longevity gaps between people of high and low education 141
Figure 4.5. Breakdown of factors that contribute to differences in mortality rates between the low- and highly educated, 2011 143
Figure 4.6. Smoking prevalence in 2014 144
Figure 4.7. Distribution of ages at death by gender and education in Latvia and Sweden, 2011 146
Figure 4.8. Probability of survival to a given age, up to 85 years 146
Figure 4.9. Education premium in real hourly wages by gender and male real hourly wages by level of education 148
Figure 4.10. Career average of the education premium in real hourly wages for three selected cohorts 150
Figure 4.11. Real expected lifetime earnings by cohort, education group and gender 152
Figure 4.12. The high-to-low education ratio of real expected lifetime earnings 153
Figure 4.13. Difference in employment rates between the highly educated and the low-educated 154
Figure 4.14. Career average of the education premium in real hourly wages according to ISCED and a percentile definition of education levels 156
Figure 4.15. Progressivity of mandatory pension schemes 158
Figure 4.16. How increases in wage inequality affect pension inequality 159
Figure 4.17. Gross pension entitlements of average earners who start at age 25 and experience ten years of unemployment 160
Figure 4.18. Declines in pension wealth attributable to a three-year shortfall in remaining life expectancy at retirement age 162
Figure 5.1. Employment rates among older people rise with educational attainment, 2015 179
Figure 5.2. Last self-declared labour market status before retirement in OECD countries, people retiring between the early 2000s and today 180
Figure 5.3. Many older workers have no computer experience or have failed core ICT tests, 2012 and 2015 181
Figure 5.4. Workers routinely using spreadsheets or word processing software, by age group, 2016 182
Figure 5.5. Age differences in the use of increasingly complex software, average across countries, 2016 183
Figure 5.6. Daily use of email or the Internet, by routine-task intensity of occupation, 2016 184
Figure 5.7. Share of older workers (55-64) in total employment in occupations where ICT intensity is low and high, 2016 185
Figure 5.8. Effects of technological change on the risk of unemployment among older workers (aged 55-64), 2016 186
Figure 5.9. Highly educated older workers are, on average, more likely to have access to continued training, selected OECD countries,[a] 2012 and 2015[b] 188
Figure 5.10. Changes in labour market (LM) exit ages and life expectancy (LE) at the age of 65 among men and women since 1975 195
Figure 5.11. Labour market participation among older workers in their 50s and 60s and remaining life expectancy, 2015 or latest 197
Figure 5.12. Labour force participation among older workers: Actual rates, upper frontiers (estimated maximum health-related work capacities) and the lower frontiers of labour force participation, 2015 or latest available year 198

Figure 5.13. Gender gaps in labour force participation among 50-69 year-olds, 2015 or latest available year 199
Figure 5.14. Differences in estimated health-related work capacity between educational groups, 2015 or latest available year 200
Figure 5.15. Effect of the time left to legal retirement age on the probability of retiring over the next two years 201
Figure 5.16. Increases in the probability of retirement due to poor health and poor job quality 202
Figure 5.17. Retirement probability of married workers, by retirement status of worker's spouse 204
Figure 5.18. First-tier old age pension benefits as a percentage of average earnings, 2015 205
Figure 5.19. Net projected pension replacement rates from mandatory schemes for low earners 206
Figure 5.20. Low earners' net replacement rates from mandatory pension schemes versus coverage from voluntary pension schemes, 2013 and 2014 207
Figure 6.1. The share of older people varies widely between regions and countries 220
Figure 6.2. The share of older people varies a lot between regions within countries 221
Figure 6.3. Predominantly rural regions are ageing slightly faster 223
Figure 6.4. The regional concentration of older people is moderate 224
Figure 6.5. Large regional disparities in the ratio of active physicians to older people 225
Figure 6.6. Large regional disparities in the ratio of hospital beds to older people 226
Figure 6.7. Physical access to a hospital is difficult for older people in some regions 227
Figure 6.8. Large regional disparities in the access of older people to public transport 228
Figure 6.9. The share of people older than 80 years will continue to grow 230
Figure 6.10. Life expectancy at the age of 80 has risen steadily 230
Figure 6.11. Prevalence of excess weight and obesity among the 80+ varies markedly across countries 232
Figure 6.12. Women report higher rates of functional limitation 233
Figure 6.13. Proportion of 80+ showing depressive symptoms is very high in some countries 234
Figure 6.14. Women older than 80 years live alone much more than men in the same age group 235
Figure 6.15. Poverty risks are higher among people aged 76 and over on average in the OECD 236
Figure 6.16. Poverty rates among the over-80s are much higher for those living alone 236
Figure 6.17. Home care costs are high compared to a pensioner's disposable income 239
Figure 6.18. Proportion of LTC costs covered by social protection systems differs widely among countries and income groups 240
Figure 6.19. Home care for moderate needs is beyond the means of low-income groups in over half the countries 241
Figure 6.20. Income left after care cost of institutional care recipients varies greatly among countries 244
Figure 6.21. The majority of over-50s providing informal daily care are women 245
Figure 6.22. Fewer people give daily informal care in countries with high level social protection schemes 246
Figure 6.23. Women more often have interrupted careers but these women are less likely to be providing daily informal care compared to full career women 248

Tables

Table 2.1. The impact of bad health on lifetime earnings 83
Table 2.2. Evidence of disability trends among 50-64 year-olds and the over-64s, selected OECD countries 87
Table 2.3. Relative risk of disability comparing higher and lower educated groups by gender and age in the most recent survey year 90
Table 2.A1.1. Health indices (HI) in China (CHARLS), Indonesia (IFLS) and OECD countries (SHARE) 107
Table 2.A1.2. Health equations in China, Indonesia and OECD countries by gender 108
Table 2.A1.3. Health equations in China, Indonesia and OECD countries by level of education 109
Table 2.A1.4. Health equations in China, Indonesia and OECD countries according to rural or urban dwelling places 110
Table 3.1. Poverty risks have shifted from the old to the young in almost all countries 120
Table 4.1. Remaining years of life, of disability-free life and of life with 3+ chronic diseases after age 50 165
Table 4.2. Average duration of working for pay and of claiming pension after age 50 167
Table 4.3. Impact of rising retirement age on duration of working life and pension wealth 168
Table 4.A1.1. Calculating multi-dimensional living standards by cohort 176

Follow OECD Publications on:

http://twitter.com/OECD_Pubs
http://www.facebook.com/OECDPublications
http://www.linkedin.com/groups/OECD-Publications-4645871
http://www.youtube.com/oecdilibrary
http://www.oecd.org/oecddirect/

This book has...

StatLinks
A service that delivers Excel® files from the printed page!

Look for the *StatLinks* at the bottom of the tables or graphs in this book. To download the matching Excel® spreadsheet, just type the link into your Internet browser, starting with the *http://dx.doi.org* prefix, or click on the link from the e-book edition.

Acronyms and conventional signs

AAL	Age as leveller
ADL	Activity of daily living
DB	Defined benefit
DC	Defined contribution
EU-SILC	European Union Survey on Income and Living Conditions
GALI	Global Activity Limitation Index
GP	General practitioner
IADL	Instrumental activity of daily living
ISCED	International Standard Classification for Education
LIS	Luxembourg Income Study
LTC	Long-term care
MDLS	Multi-dimensional living standard
NAIRU	Non-Accelerating Inflation Rate of Unemployment
NDC	Notional defined contribution
NEET	Youth not in education, employment or training
PES	Public employment service
PIAAC	OECD Survey of Adult Skills
PISA	OECD Programme for International Student Assessment
PPP	Purchasing power parity
PRSTE	Problem solving in a technology-rich environment
SES	Socio-economic status
TL	Territorial level
VET	Vocational education and training

Conventional signs

.. Not available

In figures, OECD refers to unweighted averages of OECD countries for which data are available.

(↘) in the legend relates to the variable for which countries are ranked from left to right in decreasing order.

(↗) in the legend relates to the variable for which countries are ranked from left to right in increasing order.

OECD country ISO codes

Australia	AUS	Korea	KOR
Austria	AUT	Latvia	LVA
Belgium	BEL	Luxembourg	LUX
Canada	CAN	Mexico	MEX
Chile	CHL	Netherlands	NLD
Czech Republic	CZE	New Zealand	NZL
Denmark	DNK	Norway	NOR
Estonia	EST	Poland	POL
Finland	FIN	Portugal	PRT
France	FRA	Slovak Republic	SVK
Germany	DEU	Slovenia	SVN
Greece	GRC	Spain	ESP
Hungary	HUN	Sweden	SWE
Iceland	ISL	Switzerland	CHE
Ireland	IRL	Turkey	TUR
Israel	ISR	United Kingdom	GBR
Italy	ITA	United States	USA
Japan	JPN		

Other major economy and G20 country ISO codes

Argentina	ARG
China	CHN
Colombia	COL
Costa Rica	CRI
India	IND
Indonesia	IDN
Lithuania	LTU
Russian Federation	RUS
South Africa	ZAF

Executive summary

"Ageing unequally" refers to inequality that develops throughout the life course and materialises in old age. It is often the result of specific episodes during people's lives that tend to cumulate their detrimental effects on health and income at old age. Ageing unequally is not a new phenomenon, but while the current generation of older people is experiencing higher incomes and lower poverty risks than previous ones in most countries, the younger generations are likely to face again higher inequality in old age. They are expected to live longer, but have been experiencing more unstable labour market conditions and widening inequalities in the distribution of earnings and household income. This contributes to widening inequality in old age, while socio-economic disparities in health status remain large.

Ageing unequally is detrimental to future economic growth, particularly where inequality of opportunity locks in privilege or exclusion, undermining intergenerational social mobility and jeopardising social cohesion. This report examines how population ageing and rising inequalities have been developing and interacting, both within and across generations. It suggests a policy agenda to prevent, mitigate and cope with such inequalities, drawing on good practices in OECD countries and emerging economies.

Key findings

Population ageing will accelerate while health disparities across socio-economic groups are large

- New mortality data at older ages show higher impact of socio-economic conditions on inequality in longevity than previously reported.
- Old-age inequality issues are more acute in emerging economies and a number of them are facing rapid ageing at a relatively early stage of development, have wider health inequalities than OECD countries and a less effective social protection.

Increasing income inequality from one generation to the next

- In most countries, people's average real incomes are still higher than those of previous generations at the same age. But this is not the case any more for those born from the 1960s compared to the generations born one decade earlier.
- Income inequality has been rising from one generation to the next at the same age in two-thirds of the countries, in particular among younger groups for which inequality is nowadays much higher than for the elderly.

Compounding inequality across various dimensions

- Health and socio-economic inequalities start early. Disadvantages in health, education, employment and earnings reinforce each other and compound over the life course.
- At all ages, men and women in bad health work less and earn less when they work. Over the whole career, bad health reduces lifetime earnings by 33% and 17% for men with low and high levels of education, respectively, with smaller effects for women.
- Low-educated people are more likely to retire when they reach the retirement age, whereas individuals with higher education tend to work longer.
- Poor health is an important factor pushing older workers into early retirement. However, health explains the sharp decline of employment rates from age 55 to a limited extent, which points to the importance of other factors such as the way professional training operates, the functioning of labour markets and the design of pension systems.

Old-age income inequality and transmission of inequalities to pensions vary a lot across countries

- On average, about two-thirds of lifetime earnings inequality passes on to pension inequality – from less than 25% for many Anglo-Saxon countries to more than 85% in about one-third of OECD countries.
- Low earners tend to have a lower life expectancy than high earners and this reduces further their total pensions by about 13%. Raising the retirement age tends to widen inequality in total pensions between low and high earners, but the impact is small.

Dependency in old age is felt more acutely by low socio-economic groups

- People with lower socio-economic status are more likely to need long-term care, but formal home care services – even for moderate needs – remain unaffordable for many of them in some countries, who have an incentive to go into institutional care.
- In countries with higher levels of social protection for long-term care services, rates of informal care are lower, and gender inequality in caring is smaller.

Large inequalities across genders remain

- The gender employment gap has fallen, through both a sharp increase in female employment rates across generations and a more recent decline in male employment in a number of countries.
- Annual pension payments to the over-65s are about 27% lower for women on average, and old-age poverty is much higher among women than among men.

Key recommendations

Prevent inequality before it cumulates over time

- ***Place early-life interventions at the top of the policy agenda***: start social protection measures at early ages, especially for children from disadvantaged background; ensure a good quality of childcare services and early childhood education; reduce school failure; improve low performing disadvantaged schools; fight early school leaving; and combat gender stereotyping early at school.
- ***Promote a good start in working life***: ensure a smooth school-to-work transition by providing sufficient orientation, especially to youth who cannot draw on social support networks and strengthening vocational education; and, design effective labour market policies to connect youths not in employment, education or training with jobs.
- ***Break the links between socio-economic disadvantages and health status***: develop a strategy that addresses the wide range of social determinants of health inequalities; and, expand health spending allocated to prevention targeted at key risk factors and population groups.

Mitigate entrenched inequalities

- ***Promote healthy ageing by developing a multisectoral active ageing strategy and through equal access to health care***: remove financial obstacles; better co-ordinate health care across various disciplines towards a patient-centred approach; further develop physician specialisation in geriatric care; and improve health literacy.
- ***Limit the impact of job loss and combat long-term unemployment***: strengthen policies to assist displaced workers; make counselling, skills audits, job-search assistance and retraining ready early on after job losses or even during notice periods.
- ***Provide equal opportunities for workers to upgrade their skills***: improve access to lifelong learning, especially for low-skilled and older workers; and better recognise skills acquired throughout working lives.
- ***Enhance job quality for older workers***: improve regulations on working-time and safety at work; promote healthy working conditions; implement well-designed sickness schemes; and improve the role of labour inspection bodies and occupational health care services.
- ***Remove barriers to retain and hire older workers***: ensure a better match between the labour cost and the productivity of older workers; and, eliminate special employment protection and unemployment benefit rules for older workers.

Cope with inequality at older ages

- ***Limit the impact of socio-economic differences in life expectancy on pension benefits.*** These differences are often ignored but can have a large unintended impact on how pension systems redistribute income between different groups; such inequalities can be addressed through first-tier pensions and redistributive components embedded in benefit and/or contribution rules.

- ***Target adequate levels of retirement income through a combination of old-age safety nets, mandatory pensions, annuities in private schemes and pension credits.***
- ***Increase pension coverage***, especially for the self-employed and those with non-standard jobs, and more generally in emerging economies, including through improved financial literacy.
- ***Design survivors pensions carefully*** to protect widow(er)s effectively while limiting inefficient forms of redistribution and work disincentives.
- ***Move towards a unified pension framework for all workers.***
- ***Reduce inequalities in long-term care by making home care affordable for all.***
- ***Reduce inequalities in caring through better support to informal carers.***

Chapter 1

Preventing ageing unequally

This introductory chapter gives an overview of the entire publication drawing on analyses carried out in the other chapters. A special attention in this report is paid to life course trajectories comparing outcomes across generations. This chapter summarises how old age inequality is often the result of developments which interact across different dimensions and accumulate with age. It highlights that demographic changes combined with recent inequality trends and tight public finance constraints are changing the balance of societies. Risks of increasing inequality among future retirees have been building up in many countries. This chapter also suggests a policy agenda to prevent, mitigate and cope with such inequalities, drawing on good practices in OECD countries and emerging economies. The Executive Summary of the publication includes the key findings and recommendations.

1. Preventing ageing unequally – Why policy makers should care

In a context of sluggish growth and widening inequalities in income and other social outcomes, policy makers are seeking to identify comprehensive, coherent and effective policy packages to foster inclusive growth. Growing unequally undermines future economic development, particularly where inequality of opportunity locks in privilege and exclusion, reducing intergenerational social mobility and social cohesion. Ageing unequally means inequality that develops through the ageing process and materialises in old age. While old-age inequality could be a short cut for "ageing unequally" the report highlights that it is often the result of developments occurring in different dimensions, which interact and cumulate over the life course.

Inequalities are now at the centre of the international policy agenda. The OECD has contributed to this outcome through a series of publications since the late 2000s, such as *Divided We Stand: Why Inequality Keeps Rising* (2011) and *In It together: Why Less Inequality Benefits All* (2015). The OECD *Better Life Initiative* (2011) has led to a better understanding of what drives well-being of people and nations. With the *All on Board for Inclusive Growth* initiative launched in 2012, the OECD has developed a comprehensive framework to help countries design and implement comprehensive, multisectoral policies that can deliver stronger growth and greater inclusiveness. Recent OECD work (OECD, 2016a, 2015a, 2011a) documented the increase in earnings inequality, the rising share of non-standard work, labour market difficulties encountered by youth, and high unemployment in some countries over past decades.[1]

Younger generations are living in a very different world from the one previous generations experienced. Baby boomers, i.e. those born after World War II and until the early 1960s, benefited from a period of sustained economic growth, major health and social improvements and growing employment rates. By contrast, members of "Generation X", the people now aged 35-50, can no longer assume to be richer in old age than their parents. The "Millennial Generation", which reached adulthood after 2000, has been particularly hard hit by the Great Recession and its aftermath, reducing their prospects for stable careers (OECD, 2016b). Furthermore, digitalisation and automation are progressing rapidly. They are leading to substantial improvements in living standards, e.g. through technological progress in the health sector and improved communication for those living alone or losing physical autonomy. But they are also profoundly transforming the world of work, challenging the job prospects of many workers and requiring them to adapt their skills to a rapidly changing environment. For many a "job for life" or even a "career for life" are no longer realistic scenarios. Income gains seen over past generations have slowed down or even stalled in many countries. While life expectancy continues to rise, new health risks have also emerged such as the threat posed by rising obesity, modifying the way populations age.

As a result of these trends, the future elderly population will experience old age in much more varied ways. Most people will live longer but some will have accumulated periods of inactivity and low pay while others will have experienced stable and rewarding careers. Some will be in relatively good health until old age while others will still experience health problems at an early age, with risks for their employment and earnings, and depend on others for their care. Growing disparities in labour market conditions will likely result in higher pensioner poverty in the future. Moreover, many countries have already lowered pension promises as a response to population ageing. Financing of pensions and long-term caring is likely to become more difficult. Therefore, the sustained

and broadly shared improvement in the living standards of elderly people seen over past decades may not continue in the future.

This report examines how the two global mega-trends of population ageing and rising inequalities have been developing and interacting, both within and across generations. It first discusses global ageing trends and documents how health status and life expectancy differ between socio-economic groups. It then analyses how younger generations today fare compared to the inequalities their parents and grandparents experienced. Taking a life course perspective the report shows how inequalities in education, health, employment and earnings compound resulting in large differences in lifetime earnings across different groups. It suggests a policy agenda to prevent, mitigate and cope with inequalities along the life course drawing on good practices in OECD countries and emerging economies.

Rapid ageing with large differences in life expectancy within and across countries

Worldwide, populations are ageing rapidly due to life expectancy gains and declines in fertility rates. Health improvements have been tremendous since the second half of the 19th century and life expectancy has increased for each successive cohort, apart from temporary mortality spikes due to the world wars. In 1980, there were 20 persons aged 65 and over for every 100 people of working age (20-64 years) on average across the OECD; by 2015 this number had risen to 28 (Figure 1.1) and with sharp acceleration is projected to almost double between 2015 and 2050.

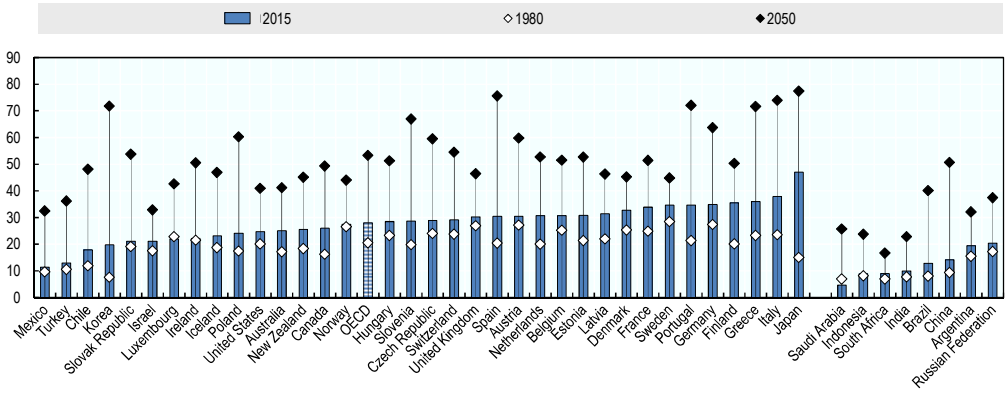
Japan is by far the oldest OECD country: its old-age dependency ratio increased by 32 points between 1980 and 2015. During that period, ageing was also rapid in Finland, Greece, Italy and Portugal while that ratio remained broadly stable in Ireland, Luxembourg, Mexico, Norway and the Slovak Republic. On this measure, Japan will remain the oldest country in 2050. Korea, however, is ageing the fastest, followed by Greece, Italy, Portugal and Spain which will also be ageing very rapidly. Across OECD countries, life expectancy at age 65 ranges from 19 to 22 years in 2010-15.

Population ageing differs across regions (within countries): urban centres draw younger and more mobile workers while rural areas are often already much older, larger shares of retirees and fewer younger workers to support them. On a national level, the share of the older population ranged from 6% in Mexico to 26% in Japan in 2014, but taking a closer look at the regional (TL3) level shows much more variation.[2] The share of the population aged 65+ ranged from 2% in the Chilean region of Antártica Chilena to 33% in Greece's Evrytania region; both are classified as rural remote regions. Spain, Mexico and Australia have the largest regional differences, with about 20-percentage point differences between the youngest and oldest regions. At around 5 percentage points, regional differences are lowest in Central and Eastern European countries and Ireland.

The pace of ageing of the population structure is much faster in many emerging economies. In OECD countries, life expectancy at birth rose by an average of 7.2 years between 1980 and 2015; by contrast, it increased by 20.5 years in India and by 11.3 years in Brazil over the same period. In Russia, however, the increase was only 2.4 years and South Africa lost 1.3 years of life expectancy. In 2015, old-age dependency ratios in Brazil and China were half the OECD average; by 2050 both countries will be rapidly closing in on the average OECD country and by 2075 they will be older than the average OECD country.

Figure 1.1. The old-age dependency ratio will almost double in the next 35 years on average

Number of people older than 65 years per 100 people of working age (20-64), 1980-2050



Source: United Nations World Population Prospects: The 2015 Revision.

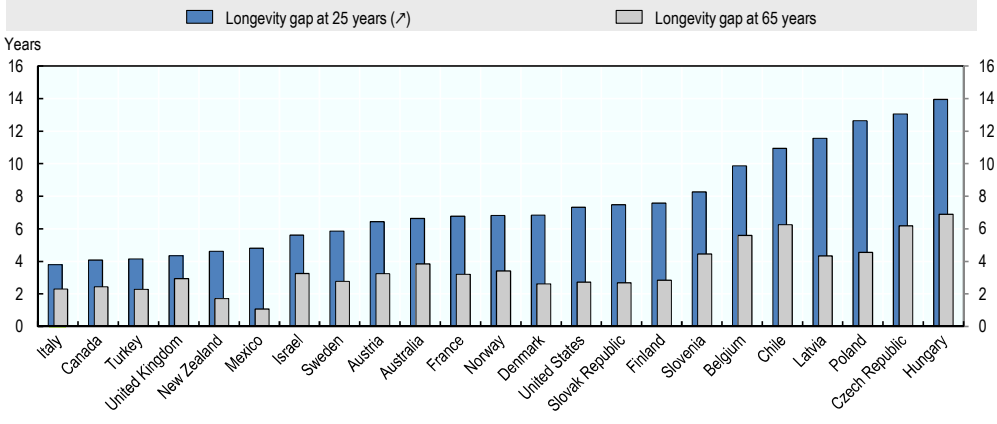
StatLink http://dx.doi.org/10.1787/888933566058

Living a long life will be the norm in most countries. On average across countries, 80% of males born 70 years ago have reached age 70 and 93% of males born today are expected to do so; for women, the respective shares are 89% and 96%. The probability of surviving to age 85 will increase from 50% today to 75% by 2100 for males born today, and from 64% to 83%, respectively, for females.

Ageing is not a uniform process, however. A 25-year old university-educated man can expect to live 7.5 years longer than his low-educated peer, on average across countries; for women the difference is much lower at 4.6 years.[3] At age 65, these life expectancy gaps are 3.5 and 2.4 years, respectively. They are especially large for men in Belgium, Chile, the Czech Republic and Hungary, but comparatively low in Mexico and New Zealand (Figure 1.2). Expressed as a percentage of remaining life expectancy of the highly educated, differences between high- and low-educated groups, are 18.5% for men and 11.9% for women at age 65, on average across countries, and larger than at age 25.

Figure 1.2. Life expectancy gaps between high- and low-educated groups at ages 25 and 65 are large

Males, around 2011, in years



Note: New collected data – although from 2011 – improve on currently available data by better accounting for mortality differences across educational groups at older ages (see endnote 3).

Source: OECD data and calculations.

StatLink http://dx.doi.org/10.1787/888933566077

In emerging economies too, highly educated individuals have greater chances of living longer (e.g. Mondal and Shitan, 2013). Evidence from Brazil shows that regions with higher illiteracy rates have lower average life expectancy (Messias, 2003). Moreover, inequalities in education tend to be larger than in OECD countries. In most of the large emerging economies primary school enrolment is close to universal, but fewer students finish secondary or tertiary education compared to OECD countries. These inequalities are likely to affect all phases of life as well as future generations; high parental education in China, for example, especially mother's education, is found to improve children's health (Chen and Li, 2008).

In China and Indonesia, being well educated, wealthier, employed or living in an urban area is associated with better health (Chapter 2). New OECD analysis finds that a higher socio-economic status is more strongly associated with better health in China and Indonesia than in OECD countries. For women, health gaps between the high- and low-educated are the largest in Indonesia, where high-educated women are, all else equal on average, about 14 percentiles higher in the health distribution than low-educated women. This gap is about 12 percentiles in China and 9 percentiles in OECD countries. Larger wealth is more strongly associated with better health in China than in both Indonesia and Europe, especially for men. Moreover, disadvantages in the health status of rural versus urban residents are much larger in China and Indonesia than in the OECD, even after accounting for differences in population characteristics.

In most emerging economies, health care is still limited in scope and effectiveness. There are fewer than two doctors per 1 000 inhabitants in all large non-OECD emerging economies, except the Russian Federation, compared to 3.3 doctors on average in OECD countries (OECD, 2015a). Lack of insurance and financial constraints limit the use of prevention, detection and health care options and result in worse health, especially among older people. A large share of informal employment means that many people are excluded from formal social protection. In China, until 2003, 80% of people living in rural areas had no health insurance. More recently, however, China has been expanding its welfare system and universal health insurance coverage was virtually achieved in 2011 (Yu, 2015). Similarly, Indonesia started the extension of health care provision in 2014, with the aim of covering the entire population by 2019, but progress has been uneven (Pisani et al., 2017). While health care expansions in China and Indonesia are important to address entrenched health inequalities it is too early to assess their actual scope and effectiveness.

Are the additional years lived in good or bad health?

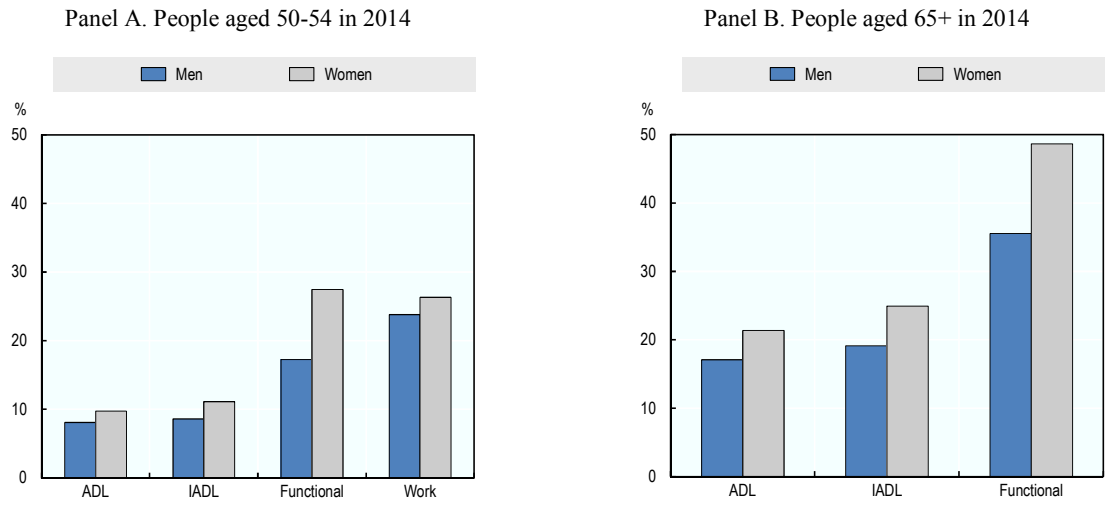
A key question is whether and which people live the additional life years gained over past decades in good or bad health. Between 2000 and 2015, life expectancy at birth in OECD countries increased by 3.4 years, on average, and 92% of these additional years have been spent in good health, i.e. free of disability. This means that the share of healthy years in total life years has been stable. At age 50, however, the picture is a bit different: 40% of the gains in male life expectancy at age 50 have been in good health. For women, the share is even lower at 30%. Overall, this implies that the number of healthy life years at age 50 has increased over time, but that the ratio of healthy life years over remaining life expectancy has fallen slightly for both men and women over the past decade.

New OECD analysis examines the links between education levels and disabilities for men and women above 50.[4] It covers 12 European countries, China, Israel, Japan and the United States. Disability inequalities by gender and level of education are similar in most

countries (Chapter 2). Women more often report disabilities in both the 50-64 and 65+ age groups (Figure 1.3), because they more often have non-fatal but disabling diseases, such as arthritis or depression. Men, in turn, more frequently suffer from fatal diseases, such as lung cancer or heart attacks (Espelt et al., 2010; Sarkeala et al., 2011). Unsurprisingly, disability increases with age: for example, about 8% of men aged between 50 and 64 years report at least one ADL (activity of daily living) restriction compared to 17% for those older than 65.

Figure 1.3. Disability increases with age

Disability rates for individuals aged 50-64 and 65+, average across 16 countries, 2013/14 or nearest year



Note: The chart shows age-standardised rates. Age standardisation using the 2005 OECD population. Sampling weights are used. The survey of health and ageing in Japan does not include a question about work participation related to disability. Disability is measured using four self-reported indices: i) at least one limitation in activity of daily living (ADL), ii) at least one limitation restriction in instrumental activity of daily living (IADL), iii) at least one functional limitation related to mobility, and iv) being limited in paid work because of a health problem.

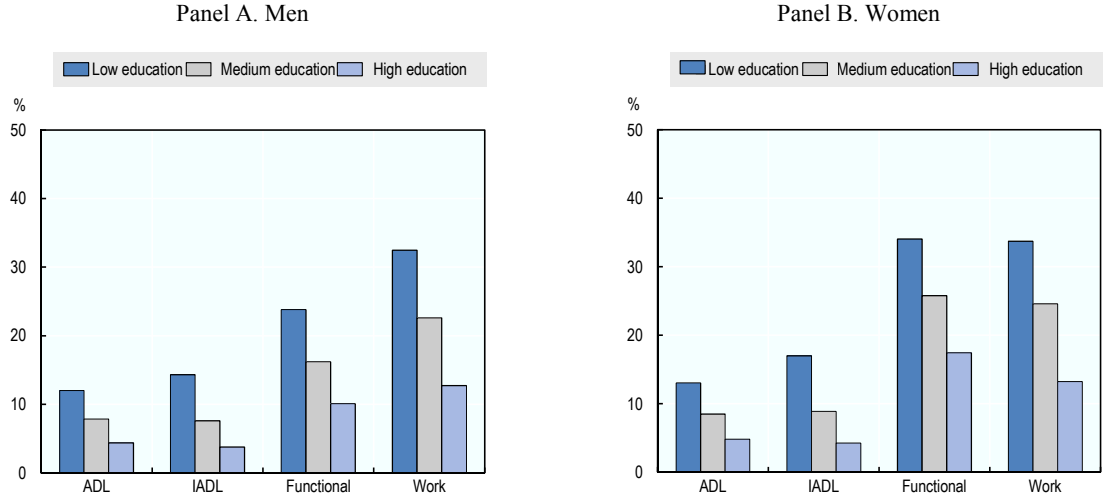
Source: OECD estimates based on SHARE, ELSA, HRS, JSTAR, and CHARLS data.

StatLink http://dx.doi.org/10.1787/888933566096

Lower educated individuals, both male and female, are more likely to have a disability (Figure 1.4). About 30% of males between 50 and 64 years with low education declare being limited in paid work because of a health problem against only 10% of those with high education.[5] Disabling chronic diseases are also more frequent among people with lower education levels, due to lower incomes, worse working and living conditions, behavioural risk factors (such as smoking, harmful alcohol consumption and less healthy nutrition habits), and less access to appropriate health care (OECD, 2016c; James et al., 2016). The education-health gap, while persisting at older ages narrows in the 65+ age group compared to middle-aged adults (see Chapter 2). Moreover, in Indonesia having some education has been found to increase life expectancy, but also to increase the expected years with major functional problems (Hidajat et al., 2007).

Figure 1.4. Low-educated people are more exposed to disability risks

Predicted prevalence of disability among people aged 50-64 by gender, average across 16 countries, 2013/14 or nearest year



Note: Predicted probabilities are derived from four separate logistic regression models (for each gender and age group). Control variables include: five-year age group, time, time squared, education level and country dummies. Age standardisation is to the 2005 OECD population. The survey of health and ageing in Japan does not include a question about work participation related to disability.

Source: OECD estimates based on SHARE, ELSA, HRS, JSTAR, and CHARLS data.

StatLink http://dx.doi.org/10.1787/888933566115

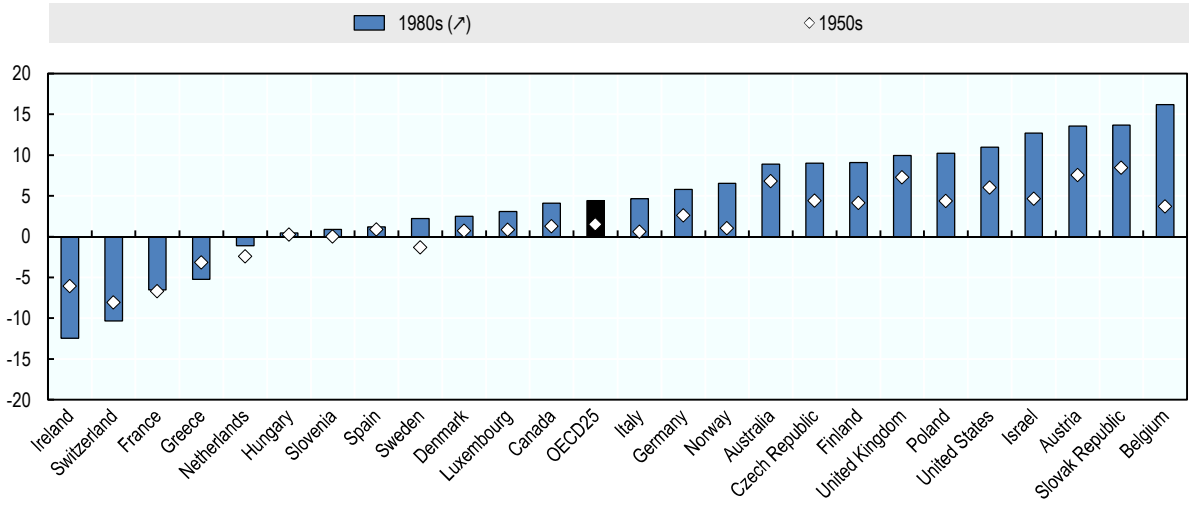
How has income inequality evolved across generations?

Income inequality in OECD countries is at its highest level for the past half century. The average income of the richest 10% of the population is about nine times that of the poorest 10% across the OECD, up from seven times 25 years ago.[6] Only in Turkey, Chile, and Mexico has inequality fallen, but in the latter two countries the incomes of the richest are still more than 25 times those of the poorest. Over the past few years, despite economic recovery in many countries, income inequality levels have remained at historically high levels. Income inequality is commonly measured by the Gini coefficient which scores 0 when everybody has the same income and 1 when all of the income goes to only one person. Across OECD countries, the average Gini coefficient of disposable household income was fairly stable between 2010 and 2014 just below 0.32.

In most OECD countries, income inequality has been rising from one generation to the next. Comparing people born in the 1920s and in the 1980s at the same ages shows a Gini increase of 4.4 percentage points, on average across the OECD. The increase is very large (i.e. greater than 9 points) in Belgium, the Czech Republic, Austria, Israel, the United States, Poland, the United Kingdom, Finland, the Slovak Republic and Australia (Figure 1.5). There are some exceptions, however: income inequality at the same age declined across generations in Ireland, Switzerland, France and Greece, mostly among people born between the 1920s and the 1950s.

Figure 1.5. Income inequality at the same age has increased from one generation to the next in most countries

Changes in income Gini coefficients at the same age across birth cohorts in percentage points, average across age groups, cohort reference = 1920s



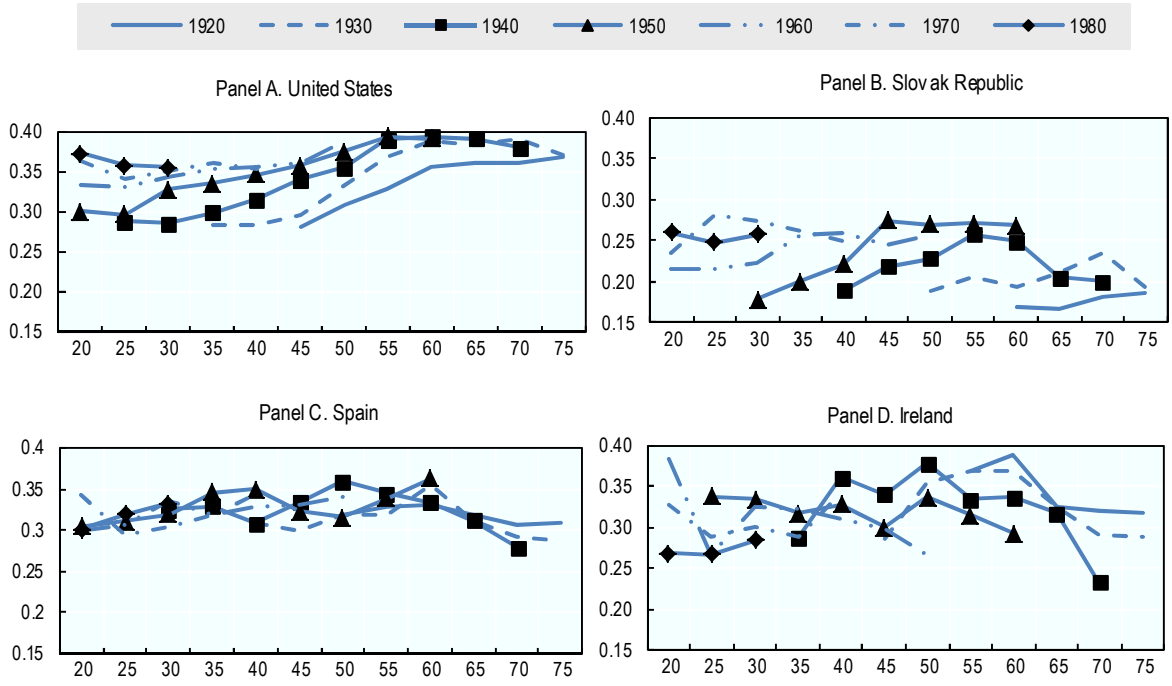
Note: The change in the income Gini coefficient at the same age across cohorts is estimated per country through cohort fixed effects controlling for age-group effects. Older cohorts tend to be observed at old ages only and younger cohorts at young ages.

Source: OECD calculations from the Luxembourg Income Study data.

StatLink http://dx.doi.org/10.1787/888933566134

Overall, income inequality at the same ages has thus increased across cohorts in about two-thirds of countries, has been about flat in one-sixth of countries and has declined in about one-sixth. For example, in the United States (Figure 1.6, Panel A), inequality has been rising for each age group from one cohort to the next, from already high levels for the oldest cohort. A similar pattern is seen in the Slovak Republic (Panel B), albeit at lower levels of inequality. In Spain (Panel C), however, inequality across cohorts at the same ages has been relatively stable. Ireland, in Panel D, provides a counter-example with declining income inequality across cohorts.

Figure 1.6. Income Gini coefficient by cohort and age groups in four selected countries



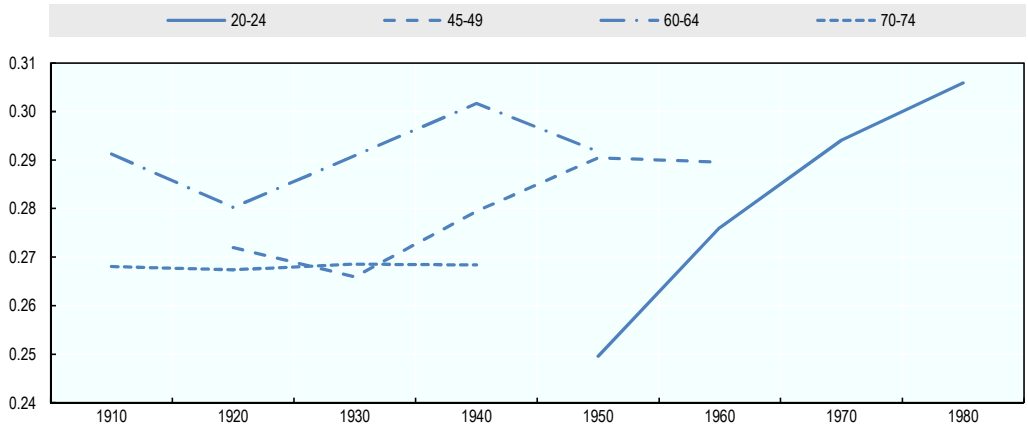
Source: Calculations from the Luxembourg Income Study covering 25 OECD countries.

StatLink http://dx.doi.org/10.1787/888933566153

Moving from the average across ages, as illustrated above, to specific age groups shows that the younger age groups are now the most unequal.[7] Figure 1.7 shows that, on average across countries, income inequality among those aged 20-24 is about 6 percentage points – or about 24% – higher for the generations born in the 1980s than it was for those born in the 1950s. Some major trends, such as the development of education and changes in household structures across generations, are likely to have influenced these developments. Inequality in middle age (45-49 years), also increased especially between the generations born from the 1930s to the 1960s; for older age groups, by contrast, it remained broadly stable. This means that inequality among people starting their working life is now already much higher than among today's elderly, which is in stark contrast to patterns observed in the past.

Figure 1.7. High income inequality for youngest cohorts at the start of their working life

Gini of income by age groups for different birth cohorts



Note: The pattern for each cohort is estimated using age and country fixed effects to control for the unbalanced nature of the data. The above chart shows the age effects. For example, on average across countries, the Gini coefficient among those aged between 20 and 24 years increased from 0.250 for those born in the 1950s to 0.306 for those born in the 1980s.

Source: OECD calculations from the Luxembourg Income Study data.

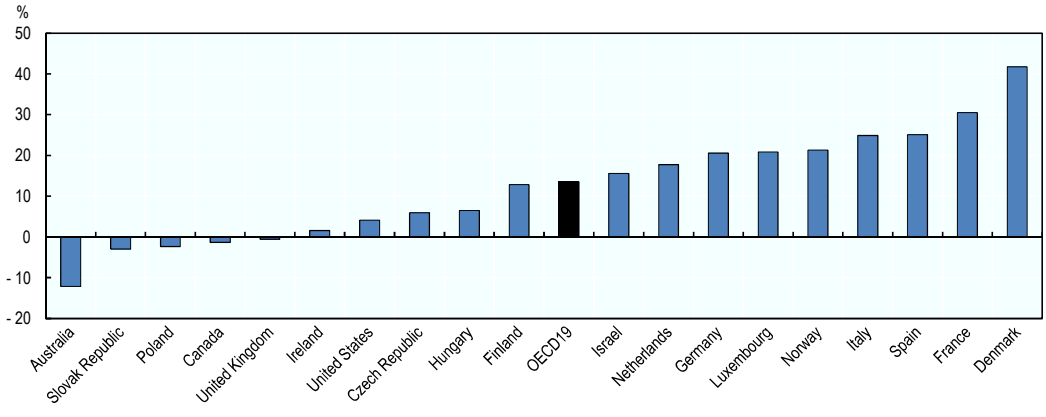
StatLink http://dx.doi.org/10.1787/888933566172

Poverty risks are shifting from the old to the young

Compared to younger age groups, the economic situation of older people has improved over past decades. Figure 1.8 shows that since the mid-1980s the income of the group aged 60-64 grew by a cumulative 13% more than that of the 30-34 age group, on average across countries. The income shift benefited older people in most countries for which data are available, except in Anglo-Saxon countries, the Slovak Republic and Poland. The relative position of older people has improved especially in Italy, Spain, France and Denmark.

Figure 1.8. Real income growth was faster for the older age groups

Change in relative income of 60-64 vs 30-34 between the mid-1980s and the mid-2010s



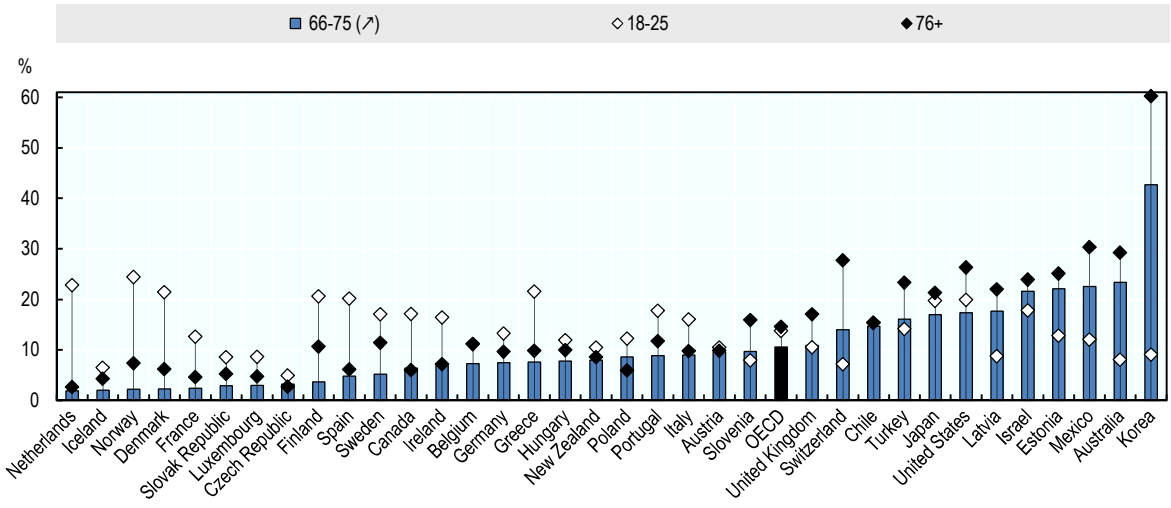
Source: OECD computations from the Luxembourg Income Study data.

StatLink http://dx.doi.org/10.1787/888933566191

Poverty risks have shifted from older to younger groups in most OECD countries since the mid-1980s (Chapter 3). Relative poverty rates have steadily increased for youth aged 18-25 years, reaching 13.9% on average across the OECD. Pensioners, by contrast, have been relatively protected from negative income shocks since 2007-08, except in countries where the crisis hit hardest. The poverty rate for those aged 66-75 years today is 10.6% on average across OECD countries, against 11.4% for the whole population (Figure 1.9).

It should be noted, however, that those older than 75 are still the most vulnerable with an average poverty rate of 14.4 %. More than one in five people above 75 are poor in Japan, Latvia, Turkey, Israel, Estonia, the United States, Switzerland, Australia, Mexico and Korea.[8] Among OECD countries, old-age poverty rates are closely related to the poverty rate for the whole population, except in Australia, Korea and Switzerland where the old-age poverty rate is much higher.

Figure 1.9. Relative poverty rates by age group, 2014 or latest year available



Note: Poverty rates are defined at half the median-equivalised income. Data refer to 2014 for the Netherlands, Finland, Hungary, the United States, Israel, Mexico, Australia and Korea; to 2012 for New Zealand and Japan; and to 2013 for all other countries. For the OECD average, the poverty rate is 13.9% for the 18-25 and 14.4% for the 76+.

Source: *OECD Income Distribution Database.*

StatLink http://dx.doi.org/10.1787/888933566210

2. How disadvantage becomes entrenched: Compounding inequalities over the life course

Ageing unequally starts early and builds up from childhood to old age. This section shows how inequalities in different dimensions, such as education, health, employment and earnings, reinforce each other and evolve over the life course. Children who are healthy and living in a safe and nurturing environment perform better in school, reach higher degrees and have better chances of succeeding later on in the labour market. People with stable jobs and higher incomes, good access to health and other services are more likely to retire with adequate income. People with low quality jobs, low incomes and unstable careers, by contrast, tend to be in worse health and face higher risks of unemployment and poverty, and these disadvantages are passed on to the next generation.

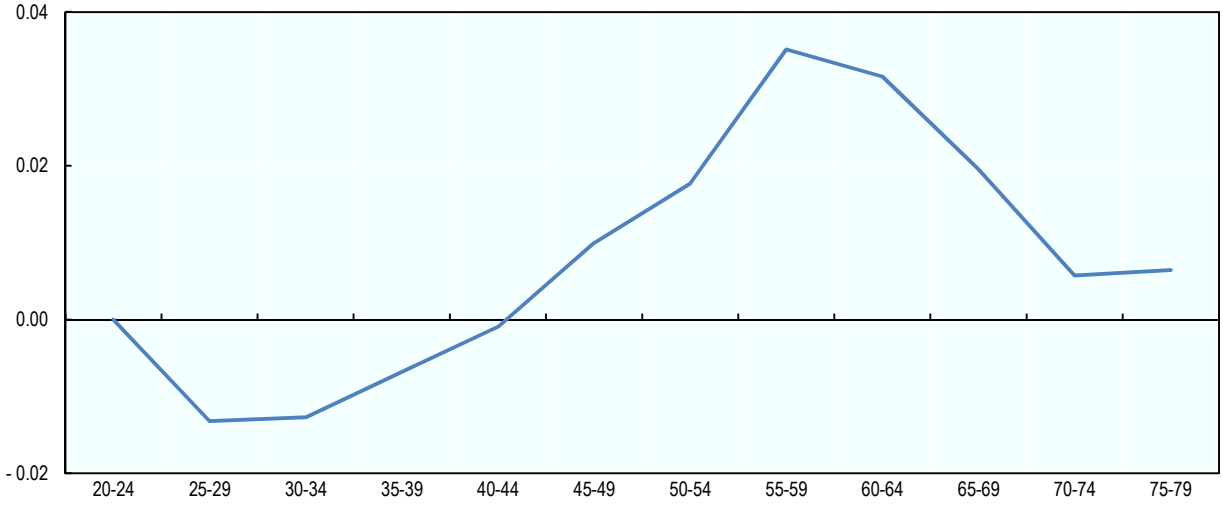
A look at income inequality over the life course

Income inequality, as measured by the Gini index, has typically been rising with age within the same cohort, peaking at about age 55-60, on average across cohorts and countries (Figure 1.10). Inequality generally then declines, dropping by about 3 percentage points at ages 75-79, which corresponds to a 10% reduction of inequality. This is consistent with the age-as-leveller (AAL) hypothesis, which states that inequality falls as older adults disengage from systems which perpetuate social strata, such as the labour market, and as pension systems tend to redistribute income to poorer retirees (Corna, 2013; OECD, 2015b).

Figure 1.10. Income inequality reaches a peak at age 55-59 over the life course for the same generation

Estimated age pattern within cohorts of the Gini index of income, average across cohorts and countries

Reference age group = 20-24



Note: The age pattern is estimated using cohort and country fixed effects. On average across countries and cohorts, the Gini index falls between the 20-24 and the 25-29 age groups and then reaches a peak at age 55-59 at a level which is 3.5 points above that at age 20-24.

Source: OECD calculations from the Luxembourg Income Study data.

StatLink http://dx.doi.org/10.1787/888933566229

Early childhood is the starting point for lasting disadvantage

Early-life health and socio-economic conditions lay the foundations for people's future and are important predictors of future well-being (Dannefer, 2003; George and Ferraro, 2016). Material, physical, and educational factors as well as living arrangements and the composition of families are important factors for child well-being. Disadvantages in these dimensions reinforce each other.

Children aged between 11 and 15 years from poorer families are more likely to report poor health (18%) than those from affluent families (11%),[9] and show a rate of overweight that, at 22%, is 1.5 times the level among children from richer families (Inchley et al., 2016). Child poverty can damage brain development and reduce learning outcomes later on in life. The brain develops rapidly in the earliest years of life, and its capacity to adapt and develop slows with age. A five-year-old's level of self-regulation, oral language and communication, numeracy, fine motor skills, locus of control and

social skills are predictive of their later outcomes in terms of employment, income, educational attainment and health (Schoon et al., forthcoming). Social and non-cognitive skills (e.g. personality traits, self-confidence and self-control, pro-social behaviour) also develop early; these skills are particularly important to adapt in the new world of work (Kautz et al., 2014).

Evidence for the United States suggests that the gap in child outcomes between poorer and richer households has widened over time, mainly as a result of growing investment of time and resources by richer parents in the education and *extra-curricular* activities of their children (Putnam, 2015). A striking example of the divide between poor and affluent children is the development of a large "vocabulary gap" already at a very young age: children growing up in poor neighbourhoods and/or from lower-income families in the United States may hear up to 30 million fewer words than their affluent counterparts by age three (Fernald et al., 2013). Children from more affluent families tend to develop better skills in reading and problem solving, are less likely to drop out of school without a diploma, and are more likely to complete tertiary education.

The mechanics of working-age disadvantage: links between health and labour market outcomes

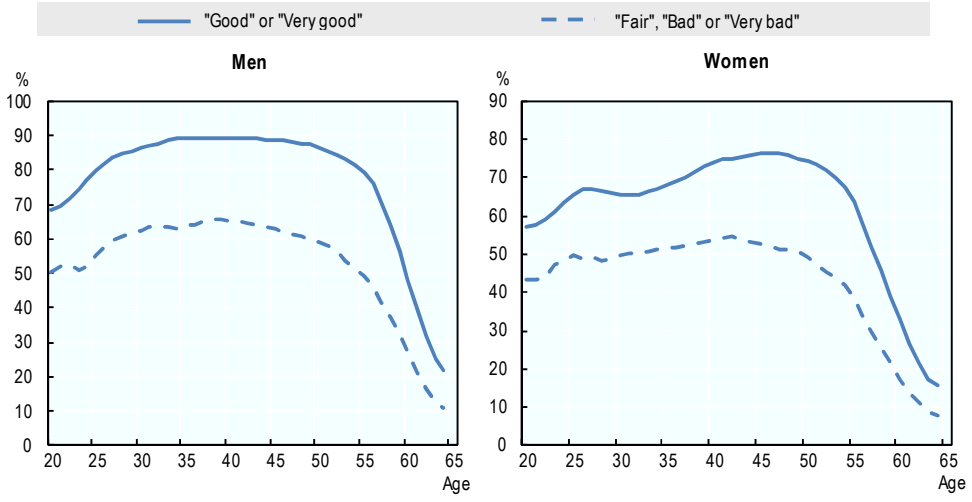
Inequalities in adulthood are driven by an interaction of factors related to education, health, employment and incomes. About one third of all surveyed persons in European countries, Australia, Korea and the United States and one fifth of those employed report having less than good health. Not surprisingly, people become sicker as they age. While only 11% of 20-year olds say their health is less than good, this share rises to 58% at age 64; for those who are employed, the respective shares are 8% and 39%.

Figure 1.11 shows the differences in employment rates and hourly wages along health status for both men and women. At all ages, men and women in bad health work less (Panel A), and earn less when they work (Panel B). The health-wage gap widens with age, compounding disadvantage. Indeed, healthy workers, in particular males, see their wages increase more steeply with age (Panel B). Health-employment gaps – in percent – are three times larger than health-wage gaps, on average. They are broadly stable until the age of 45, at around 25-35% for both men and women. After age 55, employment falls sharply for men and women both in good and bad health, but the gap widens to more than 50% from age 60.

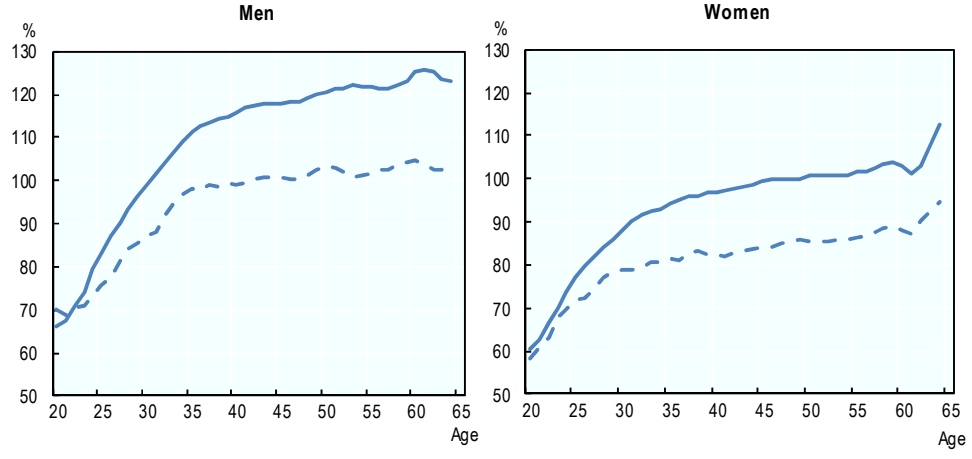
This association between health and labour market outcomes cuts both ways: health problems can cause problems at work and trigger earnings losses, but work can also damage people's health. Health affects earnings and employment through its impact on educational attainment, and has on top a direct effect on labour market outcomes, which differs across educational groups. To disentangle the impact of health on employment and wages, the path of earnings between the age of 20 and 67 has been estimated, taking into account the wage and employment effects of bad health, for selected typical cases with different health status (bad versus good), education levels (low, medium and high) and gender.[10] Bad health is found to lower the probability of working for both men and women, and to reduce wages for men but not for women.

Figure 1.11. People in bad health work less and earn less at all ages

Panel A. Employment rate by gender, age and self-reported health



Panel B. Normalised hourly earnings by gender, age and self-reported health



Note: Individual hourly earnings are divided by the corresponding country-year mean and multiplied by 100.

Source: OECD calculations based on micro data covering 24 OECD countries including Australia, European countries, Korea and the United States (see text).

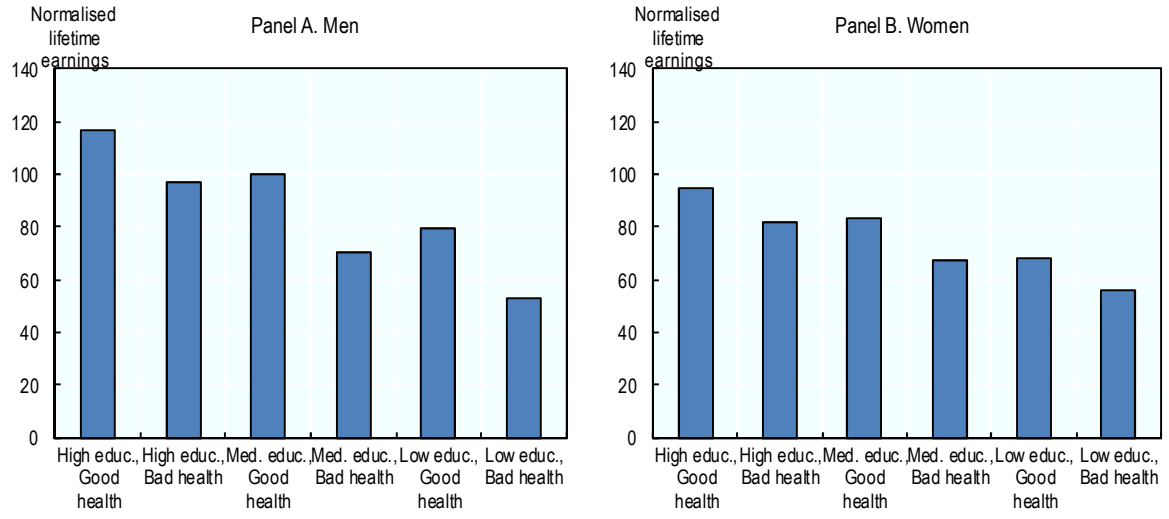
StatLink http://dx.doi.org/10.1787/888933566248

Figure 1.12 shows lifetime labour earnings for different typical cases, taking as a baseline the lifetime earnings of medium-educated men in good health. Employment risks due to bad health are factored in but otherwise those typical cases assume that individuals work a full career. Low-educated people's earnings are affected the strongest by bad health, mostly due to employment losses. Over the whole career, bad health reduces lifetime earnings by 33 and 17% for men with low and high levels of education, respectively. The health effects are much smaller for women, at 18 and 13%, respectively, as employment risks due to bad health are more limited for female workers. Women's employment patterns depend more than men's on other factors, such as caring responsibilities, and less on their own health status, for example because their partner's income plays a greater role and due to less physically demanding working conditions.

Nevertheless, bad health lowers female's earnings, thereby compounding gender gaps (Figure 1.12). Women in good health with medium education start with a 16% lifetime earnings gap compared to their male peers. Being in bad health further reduces these women's lifetime earnings by 19%. Overall, a high-education (medium-education) woman with bad health has comparable lifetime earnings to that of a medium-education (low-education) woman with good health.

Figure 1.12. Impact of health on lifetime labour earnings by education level

Average across countries, 100 = Lifetime earnings for a man in good health with a medium education level



Note: Details about the estimated impact of bad health on labour market outcomes by gender and education level and about the computation of lifetime earnings are found in Chapter 2. Lifetime earnings are normalised such that a full-career medium-education man in good health has a real lifetime earnings of 100.

Source: OECD estimates.

StatLink http://dx.doi.org/10.1787/888933566267

Health disparities along socio-economic lines increase with age until around the mid-60s and then decline at older ages (Herd, 2006). However, less advantaged groups of people tend to die earlier on average (and participate less in surveys due to health limitations), potentially leading *ceteris paribus* to a reduction of inequality among those who survive to older ages. Most studies find that correcting for this selective mortality weakens but does not eliminate completely the decline of health disparities beyond a certain age.

Making the work-to-retirement transition

The transition from work to retirement is a decisive moment which can reinforce and cement inequalities. Identifying and quantifying the obstacles that prevent people in different socio-economic groups from working longer is thus essential. Not all retirement is voluntary and many workers leave the labour market before having full pension rights, running the risk of low retirement income and old-age poverty.

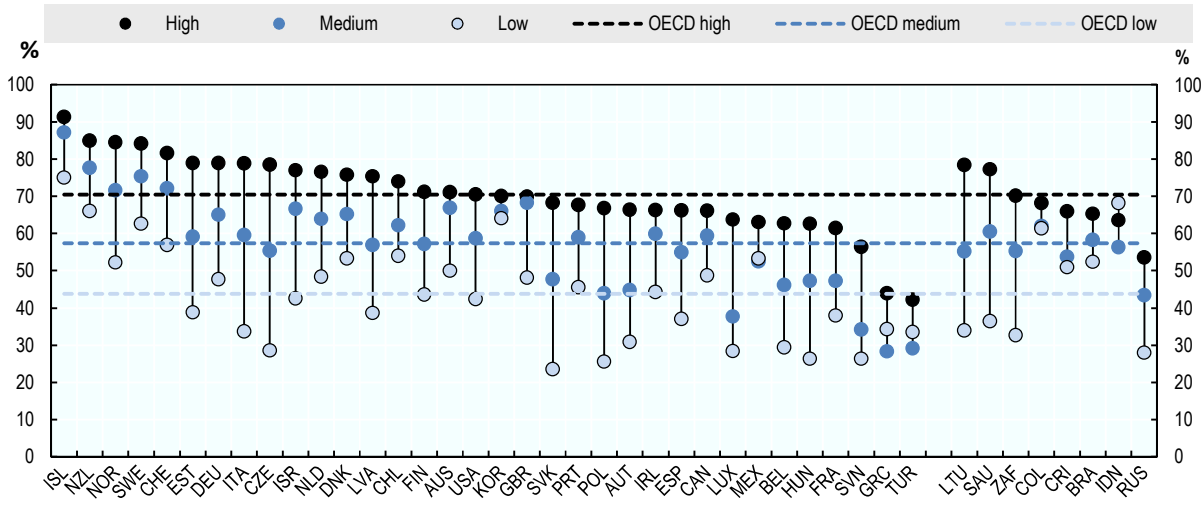
While life expectancy at age 65 was increasing rapidly between the mid-1970s and the late 1990s, the average effective labour market exit age fell by more than four years,

on average in OECD countries. Since 2000 the trend has been reversing in most countries, but workers still leave the labour market earlier than they did 40 years ago.[11]

Labour market participation differs strongly across age groups, educational levels, gender and countries, even when remaining life expectancies are similar. Health *at a given age* is significant for the retirement decision: about 26% of men and women who are in work four years before the normal pension age are likely to retire at least two years early when they are in bad health, compared with 14% of those in good health.[12] But health limitations only explain part of the sharp decline of employment rates from age 55; other factors are also at play reducing participation of older workers, especially those with lower socio-economic status. A workers' education level influences the retirement decision as well. Low-educated people are found to be more likely to retire when they reach the retirement age whereas higher-educated people tend to work longer. The strong effect of educational background over the lifetime is illustrated by the employment rates of older workers, as shown in Figure 1.13, which average 44% for low-educated older workers and 70% for those with high education.

Figure 1.13. Employment rates of population aged 55-64 by educational group

Percentage of the population, 2015 or latest



Source: Calculations from the *OECD Education Database*.

StatLink http://dx.doi.org/10.1787/888933566286

3. When I was your age: How employment and income patterns are changing across generations

Employment pattern across generations

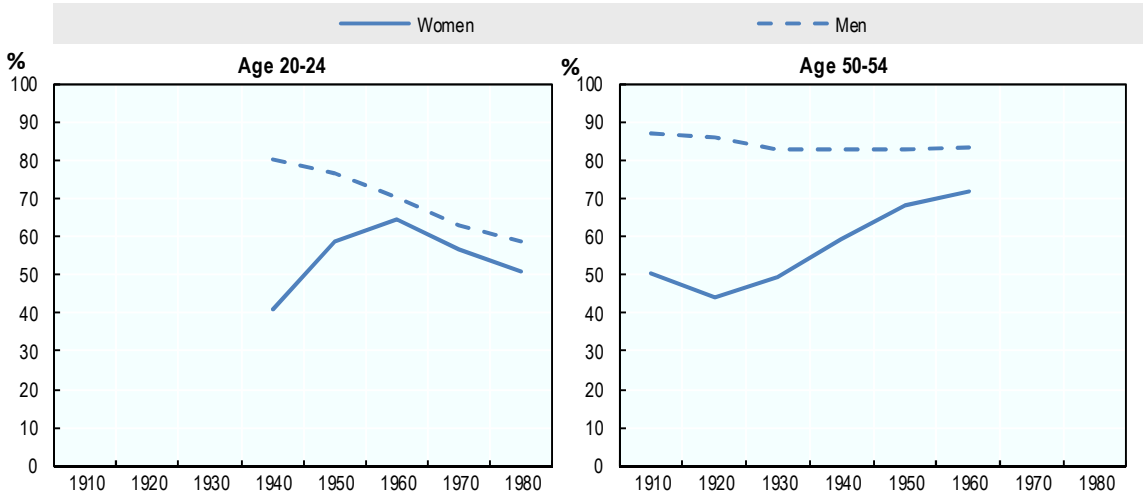
Work patterns vary significantly between generations. Overall, employment rates at the same age across cohorts increased substantially for those born until the 1960s, mostly thanks to more women in work. Male employment rates at younger ages (20-24 years old), by contrast, have steadily declined across cohorts on average in the OECD (Figure 1.14, Panel A). Young female employment rates increased sharply for those born before 1970, and then fell at a similar pace, consistent with greater

participation in higher education and high rates of youth not in education, employment or training (NEET) in recent decades.

For men born since 1930, the average employment rate of age group 50 to 54 has been stable while it has sharply increased for women in the same age group, resulting in an average gender gap of about 10 percentage points for those born in the 1960s (Panel B). Having more women in work has reduced overall income inequality, even though there are large employment gaps between high- and low-educated women (Harkness, 2013; OECD, 2015a).

Figure 1.14. Employment rates by gender across cohorts, at ages 20-24 and 50-54

Birth decades



Note: The cohort pattern of employment rates is estimated for each age group using country fixed effects to control for unbalanced panel data.

Source: OECD calculations from the Luxembourg Income Study data.

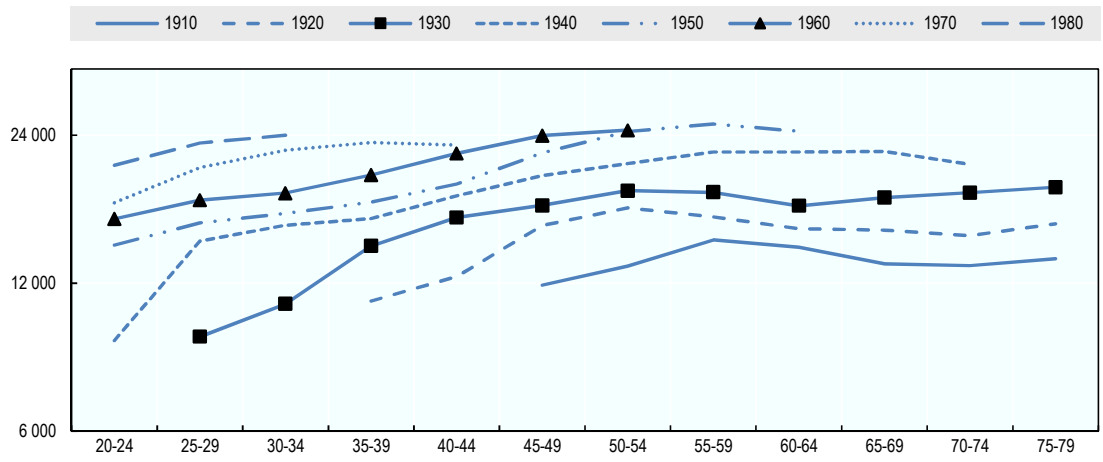
StatLink http://dx.doi.org/10.1787/888933566305

Income improvements across generations are losing steam

Income at the same age used to increase from one generation to the next. Figure 1.15 shows real average income by age groups for cohorts born from the 1910s to the 1980s.[13] Each successive cohort has been enjoying higher incomes than previous ones at the same age: for example, each birth decade between the 1910s and the 1950s had an income at age 60-64 that was on average 15% higher than that of the previous cohort. But the situation has changed: people born in the 1960s, who are now in their early fifties, have incomes which are not higher at the same age than those of the cohort born ten years earlier. The same applies to those born in the 1970s at age 40-44. This new pattern may well reflect the impact of the Great Recession, and the verdict is still out on whether this will result in persistently lower incomes of the affected cohorts.[14]

Figure 1.15. Substantial income gains at the same age across birth cohorts until recently

Age-cohort pattern of real disposable income, OECD average, 2010 USD PPP



Note: Data cover 21 OECD countries. However, due to quality issues, data from Mexico have not been used. To limit the biases from the unbalanced nature of the panel data then obtained, the series shown in the chart are derived for each cohort from specification with country and age fixed effects.

Source: OECD calculations from the Luxembourg Income Study data.

StatLink http://dx.doi.org/10.1787/888933566324

Looking beyond the averages, however, reveals large country variation. People aged 50-54 today, for example, have an average real income at least 5% greater than those born in the 1950s in the Slovak Republic, Slovenia, the Czech Republic, Poland and Australia. By contrast, the average income of this age group is more than 5% lower in Greece, the United States, Luxembourg, Spain and Hungary, compared to the previous cohort (Chapter 3).

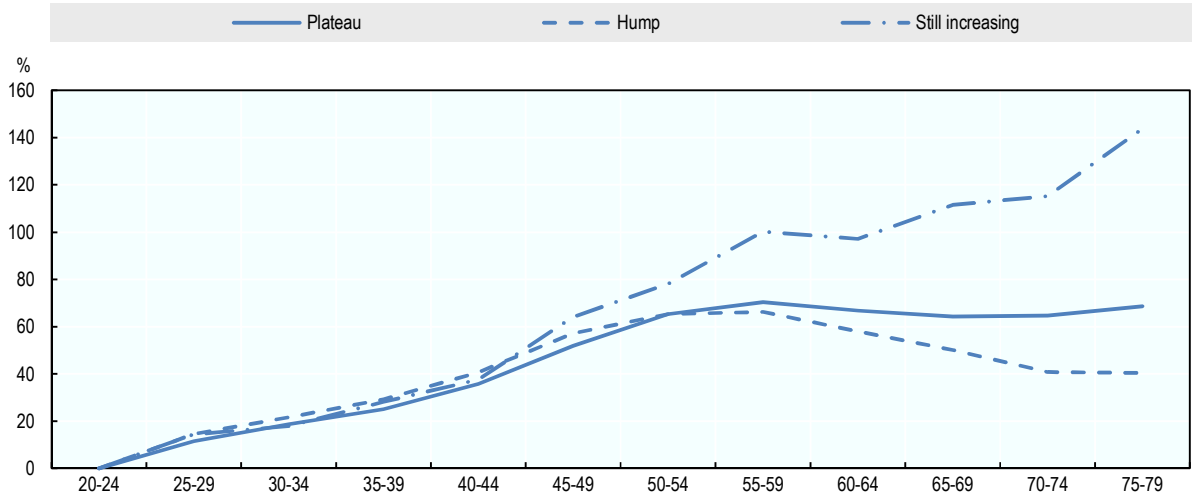
"When I'm 64": age and income within cohorts

Do people become richer *on average* as they age? For each cohort, real average income increased between age 20 and 55. From 1967 to 2013, across cohorts and countries real income grew by about 75% between the ages of 20-24 and 55-59 on average; thereafter income tended to plateau. However, income age profiles differ across countries (Figure 1.16).

Countries are here sorted into three groups, which all have a similar average increase until age 45-49. The first group ("plateau") includes Canada, Finland, Hungary, Israel, Italy, the Netherlands, Norway, Poland, the Slovak Republic and the United Kingdom; in this group, the income pattern at older ages is similar to the OECD average, with income plateauing after age 60. In the second group ("hump"), Australia, Austria, Belgium, Denmark, Slovenia, Sweden, Switzerland and the United States, average real income falls (for the same birth cohort) by about 0.9% per ageing year on average between ages 55-59 and 75-79.[15] In the third group ("still increasing"), the Czech Republic, France, Greece, Ireland, Luxembourg and Spain, individuals have gotten richer on average as they have aged with real income continuing to increase through older ages, at a fast pace of about 2% per year. Of course, incomes at older ages (between ages 55-79) are estimated on the basis of previous cohorts' progression so these profiles at older ages might not hold for the younger cohorts.

Figure 1.16. Real average income within cohorts diverge after age 50 across countries

Average changes for the same cohort per country group from age 20-24



Note: The "Plateau" group is made of Canada, Finland, Hungary, Israel, Italy, the Netherlands, Norway, Poland, the Slovak Republic and the United Kingdom. "Hump" is Australia, Austria, Belgium, Denmark, Slovenia, Sweden, Switzerland and the United States, while the Czech Republic, France, Greece, Ireland, Luxembourg and Spain are part of the "Still increasing" group. The analysis is based on country, age and cohort fixed effects.

Source: OECD calculations from the Luxembourg Income Study data.

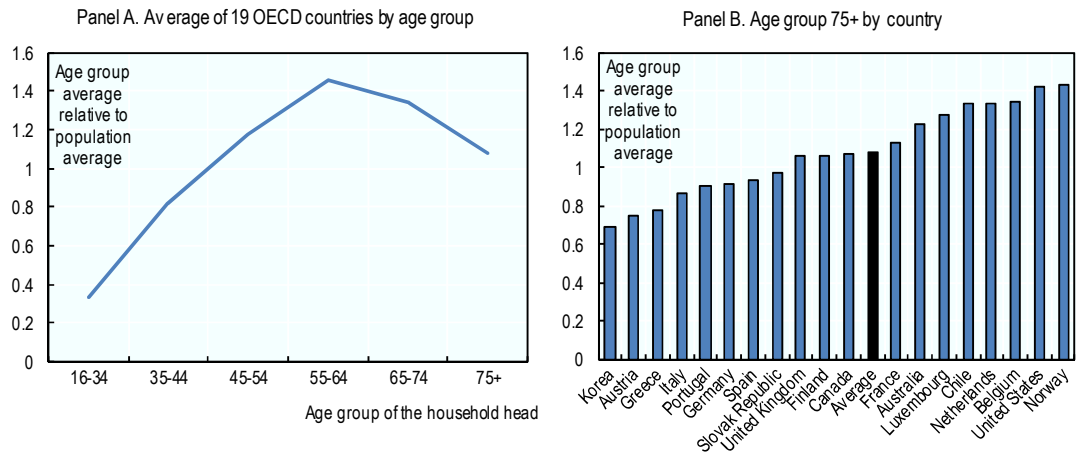
StatLink http://dx.doi.org/10.1787/888933566343

Wealth, as a complement to income, is also important to capture households' capacity to deal with negative shocks. It is also a critical factor for the accumulation of inequality over the life course, given that wealth inequality is typically much larger than income inequality (Murtin and Mira d'Ercole, 2015). Unfortunately, data limitations are substantial, not allowing for a thorough analysis of wealth disparities across cohorts. Available data, however, do allow comparing average wealth across age groups for a recent period – thus corresponding to different cohorts – for 19 OECD countries.

Based on these data, wealth in 2010 grew by a factor of 4.4 on average from the age group of 16-34 years to a peak reached at ages 55-64 (Figure 1.17, Panel A). This increase suggests that, in addition to receiving bequests and inter-vivo transfers, households use a substantial part of their income to build up wealth during their working life, replicating patterns of income inequality in wealth distribution.

Figure 1.17. Mean household net wealth in different age groups

Age group average relative to population average, 2010 or latest available year



Note: Panel A shows an unweighted average of the 19 OECD countries for which data is shown in Panel B. Data of Euro countries and the United States refer to year 2010, Chile to 2011, Australia, Canada and the United Kingdom to 2012 and Korea to 2013. The age group refers to the age of the household head.

Source: *OECD Wealth Distribution Database* (accessed 11 May 2017).

StatLink http://dx.doi.org/10.1787/888933566362

During retirement the average wealth declines due to the loss of labour earnings in old age and due to transfers made to their offspring. In 2010, those older than 75 years owned 26% less wealth than households at the peak age of 55-64, on average, across 19 OECD countries, but their wealth was still 8% greater than for the total population (Panel B). In Korea, Austria and Greece, however, the elderly had a much lower wealth than the total population (at least 20% less) and a much higher one in the United States and Norway (more than 40% above).

4. Equal in old age? Income, living standards and well-being in retirement

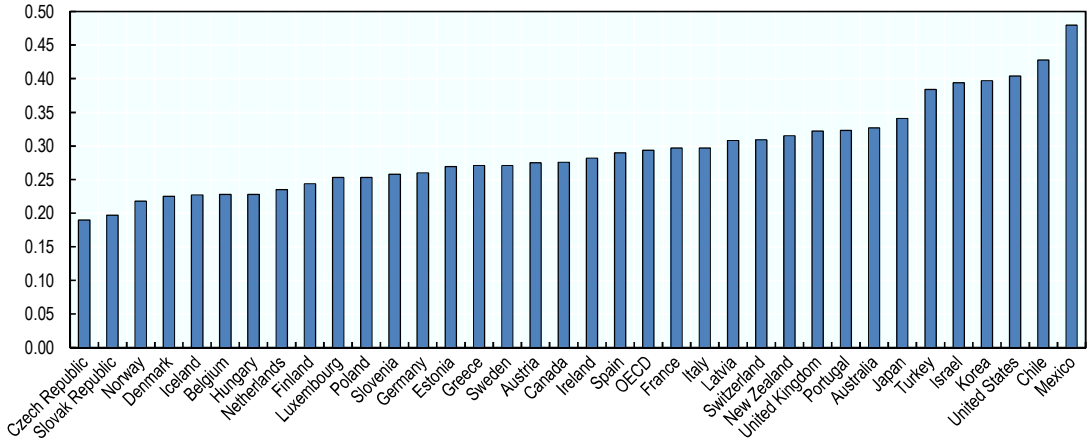
The future elderly population will become more diverse; people will live longer but more will have experienced some period of unemployment during their working lives and more will have earned low wages, while others will have enjoyed higher, stable earning paths. Old-age and care support systems will therefore likely have to cope with significantly higher inequalities, boosting the demand for more redistribution through pension policies, at least in some countries.

Focusing on income inequality and poverty at older ages

Assessing future risks of unequal ageing must start with a look at the situation today. Income inequality among the 65+ group, as measured by the Gini index, varies from about 0.20 in the Slovak Republic, the Czech Republic, Denmark and Norway to more than 0.40 in Israel, the United States, Korea, Chile and Mexico (Figure 1.18). In general, old-age income inequality in OECD countries is closely related to overall income inequality.[16] As shown in Section 1 above, old-age income inequality has been fairly stable across cohorts, suggesting that the improvements of older people's living standards in past decades have been well shared among retirees.

Figure 1.18. Income inequality among those older than 65 years varies widely across countries

Gini coefficient, 2014 or latest year



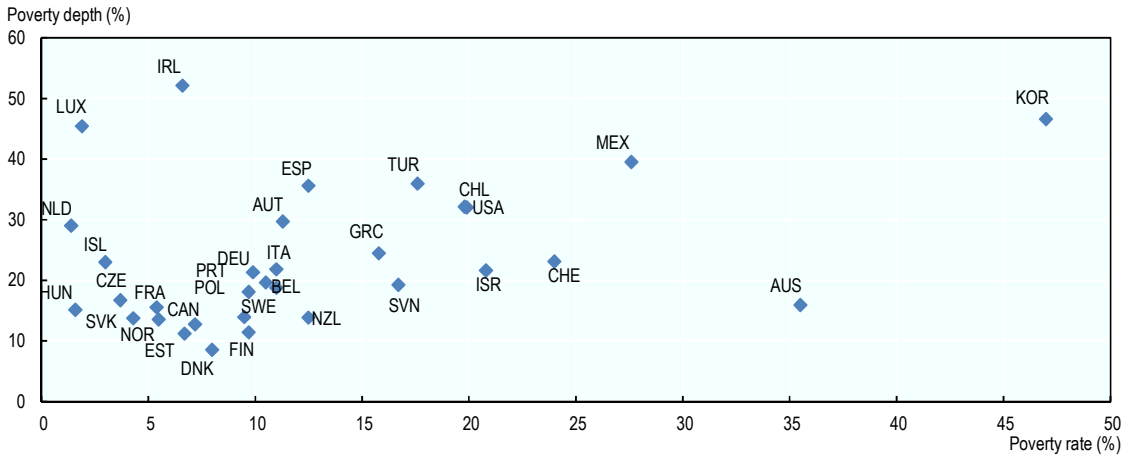
Source: OECD Income Distribution Database.

StatLink http://dx.doi.org/10.1787/888933566381

To gauge how poor older people are it is important to look at both the number of people concerned and at the depth of poverty, measured as the percentage by which the average income of the poor falls below the poverty line. Figure 1.19 presents both indicators: the old-age poverty rate and the depth of poverty for those older than 65 years. Poor older people's average income is 23% below the poverty line, on average in OECD countries. Korea stands out as having both a high old-age poverty rate and deep poverty. In Chile, Mexico, Turkey and the United States the old-age poverty rate exceeds 15% and poverty depth is greater than 30%. In Australia, poverty among older people is not deep despite a high poverty rate. By contrast, Ireland, Luxembourg and the Netherlands have low poverty rates, but the poor in these countries suffer from a large income gap on average.

Elderly women, especially those living alone, are among the most vulnerable groups. About 10% of women aged between 66 and 75 years had incomes below the poverty level, on average across countries against 7% for men. This gender poverty gap is below 0.5 percentage points in a few countries only: Belgium, Canada, France, Greece, Iceland, Ireland and Luxembourg. Women above 75 are even more at risk, with more than one in four being below the poverty line in Latvia, Estonia, Switzerland, the United States and Israel.[17]

Figure 1.19. Old-age relative poverty rate and poverty depth, 65+



Source: OECD Income Distribution Database.

StatLink http://dx.doi.org/10.1787/888933566400

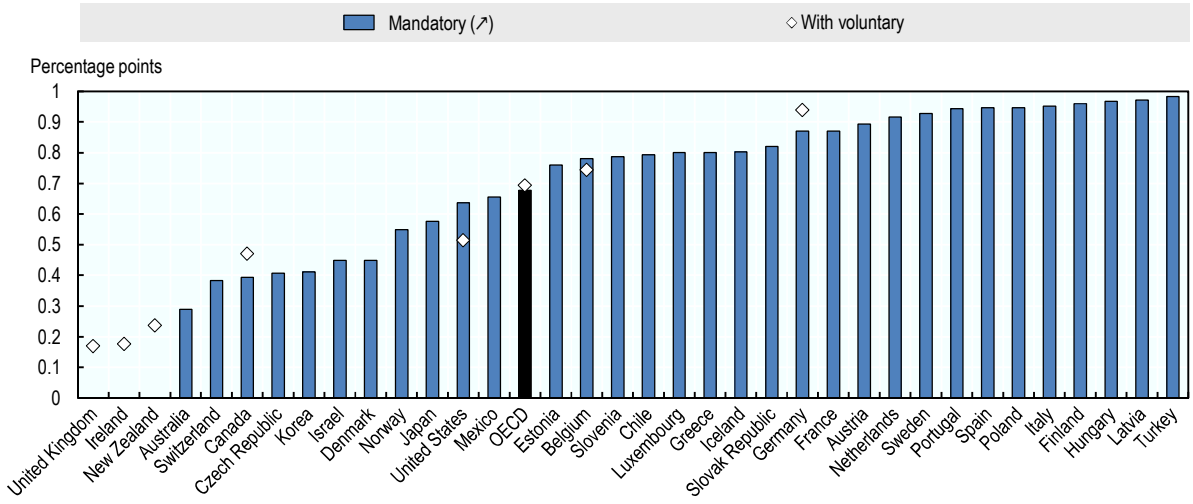
Pension systems: Equalising or widening income inequalities?

Old-age income arrangements obviously play an important role in fighting pensioner poverty and inequality. In many OECD countries, workers with low earnings (half the average wage) face poor old-age income prospects, even when they have worked and earned entitlements over a full career. They can expect net pension replacement rates (i.e. the level of the net pension received when entering retirement as a ratio of previous net earnings) from mandatory pension schemes below 60% in ten OECD countries (Mexico, Chile, the United Kingdom, Japan, Germany, Poland, the United States, Sweden, Slovenia and Canada), against an OECD average of 74% (OECD, 2015b). In G20 emerging economies, low-income workers also have poor pension prospects in Indonesia (14%) and South Africa (22%). In all of these countries, individuals who were disadvantaged in working age are likely to become very vulnerable in old age. In some countries, the situation is particularly critical for women. For example, in Chile, pension annuities are computed with gender-specific mortality tables, resulting in even lower pensions for women due to their higher life expectancy;[18] in Australia and Indonesia, lump sum payments are predominant, which implies that people who can expect to live longer – women in that case on average – have to rely on that lump sum for a longer period.

Achieving full careers is becoming increasingly uncertain in today's labour markets. Box 1.1 shows the impact of incomplete careers on pension benefits. Even for full-career workers, in most pension systems, higher wage inequality will translate into higher pension inequality, especially where there are tight links between contributions and benefits. On average, across countries, on top of any income from private savings accumulated during the working life, about two-thirds of lifetime earnings inequality is transmitted to old-age pensions. Where pensions are paid at a flat rate, i.e. regardless of past earnings, such as in New Zealand, the United Kingdom, and Ireland, higher wage inequality will not affect the pension distribution. However, when voluntary pensions in these countries are considered, 20-25% of wage inequality could be transmitted to pensions. By contrast, more than 85% of wage inequality is passed on to pension inequality in Turkey, Latvia, Hungary, Finland, Italy, Poland, Spain, Portugal, Sweden, the Netherlands, Austria, France and Germany (Figure 1.20).

Figure 1.20. Impact of an increase in wage inequality on pension inequality

Percentage point change in the Gini index of pension for a 1 percentage point increase in the Gini index of wages, full-career case



Note: Simulations are based on common earning distribution across countries and a shift from a Gini coefficient of 0.35 to 0.38. See Chapter 5 for details and for the computation of the pension progressivity index. The graph refers to gross (i.e. pre-tax) earnings and pension benefits.

Source: Computations based on the OECD pension model.

StatLink http://dx.doi.org/10.1787/888933566419

But socio-economic inequalities in life expectancy also need to be taken into account. Shorter lives of low-educated, poorer pensioners reduce their cumulated benefits proportionally more, regardless of the pension system. When the average three-year gap in life expectancy between low- and high-educated people at age 65 is considered, the pension wealth (the discounted stream of pension payments over retirement) of low-income individuals, relative to that of high-income retirees, falls further by about 12%, on average across countries (Chapter 5).

