Improving Health and Social Cohesion through Education

Centre for Educational Research and Innovation

OECD

Improving Health and Social Cohesion through Education

OECD

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, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, 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 Commission 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.

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

ISBN 978-92-64-08630-2 (print)
ISBN 978-92-64-08631-9 (PDF)

Also available in French: *L'éducation, un levier pour améliorer la santé et la cohésion sociale*

Photo credits: Cover © Fuse/Getty Images , © Tetra Images /Getty Images.

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

© OECD 2010

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 acknowledgment 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* français d'exploitation du droit de copie (CFC) at *contact@cfcopies.com*.

Foreword

This report synthesises five years of analytical research conducted under the OECD's Social Outcomes of Learning (SOL) project. The first phase of the project developed a conceptual framework for describing how learning relates to social outcomes. The second phase focused on evaluating empirical evidence in order to identify the pathways through which education is most likely to help improve social outcomes.

The report confirms that education plays a significant role in improving health and social cohesion by raising competencies. However, having better information and cognitive skills is not enough. Social and emotional skills empower individuals to better mobilise available information and cognitive skills so that they are more capable of preventing and coping with health challenges and promoting social cohesion. Education can contribute to raising such capabilities not only by facilitating the acquisition of these skills, but also by developing habits, norms and ethos of healthy lifestyles and active citizenship. Learning also takes place in the family and the community. Both are important environments in which children develop critical competencies. The difficulty is to ensure that the various environments are coherent and consistent. Government can play an indispensible role by promoting policy coherence and providing the right incentives for stakeholders to invest in the right resources. In this way, education can make a significant contribution to social progress.

The preparation of this publication was co-ordinated by the Centre for Educational Research and Innovation (CERI) under the responsibility of Koji Miyamoto (Project Manager), with significant contributions from Dirk Van Damme (Head of CERI), Francesca Borgonovi (Project Analyst) and Tom Schuller (former Head of CERI and Project Manager).

Acknowledgements

This report is a result of the second phase of the Social Outcomes of Learning (SOL) project, an effort made possible by the financial support and active participation of ten OECD countries: Australia, Belgium (Flemish Community), Canada, Italy, Korea, Luxembourg, the Netherlands, Norway, Sweden and the United Kingdom (England and Scotland). It takes into account the significant conceptual work of the first phase of the project, in which Austria, Japan, Switzerland and the United States also played an important role. Thanks go to the SOL project advisory group and to an international group of experts who contributed to the development of the project as well as to the drafting of this report: Dan Andersson, Satya Brink, Arnaud Chevalier, Oon-ying Chin, Andre de Moor, Richard Desjardins, Isabelle Erauw, Fareen Hassan, Young-Ran Hong, Bryony Hoskins, Francis Kelly, Don Kenkel, Stephen Leman, Gerhard Mors, Lars Nerdrum, Luisa Ribolzi, Ricardo Sabates, Tom Schuller, Dan Sherman, Astrid Shorn and Marc Suhrcke. Gratitude is also due to the Norwegian Ministry of Education and Research for generously hosting and co-sponsoring the international conference on Education, Social Capital and Health in February 2010 in Oslo and to the participants of the Conference, to the INES Network on Labour Market and Social Outcomes (LSO) for the development of the SOL indicators, to the Institut de Recherche et Documentation en Économie de la Santé (France) and Social Capital Global Network for hosting and co-sponsoring the International Workshop on Social Capital and Health, to colleagues elsewhere in the OECD, notably Franco Sassi, Michele Cecchini and Carmen Huerta in the Directorate for Employment, Labour and Social Affairs for contributing to the analyses of the health dimension of this project, and to numerous colleagues from CERI, particularly Cindy Luggery-Babic and Lynda Hawe who provided administrative support.