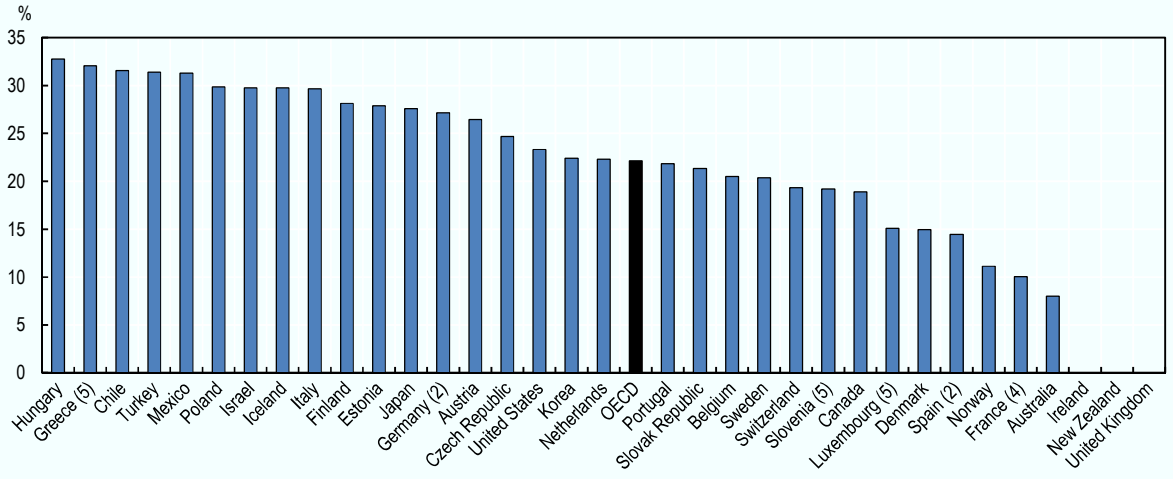
As a consequence, raising the retirement age will affect low-income workers proportionally more than higher-income workers. These losses are, however, relatively small: if retirement ages were effectively increased by three years between 2015 and 2060, the relative pension wealth of the low-income versus high-income groups would be reduced by 2.2% on average across countries, when only taking into account differences in life expectancy.[19]

Box 1.1. Impact of incomplete careers on pension benefits

Workers with incomplete careers due to late entry or career breaks will usually receive lower pensions, especially in systems where there is a tight link between pension benefits and lifetime wages. Workers with non-standard jobs and weak attachment to the labour market have thus become more vulnerable. Figure 1.21 illustrates how much workers on average earnings would lose in pension benefits from mandatory schemes due to a delayed entry into employment by five years and ten years of unemployment, compared to the standard worker with a full career. The biggest drops, of about 30% or more, would occur in Japan, Hungary, Greece, Chile, Turkey, Mexico, Poland, Israel, Iceland and Italy. Without any mechanism to offset those shocks, i.e. on a pure actuarial basis, this would imply a drop of about 35% in pension benefits. The projected drop using legislated pension rules is 22%, on average, across countries. This means that about 37% [=(35-22)/35] of the labour market difficulties in this extreme case are offset by various redistributive/stabilisation devices.

Figure 1.21. Loss in pension benefits due to incomplete careers, average-wage workers

Entry at age 25 with 10-year unemployment versus full career from age 20



Note: The numbers in parenthesis in the country labels indicate the extra years individuals with incomplete careers need to work to access a full pension, i.e. without actuarial penalty although the pension might be lower than for a full-career worker. The incomplete-career case is based on entry at age 25 versus 20 in the baseline with a ten-year unemployment period between age 35 and 45.

Source: For the full-career case, the source is OECD (2015b) and OECD computations for the career-break case, both based on mandatory schemes.

StatLink http://dx.doi.org/10.1787/888933566438

Access to health services is not the same for everyone

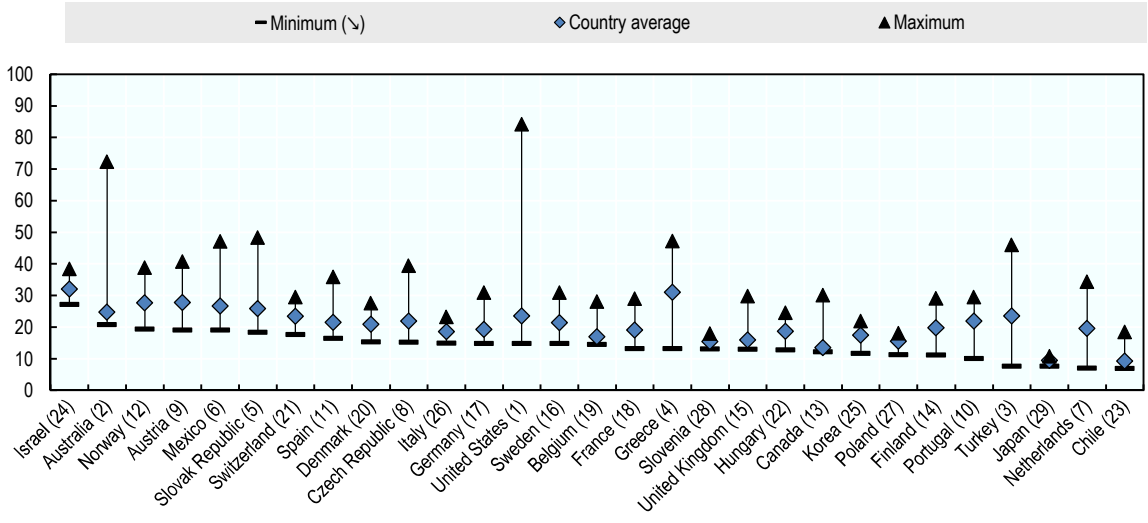
Access to health care may be prevented for a number of reasons related either to the functioning of the health care system itself (like the cost of a doctor visit or medical treatment, the distance to the closest health care facility, or waiting lists) or to personal reasons (like fear of not being understood by the doctor or not having the time to seek care). OECD (2015c, Figure 7.6) shows that unmet care needs for financial reasons are consistently higher within OECD countries among low-income people compared with high-income people. Any inequalities in unmet care needs are likely to result in larger health inequalities.

Access to services, in particular health services, also varies strongly by regions, as shown for example by the number of active physicians and hospital beds available to older people (Figure 1.22). The United States, Australia and Turkey have the largest regional (TL2) differences in the number of active physicians per 1 000 older people. Moreover, very low levels of physicians per 1 000 older people are found in O'Higgins (Chile), Iwate (Japan), Zeeland (Netherlands) and Western Black Sea – Middle and East (Turkey), where the number of physicians were below 10 per every 1 000 older people in 2014.

In 2014, Canada, Poland, Turkey, Portugal and the United States had the largest regional disparities in the density of hospital beds per 1 000 older people. While regions such as West Pomerania (Poland) and Kyushu, Okinawa (Japan) had more than 50 hospital beds per every 1 000 older people, hospital bed density was below 10 per 1 000 older people in Coahuila (Mexico) and Central Greece. Such large disparities undermine the timely and adequate delivery of services and create unequal health care outcomes within countries.

In emerging economies urban and rural areas differ strongly in access to health services (OECD, 2017a). Rural residents typically face challenges in getting medical care and support services due to long and sometimes difficult travel and few health care facilities. Furthermore, rural patients may be on average older, poorer, less educated and less likely to have insurance.

Figure 1.22. Regional disparity (TL2) in the number of active physicians per 1 000 older people, 2013



Note: Latest available years: Chile and United States 2009; Belgium, Canada, Japan and Luxembourg 2010; Greece and Mexico 2011; Australia, Israel, Italy and Sweden 2012. Number in brackets indicates ranking according to range. For example the United States is the country with the largest regional difference, measured by the gap between the regions with the maximum and the minimum ratio of active physicians.

Source: Calculations based on *OECD Regional Database*.

StatLink http://dx.doi.org/10.1787/888933566457

How the oldest old are faring: living conditions and well-being of the 80+

The elderly are a group of particular concern. Their poverty risk is higher and they are more fragile and in need of support services than other groups of the population. The share of people aged 80 and over is projected to more than double by 2050 to 9.5% of the total population, on average in the OECD, but up to 16% in Japan and Spain. In 2015, the 80+ group accounted for less than 1% in Colombia, Indonesia, India and South Africa, but 8% in Japan.

Health status deteriorates with age. The elderly are more likely than any other age group to be affected by chronic diseases or disabilities. A large share of people aged 80+ report risk factors that threaten their health, such as smoking and overweight, but this varies strongly by gender and country. Already today, a large proportion of the elderly are overweight in many countries. One in five men aged 80+ are obese in England and Slovenia, and the proportion is even higher for women in the Czech Republic, England, Estonia and Spain.

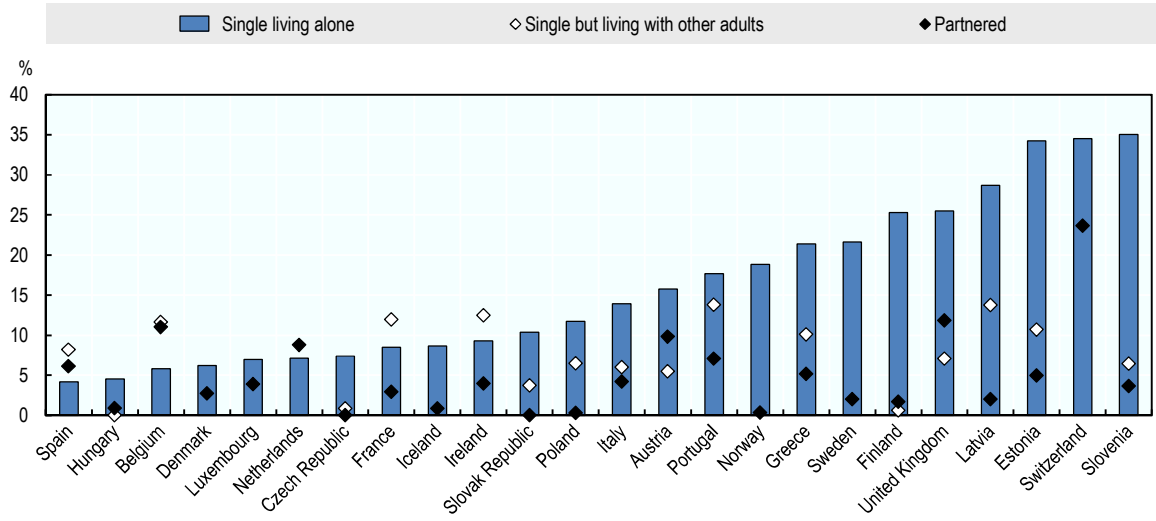
While most elderly age without severe disabilities, physical and mental dependency becomes more likely with age. More than 40% of the 80+ face some mobility limitations. Depression is frequent among them in England (57% for men and 70% for women), Italy (47 and 65%), for men in the United States (48%) and for women in Spain (60%). By contrast, it is relatively low among Danish, Dutch and Swedish older men, and among older women in Switzerland, the Netherlands and the United States. How the health status of the elderly will develop in the future, however, cannot be easily predicted. Rising overweight and obesity and more women smoking may result in worse health.

Material and subjective well-being of the elderly is also affected by family living arrangements and the availability of family carers. The number of the 80+ living in a separate household has increased in most OECD countries over past decades, due to better health and less co-residence of generations. Many countries have also taken measures to help the oldest people stay in their own homes and to support family carers (OECD, 2011b). About two-thirds of women older than 80 years live alone on average across countries, compared with about one-third for men.

In the vast majority of countries, the 80+ who live alone are much more likely to be poor than those who pool their income with other adults (Figure 1.23). But poverty rates of this group vary: more than one in three live in poverty in Estonia, Slovenia and Switzerland, but less than one in twenty in Hungary and Spain.

Figure 1.23. Poverty rates of the 80+ by family living arrangements

Percentage of the 80+ with an equivalised income below 50% of the median



Source: EU-SILC, 2014.

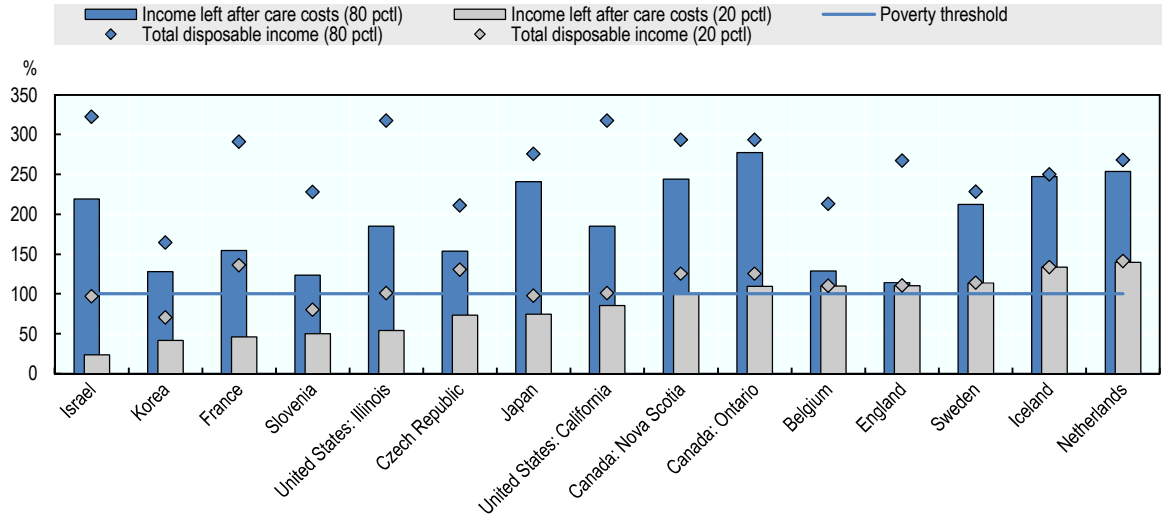
StatLink http://dx.doi.org/10.1787/888933566476

Support for the final years: Inequalities in long-term care

The impact of dependency is felt more acutely by people with lower socio-economic status. Not only are they more likely to develop disabilities and need long-term care (LTC), they also are less able to afford its costs. All OECD countries for which data are available provide some social protection to help pay for LTC, but the support varies. Someone with median income receiving home care for moderate needs in some US states may have as little as 6% of the cost of their care paid by the social protection system. This compares to about 45% in the Czech Republic and Israel and almost 100% in Sweden, Iceland and the Netherlands.

Figure 1.24 shows how the disposable incomes of older people in OECD countries relate to the poverty threshold, before and after they have paid out-of-pocket costs for moderate LTC needs through home care. In some countries, such as Slovenia and Korea, low-income older people (20th percentile of the income distribution) are already below the poverty threshold. These people are likely already struggling with the cost of living, yet they would need to spend around a third of their disposable income on LTC. Low-income older people in other countries, such as France[20] and the Czech Republic, are relatively better off, but would still have to pay out-of-pocket costs that would leave them well below the poverty threshold. In all of these countries, people with high incomes face larger absolute costs, but are able to afford them without falling into poverty.

Figure 1.24. Disposable income before and after care costs for people receiving home care for moderate needs in OECD countries, as a percentage of the relative poverty threshold



Note: Disposable income of home care recipients with moderate needs before and after their out-of-pocket contribution to care costs. "Moderate needs" denotes 22 ½ hours of care per week. The relative poverty threshold is half the median disposable income for the whole population. 20 pctl refers to 20th income percentile; 80 pctl refers to 80th income percentile. Percentiles refer to the distribution of disposable income among the over-65s in each country. Analysis assumes that people do not have savings which they can use to pay for care.

Source: Muir, T. (2017), "Measuring Social Protection for Long-term Care", *OECD Health Working Papers*, No. 93, OECD Publishing, Paris, http://dx.doi.org/10.1787/a411500a-en.

StatLink *http://dx.doi.org/10.1787/888933566495*

Meeting LTC needs through professional home care is therefore an unattractive option for low-income people in some OECD countries. However, in no OECD country for which data are available is anyone denied access to institutional care because their income is too low. Many OECD countries aim to help people with LTC needs to stay in their own homes for as long as possible, but inadequate social protection means this option is not always accessible to poorer people.

Informal care is not costless either as carers give up time for paid work or leisure. Caring can also affect health and employment prospects: informal carers have 20% more mental health problems than other people and are more likely to stop working or reduce their hours (OECD, 2011c). These costs are borne disproportionately by women, who make up between 55% and 70% of informal carers in OECD countries (OECD, 2015c). In low social protection countries (those spending less than 1% of GDP on publicly-funded LTC), women were 41% more likely than men to report providing daily informal care, against 23% in high social protection countries (i.e. spending more than 2% of GDP on publicly-funded LTC).

Changes in female labour force participation mean that younger generations of women are more likely to have full careers. In theory, this may reduce the number of women providing informal care and increase demand for LTC (see for example de la Maisonneuve and Oliveira Martins, 2013). However, patterns of care provision among current over-50s suggest that in practice women who have had full careers are no less likely to provide informal care than those who have spent ten or more years out of work (e.g. to raise a family). This suggests that, even as more women work full careers, they

will continue to provide large amounts of informal care, which might contribute to the long-term impoverishment of women. Adequate social protection and support for carers will be important in limiting gender disparities.

In emerging economies, families traditionally used to take care of their older relatives. While the elderly typically remain an integral part of the family unit, the family support system is not as robust as it used to be. As a consequence of decreasing birth rates and increasing mobility of the younger generations it is predicted to further erode (ILC Global Alliance, 2009). In addition, the larger cohorts that are advancing to older ages have been more exposed to risks related to non-communicable diseases, making them more vulnerable to disabilities that require LTC (World Bank, 2016). Combined with still nascent formal LTC systems, these developments are demanding a more rapid LTC policy response across emerging economies, including through public support for civilian-run care homes or strengthened community health care services.

China is one of the few examples among emerging economies where some LTC schemes already exist. In order to support residential care, for example, caregiver support services include short-term training on care skills and financial subsidies to caregivers (Peng, 2015). Communities have started to provide direct care services and subsidies in a range of specialised care centres as well as meal services for older people. Meanwhile, public institutions are extending their offer for example in terms of homes for the elderly in rural areas, hostels or hospices for older persons.

5. Policy implications: Preventing, mitigating, coping

This report shows that preventing ageing unequally requires a comprehensive policy approach to help individuals overcome disadvantages over their life course that could cumulate and result in low income and poverty at old age. This approach should take full account of the specific educational, labour market and health experiences of different individuals and cohorts. In the past, policies targeted to households best represented by the male breadwinner model with stable careers may have worked for a majority of people. But this is no longer the case. Policies to prevent inequalities from rising over the life cycle will need to take account of the new realities people are facing today in their families, in their workplace, in their careers and in their health and disability risks. As the analysis in this report shows, education, health and employment experiences interact and compound inequality. This also means that inequality-reducing policies in one area will spill over into other areas and thus generate greater total returns in terms of welfare than when the impacts are only considered in the area of the policy intervention.

Given that events over people's life courses shape their ageing experiences, policy efforts to limit old-age inequalities thus cannot rely only on policies targeted to the elderly. It is more efficient to pick up inequalities when they arise rather than try to remedy their consequences. This report therefore identifies crucial periods when risks of lasting disadvantage occur and proposes a range of policy interventions to prevent, mitigate and cope with inequalities over the life course. The OECD is also developing new tools to help policy makers address old-age inequality risks (Box 1.2).

Box 1.2. Policy foresight to support reforms addressing ageing unequally

The assessment of how current inequalities during the working age will pass into inequalities at older ages is enhanced by the availability of a dynamic microsimulation model that includes pension rules. Such a model projects the evolution of a representative cohort sample in terms of mortality, health, education and labour market status (see Chapter 4 for more details).

The OECD has partnered with the Schaeffer Center and the Centre for Economic and International Studies (CEIS), University of Rome Tor Vergata to develop a pilot Global Future Elderly Model (Global FEM). The starting point is the US Future Elderly Model or FEM. FEM is microsimulation model that is developed and maintained by the Schaeffer Center for Health Policy & Economics at the University of Southern California. FEM is a well-established model that has been used for many policy purposes ranging from the economic consequences of delaying disability and disease, to the long-term health outcomes of medical innovation, to the fiscal consequences of worsening population health, to financial risks in Medicare spending from new medical technologies. Similar to FEM, Global FEM tracks representative cohorts of Americans, Belgians and Italians over age 50 to project their health status and economic outcomes. Global FEM allows for complex interactions between multidimensional measures of health and economic outcomes. It begins with cohorts aged 50 where each member of the cohort enters the simulation with a lifetime income, work history and an initial health status. Then, members of the cohort age, changing their health status, labour market situation, claiming pension and finally dying.

The pilot Global FEM model has been developed for the United States, Italy and Belgium; it could be extended in the future to a broader set of countries with health and retirement surveys. The pilot Global FEM model has been used to compare the projected future impact of three different policy approaches that are each targeted to improving the health and longevity or the economic circumstances of elderly people. These include a policy initiative to address the development and progression of chronic disease; a training programme to improve the employability of older workers who have recently lost their jobs; and a pension reform to rise the official retirement ages.

An example of usefulness of the FEM is presented in the report released by the US National Academy of Science.* The FEM-based analysis shows the impact of growing gap in life expectancy by education and income deciles on lifetime entitlements to benefits from social security, disability insurance, Medicare and Medicaid benefits in the United States. The gap in estimated life expectancy between high-earning and low-earning women has grown from four years to more than 13 years for cohorts born between 1930 and 1960. For men this gap has grown from five to more than twelve years. The increases in the gap in life expectancy by socio-economic groups are due to gains for the high income quintiles, whereas the low income groups have not enjoyed the same improvements.

FEM enabled also the assessment of the impact of inequality in life-expectancy trends on social benefits. The gap in the present value of social-security lifetime entitlements between the top quintile of earners and the bottom quintile is projected to widen between women born in the 1930s and in the 1960s, with the increase representing roughly one-third of lifetime benefits of the lowest quintile.

*: National Academies of Sciences, Engineering and Medicine (2015), "The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses", National Academies Press, Washington, DC.

Preventing inequality before it becomes entrenched

Early-life interventions should be at the top of the policy agenda

Childhood circumstances affect education and later life health, as well as future labour market experiences and career progression. For example, effects from adverse health events early in life on health at older ages can be indirect, e.g. channelled through lower educational achievement and restricted life opportunities, and/or remain latent for a long period. As shown above, education heavily influences labour market outcomes, and fighting against academic failure requires a concentration of resources at an early age,

especially for disadvantaged children. In contrast, corrective measures at later stages have to overcome what may be more deeply entrenched problems (Heckman and Carneiro, 2003) and can produce benefits only over a shorter remaining period of life. Likewise, pension arrangements can correct some but not all of the inequality among the retirees that results from employment and earnings inequalities. Thus, substantial savings of public expenditure could be made if income, wealth, education and health inequalities were picked up earlier and addressed at younger ages. This section sets out a range of good practice policies which can help fight disadvantage in early childhood and school age; the list is not exhaustive, but focuses on key measures aimed at solving problems that are known to have a long-term impact.

Policies to support children's educational, health and material well-being must start in early childhood and be sustained throughout childhood (OECD, 2009 and 2011a). The pay-offs from investing early in children are enormous: US research suggests that each dollar invested in high quality programs before the age of five years yields a cumulative annual return of 13% at age 65 (Garcia et al., 2016), and that these benefits are especially large for children from a disadvantaged background. OECD Programme for International Student Assessment (PISA) data show that 15-year old students who attended pre-primary education for at least one year are likely to have higher maths scores than those who did not, the gap being equivalent to almost one year of formal schooling after accounting for students' socio-economic status (OECD, 2013a).

Preventing child income poverty and material deprivation is a priority. Beyond their obvious negative impact on children's material well-being, they generate malnutrition and bad health, which in turn affect later life outcomes. Health effects can be large but may remain latent for a long period, and deprivation during childhood has long-term consequences for health during adulthood. Constraints on poor people and their children should be alleviated through safety nets, in particular by using child benefits targeted at low-income households.

Quality childcare services and early childhood education are crucial for all children, but particularly important for children from disadvantaged socio-economic backgrounds (OECD, 2013b). In school age, a range of policies can help reduce school failure and prevent social circumstances from standing in the way of achieving educational potential (OECD, 2012a): eliminate grade repetition (by addressing learning gaps during the school year and through automatic promotion but with targeted support); avoid early tracking and defer student selection to upper secondary; manage school choice to avoid segregation; make funding strategies responsive to students' and schools' needs; and design equivalent upper-secondary education pathways to ensure completion.

Disadvantage is also related to children's learning environment. Policy priorities to improve low performing disadvantaged schools include (OECD, 2012a): strengthen and support school leadership; stimulate a supportive school climate and environment for learning; attract, support and retain high quality teachers; ensure effective classroom learning strategies; and prioritise linking schools with parents and communities. In emerging economies, conditional cash transfers have also been successful in promoting school attendance of children from disadvantaged groups (OECD, 2015a).

Fighting early school leaving is key to limit long-term difficulties in the labour market. Policy measures to address this challenge include: systematic monitoring of school attendance; comprehensive support for at-risk students and their families; after-school programmes; and flexible schooling environments (OECD, 2016b). For not

academically-minded – or school-tired – youth practical training pathways may be more suitable, because back-to-the-classroom strategies often prove ineffective for this group.

Mental health and substance abuse are often root causes of school dropout. A significant proportion of young people in OECD countries report feeling stressed on a regular basis (OECD, 2013b), and conditions like eating disorders, anxieties or depression are on the rise, especially among young women (OECD, 2012b). These youth need expert help and OECD countries show some promising models of support: Headspace centres in Australia, for example, provide 12-to-15 years old youth with access to GPs, psychologists, social workers and career counsellors at no or low cost, often on a drop-in basis. They offer advice and treatment for mental health and substance abuse issues, for problems at school or work as well as sex education. In Sweden, Youth Clinics provide free drop-in health care services for youth under 20, including access to psychologists for advice regarding mental health.

Significant gender disparities and biases remain in educational and occupational choices in OECD countries, feeding into gender gaps in employment, in particular in science, technology, engineering and mathematics (OECD, 2017b). Outside the OECD, educational opportunities for girls and young women frequently remain constrained by attitudes, social institutions, and the absence of infrastructure supporting girls. OECD (2017b) emphasises the urgency to change gender stereotypical patterns in education which will otherwise continue to affect life choices of future generations for years to come.

Ensuring a smooth school-to-work transition

Moving from education to the labour market is a decisive turning point in people's lives. Without sufficient orientation youth, especially students who cannot draw on their parents and social support networks for advice, can get lost in the system. Measures to help students in choosing their field of study and later with their school-to-work transition are therefore key to increase the likelihood of stable employment and earnings progression (e.g. OECD, 2010a; 2016b). In Denmark, for example, the Ministry of Education operates regional guidance centres that work with social partners and municipalities to offer workshops, seminars, career fairs and one-to-one counselling and ensures that guidance is relevant to stakeholders in the education system and the labour market (Field et al., 2012); all students have access to these guidance services, participation is high overall, and municipalities are legally required to refer students at risk of dropping out to these services.

Young people often start their working lives in non-standard work arrangements. The education system should equip young people with the skills the labour market needs. More broadly, policies should aim to ensure that short-term entry jobs serve as stepping stones to more stable jobs. Apprenticeships combining on-the-job training and classroom learning can help (OECD, 2010a): the involvement of social partners contributes to ensuring that training meets employers' needs, while apprentices gain initial work experience and form relationships with employers. Apprenticeship and other high-quality vocational education and training programmes are proven to facilitate successful school-to-work transitions in countries such as Austria, Germany and Switzerland (OECD, 2010a).

Early intervention to youth unemployed and those not in employment, education or training (NEET) more broadly is crucial. Non-employed young people are often not in contact with public employment services (PES) because without a sufficient contribution

period they are not entitled to out-of-work benefits. As a result, they are often excluded from training or job-search support programmes, which puts them at risk of becoming long-term inactive. For instance, European member states have committed themselves under the Youth Guarantee scheme to ensure that all young people under the age of 25 years receive an offer of employment, some further education, an apprenticeship or a traineeship within a period of four months of becoming unemployed or leaving formal education. One limitation is that the guarantee is often implemented by public employment services where many of the most disengaged youth would not spontaneously go for help. Faced with a similar difficulty, Norway created Follow-up Services to work in tight co-operation with schools for contacting all under-21 year-olds who leave (with or without a qualification) and assess their activity status. The NEET are either offered counselling or training, or they are put in touch with social support services or the local employment office. Another example of good collaboration is the Japanese PES ("Hello Work") initiative that reaches out to students at high schools and universities to offer counselling, job-search assistance and job placement.

NEET rates are often particularly high among young women because of care-giving responsibilities for children. Being able to access affordable childcare and child-friendly employment arrangements are therefore crucial for greater labour market participation among young mothers (OECD, 2016b).

Breaking the links between socio-economic disadvantage and health status

Health policies play a particularly important role in preventing ageing unequally. Gaps in health and life expectancy between different socio-economic groups is perhaps the most shocking and, for many, the most unacceptable manifestation of disadvantage. As this report shows health problems influence employment experiences and therefore can exacerbate inequalities. Improving the health of the most disadvantaged over the life course should thus be a priority.

Many factors affect health inequalities, including a broad range of social determinants of health (such as living and working conditions) and some related to access to good-quality health care. Early childhood development, education, employment conditions, income, stress related to socio-economic status and lifestyle (e.g. smoking, drug use, alcohol abuse, physical inactivity, poor diet, obesity), all contribute to disparities in health status. In addition, health literacy is often lower among poorer and less educated groups: people may not understand that they have a health problem, may not use prevention offers, such as screening campaigns, and may not fully benefit from therapy due to lower adherence to medications or poorer self-management in early stages of chronic diseases. Reducing health inequalities therefore requires a multipronged strategy that addresses the wide range of social determinants, including those falling outside the responsibilities of health ministries and those ensuring equitable access to care for poor people and other disadvantaged groups.

As in other policy areas it is important to start early to prevent lasting and growing health disadvantage. Direct early-childhood health interventions to improve physical and cognitive developments can help sever the transmission from the low socio-economic status (SES) of parents to poor health as a child to low SES as an adult (Canning and Bowser, 2010). Deaton (2013) also focuses on early-childhood health nutrition and disease prevention, and emphasises the importance of early life health inequalities, and of moderating the effects of parental deprivation on child outcomes.

Recent OECD work has shown that well-designed prevention policies are generally effective to improve health even though some measures may take time to produce their effects and become cost-effective (OECD, 2015c). The share of health spending allocated to prevention is only around 3% on average in OECD countries and should be expanded by targeting key risk factors and population groups (Devaux and Sassi, 2015). The best prevention policies are multi-intervention strategies that include a mix of public awareness campaigns, regulations (e.g. regulations of advertisements and sales of unhealthy products), taxation and counselling by general practitioners.

Prevention can reduce health inequalities. People in lower socio-economic groups are more likely to smoke, to be heavy alcohol drinkers (particularly men) and to be obese, all important risk factors for many diseases and causes of death. Cardio-vascular disease, which is strongly related to risky behaviour, smoking in particular, is the first cause of mortality inequality across educational groups (Chapter 4). People with low SES could therefore benefit more from prevention policy aiming to tackle harmful alcohol consumption (OECD, 2015c) and obesity (Sassi et al., 2009). These prevention policies might not only improve the health of vulnerable population groups, but also reduce sick leave and disability benefit claims, and help people remain in the labour market (Devaux et Sassi, 2015).

Broad health promotion campaigns, however, often fail to reach the most disadvantaged socio-economic groups. Inequalities exist even when screening services are provided free of charge: people with low level of education or income are less likely to take part in screening programmes for cancers and other health problems. This means that there are other non-financial barriers such as lack of awareness of potential benefits, waiting time and distance to travel that also need to be addressed to promote a more equal use of preventive and early diagnosis services (Devaux and de Looper, 2012).

By contrast, fiscal measures, such as taxes on certain products or substances which are identified as being unhealthy, have been found to be the only intervention producing consistently larger health gains among poorer groups than other groups due to a greater response to price changes (OECD, 2010b). Fiscal policies to curb behaviours related to smoking or alcohol consumption could be thought as stand-alone as the objective is simply to induce people to quit unhealthy behaviours. However, measures promoting a healthier diet aim at replacing unhealthy by healthier, often more expensive, products; they could therefore be regressive, and should be accompanied by targeted transfers to compensate this negative effect.

Mitigating entrenched inequalities

As illustrated in this report, disadvantage starts and is best addressed early. Prevention policies can go a long way to reduce inequalities and halt their progression. But not all inequalities can be picked up in time and not all prevention measures will be successful. Moreover, some inequalities develop at working ages and, in particular, towards the end of people's careers. Despite the evidence that by age 50 lifetime income inequality is deeply entrenched, a lot can still be done for this group by mitigating disadvantage. A range of policies is needed, such as continued promotion of healthy lifestyles, ensuring equal access to good-quality health care, adopting inclusive labour market policies for older workers and facilitating a smooth transition to retirement.

Promoting healthy ageing through equal access to health care

All OECD countries, despite the common endorsed principle of adequate access to health care for all people, have disparities in access to health services, and many people report not being able to meet health care needs, largely among low income groups. The main reason provided by survey respondents was that care is too expensive (OECD/EU, 2016; Commonwealth Fund, 2016). In addition, innovations in health care that have led to overall health improvements and longer life expectancy are likely to have benefited groups with higher levels of education and income more (Glied and Lleras-Muney, 2008), at least temporarily, due to better access to cutting edge care and service providers or to the ability to spend more money on expensive treatments.

Cost effective prevention, primary care and screening services should thus be provided for low or no cost to prevent diseases (e.g. vaccination against influenza among elderly people) and encourage early detection of cancer and other diseases. Many OECD countries have introduced mechanisms to facilitate health care access for low-income patients through co-payment reductions or exemptions (Paris et al., 2016). In emerging economies a major issue in access to health is that, even when people have the right to obtain essential medicines and treatments free of charge, these goods and services, provided in principle by the public sector, may not be available due to budget constraints.

Access to health services in rural areas, where many older and poorer people live, can be more constrained than in urban areas in both OECD countries and emerging economies. Mobile facilities and telehealth services, such as mobile diabetes counselling in Germany (CHRODIS, 2016) and the Humber Digital Health Community in the United Kingdom, can help. However, telehealth should not be seen as a replacement for more traditional face-to-face consultations, particularly among older populations who may be less able to use new mobile health (mHealth) applications.

Health systems also need to be adapted to better manage the growing number of people living with one or more chronic conditions who often are over 65 and come from lower socio-economic groups. In particular, health care should be better integrated across various disciplines towards a patient-centred approach; physician and nurse specialisation in geriatric care should also be further developed. There is a growing recognition that managing the care of ageing population will require interdisciplinary teams who can provide a seamless care between health and social care. This in turn will require changes in education and training to promote inter-disciplinary education and ensure that health care professionals can work effectively as a team across different disciplines (social care, mental health, long-term care, medical care).

Finally, policy measures can improve health literacy and self-management with emphasis on education, improving patient skills, and empowerment (Brainard et al., 2016). Increasing health literacy, particularly among lower educated and disadvantaged groups, should be a high priority to improve or at least prevent a worsening of health conditions. Most interventions on self-management provide patient education through group sessions delivered by health professionals (Berzins et al., 2009).

Tackling health inequalities among older age groups

Health prevention measures can substantially improve the health of the elderly (Goldman et al., 2009). Comprehensive programmes such as the Australia Commonwealth and Victorian Governments' packages of aged care reforms include better access to information, integration and support of home and community care

(Batchelor et al., 2016). The "Living Longer Living Stronger" physical activity intervention improved health outcomes for adults ages 50 and over in Australia (Batchelor et al., 2016).

Moreover, prevention policies targeted at middle and older ages can reduce health inequalities across socio-economic groups. In the United States, the US Senior Farmers' Market Nutrition Program, which targets coupons at low-income, older adults encourages healthy eating, is cost-effective, and improves health outcomes (Batchelor et al., 2016). The PUMP (*Por Un Millon de Pasos*) programme in Spain encourages physical activity by providing pedometers and a support network targeting the elderly and people with disabilities, including those in remote areas. This low cost programme has been replicated in other countries as a way to improve health through more physical activity (CHRODIS, 2016).

Limiting the impact of job losses and combating long-term unemployment

Many workers in OECD countries are displaced every year due to economic change (OECD, 2013c). Older and long-tenure displaced workers are at greatest risk of long-term unemployment or finding only jobs that are ill–matched to their skills and less well paid than their previous jobs. Retirement income security can be compromised as long-term job seekers will have lower contributions, thus earning lower pension entitlements, and be less likely to save. Job displacement also has significant adverse effects on health, including higher mortality (Gallo et al., 2000; Sullivan and von Wachter, 2009). Policies that assist displaced workers to reintegrate into suitable jobs can thus help to mitigate inequalities, in particular at older ages.

The OECD has identified a range of policies to assist displaced workers (OECD, 2016d). Such measures need to address the particular difficulties faced by older and long-tenure workers who have not searched for a job in many years and thus need well-targeted assistance. Counselling, skills audits and job search assistance are needed early on, preferably during the notice period before workers become unemployed. When appropriate, counselling should include an offer of training to fill specific skills gaps. In addition, to avoid becoming demoralised after a long period of unemployment, the public employment service (PES) may need to supplement job search assistance with retraining or hiring subsidies. Since these measures are expensive, it is important that the effectiveness of these measures is constantly evaluated.

Providing equal opportunities for workers to upgrade their skills

Promoting the employability of workers *throughout their working lives* is a particularly important requirement for preventing societies from ageing unequally. In the past, workers could expect to have only a few job changes during their career. Now, all workers are likely to switch jobs more frequently or at least adapt to frequently changing tasks. Upgrading and adapting skills will therefore be crucial for employment and earnings prospects. Yet, workforce groups at greater risk of labour market disadvantage – including older workers – receive less training, thereby compounding their disadvantage. This needs to change urgently as the failure to respond to these new challenges will risk creating an army of unemployable older workers.

Digitalisation can generate large welfare gains (including for example by expanding employment opportunities of workers suffering from some disability through telework), but raises anxieties about potential job losses and technological unemployment which are particularly threatening for older generations (OECD, 2016e). Many older people are less

familiar with the use of digital technologies than their children and grandchildren, both at home and in the workplace. Data from the OECD Survey of Adult Skills (PIAAC) show that the use of these digital technologies at work differs significantly among age groups. For example, on average, only 27% of older workers (aged 55-64) use email or the Internet at work daily against 49% of prime age workers (aged 35-44). Moreover, the age gap in the use of digital technologies increases with their complexity; digitalisation is thus likely to accelerate the obsolescence of older workers' skills.

Data for 2008-12 show that workers in more technology-intensive occupations had a lower risk of unemployment; however, older workers were less likely to be employed in these occupations. Older workers were almost three times more likely to have lost their job than younger workers in highly technology-intense occupations. But this ratio is 1.7 "only" in low technology intense occupations. Overall, these results strengthen the case for high-quality professional training, in particular for older workers.

Some countries have targeted measures at workers in their mid to late careers to improve access to lifelong learning and vocational education training, including programmes for upskilling specific groups, providing financial support, defining employees' rights to training and introducing training leave schemes. To promote higher participation of older workers in non-routine jobs, lifelong learning programmes should be designed to strengthen skills for the completion of non-routine and non-manual tasks.

For example, in Germany, the programme WeGebAU, launched in 2006, financed by the Ministry of Labour and managed by the PES, promotes the upskilling of low-skilled workers and of workers from 45 years onwards (Singer and Toomet, 2013). Wages or training costs can be subsidised under the programme, and training take-up has increased. In Ireland, the Higher Education Authority in the Department of Education and Skills introduced the Springboard initiative in 2011.[21] This initiative provides free higher education opportunities for upskilling and reskilling in growth areas to unemployed citizens.

Skills acquired throughout working lives should also be better recognised and made visible. Reliable procedures are needed to assess and validate people's skills and competencies, to make skills transparent to employers, and to establish a baseline for further learning. In case of job loss, this can help workers find a matching job. This is especially important for mid-career and older workers, whose initial qualifications may be outdated. Many of them have acquired new skills and competencies in various work experiences, but most often lack certificates to prove it. Several countries can offer good examples: the Netherlands has an instrument to validate skills acquired on the job, the *Ervaringscertificaat* (Experience Certificate). Its use has increased through campaigns (television, radio and billboards), steady diffusion of a quality code for Accreditation of Prior Learning (APL), and the development of regional partnerships for lifelong learning. The Certificate is also included as part of collective labour agreements in several sectors, and is paid for by a number of training and development funds. Finland launched a new adult VET programme in 2014 for low-qualified adults aged 30-50. Portugal, a country with a large share of low-skilled workers, launched the New Opportunities Initiative (INO) in 2005 which offers skills audit to all adults and assists in education and training or in recognition and validation of competencies.

Enhancing job quality for workers at all ages

Working environments have a profound impact on workers' physical and mental health, and low SES workers typically suffer from worse work conditions. Job quality

influences people's sense of engagement and well-being at work and beyond. Therefore, a broad-based strategy to enhance job quality could pay a triple dividend: better, healthier and longer working lives for individuals; more productive workers for firms; and a lower financial burden on social protection systems.

While many aspects of working conditions and organisation primarily concern business, policies and institutions have a clear role to play to improve them. These include regulations on working-time and safety at work, well-designed sickness schemes, and implementation bodies (e.g. labour inspection bodies and occupational health care services) that give employers guidelines, run information campaigns and preventive actions (OECD, 2016a).

In some countries, the social partners include age management in collective bargaining. In Finland, a working group of social partners developed the "Job Life Cycle Model", a workplace age plan including seven central areas: age management; career planning and extending careers; managing competence and professional skills; flexible working hours; re-defining a job; health assessment in the workplace and; promoting healthy habits and life management.[22] In Switzerland, the collective agreement for the construction industry finances arrangements for early retirement, however, at a higher age than the usual exit age in the sector. This motivates workers to stay for longer and employer to improve working conditions (OECD, 2014a). The collective agreement "Lifelong Working Time and Demography" signed in the German chemical industry in 2008 includes further training, the development of competences, work organisation and lifelong working time models.

In emerging economies job quality is significantly impaired by inequalities in the levels of earnings, which are generally more than twice as high as in OECD countries (OECD, 2015d). Furthermore, while the risk of unemployment is close to the OECD average, one important difference is the high risk in most of emerging economies of falling into extreme low pay, especially for women. This is because workers simply cannot afford to be unemployed given absent (or weak) social protection. Small effective insurance for the unemployed translates into higher levels of labour market insecurity than in most OECD countries. In countries where the risk of low-pay is significant, the ability of social protection to cushion earnings shocks is crucial and needs to be extended (OECD 2015d).

In emerging economies the gap in job quality between formal and informal workers is substantial, which comes on top of large shares of informal employment. Informal workers have lower earnings, they face a higher risk of extremely low-paying jobs and a higher probability of working very long hours. In-depth analysis of the quality-gap between formal and informal jobs would enable policy makers to better address the determinants of informality and to reduce the welfare costs of segmented labour markets (OECD, 2015d).

Gradual withdrawal from the labour market through phased or partial retirement – possibly with changing responsibilities within the same company – can extend working life. Changes in responsibilities might include greater focus on training younger workers, for example. Phased retirement also makes it easier to take on caring responsibilities for older family members and grandchildren. By contrast, inflexible arrangements of pension systems sometimes result in coming back to a less attractive part-time job after having claimed the full pension. While the impact on income inequality is not straightforward, phased retirement should support older individuals, including those with low retirement income, by enhancing pension entitlements.

Policies could promote phased retirement in two ways. First, employers might be encouraged to design more flexible work arrangements to their employees. Second, pension systems should allow or at least not penalise combining pensions and working longer at reduced hours in terms of retirement benefits. Promoting gradual withdrawal from the labour market without generating too early a switch to partial employment remains a challenge though.

Flexible working time arrangements to combine work and care-giving are becoming more frequent. In Canada, under the Employment Relations (Flexible Working Arrangements) Amendment Act of 2007 all employees with caring responsibilities have the right to request flexible working arrangements. In England, from 1 April 2015, the Care Act 2014 places new duties on local authorities to assess and support adult carers to maintain or re-enter employment and training, for example by helping to ensure that the person they care for is looked after while they are at work. These measures can help fight inequalities among older workers, in particular women, triggered by long-term care needs of family members and often resulting in employment, earnings and pension losses for the carers.

Removing barriers to retain and hire older workers

Several factors discourage employers from hiring and retaining older workers, especially the most vulnerable among them. First, there needs to be a better match between the costs of employing older workers and their productivity, even though seniority wage-setting has diminished in many countries. A New Pay System (NPS) has been finalised for central government employees in Finland**.** In 2008, the pay system was further developed through collective and sector agreements.

Second, the desire to protect jobs of older workers has to be balanced with the need to enhance labour mobility, both in terms of hiring of older job seekers and of job-to-job moves for older workers. Special employment protection and unemployment benefit rules for older workers can be counterproductive. For example, policies that penalise firms for laying-off older workers can reduce hiring rates of older workers. Firms may also seek to avoid these penalties through various early retirement arrangements and schemes. In Poland, special employment protection rules are intended to limit the layoff of older workers with less than four years remaining until retirement age. According to Kryńska et al. (2013), employers refrain from recruiting people soon to be "protected" by this regulation. According to Cahuc et al. (2016), a longer unemployment insurance period after age 50 in France has created a disguised form of early retirement and a rising trend in the subsidised termination of employment contracts by mutual agreement ("rupture conventionnelle") after the age of 58. Ultimately, older workers are best served by efforts to improve their employability and increase the range of job opportunities more generally.

Coping with inequality at older ages

The third set of policies to prevent ageing unequally focuses on reduction of inequalities in old-age pensions and long-term care. Its main objectives are to avoid old-age poverty, limit retirement income inequality and inequality in living standards and well-being of the elderly by: providing adequate old-age pensions and social assistance in a financially sustainable way; developing age-friendly environments; providing affordable good-quality long-term care: and strengthening support for informal carers, who are often themselves aged.

Over past decades, most OECD countries have been reforming their pension systems (see OECD, 2015b). Reforms mainly aimed to improve the financial sustainability of pension systems in light of demographic changes. As a result, replacement rates have been reduced and pension benefits more closely aligned to earnings history, e.g. through the development of defined contribution (DC) or notional defined contribution (NDC) schemes, with less pooling and lower redistribution to low-income contributors (OECD, 2015b; Quesnel-Vallee et al., 2015). Closer contribution-benefit links tend to increase the transmission of wage inequality to retirement income inequality as the capacity of individuals to contribute will be reflected in the pensions they receive. More recently, concerns about retirement income adequacy and prevention of poverty among retirees have been gaining traction in public policy debates.

Effects of higher retirement ages on inequalities

Many OECD countries have mechanisms in place to increase the retirement age in line with life-expectancy gains in order meet the twin goal of pension adequacy and financial sustainability of pension systems (OECD, 2015b; 2016f). These reforms raises three main issues with respect to their impact on inequalities due to the substantial socio-economic differences in life expectancy discussed above.

The first issue is about the healthy or unhealthy years added to the life span and what this means for people's capacities to work until higher retirement ages. If growing life expectancy were mostly adding unhealthy years, higher retirement ages would indeed mean that workers would be forced to retire earlier than the new normal pension age, generally with reduced benefits. The data, however, show that the share of healthy years in the steadily growing life duration expected at birth, at age 50, or at age 65 has been relatively stable over time – although it declined slightly over the past decade – suggesting that rising longevity also increases people's work capacity at a given age.

The second issue is whether inequalities are exacerbated by pension rules given that poorer groups die younger than their richer peers. It is often argued that increasing the retirement age is regressive. This is indeed the case: as low-income workers tend to have shorter lives, a one-year increase in the retirement age represents a larger proportional cut in their total pension benefits paid during retirement than it does for higher-income people. As shown above though, this effect is quantitatively small: if retirement ages were increased by three years between 2015 and 2060 – life expectancy at 65 years is projected to increase by 4.2 years on average – the total pension benefits of low-educated retirees relative to those of the highly educated groups would be reduced by 2.2%.

The third and main reason why a higher retirement age might be regressive is grounded in fewer employment opportunities for more disadvantaged older workers. This is a major challenge for policy makers, but it does not mean that a higher retirement age is an inadequate policy. Instead, it underlines the crucial importance of improving the situation and opportunities of older workers through inclusive labour market policies for older ages.

Most pension arrangements do not take these life-expectancy differences into account. The rules of defined-benefit (DB) pension schemes and the way annuity markets and insurance companies work in defined-contribution (DC) schemes typically disregard inequalities in life expectancy. Most use a uniform benefit accrual rate in DB schemes and common mortality tables when converting assets from DC schemes into pension annuities, despite the fact that people's remaining life years are different.[23] This means that a pure DC scheme, for example, which is a priori regarded as distribution-neutral, is

in fact regressive. People with shorter life expectancies receive – for shorter periods – lower benefits than their individual situation would warrant, thus subsidising those who get paid higher pensions for a longer period.

Pension policy measures to take account of socio-economic differences in life expectancy could target the benefit formula (granting higher accrual rates for low earnings, as applied in Portugal), the level of contribution rates (increasing with income such as in Brazil) or through a higher wage ceiling for contributions than for pension entitlements. In DC schemes, the annuity factors for conversion of assets into a pension benefit could be set in ways that increase pensions for people with low pensionable income (who die earlier on average) while people with high pensionable income (who die later on average) would receive lower benefits. The United Kingdom introduced a rare example of this through private "enhanced annuities" (OECD, 2016g): higher annuities are paid for the same accumulated pension assets to people with certain health or behavioural factors which are associated with lower life expectancy, such as smoking, obesity or cardiovascular disease, and which are more prevalent in lower socio-economic groups. OECD (2016f) calls for more accurate mortality data by socio-economic groups so that higher benefits could be offered to people with higher health risks. Schemes "rewarding" risky behaviours should be designed carefully though.

Voluntary pensions are typically subsidised, which tends to be regressive

Contributions to public pension systems are exempt from taxation while pension benefits are taxed upon receipt. This mechanism generates tax advantages as marginal taxes on earnings are typically higher than those applying to pension benefits. Beyond the specificities of the tax structure, the amount of these tax advantages is larger, the larger the contributions, and therefore the larger the earnings. Private pensions also generally are tax-advantaged and, depending on the specific schemes, this can benefit high-income more than low-income earners, such as in Chile, Denmark, Israel or Switzerland (OECD, 2016f).

Voluntary pensions are savings that are earmarked for retirement. The positive side is that they rely on individual choices, which could improve welfare. This advantage has to be tempered by income adequacy risks for those who "choose" not to be covered, especially given the social gradient of that "choice". Due to higher savings capacity and financial literacy among advantaged socio-economic groups, voluntary pension coverage is heavily biased in favour of workers with high earnings. Voluntary pensions might therefore magnify the tax exemptions which benefit the better-off in mandatory schemes, and as a result tend to increase old-age inequality.

Where replacement rates from mandatory pension schemes are low, increasing the mandatory component would be preferable to subsidising voluntary private schemes. Moreover, these subsidies should be limited, with voluntary pensions being instead subject to the standard taxation of savings instruments, with well-designed auto-enrolment schemes (OECD, 2014b). When coverage is low, providing incentives, through targeted matching contributions or a flat introductory bonus contribution, should encourage participation of low-income earners. In New Zealand the auto-enrolment KiwiSaver scheme promised a temporary flat rate payment to all new members as an incentive and over 70% of those enrolled have remained within the scheme. In the auto-enrolment scheme in the United Kingdom the government pays 25% of the minimum employee contribution as a bonus, which will equal 1% of qualifying earnings from April 2019. Riester pensions in Germany have provided subsidies and taxed deductions based on marital status and family composition, which have been successful in persuading

families to contribute, but less so for lower earners – even though participation in Riester plans is less skewed towards the high-income than other occupational and private plans in the country (Börsch-Supan et al., 2012). Overall, improving financial literacy would contribute to expand coverage, and is likely to reduce inequality.

Redistribution in pension systems to protect retirees at risk

In most countries, the most extreme retirement income adequacy risks and prevention of old-age poverty are addressed through first-tier safety-net pensions. OECD (2015b) identifies significant scope for benefit improvement in several countries with high old-age poverty rates and low safety-net benefits, even in relatively less affluent countries, such as Chile, Korea, Mexico and Turkey, but also in high-income countries like Switzerland and the United States. Moreover, many countries increase first-tier pensions in line with prices, meaning that retirees will increasingly lag behind workers' living standards, especially the very old, who are often women.

Low-income workers, even when they contribute for a full career, are at particular risk of old-age poverty in Mexico, Chile, the United Kingdom, Japan, Germany, Poland, the United States, Sweden, Slovenia and Canada. In these countries, workers earning half the average wage will receive net replacement rates below 60%, i.e. less than a third of average wage. Among them, due to close contribution-benefit links, pension inequality is more reactive to wage inequality in Germany, Poland and Sweden, and also in Chile and Slovenia, thereby increasing old-age inequality risks.

Most pension systems include redistribution mechanisms to compensate for some of the pension impact of time spent in unemployment and taking care of children. Such pension credits are effective instruments to offset the effects of career interruptions. At the same time, they should avoid encouraging workers to stay out of work. Policy makers need to strike the right balance between protecting the period of leave from work and setting benefit entitlements to ensure that people return to work. In contrast, credits for periods of higher education are generally regressive as they tend to reward people with higher lifetime earnings. Most OECD countries which had credits for periods of higher education have abolished them or are phasing them out.

Increasing pension coverage to ensure adequate pensions

Insufficient coverage through earning-related pension systems not only results in inadequate old age incomes but also increases old-age inequality because low coverage disproportionally affects low earners. Mandatory pension systems in most OECD countries have very high levels of coverage as informal sectors are relatively small, but there are exceptions, such as Chile, Mexico, and Turkey. In Korea many older people are still not covered due to the relatively recent introduction of the pension system. Many less developed countries are suffering from low coverage rates. The share of the workforce contributing to a pension plan ranges from about 12% in India (OECD, 2013d) and Indonesia (Muliati, 2013), to over 50% in Brazil (Rofman and Oliveri, 2012; OECD/IDB/The World Bank, 2014). Promoting formal labour market participation is the most efficient way of increasing coverage. However, most Latin American countries have struggled to close the coverage gap this way, ending up expanding social pensions instead to address adequacy concerns with the added side effect of straining government finances (OECD/IDB/The World Bank, 2014). Expanding mandatory pensions to cover self-employed workers is another important measure to increase coverage. Reducing the size of the informal sector more generally requires a range of labour market, tax and structural policies.

Ensuring a sufficient level of conversion of private pensions into annuity payments

One important objective of pension systems is to pool longevity risks and prevent those lucky enough to live a long life from falling into poverty. Annuities are the instruments that ensure that individuals, possibly including widow(er)s, do not outlive accumulated assets. This is especially relevant for retirees who have saved less during working age and have accumulated low pension assets. Individuals covered by public pensions are typically immune from that risk as pension benefits are in that case provided in the form of monthly instalments until they die. However, shortfalls in annuitisation in private schemes, such as e.g. in Australia, Switzerland and the United States, and potentially the United Kingdom in the future, raise concerns.

Within private pensions, automatic annuitisation is common for DB while DC plans allow easier access to lump-sum distributions (Orlova et al., 2015). There is ample evidence of economic myopia: individuals tend to underestimate financial needs and life duration, and find lump sums attractive. This is worrying in terms of inequality as insufficient financial literacy is closely related to other socio-economic disadvantages. Short-sighted behaviour is indeed one key reason why pension systems enhance welfare, especially for those with low financial wealth. It is therefore critical to ensure a high enough replacement rate from annuities by discouraging early lump-sum withdrawals on a sufficiently high threshold of the pension assets.

Carefully designing survivors pensions

Older women are the most exposed to old-age poverty risks. Survivor benefits play an important role to avoid the poverty of widow(er)s, although less than in the past thanks to improvements in women's labour force participation. They should, however, be carefully designed to avoid inefficient forms of redistribution and work disincentives (Chapter 5). Some countries, such as Sweden, have indeed decided to phase survivors' benefits out. However, as gender gaps in employment and earnings are still substantial in many countries, care needs to be taken not to leave women who worked part-time and had low earnings with insufficient resources in old age, in particular after the death of the spouse which can dramatically reduce household income.

According to Orlova et al. (2015), the choice to subscribe, or not, to the joint-and-survivor life option for private pensions in the United States substantially increases the risk that surviving spouse falls into poverty: a great majority of couples prefer to opt out from the survivor pension to get a higher pension at the time of retirement. Hence, the joint-and-survivor life option should be automatic and reflected in either higher contributions or lower benefits. Survivor pensions are not mandatory in any scheme in Denmark, Iceland and Latvia (James, 2009).[24] Here again, survivors' benefits are less common in DC schemes.

Toward a unified pension framework for all workers

Inequalities in the pension treatment of different categories of pensioners can be substantial and give way to suspicion and distrust towards those who are perceived, rightly or wrongly, to be getting a better deal. Belgium, France, Germany and Korea are the only OECD countries that maintain a separate pension system for civil servants (OECD, 2016f). Moreover, among the countries with a fully integrated system, Canada, Iceland, Ireland, Mexico, Norway, the United Kingdom and the United States top up civil servant pensions which results in large benefit differences. Many countries also have

special schemes for specific groups in the public sector, such as police, firefighters, teachers or local government employees. A unified framework covering all workers in an identical and financially sustainable way would contribute to limiting inequality, enhance transparency and labour mobility, and reduce costs. To address the situation of workers in arduous professions, assistance such as retraining and offers of alternative job opportunities would need to be provided throughout the career to ensure that workers do not get sick and disabled on the job. Rather than introducing separate early retirement schemes, training programmes should be targeted to employees who are deemed unfit to continue in their previous occupation (OECD, 2016f).

Developing age-friendly environments

Developing age-friendly environments to foster older people's autonomy is an integral component of a strategy to promote healthy ageing (WHO, 2016). It has the potential to limit socio-economic inequalities in old age as poor older people in particular might need supportive environments to lead a life of dignity when faced with declines in capacity. Enabling greater functional ability – including to meet basic needs, be mobile, continue to learn, build and maintain relationships – can help older people live in a place that is right for them (WHO, 2016). Creating more age-friendly environments requires promoting multisectoral action beyond the health sector, for example in such areas as transport, housing and urban planning.[25]

Reducing inequalities in long-term care: Making home care affordable for all

Many older people with LTC needs prefer to stay in their home for as long as possible. As a result, most OECD countries have aimed to reduce the use of institutional care and promote community care. However, while all countries for which data are available cover the cost of institutional care for those who cannot afford it (even if some expect people to put nearly all of their income towards the cost), there are gaps in the coverage of home care needs. Some older people may therefore have incentives to go into a care institution where their care needs will be met and their food and board provided, even if home care might in some cases meet their needs more effectively and give them a better quality of life.

Comprehensive social protection systems, such as those found in Nordic countries and the Netherlands, ensure access to affordable LTC for all, irrespective of income. However, this requires high public spending. Adequate support for low-income people is provided at a lower cost in countries with targeted systems, such as England and Belgium – although richer people are required to make large contributions that may reduce their living standards or deplete their assets. Where social protection is neither comprehensive nor well-targeted, home care is often unaffordable to people with low incomes.

Reducing inequalities in caring through better support to informal carers

Although many people want to provide informal care to friends and family, doing so has costs. There is an opportunity cost to the time spent providing unpaid care; and caring can conflict with work responsibilities or increase the risk of mental health problems. Strengthening social protection for LTC can help to reduce disparities in providing care: in countries with comprehensive LTC coverage, such as the Netherlands, Iceland or Sweden, inequalities along socio-economic lines in the provision of informal care are less pronounced. Countries must also do more to support informal carers. A range of policy options exist, including cash benefits, respite care, training and counselling, but evidence of their effectiveness is mixed and further evaluations are needed. Interventions may need

to be targeted on those who need them most, in particular women with low socio-economic status.

More flexible working arrangements of employees with a dependent elderly will be needed. To meet those needs, many countries provide employees with a right to either flexible working time or to family-caregiver leave, but often without financial compensation. It is also important that such leave can be granted within a short notice period given that LTC needs are largely unpredictable. In April 2017, the European Commission adopted a Directive proposal which would introduce a carer's leave of five days per year compensated at least at the level of sick pay.[26]

Redesigning policies in a life course perspective

The best policies to prevent ageing unequally are those that start early and that work together in a comprehensive package across the various dimensions of inequality, picking up on disadvantage as soon as it arises. To do so requires rethinking the way policy is made and moving out of policy silos. The evidence on how inequalities compound over the life course calls for joint action by family, education, employment, social and territorial development ministries and agencies. Integrating policies and social services, in particular for more vulnerable groups, has the potential to address the multiple underlying reasons of vulnerability simultaneously. It can also facilitate information and knowledge sharing between administrations and agencies and reduce the cost burden of delivering support, both in the short term but even more so in the longer term by preventing inequalities from widening. Countries will differ in the way such knowledge sharing and joint policy action is best set up, but all will need strong leadership in identifying needs, acting upon them with appropriate policies and co-ordinating policy responses between the different actors.

Notes

1. Non-standard employment has increased in most OECD countries at a moderate pace since the mid-1980s, although its share has declined in European Nordic countries (OECD, 2015a).

2. Regions within the 34 OECD countries are classified on two territorial levels reflecting the administrative organisation of countries. The 391 OECD large (TL2) regions represent the first administrative tier of subnational government. The 2 197 OECD small (TL3) regions are contained in a TL2 region.

3. The new collected data show estimated longevity gaps at age 65 between the highest and lowest education groups which are substantially larger in most countries than those found in previous studies, due to more precise information on mortality after the age of 75 (see Chapter 4).

4. It uses data from the Harmonized Survey of Health, Ageing, and Retirement in Europe (SHARE) 2004-2013, Health and Retirement Survey (HRS) in the United States 2000-2014, English Longitudinal Study of Ageing (ELSA) 2002-2012, Japanese Study on Aging and Retirement (JSTAR) 2007-2011, and China Health and Retirement Longitudinal Study (CHARLS) 2011-2013. The 12 European countries are Austria, Belgium, Czech Republic, Denmark, England, France, Germany, Italy, Netherlands, Spain, Sweden and Switzerland. Disability is measured using four self-reported indices: i) at least one limitation in Activity of Daily Living (ADL), ii) at least one limitation restriction in Instrumental Activity of Daily Living (IADL), iii) at least one functional limitation related to mobility, and iv) being limited in paid work because of a health problem. See Box 6.4 in Chapter 6 for the full list of limitations in ADL and IADL that are considered.

5. These absolute values should be taken cautiously as true limitations could be overestimated given that studies (e.g. Bound, 1991; Baker et al., 2004) find that some non-employed workers report worse than actual health to justify not working.

6. *2016 OECD Income Distribution Database*.

7. In each country, it is assumed for estimation purposes that the level of inequality differs across cohorts but that the evolution of inequality with age is the same across cohorts (age and cohort fixed effects).

8. In Australia and Switzerland, this partly reflect the fact that many pensioners have taken their accumulated pensions as lump sums, which are not counted as current income, rather than annuitising them to provide income streams.

9. Family affluence is defined as a four-item measure of family wealth that includes: car possession, the availability of a bedroom for each child, holiday or travel over the last 12 months, and the number of computers owned by the family. The scale has been developed in the World Health Organization (WHO) Health Behaviour in School-aged Children Study.

10. Determining how exactly health affects labour market outcomes is complicated for various reasons. Beyond two-way causation, there are also other, unobserved factors that affect health and labour market outcomes, and measuring the true health status is also a challenge. Moreover, because the employed and non-employed might differ in characteristics that influence both wages and health, but that are not captured in the data – such as individuals' motivation – the estimated effect of health on wages is prone to sample selection biases. Best efforts to correct for these limitations are discussed in greater detail in Chapter 2. Estimates presented in this report should thus be treated with caution and taken to indicate approximate rather than precise effects.

11. The effective age of labour market exit was only higher in 2000 than in 2014 for men in Denmark, Greece, Iceland, Japan and Mexico and women in Greece, Ireland and Mexico.

12. This part is based on the Survey on Health, Ageing and Retirement in Europe (SHARE), the Health and Retirement Study (HRS) and the English Longitudinal Study on Ageing (ELSA), covering many European countries, Israel and the United Stated. The OECD has computed an aggregate measure of health from of a number of health indicators, including self-assessed health and a personal history of diabetes, high blood pressure, cancer, mental health problems and previous stays in hospital (see Chapter 5).

13. The covered period varies across countries. Birth cohorts are grouped per decade of birth year: from 1910-1919 to 1980-89 while age groups cover five-year periods.

14. With currently available data, when period effects are explicitly controlled for, such as through the Deaton-Paxson transformation (Deaton and Paxson, 1994), the age-cohort patterns are basically similar to the unadjusted ones shown in Figure 2. The Deaton-Paxson normalisation constrains the estimated time effects to be orthogonal to a linear time trend and to add up to zero. Hence, any linear time trend is therefore attributed to cohort and/or age effects, but not to time effects.

15. For Australia and Switzerland, this is subject to data limitations referred to in the endnote 8.

16. The linear correlation coefficient is 0.87 between the two series.

17. Persons living in collective households and in institutions are generally excluded from surveys used in the OECD Income Distribution database.

18. In Chile, just taking into account gender differences in life expectancy lowers female pensions by 5% compared to male's and the replacement rate from 39 to 37%; this comes on top of the impact of gender gaps in the labour market.

19. The pension wealth calculations assume that people work until the normal retirement age. Given the socio-economic differences in health status and employment rates, however, the increase in the statutory retirement age might raise the effective retirement age less for low-educated than high-educated workers.

20. Estimates for France include the *Allocation personnalisée d'autonomie* (APA) and tax reductions for disabled people. Some people in France get LTC through their health insurance, but access to this cover varies by region. Where people do get support from health insurance, coverage may be more comprehensive than shown in Figure 1.23. Future work will explore this issue in more detail.

21. http://www.springboardcourses.ie/pdfs/Springboard%20Trend%20Analysis.pdf.

22. http://www.akava.fi/en/current_issues/current_themes/longer_careers_with_the_job_life_cycle_model.

23. The exception to common mortality tables is the use of gender-specific tables in Chile, Indonesia and Mexico. Gender-specific mortality tables lead to lower pensions for women with the same pension contributions as men given that women live longer on average; with respect to life expectancy this is thus "fairer" but, at the same time, women are disadvantaged during their working lives through persistent wage and employment gender gaps; while addressing life expectancy inequality, gender-specific tables therefore exacerbate the economic vulnerability of older women.

24. There are no mandatory survivors pensions in Australia either, but accumulated pension assets are predominantly withdrawn as lump sums and pension balances are transferrable to the spouse on death of the holder.

25. In Portugal, the Ministry of Health proposed a National Strategy for Active and Healthy Ageing. An interministerial work group was created in October 2016 to develop the Strategy. It is meant to help local authorities and policy makers in charge of social, labour market and health policies co-ordinate their actions to promote active and healthy ageing.

26. http://europa.eu/rapid/press-release_IP-17-1006_en.htm.

References

Baker, M., M. Stabile and C. Deri (2004) "What Do Self-Reported, Objective, Measures of Health Measure?", *Journal of Human Resources*, Vol. 39, pp. 1067-1093.

Börsch-Supan, A., M. Coppola and A. Reil-Held (2012), "Riester Pensions in Germany: Design, Dynamics, Targeting Success and Crowding-in", *NBER Working Paper Series*, No. 18014, Cambridge, Untied States.

Bound, J. (1991) "Self-reported Versus Objective Measures of Health in Retirement Models", *Journal of Human Resources*, Vol. 26, No. 1, pp. 106-138.

Cahuc P., J.-O. Hairault and C. Prost (2016), "The Employment of Seniors: A Choice to Clarify and Personalize", *Les notes du Conseil d'analyse économique*, No 32, May.

Canning, D. and D. Bowser (2010), "Investing in Health to Improve the Wellbeing of the Disadvantaged: Reversing the Argument of *Fair Society, Healthy Lives* (The Marmot Review)", *Social Science and Medicine*, Vol. 71.

Chen, Y. and Li H. (2008), "Mother's Education and Child Health: Is There a Nurturing Effect?", *Journal of Health Economics*, Vol. 28, pp. 413-426.

CHRODIS (2016), "Good Practices in the Field of Health Promotion and Chronic Disease Prevention Across the Life Cycle – Outcomes at a Glance", Joint Action CHRODIS Work Package 5, Federal Centre for Health Education (BZgA), Germany and EuroHealthNet, Brussels.

Commonwealth Fund (2016), "2016 International Health Policy Survey", November.

Corna, L.M. (2013), "A Life Course Perspective on Socioeconomic Inequalities in Health: A Critical Review of Conceptual Framework", *Advances in Life Course Research*, Vol. 18, pp. 150-159.

Dannefer, D. (2003), "Cumulative Advantage/Disadvantage and the Life Course: Cross-Fertilizing Age and Social Science Theory", *Journal of Gerontology*, Vol. 58B, No. 6, pp. 327-337.

Deaton, A. (2013), "What Does the Empirical Evidence Tell Us About the Injustice of Health Inequalities?", in Nir Eyal, Samia Hurst, Ole Frithof Norheim and Daniel Wikler (eds.), *Inequalities in Health: Concepts, Measures and Ethics*, Oxford University Press, Oxford, United Kingdom.

Deaton, A. and C. Paxson (1994), "Saving, Growth, and Ageing in Taiwan", in D.A. Wise (ed.), *Studies in the Economics of Aging*, Chapter 9, Chicago University Press for the National Bureau of Economic Research.

de la Maisonneuve, C. and J.O. Martins (2013), "Projection Method for Public Health and Long-term Care Expenditures", *OECD Economics Department Working Paper*, No. 1048, OECD Publishing, Paris, http://dx.doi.org/10.1787/5k44v53w5w47-en.

Devaux, M. and M. de Looper (2012), "Income-Related Inequalities in Health Service Utilisation in 19 OECD Countries, 2008-2009", *OECD Health Working Papers*, No. 58, OECD Publishing, Paris, http://dx.doi.org/10.1787/5k95xd6stnxt-en.

Devaux, M. and F. Sassi (2015), "The Labour Market Impacts of Obesity, Smoking, Alcohol Use and Related Chronic Diseases", *OECD Health Working Papers*, No 99, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jrqcn5fpv0v-en.

Espelt, A. et al. (2010), "Disability Among Older People in a Southern European City in 2006: Trends in Gender and Socioeconomic Inequalities", *Journal of Women's Health*, Vol. 19, No. 5.

Fernald, A., V. Marchman and A. Weisleder (2013), "SES Differences in Language Processing Skill and Vocabulary Are Evident at 18 Months", *Developmental Science*, Vol. 16, No. 2, pp. 234-248.

Gallo, W.T. et al. (2000), "Health Effects of Involuntary Job Loss Among Older Workers Findings from the Health and Retirement Survey", *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, Vol. 55, No. 3, pp. S131-S140.

García, J.L. et al. (2016), "The Life-cycle Benefits of an Influential Early Childhood Program", *NBER Working Papers*, No. 22993, National Bureau of Economic Research, Cambridge, United States.

George, L.K. and K.F. Ferraro (2016), "Aging and the Social Sciences: Progress and Prospects", in L.K. George and K.F. Ferraro (eds.), *Handbook of Aging and the Social Sciences*, Eight edition, Chapter 1.

Glied, S. and A. Lleras-Muney (2008), "Technological Innovation and Inequality in Health", *Demography*, Vol. 45, No. 3, pp. 741-761.

Goldman, D. et al. (2009), "The Benefit of Risk Factor Prevention in Americans Aged 51 Years and Older", *American Journal of Public Health*, Vol. 99, No. 11.

Harkness, S. (2013), "Women's Employment and Household Income Inequality", in J. Gornick and M. Jantii (eds.), *Income Inequality: Economic Disparities and the Middle Class in Affluent Countries,* Stanford University Press, Stanford, United States, pp. 207-233.

Heckman, J. and P. Carneiro (2003), "Human Capital Policy", in Heckman, J. and A. Krueger (eds.), *Inequality in America: What Role for Human Capital Policy?*, MIT Press.

Herd, P. (2006), "Do Functional Health Inequalities Decrease in Old Age? Educational Status and Functional Decline Among the 1931-1941 Birth Cohort", *Research on Aging*, Vol. 28, No. 3, pp. 375-392.

Hidajat, M.M., M.D. Hayward and Y. Saito (2007), "Indonesia's Social Capacity for Population Health: The Educational Gap in Active Life Expectancy", *Population Research and Policy Review*, Vol. 26, No. 2, pp. 219-234.

ILC Global Alliance (2009), "Global Aging Report: Threats to Longevity", *International Longevity Centre Global Alliance Publication*.

Inchley, J. et al. (2016), "Growing Up Unequal: Gender and Socioeconomic Differences in Young People's Health and Well-being", *Health Policy for Children and Adolescents*, No. 7, World Health Organisation – Europe.

James, E. (2009), "Rethinking Survivor Benefits", *Social Protection and Labor Discussion Paper*, No. 928, World Bank.

James, C., M. Devaux and F. Sassi (2016), "Health and Inclusive Growth", *OECD Health Working Papers*, forthcoming.

Kautz, T. et al. (2014), "Fostering and Measuring Skills: Improving Cognitive and Non-cognitive Skills to Promote Lifetime Success", *OECD Education Working Papers*, No. 110, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jxsr7vr78f7-en.

Kryńska, E. et al. (eds.) (2013), *Diagnosis of the Current Situation of Women and Men Aged 50+ on the Labour Market in Poland: Final Report*, University of Lodz.

Messias, E. (2003), "Income Inequality, Illiteracy Rate, and Life Expectancy in Brazil", *American Journal of Public Health*, Vol. 93, No. 8.

Mondal, N.I. and M. Shitan (2013), "Relative Importance of Demographic, Socioeconomic and Health Factors on Life Expectancy in Low- and Lower-Middle-Income Countries", *Journal of Epidemiology*, Vol. 24, No. 2, pp. 117-124.

Muir, T. (2017), "Measuring Social Protection for Long-term Care", *OECD Health Working Papers*, No. 93, OECD Publishing, Paris, http://dx.doi.org/10.1787/a411500a-en.

Muliati, I. (2013), "Pension Reform Experience in Indonesia", *IMF paper for the IMF Conference for Designing Equitable and Sustainable Pension Post Crisis World.*

Murtin, F. and M. Mira d'Ercole (2015), "Household Wealth Inequality Across OECD Countries: New OECD Evidence", *OECD Statistics Brief*, No. 21.

OECD (2017a), *Inequality Pattern in Selected Emerging Economies*, OECD Publishing, Paris, forthcoming.

OECD (2017b), *Report on the implementation of the OECD Gender recommendations – Some progress on gender equality but much left to do*, OECD Publishing, Paris, forthcoming.

OECD (2016a), *OECD Employment Outlook 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/empl_outlook-2016-en.

OECD (2016b), *Society at a Glance 2016: OECD Social Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264261488-en.

OECD (2016c), *Health at a Glance: Europe 2016: State of Health in the EU Cycle*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264265592-en.

OECD (2016d), *Back to Work: Japan: Improving the Re-employment Prospects of Displaced Workers*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264227200-en.

OECD (2016e), "New Markets and New Jobs", *OECD Digital Economy Papers*, No. 255, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlwt496h37l-en.

OECD (2016f), *OECD Pensions Outlook 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pens_outlook-2016-en.

OECD (2016g), *OECD Business and Finance Outlook 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264257573-en.

OECD (2015a), *In It Together: Why Less Inequality Benefits All*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264235120-en.

OECD (2015b), *Pensions at a Glance 2015: OECD and G20 indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_glance-2015-en.

OECD (2015c), *Health at a Glance 2015: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/health_glance-2015-en.

OECD (2015d), *G20 Framework for Promoting Job quality,* OECD Publishing, Paris, http://g20.org.tr/wp-content/uploads/2015/11/G20-Framework-on-Promoting-Quality-Jobs.pdf.

OECD (2014a), *Ageing and Employment Policies. Switzerland. Working Better with Age*, OECD Publishing, Paris.

OECD (2014b), *OECD Pensions Outlook 2014*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264222687-en.

OECD (2013a), *PISA 2012 Results: Excellence through Equity (Volume II): Giving Every Student the Chance to Succeed*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264201132-en.

OECD (2013b), "The OECD Action Plan for Youth", OECD, Paris, http://www.oecd.org/els/emp/Youth-Action-Plan.pdf.

OECD (2013c), *OECD Employment Outlook 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/empl_outlook-2013-en.

OECD (2013d*), Pensions at a Glance Asia/Pacific 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_asia-2013-en.

OECD (2012a), *Equity and Quality in Education: Supporting Disadvantaged Students and Schools*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264130852-en.

OECD (2012b), *Closing the Gender Gap: Act Now*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264179370-en.

OECD (2011a), *Divided We Stand: Why Inequality Keeps Rising*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264119536-en.

OECD (2011b), *Doing Better for Families*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264098732-en.

OECD (2011c), *Help Wanted?: Providing and Paying for Long-Term Care*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264097759-en.

OECD (2010a), *Off to a Good Start? Jobs for Youth*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264096127-en.

OECD (2010b), *Obesity and the Economics of Prevention: Fit not Fat*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264084865-en.

OECD (2009), *Doing Better for Children*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264059344-en.

Orlova N.S., M.S. Rutledge and A.Y. Wu (2015), "The Transition from Defined Benefit to Defined Contribution Pensions: Does It Influence Elderly Poverty?", *Center for Retirement Research at Boston College Working Papers*, No. 17.

Paris, V. et al. (2016), "Health Care Coverage in OECD Countries in 2012", *OECD Health Working Papers*, No. 88, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlz3kbf7pzv-en.

Pisani, E., M.O. Kok and K. Nugroho (2017), "Indonesia's Road to Universal Health Coverage: A Political Journey", *Health Policy Plan*, Vol. 32, No. 2, pp. 267-276.

Peng, D. (2015), "Long-term Care for Older Persons in China", *SDD-SPPS Project Working Papers Series*.

Putnam, R. (2015), *Our Kids. The American Dream in Crisis*, Simon & Schuster Publisher.

Quesnel-Vallee, A., A. Willson and S. Reiter-Campeau (2015), "Health Inequalities Among Older Adults In Developed Countries: Reconciling Theories and Policy Approaches", *Population Change and Lifecourse Strategic Knowledge Cluster Discussion Paper Series*, Vol. 3, No. 1, Article 6.

Rofman, R. and L.M. Oliveri (2012), "Pension Coverage in Latin America", *World Bank discussion paper*, No. 1217

Sarkeala, T. et al. (2011), "Disability Trends Among Nonagenarians in 2001-2007: Vitality 90+ Study", *European Journal of Ageing*, Vol. 8, No. 2, pp. 87-94.

Sassi, F. et al. (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", *OECD Health Working Papers*, No. 48, OECD Publishing, Paris, http://dx.doi.org/10.1787/220087432153.

Schoon I. et al. (forthcoming), *The Impact of Early Life Skills on Later Outcomes. Final Report*, OECD Publishing, Paris.

Sullivan, D. and T. von Wachter (2009), "Job Displacement and Mortality: An Analysis Using Administrative Data", *Quarterly Journal of Economics*, pp. 1265-1306.

WHO (2016), *WHO Global Strategy and Action Plan on Ageing and Health*, April.

World Bank (2016), "Live Long and Prosper: Ageing in East Asia and Pacific", World Bank, Washington DC.

Yu, H. (2015), "Universal Health Insurance Coverage for 1.3 Billion People: What Accounts for China's Success?", *Health Policy*.

Database references

OECD Education Database, http://www.oecd.org/education/database.htm.

OECD Income Distribution Database, http://www.oecd.org/social/income-distribution-database.htm.

OECD Regional Database, http://www.oecd.org/cfe/regional-policy/regionalstatisticsandindicators.htm.

OECD Wealth Distribution Database, http://stats.oecd.org/index.aspx?DatasetCode=WEALTH.

Chapter 2

How inequality compounds over the life course

This chapter shows how inequalities in education, health, employment and earnings reinforce each other and evolve over the life course. It first discusses how unequal ageing begins in childhood because of the crucial influence of early life circumstances on health and socio-economic developments later in life. It then analyses the interactions between health, education and labour market outcomes through the different stages of working life, and builds life course trajectories highlighting differentials in lifetime earnings. The chapter then focuses on trends and social disparities in disability among the over 50s in Europe, Japan and the United States. Finally, the last section zooms in on some of the key challenges in health, education and income inequalities faced by emerging economies.

Key findings

- Early-life health and socio-economic conditions have long-lasting effects. Disadvantages reinforce each other in different dimensions and compound over the life course.
- At all ages, men and women in bad health work less and earn less when they work. Over the whole career, bad health reduces lifetime labour earnings by 33% and 17% for men with low and high levels of education, respectively, with smaller effects for women.
- The share of healthy life years in remaining life expectancy at age 50 has been broadly stable. Lower educated individuals are more likely to have a disability, due to lower incomes, worse working and living conditions, behavioural risk factors and less access to appropriate health care.
- Emerging economies are facing rapid population ageing at a relatively early stage of development and have wider health inequalities than OECD countries. Access to social protection is significantly more difficult in rural areas than in urban areas in most emerging economies.

Introduction

This chapter shows how inequalities in education, health, employment and earnings reinforce each other and evolve over the life course. Unequal ageing begins in childhood. Children from more privileged socio-economic backgrounds are healthier, perform better in school, obtain higher degrees and have better chances of succeeding later in the labour market. Adults with stable jobs, higher incomes and better access to health care and other services are more likely to retire with adequate income. People with low-quality jobs, low incomes and unstable careers, by contrast, tend to be in worse health, prone to unemployment and at greater risk of poverty throughout their lives into old age. Finally, despite the continuing growth in life expectancy, people do not necessarily spend the end of their working lives and retirement years in good health – there are, for instance, wide disparities in disability rates along gender, educational and geographical lines. The wide variety of health and socio-economic outcomes over people's working lives can add up to significant inequality in old age.

Delving into the causes of cumulative inequality, the first section briefly summarises the crucial influence of circumstances early in life on socio-economic developments later in life. Effects may be indirect, e.g. channelled through mediating factors such as lower educational achievement and restricted life opportunities, and/or remain latent for long periods. Section 2 goes on to analyse in depth the interactions between health, education and labour market outcomes through the different stages of working life. It highlights the close relationships in the data between those outcomes, and builds life course trajectories for typical cases, thereby estimating differentials in lifetime earnings related to education, gender and health status. The chapter then focuses on trends and social disparities in disability among the over-50s in Europe, Japan and the United States. Finally, the last section zooms in on some of the defining challenges facing emerging economies in health, education and income inequalities.

1. The critical influence of early-life circumstances

Early-life health and socio-economic conditions have long-lasting effects. They lay the foundations for people's future and are important predictors of future well-being. Inequalities in health and socio-economic status observed in adulthood indeed originate very early in life – before the age of three – and tend to become more pronounced during childhood (Case et al., 2002; Currie and Stabile, 2003). Misfortune and deprivation in childhood, or even in the womb, are likely to affect adult health, education and occupational achievement. Effects can be strong and may often lie latent for long periods.

Cunha et al. (2006) show significant disparities in cognitive and non-cognitive skills (e.g. personality traits, pro-social behaviour, self-confidence and self-control) among children from different socio-economic backgrounds who enter primary school. Those disparities tend to widen thereafter. Parents' socio-economic background, early-life health and skills acquired during childhood have been shown to influence later life health, education, earnings, and work effort (Almond and Currie, 2011a; Black and Devereux, 2011).

There are various reasons why early life events have such strong impact on later socio-economic outcomes. Child poverty can damage brain development and reduce learning outcomes. The brain develops rapidly in the earliest years of life, its capacity to adapt and develop slowing with age. Childhood health affects health in adulthood and, thereby, later-life socio-economic outcomes like wages and employment (Currie, 2009). Additionally, individuals who suffered from poorer childhood health tend to have lower household income as adults because they are more likely to live with lower-income partners (Smith, 2009). The effects of a child's socio-economic background on later life socio-economic status also operate through family connections, social skills and other personality-related non-cognitive skills.[1] The impacts of adverse events early in life are thus likely to accumulate over the life course.[2]

To combat inequalities over the life course, early intervention is the most efficient. A recent evaluation of a public cash-transfer programme to poor mothers in the United States confirms that the children of successful programme applicants had higher incomes during adulthood and lived significantly longer than the children of rejected applicants (Aizer et al. 2016). In general, the pay-offs from investing early in children are enormous: US research suggests that each dollar invested in high quality programmes before the age of 5 years yields a cumulative annual return of 13% at age 65 (Garcia et al., 2016), and that these benefits are especially large for children from a disadvantaged background.

Substantial public expenditure savings stand to be made if income, wealth and health inequalities can be picked up and addressed at younger ages. Policies to support children's educational, health and material well-being must start early and be sustained throughout childhood (OECD, 2009; 2011b). Preventing child poverty and material deprivation should be a priority. To alleviate hardship among low-income households and their children social safety nets should be in place – particularly child and family benefit programmes and services like free health care for children and cash and in-kind income support.

2. How health status and labour market outcomes interact

The effects of early-life circumstances on health and socio-economic outcomes might lie dormant and not become apparent until years later. By the time individuals enter the labour market they may significantly lead or lag behind their peers in educational attainment and health. The impact on labour market outcomes is considerable. People with poor health are less often in work and have lower wages than their healthy peers – particularly among workers with low levels of educational attainment.

When it comes to older workers with health problems, they might earn and work less or exit the labour market before the statutory retirement age – as they become eligible for disability benefits, for example (Wise, 2016). Reciprocally, employment and wages may impact on physical or mental health (Currie and Madrian, 1999; Grossman, 2000), even though the empirical evidence as to the causal effect of labour market outcomes on health is mixed.[3] It is therefore important to investigate in detail how health, socio-economic status and labour market outcomes are interrelated.

Economic theory treats health as part of an individual's human capital: healthier individuals are more likely to be employed because they have a greater capacity to work and they earn higher wages as they tend to be more productive (Becker, 1962; Grossman, 1972). Health may also influence preferences. Someone who has experienced a serious health shock – a heart attack, for instance – may, beyond possible induced health limitations, value employment and leisure differently and decide to work less after recovery. Whether it reflects human capital depreciation or changes in preferences, the effect of health on labour market outcomes strengthens with age (Currie and Madrian, 1999) and is an important contributory factor in explaining employment at older ages (Kalwij and Vermeulen, 2008).

The data analysis below pools the 2005-2014 waves from the European Union Survey on Income and Living Conditions (EU-SILC), the 2001-2013 waves of the Household Income and Labour Dynamics in Australia (HILDA), the 2003-08 waves from the Korea Labour and Income Panel Study (KLIPS) and the 1999-2009 waves from the Panel Study of Income Dynamics (PSID). In all, the analysis takes in 24 OECD countries.[4] Health statuses are self-reported, with "bad" health defined as less than good health – i.e. "fair", "bad" or "very bad" health status in the EU-SILC and KLIPS and "fair" or "poor" in HILDA and PSID.[5]

Bad health worsens with age with wide disparities between education levels

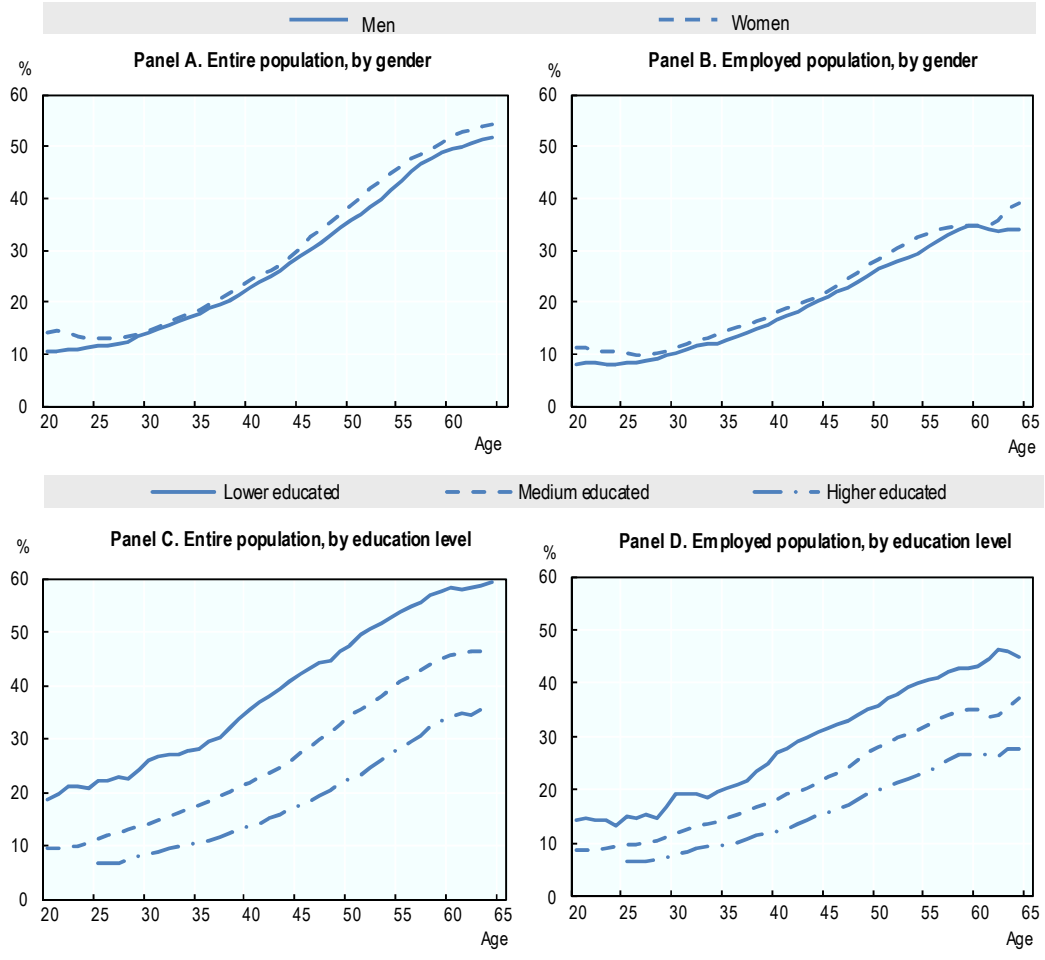
The proportion of people reporting bad health rises with age:

- from about one-tenth of the entire population at the age of 20 to more than half at 64 years old (Figure 2.1, Panel A)
- from about one-tenth of the employed to slightly over one-third, respectively (Panel B).

While the figures do not differ significantly between men and women, there are substantial disparities between education levels (Panels C and D). Among the highly educated, less than 10% are in bad health at the age of 25 and about 35% at the age of 64. The figures are close to 20% and 60%, respectively, among people with low levels of education.

Figure 2.1. Health worsens with age

Share of people reporting bad health by age, gender, and education



Note: "Low", "medium" and "high" levels of education correspond to International Standard Classification of Education (ISCED) codes 0-2, 3-4, and 5-6, respectively.

Source: OECD calculations from microdata on 24 OECD countries.

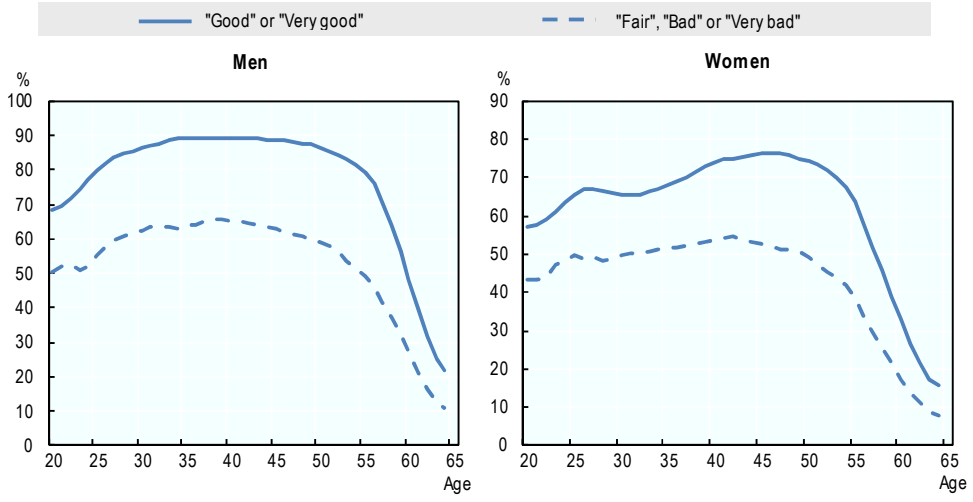
StatLink http://dx.doi.org/10.1787/888933566514

Individuals in bad health work less and earn less when they do work

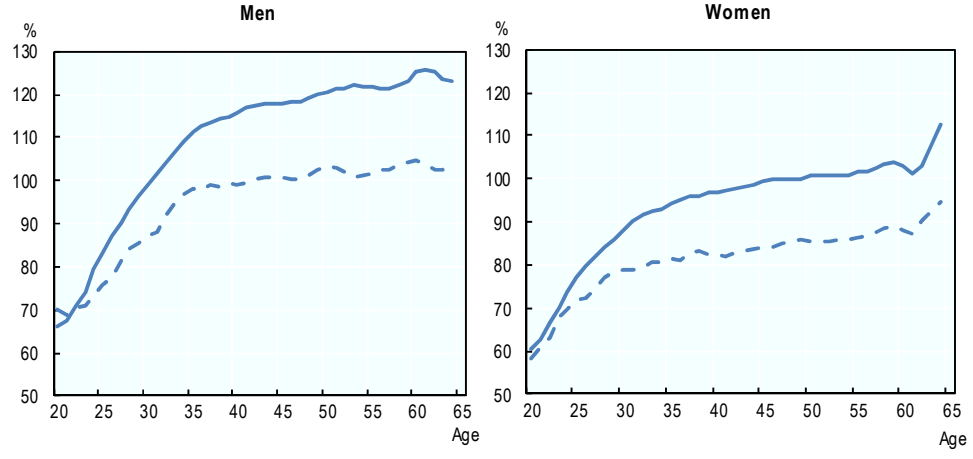
Individuals in bad health are less likely to work and, when they do, earn lower wages than their healthy peers. Health gaps are observed across dimensions such as gender, age and education. As regards age, for example, among both men and women in good or bad health, age-related employment rate curves are hump-shaped, falling away sharply after the age of 55 (Figure 2.2, Panel A) – a reflection of the typical working life cycle, where the young steadily transition from education to work and older workers into retirement. At all ages, employment rates are lower among the unhealthy than the healthy. Similarly, the wages of workers with health problems rise less steeply with age than those of their healthy peers, especially among men (Panel B). Within age- and health-related categories, men earn higher wages and are more likely to work than women.

Figure 2.2. Employment rates and earnings are lower for individuals in bad health

Panel A. Employment rate by gender, age and self-reported health



Panel B. Normalised hourly earnings by gender, age and self-reported health



Note: Individual hourly earnings are divided by the corresponding country-year mean and multiplied by 100.

Source: OECD calculations from microdata on 24 OECD countries.

StatLink http://dx.doi.org/10.1787/888933566533

There are plenty of reasons for differences in employment rates. First and foremost, bad health might physically prevent people from holding down a job. Second, healthy people are generally more productive and therefore more likely to be hired than the unhealthy. They are also more likely to look for work. However, as mentioned above, causation might run the other way, with strenuous and stressful jobs damaging health, for example. It is therefore important to understand that the health-employment causal relationship runs both ways and can be self-perpetuating – which makes it vitally important that policies seek to prevent bad health and promote healthy workplaces.

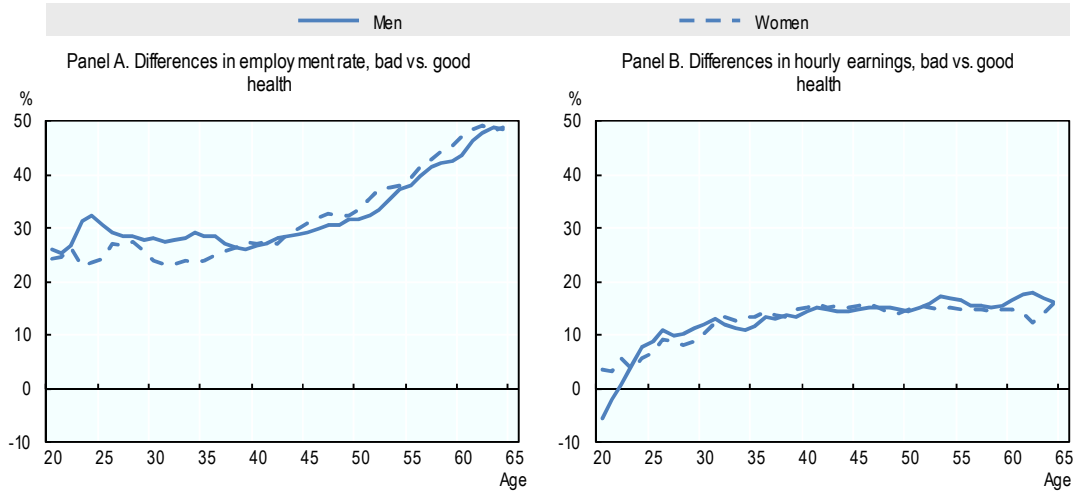
The health-related employment-rate gap (Figure 2.3, Panel A), while large, is no larger among 40- than 20-year-olds – around 25-30% among both men and women. Thereafter, it increases substantially – up to 50% among people in their early 60s. The

employment gap is expressed as a percentage and not in percentage points for reasons of consistency with the health-related wage gap in their contribution to the total earnings gap. The health-related wage gap also widens among men and women with age. From negligible at the very young working age of 20-24, it widens to about 15% among the over-60s. In other words, the wages of healthy workers climb faster than those of their less healthy peers. There are various reasons, many of which overlap with reasons for the health-related employment gap – healthy workers are likely to be more productive, to call in sick less often, to attach greater importance to work, and to get promoted (which is related to being more productive).

Yet health-related wage gaps – which necessarily apply to the employed – are not especially wide. This could be due to the lower health variation among the employed than among the entire population. Overall, though, it is important to understand that, on average, employment gaps related to health are three times greater than wage gaps.[6]

Figure 2.3. Health-related gaps widen in the second half of the career for employment but early for wages

Gaps expressed as percentages with good health outcomes as the reference



Source: OECD calculations from microdata on 24 OECD countries.

StatLink http://dx.doi.org/10.1787/888933566552

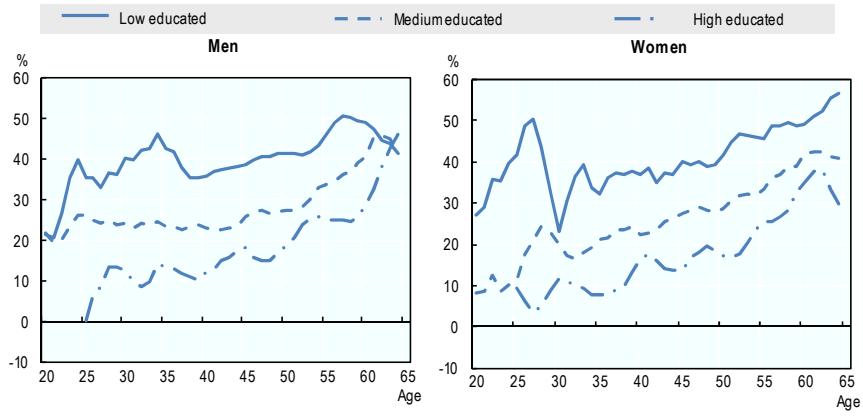
Health-related labour market gaps are similar across countries but vary with education levels

In the previous paragraphs the data for 24 OECD countries was pooled. Actually, health-related wage and employment gaps vary little from one geographical area to another, when dividing European countries into Nordic, Continental, Southern European, and Central and Eastern European groups.[7] That there should be such little variation between geographical groupings is noteworthy given that their taxation and benefits systems and labour market performances differ significantly. The lack of variation in health-related employment gaps is in line with evidence in Flores and Kalwij (2013) for older workers. However, when comparing European countries to Australia, Korea and the United States some differences emerge, especially for employment. Health-related employment gaps over the working life tend to be larger in Europe (for men) and lowest in Korea. For example, in Korea these gaps remain lower than 20% until people reach their late 50s.

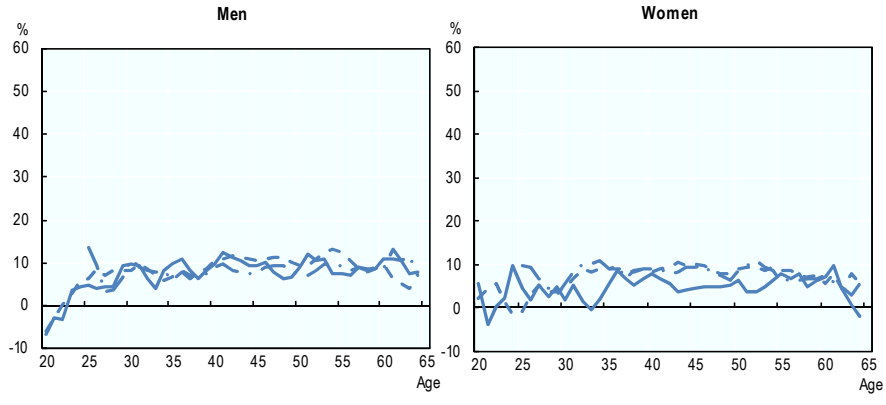
Turning to health-related employment gaps by level of education, men and women in bad health work less than their healthy peers (Figure 2.4, Panel A) and earn lower wages (Panel B), for all education levels. Moreover, there are wide disparities in the health-related employment gap by level of education. With an average of 20% for both men and women, the gap is half as large among the highly educated as among the less well educated (Panel A).

Figure 2.4. Health-related employment gaps are larger among the low educated

Panel A. Differences in employment rate by education level, bad vs. good health



Panel B. Differences in hourly earnings by education level, bad vs. good health



Note: Individual hourly earnings are divided by the corresponding country-year mean and multiplied by 100.

Source: OECD calculations from microdata on 24 OECD countries, see Section 2.

StatLink http://dx.doi.org/10.1787/888933566571

A possible explanation is that the less well educated perform the bulk of manual work, for which good physical health is required. In such occupations, bad health makes workers considerably less productive and sometimes prevents them from working. The relative wage rigidity for low-skilled work might also be important, making good health a greater determinant of employment. Wage inertia between healthy and unhealthy workers could therefore widen health-related employment gaps, especially among low-skilled workers. Indeed, there are no big differences in health-related wage gaps between workers with different levels of education (Panel B). In other words, poor health is associated with wage drops that are broadly similar, regardless of whether they are educated to low, medium or high levels.

Impact of health on lifetime earnings by gender and education levels

Although there is a close correlation between health status and labour market outcomes, it is not necessarily one of cause and effect. Men's and women's typical earnings trajectories are calculated, drawing on the estimated impacts of health status on labour market outcomes using the method described in Box 2.1. The typical cases are characterised on the basis of health (bad or good), education levels (low, medium and high), and employment status (in or out of work). The effect of bad health on lifetime earnings takes into account the impact on the probability of not being in employment. It takes full-career workers with medium education who are in good health as the benchmark group and assumes that their real earnings grow by 1.25% per annum.[8] Finally, it assumes that workers enter the labour market at the age of 20 and retire when they are 67.

Box 2.1. Identifying the causal impact of health on labour market outcomes

Identifying the impact of health on labour market outcomes is complicated for various reasons. Wages and employment can also affect health, while unobserved factors – like parents' socio-economic status and even prenatal circumstances – affect both health and labour market outcomes in adulthood. Moreover, because the employed and non-employed might differ in characteristics that influence both wages and health, but that are not captured in the data – such as individuals' diligence – the estimated effect of health on wages is prone to sample selection biases.

A further factor that complicates evaluations of the effect of health on labour market outcomes, is that self-reported health can differ from true health, introducing a measurement error. In the simplest case, the consequence could be a correlation between self-reported health and the residual in an estimated equation, which might result in an underestimation of the effect of health on labour market outcomes. The use of self-reported health has two additional limitations:

- Non-employed individuals might report that their health is worse than it actually is to justify not working, which would overstate the impact of health on employment (Bound, 1991).
- People use different subjective standards when they assess their health (Kapteyn et al., 2007). Some differences in self-reported health thus reflect subjective assessments rather than true health differences, thereby blurring the real impact of health on labour market outcomes.

To account for unobserved individual characteristics that do not change over time (e.g. parents' socio-economic status), so-called individual fixed-effects (FE) models are used. Furthermore, an objective health indicator for chronic illnesses in EU-SILC is used to purge self-reported health both of the biases discussed above and of reverse-causality issues (instrumental variables [IV] technique).[1]

Individual FE models, however, tend to exacerbate some measurement error problems and underestimate the impact of health (Angrist and Pischke, 2009). Nor can such models correct for unobserved characteristics that change over time, such as motivation. FE models, therefore, are implemented only in conjunction with IV models and denoted as FE-IV models (Flores, 2017a).

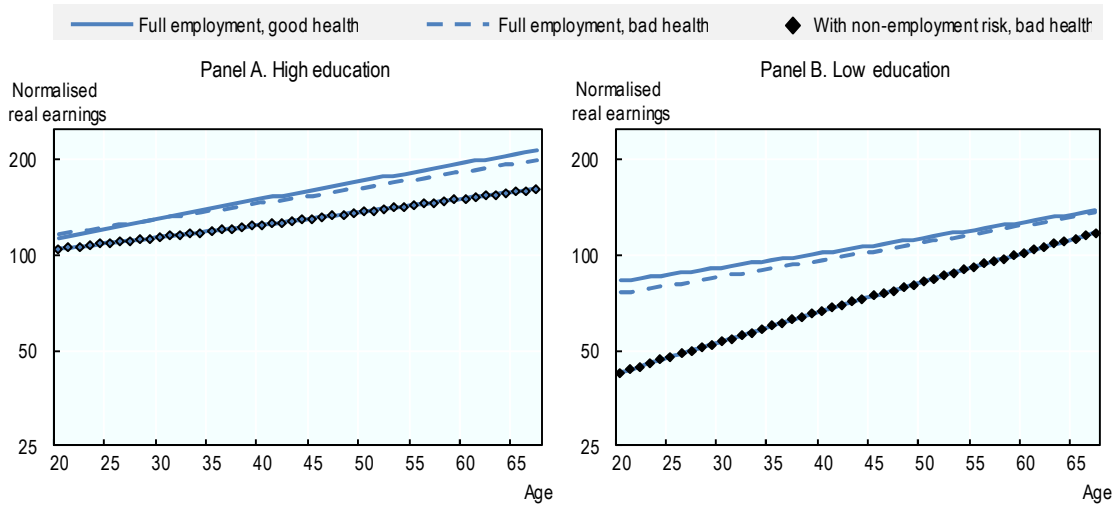
The results yielded by the FE-IV and IV models respectively produce lower and upper boundaries to earnings-trajectory differentials, even when the health-related risk to employment is factored in.[2] Although figures with earnings trajectories use an average of the FE-IV and IV models, the figures from each one are reported in Table 2.1. These numbers should be interpreted with some caution, however, as the IV models are "just-identified" and it is not possible to formally test whether the instruments are uncorrelated with the residual term in the main equation of interest (i.e. the wage and employment equation).

1. The chronic illness indicator is not used in the first place because it is an imperfect measure of physical health and does not capture mental health as well as self-reported health does. It can, though, be used in combination with self-reported health. Some studies show that major chronic diseases are not affected by employment status (Westerlund et al., 2010). To the extent that the finding also holds true for the chronic illness variable used in this analysis, the instrumental variables technique would allow correction for the reverse causality problem due to employment affecting SRH.

2. Linear probability models (LPMs) rather than probit or logit models are used because of the difficulties in computing the marginal effect of triple interaction terms in nonlinear models, while the LPM provides a good approximation.

Among men, poor health reduces earnings of the low educated more than among the highly educated (at least until age 55) especially given the risk of non-employment associated with bad health (Figure 2.5). Bad health cuts the earnings of highly educated men by about 10% at the age of 25 and by 25% at 65 (Panel A). Both figures drop significantly if the probability of not working because of bad health is ignored, i.e. if only employed workers are considered. Among the less well educated, the age pattern is different. Health-related earnings gaps are about 45% at the age of 25 and 20% at 65 (Panel B). Again, ignoring risks of being out of work lowers the figures. Further analysis is needed to understand why the age pattern of the estimated impact of bad health on earnings differs with level of education.

Figure 2.5. Effects of bad health on men's earnings accounting for the risk to employment, by education level



Note: The reference group (=100) is a 20-year-old in employment, educated to a medium level and in good health (see Box 2.1 for details on the method of estimating the effect of health on employment and Note 8 for the specifications of the wage and employment models). Y-axis is in log scale. Earnings are measured in PPP-adjusted 2015 euros. Lifetime earnings are obtained by discounting earnings using an annual real interest rate of 2%. All individuals are assumed to survive until they are 67, which ignores inequality in risks of death until that age, so underestimating health- and education-related gaps in lifetime earnings.

Source: OECD estimates based on microdata from 2005-2014 waves from the European Union Survey on Income and Living Conditions (EU-SILC).

StatLink http://dx.doi.org/10.1787/888933566590

Overall, bad health lowers the lifetime earnings of men with low levels of educations by 33% and those of the highly educated by 17%. The figures drop to around 5% for both groups if the risks of non-employment effects are ignored (Table 2.1), which bears out the lack of variation (discussed above) in health-wage differentials between education levels.[9] Earnings trajectory patterns among women are a little different and health effects are less pronounced as the risk of health-related non-employment is lower (Table 2.1). While the numbers in the table provide a useful order of magnitude, the potentially large uncertainty around the quantification of health effects is reflected in the variation between the lower and upper bounds reported in the table.[10]

Table 2.1. The impact of bad health on lifetime earnings

	Baseline	**Baseline**	Lower bound	Upper bound
	Full-time worker	**With non-employment risk due to bad health**	With non-employment risk due to bad health	With non-employment risk due to bad health
	Men			
Low education	5%	**33%**	13%	52%
Medium education	6%	**30%**	12%	47%
High education	3%	**17%**	2%	29%
	Women			
Low education	0%	**18%**	2%	34%
Medium education	2%	**19%**	8%	30%
High education	3%	**13%**	-2%	22%

Note: See Box 2.1 for details of the method that produces the results in the table.

Source: OECD estimates based on microdata from 2005-2014 waves from the European Union Survey on Income and Living Conditions (EU-SILC).

StatLink http://dx.doi.org/10.1787/888933566818

The different wage paths illustrate the extent to which disadvantage in education, health and the labour market might compound each other. Interaction between the three dimensions means that improving education, for instance, could have positive knock-on effects on the labour market and health. Similarly, inequality-reducing policies in one area will generate greater total returns in terms of welfare as they spill over into other areas – which points to the potentially powerful multiplier effects of inequality prevention in health, labour and education. Interventions at an early age are also important because, in most aspects of human capital (e.g. education and health), inequalities emerge very early in life and interventions that reduce inequality will complement each other over the life course.

3. Trends and social disparities in disability among people aged 50 and over

To better grasp later life health issues, this section zooms in on the 50-64 age group and the 65-and-over. It first seeks to determine whether gains in life expectancy at birth have mainly translated into good health later in life. Life expectancy has steadily increased in recent decades in OECD countries, yet an important question for employment and equal ageing is whether the extra years are lived in good or bad health. This report finds that, to a significant extent, they are lived in good health, but that wide gender- and education-related disparities persist. Women report higher rates of disability than men, while people with lower levels of education are at greater risk of disability than the highly educated.

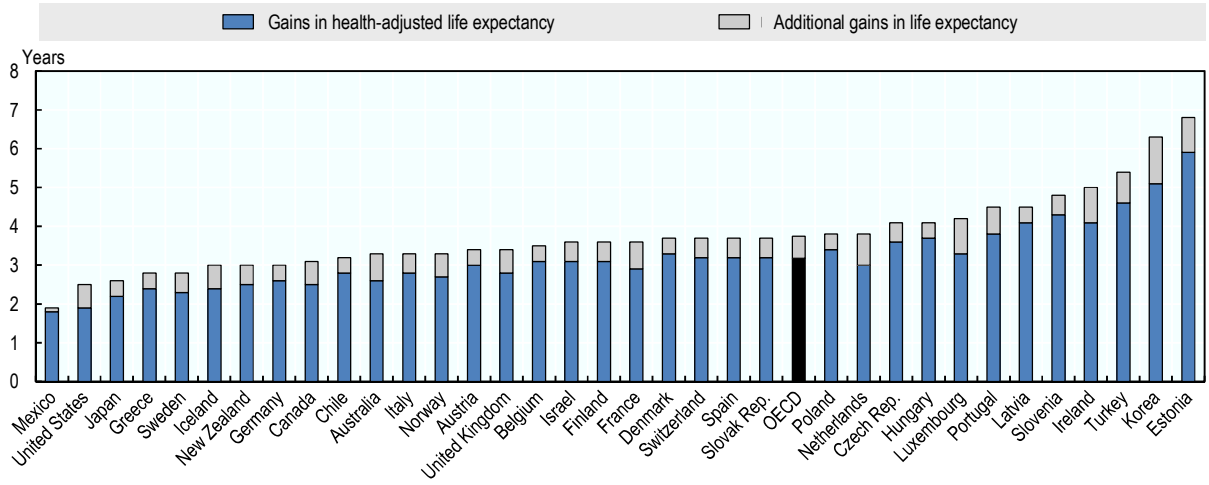
Increasing life expectancy at birth has been mainly in good health

Between 2000 and 2015, life expectancy at birth increased by an average of 3.7 years across the OECD. According to WHO estimates, most of the years gained (i.e. 85% or 3.2 years) were healthy (Figure 2.6). The remaining half-year (or 15%) was marked by bad health due to diseases and/or injuries.

The gains in life expectancy and healthy life expectancy have been particularly strong in countries that had relatively low levels in 2000 (e.g. Estonia and Turkey). There are some exceptions, however. Life expectancy in Mexico, for example, grew by less than two years due both to a greater prevalence of risk factors and persistent barriers of access to high-quality care. In the United States, life expectancy at birth grew by only 2.5 years between 2000 and 2015, making it more than one year below the OECD average.

Figure 2.6. Extra years of life expectancy have been largely in good health

Total gains in life expectancy at birth, OECD countries, 2000-15



Note: Countries are ranked in ascending order of life expectancy gains. Health-adjusted life expectancy is defined as the number of years that people can expect to live in "full health" by taking into account years lived in less than full health due to disease and/or injury.

Source: WHO (2016), "Global Health Observatory Data, Healthy Life Expectancy at Birth", http://apps.who.int/gho/data/node.main.HALE?lang=en.

StatLink http://dx.doi.org/10.1787/888933566609

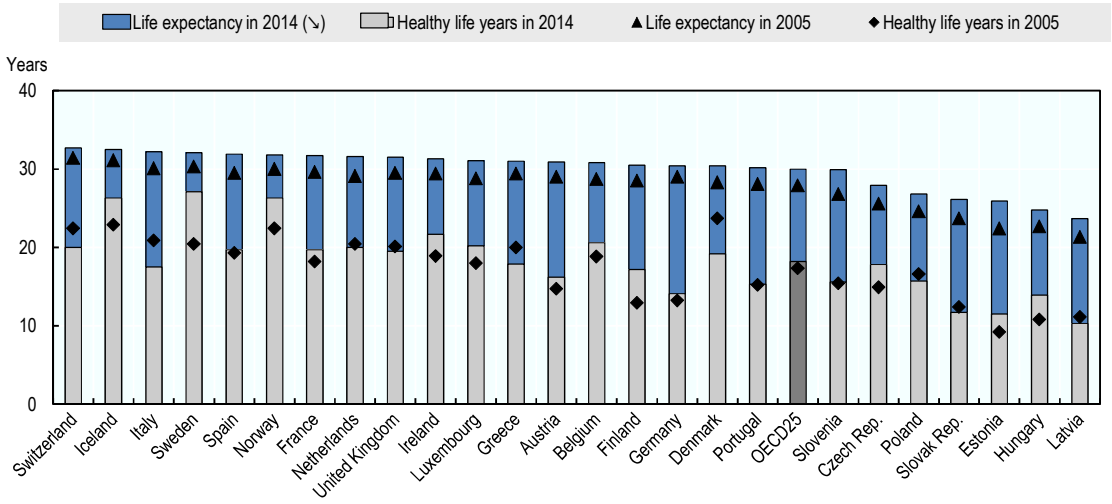
The share of healthy life years in remaining life expectancy at the age of 50 has been broadly stable

In Europe, Eurostat produces an indicator of healthy life years at different ages – equivalent to an indicator of disability-free life expectancy (Eurostat, 2016).[11] It shows that the prevalence of ill health and disability increases with age. In the 25 European OECD countries, an average of almost 40% of 50-year-old men's remaining life expectancy in 2014 is affected by limitations on activities (Figure 2.7). The share among women is even higher at 47%.

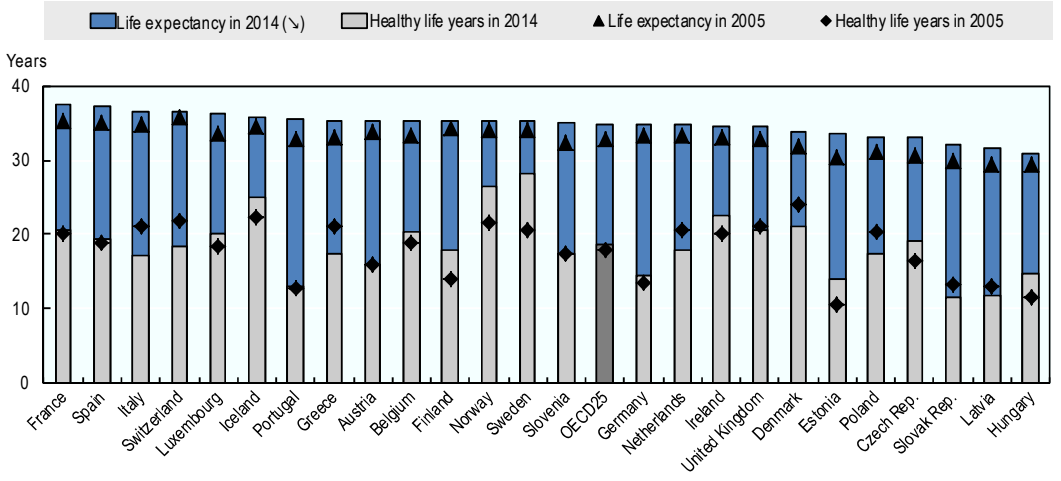
Between 2005 and 2014, average male and female life expectancy at 50 years old increased by about two years. However, 40% of those gains were estimated to be healthy (i.e. disability-free) years for men and only about 30% for women. Overall, this implies that the number of healthy life years has increased over time, but that the ratio of healthy life years over remaining life expectancy at age 50 has fallen slightly for both men and women over the past decade.

Figure 2.7. The share of healthy life years in remaining life expectancy at the age of 50 has been broadly stable

Panel A. Life expectancy and healthy life years at age 50, men



Panel B. Life expectancy and healthy life years at age 50, women



Note: Healthy life years (HLY) are years spent free of disability (or activity limitation). For Switzerland, the first estimate of healthy life years relates to 2007.

Source: Eurostat (2016), "Healthy Life Years Statistics", http://ec.europa.eu/eurostat/statistics-explained/index.php/Healthy_life_years_statistics.

StatLink http://dx.doi.org/10.1787/888933566628

Longer life expectancy and healthy life expectancy have been influenced by a wide range of factors. On the positive side, general improvements in educational attainment, standards of living of the population in general, and the older population in particular, have contributed to better health. At the same time, there has been a reduction in major health risk factors and causes of death, such as smoking. On the downside, growing income inequalities and the rise of different risk factors such as obesity are contributing to widespread and growing health and disability problems (Lin et al., 2016; Martin and Schoeni, 2014).

Mixed trends in disability across countries, gender, age group and disability metrics

The literature on the worldwide trends in the prevalence of disability among older people over time paints a mixed picture. That is true of both the 50-64 year-old age group and the 65-and-over and applies to men and women with different types and degrees of disabilities. Lafortune and Balestat (2007) focus on severe disability among the 65-and-over in 12 countries between 1980 and 2005. They find falling incidence of severe disability in some countries (e.g. Denmark, Finland, Italy, the Netherlands and the United States), growing prevalence in others, like Belgium, Japan and Sweden, stable rates in Australia and Canada, and contradictory, inconclusive results in two others, France and the United Kingdom.[12] This report uses the most recent harmonised survey data (Box 2.2) to analyse both disability trends and inequalities in disability rates.

Box 2.2. Harmonised health and retirement surveys used to compare disability trends and inequality in disability by gender, age group and education level

The analysis of disability trends and inequalities in this chapter covers 12 European countries – Austria, Belgium, the Czech Republic, Denmark, England, France, Germany, Italy, the Netherlands, Spain, Sweden and Switzerland. It also includes Israel, the United States, Japan and China. To measure different types of disability by gender, age group and education level, data from the following surveys are used: the harmonised versions of the Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, Health and Retirement Survey (HRS) in the United States 2000-2014, English Longitudinal Study of Ageing (ELSA) 2002-2012, Japanese Study on Aging and Retirement (JSTAR) 2007-2011, and China Health and Retirement Longitudinal Study (CHARLS) 2011-2013. An important advantage of using this set of surveys is that they all use similar questions to measure different types of disabilities. Nonetheless, caution should be exercised when drawing comparisons between countries because of possible cultural differences and biases in responses to disability survey questions (Chan et al., 2012).

Disability rates are reported for four population sub-groups – men and women aged 50-64 and over 64 – and four types of disabilities:

- At least one limitation on an activity of daily living (ADL). ADLs include dressing, bathing or showering, eating, getting in or out of bed, and using the toilet.
- At least one limitation on an instrumental activity of daily living (IADL). IADLs are the activities that people must perform if they are to live independently at home. These include preparing meals, shopping for groceries, making telephone calls, taking medications and managing money (e.g. paying bills and keeping track of expenses).
- At least one functional limitation related to mobility, such as the ability to walk and climb stairs.
- Limitations on paid work because of a health problem. Work limitations relate to whether people have any health problem or disability that restricts the kind or amount of paid work that they can do.

Middle-aged populations are affected by a mostly inconclusive mix of disability trends (Table 2.2) that are similar to findings that emerge from a review of the literature. The United States shows significantly increasing trends among men and women with activity of daily living limitations (ADL), instrumental activity of daily living limitations (IADL), functional limitations and work limitations. Overall trends in the 12 European continental countries in the sample are of slow increases in ADL limitations and functional limitations among middle-aged men. By contrast, England shows significant drops among men and women in ADL, IADL, functional and work limitations

in the 50-64 age group. As for Japan, there are no significant trends in the 50-64 year-old age group.

In the 65-and-over age group there is mostly a downward trend in severe and less severe disabilities or no significant trend at all. In England the rates of 65-and-over affected by severe disability (ADL limitations) has fallen significantly. The United States, by contrast, shows a rising trend in severe disabilities, which runs counter to the falling rates found in earlier OECD analysis.[13]

Table 2.2. Evidence of disability trends among 50-64 year-olds and the over-64s, selected OECD countries

		Men		Women	
		Below 65 years old	Over 64 years old	Below 65 years old	Over 64 years old
ADL limitation (severe disability)	Increasing	United States, continental Europe	United States, continental Europe	United States	
	Decreasing	England	England	England	England
	No significant trend	Japan	Japan	Continental Europe, Japan	Continental Europe, United States, Japan
IADL limitation (less severe disability)	Increasing	United States	United States	United States	United States
	Decreasing	England		England	Continental Europe, Japan
	No significant trend	Japan, continental Europe	Japan, continental Europe, England	Japan, continental Europe	England
Functional limitation	Increasing	United States, continental Europe	United States	United States	United States
	Decreasing	England	England	England	England
	No significant trend	Japan	Japan, continental Europe	Japan, continental Europe	Japan, continental Europe
Work limitation	Increasing	United States		United States	
	Decreasing	England		England	
	No significant trend	Continental Europe		continental Europe	

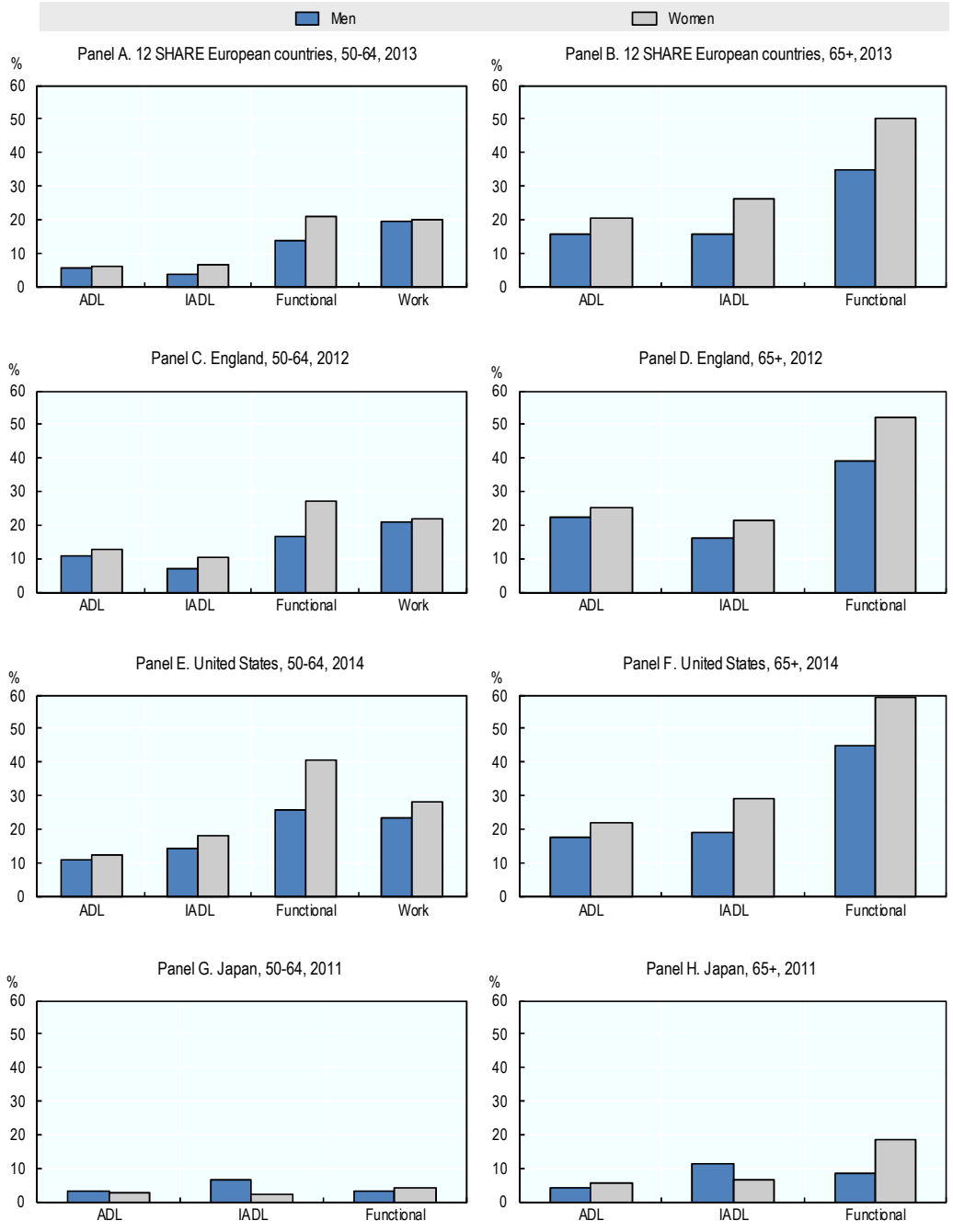
Note: Results from four separate logistic regression models (for each gender and age group). Control variables include: five-year age group, time, education level and country dummies. The survey of health and ageing in Japan does not include a question about work participation related to disability.

Source: OECD analysis based on data from Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, Health and Retirement Survey (HRS) in the United States 2000-2014, English Longitudinal Study of Ageing (ELSA) 2002-2012 and the Japanese Study on Aging and Retirement (JSTAR) 2007-2011.

Disability rates rise with age and women report higher rates of disability than men

About one in five 50- 64 year-olds in Europe report that ill health limits the kind or amount of paid work they could do (Figure 2.8). The rate was closer to 30% among women in the United States. In continental Europe and England, men were more likely to report health-related work limitations than functional limitations, while for women it was the opposite. One reason for the gender difference might be the labour-market participation gap between men and women – people not in the labour market might be less likely to report that their disability restricts paid work. However, another related explanation could be that older workers whose state of health curbs their work capacity may be entitled to disability insurance benefit and report exiting the labour market for health-related reasons. Such exits contributed to the declining employment rate of older workers in OECD countries in the 1980s and 1990s (Wise, 2016). Again, given the persistent employment gap, men were more likely to be affected.

Figure 2.8. Disability rates among 50-to-64 year-olds and the 65-and-over



Note: Percentage of people within an age group reporting at least one limitation. Numbers are age-standardised against the 2005 OECD population. Sampling weights are used. Japan's JSTAR survey does not include a question about work participation related to disability. Latest harmonised survey year is reported for all country groups.

Source: OECD analysis based on data from Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, Health and Retirement Survey (HRS) in the United States 2000-2014, English Longitudinal Study of Ageing (ELSA) 2002-2012 and the Japanese Study on Aging and Retirement (JSTAR) 2007-2011.

StatLink http://dx.doi.org/10.1787/888933566647

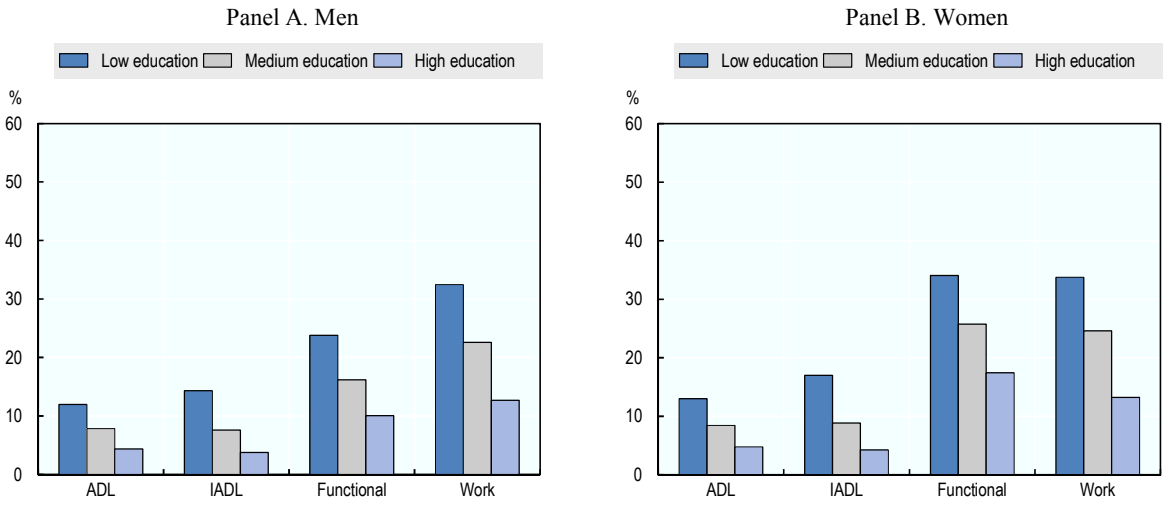
As expected, the chances of ADL, IADL and mobility limitations increase steeply with age among both women and men. In general, women are more likely than men to report disabilities in both the 50-64 and 65-and-over age groups. One possible explanation is that they suffer from a higher incidence of non-fatal but disabling diseases (e.g. arthritis), while men are more often affected by such fatal illnesses as lung cancer or acute myocardial infarction (Espelt et al., 2010; Sarkeala et al., 2011). An exception is Japan. There, possibly for cultural reasons (at least in part), women are less likely than men to report IADL limitations – which are limitations in activities that are needed to live independently at home. Moreover, overall levels of reported disability are much lower in Japan than elsewhere among both men and women.

Low-educated people have a higher risk of disability which narrows at older ages

Inequalities in health and disability status exist not only between men and women, but also between socio-economic groups. The poorly educated, both male and female, are more likely to suffer from a disability (Figure 2.9). About 30% of 50-64 year-old men with low levels of education state that poor health restricts their paid work capacity, compared to only 10% of the highly educated. Disabling chronic diseases are also more frequent among people with low levels of education, attributable to lower incomes, harder working and living conditions, a greater prevalence of behavioural risk factors (such as smoking, drinking, and less healthy eating habits), and less access to appropriate health care (OECD, 2016a; James et al., 2016).

Figure 2.9. Low-educated have a higher risk of disability

Predicted prevalence of disability among people aged 50-64, by gender and education



Note: Predicted probabilities are averages derived from four separate logistic regression models (for each gender and age group) in 2013/14 or nearest year. Three models are used for work capacity limitations since Japan's JSTAR survey of health and ageing does not include a question on work participation related to disability. Control variables include: five-year age groups, time, time squared, education level and country dummies. Rates are age-standardised against the 2005 OECD population.

Source: OECD analysis based on data from Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, Health and Retirement Survey (HRS) in the United States 2000-2014, English Longitudinal Study of Ageing (ELSA) 2002-2012 and the Japanese Study on Aging and Retirement (JSTAR) 2007-2011.

StatLink http://dx.doi.org/10.1787/888933566666

Although the education-related disability gap[14] persists at older ages, it narrows among the over-65s compared to the 50-64 year-olds (Table 2.3). For example, the incidence of functional limitations among poorly educated 50-64 year-old men is two to four times greater than among their highly educated peers. Among the over-65s, the gap shrinks to about 1.5. A similar pattern is found among women and with regard ADL and IADL limitations. The fact that the gap narrows after 65 is due to relatively greater increases in disability prevalence among the highly educated group at older ages. And although the gap between higher and lower levels of education narrows, inequalities persist even in the older age group (in other words, the relative risk remains greater than 1).

Table 2.3. Relative risk of disability comparing higher and lower educated groups by gender and age in the most recent survey year

12 European SHARE countries	Men 50-64	Men 65+	Women 50-64	Women 65+
ADL limitation	2.8	1.6	2.4	1.6
IADL limitation	3.7	2.3	3.2	2.1
Functional limitation	2.7	1.5	2.0	1.4
Work limitation	2.6	--	1.9	--
England	Men 50-64	Men 65+	Women 50-64	Women 65+
ADL limitation	4.2	1.7	3.1	1.5
IADL limitation	6.4	2.6	3.2	1.9
Functional limitation	3.9	1.6	2.0	1.2
Work limitation	3.3	--	2.5	--
United States	Men 50-64	Men 65+	Women 50-64	Women 65+
ADL limitation	3.1	1.7	2.9	1.5
IADL limitation	3.6	2.3	3.1	1.8
Functional limitation	2.5	1.5	1.8	1.3
Work limitation	2.4	--	2.1	--
Japan	Men 50-64	Men 65-75	Women 50-64	Women 65-75
ADL limitation	1.6	1.2	1.4	3.2
IADL limitation	3.1	2.5	3.6	2.2
Functional limitation	2.9	1.6	2.6	2.1
Work limitation	--	--	--	--

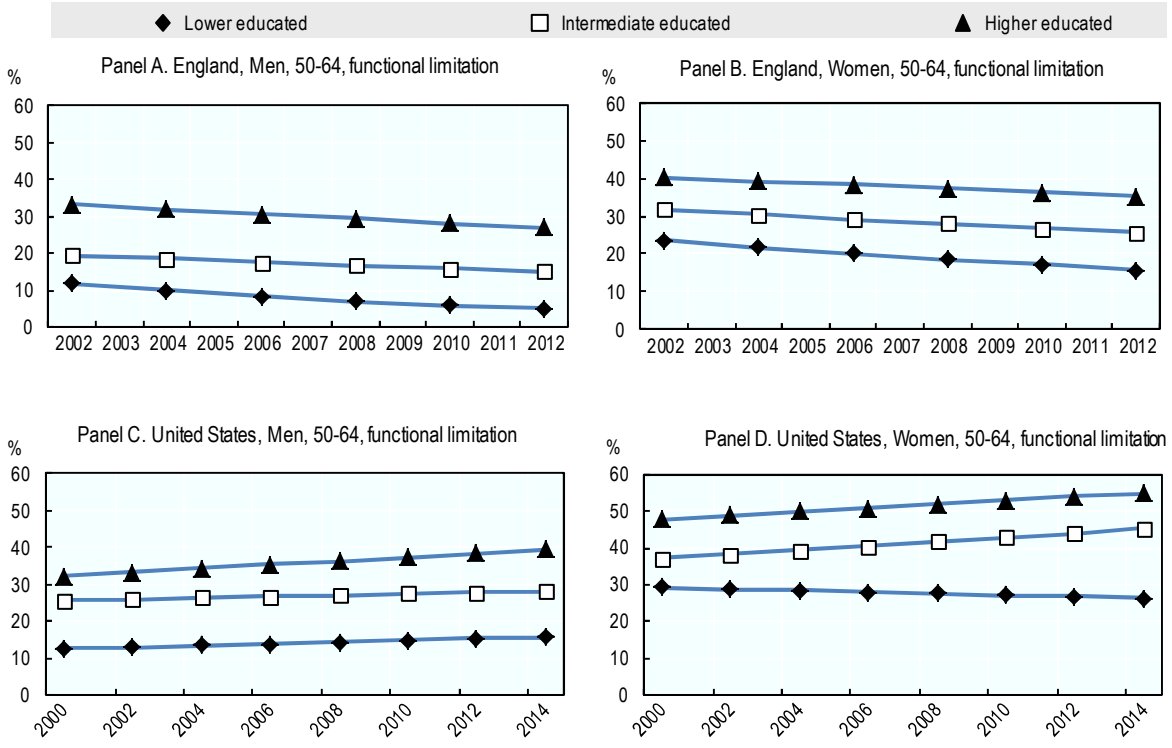
Note: Predicted probabilities are averages derived from four separate logistic regression models (for each gender and age group) in 2013/14 or nearest year. Three models are used for work capacity limitations since Japan's JSTAR survey of health and ageing does not include a question on work participation related to disability. Control variables include: five-year age groups, time, time squared, education level and country dummies. Rates are age-standardised against the 2005 OECD population.

Source: OECD analysis based on data from Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, Health and Retirement Survey (HRS) in the United States 2000-2014, English Longitudinal Study of Ageing (ELSA) 2002-2012 and the Japanese Study on Aging and Retirement (JSTAR) 2007-2011.

StatLink http://dx.doi.org/10.1787/888933566837

The way in which educational disparities in disability evolve over time is often unclear – at least in part due to data restrictions. Of the countries discussed in this section, only the United States and England have enough waves and sample sizes large enough to address the issue. The gap in disability prevalence between the highest and lowest educated groups is growing (Figure 2.10). Among 50-64 year-old men in England, rates of functional and work limitations have been declining slightly faster for the well-educated. In a more worrisome case of divergent trends, functional limitations are on the rise among 50-64 year-old women educated to low-to-medium levels in the United States. Among their highly educated peers, the trend has been slightly downward.

Figure 2.10. Selected trends in disability by level of education, gender and age group



Note: Predicted probabilities are derived from four separate logistic regression models (for each gender and age group). Control variables include: five-year age group, time, time squared, and education level. Age-standardisation uses the 2005 OECD population.

Source: OECD estimates OECD analysis based on data from the Health and Retirement Survey (HRS) in the United States 2000-2014 and English Longitudinal Study of Ageing (ELSA) 2002-2012.

StatLink http://dx.doi.org/10.1787/888933566685

In OECD countries, as discussed above, much of the increase in life expectancy over the past two decades has brought healthy years. However, there has also been a rise in the number of unhealthy years, which could put a greater burden on health and long-term care systems. And there are wide disparities between men and women, education levels and geographical areas: women report higher rates of disability than men, and the poorly educated than the highly educated people. Furthermore, while most countries have seen significant gains in both life expectancy and healthy life expectancy, some have registered disappointing results.

To ensure that extra years of life are healthy ones, policies should focus on delaying and preventing disease and disability – directly addressing risk factors such as smoking, heavy drinking, poor nutrition and the lack of physical activity – particularly in more disadvantaged groups and areas. Policy makers should also seek to ensure equal access to preventive services and high-quality treatment when people fall ill.

4. Compounding inequalities in socio-economic status and health in emerging economies

The previous sections looked at how inequalities in health, education and labour market outcomes build up over the life course in OECD countries – from early-life development, through labour market entry and working age to eventual labour market exit. With their rapidly ageing societies, emerging economies will have to deal with similar issues in the near future. The fact that they have less well developed policies or available financial resources to prevent inequalities in old age will be a challenge. On the other hand, they will also have the opportunity to avoid some of the social policy pitfalls that have hampered developed economies in the past.

This section focuses on some of the challenges specific to emerging economies. It shows that socio-economic status and health outcomes are inextricably intertwined, but that the magnitude of such linkages and the reasons underlying remain open questions that need to be further investigated. Indeed, the literature exploring them in emerging countries is relatively sparse compared to that in developed economies. This section seeks to shed light on those issues by analysing the link between socio-economic status and health in emerging economies, focusing particularly on China and Indonesia. The findings underscore the urgent need to implement effective policies that target lower socio-economic groups.

Emerging economies are aging rapidly during early stages of development

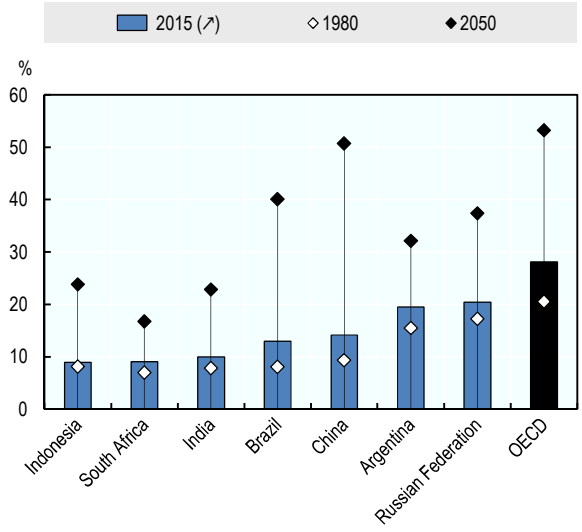
Populations in emerging economies are currently much younger than in most OECD countries. That, however, will change in the decades to come. In 2015 old-age dependency ratios in G20 non-OECD economies ranged from 9% in Indonesia to 20% in the Russian Federation, compared to 28% for the OECD average (Figure 2.11, Panel A). By 2050, though, China will have almost caught up with the OECD average, while both Brazil and China will have overtaken it before 2075.

China, in particular, has undergone a great demographic transition driven by tremendous health improvements over the past 50 years. Life expectancy at birth rose from 43 years in 1960 to 76 in 2014, while strict family planning policies introduced in the early 1970s brought fertility rates down from over six births per woman in the mid-1960s to 1.5 in 2014. The upshot is that China is looking at rapid population ageing, which is unlikely to be significantly affected by the recent relaxation of its strict family planning policies (Basten and Jiang, 2016). And although many emerging economies do not have to grapple with demographic shifts as far-reaching as China's, they are ageing at a rapid pace.

GDP per capita increased in all large emerging economies between 1990 and 2015 – from a modest 15% increase in the Russian Federation to almost 800% in China (Figure 2.11, Panel B). However, it is still well below the OECD average. Even by 2015, no G20 non-OECD economy had reached levels of GDP per capita comparable to the OECD's 1990 average. In other words, emerging economies are facing rapid population ageing at a relatively early stage of development.

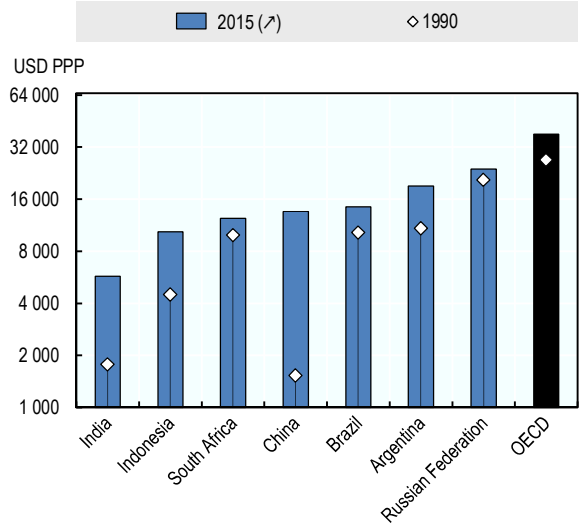
Figure 2.11. Large emerging economies are rapidly ageing at early stages of development

Panel A. Number of people of retirement age (65+) per 100 people of working age (20-64) in 1950, 2015 and 2050



Source: OECD calculations from United Nations, Department of Economic and Social Affairs, Population Division (2015), World Population Prospects: The 2015 Revision.

Panel B. Real GDP per capita (constant 2011 USD, PPP) in 1990 and 2015, log scale



Source: World Bank World Development Indicators.

StatLink http://dx.doi.org/10.1787/888933566704

Inequality in emerging economies is widespread

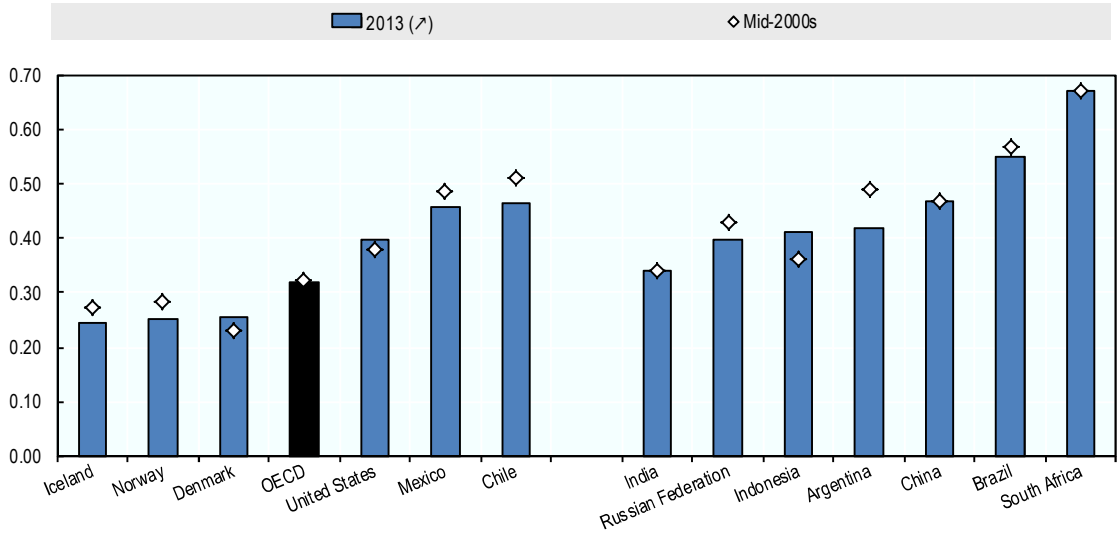
Emerging economies' impressive progress in standards of living has not always been evenly shared. Although they have seen their poverty rates drop dramatically, income inequality has come down in only a few and remains stubbornly high in others (OECD, 2011a; 2015a). Moreover, the large emerging economies still struggle with levels of income inequality that are significantly worse than the OECD average. Indeed, in China, Brazil and South Africa inequality is higher than in the most unequal OECD country (Figure 2.12).

Many of the inequalities in health, education and labour market outcomes described in previous sections for OECD countries are present – and often wider – in emerging economies. While most boast close-to-universal primary school enrolment rates, lower shares of their populations complete secondary or tertiary education than in OECD countries.[15] Such inequalities in education are likely to affect all stages of life, including working-life and retirement.

Low labour force participation rates are likely to worsen existing inequalities, especially in those emerging economies that lack a solid social safety net. While China's aggregate participation rate is comparable to those in North-Western European countries, India's and South Africa's are below 60% among the population aged between 15-64 years – similar to the lowest rates observed in the OECD, i.e. in Mexico, Turkey and Italy.[16] Moreover, even though the gender gap in labour force participation in large emerging economies has narrowed considerably over the past three decades, it is still much wider than the OECD average.[17]

Figure 2.12. Income inequality is very large in G20 non-OECD countries

Gini coefficients in selected emerging economies and OECD countries, total population



Note: Data for Indonesia, Argentina, Brazil, South Africa, India and China come from external sources are not strictly comparable with the OECD and Russian Federation figures. Three most equal and unequal OECD countries, based on Gini coefficients, are shown on the left-hand side of the graph. Mid-2000 figures for Denmark, Chile, Mexico and the United States use a different methodology than the 2013 figures.

Source: OECD (2015), *OECD Income Distribution Database* (IDD), http://www.oecd.org/social/income-distribution-database.htm.

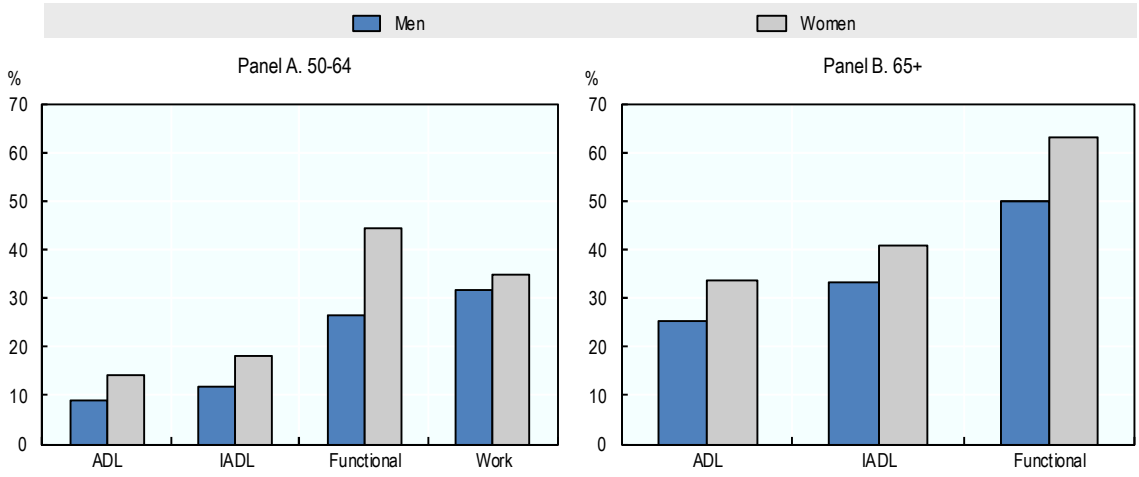
StatLink *http://dx.doi.org/10.1787/888933566723*

Education and geography, too, are significant factors in labour force participation in emerging economies. In almost all of the G20 non-OECD countries, the low-skilled are more likely than the highly skilled to be out of work (OECD, 2017). By contrast, rates of labour participation vary greatly between rural and urban dwellers. While urban dwellers are significantly more likely to be working (or looking for work) than their rural peers in South Africa, the opposite is true of India and Indonesia. In Latin American countries, women's participation rates are much lower in rural than in urban regions. Moreover, income inequalities tend to be greater in urban than in rural areas in all these countries except China (OECD, 2017).

Health inequalities are also wider in large emerging economies. When it comes to access to health care, all – with the exception of the Russian Federation – have fewer than two doctors per 1 000 inhabitants, compared to an average of 3.3 across the OECD (OECD, 2015b). Premature deaths are also more common in emerging than in OECD countries – with a much higher premature mortality rate in South Africa, for example (OECD, 2017).[18] Similarly, the difference in reported disabilities between China and OECD countries is sizable. More than 30% of 50-64 year-old men and women in China report that ill-health limited the kind or amount of paid work they could do, compared to 20% in Europe (Figure 2.13 for China and Figure 2.8 for Europe). Although, as in most OECD countries, the chances of reporting disability increase with age, a larger share of over-65s report some form of disability in China than in the OECD.

Figure 2.13. Disability rates are high in China, especially among those older than 65 years

Age-standardised rates for individuals aged 50-64 and 65+, latest harmonised survey year (2013)



Note: Percentage of people within an age group reporting at least one limitation. Numbers are age-standardised against the 2005 OECD population. Sampling weights are used.

Source: OECD analysis based on data from the China Health and Retirement Longitudinal Study (CHARLS) 2013.

StatLink http://dx.doi.org/10.1787/888933566742

Policies do not effectively deal with inequalities

Much greater inequalities in emerging economies than in most OECD countries likely translate into higher inequality among older people. Policies that directly address inequality are therefore sorely needed. One of the most recent (and ongoing) reforms has come in China, which is expanding its welfare system. The country achieved universal health insurance coverage in 2011 (Yu, 2015)[19] and plans its entire social security system – including pensions – to cover the whole population by 2020. Indonesia started to roll out an expansion of health care in 2014 to take in the entire population by 2019. However, these reforms are unlikely to eliminate entrenched inequalities. A case in point is the Chinese pension system, which paid out an annual per capita average of less than CNY 1 500 (around PPP USD 430) to 148 million recipients in 2015. By contrast, the average annual pay-out from the basic urban pension fund exceeded CNY 28 000 in 2015 (around PPP USD 8 000) (China Labour Bulletin, 2016).

Greater effects of socio-economic status on health in China than in Indonesia and the OECD

Comparing inequalities related to health, education and where people live in China, Indonesia and OECD countries helps throw light on the deeper underlying reasons for inequality in emerging economies (Box 2.3 describes the methodology of comparison).

Box 2.3. Constructing comprehensive measures of health for China, Indonesia and OECD countries

Chinese micro data from the China Health and Retirement Longitudinal Study (CHARLS) from 2011 to 2013 and Indonesian micro data from the Indonesian Family Life Survey (IFLS) from 2007 and 2014 are used to study the interaction between socio-economic status and health in China and Indonesia. Micro data for OECD countries refer to 17 OECD countries that are included in the Survey of Health, Ageing and Retirement in Europe (SHARE).[1] Like SHARE, CHARLS and IFLS contain extensive health information, which makes it possible to construct a comprehensive measure of the health of Chinese, Indonesian and respondents in OECD countries, combining subjective and objective health indicators. Self-reported health, a strong predictor of mortality (Idler and Kasl, 1991), is used as a subjective health indicator. The objective health indicators include the numbers of limitations on ADLs and IADLs, an indicator of mental health (whether the respondent has depression based on the EURO-D scale), a measure of grip strength, an indicator of underweight and measures of lung disease and hypertension. In CHARLS and IFLS clinical measures of lung capacity and hypertension are used rather than the respondent's answer to whether she or he has a lung disease and hypertension as in SHARE. Using instead self-declared measures would attenuate somewhat the (observed) education gradient in health in China and even eliminate it in Indonesia. Such a finding is in line with low-educated individuals in those countries under-reporting chronic conditions like lung disease and hypertension possibly due to restricted access to health care (see Section 4).

To obtain a single indicator of health, the polychoric principal component analysis (PCA) (Kolenikov and Angeles, 2009) is used on the pooled SHARE, CHARLS and IFLS samples and the first principal component (PC) is kept as a measure of an individual's health. Compared to the standard PCA (which is linear), the polychoric PCA takes into account the discrete nature of the variables used to measure health. The results from the polychoric PCA are given in Table 2.A1.1 in the annex to this chapter.

In the three samples, the first PC (PC1) explains a high fraction, above 30%, of the total variance and all the factor loadings on the PC1 have the expected sign. The factor loadings from the first PC are used to predict an index of good health, which is then transformed into percentiles. This index of good health, referred to as the "Health Index", is used as dependent variable in the analyses below and summarised in Figures 2.14 to 2.16. Table 2.A1.1 also shows that the second PC (PC2) accounts for a much lower fraction – 16 to 19% – of the total variance.

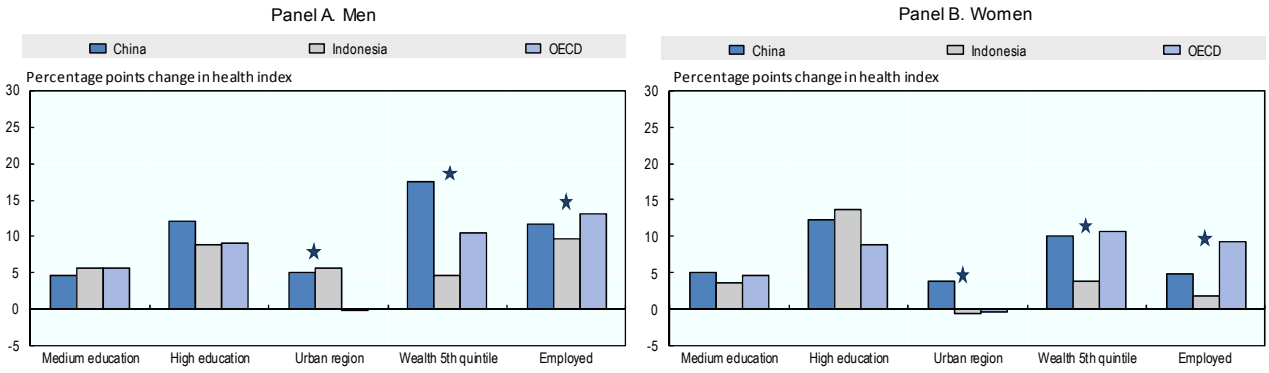
1. This subsection relies on the harmonised versions from CHARLS (Waves 1 and 2) and SHARE (Waves 1 to 5) provided by Gateway to Global Ageing (https://g2aging.org/) with comparable information across the two data sets. Data from the original IFLS (Waves 4 and 5) are harmonised as much as possible with the other two data sets. The samples are restricted to individuals aged 50 and over and the ISCED scale is used to measure education, distinguishing between primary, secondary and post-secondary education. The SHARE sample is restricted to countries that participated in Wave 3 or 5 at least, both of which contain information on childhood self-reported health in 17 OECD countries: Austria, Belgium, the Czech Republic, Denmark, Estonia, France, Germany, Greece, Israel, Italy, Luxembourg, the Netherlands, Poland, Slovenia, Spain, Sweden and Switzerland.

Given the wide differences in economic development, in social safety nets and health care systems between China, Indonesia and OECD countries, the effects of socio-economic status on health could be expected to be substantially different. For example, differences in the nature of jobs – e.g. more manual versus non-manual work in emerging economies – might be thought to benefit the healthy over the unhealthy in China and Indonesia more than in OECD countries.

In China, Indonesia and the OECD, better education, greater wealth, living in urban areas and being employed, all contribute to better health (Figure 2.14). However, for various components of socio-economic status, their effects on health are significantly bigger in China and Indonesia than in OECD countries. This is the case for example of wealth (among Chinese men), education (among women) and location (among men and Chinese women) (Panels A and B, respectively). One explanation could be for example that wealthy individuals are more likely to have access to private health care in the absence of an extensive state or insurance-based health care system. Moreover, China has

had preferential policies for city dwellers in place over recent decades. Overall though, despite the wide difference in levels of economic development, the effects of other socio-economic factors on health are similar across countries.

Figure 2.14. Effects of education, wealth, location and employment on health in China, Indonesia and OECD countries by gender



Note: The figure shows estimates of the impact of selected variables on the Health Index (which scores on a scale of 1-100, see Box 2.3). The benchmark group for comparing medium and high education is low education, for urban regions it is rural regions, for the fifth wealth quintile it is the first wealth quintile, and for the employed it is the inactive. The way to read the graphs is as follows. For example, the 20% of wealthiest Chinese men score, on average, about 18 percentage points higher on the Health Index than the 20% poorest (Panel A). These effects are estimated as "all else being equal", i.e. after controlling for other individual factors. A star indicates that the impact of that variable is statistically different between China, Indonesia and OECD countries at a 5% level of statistical significance, except for the impact of high education in Panel B which differs at a 10% level of statistical significance. For full details relating to gender, see Table 2.A1.2 in the annex to this chapter.

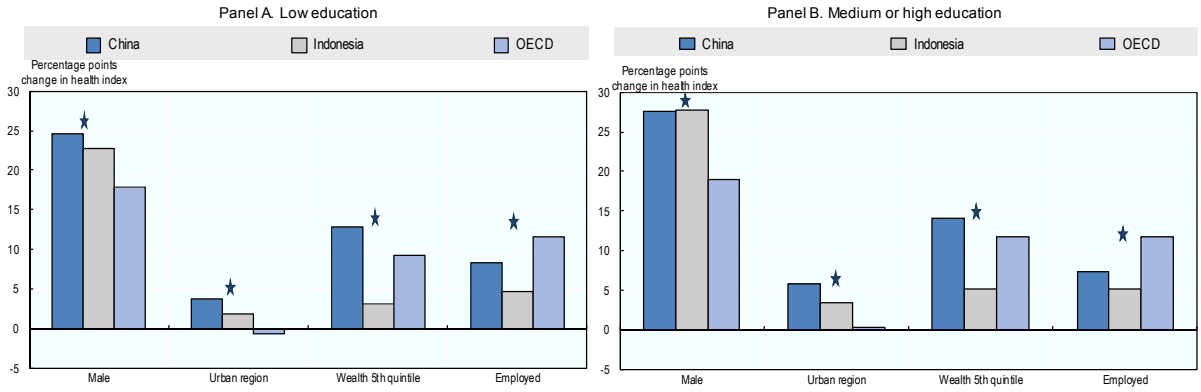
Source: Calculations for OECD countries are based on data for 17 countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, for China, on the China Health and Retirement Longitudinal Study (CHARLS) 2011-13, and, for Indonesia, on the Indonesian Family Life Survey (IFLS) 2007-2014.

StatLink http://dx.doi.org/10.1787/888933566761

The effects of socio-economic status on health can be distinguished, when restricting the analysis to specific population subgroups defined by education and urban or rural location. Similar impacts of socio-economic status on health are found across education levels (Figure 2.15, Panels A and B). For example, being employed is estimated to improve health by the same magnitude among low-educated and among medium/high-educated people. Moreover, with the exception of employment, socio-economic status has a more pronounced health effect across education groups in China than in OECD countries, consistent with what is found above (Figure 2.14) when not distinguishing by education status. For example, health gaps between rural and urban residents are significantly larger in both China and Indonesia than in the OECD. Health gaps between men and women (to the detriment of women) are also larger in these two emerging countries.

Distinguishing between rural and urban dwellers shows that the effects of other socio-economic status on health of rural residents tends to be larger in China than in Indonesia and OECD countries, especially when related to gender and wealth (Figure 2.16).[20] Both the considerable income and health-related gaps between urban and rural areas are consistent with China's long history of preferential policies toward the former.[21] Urban dwellers have, for many decades, enjoyed an "iron rice bowl" of guaranteed employment, housing, health insurance, pension support, and other subsidies not available to rural residents, even when they migrated to cities (Wang and Zuo, 1999). Such policies are likely to have exacerbated inequalities between urban and rural residents by maintaining the vicious circle between low socio-economic status and bad health among rural people.

Figure 2.15. Effects of gender, location, wealth and employment on health in China, Indonesia and OECD countries by level of education

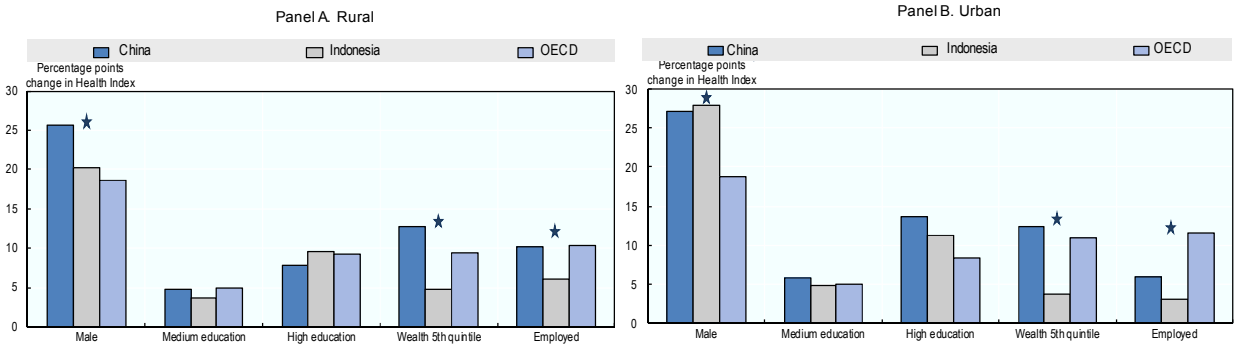


Note: The figure shows estimates of the impact of selected variables on the Health Index (which scores on a scale of 1-100, see Box 2.3). The benchmark group for comparing male is female, for urban region it is rural region, for the fifth wealth quintile it is the first wealth quintile and for the employed it is the inactive. The numbers related to the size of the bars are interpreted as percentile changes in the health distribution. A star indicates that the impact of that variable on the Health Index is statistically different between China, Indonesia and OECD countries at a 5% level of statistical significance. For full details relating to levels of education, see Table 2.A1.3 in the annex to this chapter.

Source: Calculations for OECD countries are based on data for 17 countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, for China, on the China Health and Retirement Longitudinal Study (CHARLS) 2011-2013, and, for Indonesia, on the Indonesian Family Life Survey (IFLS) 2007-2014.

StatLink http://dx.doi.org/10.1787/888933566780

Figure 2.16. Effects of gender, education, wealth and employment on health in China, Indonesia and OECD countries according to rural or urban dwelling places



Note: The figure shows estimates of the impact of selected variables on the Health Index (which scores on a scale of 1-100). The benchmark group for comparing male is female, for medium and high education it is low education, for the fifth wealth quintile it is the first wealth quintile, and for the employed it is the inactive. The numbers related to the size of the bars are interpreted as percentile changes in the health distribution. A star indicates that the impact of that variable on the Health Index is statistically different between China, Indonesia and OECD countries at a 5% level of statistical significance. For full details relating to urban and rural dwelling place, see Table 2.A1.4 in the annex to this chapter.

Source: Calculations for OECD countries are based on data for 17 countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, for China, on the China Health and Retirement Longitudinal Study (CHARLS) 2011-2013, and, for Indonesia, on the Indonesian Family Life Survey (IFLS) 2007-2014.

StatLink http://dx.doi.org/10.1787/888933566799

Notes

1. See for instance: Corak (2013) Persico et al. (2004), Lundborg et al. (2014) and Mueller and Plug (2006).

2. The various channels described in this paragraph are covered in detail in, for instance, the developmental origins hypothesis, life-course models and the emerging literature on human capability formation. See, for example: Kuh and Wadsworth (1993), Barker (1995), Almond and Currie (2011b) and Heckman (2006, 2007).

3. Some studies report an insignificant effect (Haveman et al., 1994), some a negative effect (Stern, 1989; Cai, 2010) and others a positive effect (Snyder and Evans, 2006) of employment on health. The same applies to the impact of wages on health: for Lee (1982) the effect is positive, while Cai (2009) does not find any effect. The type of job also matters. A strenuous occupation may damage health, while having a job with good working conditions can protect health (Chapter 5).

4. The countries covered are: Australia, Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Greece, Hungary, Iceland, Italy, Korea Latvia, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden and the United States.

5. Good health is defined as reporting a "good" or "very good" health status in EU-SILC and KLIPS, and a "good", "very good" or "excellent" health status in HILDA and PSID. In all figures the health variables are smoothed using a three-year moving average to reduce possible sampling errors, especially at early and late ages. The data sets contain limited additional health information. For instance, in the EU-SILC there are only two further health indicators, one of chronic illnesses and the so-called Global Activity Limitation Indicator (GALI). GALI is usually used to measure disability and does not capture variations in health at younger ages very well. The indicator of chronic illnesses is an imperfect measure of physical health (it does, for example, not distinguish between mild and severe chronic diseases). Self-reported health is chosen as it captures both physical and mental health and does a better job than GALI at capturing variation in health at younger ages. In addition, self-reported health has been shown to be a good predictor of own mortality (Idler and Kasl, 1991).

6. The definition of bad health used in this section is conservative in the sense that the implied health gaps are underestimated. First, "fair" is included in bad health rather than in good health, and Flores (2017a) shows that doing so leads to narrower health gaps in the data than if "fair" is included in good health. Second, the notion of "bad health" includes individuals in temporarily poor health. When focusing on respondents who participate in three or more consecutive survey years, permanent bad and good health can be defined as reporting bad health ("Fair", "Bad" or "Very bad" health) and good health ("Good" or "Very good" health) during all three periods. Comparing individuals in permanently good and bad health would also lead to greater health gaps in employment and wages among both men and women (Flores, 2017a).

7. Nordic countries comprise Denmark, Finland, Iceland, Norway and Sweden. Continental countries comprise Austria, Belgium, France, Luxembourg and the Netherlands. Southern European countries comprise Greece, Italy, Portugal and Spain. Finally, Central and Eastern European countries comprise the Czech Republic, Estonia, Hungary, Latvia, Poland, the Slovak Republic and Slovenia.

8. The earnings and employment trajectories are calculated using estimates on education (dummies for low and high), and interactions between education and age (linear term), between education and health (dummy for bad health), and between education, health and age obtained from wage and employment models. In addition, all wage and employment models control for age, period and cohort effects (Chapters 3 and 4) by including dummies for every single age from 20 to 64 and the unemployment rate to control for time effects. The models without individual fixed effects also include a trend for year of birth to control for cohort effects. All models control as well for an individual's employment-gaps in the career and those without individual fixed effects also include dummies for country. Finally, the employment models also control for marital status and children under age 8 living at home.

9. For full-career workers, who are thus able to remain employed all along, a highly educated individual with bad health would have an expected lifetime earnings 17% higher than an individual in good health with a medium-level education. When considering the risk of non-employment due to bad health, however, the highly educated individual in bad health would have 3% lower lifetime earnings than an individual in good health with a medium-level education (results not shown).

10. These numbers should indeed be treated with caution due to the important methodological issues discussed in Box 2.1. They could induce considerable uncertainty in the estimation. For example, for women with medium education, while the total effect of bad health is estimated to reduce lifetime earnings by 19% according to the baseline, lower-bound and upper-bound effects (Box 2.1) are equal to 8 and 30%, respectively.

11. The sources and methods used to calculate this indicator are different from those used by WHO to calculate health-adjusted life expectancy. Furthermore, the data have been available only for most European countries since 2005 (because the disability measure comes from the EU-SILC survey).

12. In more recent literature, there is conflicting evidence for increasing, declining or stable evolution of disability over the past two decades for men and women below age 65 (Hoogendijk et al., 2008; Sieurin et al., 2011; Cambois et al., 2013; Martin and Schoeni, 2014; Chatterji et al., 2015). For people aged 65 and over, there is evidence of a fall in severe disability in many, but not all, countries (Jagger, 2007; Jang et al., 2010; Palacios-Cenna et al., 2010; Sieurin et al., 2011; Jylha et al., 2013; Angleman et al., 2014; Martin and Schoeni, 2014; Bronnum-Hansen, 2015; Chatterji et al., 2015; Ishii et al., 2015; Liang et al., 2015).

13. The upward trends in IADL among men and women are a break from previous analysis of the HRS data by Chatterji et al. (2015). However, the difference could be explained by the additional survey years covered in the new OECD analysis.

14. To be precise, this gap refers to the difference between the high and low educated in the relative risk of the various types of disabilities (i.e. the ratio of the predicted probabilities using the high educated as the reference group).

15. While the OECD average share of the population with below upper-secondary schooling is 22%, the share in G20 non-OECD economies is typically over 50%, with the exception of the Russian Federation's 5% (OECD, 2016b).

16. OECD, Labour Force Statistics. Data refer to 2015 except for China (2010) and India (2012).

17. See *OECD Labour Force Statistics Database*.

18. While premature mortality (passing away before 70) in OECD countries is 25% for men and 13% for women, it is 70% and 60% respectively in South Africa.

19. A better developed welfare system can dampen the consequences of adverse shocks to health and might therefore limit the reciprocal effect of socio-economic status and health (Bengtsson and Mineau, 2009). Until as recently as 2003, 80% of people living in rural areas in China lacked health insurance (Lei and Lin, 2009).

20. Gaps in self-reported childhood health across all models in Tables 2.A1.2, 2.A1.3 and 2.A1.4 are insignificant in China, but always significant and relatively large in OECD countries. In Indonesia they are smaller than in OECD countries but still significant among females (Table 2.A1.2) and rural residents (Table 2.A1.4). Among men and women in OECD countries (Table 2.A1.2), gaps in childhood health (around 6 percentiles) are at least as wide as the health gaps between people educated to low and medium levels (5 percentiles). For China, the lack of evidence of a direct impact of self-reported childhood health on health in later life is in sharp contrast with findings for Europe and USA and, to some extent, inconsistent with studies showing that early life exposure to the 1959-1961 famine in China adversely affected adult height, which constitutes an important aspect of an individual's health status (Chen and Zhou, 2007). One possible explanation could be that the category "fair" in self-reported childhood health translates into a word which is very commonly used in China (Lei et al., 2014) and so hides some of the true variations in childhood health, possibly understating its impact on health in later life. Such an interpretation would cast doubt on the validity of self-reported childhood health as a measure of childhood health in China.

21. A strong contributory factor in socio-economic disparities between rural and urban Chinese is the Hukou system. The Hukou system determines where someone is allowed to live and is often likened to a caste system. However, the fact that the Hukou system transcends culture and is administered by the government makes it an even more potent tool for limiting socio-economic mobility.

References

Aizer, A. et al. (2016), "The Long-Run Impact of Cash Transfers to Poor Families", *American Economic Review*, Vol. 106, pp. 935-971

Almond, D. and J. Currie (2011a), "Human Capital Development Before Age Five", in O. Ashenfelter and D. Card (eds.), *Handbook of Labour Economics*, Vol. 4. Elsevier, Amsterdam, pp. 1315-1486.

Almond, D. and J. Currie (2011b), "Killing Me Softly: The Fetal Origins Hypothesis", *Journal of Economic Perspectives*, Vol. 25, pp. 153-172.

Angleman, S. et al. (2014), "Temporal Trends of Functional Dependence and Survival Among Older Adults From 1991 to 2010 in Sweden: Toward a Healthier Aging", *Journals of Gerontology: Medical Sciences*, Vol. 70, No. 6.

Barker, D.J.P. (1995), "Fetal Origins of Coronary Heart Disease", *British Medical Journal*, Vol. 311, pp. 171-174.

Basten, S. and Q. Jiang (2014), "China's Family Planning Policies: Recent Reforms and Future Prospects", *Studies in Family Planning*, Vol. 45, No. 4, pp. 493-509.

Bengtsson, T. and G.P. Mineau (2009), "Early-life Effects on Socio-economic Performance and Mortality in Later Life: A Full Life-course Approach Using Contemporary and Historical Sources", *Social Science and Medicine*, Vol. 68, No. 9, pp. 1561-1564.

Black, S.E. and P.J. Devereux (2011), "Recent Developments in Intergenerational Mobility", in *Handbook of Labour Economics*, Ch. 16, Elsevier Science, Amsterdam.

Bound, J. (1991), "Self-reported Versus Objective Measures of Health in Retirement Models", *Journal of Human Resources*, Vol. 26, pp. 106-138.

Bronnum-Hansen, H. (2015), "Health Expectancy in Denmark, 1987-2000", *European Journal of Public Health*, Vol. 15, No. 1, pp. 20-25.

Becker, G.S. (1962), "Investment in Human Capital: A Theoretical Analysis", *Journal of Political Economy*, Vol. 70, pp 9-49.

Cai, L. (2010), "The Relationship Between Health and Labour Force Participation: Evidence from a Panel Data Simultaneous Equation Model", *Labour Economics*, Vol. 17, pp 77-90.

Cai, L. (2009), "Effects of Health on Wages of Australian Men", *Economic Record*, Vol. 85, pp. 290-306.

Cambois, E., A. Blachier and J.-M. Robine (2012), "Aging and Health in France: An Unexpected Expansion of Disability in Mid-adulthood Over Recent Years", *European Journal of Public Health*, Vol. 23, No. 4, pp. 575-581.

Case, A., D. Lubotsky and C. Paxson (2002), "Economic Status and Health in Childhood: The Origins of the Gradient", *American Economic Review*, Vol. 92, pp. 1308-1334.

Chan, K.S. et al. (2012), "Measurement Equivalence in ADL and IADL Difficulty Across International Surveys of Aging: Findings from the HRS, SHARE, and ELSA", *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, Vol. 67, No. 1, pp. 121-132.

Chatterji, S. et al. (2015), "Health, Functioning, and Disability in Older Adults – Present Status and Future Implications", *The Lancet*, Vol. 385, pp. 563-575.

Chen, Y. and L.-A. Zhou (2007), "The Long-term Health and Economic Consequences of the 1959-1961 Famine in China", *Journal of Health Economics*, Vol. 26, No. 4, pp. 659-681.

China Labour Bulletin (2016), "China's Social Security System", http://www.clb.org.hk/content/china%E2%80%99s-social-security-system.

Corak, M. (2013), "Income Inequality, Equality of Opportunity, and Intergenerational Mobility", *Journal of Economic Perspectives*, Vol. 27, pp. 79-102.

Cunha, F. et al. (2006), "Interpreting the Evidence on Life Cycle Skill Formation", in E.A. Hanushek and F. Welch (eds.), *Handbook of the Economics of Education*, Vol. 1, Elsevier, Amsterdam, pp. 697-812.

Currie, J. (2009), "Healthy, Wealthy, and Wise: Socioeconomic Status, Poor Health in Cchildhood, and Human Capital Development", *Journal of Economic Literature*, Vol. 47, pp. 87-122.

Currie, J. and B.C. Madrian (1999), "Health, Health Insurance and the Labor Market", *Handbook of Labor Economics*, Vol. 3. Elsevier Science B.V., Amsterdam, pp. 3309-3415.

Currie, J. and M. Stabile (2003), "Socioeconomic Status and Health: Why Is the Relationship Stronger for Older Children?", *American Economic Review*, Vol. 93, pp. 1813-1823.

Espelt, A. et al. (2010), "Disability Among Older People in a Southern European City in 2006: Trends in Gender and Socioeconomic Inequalities", *Journal of Women's Health*, Vol. 19, No. 5.

Eurostat (2016), "Healthy Life Years Statistics", http://ec.europa.eu/eurostat/statistics-explained/index.php/Healthy_life_years_statistics.

Flores, M. (2017), "The Effect of Health on Wages: New Empirical Evidence from OECD Countries", *OECD Working Paper*, OECD Publishing, Paris, forthcoming.

Flores, M. and A. Kalwij (2013), "What Do Wages Add to the Health-employment Nexus? Evidence from Older European Workers", *Netspar Discussion Paper 03/2013-005*.

García, J.L. et al. (2016), "The Life-cycle Benefits of an Influential Early Childhood Program", *NBER Working Papers No. 22993*, National Bureau of Economic Research, Cambridge, United States.

Grossman, M. (2000), "The Human Capital Model", *Handbook of Health Economics*, Chaptre 7, Elsevier Science, Amsterdam.

Grossman, M. (1972), "On the Concept of Health Capital and the Demand for Health", *Journal of Political Economy*, Vol. 80, pp. 223-255.

Haveman R. et al. (1994), "Market Work, Wages, and Men's Health", *Journal of Health Economics*, Vol. 13, pp. 163-182.

Heckman, J.J. (2006), "Skill Formation and the Economics of Investing in Disadvantaged Children", *Science*, Vol. 312, pp. 1900-1902.

Heckman, J.J. (2007), "The Economics, Technology, and Neuroscience of Human Capability Formation", PNAS, Vol. 104, pp. 13250-13255.

Hoogendijk, E. et al. (2008), "Educational Differences in Functional Limitations: Comparisons of 55-65 Year-olds in the Netherlands in 1992 and 2002", *International Journal of Public Health*, Vol. 53, pp. 281-289.

Idler, E.L. and S. Kasl (1991), "Health Perceptions and Survival: Do Global Evaluations of Health Status Really Predict Mortality?", *Journal of Gerontology*, Vol. 46, No. 2, pp. S55-S65.

Ishii, S., S. Ogawa and M. Akishita (2015), "The State of Health in Older Adults in Japan: Trends in Disability, Chronic Medical Conditions and Mortality", *PLoS ONE 10(10).*

Jagger, C. et al. (2007), "Cohort Differences in Disease and Disability in the Young-old: Findings from the MRC Cognitive Function and Ageing Study (MRC-CFAS)", *BMC Public Health*, Vol. 7:156.

James, C., M. Devaux and F. Sassi (2016), *Health and Inclusive Growth*, OECD Health Working Papers, OECD Publishing, Paris, forthcoming.

Jang, S.-N. and D.-H. Kim (2010), "Trends in the Health Status of Older Koreans", *Journal of the American Geriatrics Society*, Vol. 58, pp. 592-598.

Jylhä, M., L. Enroth and T. Luukkaala (2013), "Trends of Functioning and Health in Nonaganerians: The Vitality 90+ Study", *Annual Review of Gerontology & Geriatrics*, Vol. 33, No. 1, pp. 3133-3214.

Kapteyn, A., J.P. Smith, J.P. and A. Van Soest (2007), "Vignettes and Self-reports of Work Disability in the United States and the Netherlands", *American Economic Review*, Vol. 97, No. 1, pp. 461-473.

Kalwij, A. and F. Vermeulen (2008), "Health and Labour Force Participation of Older People in Europe: What Do Objective Health Indicators Add to the Analysis?", *Health Economics*, Vol. 17, pp. 619-638.

Kolenikov, S. and G. Angeles (2009), "Status Measurement with Discrete Proxy Variables: Is Principal Component Analysis a Reliable Answer?", *Review of Income and Wealth*, Vol. 55, No. 1, pp. 128-165.

Kuh, D.J.L. and M.E.J. Wadsworth (1993), "Physical Health Status at 36 Years in a British National Birth Cohort", *Social Science and Medicine*, Vol. 37, pp. 905-916.

Lafortune, G. and G. Balestat (2007), "Trends in Severe Disability Among Elderly People: Assessing the Evidence in 12 OECD Countries and the Future Implications", *OECD Health Working Papers*, No. 26, OECD Publishing, Paris, http://dx.doi.org/10.1787/217072070078.

Lee, L-F. (1982), "Health and Wage: A Simultaneous Equation Model with Multiple Discrete Indicators", *International Economic Review*, Vol. 23, pp. 199-221.

Lei, X. et al. (2014), "Health Outcomes and Socio-economic Status Among the Mid-aged and Elderly in China: Evidence from the CHARLS National Baseline Data", *Journal of the Economics of Ageing*, Vol. 3, pp. 29-43.

Lei, X. and W. Lin (2009), "The New Cooperative Medical Scheme in Rural China: Does More Coverage Mean More Service and Better Health?", *Health Economics*, Vol. 18, No. 52, pp. S25-S46.

Liang, Y. et al. (2015), "Trends in Disability in Activities of Daily Living Among Chinese Older Adults, 1997–2006: The China Health and Nutrition Survey", *Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, Vol. 70, No. 6, pp. 739-745.

Lin, S.-L., A.-N. Beck and B.-K. Finch (2016), "The Dynamic Contribution of Chronic Conditions to Temporal Trends in Disability Among U.S. Adults", *Disability and Health Journal*, Vol. 9, No. 2, pp. 332-340.