Table of contents

Executive summary 11

***Chapter 1.* Introduction** 15

1.1. The policy climate 16
1.2. The role of education 17
1.3. The Social Outcomes of Learning (SOL) project 19
1.4. Challenges for assessing the social outcomes of learning 20
References 25

***Chapter 2.* The empirical framework** 27

2.1. Introduction 28
2.2. Evaluating the overall performance of education systems 29
2.3. Identifying features of the education systems that work 45
2.4. Identifying for whom education is likely to have a stronger impact 50
2.5. Additional considerations 51
2.6. Conclusion 55
References 59

***Chapter 3.* Education and civic and social engagement** 65

3.1. Introduction 66
3.2. The relationship between education and civic and social engagement 71
3.3. Causal pathways 83
3.4. The role of family and community 88
3.5. The role of social status 90
3.6. Summary of findings: What we know and don't know 92
References 104

***Chapter 4.* Education and health** 111

4.1. Introduction 112
4.2. The relationship between education and health 118

4.3. Causal pathways 127
4.4. The role of family and community 139
4.5. The role of social status 144
4.6. Interventions that address multiple pathways and contexts simultaneously . . . 146
4.7. Summary of findings: What we know and don't know 147
References 163

***Chapter 5.* Improving health through cost-effective educational interventions** 181

5.1. Introduction 182
5.2. Economic evaluation and policy making 182
5.3. The cost-effectiveness of educational interventions on obesity 185
5.4. Conclusion 194
Annex 5.A1
The Epidemiological Model 197
Annex 5.A2. The WHO-CHOICE Model 198
References 200

***Chapter 6.* Conclusion: policy messages and future agenda** 203

6.1. Introduction 204
6.2. Policy messages 204
6.3. Implications for research 209
6.4. The role of the OECD 212
6.5. Conclusion 214
References 216

Figures

Figure 2.1 Regression discontinuity designs 49
Figure 3.1 Cross-country differences in civic and social engagement 67
Figure 3.2 Cross-country differences in civic and social engagement explained by individuals' education (Europe), 2002-06 68
Figure 3.3 Education and civic and social engagement (Europe), 2002-06 72
Figure 3.4 Marginal effects: illustrative examples 73
Figure 3.5a Marginal effects of education on civic engagement (Europe and Canada), 2002-06 75
Figure 3.5b Marginal effects of education on political engagement (Europe and Canada), 2002-06 75
Figure 3.5c Marginal effects of education on interpersonal-trust and tolerance (Europe), 2002-06 75
Figure 3.6a Impact of being female on the relationship between education and civic and social engagement (Europe), 2002-06 77

Figure 3.6b Impact of having an educated father on the relationship between education and civic and social engagement (Europe), 2002-06 77
Figure 3.6c Impact of being a minority on the relationship between education and civic and social engagement (Europe), 2002-06 77
Figure 3.7 The effect of education on civic and social engagement, 2002-06 . . . 82
Figure 3.8 Marginal effects of education adjusted for labour market effects, 2006 87
Figure 4.1 Self-reported health status in OECD countries, 2007 115
Figure 4.2 Obesity in OECD countries, 2007 115
Figure 4.3 Mental health problems in OECD countries, 2003 116
Figure 4.4 Alcohol consumption in OECD countries, 2003 116
Figure 4.5 Life expectancy and tertiary attainment, 1998-2000. 119
Figure 4.6 Correlation between education and measures of health (United States and United Kingdom), 1999-2000. 119
Figure 4.7 Relationships between education and health: illustrative examples . . 121
Figure 4.8 Causal pathways: contexts and learning shaping individual attributes 127
Figure 4.9 Relationship between education and health explained by cognitive skills. 131
Figure 4.10 Relationship between education and health explained by non-cognitive skills 134
Figure 5.1 Incremental cost-effectiveness ratio (ICER) by type of educational intervention in Europe, 2005 188
Figure 5.2 Intervention costs, impact on health expenditure and DALYs gained by intervention, 2005 189
Figure 5.3 Costs by age group, 2005. 191
Figure 5.4 ICER by intervention from 10 to 100 years, 2005. 192
Figure 5.5 Incremental cost-effective ratios: Comparison of selected educational and non-educational interventions 193

Tables

Table 2.1 Instrumental variables (IVs) based on education policies 40
Table 3.1 The relationship between education and civic and social engagement . . 93
Table 4.1 The relationship between education and health. 148

Boxes

Box 4.1 Non-cognitive skills and health 132
Box 5.1 Typology of educational interventions 183
Box 5.2 Methodology: The study design 186
Box 5.3 Time frame for assessing cost-effectiveness 190

Executive summary

Well-being and social progress are high on the policy agenda of OECD countries.

The policy climate surrounding issues of development and prosperity has gradually shifted during the last decade. There is growing interest in looking beyond the traditional economic measures of success, such as income, employment and gross domestic product (GDP), towards non-economic facets of well-being and social progress, such as health, civic engagement and happiness. Recent prominent initiatives include the French government's Commission on the Measurement of Economic Performance and Social Progress (chaired by Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi) and the World Health Organization's Commission on Social Determinants of Health (chaired by Michael Marmot). These global actions have been triggered by concerns that society is not as cohesive as it should be, and that citizens are not as healthy and happy as they deserve to be. Several OECD countries have witnessed a decline in indicators of social cohesion such as voting, volunteering and interpersonal trust, changes which may well have major consequences for the quality of democratic societies. Health challenges, triggered by an increasingly high prevalence of obesity and depression, have become a major public health concern, as they lead to a significant reduction in quality of life and raise public expenditures.

Education can play a significant role in promoting well-being and social progress. Moreover, it can be considered a cost-effective approach.

A large body of literature suggests that education is strongly associated with a variety of social outcomes, such as better health, stronger civic and social engagement, and reduced crime. A smaller number of studies further suggest that education has a positive effect on most of these social outcomes. More importantly, from a policy perspective, education has been shown to be a relatively cost-effective means of improving health and reducing crime. This report suggests that school-based interventions can be a cost-effective way to tackle obesity. Hence, education policy can be a viable health policy.

Education empowers individuals by increasing their knowledge and their cognitive, social and emotional skills, as well as improving habits, values and attitudes towards healthy lifestyles and active citizenship.

Education helps individuals make informed and competent decisions by providing information, improving their cognitive skills and strengthening their socio-emotional capabilities, such as resilience, self-efficacy and social skills. As such, education can help individuals follow healthier lifestyles, manage illness, increase their interest in political issues and understand why immigrants can bring substantial benefits to society. Moreover, education can offer an ideal environment for children to develop healthy habits and participatory attitudes. For instance, nutritiously balanced school meals can help develop healthy eating habits and complement classes that inform students about the importance of maintaining a well-balanced diet and nutrition. Open classroom climate, civic classes that require practical involvement in civic matters and school ethos that promote active citizenship can be conducive to stronger civic participation.

But education cannot play its role in isolation…

Children only spend about half of their non-sleeping hours in schools. Certain home and community environments can easily undermine the efforts made by policy makers, teachers and school administrators. For instance, school-based actions to promote healthy lifestyles and habits may not be effective when children have easy access to fast-food restaurants on their way home from school and when they indulge in sedentary activities at home. Likewise, school-based efforts to form active citizens may not be successful if local communities do not provide sufficient opportunities for children to engage in civic activities (*e.g.* girl scouts) and when children do not have enough opportunity to reinforce civic values and attitudes by discussing civic matters with parents at home. Peer effects also matter. Children who engage in risky health behaviour outside of schools (*e.g.* under-age drinking, smoking) are likely to have detrimental peer effects. Clearly, parents and those involved in setting the community environment need to be mindful of what it takes for school-based efforts to work.

… and the power of education is limited if children's cognitive, social and emotional skills are not developed early.