Lundborg, P., P. Nystedt and D.-O. Rooth (2014), "Height and Earnings: The Role of Cognitive and Noncognitive Skills", *Journal of Human Resources*, Vol. 49, pp. 141-166.

Martin, L. and R. Schoeni (2014), "Trends in Disability and Related Chronic Conditions Among the Forty-and-over Population: 1997-2010", *Disability and Health Journal*, Vol. 7, pp. S4-S14.

Mueller, G. and E. Plug (2006), "Estimating the Effect of Personality on Male and Female Earnings", *Industrial and Labor Relations Review*, Vol. 60, pp. 3-22.

OECD (2017), *Inequality Patterns in Selected Emerging Economies*, OECD Publishing, Paris, forthcoming.

OECD (2016a), *Health at a Glance: Europe 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264265592-en.

OECD (2016b), *Education at a Glance 2016: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/eag-2016-en.

OECD (2015a), *In It Together: Why Less Inequality Benefits All*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264235120-en.

OECD (2015b), *Health at a Glance 2015: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/health_glance-2015-en.

OECD (2011a), *Divided We Stand: Why Inequality Keeps Rising*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264119536-en.

OECD (2011b), *Doing Better for Families*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264098732-en.

OECD (2009), *Doing Better for Children*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264059344-en.

Palacios-Cena, D. et al. (2010), "Has the Prevalence of Disability Increased Over the Past Decade (2000–2007) in Elderly People? A Spanish Population-based Survey", *Journal of the American Medical Directors Association*.

Persico, N., A. Postlewaite and D. Silverman (2004), "The Effect of Adolescent Experience on Labour Market Outcomes: The Case of Height", *Journal of Political Economy*, Vol. 112, pp. 1019-1053.

Sarkeala, T. et al. (2011), "Disability Trends Among Nonagenarians in 2001-2007: Vitality 90+ Study", *European Journal of Ageing*, Vol. 8, No. 2, pp. 87-94.

Sieurin, A., E. Cambois and J.-M. Robine (2011), " Les espérances de vie sans incapacité en France : une tendance récente moins favorable que dans le passé", *Document de travail INED No. 170*, Institut National d'Etudes Demographiques, Paris.

Smith, J.P. (2009), "The Impact of Childhood Health on Adult Labour Market Outcomes", *Review of Economics and Statistics*, Vol. 91, pp. 478-489.

Snyder, SE. and W.N. Evans (2006), "The Effect of Income on Mortality: Evidence from the Social Security Notch", *Review of Economics and Statistics*, Vol. 88, pp. 482-495.

Stern, S. (1989), "Measuring the Effect of Disability on Labor Force Participation", *Journal of Human Resources*, Vol. 24, pp. 361-395.

Westerlund, H. et al. (2010), "Effect of Retirement on Major Chronic Conditions and Fatigue: French GAZEL Occupational Cohort Study", *British Medical Journal*, Vol. 341, c6149.

Wang, F. and X. Zuo (1999), "Inside China's Cities: Institutional Barriers and Opportunities for Urban Migrants", *American Economic Review*, Vol. 89, No. 2, Papers and Proceedings of the One Hundred Eleventh Annual Meeting of the American Economic Association, pp. 276-280.

WHO (2016), "Global Health Observatory Data, Healthy Life Expectancy at Birth", http://apps.who.int/gho/data/node.main.HALE?lang=en.

Wise, D.A. (2016), *Social Security Programs and Retirement Around the World: Disability Insurance Programs and Retirement*, University of Chicago Press, Chicago.

Yu, H. (2015), "Universal Health Insurance Coverage for 1.3 Billion People: What Accounts for China's Success?", *Health Policy*, Vol. 119, No. 9, pp. 1145-1152.

Database references

OECD Income Distribution Database (IDD), http://www.oecd.org/social/income-distribution-database.htm.

Annex 2.A1

Additional tables

Table 2.A1.1. Health indices (HI) in China (CHARLS), Indonesia (IFLS) and OECD countries (SHARE)

		CHARLS		IFLS		SHARE	
Health indicators		PC1 (HI)	PC2	PC1 (HI)	PC2	PC1 (HI)	PC2
SRH (1= excellent, 5= poor)	1	-1.07	-0.76	-0.6	-0.37	-0.87	-0.41
	2	-0.78	-0.56	-0.09	-0.05	-0.51	-0.24
	3	-0.6	-0.42	0.39	0.24	-0.2	-0.09
	4	-0.38	-0.27	0.86	0.53	0.06	0.03
	5	0.14	0.1			0.46	0.22
Number of limitations with ADL's	0	-0.56	-0.38	-0.04	-0.02	-0.27	-0.05
	1	-0.28	-0.19	1.06	0.55	0.19	0.03
	2	-0.27	-0.18	1.26	0.66	0.22	0.04
	3	-0.26	-0.18	1.48	0.77	0.23	0.04
	4	0.21	0.14			0.24	0.04
	5					0.54	0.09
Number of limitations with IADL's	0	-0.6	-0.36	-0.06	-0.04	-0.26	0.02
	1	-0.31	-0.19	0.82	0.53	0.21	-0.01
	2	-0.28	-0.17	1.18	0.76	0.23	-0.01
	3	-0.27	-0.16			0.24	-0.01
	4	0.21	0.13			0.24	-0.01
	5					0.54	-0.03
Hypertension	0	-0.04	0.16	-0.11	-0.04	-0.17	-0.5
	1	0.01	-0.04	0.12	0.04	0.13	0.39
Lung Capacity	Continuous	-0.35	0.5	-0.36	0.54		
Lung disease	0					-0.15	0
	1					0.28	-0.01
Maximum grip strength	Continuous	-0.37	0.4	-0.36	0.45	-0.3	0.37
Has depression (EURO-D scale)	0	-0.55	-0.35	-0.07	-0.08	-0.29	0.02
	1	0.13	0.09	0.53	0.54	0.32	-0.03
Underweight (BMI < 18.5)	0	-0.29	0.66	-0.05	0.11	-0.07	0.36
	1	0.1	-0.23	0.33	-0.73	0.15	-0.81
Explained variance		0.36	0.17	0.31	0.19	0.39	0.16

Note: The table shows the factor loadings from a polychoric principal component analysis (PCA) on the first and second principal component (PC) with its explained variance. The Health Index (HI) is based on the first principal component (PC1). SRH: self-reported health.

Source: Calculations for OECD countries are based on data for 17 countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, for China, on the China Health and Retirement Longitudinal Study (CHARLS) 2011-2013, and, for Indonesia, on the Indonesian Family Life Survey (IFLS) 2007-2014.

StatLink http://dx.doi.org/10.1787/888933566856

Table 2.A1.2. Health equations in China, Indonesia and OECD countries by gender

	China (CHARLS)		Indonesia (IFLS)		OECD (SHARE)	
	Men	Women	Men	Women	Men	Women
	(1)	(2)	(1)	(2)	(1)	(2)
Age 50-54 = 0						
Age 55-59	-6.036***	-1.627	-4.562***	-4.139***	-3.607***	-2.725***
Age 60-64	**-9.442*** **	**-3.908** **	**-13.661*** **	**-9.798*** **	**-2.111*** **	**-1.724*** **
Age 65-69	**-14.394*** **	**-10.029*** **	**-17.380*** **	**-13.757*** **	**-1.901*** **	**-3.405*** **
Age 70-74	**-16.909*** **	**-12.260*** **	**-22.008*** **	**-18.320*** **	**-7.349*** **	**-8.548*** **
Age 75+	**-24.575*** **	**-14.987*** **	**-31.663*** **	**-22.407*** **	**-17.488*** **	**-14.441*** **
Good childhood SRH = 0						
Bad childhood SRH	**1.763**	**0.887**	**-0.813**	**-1.947** **	**-6.587*** **	**-7.206*** **
Low education = 0						
Medium education	4.680***	5.067***	5.686***	3.560***	5.650***	4.671***
High education	12.052***	*12.307***	8.923***	*13.749****	9.002***	*8.847****
Rural region = 0						
Urban region	**5.104*** **	**3.906*** **	**5.714*** **	**-0.536**	**-0.054**	**-0.314**
Wealth 1st Q = 0						
Wealth 2nd Q	**4.204* **	**-2.641**	**0.454**	**1.171**	**4.915*** **	**3.618*** **
Wealth 3rd Q	**7.875*** **	**2.95**	**1.029**	**0.351**	**6.997*** **	**5.496*** **
Wealth 4th Q	**8.796*** **	**4.484** **	**2.351**	**3.418*** **	**9.147*** **	**7.862*** **
Wealth 5th Q	**17.617*** **	**10.085*** **	**4.696*** **	**3.799*** **	**10.558*** **	**10.640*** **
Household Size	-0.024	0.242	0.055	-0.035	-0.331**	0.13
Not living alone = 0						
Living alone	**4.407**	1.216	**9.421*** **	-3.373	**-1.478** **	1.077**
Not currently married = 0						
Married	4.396	2.231	0.64	2.290***	2.190***	1.682***
Inactive = 0						
Employed	**11.726*** **	**4.934*** **	**9.618*** **	**1.789*** **	**13.098*** **	**9.317*** **
Unemployed	18.713*	2.76	9.813***	0.862	4.390***	0.121
Constant	35.101***	19.791***	66.177***	40.426***	60.310***	42.439***
Number of obs.	1564	1594	3154	4167	43296	52047
Adj, R-Square	0.271	0.198	0.273	0.183	0.276	0.27

Note: Ordinary Least Square (OLS) estimates from regressions on the Health Index (on a scale of 1-100). The numbers are interpreted as percentile changes in the health distribution. For instance, highly educated men in China, Indonesia and OECD countries lie, on average, about 9 to12 percentiles higher in the health distribution than their less well educated peers – Columns (1). All models include dummies for provinces (China and Indonesia) or countries (OECD), survey wave and month of interview. Standard errors are clustered at the individual level, because there are repeated observations on individuals. Significance levels: * p<0.10 ** p<0.05 *** p<0.01. Parameter estimates in bold and italics are statistically different between columns (1) and (2) at 5% and 10% levels of statistical significance, respectively. SRH: self-reported health.

Source: Calculations for OECD countries are based on data for 17 countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, for China, on the China Health and Retirement Longitudinal Study (CHARLS) 2011-2013, and, for Indonesia, on the Indonesian Family Life Survey (IFLS) 2007-2014.

StatLink http://dx.doi.org/10.1787/888933566875

Table 2.A1.3. Health equations in China, Indonesia and OECD countries by level of education

	China (CHARLS)		Indonesia (IFLS)		OECD (SHARE)	
	Low educ. (1)	Medium-high educ. (2)	Low educ. (1)	Medium-high educ. (2)	Low educ. (1)	Medium-high educ. (2)
Age 50-54 = 0						
Age 55-59	-3.283	-3.209**	-4.488***	-4.560***	-2.694***	-2.978***
Age 60-64	**-5.111****	**-7.972*****	**-12.866*****	**-9.431*****	**-1.992****	**-1.431*****
Age 65-69	**-11.815*****	**-11.544*****	**-16.232*****	**-15.766*****	**-3.999*****	**-1.829*****
Age 70-74	**-15.399*****	**-12.823*****	**-20.516*****	**-22.080*****	**-8.455*****	**-7.323*****
Age 75+	**-17.729*****	**-24.919*****	**-28.023*****	**-26.588*****	**-15.963*****	**-15.390*****
Good childhood SRH = 0						
Bad childhood SRH	**0.67**	**1.802**	**-1.346**	**-2.106**	**-5.146*****	**-7.533*****
Female = 0						
Male	**24.647*****	**27.593*****	**22.783*****	**27.748*****	**17.947*****	**18.915*****
Rural region = 0						
Urban region	**3.713****	**5.729*****	**1.870*****	**3.453****	**-0.65**	**0.204**
Wealth 1st Q = 0						
Wealth 2nd Q	0.843	**0.434**	1.425	**-1.467**	2.992***	**4.555*****
Wealth 3rd Q	**4.597****	**4.986****	**1.107**	**-1.054**	**5.277*****	**6.505*****
Wealth 4th Q	**7.619*****	**5.468*****	**3.675*****	**0.14**	**8.386*****	**8.919*****
Wealth 5th Q	**12.867*****	**14.042*****	**3.036*****	**5.096****	**9.160*****	**11.799*****
Household Size	0.311	0.065	-0.029	0.058	-0.269	0.168
Not living alone = 0						
Living alone	2.777	**2.193**	0.353	**12.000*****	0.667	**0.568**
Not currently married = 0						
Married	1.262	4.675*	2.252***	0.128	2.437***	1.520***
Inactive = 0						
Employed	**8.235*****	**7.372*****	**4.618*****	**5.070*****	**11.665*****	**11.682*****
Unemployed	**34.541*****	0.225	**6.653****	1.593	**2.019***	2.108***
Constant	39.638***	86.561***	65.709***	73.436***	57.720***	65.374***
Number of obs.	1534	1624	5387	1934	19871	75472
Adj. R-Square	0.31	0.356	0.366	0.367	0.299	0.345

Note: Ordinary Least Square (OLS) estimates from regressions on Health Index (on a scale of 1-100). The numbers are interpreted as percentile changes in the health distribution. For instance, high-educated Chinese and Indonesian males lie, on average, up to about 28 percentiles higher in the health distribution than their female peers – Columns (2). All models include dummies for provinces (China and Indonesia) or countries (OECD), survey wave and month of interview. Standard errors are clustered at the individual level, because there are repeated observations on individuals. Significance levels: * p<0.10 ** p<0.05 *** p<0.01. Parameter estimates in bold and italics are statistically different between columns (1) and (2) at a 5% and 10% level of statistical significance, respectively. SRH: self-reported health.

Source: Calculations for OECD countries are based on data for 17 countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, for China, on the China Health and Retirement Longitudinal Study (CHARLS) 2011-2013, and, for Indonesia, on the Indonesian Family Life Survey (IFLS) 2007-2014.

StatLink http://dx.doi.org/10.1787/888933566894

Table 2.A1.4. Health equations in China, Indonesia and OECD countries according to rural or urban dwelling places

	China (CHARLS)		Indonesia (IFLS)		OECD (SHARE)	
	Rural	Urban	Rural	Urban	Rural	Urban
	(1)	(2)	(1)	(2)	(1)	(2)
Age 50-54 = 0						
Age 55-59	**-3.672****	-3.806*	**-5.680*****	-3.405***	**-2.444*****	-3.247***
Age 60-64	**-6.315*****	**-7.875*****	**-13.049*****	**-10.767*****	**-1.344****	**-1.820*****
Age 65-69	**-11.841*****	**-12.557*****	**-15.200*****	**-17.458*****	**-3.471*****	**-2.093*****
Age 70-74	**-14.919*****	**-13.210*****	**-22.226*****	**-19.609*****	**-8.638*****	**-7.387*****
Age 75+	**-21.114*****	**-20.098*****	**-26.963*****	**-28.531*****	**-17.206*****	**-14.907*****
Good childhood SRH = 0						
Bad childhood SRH	**1.085**	**1.647**	**-2.872*****	**-0.448**	**-6.959*****	**-6.961*****
Female = 0						
Male	**25.588*****	**27.193*****	**20.275*****	**27.881*****	**18.572*****	**18.795*****
Low education = 0						
Medium education	4.801***	5.778***	3.691***	4.795***	4.933***	5.007***
High education	7.732	*13.627****	9.572***	*11.304****	9.225***	*8.414****
Wealth 1st Q = 0						
Wealth 2nd Q	**1.231**	**-2.653**	**0.114**	**2.074***	**3.067*****	**4.342*****
Wealth 3rd Q	**5.078*****	**4.213**	**1.006**	**0.987**	**4.975*****	**6.418*****
Wealth 4th Q	**6.311*****	**5.650****	**3.403*****	**2.269***	**7.298*****	**8.710*****
Wealth 5th Q	**12.699*****	**12.385*****	**4.773*****	**3.655*****	**9.482*****	**10.846*****
Household Size	0.034	0.691	-0.083	0.041	0.169	0.008
Not living alone = 0						
Living alone	2.714	0.781	0.717	4.216*	1.325**	0.262
Not currently married = 0						
Married	3.905**	-1.081	2.060**	0.863	2.024***	1.665***
Inactive = 0						
Employed	**10.260*****	**5.949*****	**6.008*****	**3.036*****	**10.387*****	**11.571*****
Unemployed	*21.480****	**-33.669*****	*3.247*	**4.592**	*1.415*	**2.484*****
Constant	43.475***	94.705***	63.618***	67.713***	60.773***	60.992***
Number of obs.	2171	987	3549	3772	30412	64931
Adj. R-Square	0.389	0.445	0.369	0.412	0.368	0.366

Note: Ordinary Least Square (OLS) estimates from regressions on Health Index (on a scale of 1-100). The numbers are interpreted as percentile changes in the health distribution. For instance, Chinese and Indonesian males with a rural dwelling place lie, on average, up to about 20-26 percentiles higher in the health distribution than their female peers – Columns (1). All models include dummies for provinces (China and Indonesia) or countries (OECD), survey wave and month of interview. Standard errors are clustered at the individual level, because there are repeated observations on individuals. Significance levels: * p<0.10 ** p<0.05 *** p<0.01. Parameter estimates in bold and italics are statistically different between columns (1) and (2) at a 5% and 10% level of statistical significance, respectively. SRH: self-reported health.

Source: Calculations for OECD countries are based on data for 17 countries from the Survey of Health, Ageing and Retirement in Europe (SHARE) 2004-2013, for China, on the China Health and Retirement Longitudinal Study (CHARLS) 2011-2013, and, for Indonesia, on the Indonesian Family Life Survey (IFLS) 2007-2014.

StatLink http://dx.doi.org/10.1787/888933566913

Chapter 3

Recent trends toward increased inequality among future retirees

This chapter finds that the relatively steady increase in real income across birth cohorts at the same ages is stalling for those born since the 1960s. It first shows that although population ageing is a common trend across the world the timing and pace of shifts in the age structure differ widely across countries. It then compares the income levels, the income inequality and the employment rates of different birth cohorts over their life course. The chapter also includes a focus on gender gaps, showing that gender-related labour market gaps have narrowed across cohorts, but that wide differences remain. The last section highlights that risks of higher inequality in old age have increased: old-age support systems will likely need to cope with higher inequalities down the road.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Key findings

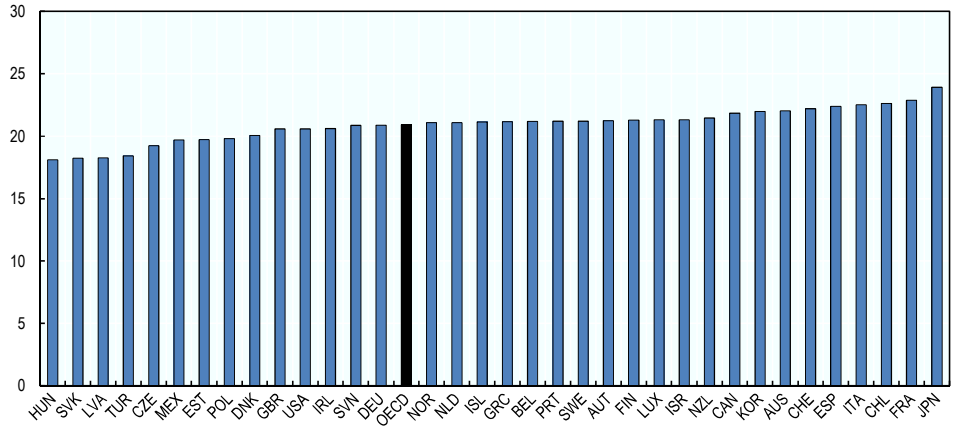
- Population ageing will accelerate sharply in the next three decades, including in some large emerging economies. There are substantial differences in the levels and pace of ageing across countries.
- In most countries, average real incomes are still higher than those of previous generations at the same age. But those born in the 1960s do not have higher incomes than those born in the 1950s.
- Employment at the same ages increased sharply between cohorts born in the 1930s and in the 1950s, especially for the 55+ age group and among women. But it has fallen for those born after 1960.
- Since the mid-1980s, the real income of the 60-64 age group has grown by a cumulative 13% more than the income of people aged 30-34, on average. Poverty risks have shifted from older to younger groups in most countries. However, those older than 75 remain the most vulnerable to poverty risks.
- Income inequality has been rising from one generation to the next at the same age in two-thirds of countries. The increase has been particularly large for younger groups among whom inequality is now already much higher than among today's elderly.

Introduction

Population ageing is not a new phenomenon. Although this is a common trend across the world, the timing and pace of population ageing and of the shifts in age structure differ widely across countries. The increase in the average age of populations stems from gains in life expectancy (one of humanity's greatest achievement) and from declines in fertility rates to below replacement levels. Life expectancy has improved across the OECD over time. However, substantial differences remain from country to country, e.g. in life expectancy at age of 65 (Figure 3.1). Over the period 2010-15, 65-year-old women were expected to live at least 22 more years on average in Korea, Australia, Switzerland, Spain, Italy, Chile, France and Japan, but less than 18½ in Hungary, the Slovak Republic, Latvia and Turkey.[1]

Figure 3.1. A 30% gap between the OECD countries with highest and lowest life expectancy at 65

Remaining life expectancy among 65-year-old women in the OECD, 2010-15, in years



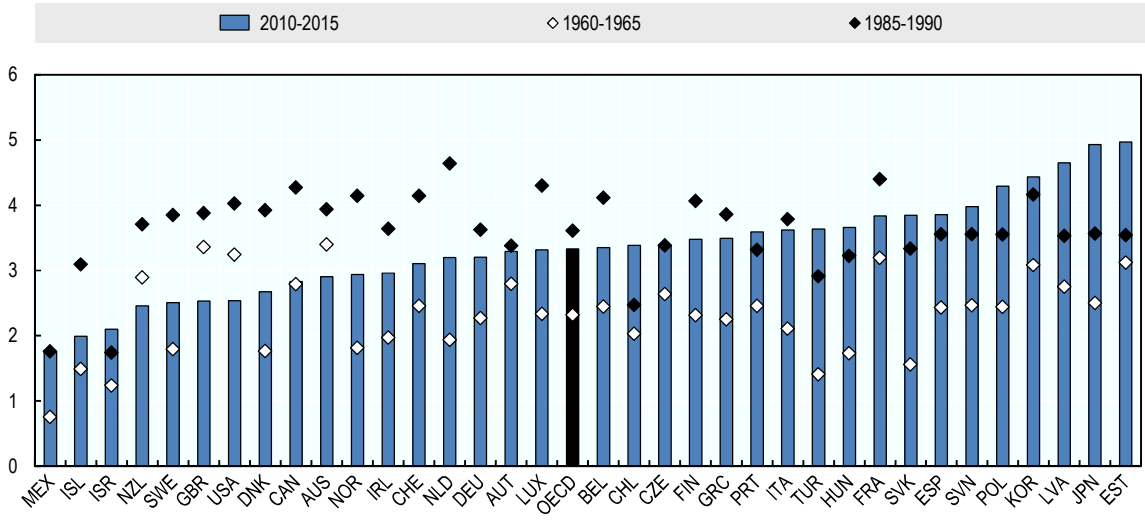
Source: United Nations (2015), *World Population Prospects: The 2015 Revision*, Department of Economic and Social Affairs, Population Division, United Nations, New York.

StatLink http://dx.doi.org/10.1787/888933566932

Everywhere women enjoy longer remaining life expectancy at 65 – by 3.3 years on average, ranging from about two years in Mexico, Iceland and Israel to approximately five in Japan and Estonia (Figure 3.2). The gender gap saw a sharp, widespread widening between 1960 and the mid-1980s, but has generally levelled out since then. This gender pattern over time has been influenced by the gender dynamics of engaging in behaviours that are risky and bad for health. However, patterns differ from one country to another, and gender differences have continued to widen in more than one-third of OECD countries: Chile, Estonia, Hungary, Israel, Japan, Korea, Latvia, Poland, Portugal, the Slovak Republic, Slovenia, Spain and Turkey.

Figure 3.2. The gender gap in life expectancy at 65 has peaked on average

Differences in remaining life expectancy at 65 between women and men, 1960-2015



Source: United Nations (2015), *World Population Prospects: The 2015 Revision*, Department of Economic and Social Affairs, Population Division, United Nations, New York.

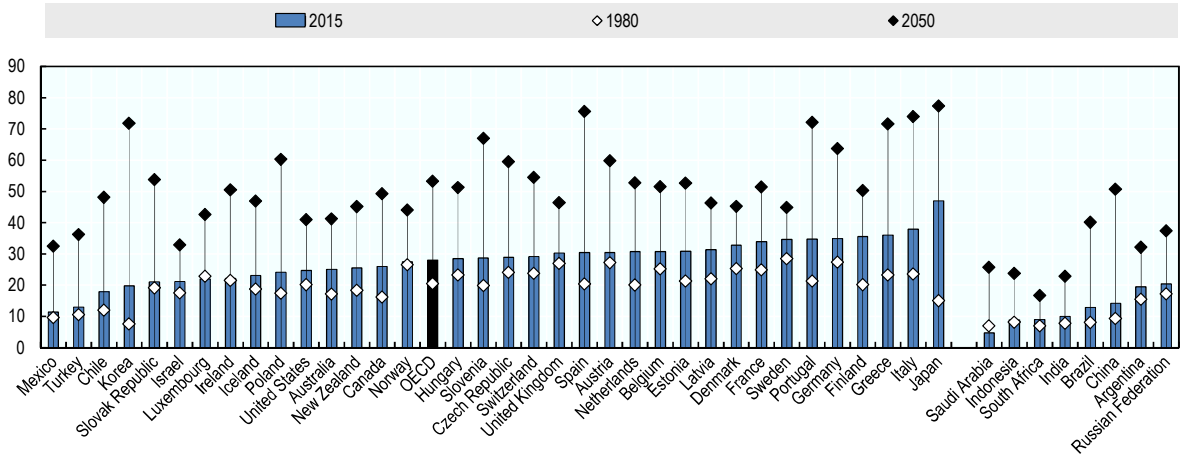
StatLink http://dx.doi.org/10.1787/888933566951

While a common long-term trend, population ageing differs considerably from country to country in timing, initial levels and pace. One widely used measure of shifts in the composition of populations is the old-age dependency ratio. Because it is based on fixed age boundaries – e.g. the 65-and-overs as a percentage of 20-to-64 year-olds – such a measure captures well the shift in the age structure, but it ignores improved health across cohorts at the same age and so overestimates increases in health-related dependency (see Chapter 5).

Between 1980 and 2015, the average number of people older than 65 for every 100 of working age (20-to-64 years old) rose from 20 to 28 in OECD countries (Figure 3.3). Japan is by far the country which aged the most over the period, with an increase of 32 points. It was followed by Finland with a 15-point rise, while the old-age dependency ratio remained broadly stable in Norway, Ireland, Luxembourg, Mexico and the Slovak Republic. Current projections suggest that population ageing will accelerate steeply, with the old-age ratio almost doubling on average by 2050.

Figure 3.3. Population ageing will accelerate sharply

Number of people older than 65 per 100 people of working age between 20 and 64 years old, 1980-2050



Source: United Nations (2015), *World Population Prospects: The 2015 Revision*, Department of Economic and Social Affairs, Population Division, United Nations, New York.

StatLink http://dx.doi.org/10.1787/888933566970

By the middle of the century, cross-country patterns of ageing will look very different from today. Although Japan will still be the oldest OECD country, based on this indicator, Korea will undergo the most extreme ageing experience with its old-age dependency ratio projected to increase from 20% to 72%. Greece, Italy, Portugal and Spain will also age fast. As for non-OECD countries, the rate is expected to accelerate sharply in Brazil and China, too.

The near-doubling of the old-age dependency ratio between 2015 and 2050 translates into a year-by-year increase of 1.8%, twice the rate recorded between 1980 and 2015. The rate of increase (in %) of the old-age dependency ratio can better capture some of the important economic implications of population ageing – such as the impact on the long-term growth rate of GDP per capita – than changes in absolute terms (in percentage points).[2] The only countries that recorded an average annual rise greater than 2% between 1980 and 2015 were Korea (2.8%) and Japan (3.3%), while those projected to do so over the period 2015-50 are:

- Greece, Iceland, the Czech Republic and Portugal with 2.0 to 2.1%;
- Ireland, Slovenia, Spain, Poland and the Slovak Republic with 2.4 to 2.7%;
- Chile, Turkey and Mexico with 2.9 to 3.0%;
- Korea with 3.8%.

A look further ahead to 2075 reveals that Israel is set to be the only OECD country whose old-age dependency ratio, at 0.40, will be lower than Japan's 0.47 in 2015. By 2075, four OECD countries are projected to be much older than their peers: Greece, Portugal, Japan and Korea. Five more, Germany, Spain, Chile, Italy and Poland, are likely to have old-age ratios in excess of 0.65. And even if the ratio is computed to assess the percentage of people aged 70 and older in 2075 versus 65 years and older in 2015 – average life expectancy at 65 is expected to be 5.8 years greater by 2075 – it will still rise by an average of 50% from 0.28 to 0.42.

The next section compares income levels, income inequality and employment by age groups across the countries covered by the Luxembourg Income Study data. The following section focuses on gender gaps. The last section shows that risks of higher inequality in old age have increased.

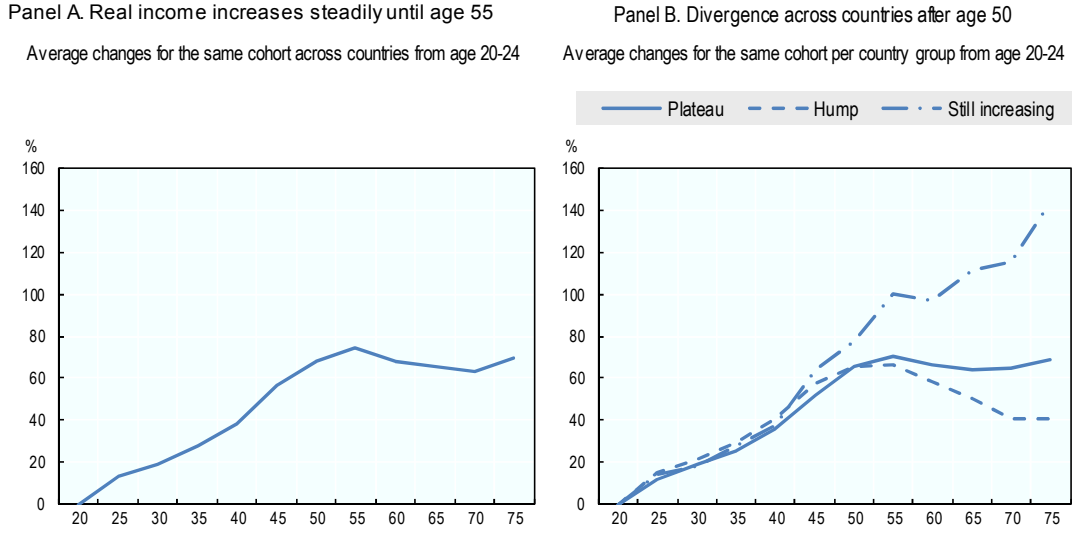
1. Older people have enjoyed big rises in real income compared with previous cohorts

Income rises as people age until about age 55

For the same birth cohorts on average, real disposable income has increased by about 75% between the 20-24 and 55-59 age brackets, and has thereafter tended to plateau at older ages on average across countries (Figure 3.4, Panel A). This is based on income data across birth cohorts at different ages over 1967-2013.[3] However, income-age patterns varied widely from country to country, especially in later life. While incomes grew at similar average rates between 20-24 years old and 45-49, they diverged thereafter. Income-age patterns can be divided into three broad groups (Panel B).

- Canada, Finland, Hungary, Israel, Italy, the Netherlands, Norway, Poland, the Slovak Republic and the United Kingdom in the first group ("plateau") have a similar income pattern at older ages than that of the overall average shown in Panel A, with income more or less plateauing after age 60.
- Real incomes fall by an average of 20% between the 55-59 and 75-79 age brackets (an average drop of 0.9% per ageing years) in the second group ("hump"): Australia, Austria, Belgium, Denmark, Slovenia, Sweden, Switzerland and the United States.
- Real incomes go on rising at a brisk rate of around 2% per year in the last group: the Czech Republic, France, Greece, Ireland, Luxembourg and Spain.

Figure 3.4. Real average incomes within birth cohorts as they age



Note: "Plateau" countries are Canada, Finland, Hungary, Israel, Italy, the Netherlands, Norway, Poland, the Slovak Republic and the United Kingdom. "Hump" countries are Australia, Austria, Belgium, Denmark, Slovenia, Sweden, Switzerland and the United States, "Still increasing" countries are the Czech Republic, France, Greece, Ireland, Luxembourg and Spain.

Source: OECD fixed-effects analysis of country, age and birth cohort data from the Luxembourg Income Study (LIS).

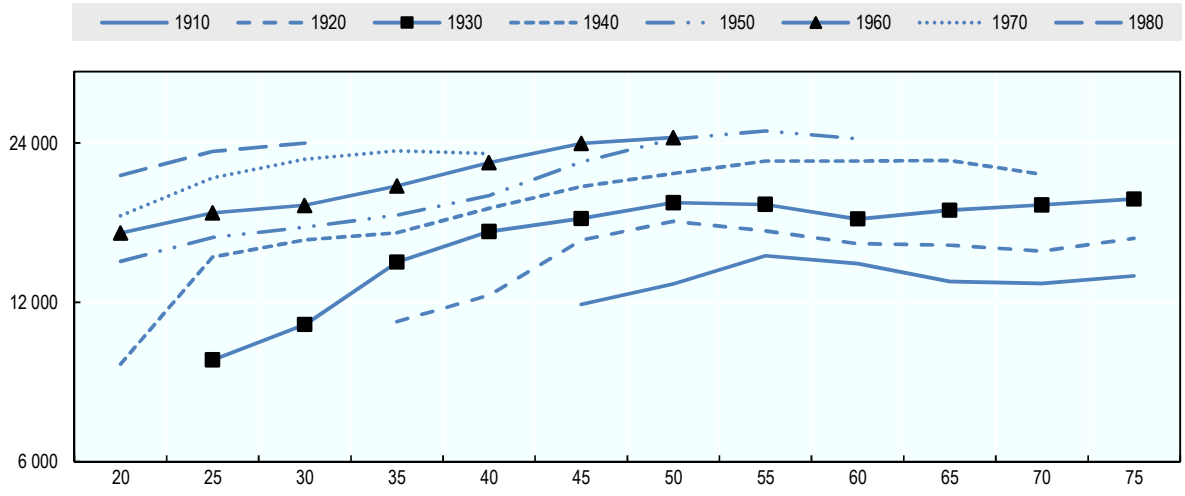
StatLink http://dx.doi.org/10.1787/888933566989

Income gains across cohorts

In addition to changes in the same birth cohorts' incomes as people age, there has been a sharp OECD-wide increase in revenues from one generation to the next at the same age (Figure 3.5). In the 35-39 age group, for example, people born in the 1970s had an average real disposable income that was 62% greater than those born 40 years before (in the 1930s). Likewise, at the age of 60-64, people born in the 1950s had a 70% higher real income than 60-to-64 year-olds born 40 years before.

Figure 3.5. Substantial income gains at the same age across cohorts, at least until recently

Age-cohort pattern of real disposable income, OECD average, 2010 USD PPP

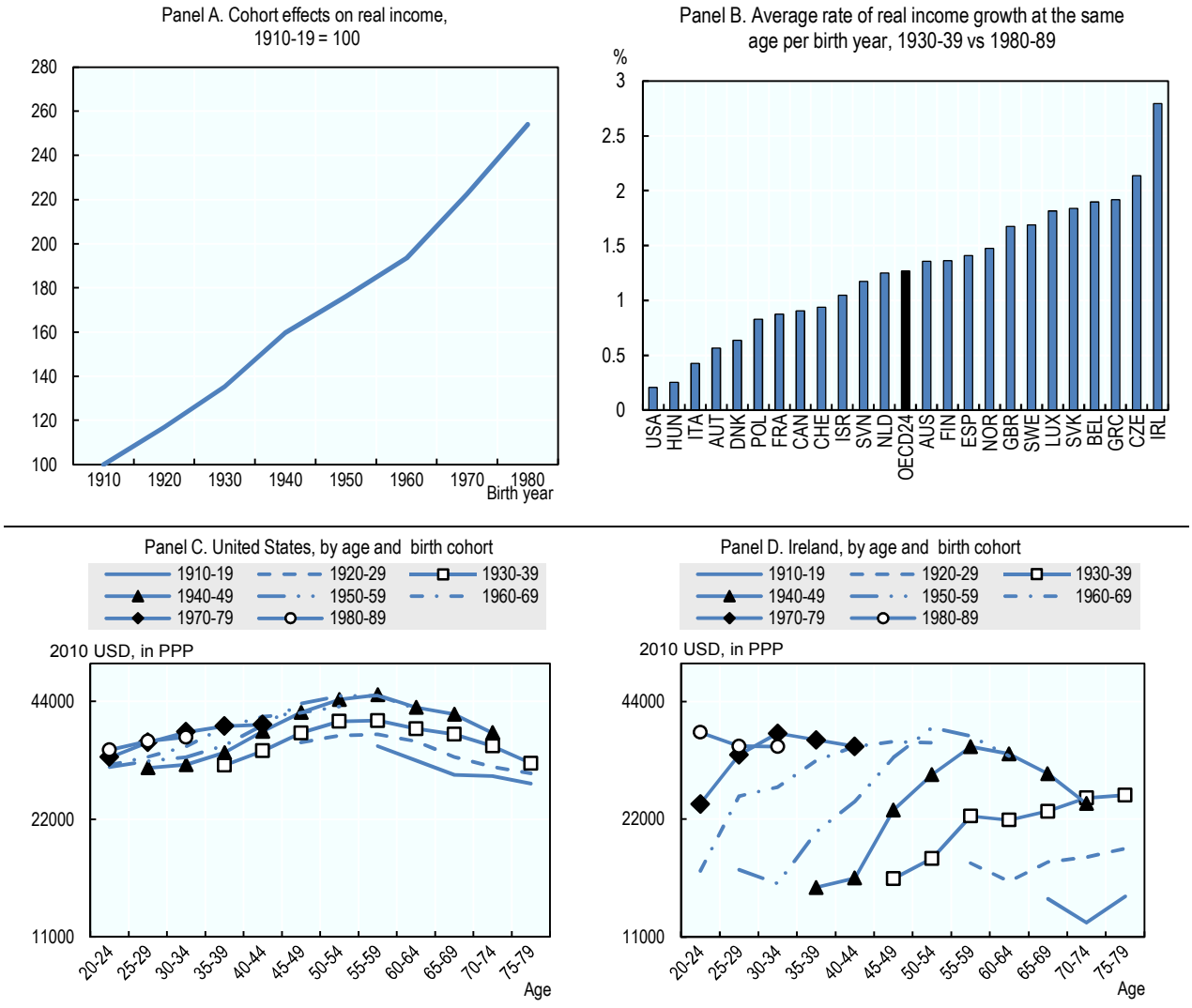


Note. Data are from the Luxembourg Income Study and cover 24 OECD countries. However, due to quality issues, data from Mexico have not been used. To limit the biases from the unbalanced nature of the panel data then obtained, the series shown in the chart are derived for each cohort from specification with country and age fixed effects.

StatLink http://dx.doi.org/10.1787/888933567008

Real income at the same age has thus grown by an average of 1.3% per birth year from the 1910s to the 1980s across the OECD.[4] The increase, driven chiefly by economic growth over time, suggests that real income in 1980 was about 2.5 times higher in the same age group born 70 years earlier (Figure 3.6, Panel A). The rise was relatively steady across all birth cohorts. However, differences between countries are wide (Panel B). For people born in the 1930s and half a century later, the average growth rate in real income per birth year at the same age (assuming a similar – although specific to each country – age profile in all cohorts) was 1.3% on average across countries. It was less than 0.5% in the United States, Hungary and Italy, but higher than 2% in the Czech Republic and Ireland. Panels C and D illustrate the cases of the United States and Ireland which, in Panel B, lie at opposite ends of the spectrum.

Figure 3.6. Real income has increased at the same age across birth cohorts



Note: The data cover 24 OECD countries. Due to quality issues, data from Mexico have not been used. To limit the biases from the unbalanced nature of the data illustrated in the panels, the series shown are derived from specifications that include cohort, country and age fixed effects.

Source: Luxembourg Income Study (LIS) data.

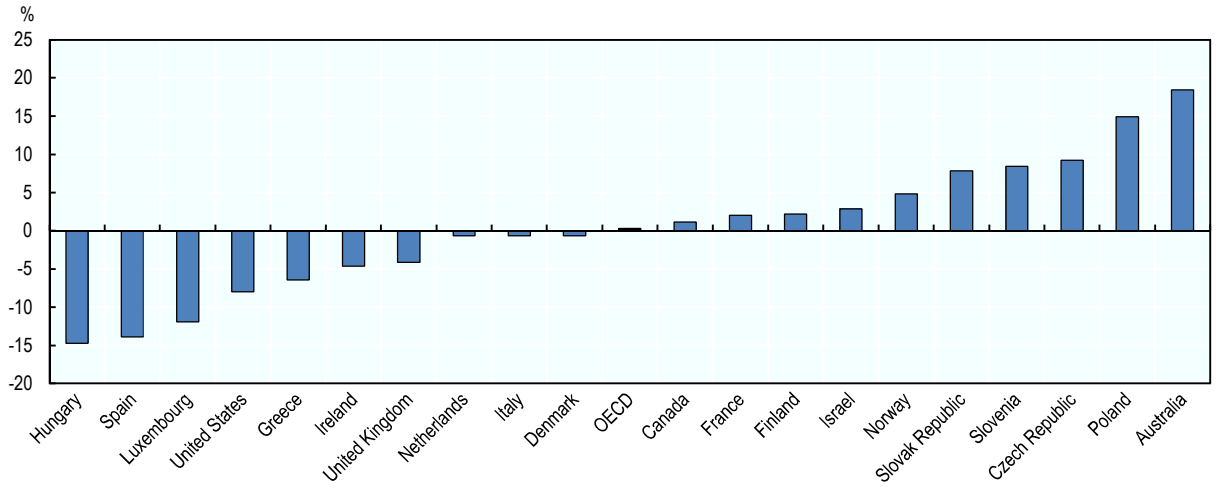
StatLink http://dx.doi.org/10.1787/888933567027

In recent years, however, economic developments have led to smaller, if any, improvements in income at the same age from one cohort to the next (see Figure 3.5 above, where "lines" are now crossing). Indeed, in their early 30s people born in the 1980s have average incomes similar to those of the 1970s-born. The same applies to 1970s versus 1960s birth cohorts in their early 40s, and so on. The little or no improvements might relate to the impact of the Great Recession, though it is too early to determine whether the difficulties that OECD economies have undergone since 2008 will translate into permanent impacts on the birth cohorts affected.[5]

The recent stalling of average growth in the real income at the same age across cohorts results from varying income trends from one country to another. Examination of

the 50-54 age bracket, for example, reveals that 1960s-born cohorts have an average real income at least 5% higher than 1950s birth cohorts in the Slovak Republic, Slovenia, the Czech Republic, Poland and Australia (Figure 3.7). By contrast, it is more than 5% lower among the 1960s cohorts in Greece, the United States, Luxembourg, Spain and Hungary.

Figure 3.7. Average real income in the 50-54 age bracket, 1960s versus 1950s birth cohorts



Source: OECD calculations based on Luxembourg Income Study (LIS) data.

StatLink http://dx.doi.org/10.1787/888933567046

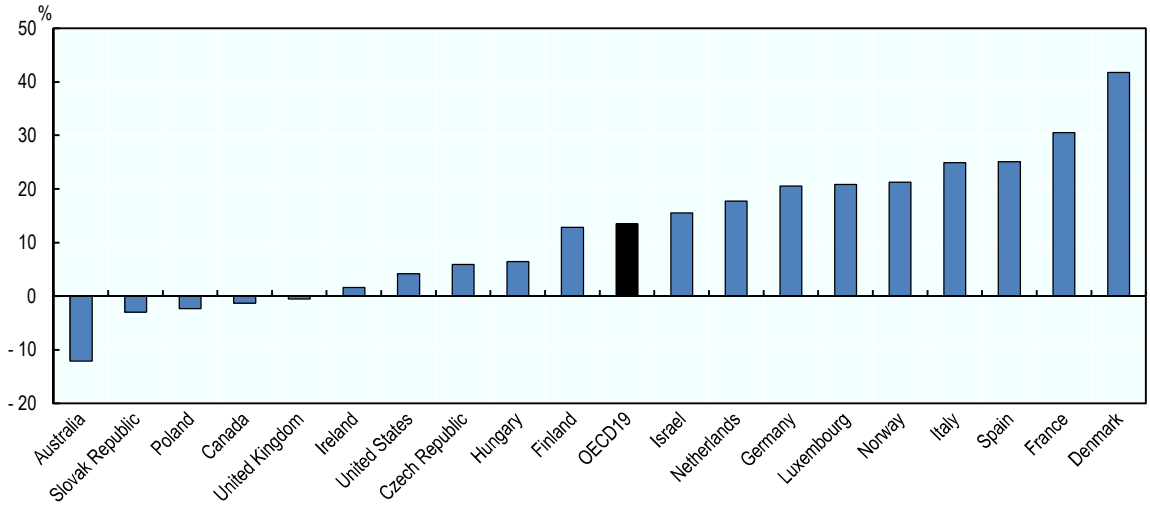
Relative income changes between age groups

The analysis now turns to capturing how shifts may have been to the benefit or detriment of particular age groups from one generation to the next in each country. Doing so reveals that the situation of those who are currently older than 60 years has improved substantially in recent decades in both relative and absolute terms, as they have gained from relatively favourable employment rates and maturing pension systems.

Shifts in income have indeed benefitted older people. For example when focusing on the working age over the three decades from the 1980s to the 2010s, the OECD-wide average income of the 60-64 age group grew by a cumulative 13% more than that of 30-to-34-year-old (Figure 3.8). Only in English-speaking countries the Slovak Republic and Poland did older people not benefit in relative terms, while in Italy, Spain, France and Denmark their gains were very large.

Figure 3.8. Shifts in income have benefited older people of working age

Changes in relative income of 60-64 vs 30-34 between the mid-1980s and the mid-2010s



Source: OECD calculations based on Luxembourg Income Study (LIS) data.

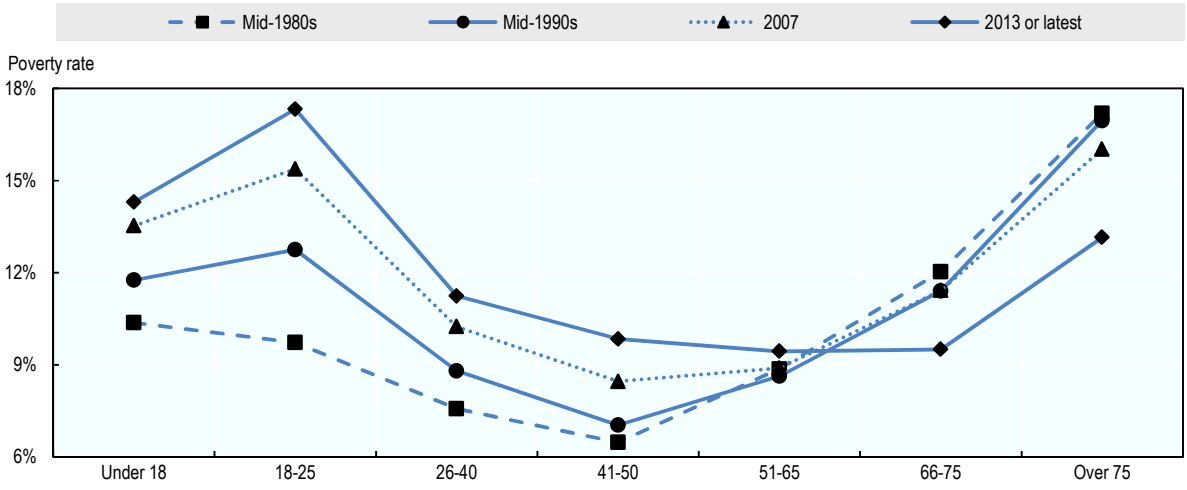
StatLink http://dx.doi.org/10.1787/888933567065

Improvements in the relative incomes of the older age groups are a mirror image of the dramatic shift in poverty risks to the detriment of the young in most OECD countries (for which data are available) since the mid-1980s (Figure 3.9). This trend has evolved against the background of an overall rise from 9.4% to 12.1% in the OECD average poverty rate (defined as half the median-equivalised income).

Since the mid-1980s, relative poverty rates steadily increased among the under-50s and especially – with an average rise of 7.6 percentage points – among 18-to-25 year-olds. By contrast, old-age relative poverty rates have recently declined, as pensioners have better withstood the negative income shocks of the 2007-08 economic and financial crisis. The shifts in poverty risks from one age group to another occurred in all 18 OECD countries for which historical data that go back far enough are available, with the exception of New Zealand. There were especially marked shifts in Denmark, Greece and Norway (Table 3.1). Nevertheless, poverty rates among the over-75s rose in Israel, New Zealand, Sweden and Turkey from the mid-1980s.

Figure 3.9. On average poverty risks have shifted from the old to the young

Relative poverty rates by age group since the mid-1980s in 18 OECD countries



Note: The graph relates to 18 countries for which data are available (see Table 3.1).

Source: OECD Income Distribution Database (http://oe.cd/idd).

StatLink http://dx.doi.org/10.1787/888933567084

Table 3.1. Poverty risks have shifted from the old to the young in almost all countries

Changes in poverty rates across age groups since the mid-1980s to 2014 or latest year

	Total	0-17	18-25	26-40	41-50	51-65	66-75	76+	Shift (76+ vs 18-25)
Norway	1.3	1.6	20.1	5.4	1.8	-1.4	-8.3	-28.1	-48.2
Greece	2.1	6.5	11.3	6.1	9.2	0.5	-17.4	-19.1	-30.4
Denmark	0.0	0.5	13.3	2.7	0.7	-1.8	-10.2	-16.2	-29.5
Italy	3.2	7.1	6.8	5.9	6.7	-0.9	-9.5	-8.6	-15.5
Netherlands	4.4	7.1	13.1	4.8	3.6	2.6	-0.5	-0.2	-13.3
United Kingdom	3.2	0.9	12.1	1.4	4.9	2.8	0.1	0.4	-11.7
OECD-18	**2.6**	**3.9**	**7.6**	**3.7**	**3.4**	**0.6**	**-2.5**	**-4.0**	**-11.6**
Japan	4.1	5.4	9.2	3.5	4.6	1.1	-5.8	-2.1	-11.3
Luxembourg	2.6	5.0	5.2	3.7	5.0	1.6	-8.1	-5.7	-10.8
United States	-0.5	-4.2	4.0	2.1	1.5	1.0	-3.7	-5.0	-9.0
Mexico	0.7	2.3	1.1	2.5	-2.1	-3.1	7.2	-4.3	-5.4
Germany	3.1	2.2	4.8	4.2	3.3	5.1	0.5	-0.4	-5.3
France	0.4	3.1	4.4	1.9	-0.4	-5.2	0.1	-0.1	-4.5
Canada	-0.1	-1.6	1.3	1.0	3.8	-0.9	-0.6	-3.1	-4.4
Sweden	6.4	6.6	9.2	8.2	3.3	4.2	4.5	5.1	-4.2
Finland	1.4	-0.2	3.9	2.3	2.1	1.2	-2.6	0.2	-3.7
Turkey	2.8	8.2	5.0	1.4	3.3	-2.9	-4.5	1.8	-3.3
Israel	9.0	15.8	5.6	7.9	6.2	2.4	7.1	3.1	-2.6
New Zealand	3.6	4.2	6.2	1.0	3.0	4.2	6.3	9.7	3.5

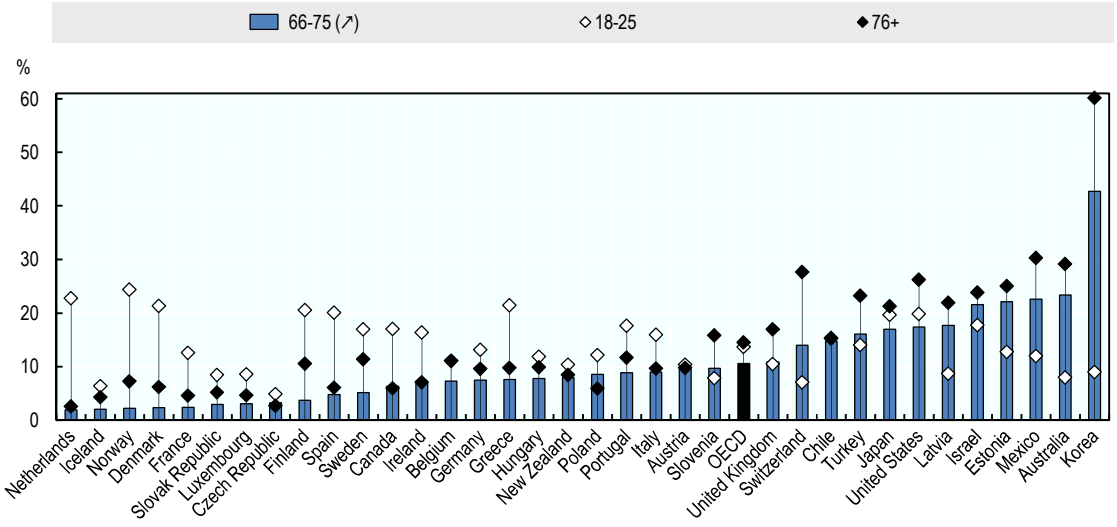
Note: Countries are ranked by the size of the change in the poverty rates of the 76+ and 18-25 age groups (in the column "Change").

Source: OECD Income Distribution Database (http://oe.cd/idd).

StatLink http://dx.doi.org/10.1787/888933567293

When all OECD countries are considered for the most recent year, the average poverty rate among people over 76-year-old is still the highest at 14.4% – slightly higher than the 18-to-25-year-old's average rate of 13.9% (Figure 3.10). Poverty among the elderly is a serious concern in some countries. It exceeds 20% in Japan, Latvia, Turkey, Israel, Estonia, the United States, Switzerland, Australia and Mexico and is close to 60% in Korea (Figure 3.10).[6] Nevertheless, younger age groups are now the most highly exposed to the risk of poverty in the majority of OECD countries.

Figure 3.10. On average across the OECD poverty rates are similar among the 76+ and the 18-25



Note: Poverty rates are defined at half the median-equivalised income. Data refer to 2014 for the Netherlands, Finland, Hungary, the United States, Israel, Mexico, Australia and Korea; to 2012 for New Zealand and Japan; and to 2013 for all other countries. For the OECD average, the poverty rate is 13.9% for the 18-25 and 14.4% for the 76+.

Source: OECD Income Distribution Database (http://oe.cd/idd).

StatLink http://dx.doi.org/10.1787/888933567103

Employment gains at different ages among cohorts born before 1960

Within the same cohorts, employment reaches its peak in middle age. In any given year, it is well established that the age pattern of employment rates – which cuts across different birth cohorts – first rises with age, reaches its peak for workers in the middle age, then declines for older workers. Although there are some differences between cohorts (see Figure 3.12 further below), age-related average employment rates among the same individuals (captured in the aggregate by employment rates within the same cohorts) show a peak when workers reach their 40s.

Cohort analysis shows employment rates at the same ages that are much higher – by about 12 percentage points on average – among generations born in the 1950s, 1960s and 1970s than among those born in the 1930s (Figure 3.11). As for the youngest cohorts, born in the 1980s, employment rates are lower – just above those of the generation born 40 years earlier. Of course, the cohort effect among people born in the 1980s is based on their employment situation prior to 2015 – i.e. when they were under 30-35 years old – and is likely to be strongly influenced by the deteriorating economic situation since the mid-2000s. When restricting the analysis to data observed at older ages, employment rates improved markedly across cohorts born before 1960.

The OECD average employment patterns shown in Figure 3.11 for cohorts born in certain decades divides into four groups of countries:

- The first group comprises Australia, Austria, Canada, Germany, Hungary, Israel, Mexico, the Netherlands, Poland and Spain. Improvements in the employment rates of all cohorts are greater than the OECD average and 1980s-born cohorts do as well as those born in the 1970s.

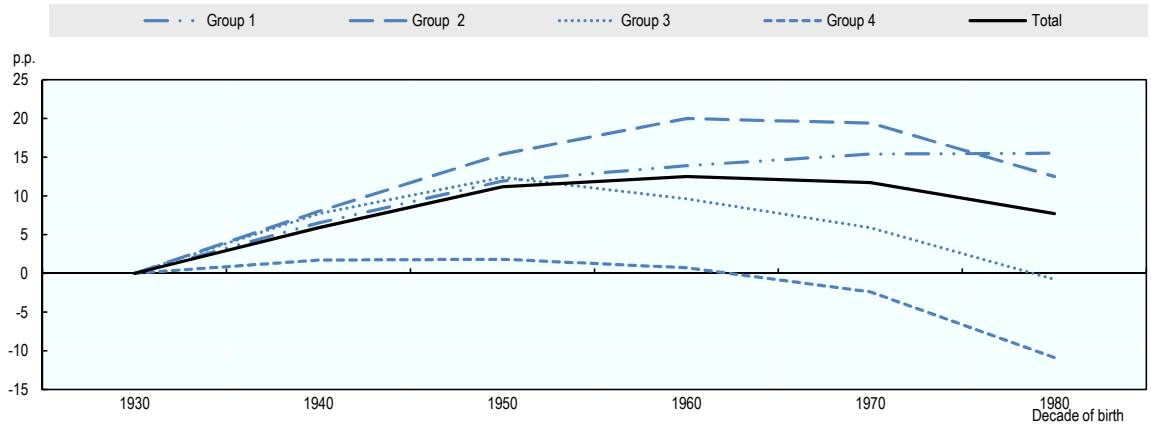
- The second group: Belgium, Italy, Luxembourg, Slovenia and the United States. Increases in in employment from one birth cohort to the next are even steeper up to and including the 1960s- and 1970s-born cohorts – almost 20 percentage points compared to the 1930s. However, almost half of that rise is lost in the employment outcomes of the 1980s-born cohorts.

- The third group: the Czech Republic, Denmark, Finland, France, Norway, the Slovak Republic and Switzerland. Labour outcomes have deteriorated sharply among cohorts born after the 1950s, with 1980s-born workers recording employment levels that are no better than those of workers born 50 years earlier.

- The fourth group is made up of Greece, Ireland, Sweden and the United Kingdom. Changes are the least favourable of the four, with no real improvement since the 1930s. There have been sharp drops in employment among cohorts born after the 1960s and falls of over 10 percentage points among those born after 1980.

Figure 3.11. Employment peaked for the 1960s-born cohorts on average across countries

Changes in average employment rates at the same age compared with those among 1930s-born cohorts



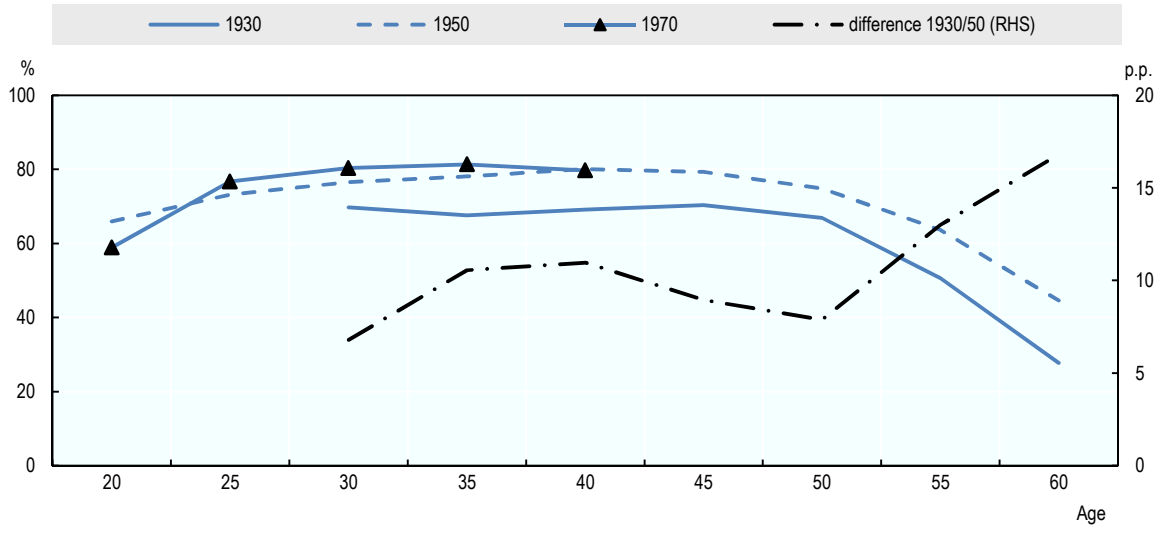
Note: The cohort pattern distinguishes four groups of countries. Data include specifications with cohort and age fixed effects for each country. "Total" denotes the cross-country average. Group 1: Australia, Canada, Germany, Hungary, Israel, Mexico, Netherlands, Poland, Russia, United States. Group 2: Austria, Spain, Italy, Belgium, Luxembourg, Slovenia. Group 3: Czech Republic, Denmark, Finland, France, Norway, Slovak Republic, Switzerland. Group 4: Greece, Ireland, Sweden, United Kingdom.

Source: OECD calculations based on Luxembourg Income Study (LIS) data.

StatLink http://dx.doi.org/10.1787/888933567122

Improvements in employment rates have been more pronounced in older age groups. Between the 1930s- and 1950s-born generations, employment rates increased by 7 percentage points in the 30-34 age group and, albeit from a lower level, by 17 percentage points among 60-to-64 year-olds (Figure 3.12). Between the 1950s- and 1970s-born generations, however, the improvement in employment is not so clear, with lower rates below the age of 25 and slightly higher ones up to 40 years old. In other words, employment levels at young ages were low for the younger cohorts, possibly due to the expansion of tertiary education.

Figure 3.12. Employment rates by age group in specific cohorts, cross-country averages



Note: The cross-country average employment rates of 30-34 year-olds born in the 1930s was 70%. For people born in the 1950s, it was 77%, an increase of 10% (right-hand y axis). The specification for each cohort is based on country and age fixed effects.

Source: OECD calculations based on Luxembourg Income Study (LIS) data.

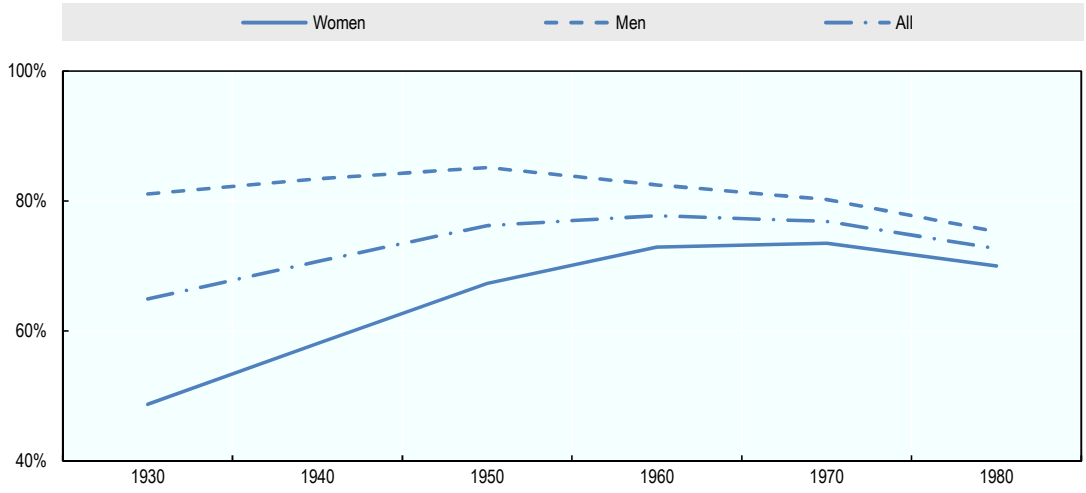
StatLink http://dx.doi.org/10.1787/888933567141

2. Gender gaps have narrowed but are still wide

Gender gaps have narrowed on a number of fronts over recent decades (Olivetti and Petrongolo, 2016). Women's labour market performance in particular has contributed to the rise in employment from one cohort to the next (Figure 3.13 and Figure 1.14 in Chapter 1). Female employment grew fast (from low levels) between the 1930s- and 1960s-born generations, although it did decline slightly for the younger cohorts. At the same time, employment rates of men born after the 1950s have been lower.

These trends have combined to yield a steady narrowing of the gender gap in all age groups, though less so among 30-to-34 year-olds, due to motherhood and unevenly split childcare. The closing of the employment gap is consistent with long-term progress towards gender equality in education in many countries (OECD, 2012). There is some evidence that the climb in women's employment rates has cut overall income inequality despite the wide disparity between highly and poorly educated women (Harkness, 2013; OECD, 2015a). Consequently, given the importance of employment history for income prospects at older ages, increased female labour market participation across cohorts is likely to help reducing future ageing-related income inequality.

Figure 3.13. Cohort effects in employment rates by gender, OECD average



Note: The chart displays the average estimated cohort effects across countries from a specification which for each country includes age and cohort effects. Using the Deaton-Paxson approach to control for period effects has very little impact. To illustrate the narrowing of the employment gender gap, the graph uses the cohort series based on a reference age of 50-54 years old.

Source: OECD calculations based on Luxembourg Income Study (LIS) data.

StatLink http://dx.doi.org/10.1787/888933567160

To illustrate the narrowing of the employment gender gap, Figure 3.14 considers the 40-44 age group and shows how the gender gap in countries' employment rates halved on average between the 1940s- and 1970s-born generations. The reduction was greater than 20 percentage points in Belgium, Germany, Ireland, Italy, Luxembourg, Mexico, Spain and Switzerland. In the younger 1970s-born generation, the gap is still far from closed though as it stands at an average 14 percentage points, and remains especially wide in Greece, Mexico, the Netherlands, Italy and Luxembourg. It is negligible in Hungary, Ireland and Finland.

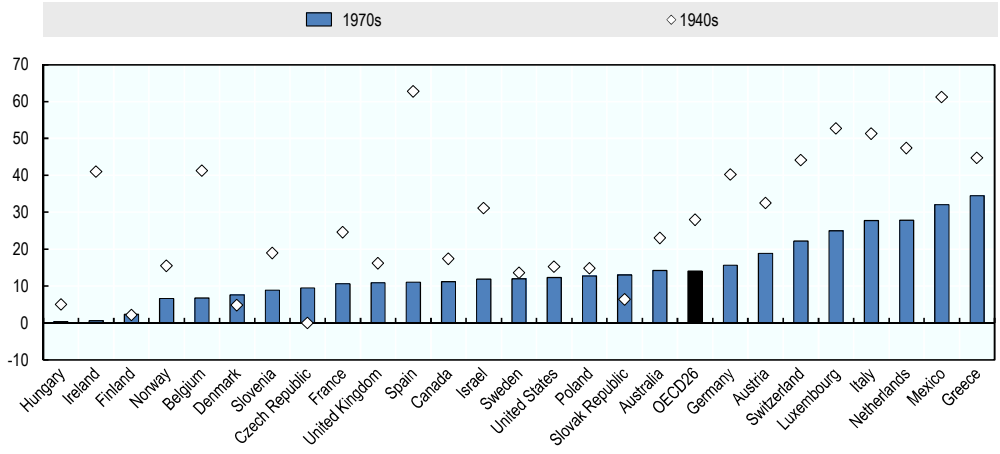
Notwithstanding their improved labour market performance over time, women are still more likely than men to work part-time and take career breaks, which create obstacles to adequate retirement income. A related factor is that women also bear most of the burden of unpaid household chores and are more likely to care for both children and older relatives (Chapter 6). Although wage gaps have also narrowed, full-time female employees' median earnings in 2015 were still about 15% lower than men's, with gaps wider than 20% in Chile, Estonia, Israel, Japan, Korea and Latvia (OECD, 2017). Gender differences are especially pronounced in emerging economies, with low-skilled women from the poorest families typically facing the largest disadvantages relative to men (OECD, 2016).

To sum up, despite unprecedented improvements, substantial gender disparities persist and continue to fuel unequal ageing. The disadvantages which generations of women had to contend with during their working lives have translated into wide annual pension gaps – though lower annual retirement incomes are partly offset by longer retirement as women tend to live longer. On average across 28 OECD countries for which data are available, annual pension payments to the over-65s are about 27% lower for women on average (Figure 3.15).[7] Differences are especially wide in Germany and the Netherlands, over 40%, while there are lower than 10% only in Estonia, the Slovak

Republic and Denmark. The shift towards pension systems with a stronger link between earnings and pensions has exacerbated the already weak pension position many women find themselves in (OECD, 2015b). On the other hand, rising female participation rates and closing pay gaps have improved the prospects for many women of receiving a pension on par with men.

Figure 3.14. Gender gaps in OECD countries' employment rates among 40-44 year-olds in 1940s versus 1970s birth cohorts

Percentage points



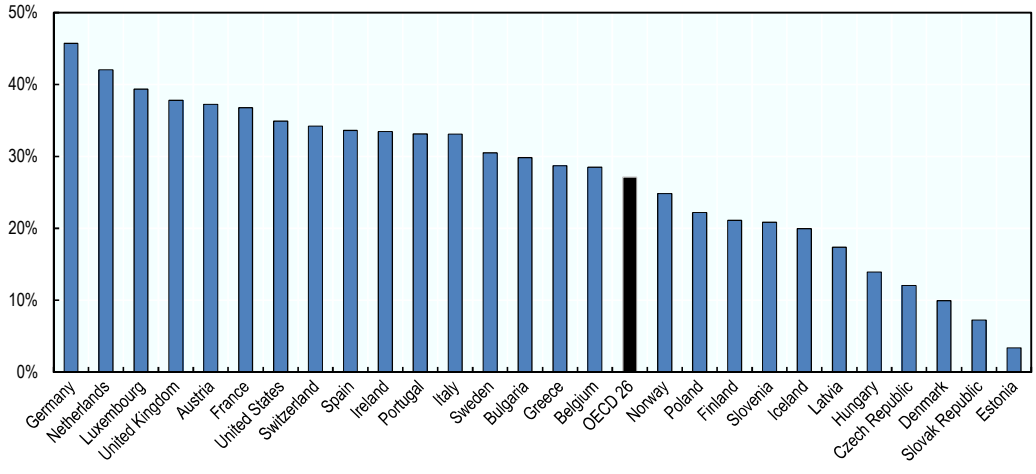
Note: For Sweden and Switzerland, data refer to the 30-34 and 35-39 age groups, respectively. For Austria and Belgium, the gender gap among 1970s-born cohorts is that of the 30-34 age group. For Greece and Slovenia, it is the 40-44 year-old age group in the 1940s cohorts.

Source: OECD calculations based on Luxembourg Income Study (LIS) data.

StatLink http://dx.doi.org/10.1787/888933567179

Figure 3.15. Gender gap in pensions in OECD countries, 2014 or latest

Relative difference in women's pensions compared to men's



Note: The gap is computed as the difference in average pensions across genders divided by male's average pensions.

Source: For European countries: EU-SILC 2014 and 2013, for USA EBRI Databook on Employee Benefits Updated 2010.

StatLink http://dx.doi.org/10.1787/888933567198

3. There is a rising risk of more unequal ageing

Repercussions in old age of inequality at working age

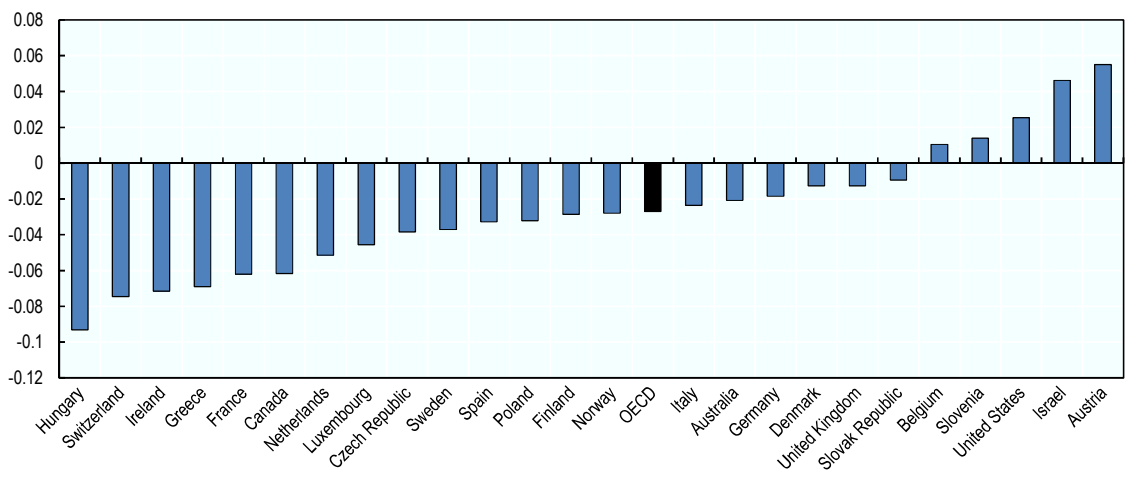
The elderly population of the future will be far more varied than today's. Although they will live longer, more will have undergone long spells of unemployment and low wages, while others will have enjoyed higher, stable earnings. As noted above, income gains have faltered in some countries and new threats to health, such as obesity, are coming to the fore (Chapter 2).

Caution should be exercised when extrapolating the future of the elderly from their current, improved situation. The experience of today's young and middle-aged people could be quite the opposite when they grow old in forthcoming decades. There is a serious risk that ageing will be tough for the poorly educated and, due to the persistent gender gap, particularly tough for poorly educated women. Chapter 4 gives an idea of the extent to which wide income inequality in working life impacts on inequality in retirement incomes. Indeed, old-age support systems will have to cope with significantly higher inequalities, so increasing the need for their redistributive components to play a greater role.

Within any given cohort and country, income inequality – measured by the Gini coefficient, where 0 indicates that everybody has the same income and 1 that all income goes only to one person – typically increases with age up to 55-60 years old, when it generally reaches a peak (see Figure 1.10 in Chapter 1). Thereafter, it tends to fall as the Gini coefficient declines between the ages of 55-59 and 75-79 (within the same cohort) by about 3 percentage points – i.e. an about 10% drop in equality. Income inequality continues to increase substantially with age among the over-60s (among the same birth cohorts on average) only in Austria, Israel and the United States (Figure 3.16). By contrast, inequality declines sharply at older ages in Hungary, Switzerland, Ireland, Greece, France, Canada, the Netherlands and Luxembourg.

Figure 3.16. Income inequality decreases at older ages in most countries

Changes in the Gini coefficient between the 55-59 and 75-79 age groups among the same birth cohorts



Note: Specifications by country include age and cohort fixed effects.

Source: OECD calculations based on Luxembourg Income Study (LIS) data.

StatLink http://dx.doi.org/10.1787/888933567217

Ageing automatically affects income inequality

Given that income inequality evolves with age among the same individuals, demographic changes affects total inequality directly through a composition effect. Inequality changes with shifts in the age structure of the population, even if inequality within each age group remains constant over time (Box 3.1). The advantage of the Theil index, as a measure of inequality, is that it breaks total inequality down into the sum of the inequality (as a weighted average) within age groups (weighted by their share of the population) and of the inequality in average income between five-year age groups. Inequality within age groups accounts for more than 90% of inequality.

If there is an increase in the share of people aged 55 to 65 years old (generally the age group with the highest inequality), then total inequality automatically rises – and vice-versa for the share of over-70s, where inequality is relatively low. However, there may be offsetting effects, as ageing may be associated with increases in the shares of both 55-to-65 year-olds and the over-70s. Between 2015 and 2050, current demographic projections suggest that the automatic effect of ageing on inequality is close to zero on average in the OECD, with changes in equality never exceeding 4% (Box 3.1).

Box 3.1. Impact of demographic changes on income inequality

The Theil index of disposable income is a measure of inequality in the population, similar to the Gini index. It is defined as follows:

$$T \equiv \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{\bar{y}}\log\left(\frac{y_i}{\bar{y}}\right)$$

where n is the number of individuals, y_i is the income of individual i, and $\bar{y}$ is the average income of the population. The Theil index belongs to a group of inequality measures, generalised entropy indices, which can be broken down into inequality within and between certain groups in the population. It can therefore be used to examine the effect of shifts in the age composition of the population on overall inequality. To that end, it can be re-written as:

$$T = \underbrace{\sum_{j=1}^{k} s_j T_j}_{\text{within-group inequality}} + \underbrace{\sum_{j=1}^{k} s_j \log\frac{\bar{y}_j}{\bar{y}}}_{\text{between-group inequality}}$$

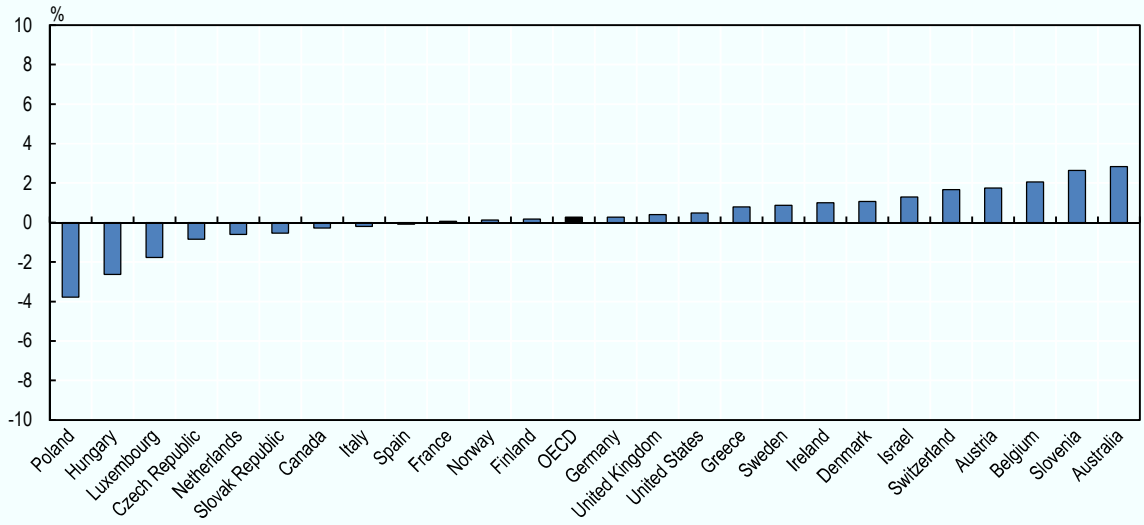
where j indicates the age group of the population, while T_j, $\bar{y}_j$, and s_j are, respectively, its Theil index, average income, and share in the total income of the population. As for k, is the total number of age groups. A change in the age composition alters the income shares (s_j) of the age groups while both the inequality within (T_j) and average income ($\bar{y}_j$) of each age group are assumed to remain constant over time.

The age composition effect of demographic changes between 2015 and 2050 on inequality is computed from available data on five-year age groups in 26 OECD countries (see Figure 3.17). The effects are slight, ranging from a 3.8% fall in inequality in Poland to a rise of 2.8% in Australia. In about two-thirds of the OECD countries considered, the magnitude of the effect fails to exceed 1%. Currently, countries like Poland, Hungary and Luxembourg are characterised by a marked drop in inequality at older ages. The large number of baby boomers retiring over the next three decades thus reduces overall inequality. Meanwhile, the shift in the composition of the population is projected to increase overall inequality in countries like Australia, Slovenia and Belgium, where inequality does not fall in old age or does so to a lesser degree.

Box 3.1. Impact of demographic changes on income inequality *(cont.)*

Figure 3.17. How changes in the age composition of populations automatically affect the Theil index of disposable income in selected OECD countries, 2015 and 2050

Change measured as percentage of the 2015 Theil index



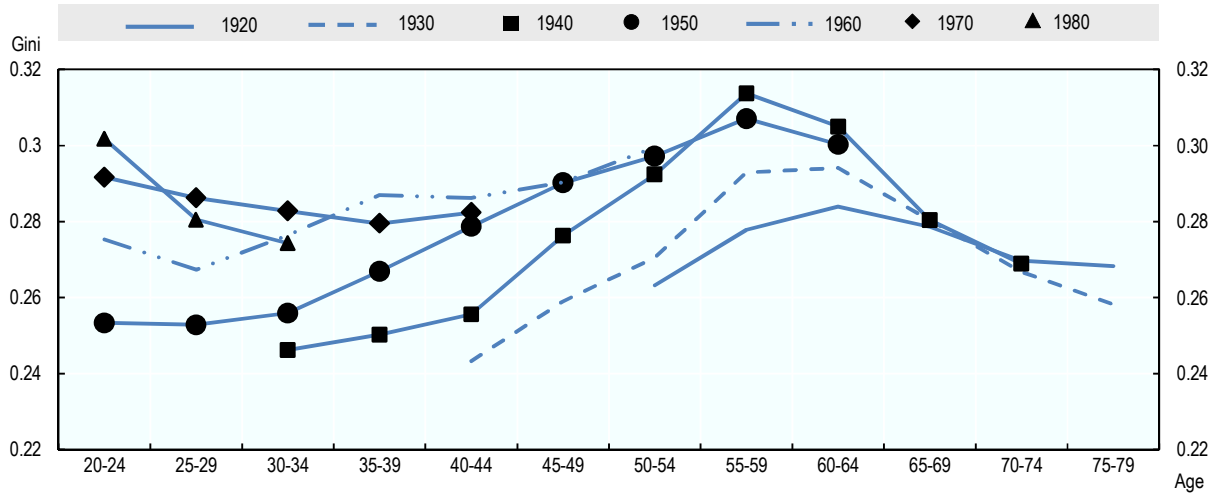
Source: OECD calculations based on United Nations (2015), *World Population Prospects: The 2015 Revision*, Department of Economic and Social Affairs, Population Division, United Nations, New York, Luxembourg Income Study (LIS) data; for details see Geppert, C. (2018), "Age- and Education-related Composition Effects on Measures of Aggregate Inequality", *OECD Working Papers*, forthcoming.

StatLink http://dx.doi.org/10.1787/888933567236

Inequality at the same age between birth cohorts is on the rise

Within-cohort income inequality typically rises with age, generally peaking between 55 and 60 years old in OECD countries and declining thereafter (Chapter 1). However, inequality evolves differently from one birth cohort to the next, with the 1940s-born experiencing a particularly pronounced rise and fall in income with age (see the hump corresponding to the 1940s cohort in Figure 3.18). Indeed, for this generation, the Gini index rose substantially from an OECD-wide average of 0.245 among 30-to-34 year-olds to 0.315 when, 25 years later, they reached 55 to 59. The increase was much more gradual among the 1960s cohort (for which data are available only up to 50-54) albeit from a higher level of inequality at younger ages. For the youngest cohorts, the Gini index even declines up to the age of around 35, in contrast to the initial upward sloping segment (of the hump shape) that had prevailed up to and including the 1950s-born cohort.

Figure 3.18. Income Gini index by cohort and age group, OECD-wide averages



Source: OECD calculations based on Luxembourg Income Study (LIS) data.

StatLink http://dx.doi.org/10.1787/888933567255

Overall, income inequality in the same age groups has climbed steadily in all cohorts born between the 1920s and 1980s, particularly in the younger age groups. To put it more precisely, inequality at the same age rose, on average, in all cohorts:

up to the age of…	between the cohorts born in…
65-69	1920s and 1940s
and 50-54	1940s and 1960s
and 30-34	1960s and 1970s
and 20-24	1970s and 1980s

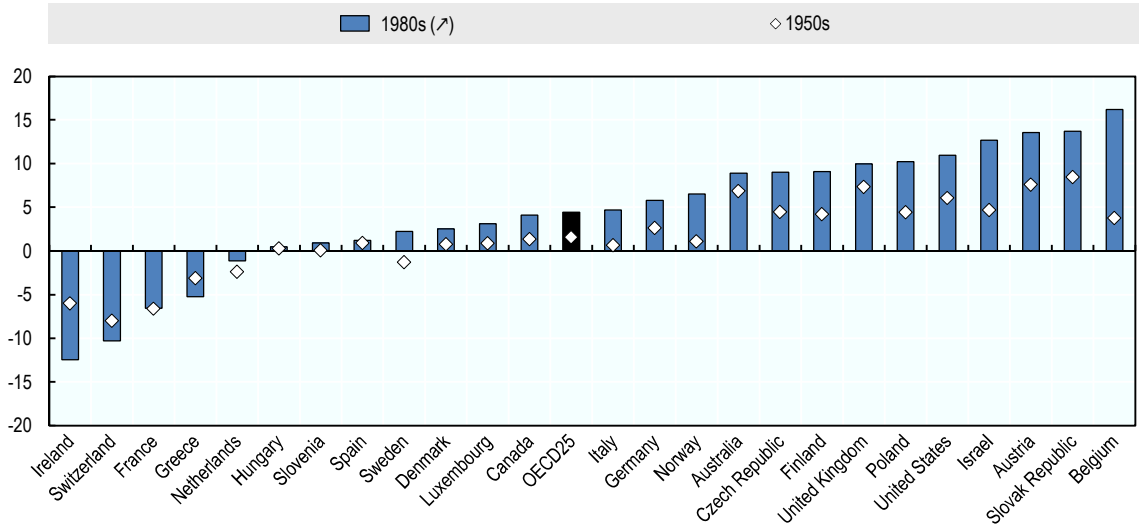
The inference is a very sharp cumulative rise in inequality among the younger age groups. For those born in the 1980s, it is much higher than among their parents at the same age, which in turn was higher than for their parents. If the age patterns of the past prevail among the younger cohorts, they will suffer from great inequality in old age.

The average increase in the Gini coefficient at the same age between generations born in the 1920s and in the 1950s is equal to 1½ percentage points (Figure 3.19) – a rise in inequality of about 6%.[8] Between the 1950s and 1980s birth cohorts, the Gini index at the same age increased by a further 3 percentage points (or 10%) on average. In other words, at a given age, income inequality climbed by about 0.3% per birth year on average among people born from 1950 onwards.

Behind such OECD averages lie marked differences between countries. The cumulative increase (between the 1920s and 1980s birth cohorts) has been very large – greater than 10 points – in Belgium, the Slovak Republic, Austria, Israel, the United States, Poland, the United Kingdom, Finland, the Czech Republic and Australia. By contrast, inequality at the same age declined between cohorts in Ireland, Switzerland, France and Greece. Overall income inequality at the same ages across cohorts increased in about two-thirds of countries, was more or less stationary in one-sixth, and declined in the remaining sixth.

Figure 3.19. Income inequality at the same age has increased from one generation to the next in most countries

Changes in Gini indices across birth cohorts in percentage points, average across age groups, cohort reference = 1920s



Note: For each country, reported figures are derived from a specification that includes cohort and age fixed effects. Older cohorts tend to be observed at old ages only and younger cohorts at young ages. Due to quality issues, data from Mexico have not been used.

Source: OECD calculations based on Luxembourg Income Study (LIS) data.

StatLink http://dx.doi.org/10.1787/888933567274

In addition to the repercussions on old-age inequality of higher income inequality in working life, analysed in the next chapter, population ageing could heighten the difficulties that the disadvantaged elderly of the future may experience. It would do so through four interrelated factors.

First, as the proportions of older people in populations grow, any disadvantage borne by the elderly (e.g. those resulting from high income inequality during working life) would be magnified at the aggregate level, and at a fast pace in some countries. Second, health differences, both within and between socio-economic groups, tend to grow over the life cycle (Chapter 2), at least up to a certain age, and the growing share of older people is likely to make health-related inequalities more prominent.

Third, population ageing is closely associated with the decline in the share of the working-age population, which will considerably affects the relative supply of productive factors, labour and capital. Workers supply labour while retirees hold substantial amounts of assets. Consequently, a fall in the ratio of workers to retirees turns labour into the scarcer factor of production and capital into the more abundant one – unless working and saving patterns over the life cycle change dramatically. This ageing-related labour scarcity is likely to lead to an increase in income inequality if, as may be expected, physical capital continues to be a stronger complement to highly skilled than to low-skilled labour (Krusell et al., 2000; Ludwig et al., 2012).

Fourth, as ageing tends to exert upward pressure on public spending, public finance is likely to be tight for a prolonged period. OECD (2010) estimated that ageing-related pressures on health care, long-term elder care and pension spending will generate fiscal consolidation needs of 3% of GDP between 2010 and 2025, on average. The pressure on

public expenditure has already motivated reforms which have led to lower pensions. Policy makers' leeway for correcting the impact of greater inequality among the elderly or mitigating their deteriorating position might therefore be limited.

Notes

1. These numbers relate to the usual period life expectancy used in most comparative analyses. They therefore reflect the gains in life expectancy that will benefit current cohorts only partially. For a more detailed discussion of the distinction between period and cohort life expectancy, and related data issues, see Chapter 4.

2. The growth rate of GDP per capita is related to the growth rate of labour productivity and the percentage change in dependency ratios (old and young). Moreover, Chapter 2 in the 2015 edition of the OECD's *Pensions at a Glance* shows that the ageing-related financial cost of indexing old-age benefits above prices was closely related to the relative change (as a percentage) in the old-age dependency ratio.

3. The period covered varies from country to country. The data relate to countries in the Luxembourg Income Survey (LIS). Birth cohorts are grouped by the decade of birth, from 1910-19 to 1980-89, while age groups cover five-year periods. The descriptive analysis uses country, age and cohort fixed effects.

4. Because there are not enough data available to measure income in all cohorts and age groups in every country, these results assume that, within each country, there is a common age pattern of real income in all cohorts. Figure 3.5 shows that at least until recently there are no obvious changes in the age pattern across cohorts.

5. When period effects are explicitly controlled for in currently available data – e.g. through the Deaton-Paxson transformation (Deaton and Paxson, 1994) – the age-cohort patterns are basically similar to the unadjusted ones shown. Deaton-Paxson normalisation forces the estimated time effects to be orthogonal to a linear time trend and to add up to zero. Any linear time trend is therefore attributed to cohort and/or age effects, but not to time effects.

6. Measured old-age poverty in Australia and Switzerland is partly attributable to the fact that many pensioners have taken their accumulated pensions as lump sums, which are not counted as current income, rather than converting them into annual income stream.

7. For more on the wide gender gap in pensions, go to the OECD webpage, "New OECD data and analysis revealing the wide gap in pension benefits between men and women" at http://www.oecd.org/gender/data/newoecddataandanalysisrevealingthewidegapinpensionbenefitsbetweenmenandwomen.htm.

8. The percentage increase in the Gini index is estimated by assuming a common age pattern in inequality in all cohorts.

References

Deaton, A. and C. Paxson (1994), "Saving, Growth, and Ageing in Taiwan," in D.A. Wise (ed.), *Studies in the Economics of Aging*, Chapter 9, Chicago University Press for the National Bureau of Economic Research.

Geppert, C. (2018), "Age- and Education-related Composition Effects on Measures of Aggregate Inequality", *OECD Working Papers*, forthcoming.