Essential competencies are better acquired even before children start compulsory schooling. Basic cognitive skills, positive attitudes, healthy habits and other personality traits such as patience, self-efficacy and self-confidence can be nurtured in the family environment early in life. Children who start primary school equipped with these basic skills and personality traits

are more capable of enhancing them, developing higher-order competencies and achieving better outcomes in terms of health and social cohesion. Given that a significant fraction of children, mostly from disadvantaged households, are deprived of quality home environments and/or access to quality early childhood education, compulsory and remedial education have an important role to play. For equity purposes, education policy should help address the skills deficits of children who have missed the opportunity to develop basic competencies early in life.

Education policy makers, teachers and school administrators can play an essential role in enhancing health and social cohesion …

Education policy makers are increasingly challenged to improve results with limited public expenditure. Teachers and school administrators are already over-burdened by pressures to meet the criteria that define success, *e.g.* raising student performance in high-stakes tests, improving the quality of curricula and instruction, and dealing with children from diverse cultural and linguistic backgrounds. Does this report suggest that these education stakeholders need significantly more resources and new sets of tasks in order to address diverse societal needs? It is important to realise that education's contribution to addressing societal challenges such as health and social cohesion does not necessarily require significant investments in major curriculum reform, teacher training and reduction of class size. Significant investments have already been made to raise competencies that help improve social outcomes, since these are known to affect educational and labour market success. Moreover, this report proposes changes in the learning environment (school norms and ethos) that would help improve a culture of health, civic engagement and lifestyles among children. This can be accompanied by adjustments in curricular and extra-curricular activities so that children learn active citizenship, healthy lifestyles and balanced diet through practice. In this way, children can improve their competencies (including health competencies or citizenship skills). They would be better prepared to prevent health problems, address health challenges when they occur and to engage in and contribute to the broader society. All of these changes are likely to yield significant societal returns with modest additional investments.

… but the success of these efforts is likely to depend on coherent policies and actions among those working to improve well-being and social progress. This calls for a whole-of-government approach.

School-based efforts to foster well-being and social progress are likely to work better when the home and community environments are synchronised with what children experience in schools. There is also a need to ensure

that educational institutions provide services that are consistent as children progress through education. This suggests the importance of adopting a holistic approach, with all stakeholders fully aware of their responsibilities and those of others. Policy coherence requires governments to promote strong linkage horizontally (*i.e.* across ministries of education, health, family and welfare), vertically (*i.e.* across central, regional and local levels of government) and dynamically (*i.e.* across different levels of education). This is a challenge, as OECD governments have limited experience in fostering such linkage. Governments may consider enhancing governance and management structures as well as policy instruments to improve horizontal, vertical and dynamic collaboration and adopt a whole-of-government approach to social progress.

Chapter 1

Introduction

Koji Miyamoto and Tom Schuller

Today's global policy climate recognises the importance of better addressing non-economic dimensions of well-being and social progress such as health, social engagement, political interest and crime. It is well known that education plays an important role in shaping these indicators of social progress. However, little is understood about the causal effects, the causal pathways, the role of contexts, and the relative impacts of different educational interventions on social outcomes. This limited knowledge base prevents policy makers from taking concrete actions to improve the well-being of nations. This report aims to address the challenges for assessing the social outcomes of learning by providing a synthesis of the existing evidence, original data analyses and policy discussions.

1.1. The policy climate

The policy climate surrounding issues of development and prosperity has gradually shifted during the last decade. There has been growing interest in looking beyond the traditional economic measures of success – such as income, employment and gross domestic product (GDP) – towards non-economic aspects of well-being and societal progress – such as health, civic engagement, political interest, crime and even happiness. This is a significant change as it represents strong commitments by governments to address the diverse needs of their citizens.

One prominent example of this shift is the global monitoring of the Human Development Index (HDI), which captures dimensions such as "long and healthy life" and "access to knowledge" (UNDP, 2009).[1] This index was inspired by the concepts of "capability" and "empowerment", on the understanding that simply having access to commodities and services is not sufficient to improve individual well-being (Sen, 1979, 1985). A further example is the call to tackle persisting and widening health inequalities by the Commission on Social Determinants of Health (CSDH).[2] In its influential report, *Closing the Gap in a Generation*, the CSDH presented national, multilateral and intersectoral policy strategies to tackle health challenges based on a comprehensive assessment of the social and political drivers of health inequalities (WHO, 2008). More recently, the French government published the final report of the Commission on the Measurement of Economic Performance and Social Progress which describes strategies to improve and monitor indicators that capture well-being and social progress (Stiglitz *et al*., 2009).[3] The Commission recommended that measurement systems should shift attention from metrics of economic production to a system that focuses on the well-being of individuals.

The global financial crisis of 2008-09 provides an even stronger case for pursuing the non-economic agenda. Although the crisis was initiated and propagated by deficiencies in the global financial system and regulatory mechanisms, its consequences for individual lives go far beyond the economic effects to issues such as unemployment and drastic decreases in earnings and assets. There are concerns that the crisis has led to a decline in individuals' health, political trust and social engagement. In response to the economic crisis, a G20 meeting was held in Pittsburgh in September 2009 to discuss how the advanced economies might foster recovery from the crisis through well co-ordinated policies, regulations and reforms. Although the discussions in Pittsburgh centred on policy measures to stimulate private demand and to ensure that the regulatory system for financial institutions works effectively, the leaders were also conscious of the social consequences of the crisis. The outcome of the G20 was a framework that lays out the policies needed to generate strong, sustainable and balanced global growth (G20,

2009). In doing so, the leaders acknowledged that its implementation would require taking better account of the social and environmental dimensions of economic development.

These global actions, which aim at addressing the social dimensions of well-being, have been triggered by concerns that society is not as cohesive as it should be, and that citizens are not as healthy and happy as they deserve to be. Several OECD countries have witnessed a decline in indicators of social cohesion such as voting, volunteering and interpersonal trust, trends which may have major consequences for the quality of democratic societies. Health challenges related to obesity and depression have become a major public health concern, as they lead to a significant reduction in the quality of life and also raise public health expenditures.

1.2. The role of education

Given this policy climate, policy makers, researchers and practitioners interested in education might consider what role education can play in fostering well-being and social progress. A large number of empirical studies show that education is strongly related to a variety of health and social capital indicators (Grossman, 2006; OECD, 2007; OECD, 2009).[4] A growing number of studies further suggest that education has a direct effect on social outcomes.[5] Moreover, education's effects have been shown to be substantial when measured in monetary terms. For instance, individual returns to health from education in the Netherlands have been calculated to be of the order of 1.3% to 5.8%; these returns, on top of direct wage returns of 6% to 8% are significant (Groot and van den Brink, 2007). In the United States, the monetary benefits of completing high school (at a cost of approximately USD 8 000 per student in 1997) have been shown to include not only wage gains of approximately USD 10 000 a year but also additional gains of USD 1 600 to USD 3 000 a year from savings associated with reduced crime (Heckman and Masterov, 2007).[6] Hence, the evidence suggests that education can potentially play an important role in fostering well-being and social progress.

Education systems can help promote social progress

As this report suggests, individuals' education may affect their social outcomes in various ways. First, it can help them make informed and competent decisions by providing information, raising cognitive skills and strengthening social and emotional skills such as resilience, self-efficacy and self-esteem.[7] These can help individuals choose healthier lifestyles, manage illness, raise their political interest and understand why immigrants can bring substantial benefits to society. Second, it can help them obtain higher earnings, greater social status and useful social networks. These may provide access to better

health care, healthier working and living environments, and greater political influence. Third, it may offer an ideal environment for helping children to develop healthy lifestyles and participatory attitudes. For instance, nutritiously balanced school meals may help develop healthy eating habits and can complement a health curriculum that teaches the importance of maintaining a balanced diet and nutrition. School activities, climate and norms which promote active citizenship among children can be conducive to enhanced civic participation during adulthood. It is important to note that the total effects of education include all of these pathways through which education may have an impact.[8]

The effects of education may be boosted through externalities

An individual's education can also have a positive effect on the health and social capital of other people. For instance, educated parents may be better able to take good care of their children's health and provide a home environment that encourages civic and political interest. Likewise, better educated teachers may be able to encourage healthy behaviour and a participatory spirit. Moreover, societal and community levels of education can affect health-related behaviour, civic engagement and trust. Children and adults are less likely to use illegal drugs or engage in binge drinking in a highly educated community. Individuals may be more inclined to participate in community activities and feel a stronger sense of trust towards neighbours and immigrants if they are surrounded by others with a high level of education.