Harkness, S. (2013), "Women's Employment and Household Income Inequality", in J. Gornick and M. Jantii (eds.), *Income Inequality: Economic Disparities and the Middle Class in Affluent Countries,* Stanford University Press, Stanford, United States, pp. 207-233.

Krusell, P. et al. (2000), "Capital-skill Complementarity and Inequality: A Macroeconomic Analysis", *Econometrica*, Vol. 68, No. 5, pp. 1029-1053.

Ludwig, A. et al. (2012), "Demographic Change, Human Capital and Welfare", *Review of Economic Dynamics*, Vol. 15, No. 1, pp. 94-107.

OECD (2017), *OECD Employment Outlook 2017*, OECD Publishing, Paris, http://dx.doi.org/10.1787/empl_outlook-2017-en.

OECD (2016), *OECD Employment Outlook 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/empl_outlook-2016-en.

OECD (2015a), *In It Together: Why Less Inequality Benefits All,* OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264235120-en.

OECD (2015b), *Pensions at a Glance 2015: OECD and G20 indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_glance-2015-en.

OECD (2012), *Closing the Gender Gap: Act Now*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264179370-en.

OECD (2010), "OECD Economic Outlook No. 88 (Edition 2010/2)", *OECD Economic Outlook: Statistics and Projections* (database), http://dx.doi.org/10.1787/data-00533-en.

Olivetti, C. and B. Petrongolo (2016), "The Evolution of Gender Gaps in Industrialized Countries", *NBER Working Papers*, No. 21887, Cambridge, United States.

United Nations (2015), *World Population Prospects: The 2015 Revision*, Department of Economic and Social Affairs, Population Division, United Nations, New York.

Chapter 4

Life course inequality across generations

This chapter examines how inequality which builds up over an entire lifetime from disparities in the length of life, employment rates, earnings and pensions evolves across birth cohorts. It shows that great strides in longevity have been a common phenomenon across countries and genders, but also that marked gaps in the length of life between educational groups and genders exist in all countries for which data are available. It then turns to education- and gender-related gaps in total-career labour earnings by showing how the diverse trends in employment rates, hourly wages and annual hours worked shape their evolution from one generation to the next. The chapter subsequently investigates how inequality during the working life and gaps in life expectancy translate into differences in pension benefits. A pilot dynamic micro-simulation model finally simulates for a limited number of countries the impact of higher life expectancies on the share of healthy life years and on the length of working lives. It also estimates the effect of raising the retirement age on the career length and pension entitlements across socio-economic groups of the late 1960s cohort.

Section 4 building on the pilot Global Future Elderly Model was developed with Barbara Blaylock (Health Division); Vincenzo Atella, Federico Belotti and Andrea Piano Mortari (University of Rome Tor Vergata); and Dana Goldman and Bryan Tysinger (University of Southern California).

Key findings

- Health has improved over time, but health inequalities across socioeconomic groups are striking, fueling unequal ageing. New mortality data at older ages show higher inequality in longevity than previously reported. At age 65, men with high education can expect to live about 3½ years longer than low-educated men on average; for women, the gap is 2½ years.
- The gender gap in lifetime earnings – factoring in employment rates, hourly wages, hours worked and survival rates – has narrowed by about one-third between the cohorts born in 1940-44 and in 1970-74.
- On average across OECD countries, the education premium in lifetime earnings has declined over generations among women, but has risen among men, chiefly driven by employment trends.
- About two-thirds of lifetime earnings inequality passes on to pension inequality – from less than 25% for many Anglo-Saxon countries to more than 85% in about one-third of OECD countries. Entering the labour market late and being unemployed during long periods substantially reduces pensions in most countries, where younger generations might find it harder to earn sufficient pensions.
- A shorter retirement period implied by a shorter life expectancy reduces total pensions received by low earners by about 13% relative to high earners. Raising the retirement age tends to affect low earners proportionally more, but the impact is small.

Introduction

This chapter examines inequality that builds up over an entire lifetime, arguably the most comprehensive measure of inequality. It captures disparities in the length of life as well as in employment rates, earnings and pensions, and digs deeper into the differences between countries, genders, birth cohorts and educational groups.

The great strides in longevity in all cohorts are one of the main driving forces of population ageing and one of the societies' greatest achievements over the past century. At the same time, wide socio-economic gaps in life expectancy persist. Disparities in education are critical determinants of life expectancy inequality.

Gaps in health and life expectancy between different socio-economic groups are perhaps the most shocking and, for many, the most unacceptable manifestations of disadvantage. Life expectancy gaps translate directly into differences in earnings that accumulate over working lives across socio-economic groups. What is more, they also contribute to differences in well-being, as life itself is a non-income component of well-being: it has a non-monetary value that goes beyond income earned. Moreover, earnings inequality translates into pension inequality to greater or less degrees, depending on the progressivity of pension systems, which includes instruments that cushion the impact of labour market shocks on pension entitlements.

Section 1 explores gains in life expectancy from one birth cohort to another by age and gender in a wide range of OECD countries. Drawing on the OECD's Multi-Dimensional Living Standards indicator, it seeks to estimate the contribution of life expectancy to differences in living standards across countries. Section 2 then focuses on education gaps in longevity based on new OECD data and shows that differences in life expectancy, measured as a share of remaining life expectancy across education levels increase with age. The evidence across countries is mixed, however, as to how inequality in life expectancy has evolved over time. Socio-economic differences in life expectancy are major contributory factors in inequality in standards of living.

Section 2 computes education-related disparities in lifetime earnings by cohort and gender in 13 OECD countries, factoring in differences in hourly wages, hours worked, employment and life expectancy. Generally, inequality in lifetime earnings has substantially fallen across cohorts among women, but risen, albeit to a smaller extent, among men. A change in the employment patterns of both genders has been the key driver of those aggregate trends. Overall, the gender gap in lifetime earnings has narrowed by about one-third between the cohorts born in 1940-44 and in 1970-74. How these lifetime developments affect pensions is the focal point of the fourth and last section.

Section 3 finds that, on average, about two-thirds of lifetime earnings inequality passes on to pension inequality across OECD countries. However, the pass-through from labour earnings to pension inequality differs substantially from one country to another – it is low in countries where the pension system relies primarily on universal basic pensions and high in those where earnings and pensions are closely tied. Section 4 also shows that differences in life expectancy between education levels have a substantial impact on inequality in total pension benefits, which makes the raising of the retirement age a regressive measure, even though only to a quantitatively small extent.

Finally, Section 4 presents results from the pilot Global Future Elderly Model (Global FEM)[1] which projects health and economic circumstances of representative cohorts of individuals born in the late 1940s, the mid-1950s and the late 1960s in Belgium, Italy and the United States. A policy scenario simulates the effect of raising early and normal retirement ages for the late 1960s cohort on the length of working lives and pension entitlements across socio-economic groups.

1. Gains and differences in life expectancy

Gains in life expectancy

Tremendous progress in longevity over the last 100 years has been driven by falls in mortality in all birth cohorts at all ages, particularly very early in life. Historical data (United Nations, 2015) covering 15 OECD countries show that male infant mortality (up to 1 year old) fell from an average of 150 deaths per 1 000 live births between 1900 and 1904 to 3.5 in 2010-14. At the same time, average mortality between the ages of 70 and 71 dropped from 56 to 25 deaths per 1 000 people.

By combining historical mortality data from the same United Nations source with a birth cohort's projected mortality rates to the year 2100, it is possible to work out the cohort's life expectancy at a given age in any OECD country. This *cohort* life expectancy by age is the length of time people from a cohort may, in a given year, be expected to live. It differs from *period* life expectancy which is typically used in most comparative analyses of longevity (and later in this section to describe education-related inequalities in longevity).[2]

All birth cohorts are expected to enjoy longer remaining life spans at each age than earlier cohorts. Projections pertaining to OECD countries show that, on average, the male cohort born between 2010 and 2014 is expected to live 88.0 years and the female 92.3 (Figure 4.1). Those figures translate into gains of 17.3 and 14.3 years, respectively, over the baby-boomer cohort born between 1950 and 1954. At the age of 60, men are expected to live 7.3 and women 6.7 years longer: slightly less than half of the gains in longevity at birth will come after the age of 60.

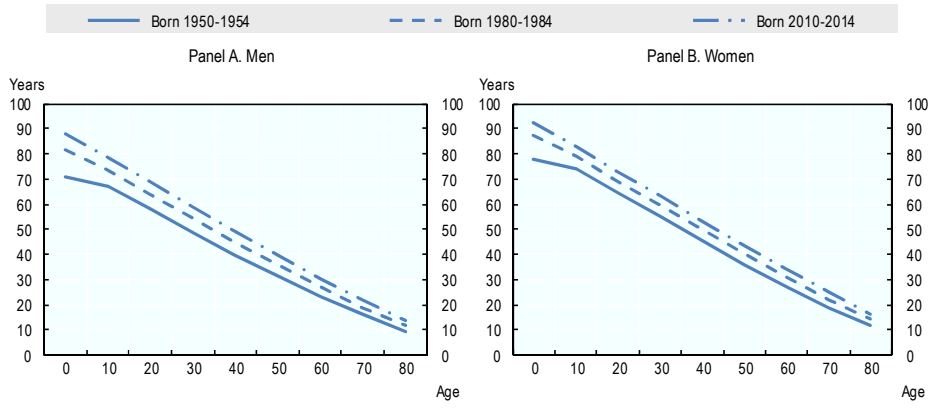
Improvements in cohort longevity at birth are expected to slow down, since physiological limits make it more difficult to reduce mortality at older ages and given that infant as well as prime-age mortality have already fallen to very low levels. Men and

women born in 2010-14 are expected to live, respectively, 6.5 and 5.0 years longer than those born in 1980-84 who are, in turn, projected to live 10.8 and 9.3 years longer than those born in 1950-54 (Figure 4.1).

Previous studies have highlighted the relationship, at the national level, between health and well-being. Period life expectancy at birth increased by an average of 4.2 years in 26 OECD countries between 1995 and 2013, which accounts for about half of the growth in the OECD's well-being measure – the Multi-dimensional Living Standards (MDLS) (Boarini et al., 2016) – over the same period (Box 4.1). This indicates that life expectancy gains have largely contributed to progress in well-being among OECD countries in recent decades.

Figure 4.1. Projected remaining cohort life expectancy by age in 35 OECD countries

Life expectancy in years



Source: OECD calculations based on United Nations (2015), *World Population Prospects: The 2015 Revision*, Department of Economic and Social Affairs, Population Division, United Nations, New York.

StatLink http://dx.doi.org/10.1787/888933567312

Box 4.1. The impact of increases in longevity on well-being

Multi-dimensional living standards (MDLS) is a metric developed as part of the OECD Inclusive Growth Initiative to help assess policies' impact on the income and non-income components of well-being. It draws on a methodology that combines the level and the inequality of disposable household income with the benefits from the non-income components unemployment and longevity by assigning a money value to the latter three components as further described in Annex 4.A1.

Progress in longevity has been a key driver of higher MDLS at all ages

Increases in longevity have contributed half of the increase of MDLS over the period 1995-2013. Each additional year of longevity raises MDLS by an average of 5.9%, so generating an increase of 25% in well-being over the period – an annual growth rate of 1.4%. In comparison, household income growth accounted for 1.5% of the rise in MDLS. The contribution of longevity to the annual improvement in MDLS is expected to decline to 0.5% by 2050, as gains in longevity lessen over time (Murtin, 2015).

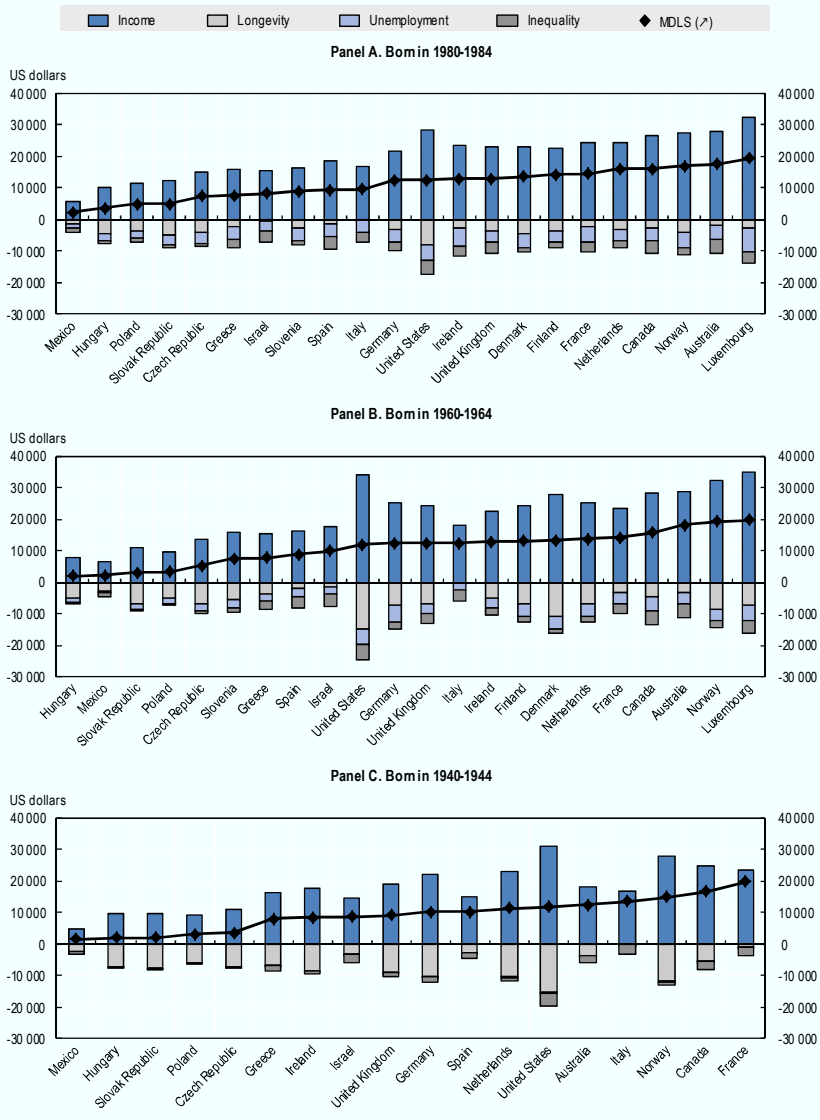
The MDLS of birth cohorts can be compared for different countries. In 2010, the rankings of countries were similar from one cohort to another (in 2010 these cohorts have therefore different ages). There were some exceptions, however (Figure 4.2). France, for instance, came top for MDLS among 66-70 year-olds in 2010 (born 1940-44), but sixth among people aged 26-30 (born 1980-84). In Italy, too, older cohorts were better off than younger ones in 2010, while the opposite was true for Ireland. As for the United States, the wide longevity shortfall in all cohorts – compared to the best-performing country – produced an MDLS ranking that was considerably worse than a ranking on the basis of income alone would have been.

Box 4.1. The impact of increases in longevity on well-being *(cont.)*

While additional work shows that MDLS of all age groups are estimated to have risen across cohorts, older people have enjoyed greater gains. Across the 22 OECD countries under study, the MDLS of 70-year-olds grew at an average annual rate of 4.5% between 1980-84 (the 1910-14 birth cohort) and 2010-14 (the cohort born between 1940 and 1944). By contrast, MDLS rose at an annual rate of 1.4% among people in their 30s – that is between the 1950-54 and 1980-84 birth cohorts – a finding attributable in part to the impact of changes in longevity.

Figure 4.2. Multi-dimensional living standards by cohort in 2010

Average of 22 OECD countries



Source: OECD calculations based on *OECD Income Distribution And Poverty Database, OECD Labour Force Statistics Database* and United Nations (2015), *World Population Prospects: The 2015 Revision*, Department of Economic and Social Affairs, Population Division, United Nations, New York.

StatLink http://dx.doi.org/10.1787/888933567331

Box 4.1. The impact of increases in longevity on well-being *(cont.)*

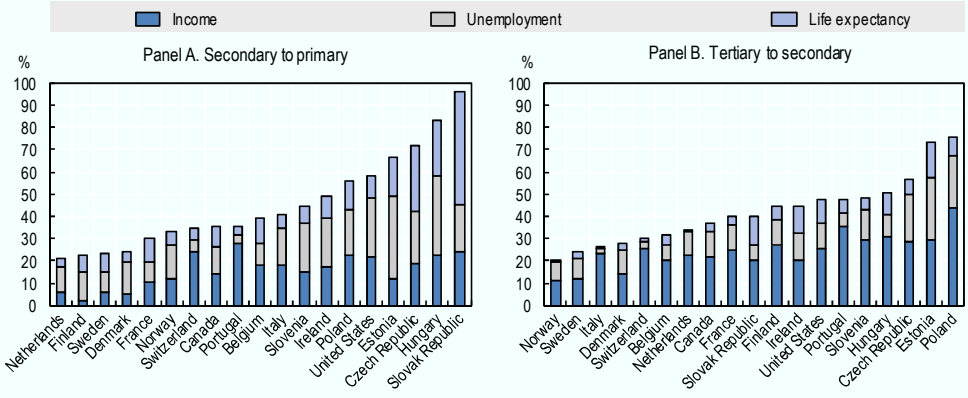
Wide education-related disparities in longevity fuel inequality in well-being

Longevity gaps by level of educational attainment fuel inequality in MDLS. As data on education-related longevity are not available by cohort, disparities in period life expectancy at the ages of 25 and 65 between groups with different educational levels are used here to calculate well-being according to educational attainment. Indeed, new OECD evidence 23 OECD countries around 2011 reveals large education-related differences in life expectancy at those ages (see below), which contribute substantially to inequality in MDLS in OECD countries.

While the income gap between people with medium and low education is, on average, around 15%, Diaz and Murtin (2017a) show that the MDLS gap between the two groups is three times wider (Figure 4.3). The MDLS premium associated with moving from primary to secondary education is attributable chiefly to non-income components, with longevity and unemployment accounting, respectively, for 28% and 38% of the total gap, compared to 34% for income. Here again differences in life expectancy contribute substantially to MDLS gaps, particularly in Central and Eastern European Countries (CEECs). The MLDS gaps between people with medium and high education can be ascribed principally to household income gaps, although inequality of life expectancy is an important factor in CEECs, Ireland and the United States.

Figure 4.3. Differences in components of multi-dimensional living standards between educational groups

Premium between two educational groups in 2010 in percentage



Note: United Kingdom refers to data for England and Wales.

Source: Díaz, M. and F. Murtin (2017), "Socio-economic Inequality in Living Standards", *OECD Statistics Directorate Working Paper*, OECD Publishing, Paris, forthcoming.

StatLink http://dx.doi.org/10.1787/888933567350

Premature mortality impacts strongly on inequality in well-being measured over a lifetime

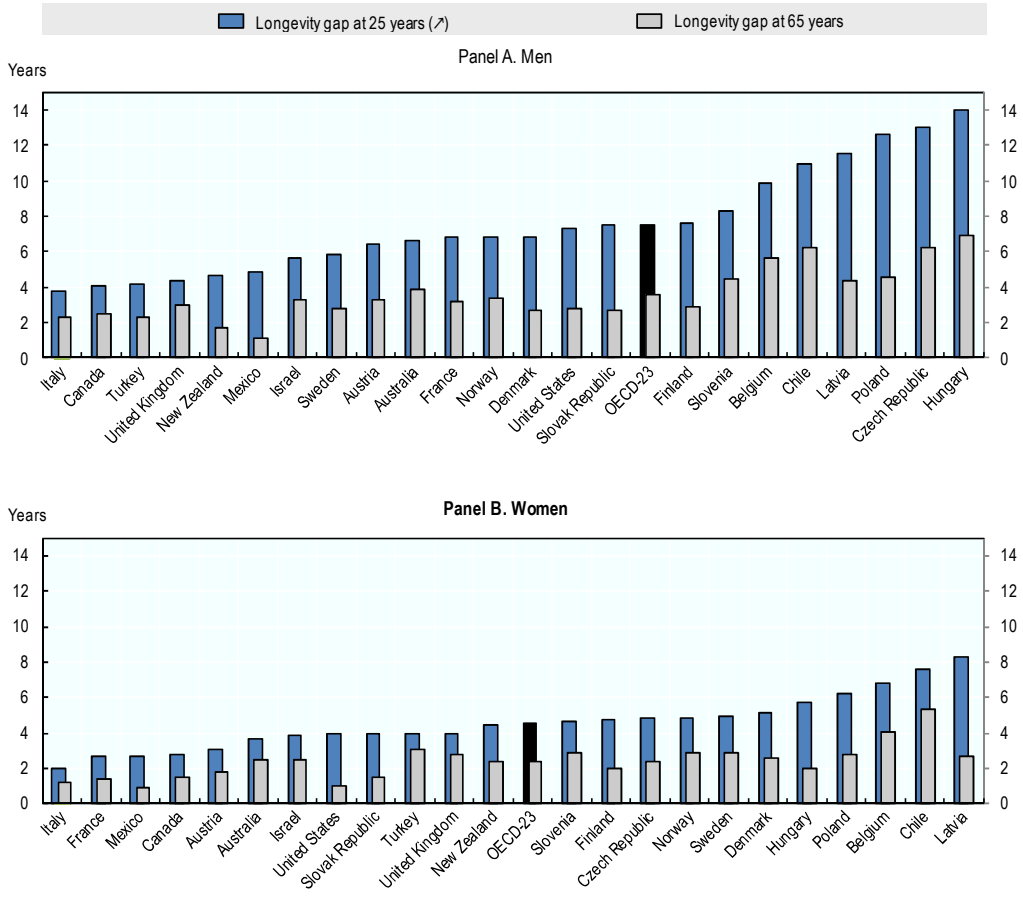
Premature mortality, here defined as the death before the age of 70, is a key driver of total lifespan inequality. However, mortality rate projections by the United Nations (2015) suggest that premature mortality is expected to shrink by 2100. The expected reduction in premature mortality is also likely to lower inequality in well-being over the lifetime. Diaz and Murtin (2017b) compare inequality in lifetime income in France with inequality in lifetime well-being, where the latter captures income (and unemployment) dynamics over a lifetime, which is itself uncertain and differs across individuals. The measure of well-being is equal to lifetime income corrected for the monetised values of both the length of life and unemployment risk. With a Gini coefficient equal to 0.23, inequality in average annual income during a lifetime is substantially lower than income inequality in a given year due to income mobility among the same individuals across ages. On the other hand, if differences in life expectancy are taken into account, the Gini coefficient that measures inequality in lifetime well-being is equal to 0.33, that is an increase of about 10 percentage points. This suggests that about one-third of inequality in well-being is attributable to inequality in lifespan, with the most part coming from premature mortality (Diaz and Murtin, 2017b). Income inequality accounts for the rest.

Wide education-related disparities in longevity

New OECD evidence improving on the quality of commonly used mortality rates at older ages for 23 OECD countries around 2011 reveals large education-related differences in period life expectancy at the ages 25 and 65 (see Murtin et al., 2017, for details).[3] The average gap in life expectancy across countries at age 25 between highly and low-educated men is 7.5 years and 4.6 for women (Figure 4.4). At the age of 65, male gaps are, on average, 3.5 years and female 2.4. Disparities in life expectancy between education levels are especially wide in Chile, Hungary, Latvia and Poland, while comparatively low in Canada and Italy. When expressed as a percentage of the remaining life expectancy of the highly educated, differences between groups are greater at 65 than at 25 years old – 18.5% versus 13.4% among men and 10.9% versus 7.6% for women. In that sense, inequality in longevity by level of education rises with age.

Figure 4.4. Longevity gaps between people of high and low education

At ages 25 and 65 by gender in 23 OECD countries around 2011



Note: United Kingdom refers to data for England and Wales. "High" education corresponds to tertiary education of the 1997 International Standard Classification of Education (ISCED) and "low" education merges the categories "no schooling" and "primary and lower secondary education".

Source: Calculations based on OECD data except for the Slovak Republic for which they are based on Eurostat data. See Murtin, F. et al. (2017), "Inequalities in Longevity by Education in OECD Countries: Insights from New OECD Estimates", *OECD Statistics Directorate Working Papers*, No. 2017/02, OECD Publishing, Paris, http://dx.doi.org/10.1787/6b64d9cf-en for details.

StatLink http://dx.doi.org/10.1787/888933567369

Evidence regarding *changes* in education-related inequality in longevity in the medium and long term is mixed. It depends on countries, and different measures paint different pictures. Recent studies suggest that, in recent decades, gaps in life expectancy by level of educational attainment have grown in the United States (Meara et al., 2008; Olshansky et al., 2012) and Denmark (e.g. Bronnum-Hansen and Baadsgaard, 2012). Composition effects due to the shrinking shares of people with low levels of education do not seem to account fully for the trend (Hendi, 2015). Currie and Schwandt (2016) confirm that mortality gaps increased among older adults, but decreased among young people between 1990 and 2010 in the United States. Since these younger cohorts will form the future adult population, this suggests that inequality in old-age mortality would decline down the road.

James et al. (2017) report that the longevity gaps between people with high and low levels of education have remained constant or risen slightly over the last decade in Europe. In France, differentials in life expectancy have remained stable (Blanpain, 2016), while Norway[4] has experienced a relatively large widening of gaps over the last four decades (Murtin et al., 2017). In *absolute* terms, reductions over the last 20 years in premature mortality have, in many countries, been greater among the lower educated, who have closed the gap on the highly educated by up to 35% (Mackenbach et al., 2015; Mackenbach, 2016). However, Finland, Sweden, Norway, Denmark, Belgium, Switzerland, Hungary, Lithuania and Estonia have seen a widening of *relative* education-related inequalities in premature mortality, measured by the ratio of mortality rates. Inequalities have remained stable in England and Wales, France, Spain and Italy.[5]

Determinants of education-related longevity gaps

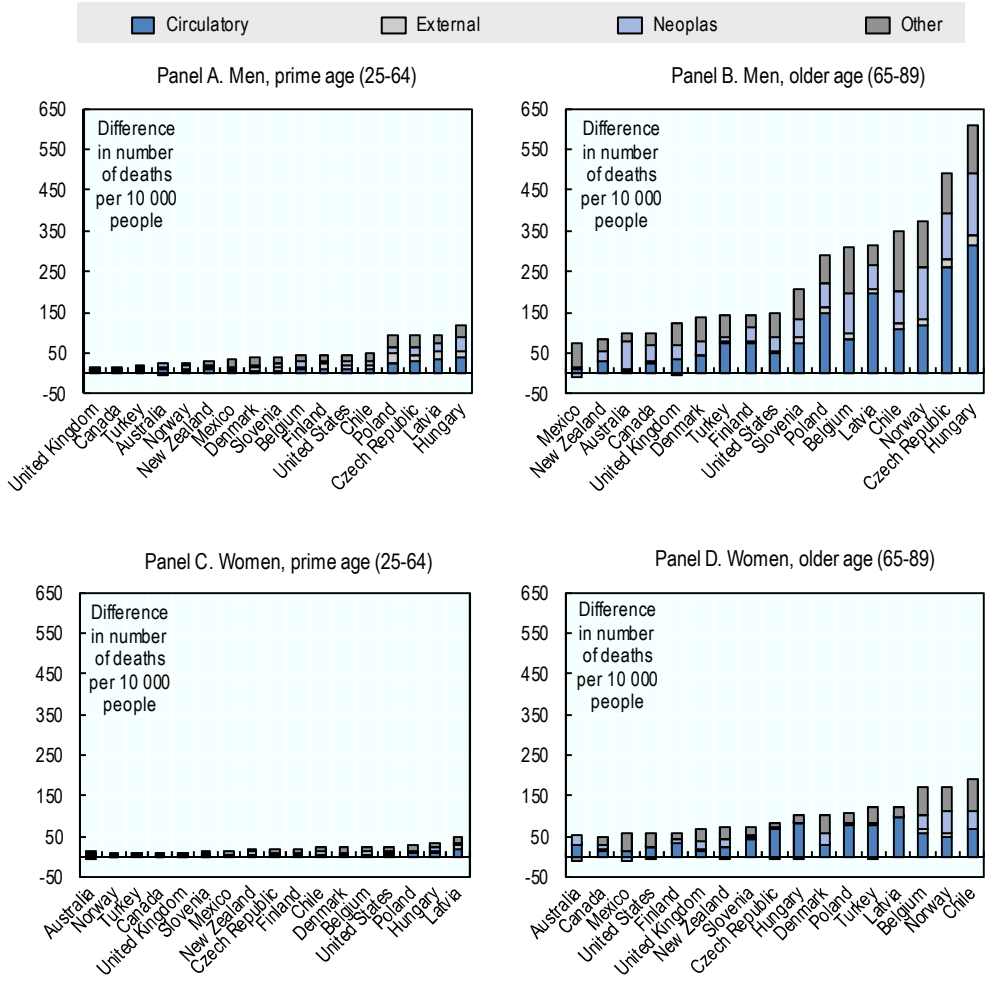
What are the medical causes behind disparities in longevity by level of education? Based on the same sample used in Murtin et al. (2017), the difference in mortality rates between the low- and highly educated is broken down into four broad contributory factors of death; circulatory system diseases, cancers, external causes[6] – such as accidents, complications of medical care or suicide – and other causes (Figure 4.5).

- Among older people, circulatory diseases account for 41% of the difference in male mortality and 49% in female. Next come “other causes”, followed by cancer with a 25% share of the difference in men’s mortality and 14% in women’s.
- Among prime-age adults aged between 25 and 64, “other causes” account for the bulk of the difference in mortality – 32% for men and 39% for women. Next come circulatory system diseases and cancers, with around 25% each of the difference in male and female mortality.

As mortality differentials are about five times greater among older people (aged between 65 and 89) than among prime-age adults, it can be concluded that circulatory problems are the main contributory factor in the mortality gap between the low and highly educated.

Figure 4.5. Breakdown of factors that contribute to differences in mortality rates between the low- and highly educated, 2011

Difference in number of deaths per 10 000 people between the low- and the highly-educated



Note: The figure describes the differences in cause-specific mortality rates between the low- and highly educated groups for each cause of death. The sum of all causes of death is equal to the difference in the total mortality rate between the low- and highly-educated. "High" education corresponds to tertiary education of the 1997 International Standard Classification of Education (ISCED) and "low" education merges the categories "no schooling" and "primary and lower secondary education". United Kingdom refers to data for England and Wales.

Source: Murtin, F. et al. (2017), "Inequalities in Longevity by Education in OECD Countries: Insights from New OECD Estimates", *OECD Statistics Directorate Working Papers*, No. 2017/02, OECD Publishing, Paris, http://dx.doi.org/10.1787/6b64d9cf-en.

StatLink http://dx.doi.org/10.1787/888933567388

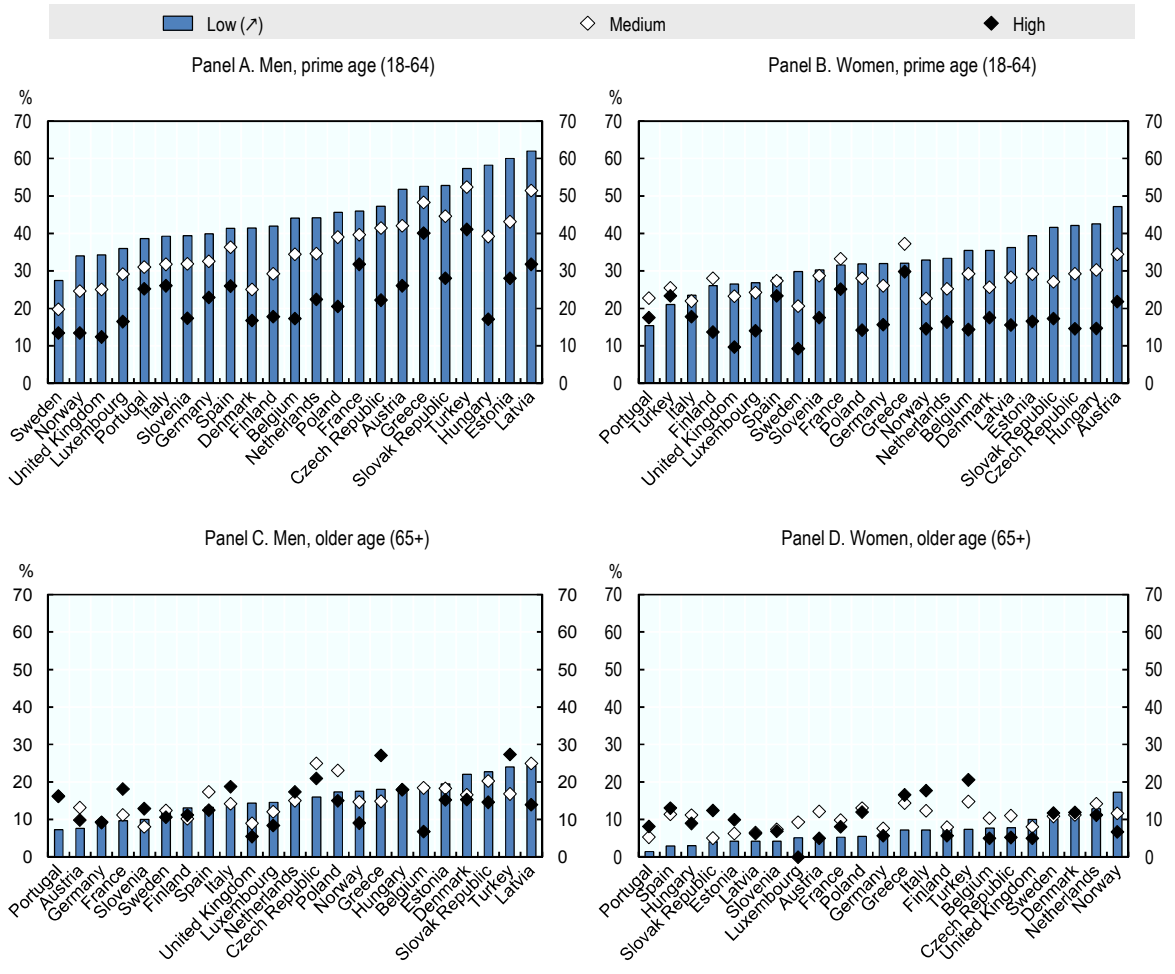
Smoking is a very high risk factor in cardiovascular disease by age, gender and level of education among 23 European OECD countries (Figure 4.6). In almost all of them, prime-age people, both male and female, with lower levels of education are more likely to smoke than those with medium or higher education. An average of 45% of low-educated men and 32% of women between the ages of 18 and 64 smoked daily or occasionally, compared to 23% and 17% of their highly educated peers in 2014. The education gradient in the prevalence of smoking disappears after the age of 65 and even reverses in some

countries. Indeed, highly educated elderly men smoke more than their less well educated peers in 10 and women in 13 of the 23 countries. The inference is that part of the education gradient of mortality is attributable to the difference in smoking prevalence before the age of 65.

Smoking accounts for up to half of the observed inequalities in mortality in some countries. When analysing the contribution of smoking to socio-economic inequalities in mortality in 14 European countries between 1990 and 2004, Mackenbach (2016) finds that smoking-related mortality represents a larger fraction of total mortality among people with a lower level of education than among those with higher education, especially among men. In 2000-04, the contribution of smoking to differences in mortality between the low- and highly-educated groups ranged between 19% and 55% across countries among men and 0% and 56% among women. Since the early 1990s, the contribution of smoking to inequalities in mortality by level of education has fallen in most countries among men, but increased among women.

Figure 4.6. Smoking prevalence in 2014

Percent of population, by age, gender and education in 23 OECD countries



Source: Eurostat (2016): Tobacco Consumption Statistics.

StatLink http://dx.doi.org/10.1787/888933567407

Education is in itself an important determinant of longevity. The long-term causal relationship between education and longevity has been ascertained by Lleras-Muney (2005), who looks at exogenous changes in school laws, and by Murtin (2013), who considers education over very long time spans that encompassed generations (that is education of grandparents and great-grandparents). Both authors find that education is a powerful factor in longevity. Similarly, James et al. (2017), who examine numerous proximate determinants of longevity (including risk factors such as smoking, alcohol and obesity) in a number of OECD countries between 1990 and 2013, conclude that education exerts the greatest effect, followed by air pollution and health spending.[7]

A high level of education has a direct impact upon longevity, in addition to any indirect effect channelled through the reduced consumption of tobacco, alcohol or calories. Moreover, the more educated tend to be more forward-looking (Farrell and Fuchs, 1982), better informed, and more adept at navigating their way through the health system (Deaton, 2003). Although socio-economic factors like income and occupation also contribute to longevity inequality, their two-way relationship with health status makes causation difficult to establish (Chapter 2).

Premature mortality impacts strongly on inequality in lifespan

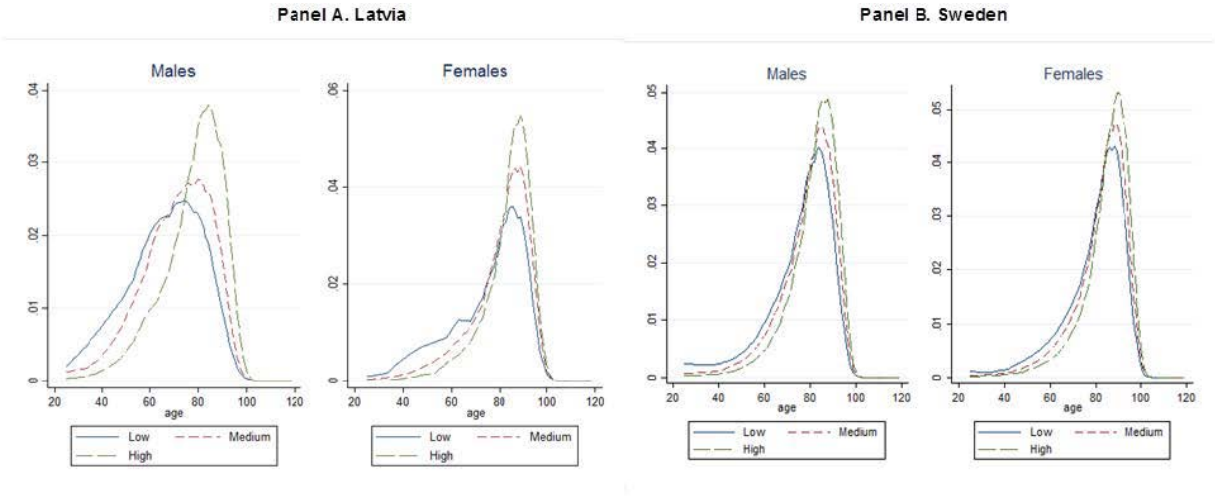
This section now turns to the analysis of the dispersion in ages at death across cohorts and how it is expected to evolve by 2100. The dispersion in ages at death, which constitutes total inequality in lifespan, can be explained mainly by mortality at a relatively early age – and especially by the probability of dying before the age of 70 (defined here as premature mortality).

Lifespan inequality between education groups (or between income and occupational groups) has received much attention in economic studies as socio-economic-related inequality is central to social policies. However, differences in levels of educational attainment account for an average of less than 10% of the overall dispersion in age at death across the studied OECD countries. Figure 4.7 shows the distributions of ages at death by gender and by educational attainment in Latvia (which has a high level of mortality inequality) and Sweden (where mortality inequality is low). Lifespan inequality across education groups is clearly reflected by the shape of lifespan distributions: they are significantly more dispersed among low-educated than highly educated men in both countries, and especially so in Latvia.

However, Figure 4.7 also reveals that the dispersion of lifespan within educational attainment and gender groups makes up the bulk of total lifespan inequality. Breaking down lifespan inequality into inequality in lifespan within and between educational and gender groups[8] shows that the between-group component represents 7.6% of total inequality on average across the 23 studied countries, ranging from 3% in Canada and the United Kingdom to 17% in Hungary (Murtin et al., 2017).

Mortality rate projections by the United Nations (2015) suggest that premature mortality is expected to shrink by 2100, probably leading to a reduction of total inequality in ages at death (irrespective of educational level). Premature mortality (as measured by 100% minus the probability of survival to the age of 70) is expected to affect about 33% of men born in 1950-54 but only 10% of the 2010-14 cohort (Figure 4.8, Panel A). A similar pattern may be observed among women: their premature mortality is expected to fall from 21% to 6% (Panel B).

Figure 4.7. Distribution of ages at death by gender and education in Latvia and Sweden, 2011

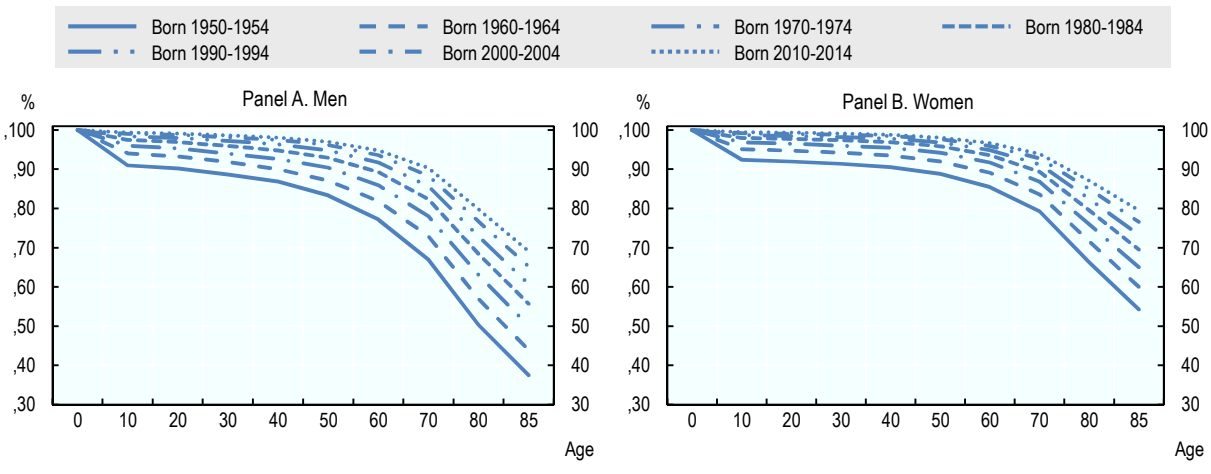


Source: Murtin, F. et al. (2017), "Inequalities in Longevity by Education in OECD Countries: Insights from New OECD Estimates", *OECD Statistics Directorate Working Papers*, No. 2017/02, OECD Publishing, Paris, http://dx.doi.org/10.1787/6b64d9cf-en.

However, limits on the availability of data prevent any firm conclusion as to how lifespan inequality is likely to evolve.[9] Nevertheless, very long lives look set to become the norm. Of men born in 1950-54, 37% are expected to survive to the age of 85, compared to 69% of the 2010-14 birth cohort, while the likelihood of women living to 85 is projected to increase from 54% to 80% from one cohort to the other (Figure 4.8).

Figure 4.8. Probability of survival to a given age, up to 85 years

OECD average by age, gender and birth cohort



Source: OECD calculations based on United Nations (2015), *World Population Prospects: The 2015 Revision*, Department of Economic and Social Affairs, Population Division, United Nations, New York.

StatLink http://dx.doi.org/10.1787/888933567426

2. Lifetime earnings by cohort, gender and education

How does inequality in earnings between workers with different levels of education develop from cohort to cohort? To answer that question, this section seeks to estimate lifetime earnings by level of educational attainment and gender of cohorts born between the early 1940s and the early 1970s in 13 OECD countries.[10] To that end, it draws on the life-cycle profiles of hourly wages, hours worked, employment rates and survival probabilities. A key aspect of the analysis is that it seeks to capture the cohorts' entire working lives, as explained below in greater detail.

Education premium in hourly wages over time

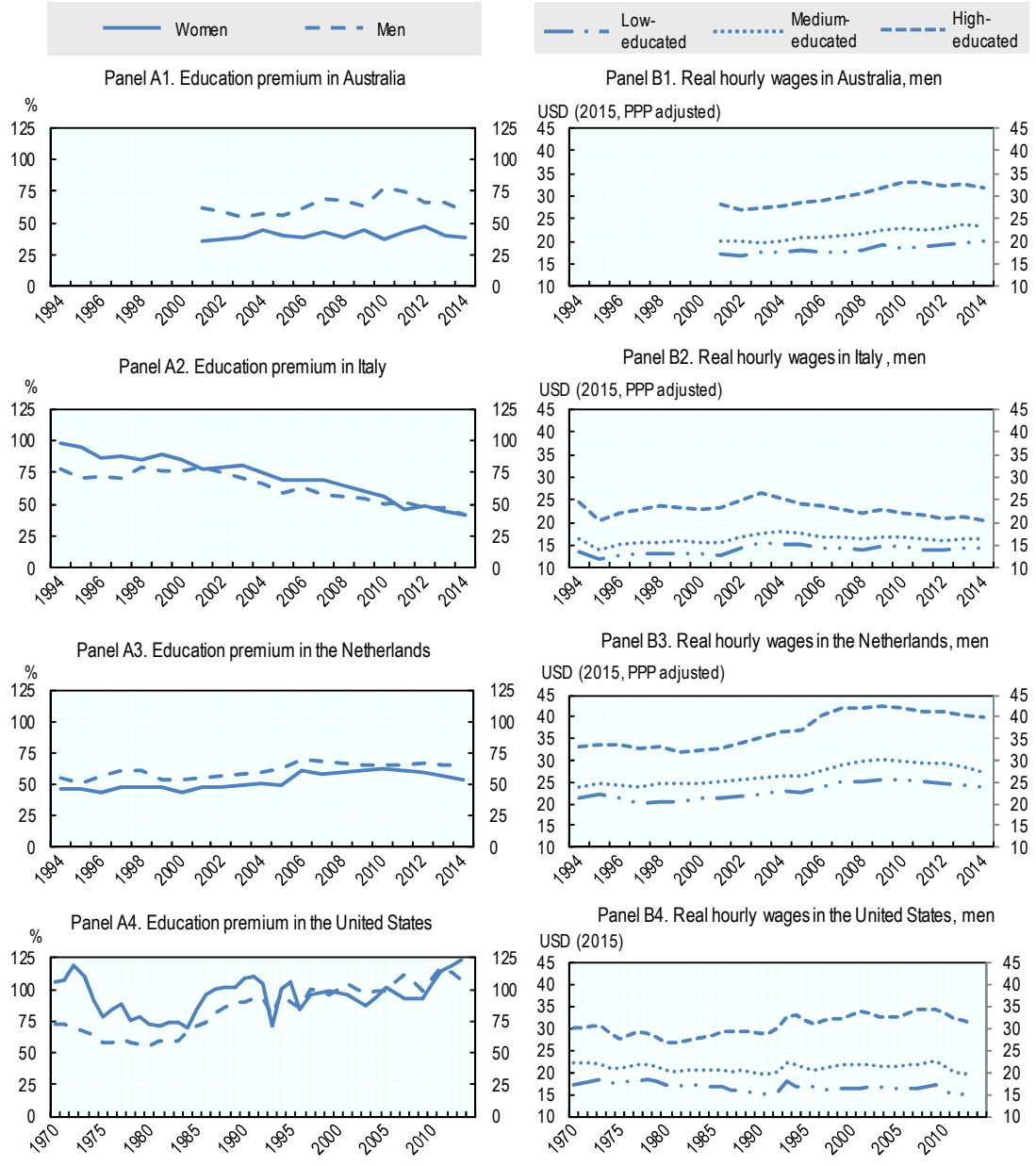
Studies into the education premium – the difference in the hourly wages of the highly and low-educated relative to the wages of the low-educated – usually monitor men over time and tend to find an upward trend in inequality (e.g. Autor, 2014, for the United States; and Dustmann et al., 2009, for West Germany). Accordingly, Figure 4.9 shows the evolution of the education premium by gender (left-hand panels) and the average real hourly wages of men by educational level (right-hand panels) over recent decades in Australia and the United States and – to exemplify patterns in Europe – in Italy and the Netherlands.

The evolution of the education premium over time – of females and males alike – differs widely across countries. In Australia (Panel A.1) it has been broadly stable at about 60% for men and 40% for women since 2001. In Italy (Panel A.2) – where trends have been comparable with those in France, Ireland and Spain – it has declined substantially from around 100% among women and 80% among men in 1994 to a similar level of about 40% for both sexes in 2014. In the Netherlands (Panel A3) – where trends have been comparable with those in Austria, Finland and Switzerland although at different levels – premiums rose between 1994 and 2014 from 55 to 66% among men and from 46 to 53% among women.[11] In the United States (Panel A4) – where longer time series are available – the premium declined throughout the 1970s (from about 105% for women and 75% for men to about 70% and 55%, respectively), mainly due to a strong expansion in the supply of highly educated workers when baby boomers started to enter the labour market (see e.g. Katz and Murphy, 1992). In more recent decades, it climbed back sharply to reach about 120% among women and 110% among men in 2013, due to an increased demand for highly educated workers (Krusell et al., 2000, among others).

The observed trends in the education premium stem from differences in real wage growth between educational groups (right-hand panels of Figure 4.9). In Australia these differences were rather small: real hourly wages of both highly and low-educated men climbed by an average of about 1% a year between 2001 and 2014 (Panel B1). While more stable over a longer horizon, real hourly wages in Italy edged up between 1994 and 2014 among low-educated men, but slipped down by about 1% per annum among their highly educated peers (Panel B2). By contrast, they increased across all levels of education in the Netherlands (Panel B3) over the same period, though faster among the highly educated (0.9% per annum) than those with low educational attainment (0.6%). In the United States (Panel B4), real hourly wages showed a modest average increase among highly educated men between 1970 and 2013 while declining by 0.3% among their peers with low levels of schooling.[12]

Figure 4.9. Education premium in real hourly wages by gender and male real hourly wages by level of education

Development in four selected OECD countries over time



Note: Low-, medium- and high-educated correspond, respectively, to levels 0-2, 3-4, and 5-8 of the 2011 International Standard Classification of Education (ISCED). The education premium is defined as the ratio of real hourly wages of high-educated to low-educated minus 1.

Source: Calculations for Australia use data from the 2001-2014 Household Income and Labour Dynamics in Australia (HILDA) Survey, for Italy and the Netherlands from the 1994-2001 European Community Household Panel (ECHP) and the 2004-2014 European Union Statistics on Income and Living Conditions (EU-SILC) survey, and for the United States from the 1970-2013 Panel Study of Income Dynamics (PSID). The HILDA and PSID are taken from the Cross-National Equivalent File (CNEF). Interpolation is used to retrieve missing years for the period of analysis.

StatLink http://dx.doi.org/10.1787/888933567445

Education premium in hourly wages from a cohort perspective

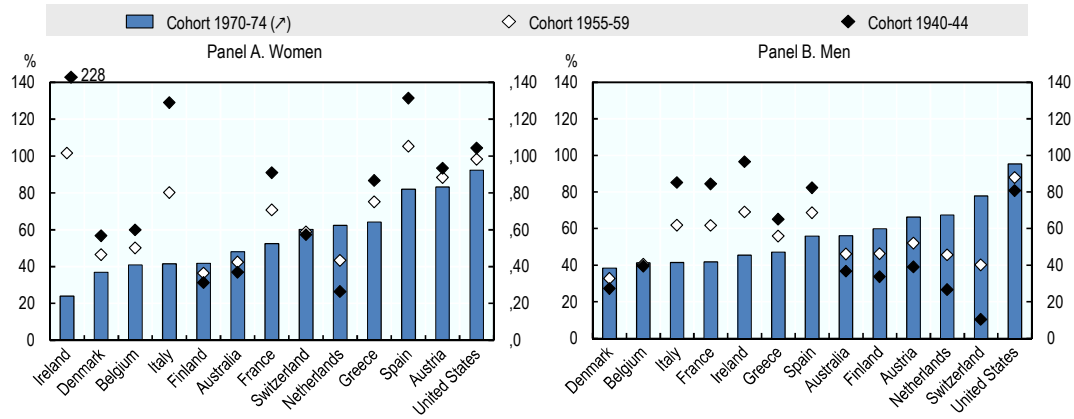
Switching from a time to a birth-cohort perspective involves measuring inequality over the whole working career. To that end, life-cycle profiles of younger cohorts' hourly wages are extrapolated forward as they have not yet completed their working lives. Conversely, the same variables are extrapolated backward when it comes to older cohorts as data on their early working lives are not available (the way data are extrapolated is based on the method described in the first part of Box 4.2.).

Among women, the career average of the education premium in hourly wages has been falling between the 1940-44 and 1970-74 birth cohorts in three-quarters of the 13 OECD countries (Figure 4.10, Panel A) as low-educated women partly catch up with their highly educated peers. Sharp falls have been observed in France and Spain (by 40 and 50 percentage points, respectively) and even steeper ones in Italy and Ireland (90 and 200 percentage points). The decline was most pronounced in countries where the premium was very high in the older cohort born in 1940-44 – especially in Ireland, Italy and Spain. The development of female education in these countries is likely to have played a crucial role. Conversely, the education premium among women increased from the 1940-44 to the 1970-74 birth cohorts in Australia, Finland and the Netherlands where wage growth of the highly educated exceeded the one of the low-educated. In Switzerland, the education premium remained generally unchanged.

As for men (Panel B), the average education premium over the working career has risen from one cohort to the other in a small majority of countries (including Australia, Austria, the Nordic European countries, Switzerland and the United States). Overall, labour demand effects – such as those generated by globalisation and skill-biased technological change which have boosted (reduced) in relative terms the demand for highly (low) skilled labour in OECD countries over time – seem to have dominated the dampening effect exerted by the larger (smaller) supply of highly (low) educated workers. Moreover, with the expansion of education, the share of the highly educated in the workforce has increased while the opposite is true for the share of the low-educated. This structural shift in the composition of the workforce complicates the comparison of the education premium over time. However, these mechanical education-related composition effects, whose total impact is a priori ambiguous, do not seem to have substantially affected the size of the education premium (Box 4.3).

By contrast, the male premium has dropped from initially high levels in the four countries that have recorded the biggest falls among women (Ireland, Italy, France and Spain) and, though to a lesser extent, in Greece, while it has remained generally unchanged in Belgium. A particularly strong expansion of tertiary education in recent decades and the phenomenon of over-education on the job, in particular for the highly educated in Spain (Dolado et al., 2000), as well as the dynamics of the minimum wage are likely explanatory factors of the decline in the education premium in southern Europe (e.g. Pijoan-Mas and Sánchez-Marcos, 2010).

Figure 4.10. Career average of the education premium in real hourly wages for three selected cohorts



Note: Low-, medium- and high-educated correspond, respectively, to levels 0-2, 3-4, and 5-8 of the 2011 International Standard Classification of Education (ISCED). The education premium is defined as the ratio of real hourly wages of high-educated to low-educated minus 1.

Source: OECD calculations based on the data sources and method described in the first part of Box 4.2.

StatLink http://dx.doi.org/10.1787/888933567464

Box 4.2. Estimating real expected lifetime earnings

Computing the expected lifetime earnings of generations from the 1940s to the early 1970s requires the following data: cohort-specific hourly wages, hours worked, employment rates and survival probability profiles over the whole working career. Analysis therefore extrapolates the profiles of younger generations who have not yet reached retirement and those of older generations for whom data are not available in the early parts of their working lives. For instance, the cohort born in 1960-1964 was last observed at the ages of 50 to 54 in 2014. Their life-cycle profiles need therefore to be extrapolated up to the time at which they retire.

The estimation of life cycle profiles uses a specification which disentangles the effects of age, cohort and time by means of a pseudo-panel approach (Deaton, 1985) that draws on data from the 1994-2001 European Community Household Panel (ECHP), the 2004-2014 European Union Statistics on Income and Living Conditions (EU-SILC), the 2001-2014 Household Income and Labour Dynamics in Australia (HILDA) Survey, the 1970-2013 Panel Study of Income Dynamics (PSID) and the 1999-2014 Swiss Household Panel study. Separate estimates of hourly wages, hours worked and employment rates by country and gender are derived from Equation 4.1:

$$y = \alpha_0 + \alpha_1 Age + \alpha_2 Age^2 + \alpha_3 Cohort + \alpha_4 D^{med} + \alpha_5 D^{high} + \alpha_6 D^{med} \times Age + \alpha_7 D^{med} \times Age^2 + \alpha_8 D^{high} \times Age + \alpha_9 D^{high} \times Age^2 + \alpha_{10} D^{med} \times Cohort + \alpha_{11} D^{high} \times Cohort + \alpha_{12} UGAP + \varepsilon \quad (4.1)$$

where

- y is the logarithm of the hourly wage rate, the logarithm of the number of annual hours worked or the employment rate,
- *Age* and *cohort* (birth year) are continuous variables,
- D^{med} and D^{high} are dummy variables indicating medium and high education (levels 3-4 and 5-8 of the 2011 International Standard Classification of Education respectively),
- $UGAP$ stands for the unemployment-rate gap defined as the deviation of the unemployment rate from the Non-Accelerating Inflation Rate of Unemployment (NAIRU) and is meant to capture cyclical time effects*,
- ε is an error term.

Box 4.2. Estimating real expected lifetime earnings *(cont.)*

Equation 4.1 allows different life-cycle profiles in hourly wages, annual hours worked and employment across education levels. Cohort effects, too, can also differ by level of education. The hourly wage rate and the number of annual hours worked are estimated by ordinary least squares while the employment rate is estimated using a fractional Probit model.

For each group – by country, gender, cohort and level of education – estimated parameters of the α-terms in equation 4.1 are used to predict hourly wages, annual hours worked and employment rates from the age of 20 to 64. They are then factored into equation 4.2 to compute each group's lifetime earnings.

The real expected lifetime earnings of a country's sub-groups – defined by level of education, gender and cohort – are computed at 20 years old (when labour market entry is assumed). They are defined as the sum of expected discounted annual average earnings computed from hourly wages plus the number of annual hours worked plus the probability of employment:

$$E_c \equiv \sum_{a=20}^{T} s_{c,a} \cdot \frac{w_{c,a} \cdot h_{c,a} \cdot e_{c,a}}{(1+r)^{a-20}} \qquad (4.2)$$

where

- c is the cohort,
- a is age,
- E_c denotes the real expected lifetime earnings of cohorts,
- $s_{c,a}$ denotes the survival probabilities,
- $w_{c,a}$ indicates real hourly wages in PPP-adjusted 2015 United States dollars,
- $h_{c,a}$ indicates hours worked,
- $e_{c,a}$ denotes the probability of employment,
- r is the real discount rate of payments accruing after the age of 20 and is assumed to be 2% per year.

Career lengths in all population sub-groups are from 20 to T=64 years. This avoids adding further sources of inequality to the analysis when comparing generations.

*: For the United States, the unemployment rate level instead of the unemployment-rate gap is used as the estimated NAIRU is only available from 1985. Since 1985 at least, the NAIRU has had little variation in the United States, especially compared with other OECD countries.

Education premium in lifetime earnings

Lifetime earnings paint a more comprehensive picture of inequality between groups of different levels of educational attainment. They capture differences in employment rates, hours worked, hourly wages and survival probabilities (Box 4.2). Figure 4.11 shows the average real expected lifetime earnings of five-year birth cohorts from 1940-44 to 1970-74 by gender in the 13 OECD countries.

Differences in lifetime earnings by level of education are greater than in average hourly wages given the education gradient in the other components of lifetime earnings – employment, hours worked and survival probabilities – particularly among women. For example, the ratio of lifetime earnings of highly educated women born in 1970-74 to those of their low-educated peers is estimated at 3.10 (see the right side of Figure 4.11, Panel A:

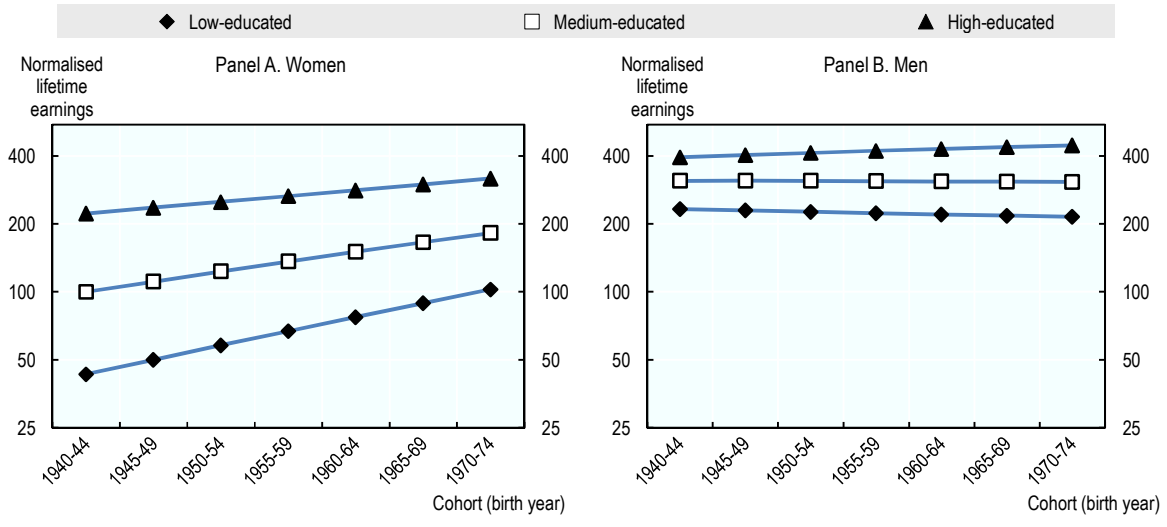
3.10 = 318.0/102.6). This ratio would be reduced to 1.95 if both groups had the same employment rates. Moreover, despite a sizeable gap in life expectancy at birth (Section 2), differences in survival probabilities at working ages between education groups are rather small and contribute little to the education premium in lifetime earnings.[13]

On average among the 13 OECD countries, women's lifetime earnings have increased from one generation to the next at all levels of education. For men, they have risen slightly among the highly educated and fallen a little among the low-educated (Figure 4.11). Two main inferences can be drawn:

- First, the lifetime earnings of younger generations of women have caught up with those of men educated to the same level. The gender gap[14] in lifetime earnings has shrunk by about one-third – from 45% among highly educated cohorts born in 1940-44 to about 30% among those born in 1970-74, and from 80% to about 50% among the low-educated in the same birth cohorts.[15] The pattern is driven chiefly by employment trends. While women's lifetime employment rates have risen robustly from older to younger cohorts, men's have tended to decline. Nevertheless, remaining gaps are wide.
- Second, the education premium of lifetime earnings has declined over generations among women, but has risen among men. The prime reason is that the education gap in employment rates has moved in opposite directions for women and men, as further discussed below.

Figure 4.11. Real expected lifetime earnings by cohort, education group and gender

Normalised to 100 for medium-educated women born in 1940-44, average of 13 OECD countries



Note: Low-, medium- and high-educated correspond, respectively, to levels 0-2, 3-4, and 5-8 of the 2011 International Standard Classification of Education (ISCED). Estimated real lifetime earnings are the sum of expected discounted annual earnings derived from hourly wages, the number of annual hours worked, the probability of employment and the probability of survival (Box 4.2). In every country, the reference group (=100) is medium-educated women born in 1940-44.

Source: OECD calculations based on the data and method described in Box 4.2.

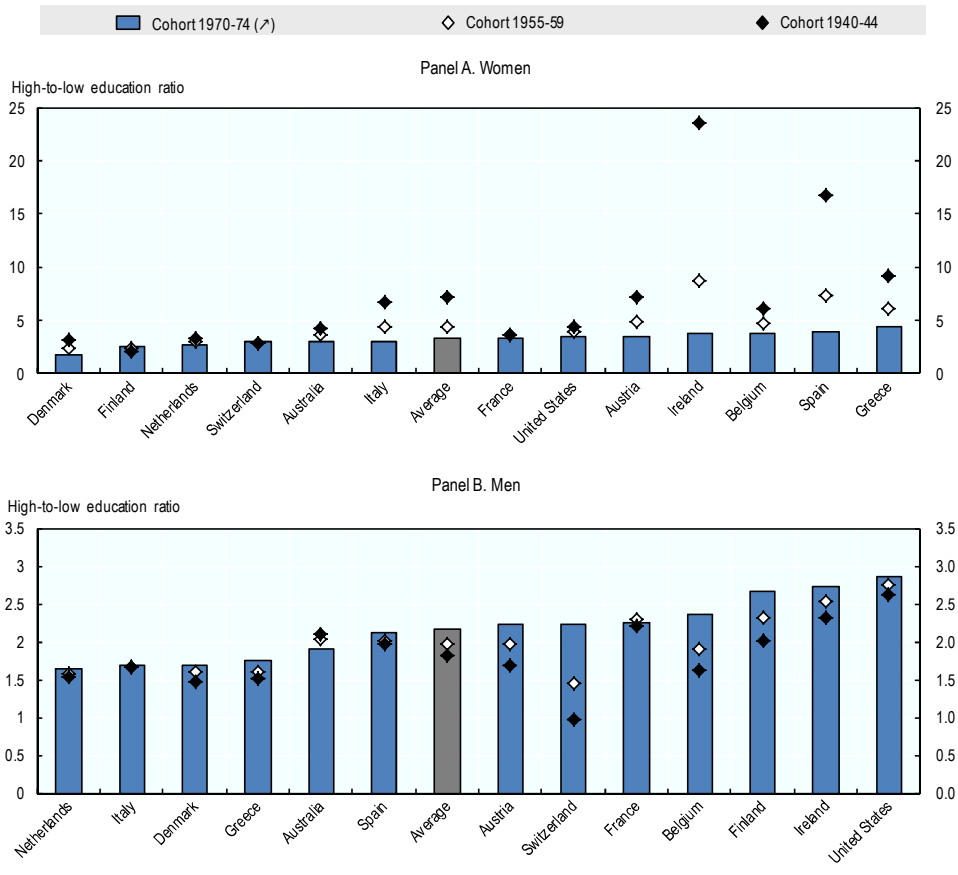
StatLink http://dx.doi.org/10.1787/888933567483

The ratio of the lifetime earnings of the highly educated to those of the low-educated varies widely between cohorts, genders and countries (Figure 4.12). In the 1970-74 female birth cohort, it ranges from 1.7 in Denmark to 4.3 in Greece (Panel A), and from 1.6 in the Netherlands to 2.9 in the United States among men (Panel B).

As for patterns in the high-to-low education ratio, it has declined among women from one generation to the next, except in Finland, France and Switzerland, and has increased among men, except in France and Italy, where it has remained broadly constant, and in Australia where it has decreased slightly. Among women, the cross-generational fall has been very steep in Greece, Spain and Ireland. In Ireland, for example, the ratio of lifetime earnings has fallen from 24 for the oldest cohort to about 4 among the youngest. Declines in education-related employment gaps in the country have added up to the sharp declines in the education premium in hourly wages shown in Figure 4.10.

Figure 4.12. The high-to-low education ratio of real expected lifetime earnings

By cohort and gender in 13 OECD countries



Note: Low-, medium- and high-educated correspond, respectively, to levels 0-2, 3-4, and 5-8 of the 2011 International Standard Classification of Education (ISCED). Estimated real lifetime earnings are the sum of expected discounted annual earnings derived from hourly wages, the number of annual hours worked and the probability of employment (Box 4.2). The high-to-low education ratio of real expected lifetime earnings is defined as the ratio of the lifetime earnings of the highly educated to those of the low-educated.

Source: OECD calculations based on the data and method described in Box 4.2.

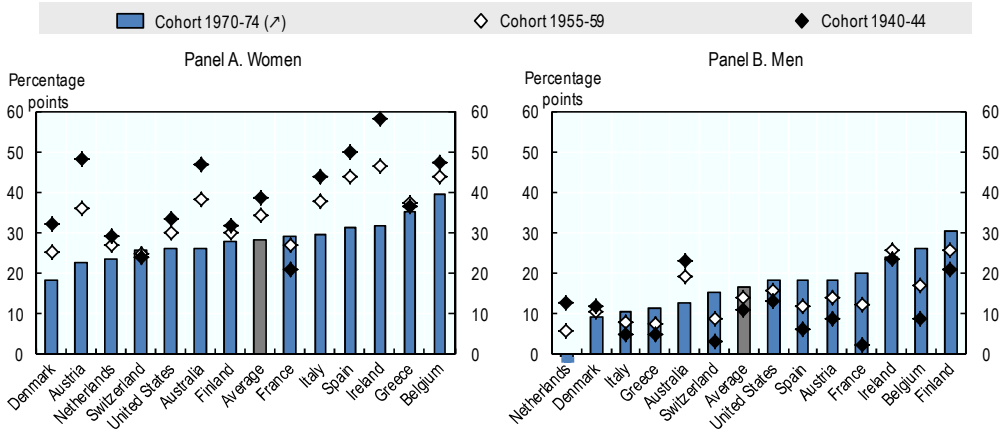
StatLink http://dx.doi.org/10.1787/888933567502

The decline in the female high-to-low education ratio of lifetime earnings across cohorts in most of the countries under study can be attributed to the relatively strong growth in the employment rates of low-educated women compared to their highly educated peers. In contrast, a relatively steeper drop in the employment rates of low-educated men has contributed to an increase in the male ratio (Figure 4.13).

With their average fall among women and their average rise among men, the education-related lifetime employment gaps have been converging across genders (Figure 4.13). These gaps, however, remain substantially wider among women (Panel A) than men (Panel B) for the younger cohorts. In the 1970-74 birth cohort, they range from about 20 percentage points in Denmark to 40 in Belgium for women, and from 0 in the Netherlands to 30 in Finland for men. As for hourly wages, the education-related employment gap has tended to narrow across cohorts (with the exception of France and Switzerland) among women and to widen among men (except in Australia, Denmark, Ireland and the Netherlands). The decline in women's gap has again been considerable in Ireland (26 percentage points) and Spain (18 percentage points). It has also been steep in Austria, at 25 percentage points, and in Australia (21 percentage points).

Figure 4.13. Difference in employment rates between the highly educated and the low-educated

Career average of the difference in percentage points, for three selected cohorts in 13 OECD countries by gender



Note: "Low-", "medium-" and "high-educated" correspond, respectively, to levels 0-2, 3-4, and 5-8 of the 2011 International Standard Classification of Education (ISCED). The education premium is defined as the percentage-point difference in average employment rates between the highly educated and the low-educated.

Source: OECD calculations based on the data sources and method described in the first part of Box 4.2.

StatLink http://dx.doi.org/10.1787/888933567521

Across countries and cohorts, differences between highly and low-educated workers in hours worked have contributed comparatively little to the lifetime earnings gap, particularly among men. In the 13 OECD countries under study, highly educated male and female workers generally work slightly more hours when employed than their low-educated peers. That tendency has marginally expanded from one cohort to the next among both men and women, contributing somewhat to the rise in the high-to-low education ratio of lifetime earnings among men and attenuating somewhat the decline in this ratio among women.[16] However, educational differences in hours worked on the job remain at a too low level to explain a substantial share of the education premium in lifetime earnings.

Income inequality is deeply engrained at age 50. At that age, a large fraction of lifetime income inequality has settled in terms of both accumulated earnings and pension entitlements. On average across the 13 OECD countries under study, about 60% of the difference in lifetime earnings and pension claims between the highly and low-educated workers is estimated to have accrued by age 50.[17] Just after labour market entry the accumulation of inequalities is rather slow but it accelerates sharply from about age 35. Moreover, much more than 60% of inequality in lifetime earnings is already underway at age 50. The high persistence of wage and employment trajectories implies that experience accumulated by age 50 also generate inequalities of late career outcomes. Finally, because the education system does not typically correct a substantial part of the inequality that is passed through across generations (Chapter 2), income levels during working life are also positively correlated to those during childhood – before labour market entry.[18] The next section examines in greater detail how inequality in lifetime earnings affects that in pension benefits.

Box 4.3. Expansion of higher education and the impact on the education wage premium

In all OECD countries, the average number of years spent in education has risen from one generation to the next, particularly among women. Between 2000 and 2015, the OECD-wide average share of women aged 25 to 64 with high education (levels 5-8 of the 2011 International Standard Classification for Education, ISCED) rose from 21% to 38%. Among men, the increase was from 22% to 32%. Over the same time span, the OECD average share of 25-to-64 year-olds who had not completed upper-secondary education (ISCED levels 0-2) declined from 37% to 22% among women and from 33% to 22% for men.

The expansion of higher education changes the composition of ISCED-defined education groups. While the highly educated (ISCED levels 5-8) become a bigger and thus less selective group, the opposite holds for the low-educated (ISCED levels 0-2). As the best performers move up the education ladder first - all other things equal – the average education performance of the 22% men with low education in 2015 is worse than that of the 37% men with low education in 2000. As a result, it is expected that – again all other things equal – the average wage of the low-educated men in 2015 is lower than that in 2000. This composition effect tends to raise the education-related wage premium. The same line of reasoning implies that the increasing share of people with high levels of education adds the least performers to the group of the highly educated which tends to reduce their average wage and, in turn, the wage premium. The total effect of these two composition effects is a priori undetermined.

In order to illustrate the size of the aggregate compositional effect, Figure 4.14 adds to the baseline of Figure 4.10 the education premium in hourly wages – averaged over the working career – of the 1970-74 cohort comparing wages at the same two percentiles of the education distribution as the average low- and highly educated persons of the 1940-44 birth cohort. This perspective excludes a potential compositional effect between the 1940-44 and the 1970-74 cohorts by definition (for details see Geppert, 2018).

The education premium of the 1970-74 cohort does not substantially differ between the percentile and the ISCED definitions in most cases (Figure 4.14). Hence, comparing people educated to high and low levels according to the ISCED definition rather than according to (1940-44) percentiles does not have a major effect on how the higher-education wage premium evolves between the 1940-44 and 1970-74 cohorts in most countries. This indicates that the two opposing components of the compositional effect described above, if present at all, are small in size or offset each other. However, there are a few exceptions.

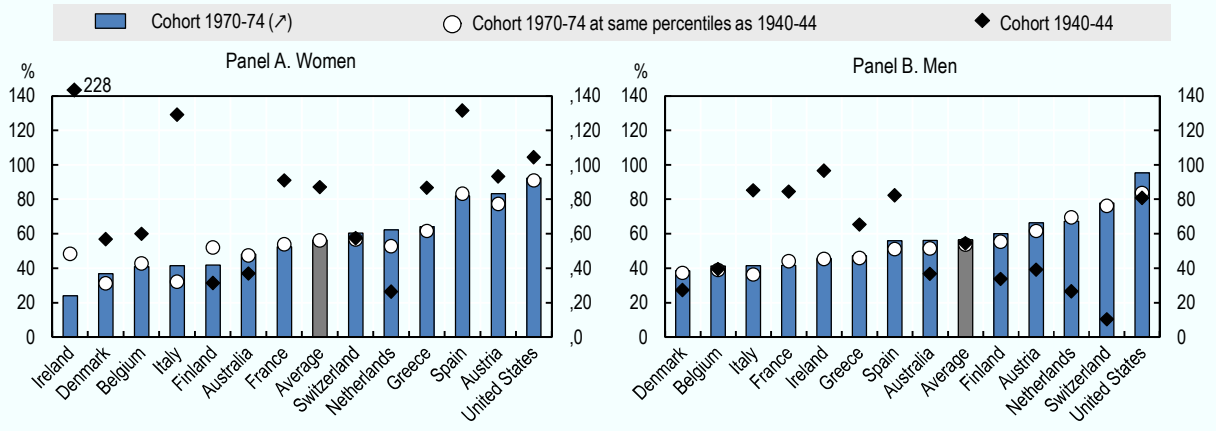
In Denmark, for instance, the ISCED-based female wage premium has fallen from 57% for the 1940-44 cohort to 37% for the 1970-74 cohort. However, if the premium for the 1970-74 cohort is estimated at the same percentiles of the education distribution as the ISCED-defined low- and high-educated women of the 1940-44 cohort, it is then equal to 31% (instead of 37%). The inference is that the positive effect on the ISCED-based premium of the drop in the share of low-educated women between the two cohorts is stronger than the negative effect generated by the increase in the share of the highly educated.

Box 4.3. Expansion of higher education and the impact on the education premium *(cont.)*

In the United States, the increase in the higher education wage premium between men born in 1940-44 and 1970-74 is almost entirely attributable to compositional change – the stronger effect of the decline in the share of the low-educated workers compared to the impact of the increase in the highly educated share. Finally, a small but non-negligible part of the decline in the education premium of women in Ireland can be ascribed to the drop in the proportion of low-educated workers having a stronger effect than the rise in the share of highly educated workers. Overall, however, compositional effects are not the main driving force behind the cohort trend in the education premium in hourly wages.

Figure 4.14. Career average of the education premium in real hourly wages according to ISCED and a percentile definition of education levels

Average over a working lifetime of the 1940-44 and the 1970-74 cohorts in 13 OECD countries



Note: The two percentiles selected for comparison are country-specific and equal the positions of the average low- and high-educated individuals of the 1940-44 cohort in the education distribution of the country concerned. Thus, the education premium of the 1940-44 cohort considered from ISCED and percentile perspectives are by definition identical.

Source: OECD calculations based on the data sources and the method described in Box 4.2.

StatLink http://dx.doi.org/10.1787/888933567540

3. Impact of lifetime inequality on pensions

Old-age support systems might well have to cope with significantly higher inequalities, strengthening calls for them to play a more redistributive role. However, it is not realistic to expect pension systems to compensate for all the consequences of adverse events and developments that build up over people's working lives. Although most pension systems do perform redistributive functions, particularly to protect retirees against old-age poverty, they can offset only to a limited extent the wide inequalities that develop over the life course.

In most pension systems, inequality in working life translates into inequality in retirement, a pattern reinforced by the rise of defined contribution pensions and some public pension reforms. Workers whose careers are shortened by breaks or late entry into the labour market generally receive lower pensions, especially in systems where there is a close link between old-age benefits and lifetime earnings. As a result, workers with non-

standard jobs and weak attachment to the labour market in old age become more vulnerable.

How lifetime earnings inequality translates into pension inequality depends on the progressivity of pension systems – income inequality in old age is of course a broader question, including the extent to which disparities in earnings generate inequality in income from private savings. Within pension schemes, the redistributive components that cushion the impact of labour market shocks or curtailed careers can take different forms. The overall progressivity of a pension system is determined not only by the relative importance of non-contributory and contributory elements, but also more particularly by instruments such as credits that help cover periods when people are not earning income for reasons such as unemployment or childcare. Socio-economic inequalities in life expectancy also need to be taken into account in assessments of inequality among retirees. If poor pensioners with low levels of education die younger, they receive benefits over a shorter period: their accumulated benefits are proportionally lower than those of their highly-educated peers.

This section deals first with the transmission of inequality from wages to pensions. It then goes on to examine how late-start, interrupted careers impact on pension entitlements. Finally, it seeks to quantify how life expectancy disparities between socio-economic groups affect total pension wealth in retirement. It also explores the distributive implications of raising the retirement age given the inequality in life expectancy.

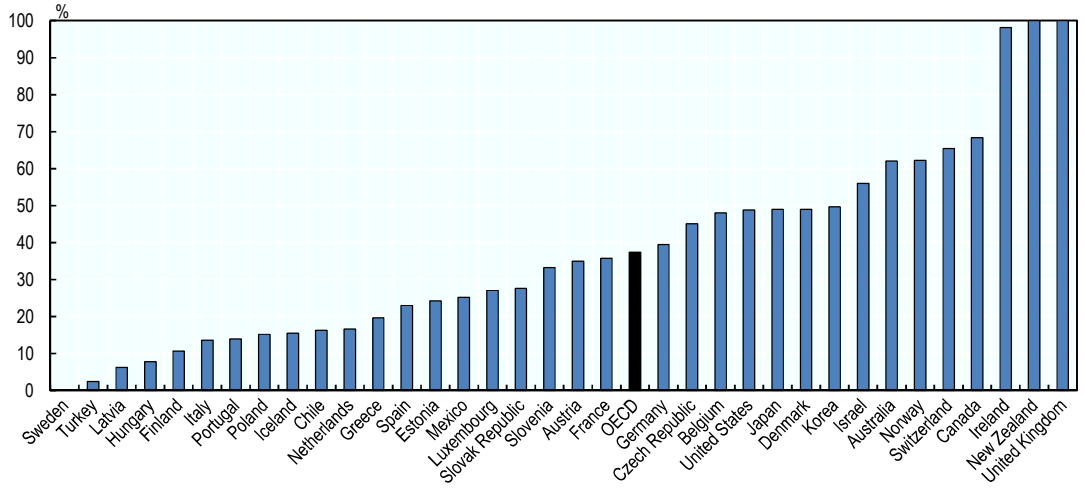
How wage inequality translates into pension inequality

The consequences for pension income of high levels of inequality during working life depend on how progressive the pension system is. OECD (2013) built a progressivity index originally proposed by Whitehouse (2006). It is designed so that a universal basic scheme scores 100% and a pension plan which mirrors wage inequality 0%. The index formally calculates the progressivity of a pension scheme as 1 minus the Gini coefficient of projected pension entitlements divided by the Gini coefficient of earnings. This index is refined here to take into account first-tier pensions even for people who did not work. [19] It is well understood, however, that the focus on pension income ignores retirement income inequality that would result from disparities in income from accumulated private wealth during the working life.

In many countries, pensioners are entitled to basic pensions based solely on residence or they receive social assistance benefit (see Chapter 2 of OECD, 2015). Since all pensioners receive the same benefit and pension income inequality does not arise in mandatory schemes in Ireland, New Zealand and the United Kingdom, their progressivity index scores are 100% (Figure 4.15). By contrast, scores are very low in Sweden, Turkey, Latvia, Hungary and Finland, where pension entitlements are very closely tied to wages. The average OECD index score is 37%, which suggests that pension benefits' Gini score is, on average, equal to 63% of the Gini coefficient of lifetime wages.

Figure 4.15. Progressivity of mandatory pension schemes

Index from 0% (pension scheme mirrors wage inequality) to 100% (universal basic scheme)



Note: The progressivity index is calculated as 1 minus the Gini coefficient of projected pension entitlements divided by the Gini coefficient of wages.

Source: Computations based on the OECD pension model.

StatLink http://dx.doi.org/10.1787/888933567559

What happens when wage inequality increases? An average of about two-thirds of the increase in wage inequality is transmitted to pension inequality in OECD countries (Figure 4.16). There is a close inverse relationship between the pass-through of wage inequality into pension equality and the progressivity index.[20] There is thus no change in the Gini coefficient of pension benefits from mandatory schemes in Ireland, New Zealand or the United Kingdom in the event of rises in wage inequality, as all three countries provide only basic pensions and social assistance payments which do not change with the level of individual wages. In other words, increases in wage inequality have no effect. They of course still affect retirement income inequality beyond pensions through their impact on the differences in the capacity to save and build private wealth across wage levels.

There are seven other OECD countries where a rise of one percentage point in the Gini coefficient of wages generates less than half a percentage point increase in the Gini score of pensions. In Australia and Canada, the means-tested pension component (through the withdrawal rate) ensures that low earners receive higher proportions of state support. In Denmark and Israel, the basic component is much higher for low earners. In Korea, low-income workers are entitled to the basic pension and benefit from the fact that half the earnings-related pension is based on nationwide contributions, thereby redistributing from high to low earners. The Czech system is also redistributive thanks to income thresholds in the calculation of earnings-related pensions, with low earners having a much higher proportion of their earnings replaced at 100%. In Switzerland, contribution threshold levels and a low ceiling on contributions ensure a redistributive element.

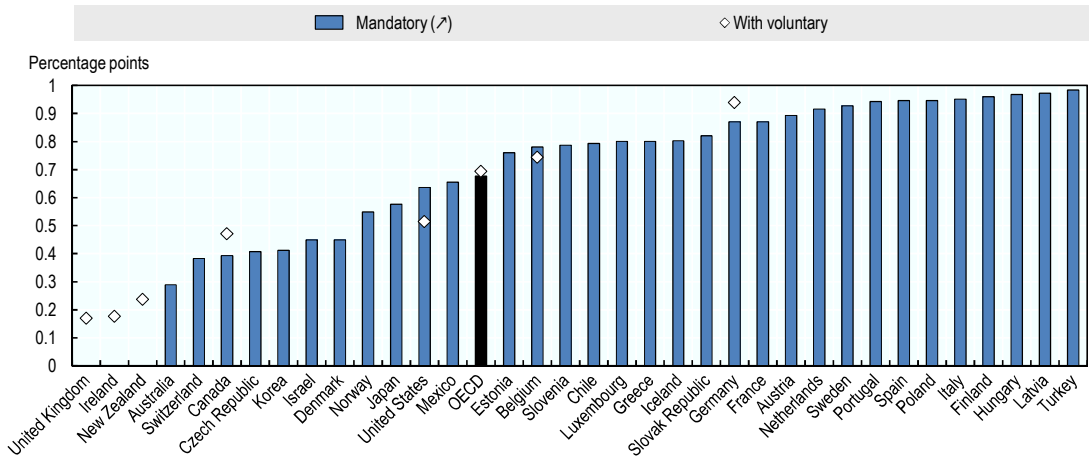
By contrast, more than 85% of the wage inequality increase passes through into pensions in over one-third of OECD countries – Turkey, Latvia, Hungary, Finland, Italy, Poland, Spain, Portugal, Sweden, the Netherlands, Austria, France and Germany. In all of them, pensions are very closely tied to earnings. The only controlling factor is the value

of the wage ceiling that applies to contributions. However, some countries do not apply ceilings or have ceilings that are over twice average earnings (they appear on the extreme right of Figure 4.16). Austria and Germany, for their part, set ceilings at around 150% of average earnings.

When voluntary pensions are taken into account in the seven countries which have coverage levels greater than 40% (Belgium, Canada, Germany, Ireland, New Zealand, the United Kingdom and the United States) (OECD, 2015), the effect of wage inequality is amplified since high-earners tend to be better covered by voluntary pensions (Chapter 5). The effects of voluntary pensions on the inequality pass-through shown in Figure 4.16 should be seen as a maximum transmission given the assumptions made about their coverage.[21] The result is that, in the seven countries, the accounting for voluntary pensions raises the transmission of wage inequality from 0.38 to 0.46 – that is an increase of about 20% in the pass-through of inequality attributable to voluntary pensions.

Figure 4.16. How increases in wage inequality affect pension inequality

Percentage point change in the Gini index of pensions for a 1 percentage point increase in the Gini index of wages, full career case



Note: The graph refers to gross (i.e. pre-tax) wages and pension benefits.

Source: Computations based on the OECD pension model.

StatLink http://dx.doi.org/10.1787/888933567578

How late-start, interrupted careers affect pension entitlements

Working a full career is becoming increasingly uncertain in today's labour markets. Many countries currently experience very high levels of unemployment, particularly among the young. Workers with careers shortened by late entry or breaks will usually receive lower pensions, especially in systems where pension benefits and lifetime earnings are closely tied.

Chapter 3 of OECD (2015) examines in detail the effect on pension entitlements of delaying labour market entry by five years, taking five or ten years off work for childcare, or spending three or five years unemployed. It also takes an in-depth look at the various instruments built into pension systems which might ease some labour market shocks. None of the case studies, however, analyse the full consequences for careers that both start late and undergo interruptions.

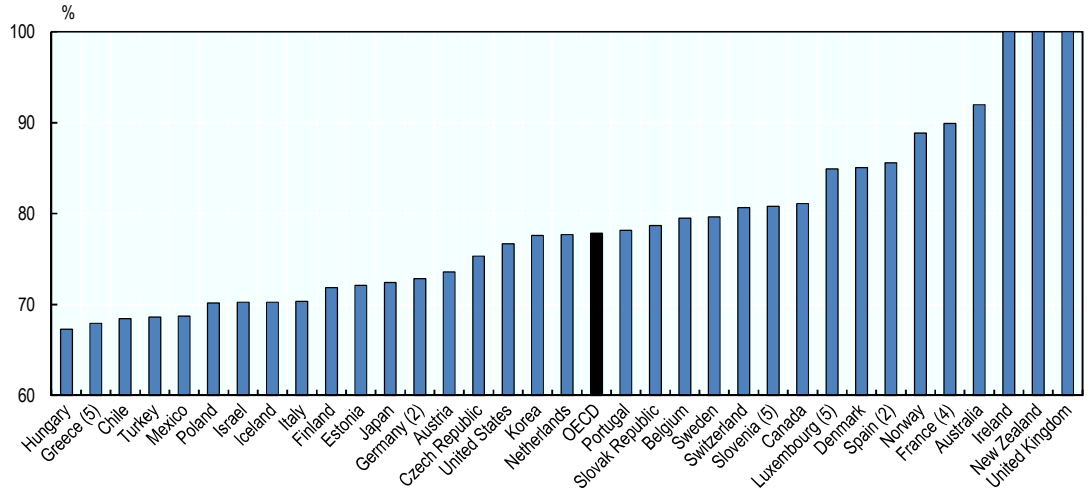
Pension entitlements are therefore calculated for male average earners who enter the labour market at 25 years old (rather than the standard 20) and spend ten years unemployed between the ages of 35 and 45. What they would receive is measured against the OECD baseline pension, corresponding to a full career from the age of 20. In the absence of any mechanism to offset late starts and career breaks, such an incomplete-career scenario would translate into a drop of about 35% in pension benefits. The OECD average projected fall based on legislated pension rules is 22% on average across countries (Figure 4.17). This means that redistributive/stabilisation devices would offset about 37% – that is (35-22)/35 – of the shortfall in this relatively extreme case.

Under this scenario, the level of mandatory scheme pensions among latecomers with gaps in their record is, on average, 78% of that of a 20-year-old starter with an unbroken career. There are, however, considerable variations from country to country. Pensions in Ireland, New Zealand and the United Kingdom are unaffected by shorter careers as they are either residence-based basic in New Zealand, or contribution-based basic in Ireland and the United Kingdom.[22] But these three countries are exceptions.

The biggest drops – of 30% or more – would come in Hungary, Greece, Chile, Turkey, Mexico, Poland, Israel, Iceland and Italy. In Greece, this accounts for five additional years of work at older ages. Indeed, whilst the retirement age in most countries is relatively independent of contribution histories, workers who have gaps in their records need to work to a later age than full-career workers in six countries – France, Germany, Greece, Luxembourg, Slovenia and Spain. For example, late-start workers with unemployment gaps in their careers need to work two years longer in Germany and Spain, four in France, and five in Greece, Luxembourg and Slovenia to avoid being penalised for early withdrawal.

Figure 4.17. Gross pension entitlements of average earners who start at age 25 and experience ten years of unemployment

Percentage of full-career entitlements, mandatory pensions only



Note: Figures in brackets are the number of years more (than workers with unbroken careers) that labour-market latecomers with career gaps must work to qualify for a full pension. No number in brackets corresponds to 0 years.

Source: Calculations based on the OECD pension model.

StatLink http://dx.doi.org/10.1787/888933567597

In Australia, although there is a 15-year gap in contributions to the defined contribution scheme, the Age Pension makes up for over two-thirds of the fall in pension levels, leading to a benefit equal to 92% of that of the full-career worker. In France, too, a latecomer with an unemployment history also qualifies for around 90% of a full-career worker's pension by working four years longer at older ages. The proportion is 70% in Israel, by contrast, where the pension system also has a strong DC component and no means-tested element.