Learning takes place in diverse contexts

In addition to the organised provision of learning experiences,[9] non-formal and informal learning are also relevant forms of education.[10] These learning experiences take place in contexts such as families, schools, workplaces and communities. At any period in individuals' lives, contexts are likely to shape the development of their skills, traits and habits, with consequences for their level of health and civic engagement. This is why it is important to take account of family and community factors when evaluating the impact of schooling on social outcomes. Moreover, contexts interact across time: what children learn in the family during early childhood can have immense consequences for how they continue to learn later in life and their social outcomes. Early development of competencies is likely to make future investment in competencies more effective. Thus, there are horizontal and dynamic interactions in learning contexts.

1.3. The Social Outcomes of Learning (SOL) project

The OECD Centre for Educational Research and Innovation (CERI) launched the Social Outcomes of Learning (SOL) project in 2005. CERI understood that education can help promote various aspects of well-being and social progress, but was also aware that much of the information available was not well synthesised, so that there was limited understanding of whether, to what extent, for whom and how education can make a difference. The SOL project focused on two domains: health and civic and social engagement,[11] both of which are key factors in the quality of individual and collective life. Both add a specific dimension to the challenge of measuring educational effects. They reveal the complexity of the relationships involved, and specifically the need to take into account the multiple natures of the interactions.

Health is an area which commands increasing attention. An ageing population in OECD countries is driving up private and public costs, so that the rise in health expenditures regularly outstrips growth of GDP. Other health issues, such as obesity, substance abuse and depression, generate huge personal and social problems. Education can play a part both in improving health levels and in containing costs. At the same time, health conditions can significantly affect the learning environment: it is easy to imagine that the health of a child and the child's parents affect the child's cognitive development. It is important to remember that health is an integral component of the original theoretical formulation of human capital, which is defined as the capacity of individuals to contribute to economic and social progress. Thus health is a part of human capital and a product of education, but there is no simple one-way relationship between the two.

The state of civic and social engagement is also a matter of concern in many OECD countries, although it is obviously difficult to make an argument based on cost. Falling voter turnout and a hollowing out of traditional political parties are common and increasingly worrying. There is a perceived, though contested, weakening of voluntary activity and social solidarity. Again, education is assumed to have the potential to strengthen civic and social engagement. As with health, however, the relationship is two-way: while education can influence civic and social engagement, people's levels of civic and social engagement can have a marked influence on their educational success and on the distribution of educational opportunity. A useful analysis must aim to capture these complex interactions.

The first phase of the SOL project focused on developing a conceptual framework that describes the ways in which education can affect health and civic and social engagement and on mapping the available evidence in order to identify probable pathways.[12] The second phase has built on this conceptual framework to strengthen the empirical knowledge base by focusing on three

sub-domains of health (*i.e.* obesity, mental health and alcohol consumption) and three sub-domains of civic and social engagement (*i.e.* volunteering, political interest and trust/tolerance). Two issues that have been carefully considered are the causal and marginal effects of education on social outcomes.[13] They shed light on whether and which level of education matters. This report draws on many of the latest empirical studies as well as on complementary micro-data analyses conducted by the OECD to strengthen the evidence base on causal and marginal effects. Causal pathways are also emphasised. The recent surge in studies of causal pathways calls for a careful assessment of the evidence base. In doing so, the report distinguishes: *(i)* the effect of education on shaping individual features, *i.e.* information, cognitive skills[14] and socio-emotional skills;[15] *(ii)* the effect of school environments, *e.g.* school meals and peer effects; and *(iii)* indirect effects of education, *e.g.* income and social networks. The report also highlights the role of family and community contexts in promoting or undermining the efforts made through education. Finally, to better understand the relative effectiveness of different types of education on health outcomes, the report includes a cost-effectiveness analysis of educational interventions on obesity.

1.4. Challenges for assessing the social outcomes of learning

A better understanding of the social outcomes of learning is clearly valuable. However, it is an extremely complex task to evaluate the claimed, potential and actual role of education in fostering positive outcomes. This report sheds light on the key difficulties preventing progress in this area of research and policy making.

The first is the ***methodological challenge***. There has been a significant improvement in methodologies for analysing data and an expansion in the range of relevant micro-data. However, progress in establishing robust causal relationships has not been as strong as might have been expected, and researchers are still grappling with the issue of the relative impact of different causal pathways. Moreover, the literature on the evaluation of educational interventions provides limited understanding of the specific content of education that matters. Policy makers and researchers would do well to ask how much can be expected from the continuous extension and refinement of current techniques. This report brings this challenge to the fore, and not solely in relation to the specific areas it addresses. Chapter 2 presents the methodological context and sets out the challenges surrounding quantitative analysis of the social outcomes of learning along with possible strategies to address them. Much of the empirical evidence (including original analyses) presented in Chapters 3 and 4 is based on the empirical framework described in Chapter 2.

The second challenge is to ***respond to calls to say something beyond "education matters" with solid evidence***. For policy makers, knowing that education matters is useful but not particularly informative. Is it possible to say something concrete about the specific benefits of investing in certain levels, types or content of education? Is it possible to assess the relative impacts of different types of educational interventions? Chapter 3 and 4 provide information on the levels, types and content of education that are likely to matter more. Chapter 5 provides a first attempt to assess the relative effectiveness of various educational interventions.

The third challenge is ***the need for educationalists to recognise that education's net effects may not be positive and may actually be negative.*** Giving individuals an extra year of education may not necessarily improve their situation in terms of health and civic and social engagement. This is because education may generate undesirable effects such as stress[16] and unbalanced diet, and school experience may expose students to delinquent peers. Education may often have positive and negative effects simultaneously. This creates some confusion for the process of analysis, as the net effects of education may be very small as a result of the combination of the opposing effects. Education can also have negative effects indirectly, notably by its distribution of opportunity and reward. Where it fails to do this equitably, it increases inequalities and thus exacerbates the social and individual problems that accompany excessive inequality. Chapters 3 and 4 take these issues into consideration when interpreting the results.

The fourth challenge relates to ***translating evidence into policy action***. Evidence presented in Chapters 3, 4 and 5 provides some indication of "what works". However, is the evidence base really strong enough to give policy makers a powerful toolkit for concrete policy actions? If not, what kinds of evidence are missing? What sorts of research are necessary to fill the gap? Chapter 6 discusses this issue.

The last challenge is the difficulty of ***identifying contexts in which education would have a substantial impact***. Even if the sorts of education policies that foster better health and social cohesion are known, the effectiveness, efficiency and sustainability of these interventions are likely to depend on the family, community and specific country in which education takes place.[17] For instance, the role of education in curbing heavy alcohol consumption might be limited in countries with social norms of heavy drinking among those in occupations requiring high levels of education. Likewise, efforts to reduce child obesity via school health literacy campaigns may not succeed unless accompanied by complementary action to engage parents in developing healthy home environments. Chapters 3, 4 and 6 discuss this important aspect of policy coherence.

Notes

1. The HDI is published annually by the United Nations Development Project (UNDP). "A long and healthy life" is captured by life expectancy at birth and "access to knowledge" is captured by enrolment ratios (from primary through tertiary education) and adult literacy rates. The HDI also captures the economic dimension of well-being, "a decent standard of living", which is measured by GDP (UNDP, 2009).