Quantifying the impact of disparities in life expectancy on pension entitlements

Although low earners typically enjoy greater pension replacement rates than high earners (OECD, 2015) thanks to basic and minimum pensions, income-tested benefits and ceilings on contribution levels, they tend to have a lower life expectancy (see Section 2). Few pension arrangements take life expectancy disparities into consideration, so low earners generally receive benefit over shorter periods than high earners, which lowers their total effective pension payments – that is their pension wealth. OECD-wide, the highly educated (usually high earners) can expect to live an average of three years longer at the age of 65 than workers with low educational attainment (usually low earners).[23]

Is there, then, a method of quantifying the impact of a three-year difference in life expectancy on pension wealth, that is in the discounted stream of expected pension payments? It is assumed that low-wage workers (on 50% of average earnings) have a 1.5-year shorter life expectancy than the average-wage earner who, in turn, dies on average 1.5 years earlier than high earners (200% of average earnings) – on condition that they survive until the retirement age. The specific earnings levels are chosen arbitrarily, but have very little impact on the estimated effect of differences in life expectancy.

The annuity factor is the parameter of the pension system which is affected by changes in life expectancy through the set of survival probabilities. In addition to the influence of life expectancy, it is determined by the retirement age, the indexing of benefits during retirement and the discount rate (Box 4.4).

For low-income earners, lower survival probabilities reduce the annuity factor, which reduces pension wealth. The opposite holds true when it comes to high earners. Applying the three-year difference in life expectancy reduces the annuity factor of low earners relative to that of high earners and, by the same token, lessens their relative pension wealth (Figure 4.18).

Box 4.4. Calculating pension wealth and annuity factor

Pension wealth is equal to the discounted flows of pension benefits, b_t, expressed by:

$$PW = \sum_{t=R}^{T} \frac{b_t \, s_t}{(1+r)^{t-R}}$$

where s_t is the probability of survival to age t conditional on being alive at retirement age R, with T being the terminal age. The retirement age – the age at which a full-career worker who enters the labour market at the age of 20 can retire on a full pension – is country-specific. If pension benefits rise during retirement at indexed rate x, then pension wealth is equal to:

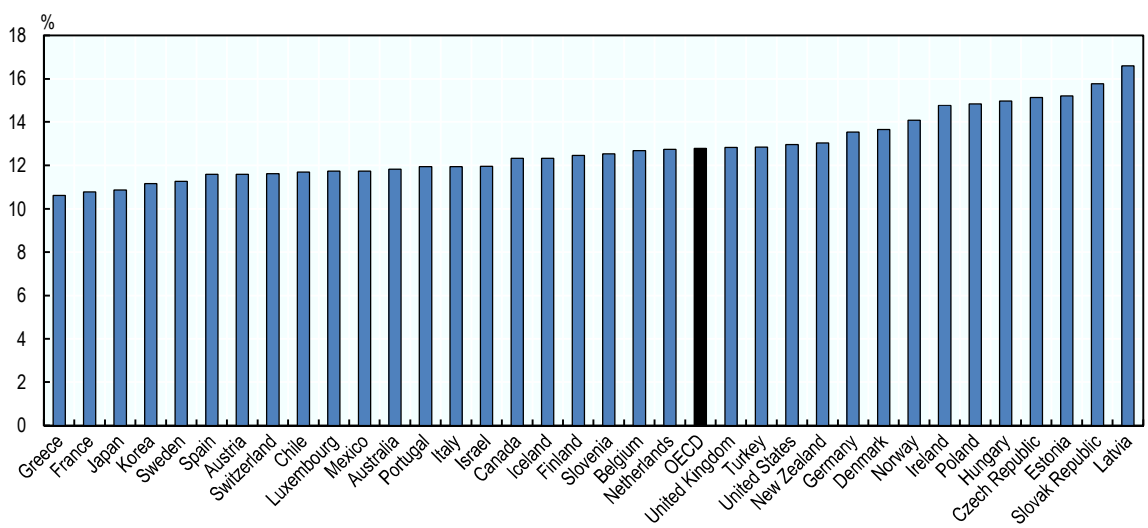
$$PW = b_R \sum_{t=R}^{T} \frac{(1+x)^{t-R} \, s_t}{(1+r)^{t-R}} \equiv b_R * AF_R$$

In other words, cumulated pensions are the product of pension benefit on retirement and the annuity factor (AF), which is equal to:

$$AF_R \equiv \sum_{t=R}^{T} \frac{(1+x)^{t-R} \, s_t}{(1+r)^{t-R}}$$

Figure 4.18. Declines in pension wealth attributable to a three-year shortfall in remaining life expectancy at retirement age

Fall in pension wealth between low and high earners due to a three-year life expectancy shortfall



Source: Calculations based on the OECD pension model.

StatLink http://dx.doi.org/10.1787/888933567616

Across the OECD, assuming a three-year difference in life expectancy on retirement penalises low earners by 12.8% in their total pension benefits relative to high earners compared to the common life expectancy baseline. High earners enjoy greater relative pension wealth in all OECD countries – by over 10% in Greece to nearly 17% in Latvia.

The differences across countries arise mainly from the effect of remaining life expectancy at the time of retirement and the indexation of benefits in payment. For example, the expected duration of retirement is longest in France, Greece, Japan and Korea. At the other extreme life expectancy is shortest in the Czech Republic, Estonia, Latvia and the Slovak Republic, where the three-year difference in life expectancy exerts the greatest effect. All these estimates are relatively large and encourage policy makers to consider adjusting pension parameters to account for how life expectancy varies with different socio-economic factors. As a result, apparently distribution-neutral schemes, such as pure defined-contribution pension, are in fact regressive.

A further issue relates to the distributive consequences of raising the retirement age in line with life expectancy gains. If the effective retirement age were raised across the board, the increase would eat relatively more deeply into low earners' average remaining life expectancy due to mortality differences. All other things being equal and ignoring changes in replacement rates, in particular, accumulated pension entitlements would fall due to the retirement-age increase relatively more among low earners than among high earners. The relative fall would, however, remain relatively small. If the retirement age were to be increased by three years between 2015 and 2060, the pension wealth of low earners relative to that of high earners would fall by a cross-country average of 1.2%.

Moreover, if the same argument – that is lower life expectancy for low earners – is applied to retirement ages that would be kept constant in a context with similar life-expectancy gains for everyone, then the total pension benefits of low-income pensioners would increase relatively more. An increase in the retirement age together with longer life expectancy would restore neutrality. However, if gains in life expectancy were not evenly distributed and favoured higher-income groups, so further exacerbating inequality in life expectancy, a higher retirement age would raise equity concerns. As discussed above, though, there is conflicting evidence about trends in life-expectancy inequality. In some countries, however, such as Denmark and the United States, it has risen.

Leaving health to one side, the main reason why a higher retirement age might affect more disadvantaged groups perhaps relates to the shortage of employment opportunities as they near retirement. It is a serious issue. However, this does not imply that raising the retirement age is the wrong policy. Low-earning workers' struggle to find work in their later years throws into relief the importance of labour market policies that foster a more inclusive elder labour participation (Chapter 5). After all, shortcomings in the labour market are the root cause of these difficulties.

4. Policy foresight to address unequal ageing

This section presents the results from the pilot Global Future Elderly Model (Global FEM)[24] for Belgium, Italy and the United States. Global FEM projects health and economic circumstances of representative cohorts of individuals born in the late 1940s, the mid-1950s and the late 1960s.[25] As the cohort born in the late 1960s is just turning age 50, these projections help policy makers to foresee the extent to which this younger cohort would be different from the cohorts that have preceded it; and the degree to which emerging differences need to be considered when introducing new policies. These preliminary results show how the Global FEM model may be used to test the potential future impact of a policy reform. The model is still in the pilot phase; hence current outcomes are subject to further validation. Results are presented from a policy scenario to increase the normal retirement age within public pension plans.[26]

Large share of life expectancy gains in good health in Belgium and Italy but not in the United States

Results from Global FEM show different dynamics in the United States and the two European countries, Belgium and Italy. While life expectancy gains generate an increase in both healthy and unhealthy years of life in Belgium and Italy, there are very limited total gains and almost none in good health in the United States between cohorts born in the early 1940s and one-quarter of a century later (Table 4.1). In the two European countries, a substantial share of life expectancy gains at age 50 is projected to be disability-free – about 70% in Belgium and 60% in Italy on average across men and women – which of course also means that not all years gained will be spent in good health.

For example, while 50-year-old men (women) born in 1960s in Belgium are expected to gain 5.5 (3.8) years of life compared to those born in early 1940s, 4.0 (2.7) of these additional years are expected to be disability-free. In Italy, the situation is less favourable as men (women) are expected to gain 5.0 (3.0) years but only 2.9 (1.8) would be disability-free. Moreover, the number of years with three or more serious health conditions (cancer, diabetes, heart disease, hypertension, lung disease, and stoke) after age 50 increases in all countries, by 1.7 years in Belgium, 2.2 years in Italy and 3.1 years in the United States. These years represent about one third of life expectancy gains in Belgium and over one half in Italy. By contrast, the 3.1-year increase in the United States is larger than total life expectancy gains of only 1.6 years.

According to Global FEM projections, the educational gradient in remaining life expectancy at age 50 is stronger in Belgium and the United States than in Italy. The highly educated born in the late 1960s who reached age 50 can expect to live longer than their low-educated peers by 7.5 years in the United States, 6.2 years in Belgium and 3.8 years in Italy. Moreover, in all three countries, the highly educated in all cohorts are projected to spend more years without any disability than their counterparts with less education (Table 4.1); from almost 7 years in Italy and Belgium to 11 years in the United States for the 1960s cohort. Furthermore, after age 50, the low-educated are projected to live more years with three or more chronic diseases than their highly educated peers in all countries.[27]

Turning to changes in longevity disparities, life expectancy has been growing faster for men than for women in all three countries. However, educational gaps in life expectancy are stable in Belgium, while there is some further divergence in Italy and the United States (Table 4.1). For example, life expectancy at age 50 is projected to grow by 3.6 years for the low-educated and by 3.7 years for the highly educated between the cohorts born in the early-1940s and late 1960s in Belgium.[28] The respective numbers are 3.1 versus 4.1 years in Italy, and 0.1 versus 1.2 years in the United States.[29]

Table 4.1. Remaining years of life, of disability-free life and of life with 3+ chronic diseases after age 50

By cohort, gender and education in Belgium, Italy and the United States

Country	Outcome	Cohort	Gender			Level of education		
			All	Men	Women	Low	Middle	High
Belgium	Remaining life years	Early 1940s	28.2	24.6	31.6	26.2	28.8	32.3
		Mid-1950s	31.1	27.8	33.9	28.5	30.7	35.0
		Late 1960s	32.9	30.0	35.4	29.8	32.1	36.0
		1960s-1940s	4.7 yrs (17%)	5.5 yrs (22%)	3.8 yrs (12%)	3.6 yrs (14%)	3.4 yrs (12%)	3.7 yrs (12%)
	Disability-free life years	Early 1940s	23.2	21.1	25.3	21.0	24.2	27.9
		Mid-1950s	25.3	23.7	27.0	22.5	25.5	29.5
		Late 1960s	26.5	25.0	28.0	23.1	26.1	29.9
		1960s-1940s	3.3 yrs (14%)	4.0 yrs (19%)	2.7 yrs (10%)	2.2 yrs (10%)	1.9 yrs (8%)	2.0 yrs (7%)
	Life years with 3+ chronic diseases	Early 1940s	6.7	6.1	7.3	7.1	6.5	5.8
		Mid-1950s	7.6	7.2	8.0	8.2	7.5	6.6
		Late 1960s	8.4	8.2	8.5	9.3	8.3	7.5
		1960s-1940s	1.7 yrs (25%)	2.1 yrs (35%)	1.2 yrs (16%)	2.2 yrs (31%)	1.8 yrs (29%)	1.7 yrs (29%)
Italy	Remaining life years	Early 1940s	30.8	26.1	34.7	30.7	29.9	33.4
		Mid-1950s	33.0	29.1	36.1	32.5	32.3	35.8
		Late 1960s	34.8	31.1	37.7	33.7	34.7	37.5
		1960s-1940s	4.0 yrs (13%)	5.0 yrs (19%)	3.0 yrs (9%)	3.1 yrs (10%)	4.8 yrs (16%)	4.1 yrs (12%)
	Disability-free life years	Early 1940s	25.3	22.9	27.7	24.8	25.7	30.0
		Mid-1950s	26.8	24.9	28.6	25.4	27.1	31.3
		Late 1960s	27.7	25.9	29.5	25.7	28.2	32.4
		1960s-1940s	2.3 yrs (9%)	2.9 yrs (13%)	1.8 yrs (7%)	0.9 yrs (4%)	2.5 yrs (10%)	2.4 yrs (8%)
	Life years with 3+ chronic diseases	Early 1940s	7.1	6.5	7.6	7.4	6.6	5.8
		Mid-1950s	8.3	7.9	8.6	9.1	7.6	6.8
		Late 1960s	9.3	9.1	9.4	10.3	8.9	7.3
		1960s-1940s	2.2 yrs (31%)	2.6 yrs (40%)	1.8 yrs (24%)	2.9 yrs (40%)	2.3 yrs (35%)	1.5 yrs (25%)
United States	Remaining life years	Early 1940s	29.7	27.7	31.5	26.5	29.9	33.0
		Mid-1950s	30.3	28.3	32.3	25.6	29.8	33.5
		Late 1960s	31.3	29.4	33.2	26.6	30.9	34.1
		1960s-1940s	1.6 yrs (6%)	1.7 yrs (6%)	1.6 yrs (5%)	0.1 yrs (1%)	1.1 yrs (4%)	1.2 yrs (4%)
	Disability-free life years	Early 1940s	22.5	21.7	23.2	17.8	23.0	27.0
		Mid-1950s	22.3	21.5	23.0	15.4	21.9	26.2
		Late 1960s	22.4	21.8	23.0	15.2	22.2	26.3
		1960s-1940s	-0.1 yrs (0%)	0.1 yrs (0%)	-0.3 yrs (-1%)	-2.7 yrs (-15%)	-0.8 yrs (-4%)	-0.7 yrs (-3%)
	Life years with 3+ chronic diseases	Early 1940s	6.5	6.2	6.8	6.7	6.6	6.1
		Mid-1950s	8.6	8.3	8.8	8.7	8.7	8.2
		Late 1960s	9.6	9.3	9.8	9.6	9.7	9.3
		1960s-1940s	3.1 yrs (47%)	3.1 yrs (50%)	3.0 yrs (44%)	2.9 yrs (43%)	3.1 yrs (48%)	3.3 yrs (53%)

Source: Global FEM.

StatLink http://dx.doi.org/10.1787/888933567635

Shifts in the composition of populations in terms of educational attainment over time have a significant impact on these trends. Even though disability-free years are expected to decrease by more than half a year in each educational group in the United States, the aggregate is expected to remain almost constant. Similarly in Belgium, the aggregate increase in disability-free years across cohorts is over three years, whereas the increases in each educational group are around two years (Table 4.1).

Working lives are expected to lengthen

Projected gaps in employment at older ages between European countries (Italy and Belgium) and the United States are closing due to strong increases in employment rates in Italy and Belgium (Table 4.2). Italians and Belgians born in the late 1960s are expected to work only four months less after age 50 than their US peers; this difference exceeds four years for Belgians and five for Italians born in the early 1940s. These increases are strongest among women, from 4.4 to 10.7 years in Belgium and from 3.4 to 9.4 years in Italy, against only 1.0 year from 9.7 to 10.7 years in the United States. As a consequence, the gender gap in employment after 50 is narrowing to below two years in Belgium, while remaining larger than four years in Italy.

Projections of working years are conditional on individuals' health and socio-economic histories. In all three countries, there are substantial and persistent differences in the length of working lives by level of educational attainment. Highly educated born in the late 1960s are expected to work longer after age 50 by 5.2 years in Belgium, 6.3 years in the United States and 6.9 years in Italy. These duration gaps are widening from 4.8 years for the early 1940s cohort in Belgium and 6.1 years in Italy. By contrast, the duration gap is narrowing slightly from 6.6 years in the United States.

Changes in pension systems, raising life expectancy and prolonging working lives result in changes in the duration of claiming a pension. Trends in the number of years claiming a pension differ widely across countries (Table 4.2). In the United States, that duration is stable on average across cohorts at about 17.5 years. Belgium would record a marked increase from about 14 to 16.5 years between the cohorts born in the early 1940s and the late 1960s due to life expectancy gains. By contrast, the length of the period claiming a pension would fall sharply from slightly more than 18 years to about 14 years due to higher effective retirement ages. Overall, these trends imply that, across countries and cohorts, the average duration of pension receipt is the longest for the early 1940s cohort in Italy where it is will be the shortest for those born 25 years later in Italy.

Due to shorter working lives and higher life expectancy women claim pensions for a longer period in all countries and in all cohorts except in Italy for the early 1940s. Moreover, there is a clear educational gradient in the estimated average claiming years, with the highly educated claiming pension for around five to six years longer than their low-educated counterparts in all countries and cohorts.

Table 4.2. Average duration of working for pay and of claiming pension after age 50

By cohort, gender and education in Belgium, Italy and the United States

Country	Outcome	Cohort	Gender			Level of education		
			All	Men	Women	Low	Middle	High
Belgium	Life years working for pay	Early 1940s	6.9	9.3	4.4	5.6	7.0	10.4
		Mid-1950s	9.8	10.8	8.7	7.8	9.6	13.0
		Late 1960s	11.5	12.3	10.7	9.1	10.8	14.3
		1960s-1940s	4.6 yrs (66%)	3.0 yrs (32%)	6.3 yrs (141%)	3.5 yrs (62%)	3.8 yrs (54%)	3.9 yrs (37%)
	Life years claiming public pension	Early 1940s	14.1	12.4	15.7	12.1	15.7	17.1
		Mid-1950s	15.8	14.1	17.4	13.2	16.2	19.0
		Late 1960s	16.4	15.0	17.8	13.4	16.5	19.1
		1960s-1940s	2.3 yrs (16%)	2.6 yrs (21%)	2.1 yrs (13%)	1.2 yrs (10%)	0.8 yrs (5%)	1.9 yrs (11%)
Italy	Life years working for pay	Early 1940s	5.8	8.2	3.4	4.8	7.3	10.9
		Mid-1950s	10.0	13.1	7.0	8.0	11.1	15.1
		Late 1960s	11.5	13.6	9.4	9.2	12.4	16.1
		1960s-1940s	5.7 yrs (99%)	5.4 yrs (66%)	6.0 yrs (176%)	4.4 yrs (91%)	5.1 yrs (70%)	5.2 yrs (48%)
	Life years claiming public pension	Early 1940s	18.3	19.1	17.4	17.6	19.1	22.4
		Mid-1950s	13.8	13.4	14.1	12.6	13.9	18.2
		Late 1960s	13.9	13.2	14.5	12.2	14.2	18.5
		1960s-1940s	-4.4 yrs (-24%)	-5.9 yrs (-31%)	-2.8 yrs (-16%)	-5.4 yrs (-31%)	-4.9 yrs (-26%)	-3.9 yrs (-17%)
United States	Life years working for pay	Early 1940s	11.0	12.3	9.7	8.2	10.8	14.8
		Mid-1950s	11.3	12.4	10.3	7.8	10.8	13.8
		Late 1960s	11.8	13.0	10.7	8.0	11.5	14.3
		1960s-1940s	0.8 yrs (8%)	0.7 yrs (6%)	1.0 yrs (10%)	-0.2 yrs (-3%)	0.7 yrs (6%)	-0.5 yrs (-4%)
	Life years claiming public pension	Early 1940s	17.3	15.3	19.2	14.6	17.7	19.4
		Mid-1950s	17.4	15.5	19.1	13.5	17.2	19.4
		Late 1960s	17.6	15.8	19.3	13.8	17.6	19.3
		1960s-1940s	0.3 yrs (2%)	0.5 yrs (3%)	0.1 yrs (1%)	-0.9 yrs (-6%)	-0.1 yrs (0%)	-0.1 yrs (-1%)

Source: Global FEM.

StatLink http://dx.doi.org/10.1787/888933567654

Policy scenario: Impact of raising the retirement age

The strength of Global FEM is its ability to estimate the health and economic impacts of various policy proposals on different population groups. The policy example presented here is a hypothetical scenario where governments consider the impacts of raising both the normal and early retirement age to 70 and 65, respectively, for the late-1960s cohort. Many OECD countries have implemented or are considering an increase in the legal retirement age to achieve financial sustainability or preserve retirement income adequacy in a financially sustainable way (OECD, 2015). This policy represents a more substantial change in Belgium, where the normal retirement age is scheduled to increase from 65 today to 66 in 2025 and 67 in 2030, than in Italy, where it is being gradually raised with increases in life expectancy, thereby reaching 67 already in 2019 and rising beyond that over time. In the United States, the normal retirement age is increasing from 66 in 2014 to 67 by 2027.[30]

The Global FEM baseline projections, which reflect current policies, are compared to the results after the intervention. As would be expected, the policy change increases the average projected years spent working for pay in all countries: by 1.2 years in Italy, 1.6 in the United States and 3.3 in Belgium (Table 4.3). Such a reform would have a similar impact on the changes in the duration of the working life after age 50 among educational groups in Italy, should slightly reduce the educational gap in Belgium and widen it

slightly in the United States. However, the impact on the educational gap is small, not exceeding half a year in each country.

The net effect of retiring later on the discounted flow of lifetime pension benefits (pension wealth) results from different mechanisms. On the one hand the average benefits might become higher due to longer period of contributions and lower remaining life expectancy when claiming retirement (which mechanically increases pensions in Italy). On the other hand, the benefits are received for a shorter period of time and in a more distant future (hence a lower discounted value). The policy change results in a large estimated decrease (13%) in the average lifetime pensions in the United States. By contrast, pension wealth declines and increases very slightly in Belgium and Italy, respectively. The intervention would impact the pension wealth quite similarly among educational groups in each country (Table 4.3).

Table 4.3. Impact of rising retirement age on duration of working life and pension wealth

By gender and education in Belgium, Italy and the United States for the cohort born in the 1960s

Outcome	Country	Cohort	Gender			Level of education		
			All	Men	Women	Low	Middle	High
Life years working for pay after age 50	Italy	Status quo	11.5	13.6	9.4	9.2	12.4	16.1
		Intervention	12.8	14.9	10.6	10.4	13.7	17.3
		Difference (%)	1.2 (11%)	1.3 (9%)	1.2 (13%)	1.2 (14%)	1.3 (10%)	1.2 (8%)
	Belgium	Status quo	11.5	12.3	10.7	9.1	10.8	14.3
		Intervention	14.8	15.4	14.2	12.6	14.3	17.4
		Difference (%)	3.3 (29%)	3.2 (26%)	3.5 (32%)	3.4 (37%)	3.5 (32%)	3 (21%)
	United States	Status quo	11.8	13.0	10.7	8.0	11.5	14.3
		Intervention	13.4	14.5	12.3	9.3	13.0	16.0
		Difference (%)	1.6 (13%)	1.5 (12%)	1.6 (15%)	1.2 (16%)	1.6 (14%)	1.7 (12%)
Discounted lifetime public pension benefits in 2010 USD ('000s)	Italy	Status quo	731.9	696.4	772.9	625.7	755.9	945.5
		Intervention	738.8	720.0	775.3	640.7	758.5	954.0
		Difference (%)	6.8 (1%)	23.6 (3%)	2.3 (0%)	15.0 (2%)	2.6 (0%)	8.4 (1%)
	Belgium	Status quo	476.4	508.6	439.7	394.3	462.7	522.8
		Intervention	465.3	483.2	439.4	383.4	452.8	508.1
		Difference (%)	-11.1 (-2%)	-25.4 (-5%)	-0.3 (0%)	-10.9 (-3%)	-10.0 (-2%)	-14.6 (-3%)
	United States	Status quo	500.9	517.8	465.1	343.0	464.1	549.1
		Intervention	434.2	440.0	407.4	298.2	404.2	470.6
		Difference (%)	-66.7 (-13%)	-77.8 (-15%)	-57.7 (-12%)	-44.8 (-13%)	-59.9 (-13%)	-78.5 (-14%)

Source: Global FEM.

StatLink http://dx.doi.org/10.1787/888933567673

Notes

1. Global FEM uses dynamic microsimulation to project the health and economic characteristics of OECD countries. For this pilot, Global FEM was developed and validated for Belgium, Italy and the United States. All results presented in this section were produced using the Global FEM Model and have been averaged over 50 repetitions.

2. Cohort life expectancy calculates and/or projects the actual lifespan of a same-year birth cohort, while period life expectancy calculates the hypothetical lifespan of a person by factoring in current mortality rates among individuals of various ages (and, therefore, from different birth cohorts). When pooling all country-, cohort- and period-observations in the same sample, average cohort life expectancy is estimated to be equal to period life expectancy at birth plus 9.6 years, due to declining mortality at the same age across cohorts. In other words, the 2015 birth cohort will live about ten years longer than period life expectancy at birth in 2015 suggests.

3. The new collected data show estimated longevity gaps at age 65 between the highest and lowest education groups which are substantially larger in most countries than those found in previous studies, due to more precise information on mortality after the age of 75.

4. In Norway, the life expectancy gap between high and low educational groups was four years among both men and women in the 1970s, widening to five among women and seven for men in the late 2000s (Murtin et al., 2017).

5. Mackenbach (2016) also reports that absolute inequalities in self-assessed health were mostly constant in the 17 European countries between the 1990s and the 2000s, whereas relative inequalities grew. Measures of inequality in mortality by education are subject to composition effects as the distribution of education changes over time. Alternative measures immune to this problem are available, but constructing them is complicated and their robustness is untested (Murtin et al., 2017).

6. For details see http://apps.who.int/classifications/icd10/browse/2016/en (Chapter XX, V01-Y98).

7. The effect of higher education appears to be greater among lower- and middle-income OECD countries than in high-income ones.

8. Breaking down lifespan inequality into inequality in lifespan within and between educational and gender groups is based on the Theil index of lifespan inequality as further explained in Murtin et al. (2017, p. 32).

9. The United Nations cuts off survival data at the age of 85. It is not possible, therefore, to calculate total inequality in lifespan and reflect trends in mortality in very old age.

10. The data analysis pools various waves from the Cross-National Equivalent File (CNEF) to include Australia (2001-14), Switzerland (1999-2014) and the United States (1970-13). It also pools the 1994-2001 waves from the European Community

Household Panel (ECHP) and the 2004-14 waves from the European Union Statistics on Income and Living Conditions (EUSILC) to include another ten European OECD countries. These countries are Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, the Netherlands and Spain. Five countries with available data were not included because their shares of the population by education group were not reliable in some years (the United Kingdom and Luxembourg) or because survey findings were not reliable, probably because samples were too small (Korea and Portugal). Finally, Germany was excluded due to the difficulties of measuring and aggregating work careers of older cohorts in East and West Germany. However, ruling out the five countries had little effect on the country averages shown in Section 3.

11. In Belgium, Denmark and Greece (not in the figure), more mixed patterns emerge, with the female and male education premium showing slight declines and rises, respectively.

12. This evidence for the United States is consistent with the findings of Autor (2014) based on Current Population Survey data.

13. The ratio would further drop from 1.95 to 1.90 if survival probabilities were identical. Note that the education gradient in survival probabilities is taken into account when computing lifetime earnings, but is assumed constant across countries and cohorts due to data limitations. So, while the gradient affects the level of lifetime earnings of the highly and low-educated similarly across countries, it does not affect how the ratio of lifetime earnings of the two groups changes from one cohort to another. The average education gradient used refers to the average of the 23 OECD countries studied in Section 2 (Figure 4.4) which does not cover all countries studied below. However, educational differences in longevity have been found in a broader range of OECD countries (e.g. Mackenbach, 2016).

14. Following the standard definition of gender gaps, it is here equal to the difference in lifetime earnings between genders over male's levels.

15. Extrapolating the education-specific profiles in lifetime earnings for generations born after 1970-74 entails a further decrease in the gender gap. However, such extrapolations should be taken very cautiously, as the underlying data cover only a limited part of careers.

16. Results for hours worked are not shown here but are available upon request.

17. The result refers to both, men and women, born in 1970-74 and is based on the OECD pension model.

18. A high positive correlation of the educational attainment of children with that of their parents leads to a positive correlation of between the income level of adults and their parents' income which they share during childhood.

19. The wage distribution is assumed constant across countries. It is first assumed that the distribution comprises people with zero, low (50% of average wage), average (100%) and high (200%) earnings over the entire working lifetime. It is further assumed that 15% of people have zero earnings and that the total earnings distribution generates a score of 0.35 in the Gini index. It follows therefrom that the shares of low earners, average earners and high earners are 16.5%, 45.3% and 23.3%, respectively.

20. The pass-through is computed here from a shift in the wage distribution that increases the Gini index from 0.35 to 0.38, which is achieved by 15% of people with

zero earnings, 24% of low-income workers, 34% of average-wage workers and 27% of high-wage workers.

21. Indeed, it is assumed that coverage is concentrated at the top of the earnings range, so that all those on 200% of average earnings are covered first, followed by those on 100% and then by those on 50% (if needed, based on the coverage levels presented in Table 10.1 of OECD (2015). The Gini index of pension inequality is then calculated for both mandatory and voluntary schemes at both proportions of earnings identified above.

22. In Ireland and the United Kingdom, a sufficiently long contribution period guarantees eligibility to a flat-rate pension benefit independent of the individual's earnings level.

23. This refers to the average of the 23 OECD countries studied in Section 2 (Figure 4.4) which does not cover all countries studied below. However, educational differences in longevity have been found in a broader range of OECD countries (e.g. Mackenbach, 2016).

24. See endnote #1.

25. The OECD is collaborating with the University of Southern California Schaeffer Center for Health Policy & Economics and the University of Rome Tor Vergata Centre for Economic and International Studies (CEIS) to develop the pilot Global FEM from the US Future Elderly Model (US FEM). The US FEM is a mature model that has been used for a wide variety of health and social policy evaluation studies, including those related to reforms of the US Medicare and Social Security programmes (Goldman, 2014; National Academies, 2015).

26. Two other scenarios aimed at prolonging working life have been modelled with Global FEM: an improvement in the health of at older ages and an increase in the skills and employability of older workers. The first scenario estimates the effects of introducing a diabetes prevention programme. The second scenario analyses the impacts of introducing an active labour market programme to help older unemployed people to find a job.

27. The education gradient is less pronounced in the United States where the highly educated are expected to live only three months less with three or more chronic diseases compared to three years in Italy and almost two years in Belgium in the cohort born in the late 1960s.

28. A high education level is equivalent to tertiary education (ISCED 5+) and a low education level to at most a lower secondary level of education (ISCED 0-2).

29. Results reveal also an increase in the education gap in the duration of disability-free lives in Italy and the United States by 1.4 and 2.0 years, respectively, but a stable gap in Belgium.

30. The policy applies to the cohort born in the late 1960s and is phased in immediately.

References

Autor, D.H. (2014), "Skills, Education, and the Rise of Earnings Inequality Among the 'Other 99 Percent'", *Science*, Vol. 344, No. 6186, pp. 843-851.

Blanpain, N. (2016), "Les inégalités sociales face à la mort – Tables de mortalité par catégorie sociale et par diplôme", *INSEE Résultats*, No. 177, Institut national de la statistique et des études économiques.

Boarini, R. et al. (2016), "Multi-dimensional Living Standards: A Welfare Measure Based on Preferences", *OECD Statistics Directorate Working Paper*, 2016/05, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlpq7qvxc6f-en.

Bronnum-Hansen, H. and M. Baadsgaard (2012), "Widening Social Inequality in Life Expectancy in Denmark. A Register-based Study on Social Composition and Mortality Trends for the Danish Population", *BMC Public Health*, Vol. 12, p. 994.

Currie, J and H. Schwandt (2016), "Inequality in Mortality Decreased Among the Young While Increasing For Older Adults, 1990-2010", *Science*, Vol. 352, No. 6286, pp. 708-712.

Deaton, A. (2003), "Health, Inequality, and Economic Development", *Journal of Economic Literature*, Vol. 41, No. 1, American Economic Association, March, pp. 113-158.

Deaton, A. (1985), "Panel Data From Time Series of Cross-sections", *Journal of Econometrics*, Vol. 30, pp. 109-126.

Díaz, M. and F. Murtin (2017a), "Socio-economic Inequality in Living Standards", *OECD Statistics Directorate Working Paper*, OECD Publishing, Paris, forthcoming.

Díaz M. and F. Murtin (2017b), "The Distribution of Multidimensional Living Standards in France", *OECD Statistics Directorate Working Paper*, OECD Publishing, Paris, forthcoming.

Dolado, J., F. Felgueroso and J. Jimeno (2000), "Youth Labour Markets in Spain: Education, Training and Crowding-out", *European Economic Review*, Vol. 44, pp. 943-956.

Dustmann, C., J. Ludsteck and U. Schönberg (2009), "Revisiting the German Wage Structure", *Quarterly Journal of Economics*, Vol. 124, No. 2, pp. 843-881.

Eurostat (2016), "Tobacco Consumption Statistics" (database), http://ec.europa.eu/eurostat/statistics-explained/index.php/Tobacco_consumption_statistics (accessed in October 2016).

Farrell, P. and V. Fuchs (1982), "Schooling and Health: The Cigarette Connection", *Journal of Health Economics*, Vol. 1, No. 3, pp. 217-230.

Fleurbaey, M. and D. Blanchet (2013), *Beyond GDP: Measuring Welfare and Assessing Sustainability*, Oxford University Press.

Geppert, C. (2018), "Age- and Education-related Composition Effects on Measures of Aggregate Inequality", *OECD Working Papers*, forthcoming.

Goldman, D.P. and P.R. Orszag (2014) "The Growing Gap in Life Expectancy: Using the Future Elderly Model to Estimate Implications for Social Security and Medicare", *American Economic Review: Papers & Proceedings*, Vol. 104, No. 5, pp. 230-233.

Hendi, A.S. (2015), "Trends in U.S. Life Expectancy Gradients: The Role of Changing Educational Composition", *International Journal of Epidemiology*, Vol. 44, No. 3, pp. 946-955.

James, C., M. Devaux and F. Sassi (2017), "Inclusive Growth and Health", *OECD Health Working Paper*, OECD Publishing, Paris, forthcoming.

Katz, L.F. and K.M. Murphy (1992), "Changes in Relative Wages", *Quarterly Journal of Economics*, Vol. 107, No. 1, pp. 35-78.

Krusell, P. et al. (2000), "Capital-Skill Complementarity and Inequality: A Macroeconomic Analysis", *Econometrica*, Vol. 68, No. 5, pp. 1029-1053.

Lleras-Muney, A. (2005), "The Relationship Between Education and Adult Mortality in the U.S.", *Review of Economic Studies*, Vol. 72, No. 1, pp. 189-221.

Mackenbach, J.P. (2016), *Health Inequalities in Europe*, Erasmus University Publishing, Rotterdam.

Mackenbach, J.P. et al. (2015), "Trends in Inequalities in Premature Mortality: A Study of 3.2 Million Deaths in 13 European Countries", *Journal of Epidemiology and Community Health*, Vol. 69, pp. 207-217.

Meara, E.L., S. Richards and D.M. Cutler (2008), "The Gap Gets Bigger: Changes in Mortality and Life Expectancy, By Education, 1981–2000", *Health Affairs*, Vol. 27, No. 2, pp. 350-360.

Murtin, F. (2015), *Health and Prosperity*, Palgrave-MacMillan.

Murtin, F. (2013), "Long-term Determinants of the Demographic Transition", *Review of Economics and Statistics*, Vol. 95, No. 2, pp. 617-631.

Murtin, F. et al. (2017), "Inequalities in Longevity by Education in OECD Countries: Insights from New OECD Estimates", *OECD Statistics Directorate Working Papers*, No. 2017/02, OECD Publishing, Paris, http://dx.doi.org/10.1787/6b64d9cf-en.

National Academies of Sciences, Engineering and Medicine (2015), *The Growing Gap in Life Expectancy by Income: Implications for Federal Programs and Policy Responses*, Appendix B, The Future Elderly Model: Technical Documentation, National Academies Press, Washington D.C.

OECD (2015), *Pensions at a Glance 2015: OECD and G20 indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_glance-2015-en.

OECD (2013), *Pensions at a Glance 2013: OECD and G20 indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_glance-2013-en.

Pijoan-Mas, J. and V. Sánchez-Marcos (2010), "Spain Is Different: Falling Trends of Inequality", *Review of Economic Dynamics*, Vol. 13, pp. 154-178.

Olshansky, S.J. et al. (2012), "Differences in Life Expectancy Due to Race and Educational Differences Are Widening and Many May Not Catch Up", *Health Affairs*, Vol. 31, No. 8, pp. 1803-1813.

United Nations (2015), *World Population Prospects: The 2015 Revision*, Department of Economic and Social Affairs, Population Division, United Nations, New York.

Whitehouse, E. (2006), "New Indicators of 30 OECD Countries' Pension Systems", *Journal of Pension Economics and Finance*, Vol. 5, No. 3, pp. 275-298.

Database references

OECD Income Distribution and Poverty Database,
http://stats.oecd.org/Index.aspx?DataSetCode=IDD.

OECD Labour Force Statistics Database,
http://www.oecd.org/employment/onlineoecdemploymentdatabase.htm.

Annex 4.A1

Calculating multi-dimensional living standards

Multi-dimensional living standards (MDLS) is a metric developed as part of the OECD Inclusive Growth Initiative to help policy makers assess:

- how their policies and programmes might affect societal outcomes through their impact on the income and non-income components of well-being;
- how those outcomes are distributed across households.

To help assess possible synergies and trade-offs between goals, the MDLS methodology draws on:

- estimates of "shadow prices" to evaluate the importance of non-income aspects of well-being;
- assumptions about degrees of "aversion to inequalities".

For measuring the income-related dimension of MDLS, the OECD uses household real disposable income. As for non-income dimensions, it uses employment conditions and health status, measured respectively by the unemployment rate and by gaps in cohort life expectancy at birth measured against a longevity benchmark. Non-income factors are valued by the "equivalent income method" (Fleurbaey and Blanchet, 2013) defined as the *hypothetical income that would make an individual indifferent between her/his current situation in terms of non-income aspects of life and a benchmark situation*.

To monetise the benefits from non-income components, shadow prices need to be worked out. While shadow prices can be derived in several ways (see Boarini et al., 2015, for a review and Boarini et al., 2016, for a robustness analysis), they fall within a relatively narrow range. Estimated shadow prices are country-specific and, for present purposes, age- and cohort-specific too, as they depend on income, longevity and unemployment in a non-linear way. Estimates for 26 OECD countries (Boarini et al., 2016) imply that the well-being benefit of a 1-percentage-point fall in the unemployment rate is equivalent to a gain in average household income of 1.9% and that the benefit of a one-year increase in (period) life expectancy at birth is equivalent to an income gain of 5.9%.

Once equivalent income has been calculated for each individual, MDLS measures can be aggregated into country living standard measures as in Boarini et al. (2016), by level of education or age cohort, as in this report (see also Diaz and Murtin, 2017a). Aggregation takes the form of a generalised mean, equal to average living standards minus a penalty for inequality in living standards between individuals. Standard calibration is used to adjust the inequality penalty to the gap between average and median living standards, so that the resulting MDLS index translates the situation of the median household.

Table 4.A1.1 below displays the estimated MDLS indicators of various age groups in the United States born in 1950-54. Age-specific longevity benchmarks have been used so that longevity gaps are valued differently between age groups but similarly between cohorts at a given age. MDLS indicators for different cohorts at a given age are therefore comparable, but not across age groups in a given cohort. The table shows that the shadow prices of longevity at 60 are higher than at 30 – because older people value shorter remaining lifetimes over income more than younger people do.

Table 4.A1.1. Calculating multi-dimensional living standards by cohort

1950-54 cohort in the United States

		Living standards calculation					Memorendum items				
Year	Age	Income	Correction for longevity gap	Correction for unemployment	Inequality penalty	Living standards	Longevity	Longevity benchmark	Longevity shadow price	Unemployment	Unemployment shadow price
1980	30	24 843.1	-11 152.1	-4 970.5	-2 555.9	8 547.8	51.0	60.4	4.1	11.8	1.4
1990	40	29 548.0	-14 375.1	-4 616.4	-2 767.4	10 183.5	41.7	49.3	5.6	9.0	1.5
2000	50	35 877.3	-18 254.8	-4 338.2	-3 874.2	11 759.5	32.9	38.3	8.5	6.8	1.6
2010	60	35 084.7	-16 921.1	-2 958.9	-4 740.7	11 987.4	24.6	27.8	14.1	4.7	1.7

Source: OECD calculations.

StatLink http://dx.doi.org/10.1787/888933567692

Chapter 5

A closer look at the over-50s

This chapter documents labour market and retirement patterns among the over-50s. It first shows that employment of older adults varies substantially across socio-economic groups. Lifelong learning opportunities and inclusive labour markets are essential to ensuring that workers of all educational backgrounds have the possibility of extending their careers until older ages. The chapter then demonstrates that there is a large scope for higher labour force participation rates among the over-50s from a health perspective. Beyond health, other factors, including pension system parameters and difficult working conditions, contribute to the strong drop in employment rates in people's 50s and early 60s. Pension systems need to be well-designed and inclusive to fight old-age poverty effectively. The level of safety net provision in pension systems varies considerably across OECD countries.

Key findings

- Employment patterns among older adults and pathways into retirement differ considerably across socioeconomic groups. Low-educated people are more likely to retire when reaching retirement age.
- Many older workers do not possess the skills needed to use new technologies. Lifelong learning opportunities are essential to reducing labour market disparities.
- Poor health is an important factor pushing older workers into early retirement, but it explains the sharp decline of employment rates from age 55 to a limited extent only. Beyond health, pension system parameters, working conditions and family characteristics are among the factors that determine at what age workers retire.
- There is significant scope for a number of countries that combine relatively high old-age poverty rates and low safety-net benefits to increase the value of their safety-net. Poverty levels are further increased as most countries index their old-age safety nets to prices.
- Wide pension coverage is needed to fight old-age poverty. Low coverage from voluntary pensions in the lower income brackets has a variety of reasons: higher replacement rates from mandatory schemes, limited capacity to save, myopic behaviour driven in part by insufficient financial literacy, tax incentives benefiting those with higher incomes, and sub-optimal design of voluntary schemes.

Introduction

While income poverty rates among the over-50s have fallen since the mid-1980s in many OECD countries, inequality at older ages remains a major challenge to which there is no simple, one-size-fits-all solution. Among people in the second half of their lives, health, labour market and income disparities are already deeply entrenched. Efficient employment policies for older workers and equitable pension rules are needed to reduce such inequalities and fight unequal ageing. Policy makers should seek to ensure that older people of all educational backgrounds have access to inclusive labour markets, possess the skills to pursue high-quality jobs and are in sufficiently good health to extend their working lives. Pension systems should provide adequate retirement income and prevent old-age poverty.

This chapter first examines the extent of employment-related disparities between groups from different educational backgrounds. Section 2 then goes on to address the effects of the digital economy, particularly on older workers, while the following section discusses how labour markets can be made more inclusive. Section 4 looks at estimates of older workers' health-related work-capacity, Section 5 identifies and quantifies determinants of the retirement decision. Section 6 addresses issues relating to adequate retirement income.

1. Education-related employment gaps among the elderly

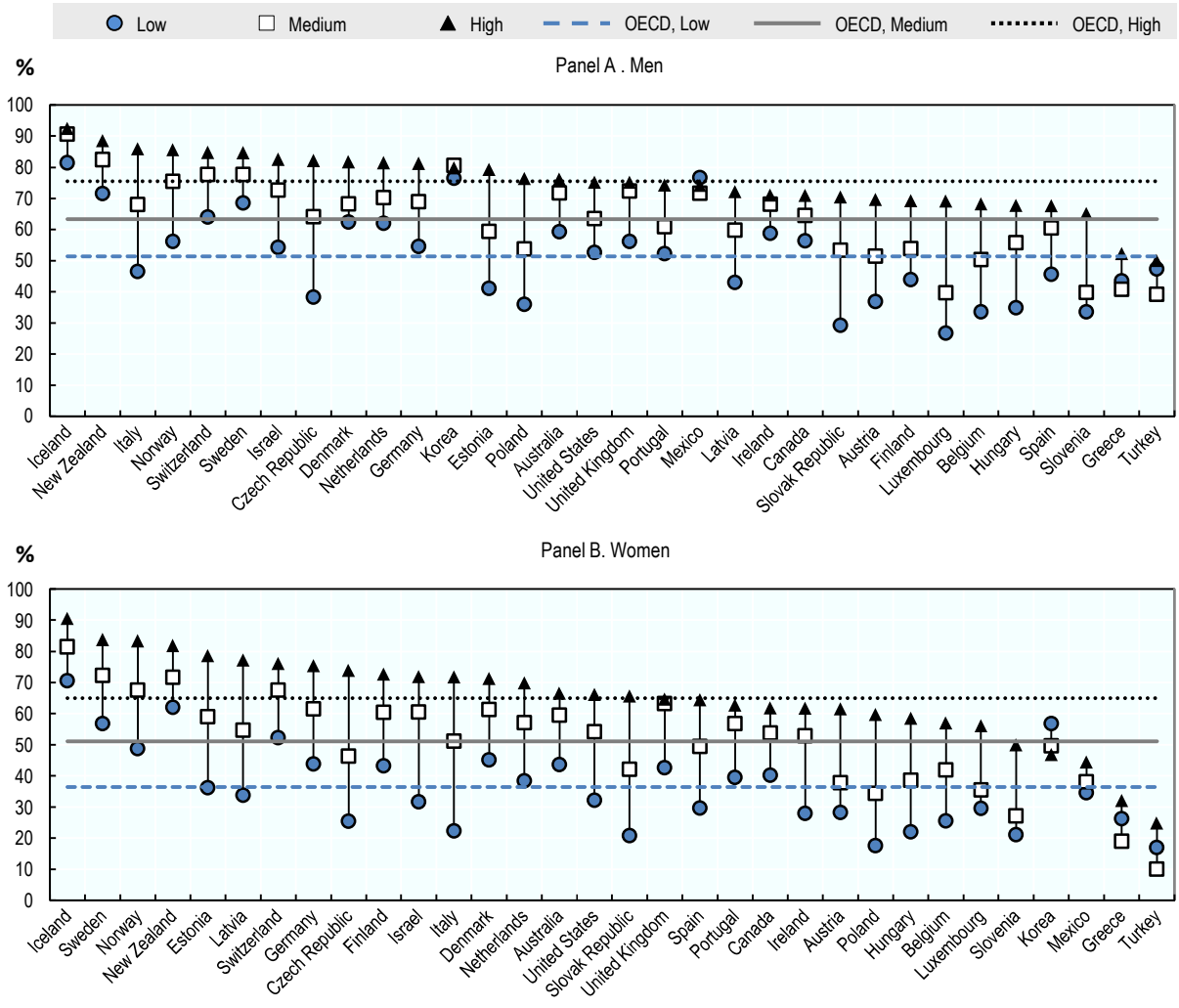
Employment rates among the over-50s differ widely along levels of educational attainment. In 2015, the average OECD employment rate among 55-to-64 year-old men with no upper-secondary schooling was 51%. Among those with upper-secondary schooling it was 63%, while 75% of men with tertiary-level degrees in this age bracket were in employment (Figure 5.1, Panel A).

For women in the same age group, employment rates show even steeper education-related gradients. In 2015, the average employment rate among females aged 55-64 who left school before the upper-secondary level was 36%. It was 51% for those who had completed upper-secondary education and 65% among those with tertiary education

degrees (Panel B). The only countries with low or no clear education-related employment gaps for men and women were Korea, Mexico, Greece and Turkey, where educational differences are small and high educational attainment does not always coincide with higher employment rates.

Figure 5.1. Employment rates among older people rise with educational attainment, 2015

Rates as percentages of the population aged 55-64 by level of educational attainment



Note: "Low" denotes below upper-secondary education, "Medium" upper-secondary and post-secondary non-tertiary education, and "High" tertiary education.

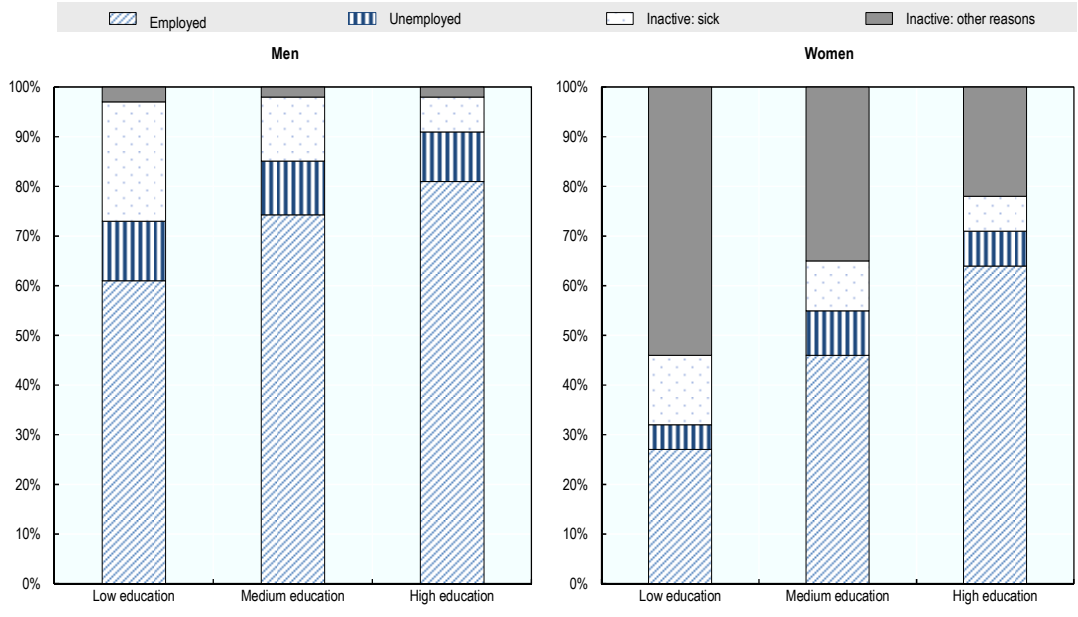
Source: OECD (2015), *OECD Education at a Glance: Educational attainment and labour-force status* (dataset), http://stats.oecd.org/Index.aspx?DataSetCode=EAG_NEAC.

StatLink http://dx.doi.org/10.1787/888933567711

The education-related employment gap later in life narrows with age in absolute terms and widens in relative terms. In absolute terms it narrows on average in the OECD from 29 percentage points among 55-to-59 year-olds with high and low levels of educational attainment to 24 points in the 60-to-64 year-old age group.[1] In relative terms, 55-59 year-olds with low levels of educational attainment were 35% less likely than their well-educated peers to have work, while 60-to-64 year-olds were 41% less likely (see Chapter 2).

The transition from work to retirement in OECD countries also differs with educational background (Figure 5.2). While most older workers with high education are employed until they retire, groups with lower levels of educational attainment are much more likely to retire after spells of inactivity, including for health reasons. The proportion of men not working prior to retirement for health reasons, for instance, is substantially higher among the poorly than the highly educated (24% versus 7%) reflecting socio-economic differences in health (Chapter 2). More than 50% of poorly educated women describe themselves as "inactive" before retirement for reasons other than health[2] – a share that falls to under 30% among their highly educated peers, pointing to retirement differences between these two groups.

Figure 5.2. Last self-declared labour market status before retirement in OECD countries, people retiring between the early 2000s and today



Note: The left-hand column in the left-hand panel indicates that about 60% of men with low education transit directly from work to retirement and slightly above 10% from unemployment, over 20% from sickness/disability. About 5% were out of the labour force for reasons other than sickness/disability immediately prior to retiring. The calculations are based on the assumption that permanently sick people, who do not work, are out of the labour force.

Source: Calculations based on data for 18 OECD countries reported in the Survey of Health, Ageing and Retirement in Europe (SHARE), the United States Health and Retirement Study (HRS) and the English Longitudinal Study (ELSA).

StatLink http://dx.doi.org/10.1787/888933567730

2. Digital technologies drive age inequalities at work

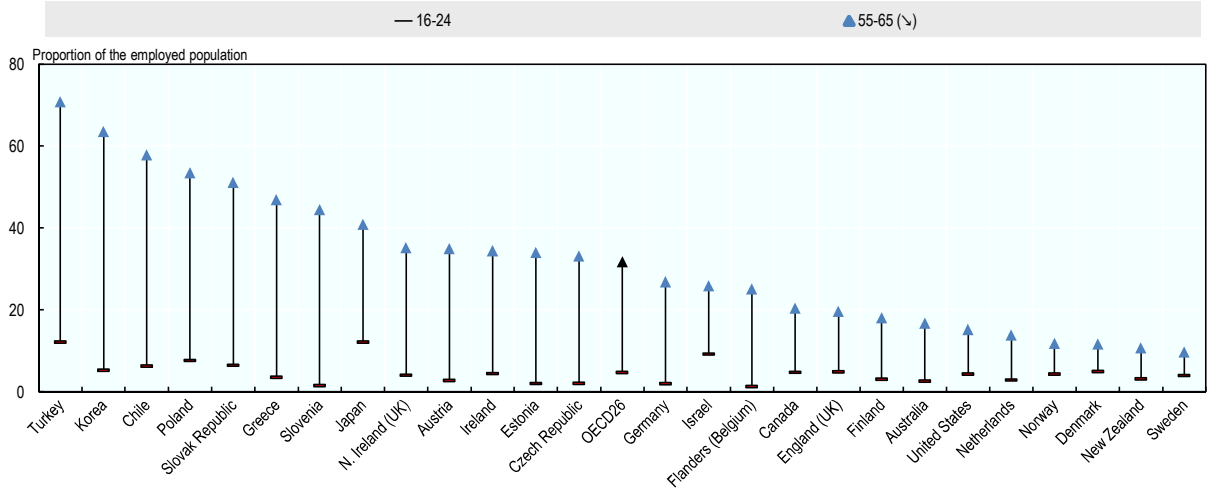
With rapid population ageing and low rates of employment among low-educated older workers, the digitalisation of the economy prompts concern over potential job losses and technological unemployment (OECD, 2016a). Although digital technologies in the workplace carry the promise of greater efficiency and productivity, they may also heighten age-related inequalities. Senior workers are less familiar with them than younger ones, thus less likely to use them effectively in the workplace. Digital technologies are also likely to accelerate skills obsolescence and make the elderly less employable. Some recent studies suggest that the demand for older workers is negatively affected by technological change and innovative work practices (Behagel et al., 2014).

Age gaps in digital technology proficiency

The latest OECD data on skills, employment and technology use provide new evidence on the effects of digitalisation on seniors' employability and well-being. In all OECD countries, proficiency in literacy, numeracy and problem solving in technology-rich environments typically peaks between the ages of 25 and 34, while 55-to-65 year-olds are generally the least proficient of all groups of working age (OECD, 2016b). It is crucial, for both individuals and society, that older workers are not left behind by fast-paced technological change, particularly in a context of rapid population ageing.

The Survey of Adult Skills (PIAAC) shows that even though there are wide variations between individuals of the same age group, older adults are generally much less proficient in computer skills than younger ones. On average, 32% of 55-to-65 year-olds have no computer experience or have failed core ICT tests, compared with 5% of 16-to-24 year-olds (Figure 5.3). Indeed, the figure is lower than 15% among older adults in five countries only – the Netherlands, Norway, Denmark, New Zealand and Sweden.

Figure 5.3. Many older workers have no computer experience or have failed core ICT tests, 2012 and 2015[a]



Note: The OECD average refers to the unweighted average of the 26 OECD countries/economies that participated in the 2012 and 2015 PIAAC surveys.

a) Data for Chile, Greece, Israel, New Zealand, Slovenia and Turkey are for 2015. For all other countries, data is for 2012.

Source: OECD, Survey of Adult Skills (PIAAC) 2012 and 2015, http://www.oecd.org/skills/piaac/.

StatLink http://dx.doi.org/10.1787/888933567749

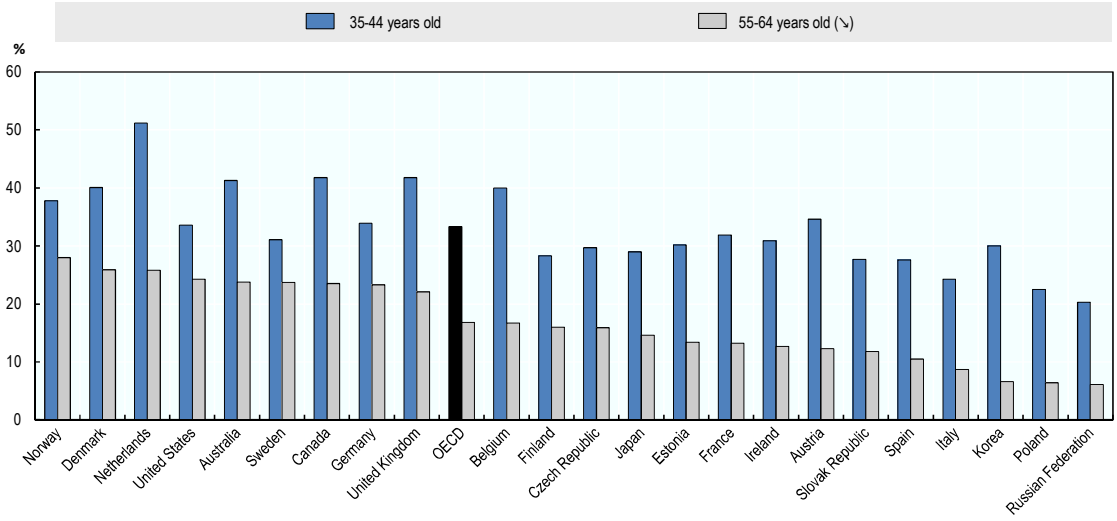
Workplace technology – such as emails, word processing software and Internet – equips workers with the tools they need to be more productive, so increasing efficiency, cutting business costs and enhancing customer service. International data from PIAAC show that the use of digital technologies at work differs significantly between age groups. On average, only 27% of older workers (aged 55-64) use email or the Internet at work daily, against 49% of prime-age workers (35-to-44 years old). There are similar age-related differences when it comes to the everyday use of word processing software and spreadsheets (Figure 5.4).

The age gap in the frequency of digital technology use in the workplace is evident across all PIAAC participant countries. It is particularly pronounced in Korea where the ratio of older to prime-age workers using email or the Internet on a daily basis in the workplace is 1/4. It is also low in Poland and the Russian Federation at 1/3. In all three countries, the routine use of email is very uncommon not only among older workers, but among all workers. Considerable age gaps are also to be found in Austria and Belgium, where older workers are, respectively, 32 and 30 percentage points less likely to use email routinely.

As for word processing software or spreadsheets, the ratio of older to prime-age workers making everyday use of them is 1/4.5 in Korea and 1/3.5 in Poland. There are also significant gaps in the Netherlands and Belgium, where older workers are, respectively, 25 and 23 percentage points less likely to make routine use of processing software or spreadsheets (Figure 5.4). Norway and Sweden, by contrast, stand out as exceptions: age-related differences in digital technology use are less than 10 percentage points.

Figure 5.4. Workers routinely using spreadsheets or word processing software, by age group, 2016

As a proportion of all workers in the same age group



Note: The OECD average is calculated from the OECD countries that participated in the first round of the PIAAC study.

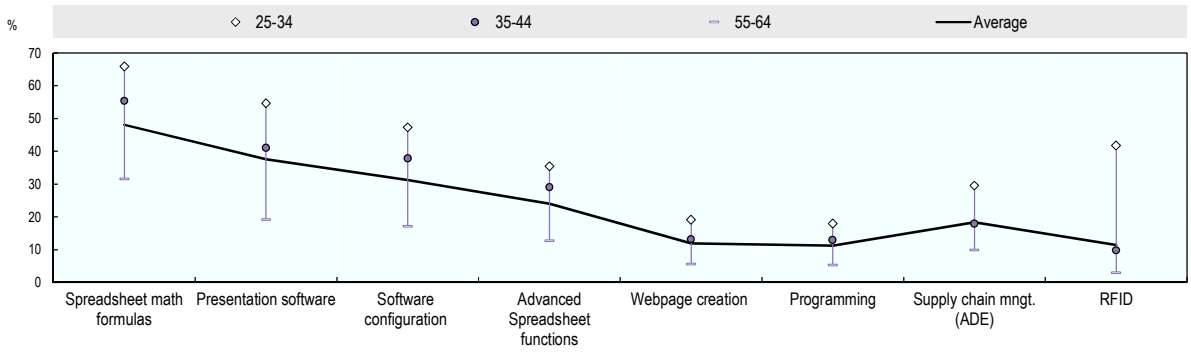
Source: OECD based on the PIAAC dataset.

StatLink http://dx.doi.org/10.1787/888933567768

The gap between older and younger workers in the use of digital technologies increases as technology grows more complex (Figure 5.5). In OECD countries, prime-age workers are 1.7 times more likely to make frequent use of simple spreadsheet

mathematical formulas than older workers. Fifty-five per cent make basic use of spreadsheets, compared to 32% of their older peers, a gap of 24 percentage points (55% vs. 32%). As for the frequent use of advanced spreadsheet functions, the gap is 16 percentage points in absolute terms – 29% versus 13% – with prime-age workers 2.3 times more likely than their elders to use them. The countries with the widest age gaps in the use of increasingly complex software functionalities are Turkey and Ireland, where younger workers are respectively 3.1 and 4.4 times more likely to use them.

Figure 5.5. Age differences in the use of increasingly complex software, average across countries, 2016



Note: RFID refers to radio frequency identification technologies.

Source: OECD findings based on Eurostat Information Society Household Survey.

StatLink http://dx.doi.org/10.1787/888933567787

Factors that shape digital technology age gaps

What shapes age-related differences in the use of digital technologies? Among the competencies measured by PIAAC, proficiency in problem solving in a technology-rich environment (PRSTE) may be regarded as a good proxy for assessing the ability to perform increasingly complex ICT-related tasks (OECD, 2016c). As proficiency in PRSTE declines with age, the question is whether older workers' lower-intensity use of digital technologies results only from their less advanced digital skills or from their generally poorer levels of educational attainment, too.

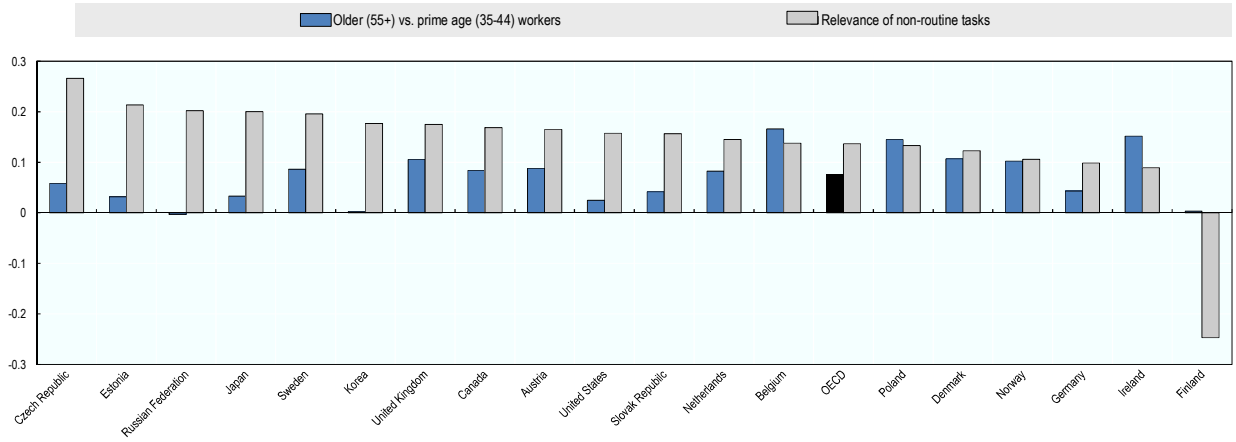
The PIAAC findings indicate that the effect of PRSTE proficiency on the routine use of email or Internet in the workplace becomes quantitatively negligible after controlling for educational attainment. One additional year of education is sufficient to increase the odds of using emails or the Internet on a daily basis by 35 percentage points on average across countries. However, higher educational attainment alone is not enough to address age-related differences. Older workers are 30% less likely to make daily use of emails or the Internet than their prime-aged (35-44 years old) peers with similar educational attainment. Indeed, the use of emails and Internet varies significantly with age in the vast majority of countries. Exceptions are Finland, Japan and Sweden where – once the effects of proficiency in PRSTE, years in education, gender and marital status are accounted for – older workers' use of email or the Internet is not significantly different from that of prime-age workers.

In addition to educational attainment and skills levels, the nature of the occupation helps explain age-related differences in the use of digital technologies. After controlling for years in education and ICT proficiency, it might be assumed that age differences between workers employed in similar types of occupations tend to fade. However, data

analysis shows that, while the level of routine tasks in an occupation matters, age-related differences in the degree of digital technology use persist. Working in occupations that entail more non-routine tasks, for example, increases the likelihood of using emails or the Internet daily in the workplace by 14 percentage points on average in the OECD (Figure 5.6). When older workers (over the age of 55) move into jobs that require them to carry out a greater number of non-routine tasks, their use of communication and office productivity software rises by an average of 8 percentage points more than among prime-age workers (35-44 years old) and by as much as 17 percentage points in Belgium and 15 in Poland and Ireland.

Figure 5.6. Daily use of email or the Internet, by routine-task intensity of occupation, 2016

Average marginal effects of routine-intensive jobs on the likelihood of using emails or the Internet daily



Note: The grey bars indicate the extent to which performing non-routine tasks affects the probability of using emails or the Internet daily regardless of age. Darker blue bars indicate the extent to which carrying out non-routine tasks increases older workers' relative probability of using emails or the Internet daily in comparison with their prime age peers. The "OECD average" bars compute the average effects for the OECD countries participating in the first round of the PIAAC study.

Source: OECD based on the PIAAC dataset.

StatLink http://dx.doi.org/10.1787/888933567806

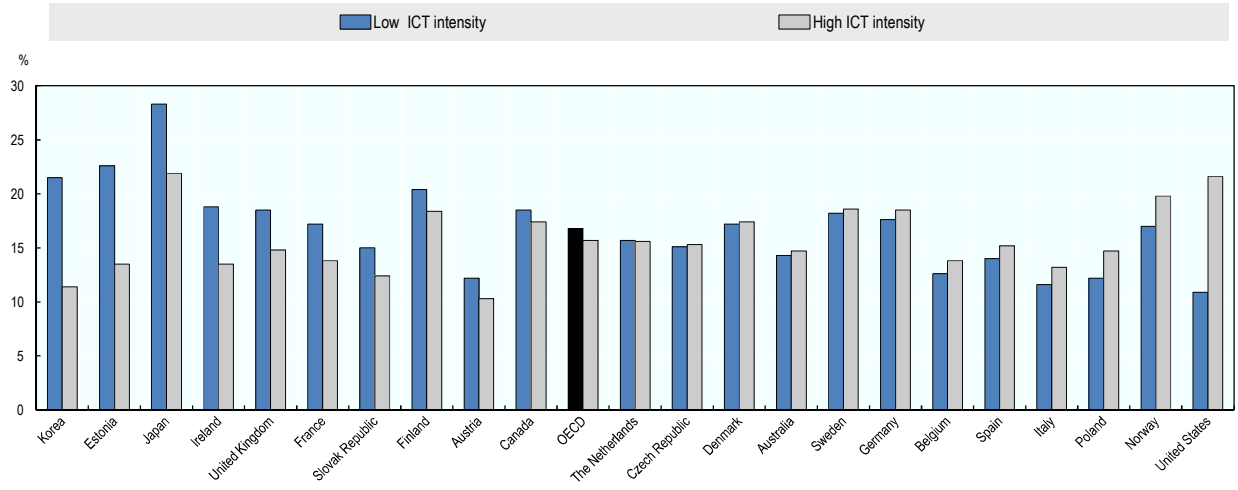
Age-biased technological change and labour market outcomes

ICT intensity of occupations and employment composition by age groups

The risk of unemployment tends to be lower in technology-intensive occupations, but older workers are less likely to work in them than their prime-age peers. Likewise, ICT-intensive occupations employ a relatively younger population. For example, the 18%-share of older workers in relatively lower-tech occupations falls slightly to 15% in more technology-intensive ones (OECD, 2017).

In some countries, the share of older workers in the employed population drops rapidly as occupations become more technology-intensive (Figure 5.7). This is the case, for example, in Korea, Estonia and Japan, where the percentage of older workers in highly technology-intensive occupations is between 6 and 10 percentage points less than in low-tech jobs. In the United States, by contrast, the percentage of older workers is significantly greater (over 10 percentage points) in occupations which are very technology intensive.

Figure 5.7. Share of older workers (55-64) in total employment in occupations where ICT intensity is low and high, 2016



Note: The OECD average is calculated as the average of the OECD countries that took part in the first round of the PIAAC study. The countries are ordered according to the difference between the share of older workers in jobs with high ICT intensity minus the share of older workers in jobs with low ICT intensity.

Source: OECD based on the PIAAC dataset.

StatLink http://dx.doi.org/10.1787/888933567825

Do digital technologies heighten older workers' risk of unemployment?

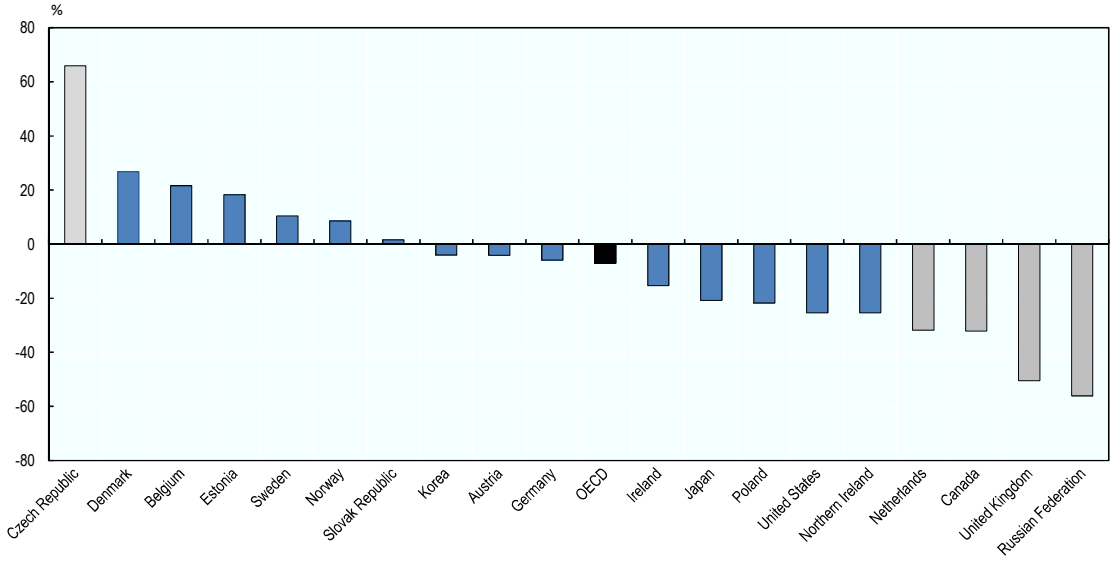
Evidence for the 2008-12 period shows that workers in more technology-intensive and innovative sectors have a lower risk of unemployment (OECD, 2017). However, older workers appear to be dismissed in greater numbers than younger workers at times of lay-offs. For every prime-age worker who loses his or her low-tech job, 1.7 older ones lose theirs'. In technology-intensive occupations the ratio rises to 1/2.9. Age inequalities may also exist in labour markets that are characterised by high levels of technological intensity and change.

In that regard, a recent OECD study explored the extent to which job losses between 2008 and 2012 could be attributed to technological change, educational attainment, technology intensity and ageing (OECD, 2017). The OECD findings suggest that, while the risk of unemployment generally falls with educational attainment, proficiency in PRSTE, and with the technology-intensive nature of an occupation, controlling for these three factors does not eliminate age-related differences in the risk of job loss. During the period 2008 to 2012, older workers were almost three (2.8) times more likely than their prime-age peers to lose their job.

At the sector level, fast-paced technological change does not generally seem to put older workers at greater risk of unemployment. Only in the Czech Republic was technological change estimated to affect them more significantly than their prime-age peers. Indeed, working in a sector undergoing technological change actually lessened the risk of unemployment among older workers in the Netherlands, Canada, the United Kingdom and the Russian Federation (Figure 5.8). Similarly, older employees working in non-routine occupations are no more at risk of unemployment than their younger peers. As in the case of ICT specialist occupations, being employed in a non-routine intense job offsets the negative impact of ageing on the likelihood of a job loss in the five years prior to the survey.

Figure 5.8. Effects of technological change on the risk of unemployment among older workers (aged 55-64), 2016

The risk of unemployment is measured relative to the risk for prime-age workers (35-44 years old)



Note: The graph displays older workers' relative unemployment risk in sectors characterised by high degrees of technological change. The y axis corresponds to the changes in the probability to fall into unemployment. Unemployment risk is measured as the probability to fall into unemployment between 2008 and 2012. Grey bars indicate statistically significant percentage changes in the probability of falling into unemployment, dark blue bars reflect changes that are statistically not significantly different from 0.

The OECD average is the average calculated for the OECD countries that took part in the first round of the PIAAC study.

Source: OECD based on the PIAAC dataset.

StatLink http://dx.doi.org/10.1787/888933567844

Lifelong learning

At the aggregate level, technological change does not seem to penalise older workers more than prime-age workers. However, age-related differences in the use of digital technology can put older workers at a disadvantage. If they are to extend their working lives, then they must have access to lifelong learning programmes that address the skills needs of technology-intensive occupations in the digital economy (Section 3) and enable them to upgrade and acquire new digital skills. Lifelong learning opportunities for all are indeed crucial to fighting age-disparities. Age-related differences in the use of digital technologies are not attributable only to older workers' lack of the required skills, however. They also reflect the fact that older people generally work in more heavily routinised occupations than the younger generation. In order to improve their access to non-routine jobs, lifelong learning programmes should be designed to strengthen the skills required to perform jobs that comprise non-routine and non-manual tasks.

3. Inclusive labour markets for older workers

Equal-opportunity employment policies are not age-specific. Rather, they seek to support at-risk groups, irrespective of their age. That is one of the key messages delivered by the OECD Recommendation of the Council on Ageing and Employment Policies (OECD, 2016b). Older workers are a very diverse group. Many do well in the labour market, while others struggle to find and hold on to jobs, very often because they lack sufficient skills.

Older workers belong to a generation that was initially less well educated than their younger colleagues and are much less likely to take part in job-related training. The additional risks of obsolete skills and reduced work capacity due to health problems (Section 5) tend to increase with age. The right policies could both mitigate those risks and harness older workers' assets – their experience for example – which are often not fully exploited (Section 5). Promoting the employability of workers throughout their working lives – with a view to strengthening labour market opportunities at an older age – is key to preventing unequal ageing. And as populations age rapidly, it is essential not only to mobilise the potential workforce as much as possible but also to increase labour productivity, which requires a healthy, albeit greying, workforce with relevant skills.

Investing in effective skill development strategies over the life course

Providing equal opportunities for workers to upgrade their skills and learn new ones at all ages

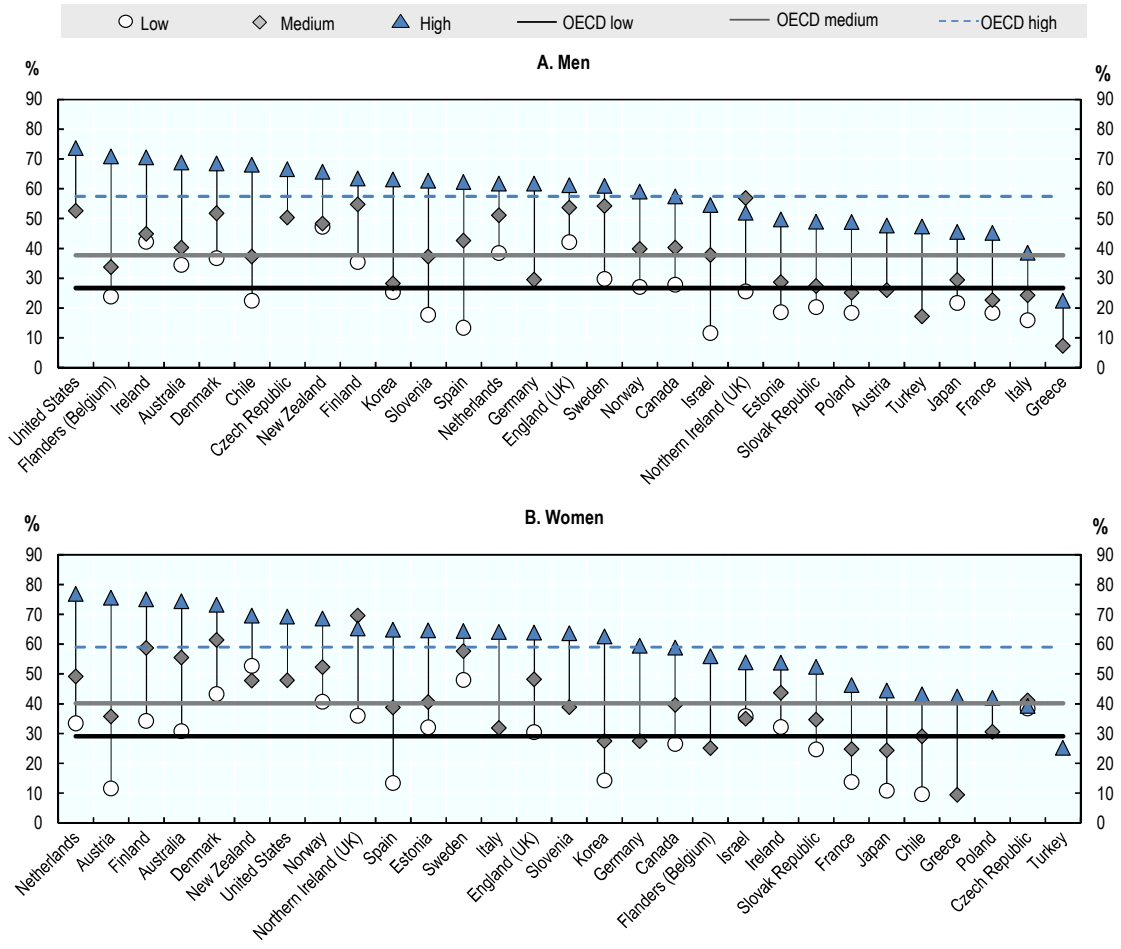
Workers who maintain and upgrade their competencies by training during their working life fare better in the labour market. They enjoy better employment prospects and better jobs. And upskilling becomes even more necessary with the digitalisation of the economy (Section 2). Yet, the most disadvantaged groups in the workforce – who include older workers – also receive less training, which further worsens their disadvantage. Moreover, as learning is inherently a dynamic process, vulnerable groups are prone to getting trapped in situations where they seldom have access to training. Their skills thus remain weak or deteriorate over time, which, in turn, makes it harder for them to draw benefit from learning activities.

Education helps increase older people's employment rates and improves their access to continuous training, to skills upgrading and to rewarding employment opportunities. And even if there are wide variations in elder employment rates between countries, those rates rise strongly with higher levels of educational attainment (Section 1). Furthermore, access to continued training is dictated primarily by workers' levels of initial education.

Thus, far from correcting the inequalities inherited from school, adult education reinforces them over the life course. On average, according to PIAAC data, access to training among employed men aged 55-to-65 increases steeply as their level of educational attainment rises – from 27% of employees with no upper-secondary education to 38% for those who completed upper-secondary education, and 57% among workers with higher-education qualifications (Figure 5.9, Panel A). The same is true of older women, so there is almost no gender gap in older workers' access to training (Panel B). Country differ strongly, however; those with the narrowest education- and gender-related age gaps are Denmark, New Zealand and Finland.

Figure 5.9. Highly educated older workers are, on average, more likely to have access to continued training, selected OECD countries,[a] 2012 and 2015[b]

As a percentage of employed individuals aged 55-65, by low, medium and high levels of educational attainment[c]



a) OECD average refers to the unweighted average of the 29 OECD countries/economies that participated in PIAAC.

b) Year 2015 for Chile, Greece, Israel, New Zealand, Slovenia and Turkey and 2012 for all other countries.

c) "Low" level is below upper-secondary level of education. "Medium" denotes education to the upper-secondary level. "High" denotes tertiary educated. The OECD does not publish statistics when the sample size is smaller than five observations per cell. That is the case for Austria, the Czech Republic, Germany, Greece, Turkey and the United States for low-educated employees who take part in training; for Belgium, Germany, Greece, Italy, Poland, Slovenia and the United States for low-educated women who take part in training; and for Greece for medium-educated men and women who take part in training.

Source: Survey of Adult Skills (PIAAC) 2012, 2015.

StatLink http://dx.doi.org/10.1787/888933567863

Relatively few older people attend education or training programmes to improve their skills. Their employment potential suffers as a consequence. Rates of participation in formal and informal training differ substantially from one age group to another (OECD, 2016b): 37% of 50-to-65 year-olds, 57% of 30-to-49 year-olds and 61% of 16-to-29 year-olds.

Older workers' restricted access to job-related training meets employers' perception that it is a poor investment that yields benefits over too short a time. Policy makers must make training more attractive in the eyes of older workers and persuade employers to provide training even after the age of 45. According to the sixth European Working Conditions Survey carried out in 2015, the main issues for workers over 50 are inadequate training provisions and fewer prospects for career advancement (Eurofound, 2016).

Policy should seek to ensure that continuous learning is more work-focused and an integral part of age management. Training for workers approaching the end of their careers should pay off swiftly to ensure positive returns for both employers and employees. It could, for example, be directly tied to a specific task or job. Denmark's *Jobrotation* scheme, for example, encourages firms to train their employees, by providing them with a short-term subsidy to hire a replacement for the employee in training (OECD, 2015b). To receive the subsidy, firms should employ stand-ins who receive unemployment insurance or social assistance benefits. The aim is to combine the upskilling of workers with workplace experience for the unemployed.

Delivering the right job skills to the right people

Adult learning has two main functions:

- equip workers with job-related skills that match employers' needs and yield direct returns in productivity, employability and earnings;
- provide people with foundation skills that have less immediate returns but are essential to the support of lifelong learning.

To be effective, vocational education and training (VET) systems should find the right mix of foundation and job-related skills. Although the mix varies according to the industry, firm, occupation, and individual workers, it is particularly important that it evolves throughout working life, with foundation skills becoming progressively less important as people grow older. Programmes designed along the lines of an apprenticeship concept – combining short classroom sessions with a firm-based approach – are more effective for older workers, as is informal, self-determined training with a clear focus on practical, relevant work issues. Only recently have countries started to promote the access of adults to apprenticeship schemes. One example is New Zealand Apprenticeships, a programme introduced in 2014 and under which all apprentices now enjoy the same level of government support, regardless of age.[3] Previously, support and mentoring were available only to 16-to-21 year-old apprentices.

Providing guidance in lifelong learning helps to improve the match between the training needs of firms and workers. Case studies showed that career guidance stimulates older employees to work on their own employability, to learn new skills and transfer expertise, so increasing job satisfaction. A further positive effect of guidance in employers' age management activities is that it counters negative stereotypes of older employees (Cedefop, 2015). Since 2007, Austria's public employment service, for example, has provided a counselling programme for employers that puts special emphasis on developing life-cycle-oriented educational programmes and disseminating the concepts of "diversity management" and "productive ageing".

Enhancing job quality for workers at all ages

Job quality improves employees' sense of engagement and well-being at work and beyond. Furthermore, there is now abundant evidence that poor working environments can profoundly impair workers' physical and mental health (OECD, 2014a). Against that background, flexible working conditions can have an important bearing on decisions by older workers to keep working or retire. Part-time work should be an option for all older workers, even the most vulnerable. It facilitates phased-in retirement – i.e. transitioning to retirement through gradual reductions in the working week.

In the first place, working conditions should not impinge negatively on workers' health. Second, the workplace should be organised to make the most of a diverse workforce. Both recommendations pertain to all firms, irrespective of their size. Older and younger workers have relative strengths and needs that may give rise to positive externalities. The most obvious strengths of older workers are those that derive from maturity and experience, whereas younger workers may boast more up-to-date skills and the capacity to carry out more physically and mentally demanding work. At the same time, workers have needs and family responsibilities that differ according to their age and relate to how and how fast they work and the balance between work and family commitments. Few OECD countries have taken steps to promote intergenerational partnerships and the initiatives undertaken to date do not seem to have had a decisive impact (European Parliament, 2013a; OECD, 2013a).[4]

Making disability an ability

Health problems are one common reason for withdrawing from the labour market, especially among older workers (Section 5). Yet many of those no longer in employment for health reasons would like to return to work. Occupational health care services and disability policies have a crucial role to play in this respect. Early intervention is often the best way of preventing long-term dependence on benefits – particularly among older workers. They are the group whose long-term absences most often translate into permanent withdrawal from the workforce and definitive loss of human capital for society.

Many countries have, in recent years, sought to strengthen both the work focus of sickness and disability benefits and assessments of remaining work capacity (OECD, 2010). To those ends, reforms have been directed at early detection and intervention, as in Switzerland.

Another example is Finland, where some private and public insurance pension agencies have developed early intervention methods – a negotiation process is required after 90 days of sick leave. Other agencies work on fostering well-being and health in the actual workplace context (Arnkil, 2012). Still in Finland, the Masto project (2007-11) sought to prevent depression and depression-related work disability by tackling mental health problems at an early stage (de la Maisonneuve et al., 2014).

Since 2010, the United Kingdom has required workers absent from work on sick leave for more than seven days to see their general practitioner (GP). The GP must determine whether the worker is fit or not for a certain degree of work and draw up a Statement of Fitness to Work ("fit note") to that effect. Research carried out by the Department of Work and Pension showed that the measure has promoted returns to work.

Sweden drew up a clearly structured framework governing sick leave and the return to work between 2008 and 2010. It sets out a rehabilitation schedule with precise time

limits for testing the ability to work. The reform has improved the possibilities for people on disability benefits to resume work. It has also led to a sharp drop in the number of people on sickness and disability benefits and an increase in the number with partial work capacity now receiving unemployment benefits or activity allowances. Nevertheless, there is room for improving early activation of workers on long-term sick leave (OECD, 2013b).

Several countries have enacted reforms that both restrict access to disability pensions and promote work and the receipt of (partial) disability pensions. Australia, for example, has increased the number of hours that disability support claimants can work without having their benefits cancelled from 15 to 30 per week. In Denmark, the June 2012 reform of the disability pension restricted entitlements to disability benefit to the over-40s and required them to attend a rehabilitation programme before they could receive any disability benefit.[5] Other countries made further improvements to their working capacity assessment methods (e.g. Sweden and Australia).

Employers also play a very important part in moves to improve job prospects for people suffering from ill health or disability. There is a large body of evidence that helping people stay in work is much more effective for sustainable employment than helping them resume after an absence. And, to a large extent, it is employers who decide whether job requirements change with employees' health status, or whether they remain the same, so forcing workers with health issues to take long-term sick leave. It is also up to employers whether a person with reduced work capacity due to health problems is hired for a particular job.

Well articulated information campaigns, together with guidelines and financial support for making the necessary work and workplace adjustments and accommodations, can make employers more receptive to taking on people with ill health or disabilities. Examples of such guidance, particularly for SMEs, include:

- An initiative from the United Kingdom's Department for Work and Pensions designed to promote national occupational health advice services.
- Finland's Forum for Well-being at Work, which ran from 2012 to 2015. It shared information and good practices, increased the availability and visibility of networks and services for occupational well-being, strengthened co-operation, supported partnerships, and singled out successful well-being at work practices.[6]
- In Canada, the Mental Health Commission of Canada (MHCC) issued a National Standard of Canada for Psychological Health and Safety in the Workplace in 2013.[7] It has received very positive responses from unions, employers, employees, and the media, and has been adopted fully or partially by a number of businesses, universities and provincial governments. An evaluation was launched in 2014.

Changing employer attitudes and encouraging them to help vulnerable older workers

Affirmative action – like information campaigns and guidelines – to promote the work capacity of older people is necessary but not sufficient. It needs to be backed up with age-discrimination legislation. Furthermore, there are still objective obstacles which prevent employers from hiring and retaining older workers, especially the most vulnerable. Policy makers should seek to ease such obstacles, especially as raising retirement ages and curbing early retirement are parts of policy responses to longer remaining life expectancy at old age. In the wake of the recent economic crisis and the

rise in elder unemployment, it is particularly critical to continue addressing demand-side issues in order to strengthen the employability of ageing workers (Sonnet et al., 2014).

Persuasion and coercion, two sides of the same coin

To counter negative employer attitudes, policy makers must take affirmative action and coercive measures. Concrete affirmative action to change employer practices has mostly entailed awareness campaigns, tool kits, and the promotion of best practices. Action has also included consulting and working with the social partners, and consultative forums or councils involving actors across sectors and disciplines are now quite widespread. However, there have been few sound evaluation studies of the effectiveness of pro-age measures.

Most coercive measures are related to the issue of age discrimination in a number of dimensions, including recruitment, career prospects and training as well as perceived low productivity. Evidence suggests age discrimination persists in hiring and other employment-related decisions, such as promotion. According to Davey (2014), legislation outlawing age discrimination in the workplace has had limited success as it is often hard to establish that it has occurred, "because much of it is not overt, and discriminatory practices are deep seated in business culture". Neumark and Song (2013) found that, in the United States, tougher laws boosted recruitment rates among older workers trying to work longer hours in response to social security reform. They also found that anti-ageist legislation may extend working lives by easing the transition to bridge employment or jobs on partial retirement.

Even though the EU directive issued in 2000 on equal treatment in employment and occupations required all member countries to have anti age-discrimination legislation in place by 2006, there is still a perception of age discrimination in Europe. A Eurobarometer survey (2012) found that 21% of respondents in Europe reported having been discriminated against on the grounds of age in the workplace in 2011 or had witnessed such discrimination (though only 6% reported it). The Netherlands has taken robust measures against age discrimination, such as the screening of vacancy adverts. In France, the public employment service has developed a job simulation recruitment method whereby new hires are selected for their aptitude without regard to age or previous work. Yet neither this tool nor the use of anonymous CVs are guaranteed to eliminate discrimination in hiring, for they are effective only in the first stage of the selection process. Moreover, they also preclude pro-age affirmative action in organisations that practice it (Behaghel et al., 2011).

In this context, the practice of mandatory retirement in firms has been called into question, as it may be considered to run counter to the principle of non-discrimination on the basis of age. Mandatory retirement is the practice of requiring workers to retire at a statutory age. As a result, employers can re-employ them only if they have retired and on a new contract, depending on national regulations on combining work and pension receipt.[8] Organisations representing older people are generally favourable to eliminating any reference to age when it comes to mandatory retirement (AARP, 2016; Age Platform Europe, 2010). Suitability for employment should be based on competence and health rather than age. In 2013, the European Parliament recommended that European Union member states should "put a ban on mandatory retirement when reaching the statutory retirement age, so as to enable people who can and wish to do so to choose to continue to work beyond the statutory retirement age or to gradually phase in their retirement" (European Parliament, 2013b).

Ending mandatory retirement altogether is certainly not without controversy. There are good economic reasons both for and against. Employers in particular often argue that their businesses could not run as efficiently without it. And, as it is difficult to measure the performance of older workers objectively, mandatory retirement is a convenient mechanism for parting with unproductive workers. Ultimately, though, why should someone who still performs well be forcibly retired just because of age? The United States progressively raised the minimum age of mandatory retirement in 1978 and eventually discontinued mandatory retirement altogether in 1986. Of course, employers will struggle more without compulsory retirement in countries where employment protection rules are very rigid. But these difficulties should be another reason for reforming such rules and affording employers greater flexibility in dismissing ageing workers for poor performance and retaining those who do well.

Mandatory retirement is still in place in many OECD countries. Age limits in some collective labour agreements remain a barrier to working at an older age and send out the signal that the ability to work is diminished beyond a certain age. In 2013, the United Kingdom was the only European OECD country that had abolished any mandatory retirement age, as have four non-European ones (Australia, Canada, New Zealand and the United States).

France is one of the few in the OECD where the mandatory retirement age for private-sector workers is higher than the age at which the full rate pension kicks in. In 2009, the government raised it to 70. For public-sector workers, by contrast, there is still a full-pension age limit (67 years in 2017) even if there are some exceptions. In Norway, however, the 2011 pension reform allows workers to postpone the take-up of pension benefits to the age of 75 on actuarially neutral terms. But, employers were free to fire employees earlier – at 70 until the age was raised to 72 years in mid-2015.

Removing objective barriers to retaining and hiring older workers

A number of objective factors still prevent employers from hiring and retaining older workers. There are two particularly important ones: i) the imbalance between the costs of employing older workers and their productivity, and ii) the imbalance between the need to protect older workers' job and to enhance their labour mobility.

To strike a more even balance between the older workers' productivity and the cost of employing them, a number of countries have introduced wage-subsidy and in-work benefit schemes. They are designed, over a certain period of time, to incentivise companies to employ older workers. Nonetheless, recent praxis shows that a package of placement, training and counselling measures targeted at disadvantaged older workers may be more effective than wage subsidies alone.

Germany placed great emphasis on intensive counselling for the older unemployed under its "Perspective 50 Plus" employment pacts for older workers in the regions, which ran from 2005 to 2015.[9] Another example comes from Canada – the Targeted Initiative for Older Workers programme (TIOW), launched in 2007. It supports older job seekers, typically between the ages of 55 and 64, who live in small, vulnerable communities, helping them to regain a place in the labour market and improve their employability. TIOW projects include a mix of group-based employment assistance services such as peer mentoring, résumé writing, counselling, interview techniques, and job search assistance and employability improvement activities such as skills upgrading and training, work placements, and self-employment assistance. Initially limited to vulnerable communities experiencing high unemployment or significant downsizing, the TIOW eligibility criteria

was broadened in 2014 to communities struggling with skills mismatches or unfulfilled employer demand. Findings from various phases of programme evaluation indicate consistently positive results from which the Government of Canada, in collaboration with provinces and territories, drew a compendium of best practices in 2014.

Policy makers need also to strike the right balance between protecting older workers' jobs and increasing their labour mobility. Greater mobility requires hiring more older job seekers and making older workers more willing and able to move from job to job. Special employment protection rules for older workers can be counterproductive. Policies that penalise firms for laying them off may backfire and actually lead to lower hiring rates or to substitution between younger and older workers. Firms may also seek to avoid penalties through early retirement arrangements. Ultimately, the best form of employment protection for older workers is to improve their employability and increase the range of job opportunities open to them.

4. Health-related ability to work at older ages

Increasing *effective* retirement ages is one main option for addressing the economic impact of population ageing and alleviating old-age inequality. Careers can be prolonged, however, only if workers are in sufficiently good health to work. This section first summarises studies that analyse the health employment nexus and then looks at differences in labour market participation rates between countries, genders and educational groups with similar remaining life expectancies. The results suggest that health alone cannot explain why labour market participation declines so sharply with age even before the retirement age, which points to the importance of other factors leading to early labour market exit (see Section 5). Based on health alone, there seems to be a considerable potential for higher participation rates, especially among women and low-educated men.

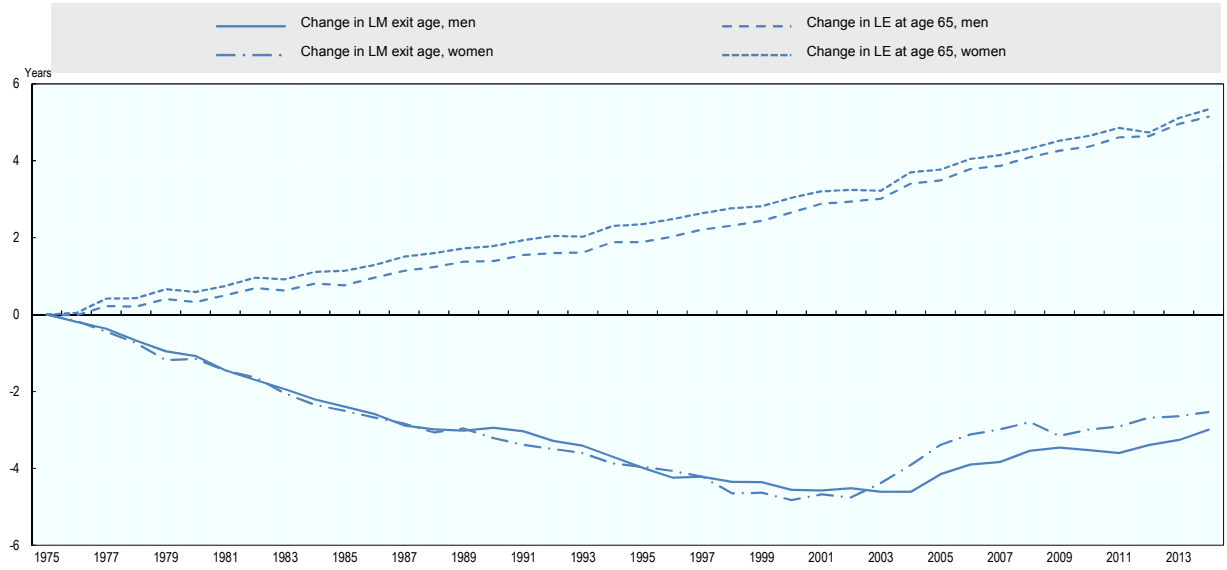
Cross-time and cross age-group comparisons point to greater health-related work potential

Two diverging trends since the 1970s are at odds with the view that poor health is the current key obstacle to higher participation rates at older ages. Life expectancy at the age of 65 has continued to rise rapidly in the OECD since the mid-1970s while the average age of effective labour market exit fell by more than four years between the mid-1970s and the late 1990s (Figure 5.10). Although this second trend reversed around the turn of the millennium, the average labour market exit age is still lower today than it was 40 years ago. These patterns fuel the contention that current labour force participation and employment rates among older people are below what health permits and that, if policies offered stronger work incentives, participation rates would increase.

Several studies have aimed to disentangle health from other determinants of labour supply and demand in order to estimate the potential for additional labour force participation and employment that older people's health really offers. Among them, the project "Social Security and Retirement Programs Around the World: The Capacity to Work At Older Ages" (Coile et al., 2016), initiated and organised by the National Bureau of Economic Research (NBER) in the United States, computes maximum health-related capacities for employment of 50-to-69 year-olds in 12 OECD countries. The estimates suggest that people's health status would permit substantially higher employment rates at older ages in all investigated countries and that the difference between health-related work potential and actual employment increases with age, exceeding 50 percentage points among 65-69 year-olds in some countries.

Figure 5.10. Changes in labour market (LM) exit ages and life expectancy (LE) at the age of 65 among men and women since 1975

OECD averages for 24 countries in years



Note: The trend reversal that led to increases in the effective labour market exit age between the early 2000s and today can be found in most OECD countries, but not all. The effective age of labour market exit was actually higher in 2000 than in 2014 for men in Denmark, Greece, Iceland, Japan and Mexico and women in Greece, Ireland and Mexico.

Source: OECD estimates. Labour market exit age data are based on the results of national labour force surveys, the European Union Labour Force Survey and, for earlier years in some countries, national censuses. Life expectancy data stem from *OECD Health Statistics* and are based on Eurostat data and national sources.

StatLink http://dx.doi.org/10.1787/888933567882

The first method used in that project compares the employment rates of older men today with those of younger men 40 years ago who had the same mortality rates – they were younger because age-specific mortality rates have fallen over time. The two assumptions underlying the method are: that health-related ability to work depends only on mortality rates, and not on age; and that the relationship between the ability to work and mortality rates has remained unchanged over time. As a consequence, older men's employment rates could increase up to the highest employment rate reached in the past among people with comparable mortality rates. This maximum rate is termed as the highest "health capacity to work". As labour markets and population demographics have changed over time, the maximum work capacity computed by the first NBER method depends heavily on the choice of the year of comparison.

A second method in the NBER project, which is more statistically elaborate, supports the project's overall findings and confirms that health would permit higher employment rates in all the countries in the study. It compares current older workers to their younger peers today, controlling for health differences between them and for many additional individual characteristics. The employment differences that cannot be attributed to health must be ascribed to other factors, such as different financial incentives to work or labour market opportunities.

Relationship between labour participation and life expectancy confirms greater work potential

Life expectancy and labour force participation across population groups and countries

This section now turns to an analysis of the relationship between remaining life expectancy and labour force participation in the OECD today, which is crucial to understanding the degree to which health accounts for low workforce participation rates at older ages. It compares remaining life expectancy and labour force participation among different population groups, which differ by age, gender, educational attainment and country.

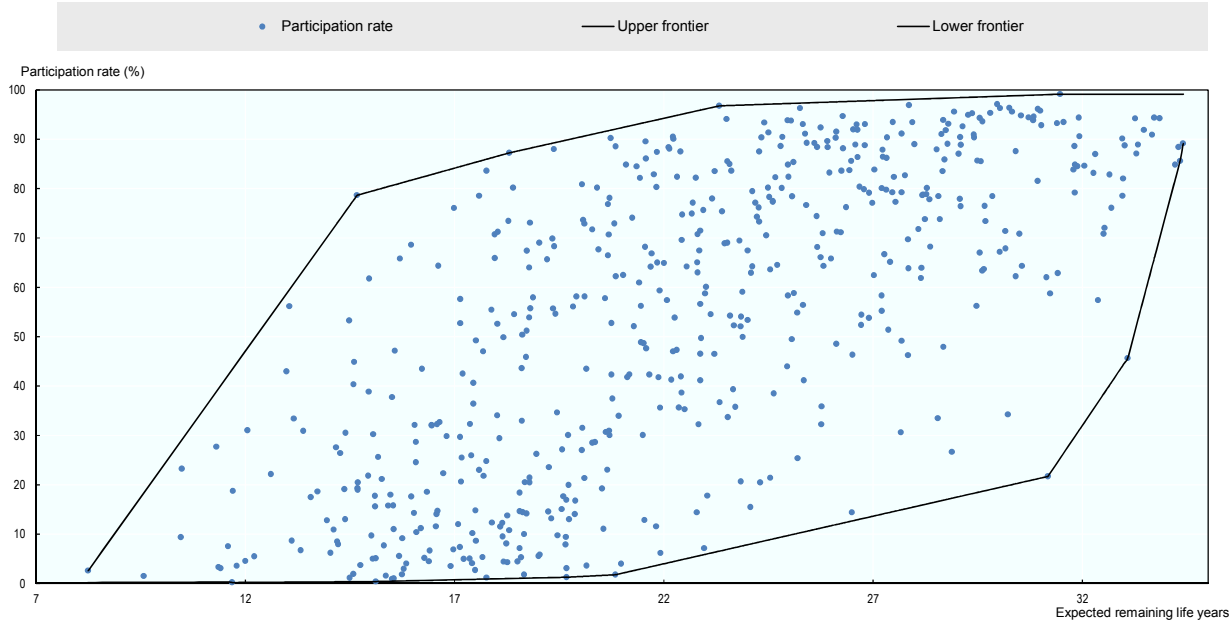
The analysis draws on a mortality-based measure to approximate the health-related ability to work. Although not all ill-health conditions lead to increases in mortality, health and mortality are closely linked. According to WHO estimates, over 90% of gains in life expectancy at birth since the year 2000 have translated into disability-free life years.[10] Moreover, many alternative health measures suffer from shortcomings, e.g. unavailable data at the gender-age-education level for some countries. As a result, the analysis focuses on remaining life expectancy, assuming that mortality rate differences capture the health disparities that matter for work capacity reasonably well.

Figure 5.11 plots the relationship between the remaining life expectancy and labour force participation of workers in their 50s and 60s in OECD countries. Each data point represents a population sub-group characterised by educational attainment (high, medium, low), a five-year age group (50-54, 55-59, 60-64 and 65-69 years old), gender and country. The two curves that encompass the data points reflect the upper and lower frontiers of labour market participation in the data.[11] When a data point lies on the upper frontier, no other group with a comparable life expectancy has a higher participation rate, which suggests that the group fully exploits its work capacity. When a point lies on the lower frontier, there is no example of a group with a comparable life expectancy and lower labour force participation. In these cases, health would permit substantially higher participation rates.

Three main insights can be gained from Figure 5.11.

- Labour force participation rates tend to be higher when expected remaining life times are longer. The inference is that older and less well educated people, who both have lower remaining life expectancies, participate less in the labour market. The pattern holds true even though labour force participation among women – who can expect to live longer – is lower than among men.
- The upper frontier is concave. In other words, when the remaining life expectancy is short (in older age-groups for example) improving health (i.e. lengthening life expectancy) has a stronger effect on the maximum work capacity.
- Labour force participation rates differ substantially between population groups with similar remaining life expectancy – a finding that suggests that bad health alone can explain low participation rates at older ages to a limited extent only. Additional factors, including financial incentives in the pension system, wealth and education, are likely to be very important.

Figure 5.11. Labour market participation among older workers in their 50s and 60s and remaining life expectancy, 2015 or latest



Note: Each blue data point in the graph corresponds to a population subgroup that is characterised by the following characteristics: educational attainment (high, medium, low), a five-year age group (50-54, 55-59, 60-64 and 65-69 years old), gender and country.

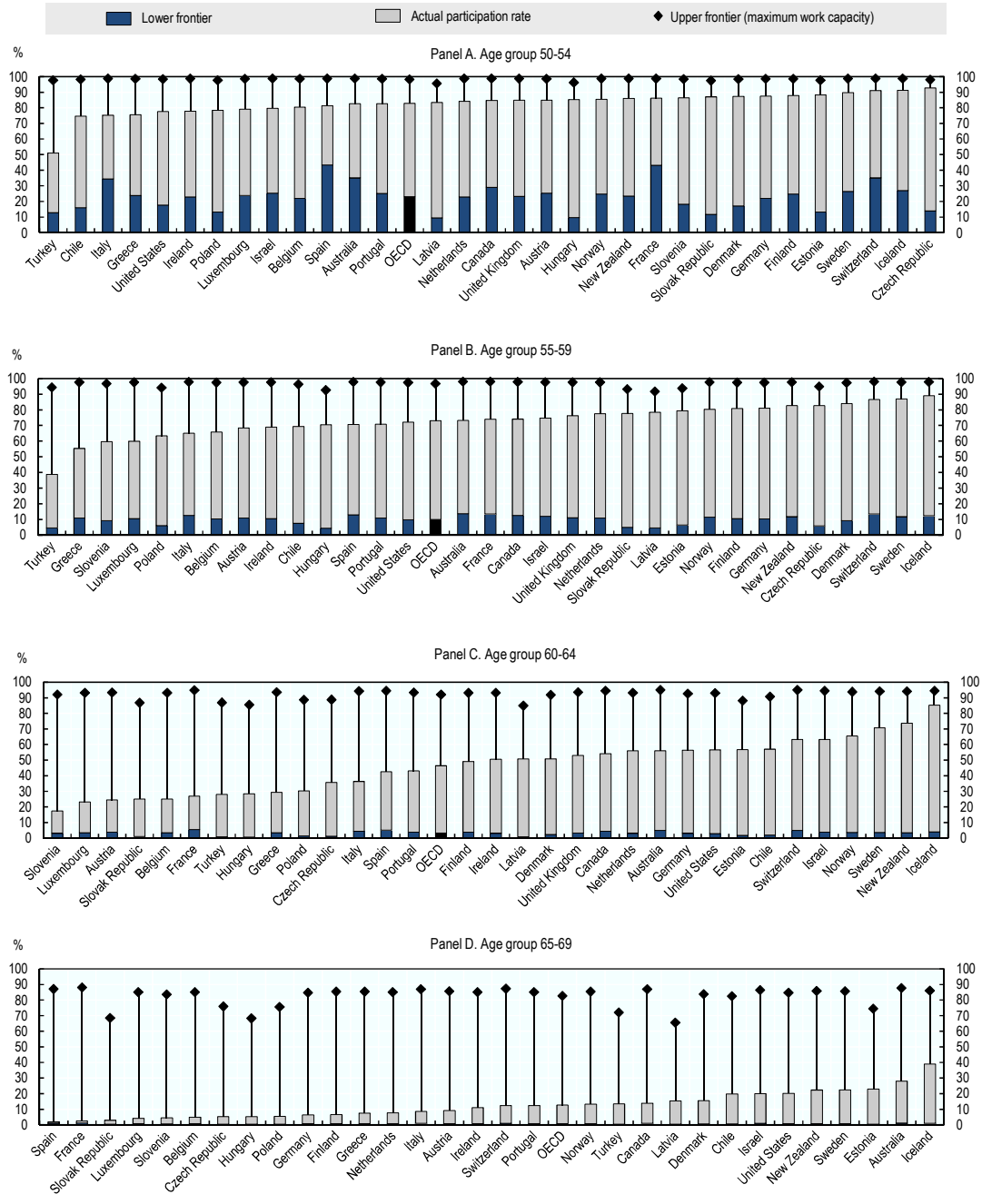
Source: *OECD Employment and Labour Market Statistics* and *OECD Health Statistics*.

StatLink http://dx.doi.org/10.1787/888933567901

Unused work potential differs with age

While participation rates in the 50-to-54 age bracket lie about 15 percentage points below maximum work capacity on average across OECD countries, the difference between work capacity and actual participation grows with age (Figure 5.12). At ages 50-to-54, the health-related capacity to work is very high in almost all OECD countries, often greater than 95%, meaning that there are examples of population subgroups in the data with comparable life expectancies and almost full labour market participation. At the same time, the OECD average rate of labour market participation among 50-54 year-olds is relatively high as well, at about 83%. At ages 65-69, participation is a lot lower, the OECD average stands at 13%, while the health-related work capacity remains comparatively high, at 82.5% on average, leading to a large difference between work capacity and actual participation. The age-related drop in participation rates in almost all OECD countries is steeper than can be explained by health alone.

Figure 5.12. Labour force participation among older workers: Actual rates, upper frontiers (estimated maximum health-related work capacities) and the lower frontiers of labour force participation, 2015 or latest available year



Note: The actual participation rates of each age group displayed is computed as the percentage of workforce participants in the total population of each age group averaged across the genders. Maximum work capacity and the lower frontiers refer to the maximum and minimum participation rates observed in population groups with comparable remaining life expectancy (see Figure 5.11). United Kingdom data for the 65-69 age group are missing.

Source: *OECD Education at a Glance* (database), http://stats.oecd.org/Index.aspx.

StatLink http://dx.doi.org/10.1787/888933567920

Unused work potential differs by gender

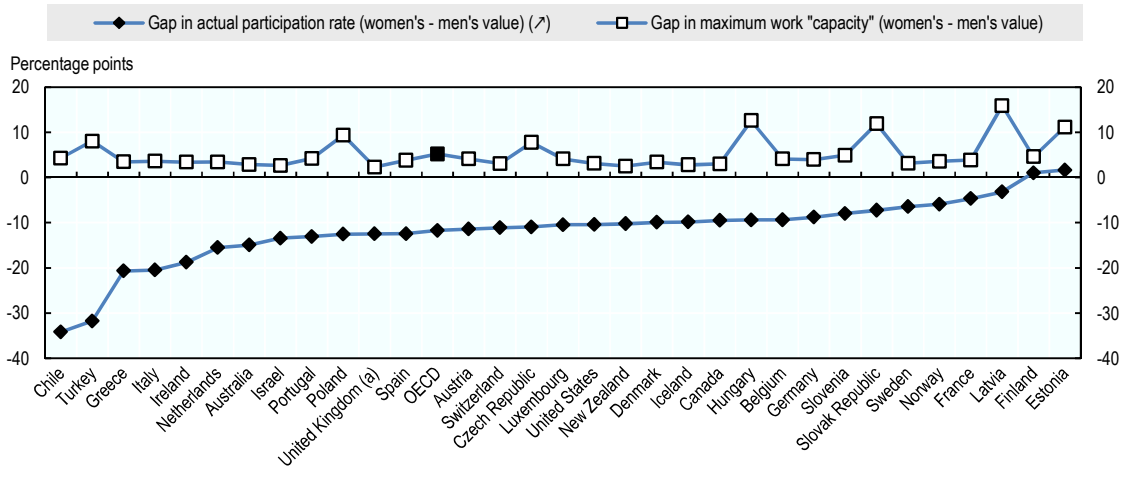
In all countries, except for Estonia and Finland, the labour force participation rates among men between 50 and 69 are higher than among women (Figure 5.13) – by more than 30 percentage points in Chile and Turkey. The OECD-wide average difference is close to 12 percentage points, which points to a considerable gender gap among cohorts born between the mid-1940s and the mid-1960s.

As women live longer, their health-related potential for working at older ages should be greater than men's according to the methodology used above, by 5 percentage points on average. Yet it may be that remaining life expectancy is a distorted measure of health-related ability to work. Non-fatal health problems can prevent people from working without making more likely they will die early. Such health problems are particularly frequent among older women and translate into higher female disability rates.[12] When controlling for disability, the gender gap in health-related work capacity shrinks to low levels in nearly all countries in the sample. In 20 out of the 23 countries for which this measure is available, the gender gap drops to below 1 percentage point, as accounting for the differences in disability between men and women offsets the differences in total life expectancy.[13]

Employment gender gaps are thus attributable mostly to non-health factors. Irrespective of the health measure, the data reveal greater unused work potential among women than men in nearly all countries. Other factors seem to be more important than health in explaining labour market participation gaps between men and women. Among them are wage gaps, different retirement ages[14] and social norms, which result among other things in a larger share of women engaging in care tasks for family members.

Figure 5.13. Gender gaps in labour force participation among 50-69 year-olds, 2015 or latest available year

Actual rates and estimated maximum health-related work capacity



Note: The gender gaps shown for the 50-69 year-old age group are computed as the average of the gaps in the 50-54, 55-59, 60-64 and 65-69 year-old age groups.

a) Due to data restrictions, the data reflect the 50-64 instead of the 50-69 age group.

Source: Calculations based on *OECD Employment and Labour Market Statistics* and *OECD Health Statistics*.

StatLink http://dx.doi.org/10.1787/888933567939

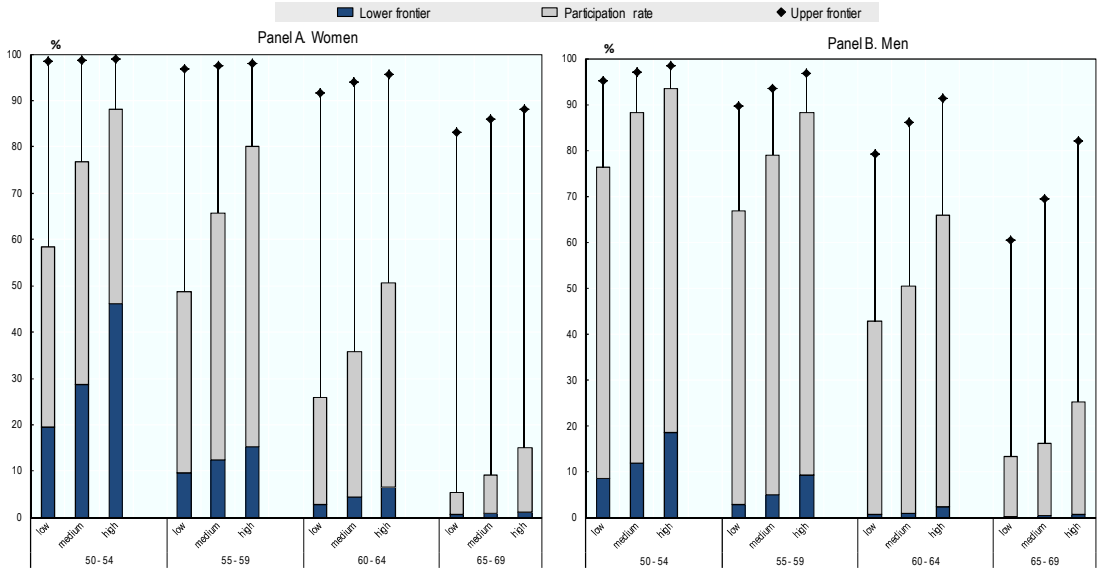
Unused work potential differs by level of education

While low-educated people in all age groups lag behind their highly educated peers on the labour market, they also suffer from worse health conditions (Chapters 2 and 4 and Section 5). However, average health differences by level of education among people in their 50s account for differences in labour market participation to a limited extent only: at these ages, the health-related capacity to work is still relatively similar across educational groups (Figure 5.14). As a consequence, most of the wide education gap in actual labour market participation – 14 percentage points out of the 17 percentage points difference between poorly educated men at age 50-54 in OECD countries and their highly educated peers – is attributable to reasons unrelated to health. As for women of the same age, the difference in health-related work potential between the high-educated and the low-educated is below 1 percentage point whereas the difference in actual labour market participation between educational groups amounts to 30 percentage points. Non-health factors explain why people in their 50s lag so far behind on the labour market when they have low educational attainment – particularly in the case of women.

Education-driven differences in maximum work capacity are more marked at older ages because health differences, as proxied by gaps in remaining life expectancy, influence work capacity more strongly at these ages.[15] However, discrepancies in actual participation rates by level of education tend to match differences in maximum work capacity. This implies that the difference between work potential and labour force participation does not vary much across education levels among people in their 60s; by only 10 and 5 percentage points on average among 65-to-69 year-olds in OECD countries for men and women, respectively, between the high- and the low-educated. That is, health increasingly contributes to disparities in labour market participation between educational groups as people age.

Figure 5.14. Differences in estimated health-related work capacity between educational groups, 2015 or latest available year

Actual rates and frontiers by age groups and genders, averages for 22 OECD countries



Note: "Upper frontier" and "lower frontier" refer to the maximum and minimum participation rates observed among population groups with comparable remaining life expectancy (see Figure 5.11). Data refer to 2015 or latest available year.

Source: *OECD Education at a Glance* (database), http://stats.oecd.org/Index.aspx.

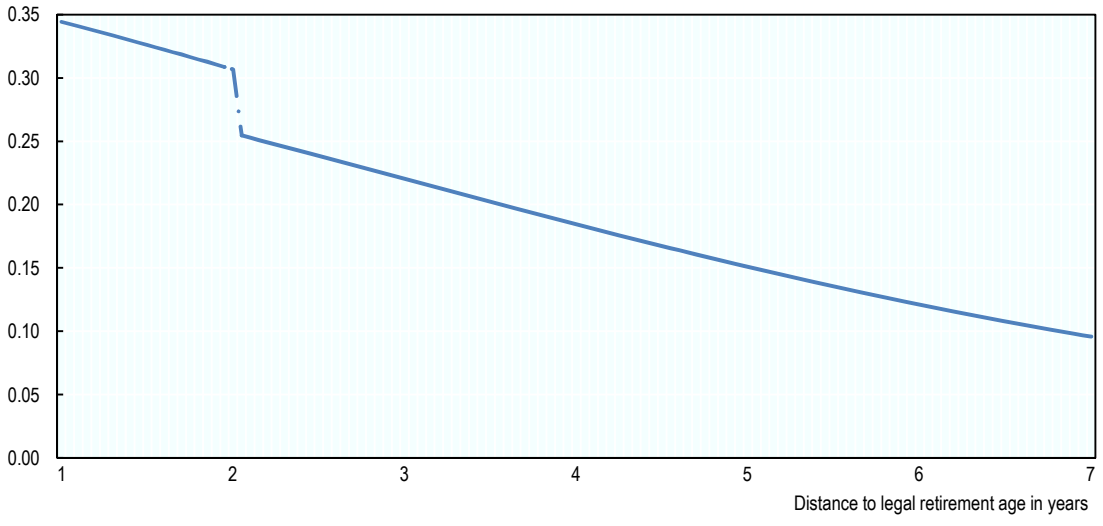
StatLink http://dx.doi.org/10.1787/888933567958

5. Barriers to longer working lives and the retirement decision

This section reports the results of an OECD analysis that seeks to quantify the impact of various determinants of the decision to retire – such as pension system parameters, health, working conditions and other personal characteristics (Luske and Rocard, 2017). The analysis draws on data from the Survey of Health, Ageing and Retirement in Europe (SHARE), the English Longitudinal Study of Ageing (ELSA) and the Health and Retirement Study (HRS) in the United States. It considers workers who were in employment when they entered the survey in 2010/11 and estimates how likely they were to retire over the following two years (see Box 5.1), taking into account a wide set of explanatory factors.

Pension system parameters strongly influence retirement patterns. As expected, the likelihood of retirement increases as people approach the statutory retirement age (Figure 5.15).[16] Workers with sample-average characteristics who are four years below the statutory retirement age have less than a 20% chance of retiring over the next two years, while those who are only two years short have over a 31% chance.[17] Reaching the statutory retirement age has a strong impact on the probability of retiring, as can be seen by the kink in Figure 5.15. This effect is particularly pronounced among the low-educated.[18]

Figure 5.15. Effect of the time left to legal retirement age on the probability of retiring over the next two years



Note: The figure shows the effect of the time to the statutory retirement age on the predicted probability of retiring over the next two years for a person with sample-mean characteristics in European countries and the United States. A person who is four years younger than the legal retirement age, for instance, has a probability of about 18% of retiring in the next two years if his/her other characteristics, such as health or wealth, match the average values in the sample.

Source: Calculations are based on data from the Survey of Health, Ageing and Retirement in Europe (SHARE), the English Longitudinal Study of Ageing (ELSA), the United States' Health and Retirement Study (HRS), and the MISSOC Comparative Tables on Social Protection.

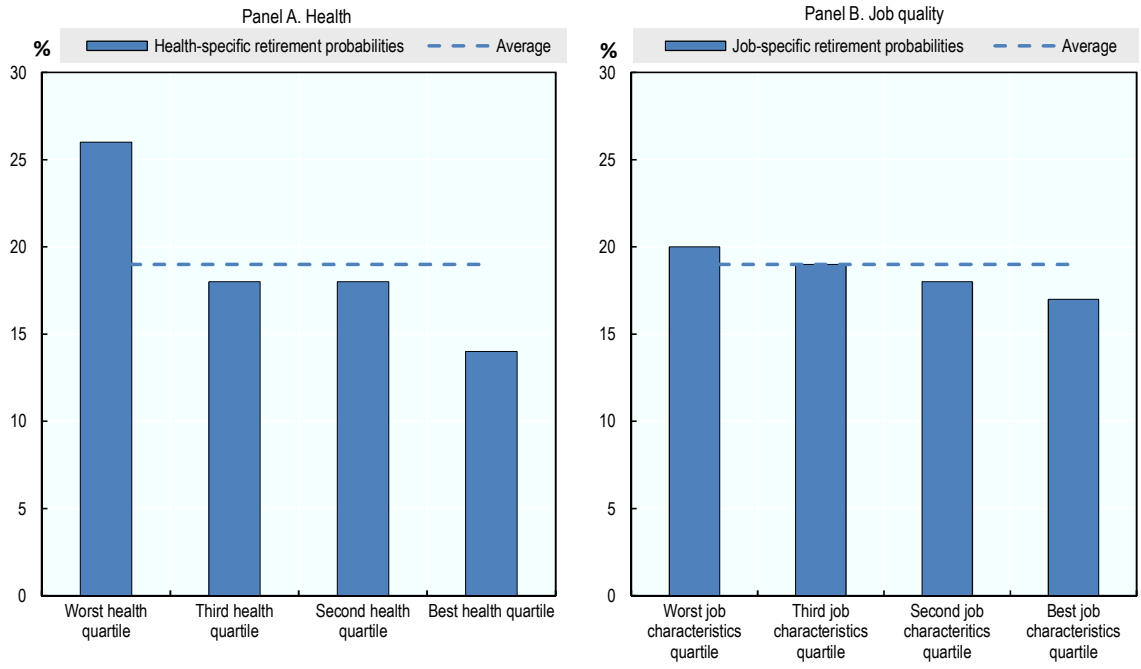
StatLink http://dx.doi.org/10.1787/888933567977

The health status of older workers also affects how likely they are to retire. The OECD computed a health index to evaluate health as comprehensively as possible. It takes into account a wide range of health information, including objective health

measures and self-assessments of health, and permits to divide respondents into health quartiles, i.e. into four health groups (Box 5.1). Men and women who belong to the healthiest 25% of the population and whose age is four years below the statutory retirement age have around a 15% chance of retiring over the following two years (Figure 5.16, Panel A). The probability increases to more than 25% for the unhealthiest 25%. These figures show that health is an important factor for labour market exits even though, as observed above, the steep age gradient in employment rates after the age of 50-55 may be ascribed to worsening health to a limited extent only.

Figure 5.16. Increases in the probability of retirement due to poor health and poor job quality

Probability that a worker aged four years below the statutory retirement age will retire over the next two years, depending on his or her health



Note: Estimates refer to a worker with sample-mean characteristics in European countries and the United States.

Source: Estimates based on the Survey of Health, Ageing and Retirement in Europe (SHARE), the English Longitudinal Study of Ageing (ELSA) and the United States' Health and Retirement Study (HRS).

StatLink http://dx.doi.org/10.1787/888933567996

Working conditions play a role, too, albeit to a lesser extent. The analysis captures them as a summary measure of job characteristics – such as self-assessed career prospects and freedom at work (Box 5.1) – which can be broken down into job quality quartiles. Older employees who enjoy very good working conditions (highest job quality quartile) retire later than those in jobs of poorer quality (Figure 5.16, Panel B). While there is a chance of about 19% that people with average or poor working conditions (the three lowest job quality quartiles) will retire in the next two years if their current age is four years short of the statutory retirement age, this chance drops to 17% among workers with very good working conditions.

Box 5.1. Methodology

The objective of the OECD study on retirement determinants (Luske and Rocard, 2017) is to quantify the factors that shape the likelihood of retiring at a given age. To that end, it uses longitudinal data from 13 OECD countries or territories and multinomial logistic regression techniques.

The longitudinal data stem from Waves 4-5 of the Survey of Health And Retirement in Europe (SHARE), Waves 5-6 of the English Longitudinal Study of Ageing (ELSA) and Waves 10-11 of the United States' Health and Retirement Study (HRS). They include 2 waves per individual and cover the time period 2010/11 to 2012/13 and 13 OECD countries/territories: Austria, Belgium, the Czech Republic, Denmark, England, France, Germany, Italy, the Netherlands, Spain, Sweden, Switzerland and the United States.

The sample includes people who were between 50 and 67 years old in 2010/11 and who were in employment at that time. The dependent variable is their labour status two years later. Possible outcomes for the dependent variable are: still in employment, retired, or no longer in employment for a reason other than retirement – unemployment, sickness or inactivity.

The OECD study uses a large number of regressors in its econometric models to explain the outcome variable. Among these factors are gender, education (levels 0-2, 3-4 and 5-6 of the International Standard Classification of Education *ISCED*), health quartiles, job quality quartiles, income, wealth, the time left until the normal retirement age is reached, a binary variable indicating that a respondent is over the retirement age, marital status, the labour force status of the spouse and the spouse's self-reported health.

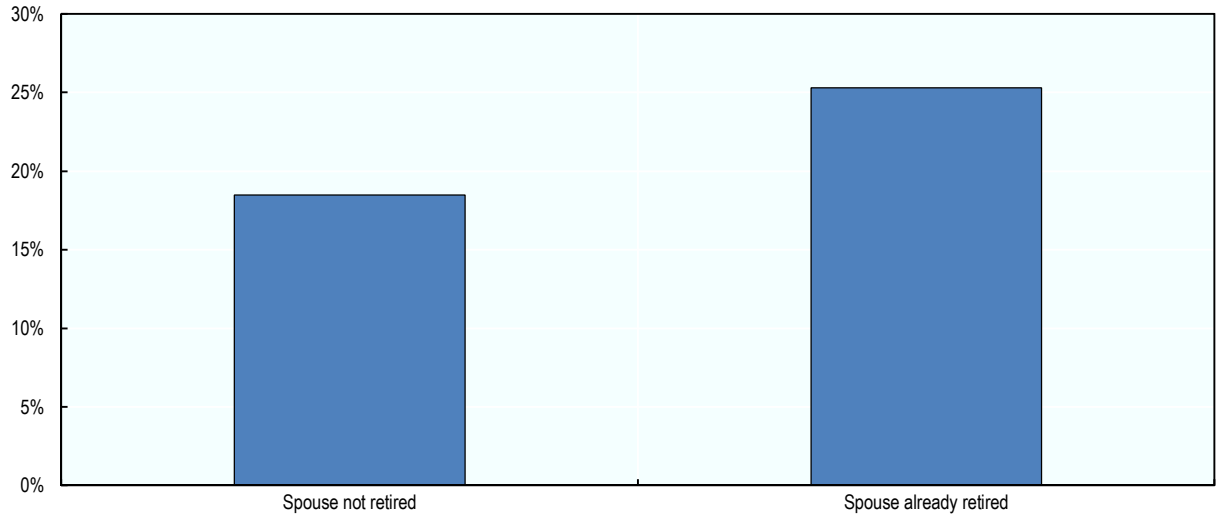
The job quality quartiles are the quartiles of the first principal component computed using a polychoric principal component analysis of a wide range of job characteristics. ELSA and SHARE include a large set of characteristics such as job satisfaction, work recognition, salary adequacy, self-perceived professional prospects, job security, work pressure, freedom to organize work, opportunity to develop skills and adequacy of support. HRS contains information on whether the work requires lifting heavy loads, stooping, kneeling or crouching, good eyesight and whether it involves much stress.

Analogously, the health quartiles correspond to the quartiles of the first principal component computed using a polychoric principal component analysis of self-reported health, a number of functional limitation indicators (e.g. ability to walk 100 metres and to climb several flights of stairs) and chronic diseases (e.g. heart problems, depression).

The OECD analysis shows that a spouse's employment situation also has a strong impact on retirement rates (Figure 5.17). Older workers whose spouses have already retired are more likely to retire over the next two years than those whose spouses are not retired – the probability of retirement is 25% versus 18%, respectively. This strong positive association between spouses' retirement statuses points to joint retirement decisions within couples.

The OECD study shows that, while retirement system rules, health, spousal retirement status and working conditions shape retirement behaviour, they do so to different degrees. Especially the first three are found to have strong effects.

Figure 5.17. Retirement probability of married workers, by retirement status of worker's spouse



Note: The estimates relate to the probability of married workers four years younger than the statutory retirement age to retire over the next two years. The calculations refer to a person with sample-mean characteristics in European countries and the United States.

Source: Reported estimates based on the Survey of Health, Ageing and Retirement in Europe (SHARE), the English Longitudinal Study of Ageing (ELSA) and the United States' Health and Retirement Study (HRS).

StatLink http://dx.doi.org/10.1787/888933568015

6. Retirement income adequacy issues

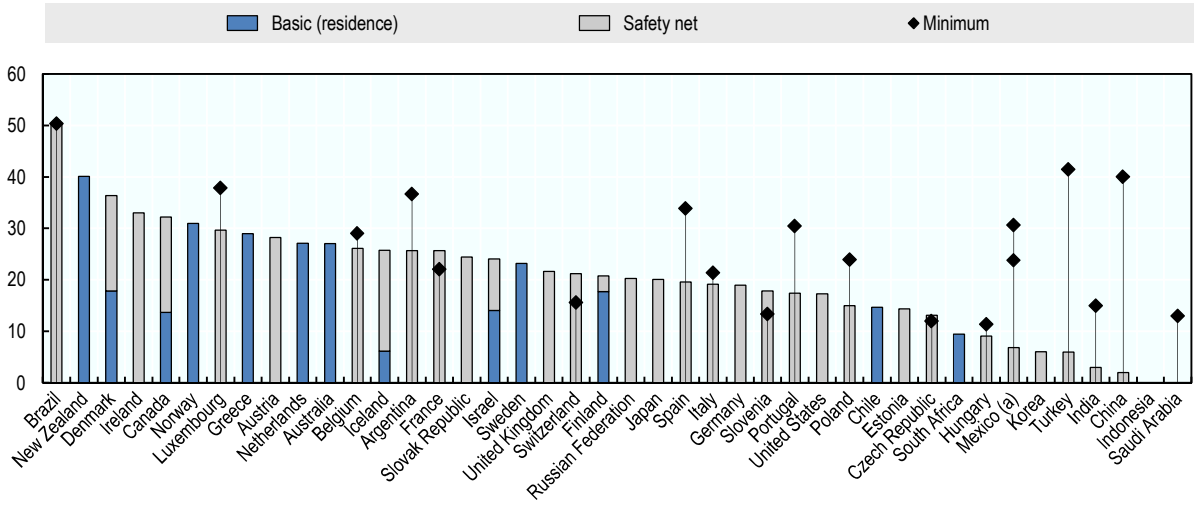
Ensuring sufficient protection from first-tier pensions

Recent pension reforms have sought chiefly to improve the financial sustainability of pension systems, particularly in response to the pressures of demographic change. Replacement rates have consequently been reduced and pension benefits more closely aligned on earnings histories. Combined with growing wage inequality and the development of non-standard work, more and more vulnerable pensioners in the OECD are likely to come to rely on the protection afforded to them by special provisions in the pension plans.

First-tier old-age pensions are defined as the first layer of protection of the elderly within the pension system. In most countries it combines financial support to those who were unable to provide for their retirement and are vulnerable to poverty with a mechanism that rewards workers who have paid in minimum levels of contribution. Although first-tier pensions exist in all countries, their structure and level vary considerably (OECD, 2015c). Residence-based basic pensions range from 6% of average earnings in Iceland to 40% in New Zealand, whereas safety-net payments vary from less than 10% in China, India, Turkey, Korea, Mexico and South Africa to 50% in Brazil, though both China and Turkey also provide high minimum pensions of above 40% of average earnings (Figure 5.18).

Figure 5.18. First-tier old age pension benefits as a percentage of average earnings, 2015

Percentage of average earnings



a) The additional marker for Mexico reflects the minimum pension benefit from the old private-sector system, which is still relevant for many workers, and is equivalent to 23.8% of average earnings.

Source: OECD (2015), *Pensions at a Glance 2015: OECD and G20 Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_glance-2015-en.

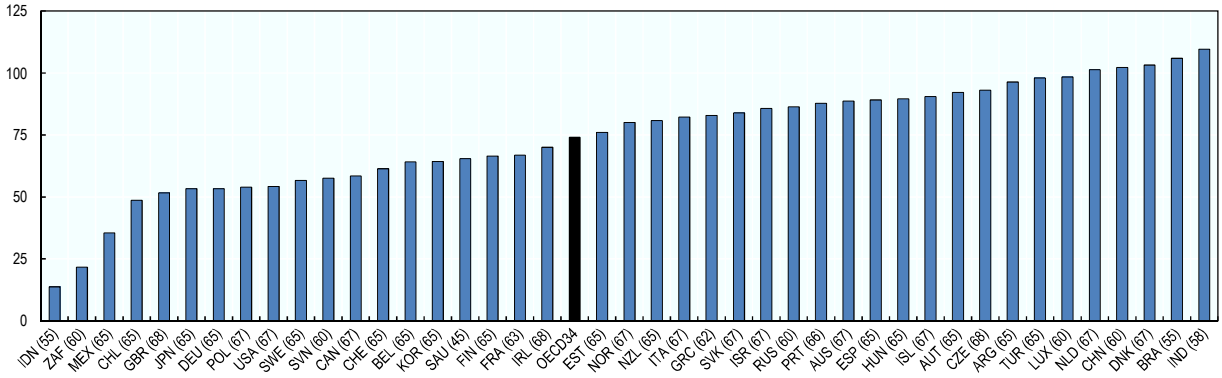
StatLink http://dx.doi.org/10.1787/888933568034

There is significant scope for a number of countries that combine relatively high old-age poverty rates and low safety-net benefits to increase the value of their safety-net payments, even after taking into account the level of GDP per capita (OECD, 2015). This is particularly the case in Chile, Korea, Mexico and Turkey but also Switzerland and the United States. All those countries belong to the quarter of OECD countries with the worst pensioner poverty rates – as high as 50% of all over-66s in Korea. Poverty levels are further compounded by the fact that most countries index their safety nets to prices, thereby reducing their value relative to wages over time.

Low-income workers are at particular risk of old-age poverty in Mexico, Chile, the United Kingdom, Japan, Germany, Poland, the United States, Sweden, Slovenia and Canada (Figure 5.19). These countries offer net projected replacement rates of below 60% at half the average wage even for a full career, meaning that the pension will then be lower than 30% of the average wage.

Figure 5.19. Net projected pension replacement rates from mandatory schemes for low earners

Full career from age 20 at half the average wage



Note: Numbers in brackets indicate countries' ages of retirement on full pension.

Source: OECD pension models; OECD (2015), *Pensions at a Glance 2015: OECD and G20 Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_glance-2015-en.

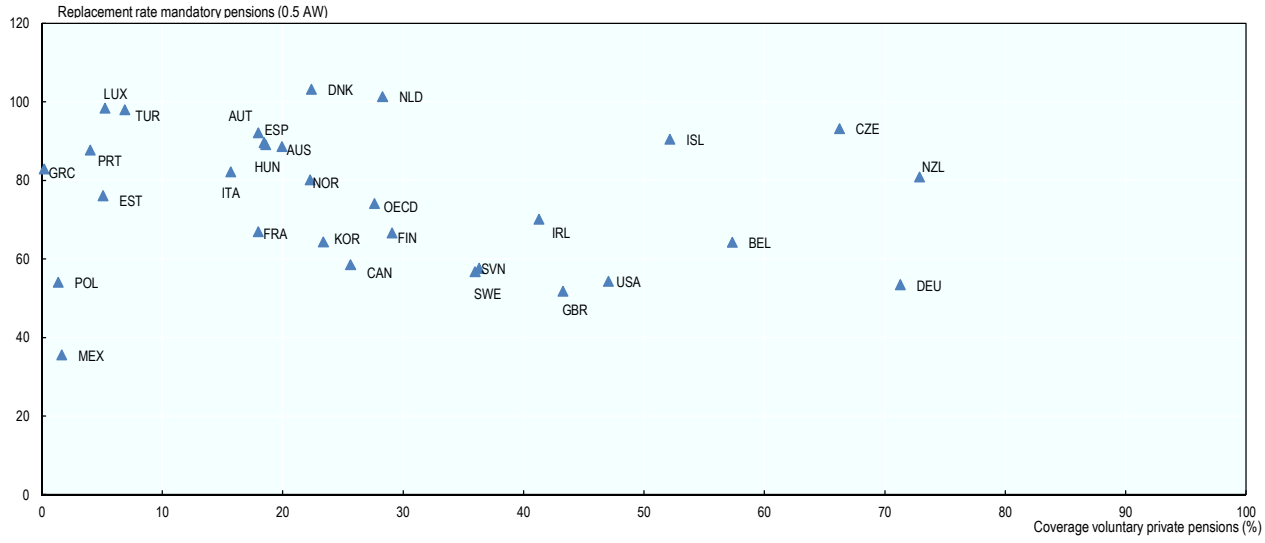
StatLink http://dx.doi.org/10.1787/888933568053

Boosting pension coverage

With the exception of Chile, Korea and Mexico, which have relatively large informal economies, coverage of mandatory earnings-related pensions is high for employees across OECD countries.[19] Many, however, do not require the self-employed to contribute, so far fewer of them enjoy coverage. In Latin America and the Caribbean, for example, about two-thirds of salaried workers contribute to pension schemes, compared to only one-sixth of the self-employed (OECD/IDB/World Bank, 2014). Moreover, the growing trend towards shorter contracts and part-time work lowers the share of the labour force who are in fact covered by traditional pensions.[20] Indeed, many mandatory earnings-related pensions do not apply to all types of contracts, demand minimum numbers of contribution years, and have limited portability. If workers on non-standard contracts are also to receive adequate pensions, countries must widen pension coverage.

Even when the coverage of mandatory earnings-related pensions is wide, replacement rates may be low. In that event, voluntary private schemes may provide the top-up required for an adequate pension. There has, in fact, been growth recently in voluntary private pension schemes. However, the coverage of voluntary private pensions varies considerably (Figure 5.20). Only eight OECD countries have coverage from voluntary private pensions (occupational and personal) that exceeds 40% of the working-age population (OECD, 2015c) – and as much as 70% in Germany and New Zealand. At the other end of the spectrum, Mexico and Poland are of particular concern. Both combine low replacement rates for low-wage workers from mandatory earnings-related pensions with low coverage from voluntary private pensions. In Canada, Sweden, Slovenia, the United Kingdom and the United States, too, replacement rates are projected to be low for private-sector workers, more than half of whom are not covered by additional voluntary private pensions.

Figure 5.20. Low earners' net replacement rates from mandatory pension schemes versus coverage from voluntary pension schemes, 2013 and 2014



Note: Coverage (x axis) refers to 2013, replacement rates (y axis) to 2014. Voluntary pensions in Austria, Hungary, New Zealand, Norway, Portugal and Turkey are personal. In Canada, Greece and Poland, they are occupational. In all other countries they are both.

Source: OECD (2015), *Pensions at a Glance 2015: OECD and G20 Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_glance-2015-en.

StatLink http://dx.doi.org/10.1787/888933568072

Expanding mandatory earnings-related pensions is the most effective way to widen pension coverage. However, if governments decide that flexibility and freedom of choice are key elements of a pension system, extending the coverage of voluntary private pensions – especially to lower-income groups – is particularly important for ensuring adequate pensions. There is solid evidence that coverage is lower among low-wage earners. Poterba (2014) reports that only 13% of the lower half of the income distribution receive (occupational and personal) private pensions in the United States, compared to over 50% of the upper half. Dushi et al. (2017) estimate that under 20% of 25-59 year-old full time workers in the lowest earning decile participated in a defined contribution plan in 2012 in the United States, against over 80% in the highest earnings decile. Similarly, Antolin (2008) reports that coverage from voluntary private pensions among the lowest income decile is low – not exceeding 20% in the nine OECD countries studied, except for Germany which boasted over 40% coverage.[21] Conversely, more than 40% of the highest income decile had a private pension plan in all nine countries, save Norway. As a result, untargeted financial incentives for widening coverage from voluntary pensions might benefit high incomes more than low ones and become a regressive policy instrument.

Low coverage from private pensions in the lower income brackets has a variety of causes. Low-earner households tend to have higher replacement rates from traditional mandatory earnings-related pensions (OECD, 2015), which lowers the incentive to save for retirement. Lower savings from voluntary private pensions could, therefore, simply be the result of lifetime income smoothing. However, they might also be attributable chiefly to the inability to save because of the financial strains of everyday life. Changing labour markets and recent pension reforms driven by the need to improve the financial soundness of the pension system mean that replacement rates are likely to fall in many

countries, increasing the need to boost coverage from private pension arrangements, especially among low-income households.

Another possible reason for disparities in coverage between income groups is that strong tax incentives are in place in many countries to encourage private saving for retirement. Private pension savings are widely deductible from taxable income, for example. The outcome may be a regressive private pension system, as in Chile, Denmark, Israel, the Netherlands, the Slovak Republic and Switzerland (OECD, 2016d), which detracts from the relative attractiveness of voluntary private pensions for low-income households. Finally, differences in financial literacy between socio-economic groups might also explain differences in coverage. A number of studies have shown a correlation between financial literacy and income (Hilgert and Hogarth, 2002; OECD, 2005).

While there are plenty of reasons for the low pension coverage from voluntary private schemes among low-income households, it is of vital importance that policy makers swiftly address the issue. The first-best policy is to design a financially sustainable mandatory system that ensures adequate benefits for low earners. If the political decision is rather to improve coverage from voluntary pensions, in particular for low-income households, a number of measures can be taken. Well designed auto-enrolment (e.g. based on income targeting and temporary financial incentives) has proven a powerful tool for widening pension coverage (OECD, 2012). It still leaves the ultimate decision in the hands of employees but nudges them in the right direction. Better tailoring annuities to socio-economic groups – e.g. increasing annuity pay-outs for disadvantaged groups who typically have a lower life expectancy – could boost demand for annuities (OECD, 2016e), and thus increase voluntary pension coverage. Other measures to improve private pension coverage include improving financial literacy and equalising tax incentives across socio-economic groups.

Well designed survivor pensions

Goal of survivor pensions

Poverty levels are higher among older women than older men in all OECD countries (Chapter 1), with the over-75s more at risk of poverty than 66-to-75 year-olds. Because they live longer and tend to be more affected by lower pension indexation, elderly women are a vulnerable group. Single female pensioners are typically more reliant on safety-net benefits or minimum pensions, since women's employment rates have historically lagged behind men's. However, the development of female employment over recent decades (Chapter 3) will reduce that reliance.

As for married female pensioners, their situation differs slightly since they may be entitled to a proportion of their partner's pension in the event of his death. Survivor benefits play an important role in averting poverty among widows and widowers and, notwithstanding improved female employment rates, the risk of old age poverty remains higher for women due to the sizable gender gaps in wages and employment that persist to this day. Moreover, most beneficiaries of survivor allowance are women, given their longer life expectancy and the fact that they are generally the younger partner in couples.[22] While survivor benefits should be carefully designed to avoid inefficient forms of redistribution and work incentives (see below), an insufficiently low benefit level increases income risks after the death of the spouse.

The main goal of survivor pensions is to serve as a joint income-smoothing measure for couples when a partner dies. This goal may therefore be regarded as a form of

insurance. Though not necessarily intended to be redistributive, survivor pensions contribute to limiting old-age poverty among widows and widowers. Moreover, it frequently includes other, less straightforward redistributive features – as from singles to married households.

Design and pitfalls of survivor pensions in defined-benefit schemes

As with the other pension systems across the OECD there is no consistent approach to the rules governing allowances for survivors. In most countries, they are built into defined-benefit (DB) pension systems which, be they funded or pay-as-you-go, comprise an element of transferral following a spouse's death. They thus supplement the individual pension that the surviving spouse already receives. In DB schemes the survivor commonly receives a proportion of their deceased spouse's entitlement. In both Estonia and Finland, for example, that proportion is 50%, while in Belgium it is 80% of the earnings-related component.

However, benefits are often capped, with payment dependent on the survivor's own earnings-related pension or reduced over time (James, 2009). Moreover, in many DB schemes, neither contributions nor benefits depend on whether a survivor pension might have to be paid. Survivor pensions often redistribute from singles to couples (especially single-earner couples), working women to non-working women, from couples with slight age differences to couples with wide age differences, from divorcees to non-divorcees and from low- to high-income families (James, 2009). Apart from distribution often being skewed towards higher-income groups, it also deters labour force participation (mainly among women) – particularly if:

- survivor benefits depend on the survivor's own pension,
- individual contributions and/or old-age benefits are not adjusted to take into account the entitlement to the survivor pension if the death risk materialises.

Design and pitfalls of survivor pensions in defined-contribution schemes

Many funded defined-contribution (DC) pension systems in Latin America include a mandatory survivor pension provision. The insurance element covers the family unit, effectively reducing benefits for couples but in the event of the death of a partner, the survivor keeps his/her own pension. Therefore, the system does not redistribute between families and has fewer disincentives to work than DB schemes. Conversely, for other countries with extensive DC schemes, such as Australia, Denmark and Iceland, surviving spouses are unlikely to receive a payment from their recently deceased partner's pension plan, as few have mandatory survivor schemes in place.

Another case in point is the United States. In voluntary (DC) pensions, people usually have to choose between annuitisation and taking a lump sum payment at the time of retirement. By ruling out old-age and survivor benefits, the latter increases the longevity risk – i.e. the material risk of outliving financial assets – which affects those living a long life and therefore surviving spouses in particular. If people choose annuitisation they can often opt for a survivor benefit provision, but this is not mandatory. If they do choose survivor benefits, the initial old age pension is lower, but the survivor continues to receive payment after the death of the spouse, though at a reduced level. If they do not choose survivor benefits, pension payments cease after the death of the spouse, which may result in a significant loss of income for the survivor.

Short-sightedness often leads to people making poor choices between the three options – survivor benefits, no survivor pension, or lump sum. Orlova et al. (2015) find that the type of pension system – DB or DC – does not have a significant impact on the likelihood of old-age poverty. However, taking out a cash lump sum – a relatively common practice under DC schemes – heightens the risk of falling into poverty. Similarly, not opting for a joint-and-survivor annuity considerably increases the surviving spouse's risk of poverty. The recent switch towards defined-contribution pension systems with a greater choice of survivor pension options has thus replaced unintended redistribution under DB systems with the higher risk of old-age poverty among widows and widowers in DC schemes.

Notes

1. In 2015, the average OECD employment rate among highly educated 55-to-59 year-old men and women was 82%, 68% among those educated to a medium level, and 53% among those with a low level of schooling. In the 60-to-64 year-old age group, the rates were 58%, 44% and 34%, respectively.
2. Inactivity for reasons other than health relates to all people in the data who report being inactive but do not self-define as sick/disabled. Many reasons beyond health can explain inactivity prior to retirement, for example care-giving activities or insufficient job opportunities.
3. New Zealand Apprenticeships replaced the Modern Apprenticeships programme, which had been designed for 16-21 year-olds.
4. In particular, the "generation contracts" created by law in France in 2013, following the national multi-sector agreement signed by all the social partners in 2012, have gained strength much more slowly than the government expected (OECD, 2014b). Its purpose is to institute specific, negotiated measures to promote the employment of young people, older workers, and the transmission of knowledge and skills between generations within the firm.
5. The Flexjob scheme introduced at the same time allows reductions in working hours or adjustments of working conditions depending on the needs of individuals. The Flexjob scheme is not targeted at older people in particular, although more than half of all people in flexi jobs in 2013 were over 50. However, a feature of the scheme is the very low share of participants who return to regular jobs. The scheme was modified in 2013 to curb the risk of flexi jobs replacing regular jobs. Regular assessments and not granting the over-40s a permanent position after their first five years in a flexi job are essential if misuse of flexi jobs is to be prevented (OECD, 2015b).
6. http://www.ttl.fi/partner/thf/eng/sivut/default.aspx.
7. For more information, go to http://www.mentalhealthcommission.ca/English/issues/workplace/national-standard.
8. Mandatory retirement ages are determined either by national law or by a clause in a worker's employment contract. In order to encourage employers to retain and hire older workers, the OECD Council Recommendation on Ageing and Employment Policies indicates that countries should seek to discourage or further restrict mandatory retirement by employers in close consultation and collaboration with employers' and workers' representatives, while accepting that, in a limited number of instances, such practices may be necessary (OECD, 2016b).
9. The regional employment pacts brought together nearly all job centres and a wide range of local stakeholders and key actors, such as companies, chambers and business associations, trade unions, municipalities, training institutions, churches and social service providers. The measures implemented included coaching, profiling, more training in general as well as training in communication skills and

job application training, internships and wage subsidies. Early evaluation of the first phase of the programme, conducted in 2007, showed that the success of the programme sprang from the combination of individualised counselling and coaching as well as the proactive, targeted outreaching to employers. The most recent evaluation of the programme showed that placement results were better than in more traditional approaches where the onus is more on active labour market measures and less on intensive counselling (Knuth et al., 2014).

10. Calculations based on the variable "healthy life expectancy" (HALE), available at www.who.int, and life expectancy data.

11. Labour market participation rates in the data are observed only at certain remaining life expectancy values. Upper and lower frontiers of labour market participation are computed using linear interpolations between the sets of remaining life expectancies with the highest and lowest observed participation rates, respectively. The curves are constructed in such a way that any point, as well as any linear combination of points, lies inside the set (e.g. convex sets). The upward sloping profiles suggest that work-related health improves in the number of expected remaining life years, allowing for higher labour market participation rates at the frontier.

12. An indication for this is the fact that older women have a longer life-expectancy but worse self-reported health than older men (OECD, 2013c).

13. The gender difference based on life expectancy is around or below 5 percentage points in most countries, even though there are a few countries with higher gender differences, such as in most Central and Eastern European Countries. When using healthy life-expectancy, the gender gap virtually disappears in most countries and remains important in a very limited number of Eastern European countries only. As healthy life expectancy is not available for all of the countries and its use does not alter the main results, the analysis sticks to life expectancy to measure health-related work capacity.

14. In several OECD countries, gender-specific retirement ages still exist. In most of these countries, the retirement age differences between men and women are planned to disappear over the next years. See OECD (2015c), Figure 1.6.

15. Gaps in life expectancy lead to different of work capacity gaps between population groups because the relationship between remaining life expectancy and estimated work capacity is non-linear, as the concave slope of the upper frontier of labour market participation indicates (see Figure 5.11).

16. The legal retirement age is defined in accordance with the Comparative Tables on Social Protection from the European Union's Mutual Information System on Social Protection (MISSOC).

17. These numbers apply to individuals whose characteristics, such as wealth or health, are in line with the average wealth or health in the sample.

18. For more information see Luske and Rocard (2017)

19. Coverage in these three countries is between 30% and 60% of the working age population (World Bank pension database) compared to well over 70% in nearly all the other OECD countries.

20. Temporary employment makes up 11.4% of total employment in OECD countries, 16.8% of employees work part-time and 15.6% of the employed are self-employed (OECD, 2017b).

21. The nine countries covered are: Australia, Canada, Chile, Finland, Germany, Ireland, Norway, the United Kingdom and the United States. The paper considers funded pensions only.

22. In the United States men are on average 2.3 years older than women in couples (Current Population Survey 2014).

References

AARP – American Association of Retired Persons (2016), *The Policy Book: AARP Public Policies 2015-2016*, American Association of Retired Persons, Washington, http://policybook.aarp.org/the-policy-book.

Age Platform Europe (2010), "Why the Mandatory Retirement Age Should Be Banned", *AGE Position Paper*, Brussels.

Antolín, P. (2008), "Coverage of Funded Pension Plans", *OECD Working Papers on Insurance and Private Pensions*, No. 19, OECD Publishing, Paris, http://dx.doi.org/10.1787/241142156207.

Arnkil, R. (2012), "Employment Policies to Promote Active Ageing: Finland", *EEO Review*, European Employment Observatory.

Behaghel, L., E. Caroli and M. Roger (2014), "Age-biased Technical and Organizational Change, Training and Employment Prospects of Older Workers", *Economica*, Vol. 81, No. 322, pp. 368-389.

Behaghel, L., B. Crépon and T. Le Barbanchon (2011), "Do Anonymous Resumes Make the Battlefield More Even? Evidence from a Randomised Field Experiment", Crest (Paris) and J-PAL Europe.

Cedefop – European Centre for the Development of Vocational Education and Training (2015), "Increasing the Value of Age: Guidance in Employers' Age Management Strategies", *Cedefop Research Paper*, No. 44, Publications Office of the European Union, Luxembourg.

Coile, C., K. Milligan, and D.A. Wise (2016), "Social Security and Retirement Programs Around the World: The Capacity to Work at Older Ages – Introduction and Summary", *NBER Working Paper*, No. 21939, Cambridge, United States.

Davey, J. (2014), "Age Discrimination in the Workplace", *Policy Quarterly*, Vol. 10, No. 3, Institute for Governance and Policy Studies, New Zealand.

De la Maisonneuve, C. et al. (2014), "The Economic Consequences of Ageing: The Case of Finland", *OECD Economics Department Working Paper*, No. 1120, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jz2qt1dtnlt-en.

Dushi, I., H. Iams, and C. Tamborini (2017), "Contributory Retirement Saving Plans: Differences Across Earnings Groups and Implications for Retirement Security", *Social Security Bulletin*, Vol. 77, No. 2.

Eurobarometer (2012), *Active ageing*, Special Eurobarometer No. 378, European Commission, Brussels.

Eurofound (2016), *First Findings: Sixth European Working Conditions Survey*, Publications Office, Luxembourg.

European Parliament (2013a), "Combining the Entry of Young People in the Labour Market with the Retention of Older Workers", Strasbourg.

European Parliament (2013b), "Resolution of 21 May 2013 on an Agenda for Adequate, Safe and Sustainable Pensions", Strasbourg.

Government of Canada (2014), *Summative Evaluation of the Targeted Initiative for Older Workers: Final Report*, Evaluation Directorate Strategic Policy and Research Branch, Employment and Social Development Canada, Government of Canada, 5 May, http://publications.gc.ca/collections/collection_2014/edsc-esdc/Em20-10-2014-eng.pdf.

Hilgert, M. and J. Hogarth (2002), "Financial Knowledge, Experience and Learning Preferences: Preliminary Results from a New Survey on Financial Literacy", *Consumer Interest Annual No. 48*.

James, E. (2009), "Rethinking Survivor Benefits", *World Bank Social Protection and Labor Discussion Paper*, No. 928.

Knuth, M., T. Stegmann and L. Zink (2014), Die Wirkungen des Bundesprogramms, "Perspektive 50plus Chancen für ältere Langzeitarbeitslose", IAQ-Report 01-2014, Universität Duisburg-Essen.

Luske, M. and E. Rocard (2017), "Retirement Determinants in OECD Countries", *OECD Working Paper*, forthcoming.

Neumark, D. and J. Song (2013), "Do Stronger Age Discrimination Laws Make Social Security Reforms More Effective?", *Journal of Public Economics*, Vol. 108.

OECD (2017), "Older Workers and Digital Technologies" *OECD Digital Economy Paper*, forthcoming.

OECD (2016a), "New Markets and New Jobs", *OECD Digital Economy Papers*, No. 255, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlwt496h37l-en.

OECD (2016b), *Skills Matter: Further Results from the Survey of Adult Skills*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264258051-en.

OECD (2016c), "Skills for a Digital World: 2016 Ministerial Meeting on the Digital Economy Background Report", *OECD Digital Economy Papers*, No. 250, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jlwz83z3wnw-en.

OECD (2016d), *OECD Pension Outlook 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pens_outlook-2016-en.

OECD (2016e), *OECD Business and Finance Outlook 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264257573-en.

OECD (2015a), *OECD Education at a Glance: Educational attainment and labour-force status (dataset)*, http://stats.oecd.org/Index.aspx?DataSetCode=EAG_NEAC (accessed on 03 February 2017).

OECD (2015b), *Ageing and Employment Policies: Denmark 2015: Working Better with Age*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264235335-en.

OECD (2015c), *Pensions at a Glance 2015: OECD and G20 Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_glance-2015-en.

OECD (2014a), *OECD Employment Outlook 2014*, OECD Publishing, Paris, http://dx.doi.org/10.1787/empl_outlook-2014-en.

OECD (2014b), *Ageing and Employment Policies: France 2014: Working Better with Age*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264207523-en.

OECD (2013a), *OECD Employment Outlook 2013*, OECD Publishing, Paris, http://dx.doi.org/10.1787/empl_outlook-2013-en.

OECD (2013b), *Mental Health and Work: Sweden*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264188730-en.

OECD (2012), *OECD Pension Outlook 2012*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264169401-en.

OECD (2010), *Sickness, Disability and Work: Breaking the Barriers: A Synthesis of Findings across OECD Countries*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264088856-en.

OECD (2005), "Improving Financial Literacy: Analysis of Issues and Policies", *Financial Market Trends*, Vol. 2005/2, OECD Publishing, Paris, http://dx.doi.org/10.1787/fmt-v2005-art11-en.

OECD/IDB/The World Bank (2014), *Pensions at a Glance: Latin America and the Caribbean*, OECD Publishing, Paris, http://dx.doi.org/10.1787/pension_glance-2014-en.

Orlova, N., M. Rutledge and A. Yanyuan Wu (2015), "The Transition from Defined Benefit to Defined Contribution Pensions: Does It Influence Elderly Poverty?", *Center for Retirement Research Working Paper*, No. 2015-17, Center for Retirement Research.

Poterba, J.M (2014), "Retirement Security in an Aging Population", *American Economic Review*, Vol. 104, No. 5, pp. 1-30.

Sonnet, A., H. Olsen and T. Manfredi (2014), "Towards More Inclusive Ageing and Employment Policies: The Lessons from France, The Netherlands, Norway and Switzerland", *De Economist*, Vol. 162.

Chapter 6

Living conditions in later life

This chapter analyses living conditions later in life. The first section focuses on regional differences and shows that there are both large regional differences within countries in the share of the older population and in access to health and transport services for the elderly. The second section deals with living conditions and well-being among the over-80s. Current generations are better off than previous generations in several dimensions of well-being. At the same time a larger share of the over-80s live alone or with a frail partner, which heightens the risks of poverty and depression. Finally, the third section focuses on long-term care (LTC). As people age, the likelihood of being in need of LTC increases. Inequalities which have accumulated over the life course are magnified in countries where the costs of LTC borne by poorer individuals are not well covered by social protection systems. This implies that in some countries people who have LTC needs might have those needs unmet or in addition fall into poverty.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Key findings

- Large inequalities are observed in access to health and transport services, with strong regional variations within countries.
- Living a very long life will become the norm. The probability of surviving to age 85 will increase from 50% today to 75% by 2100 for men (born today), and from 64% to 83% for women.
- The share of people living alone after age 80 has increased in most countries. Women older than 80 years are at least twice as likely to live alone as men, while living alone is associated with higher poverty risks. Women are more likely than men to report struggling with the instrumental activities of daily living, weighing on their capacity to lead independent lives.
- Long-term care needs risk exacerbating inequalities that start earlier in life. People on low income are more likely to need long-term care. Formal home care services remain unaffordable for people with low income in several countries. High "out-of-pocket" costs may create an incentive for them to go into institutional care, as with severe needs they generally access institutional care.
- Women bear most of the costs of providing informal long-term care. In countries with better social protection for long-term care services, rates of informal care are lower, and gender inequality in caring is smaller. Higher female labour force participation may not mean lower informal caregiving rates.

Introduction

This chapter focuses on living conditions later in life. In particular it focuses on regional differences, general living conditions of the population older than 80 and long-term care (LTC). Regional differences in the share of the older population are very large within many OECD countries. Combined with a wide disparity in availability of health services across regions, this reveals that access to health services for the elderly is problematic in some of them. Recently, rural areas have aged faster than urban areas, which is likely to stretch health services and public transport to their limit and amplify the risks of isolation. Given that health and social inclusion is crucial to older people's well-being, the regional differences in ageing and access to health services and public transport poses serious challenges.

The share of the population aged 80 and over is expected to more than double by 2050 on average across OECD countries. While more people reach that age, the over-80s are in better health than previous generations. However, a large fraction of the elderly report depressive symptoms, while caring for a frail partner at older ages is likely to become more frequent, thereby putting a strain on mental and physical well-being. Moreover, a high proportion of women aged 80 and over live alone, which combined with a persisting gender pension gap (Chapter 5), increases the risk of falling below the poverty line.

As people age the likelihood that they need long-term care (LTC) increases. Inequalities that have cumulated over the life course are magnified if the costs of LTC borne by poorer individuals are not well covered by social protection systems. Indeed, these costs – either financial or non-financial or both – can be high. The proportion of home care costs covered by social protection systems differs widely across countries. This implies that in some countries people who have LTC needs might in addition fall into poverty, choose not to have those needs met or opt for institutional care. Going into institutional care is typically not people's first choice, but in many OECD countries the costs of institutional care are better covered than costs of home care. This chapter also highlights substantial inequalities in the provision of informal care across genders. While the specific design of health

services for the old might differ by country, by region and over time, the increasing share of the elderly and the wide disparity of living standards among them increase the need for accessible health services and a well-designed LTC system.

1. Spatial inequalities in ageing populations

Around the globe societies are ageing. This affects sustainable development at national and regional levels. By 2050, 25% of the world's population will be over 65 years old, compared to less than 8% in 1950. Demographic changes have profound implications for the fiscal, economic and social health of societies as a whole. Yet, they also affect regions within countries in widely differing ways. Understanding the regional dynamics of population ageing helps identify complementary policies that can help prevent unequal ageing.

Ageing trends and services critical to well-being of older people differ widely from region to region within countries. Differences in old age shares in countries' lower-tier regions (Territorial Level 3 [TL3]; Box 6.1) were actually larger than differences between country averages of old age dependency ratios in 2014. Additionally, access to health services and public transport differs widely by region. This leaves some regions with high shares of older people but limited services to guarantee a high quality of life.[1]

Box 6.1. Description of OECD territorial levels

The OECD divides subnational regions in its 35 member countries into two territorial levels that match administrative jurisdictions. Territorial Level 2 (TL2) denotes the upper administrative tier of subnational government, and Territorial Level 3 (TL3) the lower tier. Or, put differently Territorial Level 2 consists of macro-regions, while Territorial Level 3 is composed of micro-regions. Across the OECD, there are 391 large TL2 regions, e.g. Ontario Province in Canada, which contain the 2 197 TL3, or small, regions. For example, the TL2 region of Aquitaine in France contains five TL3 regions: Dordogne, Gironde, Landes, Lot-et-Garonne and Pyrénées-Atlantique. TL3 regions match administrative jurisdictions in all OECD countries, with the exception of Australia, Canada, and the United States. TL2 and TL3 apply only to regions that lie within national borders.

This regional typology – which, for European countries, is broadly consistent with the Eurostat NUTS 2010 classification – makes it easier to compare geographic units at the same territorial level. The two levels are officially established and relatively stable in all OECD member countries, and most use them as a framework for implementing regional policies.

Source: OECD (2016), *OECD Regions at a Glance 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/reg_glance-2016-en.

Ageing trends at the regional level

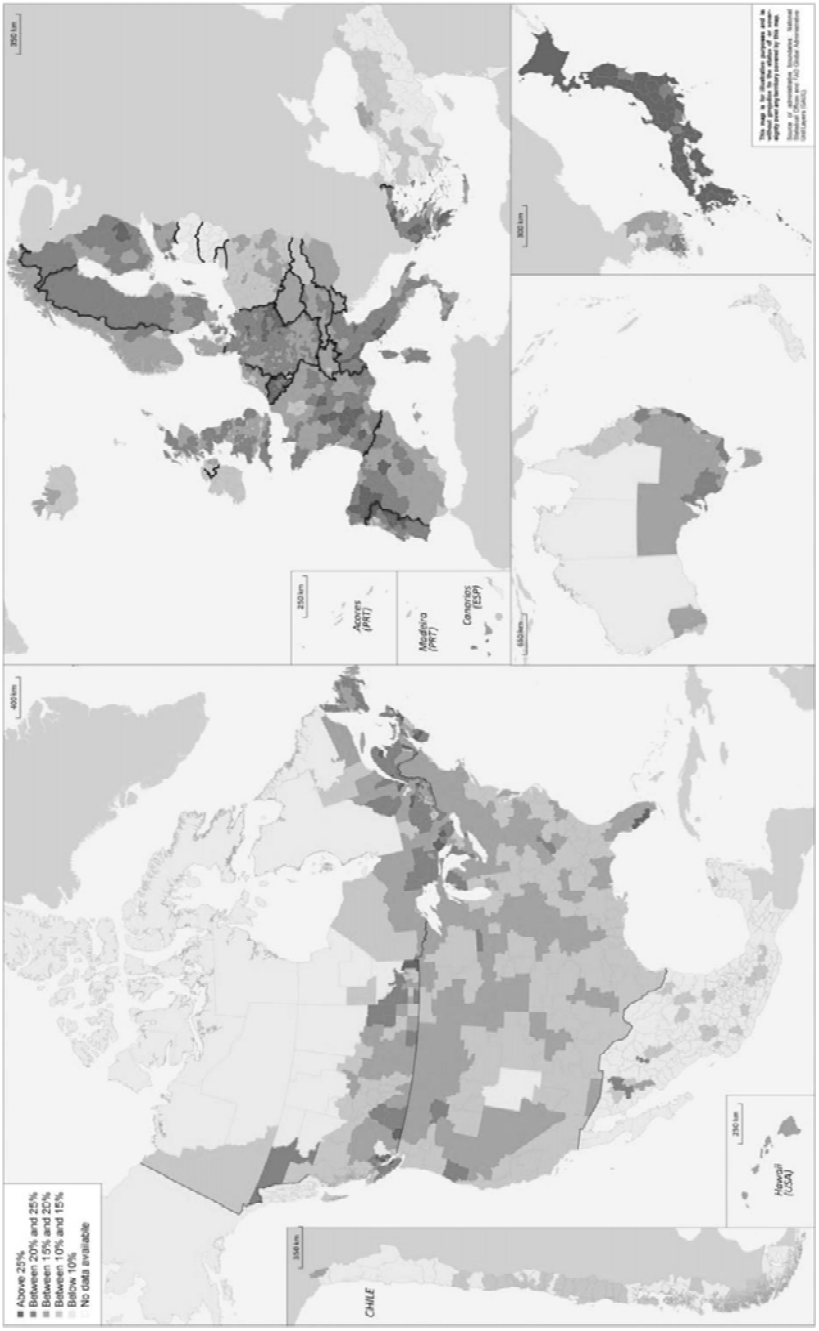
OECD analysis of ageing at the TL3 national level reveals substantial differences in the population shares of older people in regions and in the rates at which populations age. For example, the elderly account for higher proportions of predominantly rural regions, while mainly urban ones aged faster between 2000 and 2014. Spatial variations have major implications for differences in elderly people's quality of life and for economic development, inclusiveness and, ultimately, equity in the distribution and accessibility of services critical to well-being.

Regional shares of the older population in OECD TL3 regions

The average share of the old-age population in OECD countries and their regions is 16%.[2] Behind that average, though, lie wide variations, ranging from 6% in Mexico to 26% in Japan. The share of the old-age population also exceeds 20% in Italy, Germany and Greece, while Chile and Turkey are comparatively younger with 10% and 7%, respectively. At both national and regional levels, populations are noticeably younger in Central and Eastern Europe, the Americas and Oceania (Figure 6.1).

Figure 6.1. The share of older people varies widely between regions and countries

Shares of populations aged 65 and above in OECD Territorial Level 3 regions, 2014



Source: Calculations based on the *OECD Regional Database*.

In 2014, differences were actually greater at the TL3 regional level within OECD countries than between them (Figure 6.2). The populations of some subnational regions had very low shares of older people (e.g. 2% in the Chilean region of Antártica Chilena), while as many as one in three people was aged 65 and over in others (e.g. 33% in Greece's Evrytania region). The percentage-point difference between regions with the

lowest and highest shares of older people in their populations was widest in Spain, Mexico, Australia, the United States, the United Kingdom, Portugal and Canada – about 20 points (Figure 6.2).[3] In Spain, the share of the old-age population ranged between 9% in the region of Fuerteventura and 30% in Orense.

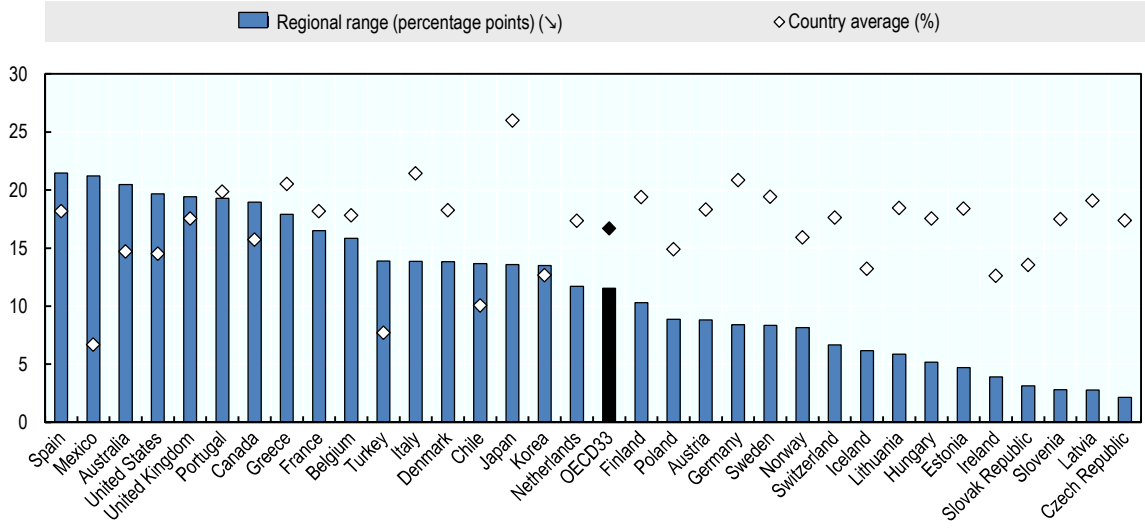
The regions in OECD countries with the highest shares of older people and which substantially exceeded national averages were (in descending order):

- Evrytania in Greece, 33%
- Akita in Japan, 32 %
- Halliburton (Ontario) in Canada, 31%
- Orense in Spain, 30%
- Beira Baixa in Portugal, 29%
- Savona in Italy, 28%.

Generally, regional variations in elderly shares of the population are narrowest in Central and Eastern European countries. Ireland's old-age population is also relatively evenly distributed, with regional variations not exceeding 5 percentage points.

Figure 6.2. The share of older people varies a lot between regions within countries

Differences between the regions with the highest and lowest shares of older people (65 years and above) in their populations, 2014



Note: "Regional range" (y axis) measures the difference between the region with the highest and the region with the lowest share of the older population within each country.

Source: Calculations based on *OECD Regional Database* (2016).

StatLink http://dx.doi.org/10.1787/888933568110

Growth in old-age populations

Over the 2000-14 period, OECD countries experienced an average 2.7 percentage-point growth in the population shares of older people. There were, however, wide regional variations in the pace of growth, especially in Canada, Belgium, the United States, and Spain. In Canada, for example, the elderly share declined by 3 percentage points in the Division 2 region in Saskatchewan, while increasing by 17 percentage points in Stikine, British Columbia. By contrast Central and Eastern European countries – particularly Latvia, Lithuania and the Slovak Republic – showed very narrow interregional differences. In the Slovak Republic, for example, the increase in the elderly share of its population ranged from 1.6 percentage points in the Prešov Region to 3.2 in Trencín.

Overall, 14 OECD countries have regions where the shares of older people declined between 2000 and 2014. The trend was particularly marked in Germany, Norway, Spain, and the United States, with the steepest decline – 5 percentage points – coming in the Spanish region of Guadalajara.[4] Most regions where the elderly share declined by more than 1 percentage point were predominantly urban (see Box 6.2 for the typology of TL3 regions).

Box 6.2. Typology of OECD Territorial Level 3 regions

Traditionally the OECD classifies Territorial Level 3 (TL3) regions as "predominantly urban" (PU), "intermediate" (IN), or "predominantly rural" (PR). The typology is based on the percentage of a regional population living in rural communities, combined with the existence of urban centres where at least one-quarter of the regional population resides. An extended regional typology distinguishes between rural regions that are located close to larger urban centres and those that are not. The result is a four-fold classification of TL3 regions:

- predominantly urban (PU)
- intermediate regions (IN)
- predominantly rural regions close to a city (PRC)
- predominantly rural remote regions (PRR).

The distance from urban centres is measured by the time it takes a certain share of the regional population to travel by road to an urban centre with at least 50 000 inhabitants. Due to lack of information on road networks and service (or catchment) areas, the extended typology has not been applied to Australia, Chile or Korea.

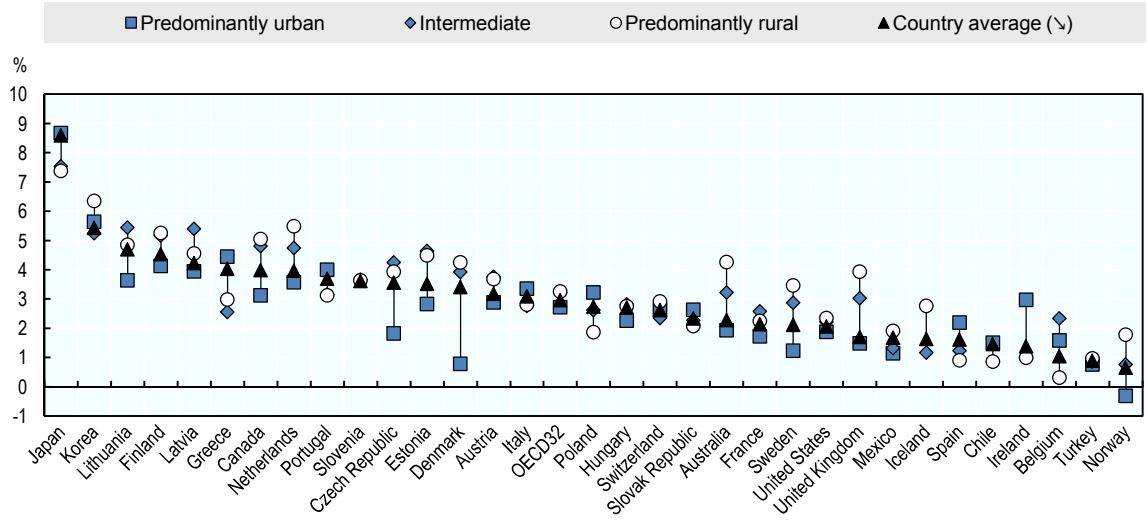
Source: Brezzi, M., L. Dijkstra and V. Ruiz (2011), "OECD Extended Regional Typology: The Economic Performance of Remote Rural Regions", *OECD Regional Development Working Papers*, No. 2011/06, OECD Publishing, Paris, http://dx.doi.org/10.1787/5kg6z83tw7f4-en.

Older population growth by type of region

Growth in the share of the older population by type of TL3 region between 2000 and 2014 reveals that populations aged at a slightly faster pace in predominantly rural regions (Figure 6.3). In Korea, the Netherlands, Denmark, Australia, Sweden, the United Kingdom, and Norway, the share of older people grew more steeply in predominantly rural regions than in urban ones. However, in a number of countries – e.g. Greece, Poland, Spain and Ireland – the share of older people in total population grew faster in predominantly urban regions.

Figure 6.3. Predominantly rural regions are ageing slightly faster

Changes in the share of the older population, 2000-14, by regional type, percentage



Source: Calculations based on *OECD Regional Database* (2016).

StatLink http://dx.doi.org/10.1787/888933568129

Concentrations of older populations in the TL3 regions of OECD countries

Is the older population concentrated in a small group of regions? According to the Normalised Herfindahl-Hirschman Index (NHHI) – a commonly used measure of concentration ranging from 0 (homogenous distribution) to 1 (extremely concentrated) (Box 6.3) – the spatial concentration of older people in TL3 regions in the year 2014 remained moderate across the OECD (Figure 6.4), with the NHHI below 0.12 everywhere except Iceland (see the note to Figure 6.4). Moreover, there was no substantial divergence between spatial concentration of older people and the under-65s. The overall levels of concentration of both older and younger populations had remained almost unchanged since 2000 and broadly similar in terms of gender in 2000 and 2014.

Box 6.3. Definition of the Normalised Herfindahl-Hirschman Index

The Herfindahl-Hirschman Index (HHI) is commonly used to measure the market concentration of firms, but may also be used to assess the regional concentrations of other variables in a country. The HHI ranges from 0 (homogeneous distribution) to 1 (concentrated in a single region). To account for differences in the number of regions in each country the Normalised Herfindahl Hirschman Index (H*) is applied. With H* it is possible to compare countries which have different numbers of regions. It is computed as follows:

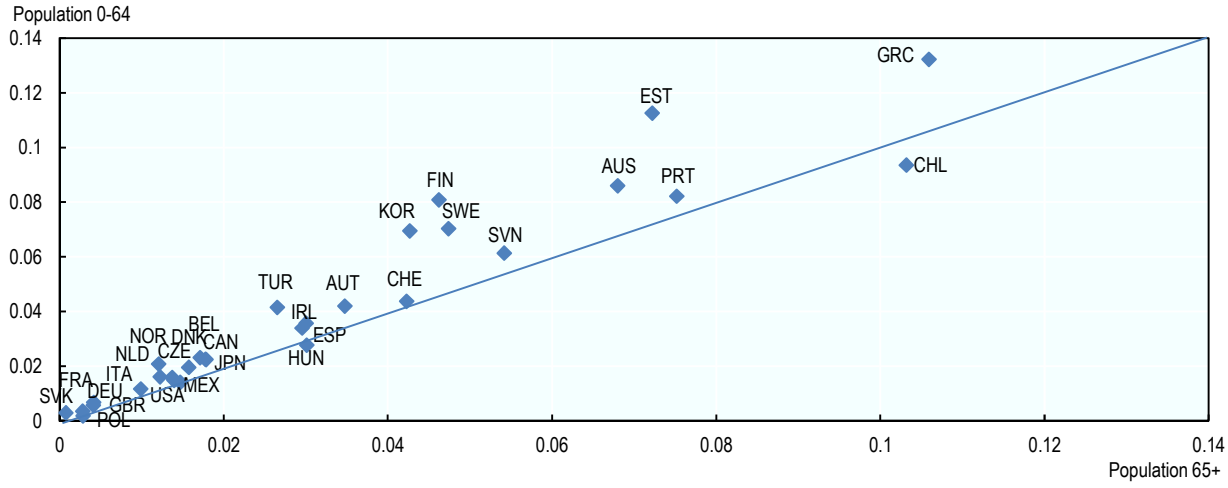
$$H^{*} = \frac{H - (\frac{1}{N})}{1 - 1/N}$$

where H is the sum of the squared share of the older population in each region relative to the older population in the country concerned, and N refers to the total number of regions in a country.

Source: Cracau, D. and J. Lima (2016), "On the Normalized Herfindahl-Hirschman Index: A Technical Note", *International Journal on Food System Dynamics*, Vol. 7, No. 4, pp. 382-386.

Figure 6.4. The regional concentration of older people is moderate

Concentration in TL3 regions of 65-and-overs and under-65s, 2014, normalised Herfindahl Index



Note: Iceland is not included in the figure for reasons of visibility. With the Normalised Herfindahl-Hirschman Index, Iceland shows strong spatial concentrations of 0.32 among people aged 65 and over and 0.35 for those aged under 65.

Source: Calculations based on the *OECD Regional Database* (2016).

StatLink http://dx.doi.org/10.1787/888933568148

Uneven access to health services

Accessibility to services is a critical component of well-being and equality, and health services are particularly important when it comes to older people's well-being. The accessibility of health services shows strong spatial patterns, hence the need for a sub-national approach when using it as an indicator of unequal ageing. Physical obstacles to accessing health care services not only translate into higher user costs, they may even contribute to higher rates of morbidity. Because very old people are most affected by poor accessibility, they pay the price of higher costs, possibly with their lives.

Removing impediments that hinder access to health care providers and addressing capacity shortages could enable older people to lead self-determined lives (OECD, 2014). The accessibility of a doctor or hospital is determined not only by physical proximity, but by adequate ratios of physicians and health care facilities to numbers of older people. Regional disparities in ratios increase inequality when the elderly in some regions can no longer see a doctor or receive stationary medical treatment in a timely manner.

The availability of physicians is positively related to a region's life expectancy at birth – an effect that remains significant even when controlling for GDP per capita (OECD, 2014). While the number of active physicians per 1 000 older people is a measure of capacity rather than accessibility, it is nevertheless a relevant proxy for access to adequate health care services as an indicator of interregional old-age inequality.

From a territorial perspective, one of the first questions to address is whether a region's older people are served by adequate health care services in the locality where they live. Information on how low numbers of physicians or poor hospital capacity restrict elderly access to health care services could then be a key input for use by local authorities as they design and implement policies that address disparities in access to

basic public services. For instance, preventive health care or the use of nurse practitioners can help alleviate strained health care services in difficult to service regions. However, they cannot fully replace doctors and hospitals and a more comprehensive approach is needed to improve health care service access.

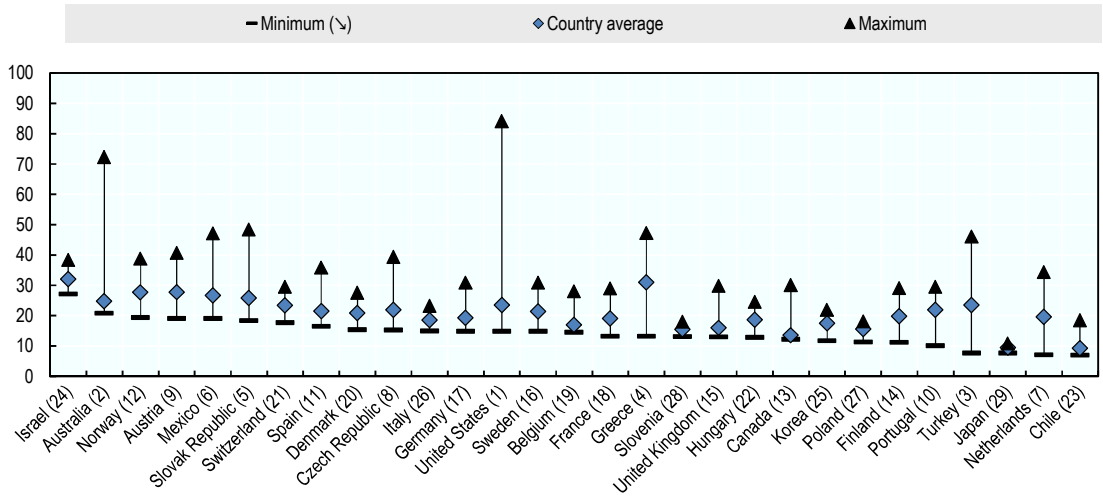
Ratios of active physicians and hospital beds to older people vary widely by TL2 regions

In TL2 regions where older people account for high shares of the population, an adequate provision of physicians is important, as health generally deteriorates with age, so increasing demand for medical care.[5] However, regional distributions of hospital beds and doctors do not match the localities where older people live in most OECD countries. Accordingly, ensuring they can access health care services and improving their health outcomes is becoming a growing concern in many regions.

The widest gaps between the lowest and highest ratios of active physicians to 1 000 older people in TL2 regions are found in the United States, Australia and Turkey (Figure 6.5). In the United States in 2013, the gap ranged from 14 physicians per 1 000 older people in the state of Iowa to 82 in the District of Columbia. In Australia, the region with the highest ratio was the Northern Territory with 72, while the lowest was Tasmania with 20 doctors per 1 000 elders. As for Turkey, Ankara boasted a ratio of 46/1 000, against just 7/1 000 in the Western Black Sea – Middle and East. Very low ratios of far below ten physicians per 1 000 older people were also found in the Chilean region of O'Higgins, Iwate in Japan, and Zeeland in the Netherlands.

Figure 6.5. Large regional disparities in the ratio of active physicians to older people

Ratio of active physicians to 1 000 older people, Territorial Level 2 regions, 2013



Note: Latest available years: Chile and United States 2009; Belgium, Canada, Japan and Luxembourg 2010; Greece and Mexico 2011; Australia, Israel, Italy and Sweden 2012. Number in brackets indicates ranking according to range. For example the United States is the country with the largest regional difference, measured by the gap between the regions with the maximum and the minimum ratio of active physicians.

Source: Calculations based on the *OECD Regional Database.*

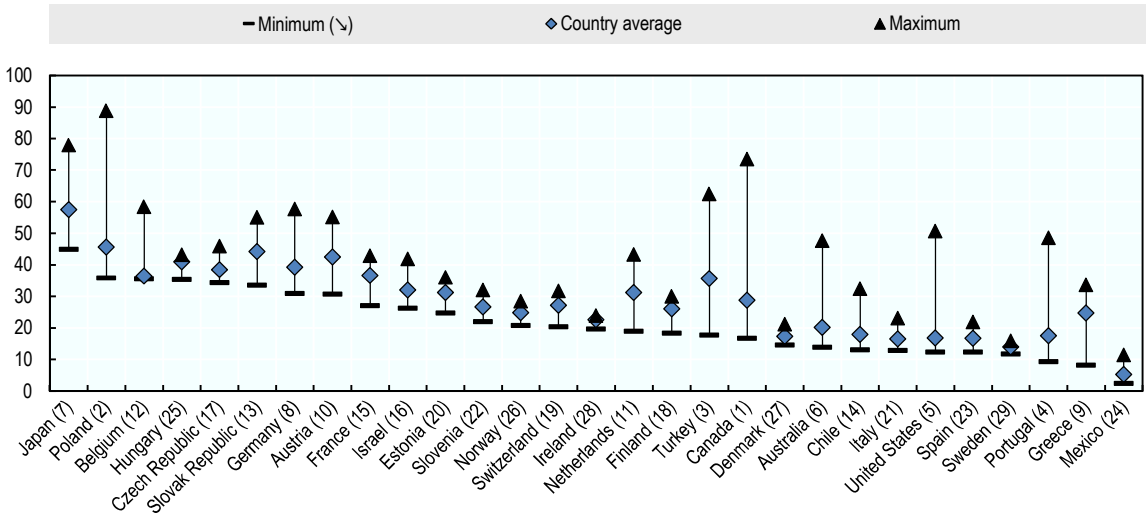
StatLink http://dx.doi.org/10.1787/888933568167

The greatest regional disparities in the number of hospital beds per 1 000 older people in 2014 came in Canada, Poland, Turkey, Portugal and the United States (Figure 6.6). In Canada, for example, the number of beds ranged from 16 in the Yukon region to 73 in the Northwest Territories. The narrowest was in Sweden, albeit at low levels, with 11 beds in North Middle Sweden to 16 in Upper Norrland.

When it comes to regions where the hospital bed and active physician indicators were high, Australia's Northern Territory stood out for its high ranking on both counts – it boasted 47 hospital beds and 72 active physicians. Portugal's Alentejo region, by contrast, had very few hospital beds or physicians – respectively, 9 and 10 per 1 000 older people.

Figure 6.6. Large regional disparities in the ratio of hospital beds to older people

Number of hospital beds per 1 000 older people, Territorial Level 2 regions, 2014



Note: Number in brackets indicates ranking according to range; e.g. Canada has the largest range across regions.

Source: Calculations based on the *OECD Regional Database*.

StatLink http://dx.doi.org/10.1787/888933568186

Physical proximity to health care services

A second stage in the territorial approach to assessing unequal access to health care services is to look at how physically near or far health care services are to older people's places of residence. How fast they can get to a hospital is determined by a combination of local factors such as topography, population density, levels of congestion and the regional road infrastructure. The location of the closest hospital and how to reach it are of prime importance, as are regional transport networks. In this analysis, the physical accessibility of health care facilities is measured by the percentage of the older population who may access a hospital within 20 minutes by road.[6]

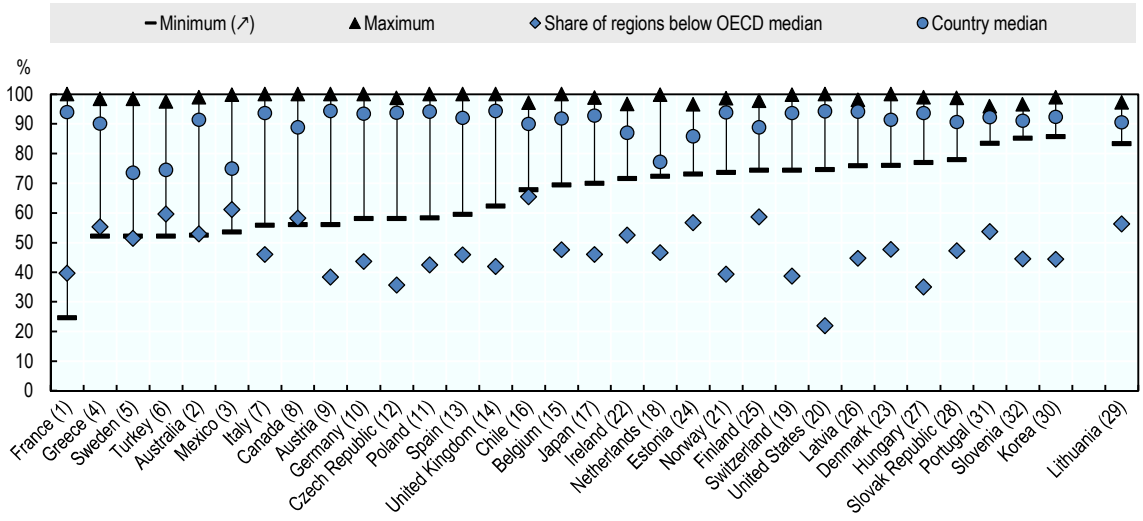
Examination of physical proximity to the nearest hospital reveals stark differences between TL3 regions. The difference between regions is widest in France at 74 percentage points and narrowest in Slovenia with 11 (Figure 6.7). In regions where hospitals are most easily accessible, almost all older people can reach one within 20 minutes by road. This is typically the case in regions of high population density. In

France's Paris region, for example, everyone lives within a 20-minute drive of a hospital, and 98% of the older population do in the United States' Miami-Fort Lauderdale-Miami Beach region.

Unsurprisingly, remoteness from hospitals is observed mostly in rural regions. In the Corrèze region of France, for instance, only 25% of the elderly can get to a hospital by road within 20 minutes. The United States is the OECD country which boasts, at 21%, the lowest percentage of regions where the physical accessibility of hospitals is below that of the OECD median region, in which 88% of older people live within a 20-minute drive of a hospital. At 65%, Chile has the highest percentage.

Figure 6.7. Physical access to a hospital is difficult for older people in some regions

Disparities between Territorial Level 3 regions in the share of older people who can reach a hospital within 20 minutes by road, 2014



Note: Public and private hospitals are considered. Number in brackets indicates ranking according to range; e.g. France has the largest range across regions.

Source: Open Street Map Contributors (2016); *OECD Regional Database* (2016); authors' own calculations.

StatLink http://dx.doi.org/10.1787/888933568205

Access to public transport

Accessible public transport services[7] are a critical component of any strategy to reduce spatial inequalities and increase quality of life for all members of society. Improving the proximity, availability and affordability of public transport services, for example, makes it easier to find and keep jobs and reduces travel costs (OECD, 2014). For older people, accessibility is critical to their integration in society. It is of particular importance with regard to health care, social services, housing and involvement in the local community (Frye, 2011). Difficulty in accessing transport services may cause social exclusion of certain groups (OECD, 2014), particularly older people. As their ability to drive fades with age, their autonomy may be further impaired (OECD, 2015a).

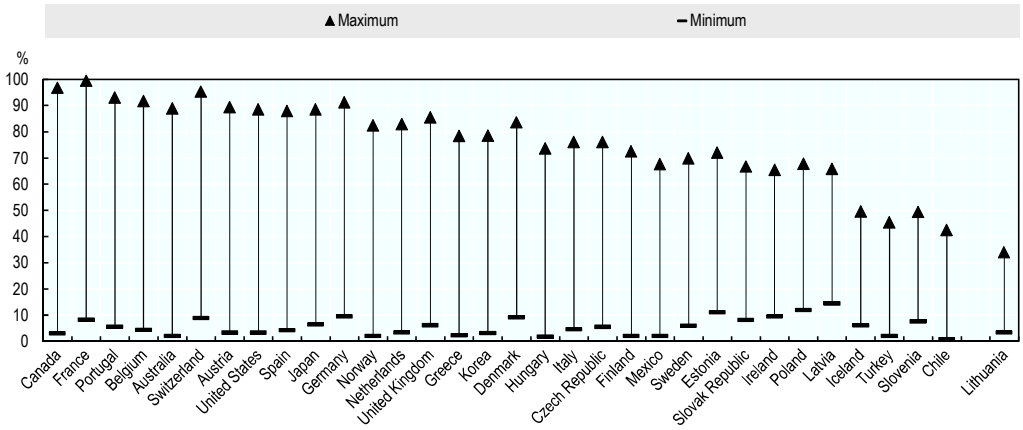
There are wide differences between TL3 regions in shares of older people residing within walking distance of public transport stations and stops in OECD countries. Disparities are particularly pronounced between, on one hand, regions that are home to

major urban centres or capital cities and, on the other, very rural remote regions. As a result, interregional differences between the highest and lowest public transport accessibility rates vary widely (Figure 6.8). In Germany, for example, the share of the older population living within walking distance of a public transit stop – where walking distance is the average distance an older person can walk in ten minutes – ranges between 82% in the München Kreisfreie Stadt region to as little as 4.5% in the region of Ostprignitz-Ruppin. In other countries, such as Lithuania, interregional differences are somewhat less pronounced. However, the overall regional share of Lithuania's older population who enjoy walkable access to public transport stops is among the lowest in the OECD and does not exceed 35%.

Not surprisingly, the highest shares of older people who can walk to public transport stops are in regions with high population densities, where agglomeration economies make public transport more cost-efficient. However, even between regions that host large urban agglomerations, sharp differences in the accessibility of public transport may be observed. For example, while in Barcelona (Spain) 85% of older people live within walking distance of a public transport stop, that share is only 67% in the Stockholm region of Sweden.

Figure 6.8. Large regional disparities in the access of older people to public transport

Shares of living within walking distance of public transit stops, Territorial Level 3, 2014



Note: Countries are ranked according to the difference between the regions with maximum and minimum access.

Source: Open Street Map Contributors (2016); *OECD Regional Database* (2016); authors' own calculations.

StatLink http://dx.doi.org/10.1787/888933568224

In some rural TL3 regions, the share of the elderly population living within a ten-minute walk of the closest public transport stop is extremely low. For example, it is only 2% in Chile's Petorca region and Canada's Mount Waddington. Both are very sparsely inhabited, with population densities of less than ten people per km^2. Technological changes such as self-driving cars may help ease some mobility constraints faced by older people in low-density areas. Nevertheless, access to transport services remains a critical issue for the elderly, particularly in remote rural areas, as they grow less autonomous with age and increasingly prone to isolation. Restricted access to services is also a major challenge in urban areas (OECD, 2014).

2. Living conditions and well-being among the over-80s

The over-80s are better off than previous generations in many, though not all, dimensions of well-being. First they represent a greater share of a given cohort reaching that age, and those who reach 80 now live longer than a few decades ago and few suffer from severe activity limitations (see below). They are also more likely to live independently and sustain their autonomy for longer.

However, more over-80's also live alone or with a frail partner, which heightens the risks of poverty and depression. Older women are especially vulnerable. Women live longer on average and frequently survive the death of a partner. At the same time women's careers are typically shorter (see for instance Chapter 5), female wages are lower and a larger share of care activities are carried out by women (Section 4 and OECD, 2017), leading to lower pensions and a higher incidence of poverty among older women. They are also more prone to physical challenges and more likely to report depressive symptoms, live alone, and experience poverty.

There is considerable uncertainty over the future of the over-80s' living conditions and well-being. On the one hand, women are increasingly working throughout the course of their lives and earning personal income, which increases their eligibility for old-age pensions and reduces the risk of living below the poverty line. On the other hand, a significant fraction of men and women in their late-50s report middling or bad health (Chapter 2) and may continue to suffer from poor health as they age.

Changes in families and living arrangements have affected the living conditions and well-being of the elderly, both positively and negatively. And the rapid change in the age structure of populations is exerting more pressure on fewer children to care for their elderly parents. Working adults will need work in proximity of their ageing parents, flexible working schemes if they are to be able to look after ageing parents on top of their childcare commitments. Frail elderly people, either living alone or with a frail partner for longer than they do today, will also require greater support.

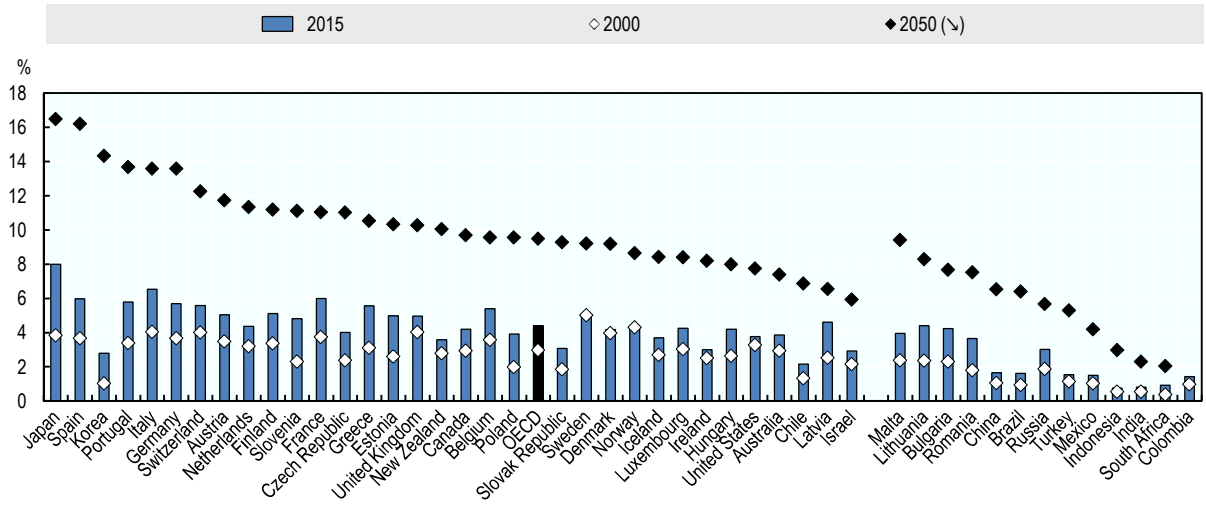
The share of the over-80s in the total population is growing ever faster

Gains in life expectancy are the key factor behind population aging, of which one of the most important consequences has been the spectacular increase over recent decades in the proportion of people aged 80 and over in the populations of OECD countries. The share of over-80s is projected to more than double by 2050, when it will account for an average of 9.5% of the OECD's total population – and up to 16% in Japan and Spain (Figure 6.9). In 2015, by contrast, the over-80s accounted for less than 1% of the population in Indonesia, India and South Africa.

Gains in life expectancy beyond the age of 80 in the 1970s were attributable chiefly to progress in the prevention of cardiovascular diseases which furthered the decline in mortality rates in old age (Meslé and Vallin, 2002). Over the past 15 years, and possibly longer, 80-year-olds' average life expectancy has continued to climb steadily in OECD countries (all of which lie above the diagonal in Figure 6.10, Panel A). Moreover, healthy life expectancy at birth is closely correlated with life expectancy at 80 years old (Panel B), which suggests that better living conditions from birth are conducive to longer lives (Oeppen and Vaupel, 2002; Vallin and Meslé, 2010; Chernew et al., 2016).

Figure 6.9. The share of people older than 80 years will continue to grow

Percentage of the population aged 80+

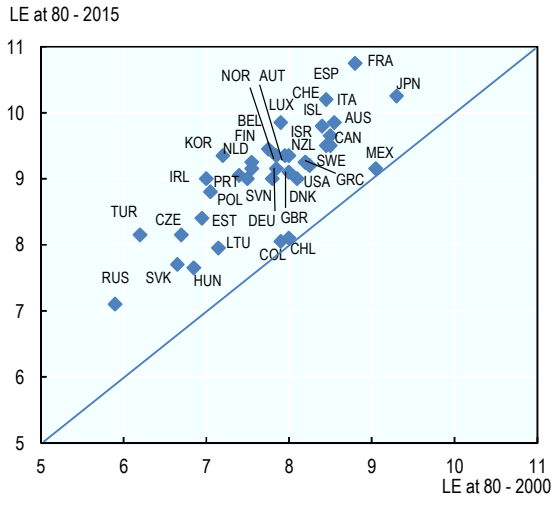


Source: OECD historical population data and projections.

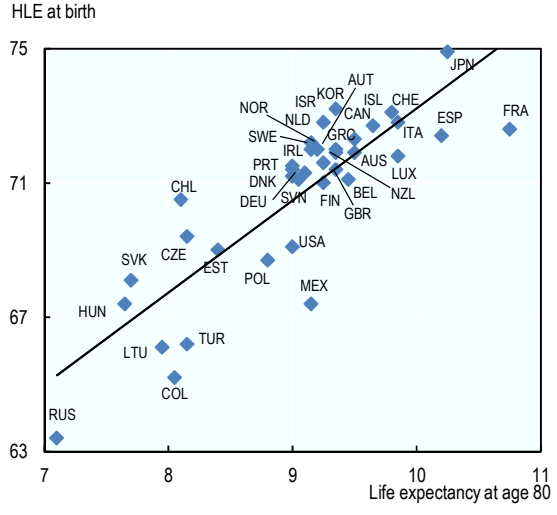
StatLink http://dx.doi.org/10.1787/888933568243

Figure 6.10. Life expectancy at the age of 80 has risen steadily

Panel A. Life expectancy (LE) at the age of 80 has risen steadily, 2000-15



Panel B. Healthy life expectancy (HLE) at birth is closely correlated with life expectancy at 80 years old, 2015



Source: *OECD Health Data* and WHO data on healthy life expectancy.

StatLink http://dx.doi.org/10.1787/888933568262

Health and the ability to function are determinants of well-being among the over-80s

Heart disease, obesity and depression impair health and well-being

Health status is a fundamental dimension of elderly well-being, though it deteriorates with age, even among the healthiest of those who survive beyond their 80s. The over-80s are more prone than any other age group to chronic disease or disabilities that curtail activities of daily living (ADL) (Box 6.4). At country level, higher incidences of strokes and lung diseases contribute to lower rates of survival to the age of 80 (Solé-Auro and Crimmins, 2013; Solé-Auro, 2016). However, there is no linear association in OECD countries between life expectancy at 80 years old and the general prevalence of chronic diseases, as both their incidence by age and the treatments they receive vary across countries (Solé-Auro and Crimmins, 2013).

Excess weight and obesity are health risk factors in all age groups, including the over-80s, as they heighten the likelihood of cardio-vascular problems and can limit the ability to perform ADLs. Prevalence among the over-80s varies markedly from country to country and, in some, by gender (Figure 6.11). A significant minority are obese in many countries – more than one in five men and women aged 80 and over in England, for example. Women are more likely to be obese than men in Spain, Estonia, the Czech Republic and Denmark.

Box 6.4. Assessing limitations on the ability to function

Self-reports of problems with the ability to function are assessed through responses to questions on activities of daily living (ADLs) and instrumental activities of daily living (IADLs).

- There are six ADLs: bathing and showering, dressing, using the toilet, getting in and out of bed, walking across a room, and eating. The ability to perform all six ADLs equates to the ability to self-care. The extent of an individual's inability to function is measured by how many ADLs he or she has trouble performing.
- There are seven IADLs: handling transportation, making phone calls, shopping, preparing meals, taking medication, housework and basic maintenance, and managing finances. The ability to perform all seven equates to the ability to live independently. The extent of an individual's inability dependence is determined by how many IADLs he or she struggles to perform.

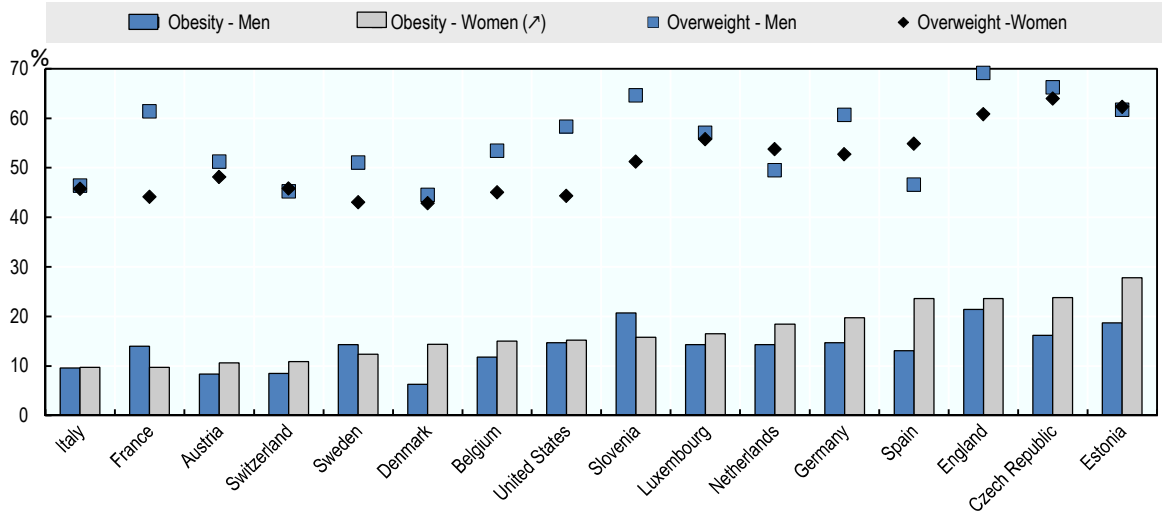
The Mobility Index measures mild and severe forms of functional limitations related to walking and climbing stairs, e.g. walking across a room, walking 100 meters, climbing one or several flight of stairs without stopping to rest, and climbing.

The Global Activity Limitation Index (GALI) assesses an individual's long-standing limitations in everyday activities due to a health problem. The individual is asked to rate to what his or her health problem is a limitation. GALI encompasses both severe and mild restrictions on activities.

Smoking is another major risk factor, though only a small proportion of over-80s report smoking – an average of 5% of women and 8% of men, though the figure is as high as 18% of men in Denmark and Spain. However, a high share of men (58%) and women (22%) in the 80+ age group have been smokers, which may affect their health in old age.

Figure 6.11. Prevalence of excess weight and obesity among the 80+ varies markedly across countries

Percentage of overweight and obese individuals aged 80 and over



Source: Börsch-Supan (2016); 2006 English Longitudinal Study of Aging; United States Health and Retirement Study 2006 as cited in Sole-Auro (2016); Solé-Auro and Crimmins (2013).

StatLink http://dx.doi.org/10.1787/888933568281

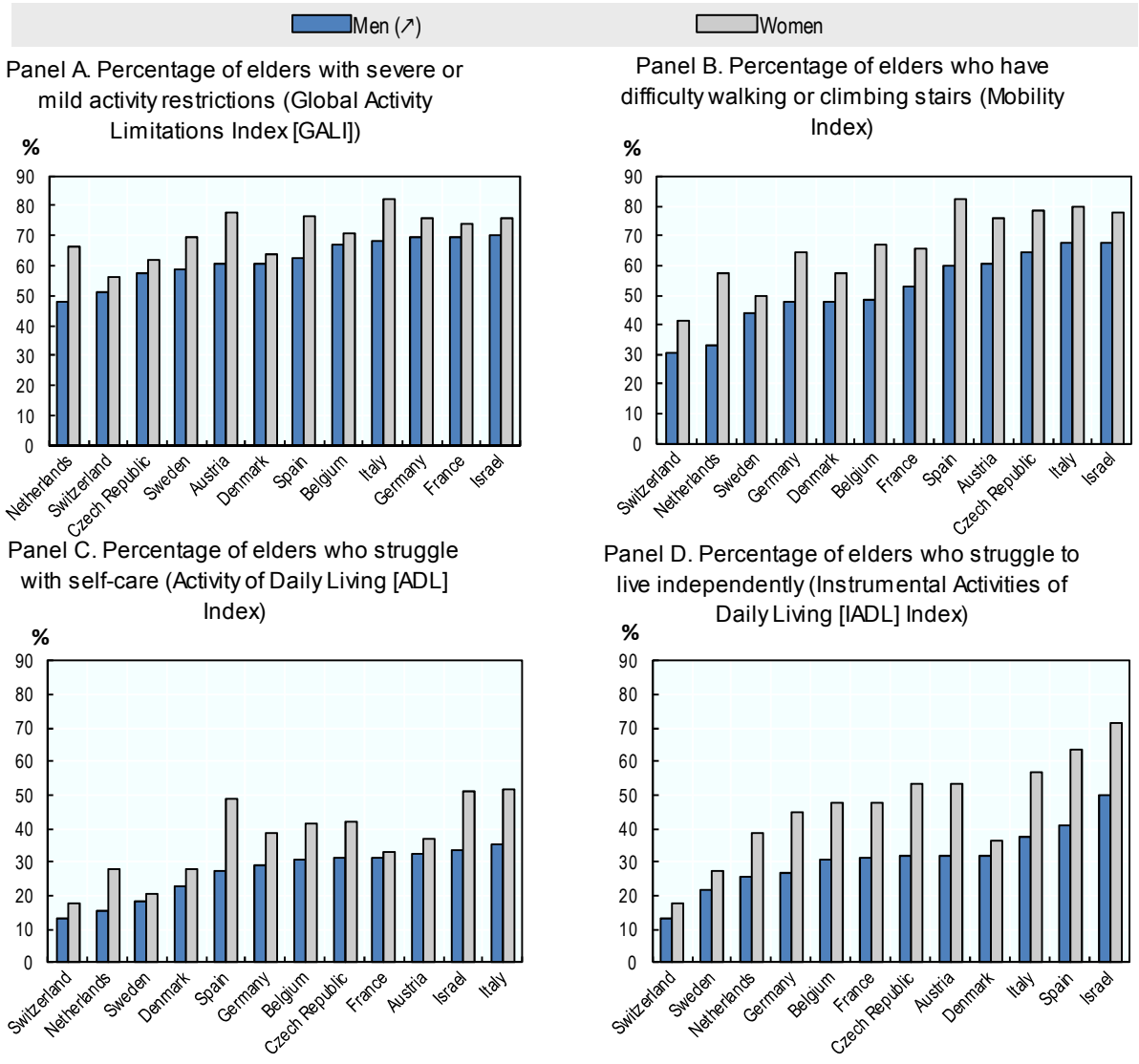
Women are more likely than men to experience physical limitations

Although most people of 80 and over grow old without suffering from any severe disability, the probability of physical and mental dependency increases with age, often making assistance on a daily basis essential. The incidence of functional limitations among the over-80s is lowest in the Netherlands, Sweden and Switzerland, and highest in Spain, Italy, Greece and France despite their comparatively high life expectancies.

The proportions of over-80s affected by some physical limitations (Figure 6.12, Panel A) or reduced mobility (Panel B) are high in all countries considered in Figure 6.12, as they encompass a wide range of possible problems (Box 6.4). However, people who report struggling with self-care (i.e. the ability to perform activities of daily living, ADLs) account for much lower shares of the over-80s (Panel C). In Israel and Italy, however, more than one-third of men and over 50% of women suffer from limitations that impair their self-care ability. Women are also more likely than men to report struggling with the instrumental activities of daily living (IADLs), which indicates that they have trouble leading independent lives (see Panel D).[8] By contrast, the proportion of men and women with IADL-related difficulties is comparatively low in the Netherlands, Sweden and Switzerland.

Getting older is not without consequences for mental health, either. The prevalence of depressive symptoms is high in England, with 57% of men over 80 and 70% of women affected. It is high in Italy, too, among both males (47%) and females (65%), in the United States among males (48%), and in Spain among women (60%) (Figure 6.13). By contrast, prevalence is relatively low in Denmark, the Netherlands and Sweden and, among older women, in Switzerland, the Netherlands and the United States.

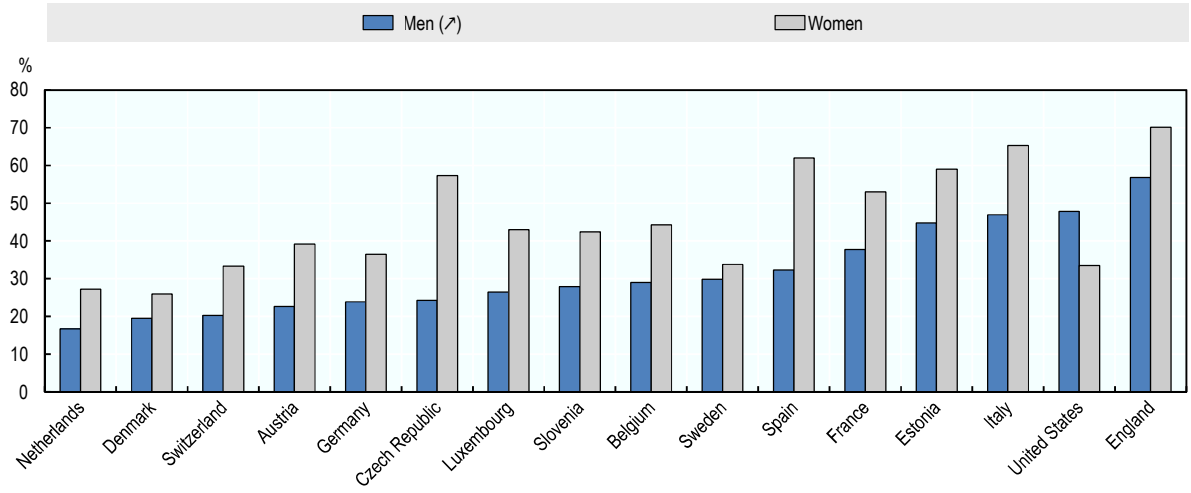
Figure 6.12. Women report higher rates of functional limitation



Source: Börsch-Supan, A. (2016), "Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 5", release version 5.0.0.

StatLink http://dx.doi.org/10.1787/888933568300

Figure 6.13. Proportion of 80+ showing depressive symptoms is very high in some countries



Source: Börsch-Supan (2016); United States Health and Retirement Study 2006 as cited in Sole-Auro and Crimmins (2013).

StatLink http://dx.doi.org/10.1787/888933568319

Living arrangements are critical to elder well-being

A high proportion of women aged 80 and over live alone

Family living arrangements are a key component of the material and subjective well-being of the elderly. They shape the material resources and home environment that family members may share with the elderly to ease their everyday life. The physical proximity of family members facilitates interaction and the provision of care when needed, and tempers the widespread feeling among the elderly that they have been left alone (Fokkema et al., 2012). When family members are absent or unavailable to provide care, demand for professional caregiving increases. Having no surviving children lessens the over-80s' residential autonomy and heightens the likelihood of being placed in an institution (Gaymu et al., 2007; OECD, 2011).

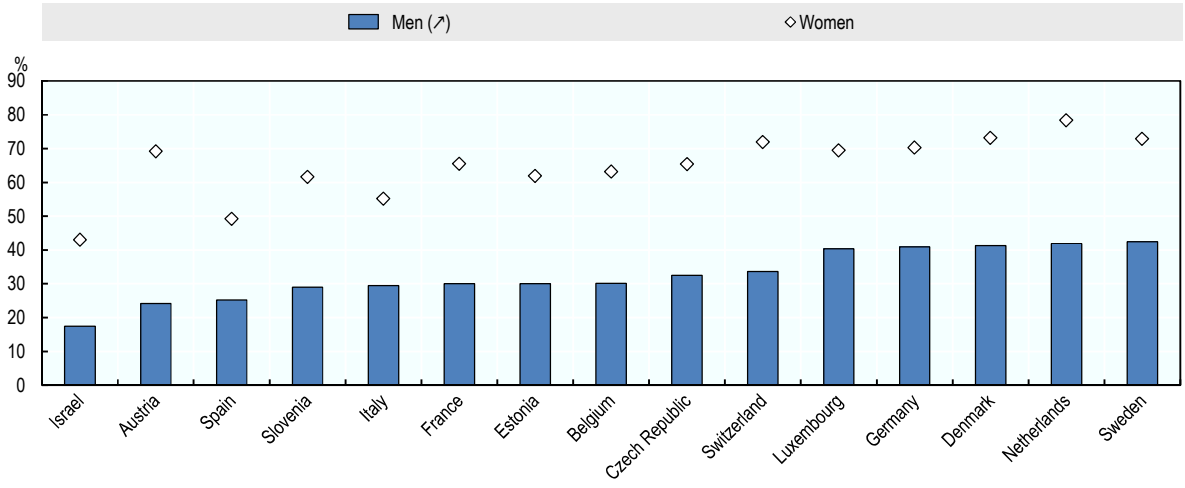
The proportion of over-80s who live in a separate household has risen in most OECD countries over recent decades. There are a number of reasons:

- better health;
- better financial conditions;
- the decline in intergenerational co-residence (Jacobzone et al., 2000; Marshall et al., 2015; Dykstra et al., 2013);
- policies to maintain the very old in their own homes and support family carers (OECD, 2011).

However, family living arrangements differ sharply with gender. In all countries in Figure 6.14, many more women than men live alone, partly because they are more likely to be widowed. Nevertheless, old women are also more likely to live with their children or other adults after the death of their partner in Estonia, Italy, Slovenia and Spain (Gaymu et al., 2008; Dykstra and Fokkema, 2011).

Figure 6.14. Women older than 80 years live alone much more than men in the same age group

Proportion of persons aged 80 and over who live alone



Source: Börsch-Supan, A. (2016), "Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 5", release version 5.0.0.

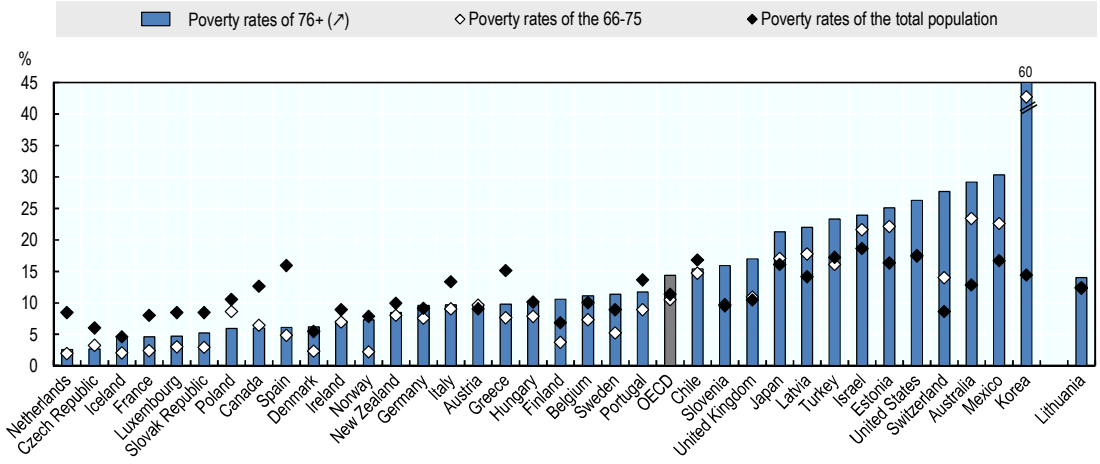
StatLink http://dx.doi.org/10.1787/888933568338

The over-80s who live alone are at a high risk of poverty

Material and care needs sharply increase with age, which reinforces the importance of income for a decent standard of living in old age. An average of one in seven people aged 76 and over is poor OECD-wide against one in nine for the total population (Figure 6.15). In many countries, the over-76s are the age group most at risk of living in poverty. Poverty rates of the over-76s are low in the Netherlands and the Czech Republic, but more than twice the OECD average in Australia and Mexico, and four times higher in Korea.[9]

The situation in Korea is the consequence of two interrelated factors. First, a powerful Confucian social contract has for centuries dictated that children should care for their ageing parents. But filial obligations are weakening as younger generations increasingly migrate to cities and a growing share of the elderly find themselves alone. Second, the national pension system was set up only in 1988, too late for the generations born in the early 1950s, before or during the Korean War, to benefit. Many of the elderly are therefore not entitled to a pension unless they can prove their offspring are unwilling or unable to provide support, which is difficult.

Figure 6.15. Poverty risks are higher among people aged 76 and over on average in the OECD



Note: The poverty rate is defined as the share of people with income below 50% of the median household income of the total population.

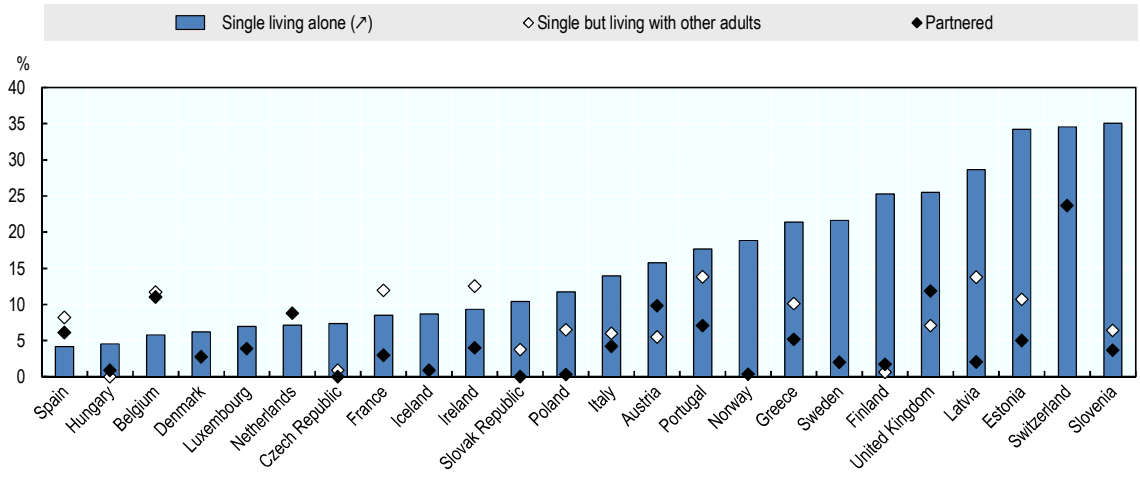
Source: *OECD Income Distribution Database*.

StatLink http://dx.doi.org/10.1787/888933568357

In the vast majority of countries, the over-80s who live alone are much more prone to poverty than those who live with people with whom they share incomes – either because they are partnered or, though single, living with other adults in a private household (Figure 6.16). Indeed, many of the poor over-80s have no family to support them. Nor do they have the personal resources to avert poverty and pay for formal care in an institution (Gaymu et al., 2008). Cross-national differences in poverty rates among the over-80s who live alone are very wide. More than 1 in 3 in three are poor in Estonia, Slovenia and Switzerland, for example, but less than 1 in 20 in Hungary and Spain.

Figure 6.16. Poverty rates among the over-80s are much higher for those living alone

Percentage of the over-80s with an equivalised income below 50% of the median



Source: European Union Statistics on Income and Living Conditions (EU-SILC), 2014 edition.

StatLink http://dx.doi.org/10.1787/888933568376

As elderly women are more likely than men to live alone, they are at greater risk of poverty at a very old age: about 17% of women aged 80 and over who live alone are in relative poverty in Europe, compared to only 10% of their male peers. The gap is partly attributable to the fact that a significant proportion of women has no personal income or receive low pension benefits because they participated little in paid work and/or earned low wages in earlier years. While higher poverty rates among women aged 80 and over compared to men is of great concern today, it may be less so in the future, as the increase in female labour force participation across cohorts combined with the narrowing of the life expectancy gender gap is likely to narrow the poverty gap as well (OECD, 2015b).

Prospects for the living conditions of the over-80s

Several factors make the outlook for the lives of the over-80s uncertain. Demographic patterns are the main determinants, but various other trends may come into play in contrasting ways. First, given the continuing decline in mortality up to the age of 80, future generations will generally live longer. However, the elderly with functional limitations may also need to learn to cope with such limitations for longer (Gaymu, 2006; OECD, 2011; Grundy et al., 2006). Second, the projected narrowing of the life-expectancy gender gap in most countries will mean more over-80s (especially women) cohabiting with a partner who may be able to care for them. However, the rising divorce rate in all cohorts may weaken that positive development although it, in turn, may be partly offset by people's growing propensity to re-partner or remarry after their first union comes to an end.[10]

Whether partners are able to look after each other when the need arises will depend on greater life expectancy not troubled by disability (Chapter 2). While both partners might live longer, they may also experience times in life when both are affected by limitations in their ability to function (Gaymu et al., 2008; OECD, 2011). Indeed, a rise is expected in the number of couples affected by frailty despite progress in monitoring health and treating illness that may help to postpone limitations until later in old age.

How care needs evolve will depend heavily on the health status of the over-80s. There is mixed evidence of an increase in restricted activity and functional limitations among people currently in mid-life (Chapter 2). However, the mounting prevalence of excess weight and obesity across cohorts, and the growing number of women smoking (WHO, 2015) also raise concerns about the health of the elderly in the future.

A further factor, the steep drop in fertility, is likely to result in elder parents having fewer children who are able to act as their possible carers. And those whose parents have long-term care needs may well have to shoulder a heavier caregiving burden. They may thus increasingly become their parents' carers, so reinforcing a trend already observed in many countries (Dykstra et al., 2013). Indeed, more children may have to look after their elderly parents while still in employment and raising their own children.

Longer working lives – partly the result of later retirement – will also heighten the likelihood of workers having to care for a dependent parent. It will therefore become increasingly important to enable workers to take time-off for caregiving (as discussed in greater detail in the following section). To that end, employees in most OECD countries are in fact entitled to flexible working hours or family-caregiver leave, though such arrangements are often short-lived or intended only for cases of very serious illness (OECD, 2016b). Ensuring that workers can use them for a wider spectrum of caregiving situations and at short notice is crucial, as the needs they are designed to meet are often unpredictable. The practical implementation of these policies needs to be thoroughly

thought through. Operational solutions need to be found to ensure that employers' and governments' administration cost and planning are well managed under these increasingly flexible arrangements. Moreover, companies need to make sure that caregiving policies are not only implemented on paper but also in practice, which requires commitment from all layers of management.

Greater flexitime is of course important from workers' own perspective as it helps them ease the strain on the work-life balance. But it is equally important for elderly parents, as being cared for by their own children considerably reduces feelings of loneliness and symptoms of depression (Fokkema et al., 2012). Not all elderly parents will have children living in the same neighbourhood and being able to be assist them on a regular basis, in which case formal care assistance will be needed (Dykstra et al., 2013). Whether the children of elderly parents prioritise formal home-based or institutional care will depend on:

- attitudes to keeping their parents in the family environment,
- the financial resources that countries are willing to channel into improving the living conditions of the elderly.

3. Long-term care

Long-term care (LTC) is essential to ensuring many older people's quality of life. As people age, they are increasingly likely to suffer from ill health or disability. For example, 1.3% of 60-64 year-olds suffer from dementia OECD-wide, a figure that rises to nearly 45% among the over-90s (OECD, 2015c). As a result, some of the things that the elderly previously took for granted become more difficult. They may find it more difficult to wash and dress every day, to cook meals and do the housework, and to keep up a social life and relationships. Many older people can, however, continue to live fulfilling, largely independent lives, provided they get the long-term care and support that they need from others.

The costs of meeting long-term care needs can worsen inequalities that start earlier in life. LTC may be provided by professionals or informally by family and friends. Either way there is a cost. Professional care can be very expensive when needs are severe. When no public provisions are available to cover these needs and if the elderly cannot afford it, their needs go unmet. While family and friends are not usually paid for providing informal care, there are nonetheless costs – in terms of the time spent giving care, their health, and their employment prospects.

The costs of LTC are not distributed evenly across the population. People on low incomes are the most likely to become disabled and the least likely to be able to afford professional care – even with support from social protection systems – leaving them at risk of unmet needs. As for informal care, costs fall disproportionately on women.

This section explores evidence of the degree to which the costs and impacts of dependence and LTC needs are unequally distributed across the populations of OECD countries, and to what extent unequal distribution drives and exacerbates inequalities.

The financial cost of LTC and the effectiveness of social protection

The cost of LTC can be high and difficult to afford, especially for lower-income groups

Professional caregiving has a financial cost. For people receiving care in the community, the main cost is that of paying someone to come to their home and help them with everyday tasks that include personal care like washing and dressing, help around the home with chores like cleaning and shopping, or support with social interaction and leisure, e.g. going to a social club or for a walk. The cost of institutional care covers this type of support plus bed and board.

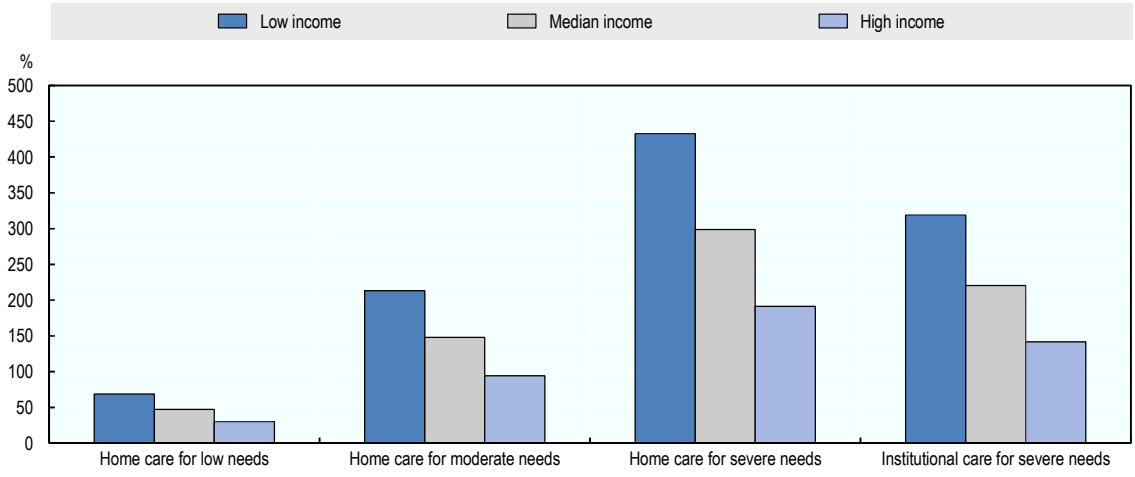
The cost of providing care, even for people with lower-level needs, can be high when set against a pensioner's disposable income (Figure 6.17).[11] In the 13 OECD countries for which data are available, 6.5 hours of professional LTC per week costs, on average, half of the median disposable income of a person over aged 65 and over.

Costs are higher for more intensive care needs. Someone with severe needs may require over 40 hours of care in the community. If it were all provided by a professional carer, it would cost on average three times the median disposable income of an older person. In the absence of informal arrangements, institutional care may be a cheaper way to meet acute needs – but even that still costs more than twice an elderly person's median disposable income.

Only the richest older people can cover high costs for moderate needs from their income. The cost of home care for moderate 22.5 hours per week of professional care is equal to 96% of the disposable income for someone in the 80th percentile of the income distribution and more than twice the disposable income of someone in the 20th.

Figure 6.17. Home care costs are high compared to a pensioner's disposable income

Cost of long-term care in different care settings, percentage of the over-65s' disposable income



Note: Percentages are averages of 13 OECD countries. Low income refers to the 20th percentile and high income to the 80th. Low, moderate and severe needs correspond to 6½, 22½ and 41¼ hours of care per week, respectively. The costs of institutional care include the provision of food and accommodation, so are overestimated relative to home care.

Source: Muir, T. (2017), "Measuring Social Protection for Long-term Care", *OECD Health Working Papers*, No. 93, OECD Publishing, Paris, http://dx.doi.org/10.1787/a411500a-en.

StatLink http://dx.doi.org/10.1787/888933568395

High and unpredictable costs provide a strong rationale for social protection

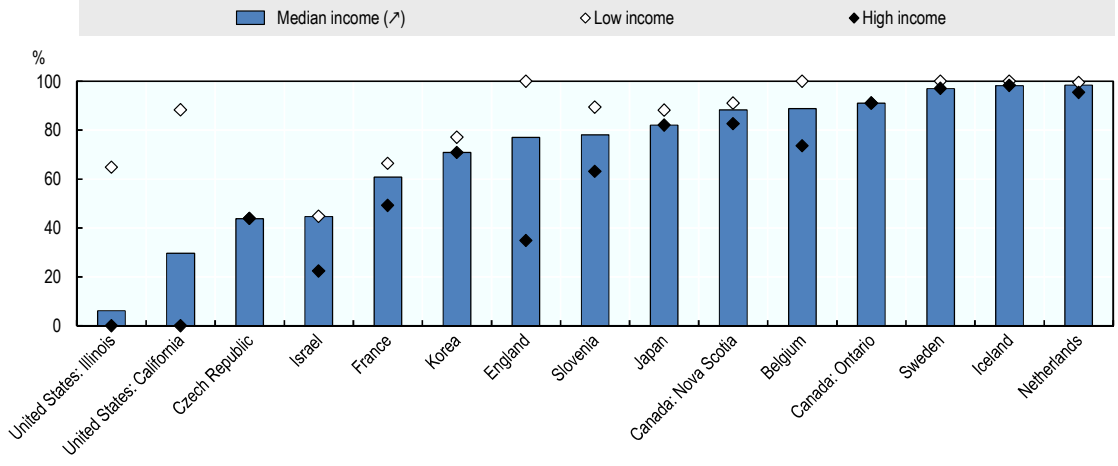
Although growing older heightens the likelihood of needing LTC, it is not easy to predict if or when someone might develop the need. The unpredictable nature of LTC costs and the fact that most people cannot afford them out of their own pockets mean that the elderly stand to benefit from pooling LTC risks. In most OECD countries, private insurance plays only a minor role in LTC (Colombo et al., 2011) and risk pooling is provided largely by public social security systems.

As Figure 6.17 shows, lower-income groups have greater trouble affording LTC. This is reflected in the design of OECD countries' social protection systems, most of which apply some form of means testing. The only exceptions among the 13 countries studied are the Czech Republic, where benefits are universal (though not comprehensive), and some parts of Canada, such as Ontario, where home care is provided free of charge, up to a limited number of hours per week.

Figure 6.18 illustrates how social protection targets lower income groups. Focusing on a scenario where home care is provided to meet moderate needs, it shows the proportion of the cost met by the public purse and how that proportion varies with a person's income. While benefits are means-tested in almost all countries, approaches vary. In the United States and England, social protection is heavily means-tested. People on very low incomes have most or all of their costs met publicly, while people on high incomes pay nearly all of the costs out of their own pockets. At the other end of the spectrum, Sweden, Iceland and the Netherlands have highly comprehensive systems that cover nearly the full cost of care, with users making only small co-payments – although the better-off are asked to make slightly larger contributions.

Figure 6.18. Proportion of LTC costs covered by social protection systems differs widely among countries and income groups

Proportion of LTC costs covered by social protection systems for someone receiving home care for moderate needs, by level of income for people with low assets



Note: Low income refers to the 20th percentile, high income to the 80th. The term "moderate needs" in the figure heading denotes 22½ hours of care weekly. It is assumed that the person does not have assets that they can use to pay for care.

Source: Muir, T. (2017), "Measuring Social Protection for Long-term Care", *OECD Health Working Papers*, No. 93, OECD Publishing, Paris, http://dx.doi.org/10.1787/a411500a-en.

StatLink http://dx.doi.org/10.1787/888933568414

Though means-tested, home care is unaffordable for low-income groups in several countries

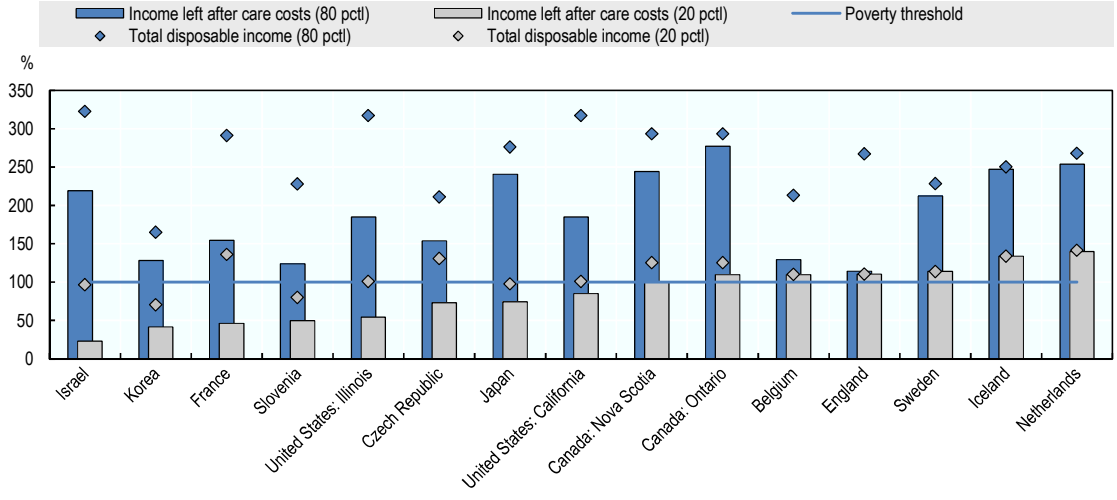
While social protection systems often pay for a high share of the cost of LTC (Figure 6.18), people cannot necessarily pay for the rest out of their own pocket. Out-of-pocket costs for recipients of care in the home must be low enough to leave them with the money they need for other living expenses, such as food, accommodation and heating. If out-of-pocket costs are too high, and family and friends cannot provide unpaid support, older people have to choose between leaving their LTC needs unmet or slipping into poverty.

Figure 6.19 illustrates one way of assessing the affordability of the out-of-pocket share of the cost of home-based LTC for moderate needs. It shows how the disposable income of the over-65s in the 20th and 80th percentiles of the income distribution compares to the poverty threshold and how it changes when their out-of-pocket LTC costs are subtracted from their income. Where the costs would drive them below the poverty line, they may not be able to afford the LTC they need plus other living costs.

People on high incomes can afford LTC for moderate needs in all 13 countries studied. They are able to pay the out-of-the-pocket costs without falling below the poverty threshold, even in the countries where those costs are significant. However, in over half of the countries studied, home care for moderate needs is beyond the means of low-income groups. As needs become more severe, out-of-pocket costs often increase and home care becomes even less affordable to those with low incomes (Muir, 2017).

Figure 6.19. Home care for moderate needs is beyond the means of low-income groups in over half the countries

Disposable income as percentage of the relative poverty threshold, selected OECD countries



Note: Disposable income of home care recipients with moderate needs before and after their out-of-pocket contribution to care costs. "Moderate needs" denotes 22½ hours of care per week. The relative poverty threshold is half the median disposable income for the whole population. 20 pctl refers to 20th income percentile; 80 pctl refers to 80th income percentile. Percentiles refer to the distribution of disposable income among the over-65s in each country. Analysis assumes that people do not have savings which they can use to pay for care.

Source: Muir, T. (2017), "Measuring Social Protection for Long-term Care", *OECD Health Working Papers*, No. 93, OECD Publishing, Paris, http://dx.doi.org/10.1787/a411500a-en.

StatLink http://dx.doi.org/10.1787/888933568433

Comprehensive or well-targeted social protection makes LTC affordable to low-income groups

Most social protection systems in countries where people on low incomes can afford home care for moderate needs fall into one of two groups. The Netherlands, Iceland and Sweden have comprehensive coverage. People with low incomes pay nothing towards the cost of care and, although the better-off do pay a little, out-of-pocket costs are low for everyone and LTC is always affordable. England and Belgium, on the other hand, have much more closely targeted systems. While people with low incomes pay little or nothing towards the cost of care, those on high incomes pay a significant share of LTC costs. However, although their disposable income is significantly reduced, which has an effect on their standard of living, the costs are not high enough to push them into poverty.

Out-of-pocket costs would push low-income people into poverty in some countries

In countries where benefits are neither comprehensive nor well targeted, old people on low incomes are left with out-of-pocket costs which they cannot afford. Such shortfalls in social protection may be ascribed to different causes in different countries.

- LTC insurance in Japan and Korea covers most of the cost of LTC and, to a certain degree, targets lower-income brackets. In Japan, for example, most people pay only 10% of the cost of home care (up to a maximum monthly amount), but those with high incomes pay 20%. In Korea, people with low incomes pay only 7.5% of the cost of the services covered by LTC insurance, while others pay 15% (although caps on total coverage mean that people would, in practice, need to pay more to meet their needs in full). However, while people often pay only a small proportion of the cost of LTC, even this may be difficult for some to afford, since low-income older people in Japan already live on the poverty threshold and in Korea significantly below it.
- The United States has a targeted system whose structure is similar to England's, which requires that people must be left with no less than a protected level of income after any out-of-pocket LTC costs. In the United States, that amount, set at state level, is known as the Maintenance Needs Allowance (MNA). Of the two states considered in the current analysis, California and Illinois, California has, by far, the higher MNA. Yet in 2014, it still guaranteed a disposable income of only 85% of the poverty threshold. As for Illinois, the MNA in 2014 was just over half of the poverty threshold. In contrast, the level of protected income in the English system is higher than the relative poverty threshold.
- Older people in France and the Czech Republic are better off than in many other countries: even the 20th percentile of the income distribution is well above the poverty threshold. However, benefits in neither country are comprehensive, nor particularly well targeted. The Czech Republic does not practice targeting at all and grants the same allowance regardless of income. However, that amount is less than half of what it would cost to meet moderate needs through professional home care. France's main LTC scheme (the *Allocation Personnalisée d'Autonomie* – APA) pays out more to those with lower incomes, but tax deductions are more valuable to those with higher incomes. However, LTC benefits in France cover only between half and two-thirds of the cost of care.[12] In both the Czech Republic and France, people with high incomes can afford the out-of-pocket costs they are left with, but those with low incomes cannot.

- Israel's LTC benefit scheme covers only personal care. Yet, to lead independent lives in their own homes, many older people also need help with shopping, cooking or laundry. Unless family and friends can provide that support, people with LTC needs have to pay for it out of their own pockets. For those on low incomes – already on the poverty line – the cost of home help services for moderate LTC needs is around three-quarters of their disposable income.
- In Slovenia, all municipalities are required by law to meet 50% of the costs of home care services. Some, though, go higher than 50% and the average level of allowances is around two-thirds of the cost of LTC. People with lower incomes are entitled to further support and typically pay only around 10% of the cost of home care for moderate needs. However, low-income older people already live below the poverty threshold and paying as little as 10% would reduce their disposable income by one-third.

High out-of-pocket costs may be an incentive to go into institutional care

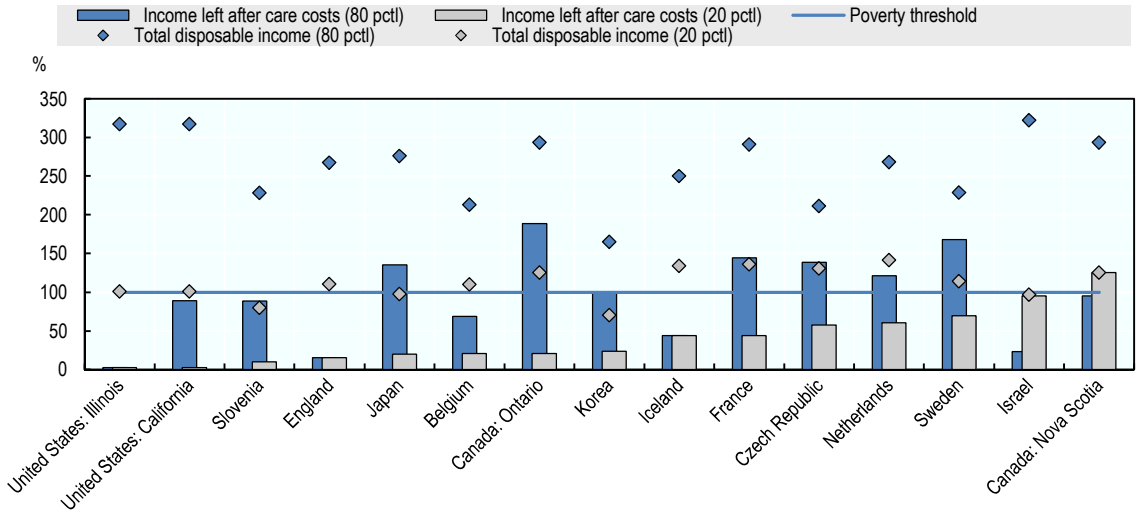
The out-of-pocket costs of institutional care are generally higher than for home care. However, this covers food and accommodation as well as care. As a result, older people in care institutions no longer need their income to meet the basic costs of living – although it can help them to maintain their independence and live better lives.

Figure 6.20 shows the disposable income of the over-65s in the 20th and 80th percentiles of the income distribution in selected OECD countries and how what they have left varies from country to country when out-of-pocket costs for institutional care are subtracted. Low-income older people in some countries, such as the United States, are left with only a very small amount of "pocket money". Nevertheless, social protection systems in all countries do ensure that even the low-income elderly are not denied institutional care on affordability grounds.

Some people with severe needs may prefer to remain at home and LTC policies often aim to help them to do so. These policies have been successful and, in recent years, the proportion of LTC recipients living in the community has increased in most countries (OECD, 2015c). However, the design of social protection systems can also influence where people receive care. Some countries restrict public funding for institutional care to people with needs above a minimum threshold, while others cap the number of hours of publicly-funded home care. Even without such policies, differences in out-of-pocket costs can provide a financial incentive for people to choose home or institutional care. In countries where people with low incomes cannot afford home care without being pushed into poverty, they may have incentives to go into institutional care where their care needs will be met and their food and board provided, even if home care might in some cases meet their needs more effectively and give them a better quality of life. Low-income groups may therefore have seen less benefit from the deinstitutionalisation of LTC.

Figure 6.20. Income left after care cost of institutional care recipients varies greatly among countries

Disposal income as a percentage of the relative poverty threshold, selected OECD countries



Note: Disposable income of institutional care recipients with acute needs before and after their out-of-pocket contribution to care costs. 20 pctl refers to 20th income percentile; 80 pctl refers to 80th income percentile. Percentiles refer to the distribution of disposable income among the over-65s in each country. Analysis assumes that people do not have savings which they can use to pay for care.

Source: Muir, T. (2017), "Measuring Social Protection for Long-term Care", *OECD Health Working Papers*, No. 93, OECD Publishing, Paris, http://dx.doi.org/10.1787/a411500a-en.

StatLink http://dx.doi.org/10.1787/888933568452

Gender inequalities in the provision of informal care

Informal caregiving can have benefits, but it also has costs

Many older people with LTC needs would prefer to be looked after by someone they know, while family and friends often wish to care for them when they become dependent. Indeed, some carers report that the experience of caregiving is rewarding (de Vugt and Verhey, 2013). However, informal carers, who are usually unpaid, may themselves pay a price for caregiving. There is an opportunity cost to the time that they spend providing care, as they could devote that time to paid work or leisure. Informal carers, especially those who give more than 20 hours of care per week, are more likely to work part-time or not at all. And they are 20% more likely than other people to have mental health problems (OECD, 2011).

In recognition of the costs and risks that carers face, OECD countries provide a range of benefits and services. A recent study of 27 EU countries (Courtin et al., 2014) found that financial benefits were the most common form of support to caregivers, followed by respite care and training. While financial benefits (paid directly to the caregiver or via the care recipient) are common, they rarely compensate carers in full for the costs they incur. Moreover, take-up of informal care benefits may be low, especially where significant paperwork is involved. For example, carers in France can be paid via the main LTC benefit, the APA, but it requires them to have an employment contract and, in practice, few people use of this provision. As a result, carers seldom receive enough financial compensation to offset the opportunity cost of caregiving (Muir, 2017).

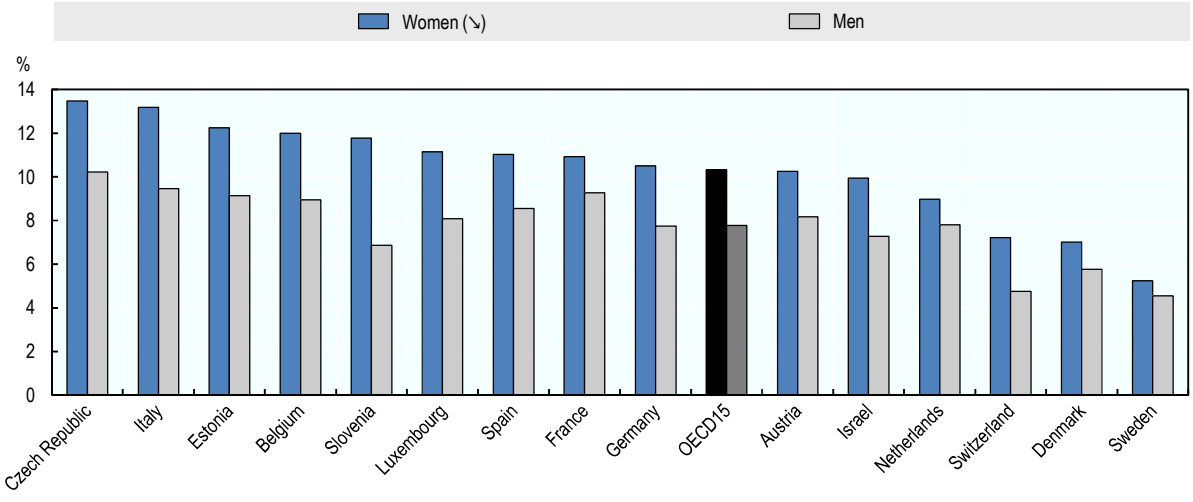
The effectiveness of support services in reducing the risks associated with informal care is unclear. Respite care – where temporary professional care services are used to give informal carers a break from caring duties – is highly valued by carers, but there is limited evidence that they improve outcomes. Similarly, while training and counselling aims to mitigate risks to mental health, evidence of its effectiveness in that regard is again inconclusive (OECD, 2011). It is crucial to strengthen support for carers and evaluate policies in order to understand which approaches work best. Meanwhile, as matters stand, carers are left facing health and employment risks.

Rates of informal care vary significantly between countries and by gender

The proportion of over-50s in the OECD who give daily informal care[13] varies significantly from country to country – from as low as 5% in Sweden to 13% in Italy and the Czech Republic (Figure 6.21). Everywhere, however, the majority of carers are women. The country with the least unequal gender balance is Sweden, where 57% of daily carers are women, followed by Denmark and the Netherlands with 59%.[14] At the other end of the spectrum lies Slovenia, where women make up 70% of informal carers. Women thus bear most of the costs of providing informal care including income losses and mental health problems leading to a higher risk of impoverishment at higher ages. Women would benefit most from any support provided to informal carers. Improving support services can help to narrow the gender inequalities caused by the unequal division of caring responsibilities.

Figure 6.21. The majority of over-50s providing informal daily care are women

The proportion of over-50s providing informal daily care in 2013, by country and gender



Note: People caring for members of the same household were not asked about the frequency of care, but are included in the definition of "daily informal care". People who care for their children, step-children, nieces or nephews are excluded from the definition.

Source: OECD analysis of data from the Survey of Health, Ageing and Retirement in Europe (SHARE) wave 5, release 5.0.0.

StatLink http://dx.doi.org/10.1787/888933568471

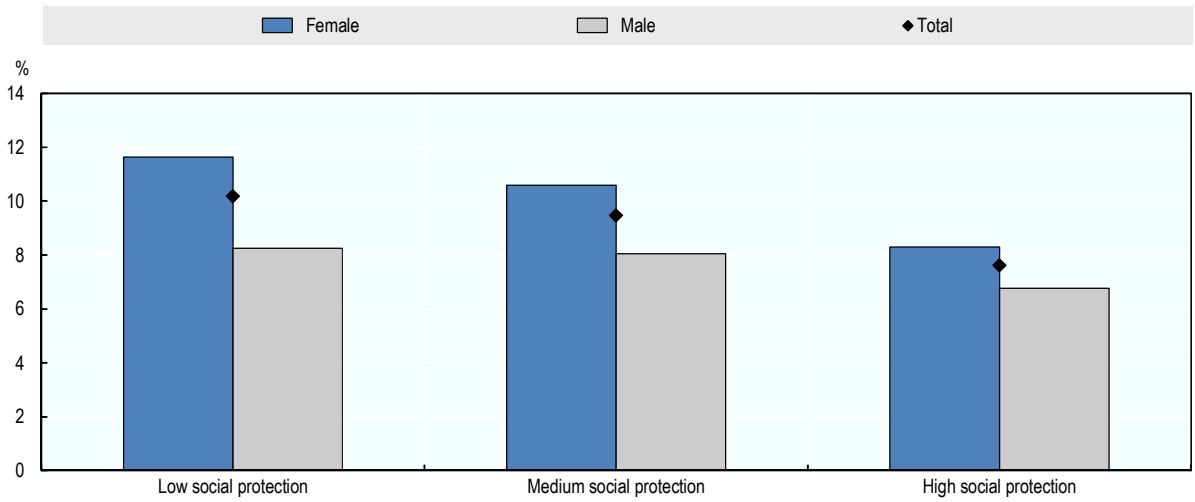
Countries with strong social protection have lower care rates and less gender inequality

Countries with the lowest informal caregiving rates have some of the most comprehensive social protection systems (Figure 6.21). Sweden, Denmark, Switzerland and the Netherlands all spend more than the OECD average on publicly funded LTC. Moreover, while the analysis of social protection for LTC above (see "Comprehensive or well-targeted social protection relieves low-income groups of much LTC cost") does not cover Denmark or Switzerland, it demonstrates that people in Sweden and the Netherlands have access to affordable LTC services, even if they are on low incomes.

Broadly speaking, in countries whose social protection schemes provide greater support for LTC, fewer people give daily informal care and there is less gender inequality (Figure 6.22). In 2013, women aged 50 and over in countries with low-level social protection (i.e. those where public spending on LTC is less than 1% of GDP) were 41% more likely to provide daily informal care than their male counterparts. The figure for their peers in countries with high levels of social protection (where public spending on LTC exceeds 2% of GDP) was only 23%. While other factors, such as cultural norms and gender stereotypes, may affect rates of informal care, it is likely that stronger support for LTC in social protection systems helps reduce the need for informal care, especially among women.

Figure 6.22. Fewer people give daily informal care in countries with high level social protection schemes

Average shares of the over-50s providing daily informal care by gender and levels of social protection, 2013



Note: People caring for members of the same household were not asked about the frequency of care, but are included in the definition of "daily informal care". People who care for their children, step-children, nieces or nephews are excluded from the definition.

Public spending on LTC is used as a proxy for social protection: <1% of GDP = low; 1-2% GDP = medium; >2% GDP = high.

Source: OECD analysis of data from the Survey of Health, Ageing and Retirement in Europe (SHARE) wave 5, release 5.0.0, and *OECD Health Data 2016*.

StatLink http://dx.doi.org/10.1787/888933568490

Higher female labour force participation may not mean lower informal caregiving rates

One reason why women may be more likely to provide informal care is that, for the current generation of women aged over 50, they are less likely to have had full careers than their male counterparts (Figure 6.23, Panel A). Their earning potential and caregiving opportunity costs are thus lower, while they are also more likely to have been caregivers earlier in life (looking after their children, for example). The apparent corollary is that, as female labour force participation increases over the coming decades, fewer women will be informal carers, so narrowing gender disparities and increasing demand for professional LTC services.

However, patterns of caregiving in the current female population of over-50s suggest that there is no clear correlation between labour force participation and caregiving rates. Women who have had full careers are actually slightly more likely to be providing daily informal care than those who have been out of the labour force for over ten years (Figure 6.23, Panel B). When other factors (such as health, family situation and country of residence) are controlled for,[15] the relationship between career history and caregiving rates is not significant.

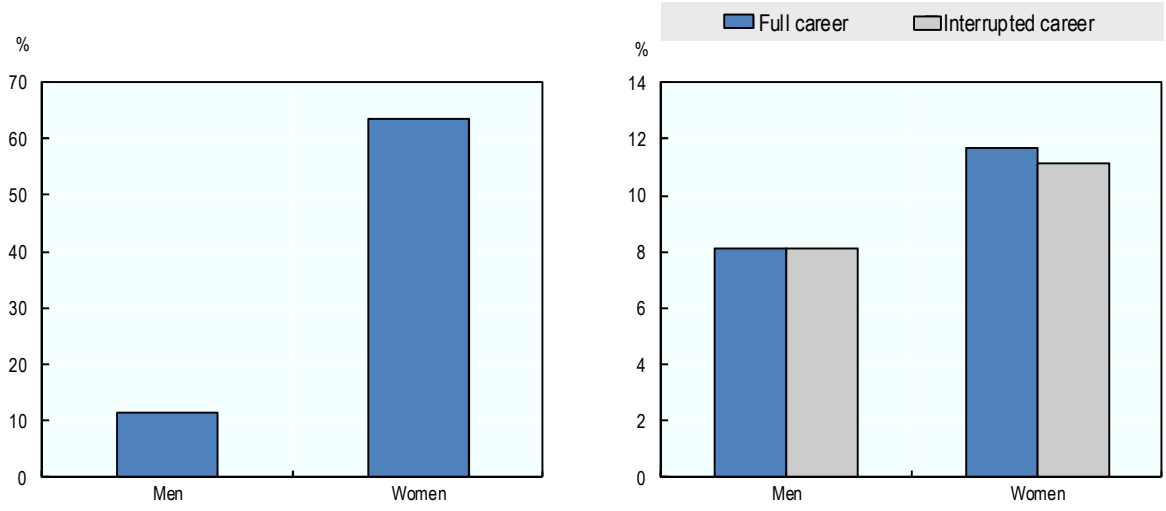
This suggests that greater female labour force participation might not, in itself, be enough to narrow gender inequality in the provision of daily informal care. Unless labour force changes are accompanied by a broader shift in expectations of gender roles, it is likely that women will continue to bear most of the burden of informal care – and its costs. Indeed, such costs may well increase, as ageing populations and higher incomes seem likely to lead to a growth in demand for LTC (de la Maisonneuve and Oliveira Martins, 2013). In this context, the provision of adequate social protection and the development of more effective policies to support informal carers will continue to be important in limiting gender inequality.

Figure 6.23. Women more often have interrupted careers but these women are less likely to be providing daily informal care compared to full career women

Informal caregiving provided by people who have had full or interrupted careers in 14 OECD countries, by gender

Panel A. Shares of the over-50s by gender with interrupted careers, 2009

Panel B. Shares of the over-50s by gender with full or interrupted careers who provide daily informal caregiving



Note: An interrupted career is defined as ten or more years between the ages of 18 and 65 during which a person is neither in full-time work nor education.

Panel A presents average figures across 14 European Countries, based on representative samples of populations of the over-50s (SHARE Wave 3). Panel B is based on data from Wave 3 of the Survey of Health, Ageing and Retirement in Europe (SHARE) which were matched to other waves of the survey to analyse the relationship between historical and cross-sectional data. The data in Panel B are therefore not strictly representative of country populations.

Source: Survey of Health, Ageing and Retirement in Europe (SHARE) waves 1-5.

StatLink http://dx.doi.org/10.1787/888933568509

Notes

1. It is useful to keep in mind that other factors such as affordable housing have a large impact on the quality of life of older people as well and vary significantly by region. Housing, transportation and health services are all important component of the age-friendly cities and communities approach of the WHO (WHO, 2007). Housing in areas with limited health care and public transport services is often cheaper, creating an affordable housing trap for the elderly poor. In the rest of this section we will focus on regional ageing trends, regional access to health services and regional access to public transport.
2. According to 2014 data and defined as the share of people aged 65 and over in the total population.
3. Latest available year for Mexico was 2010. It should be noted that many of the countries mentioned, contain very low density regions which are likely to drive the extremes.
4. The earliest available year for Germany is 2006.
5. Unfortunately the data considered in this subsection is only available on TL2 level and not on TL3 as the rest of the section.
6. The choice of 20 minutes driving distance is ad hoc. In Italy's Novara region, for example, reducing the driving distance from 20 to 10 minutes cuts the share of the older population with access to a hospital from 85% to just over 37% (for the analytical approach, see OECD, 2012). Measuring the distance to the closest hospitals in driving time relies on the availability of geo-location data for all hospitals (public and private) in a country. It should therefore be understood that, while the analysis uses the most comprehensive dataset available, the results should be seen as indicative. Hospital data used for this assessment comes from Open Street Map as it provides the only dataset that covers the entire OECD region. For a detailed description of the data and possible constraints due to limitations in geographical coverage, go to: https://www.openstreetmap.org.
7. Publicly or privately provided transport services are defined as i) rail-based public transit, like the metro and other light rail; ii) road-based transport: bus, tram and ferry.
8. Women suffer from a higher incidence of non-fatal but disabling diseases (arthritis), while men are more often affected by such fatal illnesses as lung cancer or acute myocardial infarction (Espelt et al., 2010; Sarkeala et al., 2011). Additionally, men are less likely to report limitation due to social norms (see for instance Caroli and Weber, 2016).
9. In Australia this partly reflect the fact that many pensioners have retirement savings in superannuation form or have taken their accumulated pensions as lump sums rather than annuitising them to provide income streams, both of which are not counted as current income,.

10. Trends in elders' living arrangements are likely to vary according to gender. For women, the rise in divorce rates is likely to be more than counterbalanced by a marked reduction in widowhood as the life-expectancy gender gap narrows. Consequently, more may have a spouse to support them in the future should they become dependent. Among men, the drop in widowhood will have a similar, though weaker, effect. As a result, the rise in separations and divorces may lead to situations where either fewer men live with a partner or where there is no change in their likelihood of living with a partner (Gaymu et al., 2008).

11. Additionally, in many countries a (future) shortage of workers is likely to strain long-term care services further (OECD, 2011). This might lead to unmet needs and a further increase of LTC cost.

12. The estimates for France include the APA and related tax deductions. However, some people in France may receive further support from other sources not included in this analysis. Local governments provide some LTC services and some LTC recipients are covered by their health insurance, although the availability of both varies by region. Future research will seek to understand the degree to which benefits are available and how they affect out-of-pocket costs.

13. The analysis in this report focuses on care for older people and so excludes people who care for their children, step-children, nieces and nephews. The SHARE survey does not ask people providing care to someone in the same household about the frequency of caregiving, but the definition of "daily informal care" used here does include them.

14. It should be noted however, that even when rates of informal care are similar between men and women, the type of care provided is often different.

15. A probit regression was run using life history data from Wave 3 of the Survey of Health, Ageing and Retirement in Europe (SHARE) to determine how many years women had spent out of work, cross-referenced with data from SHARE waves 1, 2, 4 and 5 to determine the provision of daily informal care and control variables. The marginal effect of a full career (fewer than ten years out of the labour force) on the likelihood of women or men providing informal care was positive but non-significant.

References

Börsch-Supan, A. (2016), "Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 5", release version 5.0.0.

Brezzi, M., L. Dijkstra and V. Ruiz (2011), "OECD Extended Regional Typology: The Economic Performance of Remote Rural Regions", *OECD Regional Development Working Papers*, No. 2011/06, OECD Publishing, Paris, http://dx.doi.org/10.1787/5kg6z83tw7f4-en.

Caroli, E and L. Weber-Baghdiguian (2016), "Self-reported Health and Gender: The Role of Social Norms", *Social Science & Medicine*, Vol. 153, March, pp. 220-229.

Chernew, M. et al. (2016), "Understanding the Improvement in Disability Free Life Expectancy in the US elderly Population", *NBER Working Paper*, No. 22306, Cambridge, United States.

Courtin, E., N. Jemiai and E. Mossialos (2014), "Mapping Support Policies for Informal Carers Across the European Union", *Health Policy*, Vol. 118, No. 1, pp. 84-94.

Cracau, D. and J. Lima (2016), "On the Normalized Herfindahl-Hirschman Index: A Technical Note", *International Journal on Food System Dynamics*, Vol. 7, No. 4, pp. 382-386.

de la Maisonneuve, C. and J.O. Martins (2013), "A Projection Method for Public Health and Long-Term Care Expenditures", *OECD Economics Department Working Papers*, No. 1048, OECD Publishing, Paris, http://dx.doi.org/10.1787/5k44v53w5w47-en.

De Vugt, M.E. and F.R.J. Verhey (2013), "The Impact of Early Dementia Diagnosis and Intervention on Informal Caregivers", *Progress in Neurobiology*, Vol. 110, pp. 54-62.

Dykstra, P. and T. Fokkema (2011), "Relationships Between Parents and their Adult Children: A West European Typology of Late-life Families", *Ageing & Society*, Vol. 31, No. 4, pp. 545-569.

Dykstra, P. et al. (2013), "State-of-the-art Report. Intergenerational Linkages in Families", *Working Paper Series*, No. 1, FamiliesAndSocieties.

Fokkema T., J. De Jong Gierveld and P. Dykstra (2012), "Cross-national Differences in Older Adult Loneliness", *Journal of Psychology*, Vol. 146, No. 1-2, pp. 201-228.

Frye, A. (2011), "Mobility Rights, Obligations and Equity in an Ageing Society", *International Transport Forum Discussion Papers*, No. 2011/05, OECD Publishing, Paris, http//dx.doi.org/10.1787/5kg9mq4tbtvh-en.

Gaymu, J. (2006), "Determinants of the Living Arrangements of Older People in Europe", *European Journal of Population*, Vol. 22, No. 3, pp. 241-262.

Gaymu, J., J. Ekamper and G. Beets (2007), "Who Will Be Caring for Europe's Dependent Elders in 2030?", *Population* (English Edition, 2002-), Vol. 62, No. 4, pp. 675-706.

Gaymu, J. et al. (eds.) (2008), "Future Elderly Living Conditions in Europe", *Les Cahiers de l'Ined*, No. 162, Paris.

Grundy, E., C. Tomassini and P. Festy (2006), "Demographic Change and the Care of Older People: Introduction", *European Journal of Population*, Vol. 22, No. 3, pp. 215-218.

Jacobzone, S., E. Cambois and J.M. Robine (2000), "The Health of Older Persons in OECD Countries: Is it Improving Fast Enough to Compensate for Population Ageing?", *OECD Labour Market and Social Policy Occasional Papers*, No. 37, OECD Publishing, Paris, http://dx.doi.org/10.1787/066187831020.

Marshall, A. et al. (2015), "Cohort Differences in the Levels and Trajectories of Frailty Among Older People in England", *Journal of Epidemiology & Community Health*, first published 2 February 2015, http://dx.doi.org/10.1136/jech-2014-204655.

Meslé, F. and J. Vallin (2002), "The Health Transition: Trends and Prospects", in G. Caselli, J. Vallin and G. Wunsch (eds.), *Demography: Analysis and Synthesis*, Academic Press, pp. 247-259.

Muir, T. (2017), "Measuring Social Protection for Long-term Care", *OECD Health Working Papers*, No. 93, OECD Publishing, Paris, http://dx.doi.org/10.1787/a411500a-en.

OECD (2017), *Dare to Share: Germany's Experience Promoting Equal Partnership in Families*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264259157-en.

OECD (2016a), *OECD Regions at a Glance 2016*, OECD Publishing, Paris, http://dx.doi.org/10.1787/reg_glance-2016-en.

OECD (2016b), "PF2.3: Additional Leave Entitlements for Working Parents", *OECD Family Database*, http://www.oecd.org/els/family/database.htm.

OECD (2015a), *Ageing in Cities*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264231160-en.

OECD (2015b), *Pensions at Glance 2015.OECD and G20 Indicators*, OECD Publications, Paris, http://dx.doi.org/10.1787/pension_glance-2015-en.

OECD (2015c), *Health at a Glance 2015: OECD Indicators*, OECD Publishing, Paris, http://dx.doi.org/10.1787/health_glance-2015-en.

OECD (2014), "Accessibility to Services and Regional Well-being: A Framework to Build Indicators", GOV/TDPC/TI(2014)2, OECD, Paris.

OECD (2012), "Measuring the Access to Public Services: The Case of Public Hospitals", Paper presented at the OECD Working Party for Territorial Indicators, 3 December 2012, Paris.

OECD (2011), *Help Wanted! Providing and Paying for Long-Term Care*, OECD Publications, Paris, http://dx.doi.org/10.1787/9789264097759-en.

Oeppen, J. and J.W. Vaupel (2002), "Broken Limits to Life Expectancy", *Science*, Vol. 296, No. 10, pp. 1029-1031.

OpenStreetMap Contributors (2016), http://planet.openstreetmap.org.

Sole-Auro, A. (2016), "La salud de los europeos mayores de 80 anos" [The Health of Europeans over 80 years old], *Panorama Social, retos demograficos*, No. 23, pp. 43-54, July.

Sole-Auro, A. and E. Crimmins (2013), "The Oldest Old Health in Europe and the United States", *Annual Review of Gerontology and Geriatrics*, Vol. 33, No. 1, pp. 1-33.

Vallin, J. and F. Meslé (2010), "Will Life-expectancy Increase Indefinitely by Three Months Every Year?", *Population and Societies*, No. 473, pp. 1-4.

WHO (2007). *Global Age-friendly Cities: A Guide*, World Health Organization, Geneva.

Database references

OECD Regional Database, http://www.oecd.org/cfe/regional-policy/regionalstatisticsandindicators.htm.

OECD Income Distribution Database, http://www.oecd.org/social/income-distribution-database.htm.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where governments work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The European Union takes part in the work of the OECD.

OECD Publishing disseminates widely the results of the Organisation's statistics gathering and research on economic, social and environmental issues, as well as the conventions, guidelines and standards agreed by its members.

OECD PUBLISHING, 2, rue André-Pascal, 75775 PARIS CEDEX 16
(81 2017 16 1 P) ISBN 978-92-64-27907-0 – 2017

Preventing Ageing Unequally

This report examines how the two global mega-trends of population ageing and rising inequalities have been developing and interacting, both within and across generations. Taking a life-course perspective the report shows how inequalities in education, health, employment and earnings compound, resulting in large differences in lifetime earnings across different groups. It suggests a policy agenda to prevent, mitigate and cope with inequalities along the life course drawing on good practices in OECD countries and emerging economies.

Consult this publication on line at ***http://dx.doi.org/10.1787/9789264279087-en***.

This work is published on the OECD iLibrary, which gathers all OECD books, periodicals and statistical databases. Visit ***www.oecd-ilibrary.org*** for more information.

OECD*publishing*
www.oecd.org/publishing

THE LONDON BOOK FAIR WINNER
INTERNATIONAL EXCELLENCE Awards 2017
IN PARTNERSHIP WITH THE PUBLISHERS ASSOCIATION

Co-funded by the European Union

ISBN 978-92-64-27907-0
81 2017 16 1 P

9 789264 279070