2. The Commission on Social Determinants of Health (CSDH) was established by the World Health Organization (WHO) in 2005 and chaired by prominent epidemiologist Michael Marmot. The final report, which identifies global health challenges and provides batteries of policy recommendations, was launched in August 2008.

3. The Commission on the Measurement of Economic Performance and Social Progress was created by the French government under the leadership of President Nicholas Sarkozy in early 2008, and was co-chaired by prominent economists Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi. The final report, which identifies challenges surrounding the measurement of social progress and provides roadmaps for the way ahead, was launched in September 2009. The OECD will be acting as secretariat to facilitate the implementation of the report's recommendations.

4. They include batteries of indicators such as life expectancy, mortality, obesity, depression, smoking, work-related sickness, as well as voting, political interest, trust, volunteering, donating and crime. The empirical analyses presented in these studies mostly use micro-data for a particular country, and many use data from the United Kingdom and the United States. The results generally hold even after controlling for individual demographic and socioeconomic differences.

5. Chapters 3 and 4 of this report discuss the literature that sheds light on the causal relationships between education and social outcomes. However, it is important to note that there are also studies that find no statistically significant effects from education.

6. The costs and benefits of education were measured in 2004 US dollars. Heckman and Masterov (2007) suggest that investing in education is a much more cost-effective strategy for reducing crime than investing in police.

7. Social skills may include communication skills, negotiating techniques and capacity to collaborate with others. Students will arguably learn these skills in the course of interacting with other students and even teachers.

8. Note that certain aspects of education may have positive impacts while others may have negative impacts. Hence, the phrase "positive education effects" implies that the net effects of education are positive.

9. Educational institutions offer formal learning. However, they can also provide informal learning experiences, for instance, through provision of healthy school meals and community volunteering.

10. Non-formal learning takes place outside of education or training institutions and typically does not lead to certification. It is, however, structured (in terms of learning objectives, learning time or learning support). It may be provided in the workplace and through the activities of civil society organisations and groups. It can also be provided by organisations or through services that have been set up to complement formal systems (*e.g.* arts, music and sports classes). Informal learning typically results from activities in daily life related to work, family, community or leisure, but can also take place within schools (*e.g.* healthy school meals). It is not structured (in terms of learning objectives, learning time or learning support) and typically does not lead to certification. It may be intentional but in most cases it is non-intentional (OECD, 2007).

11. The term "civic and social engagement" is narrower than "social capital". The latter is an aggregate that covers networks, norms and trust and facilitates socially beneficial interactions, while the former relates to individual behaviour, attitudes and perceptions. However, the two are closely related and are considered mutually reinforcing. For instance, Brehm and Rahn (1987) suggest that civic engagement affects trust, while Uslaner (1997) shows that trust also shapes civic participation.

12. The synthesis report on the first phase (OECD, 2007) describes the conceptual framework in detail. Hence, this report focuses exclusively on the empirical aspects: elaboration of the empirical framework (Chapter 2), conducting empirical analyses and synthesising the empirical evidence (Chapters 3, 4 and 5).

13. The marginal effects refer to the increase in the level of social outcomes associated with moving from one level of education to the next higher level.

14. Cognitive skills include generic skills such as literacy and numeracy, specific skills such as health literacy and civic competences and more complex skills such as higher-order processing.

15. They include psycho-social features such as resilience, self-efficacy, patience and social skills such as communication and interaction skills. They also include attitudes and values.

16. This can result from educated people being in occupations that involve high levels of responsibility, long working hours and heavy socialising. This, however,

is a debatable point. For instance, the Whitehall study suggests that higher occupational status among British civil servants is associated with less stress and consequently lower incidence of health problems such as coronary heart disease (Cabinet Office of the United Kingdom, 2004).

17. These contexts are likely to be affected by cultural, institutional and policy factors.

References

Brehm, J. and W. Rahn (1997), "Individual-level evidence for the causes and consequences of social capital", *American Journal of Political Science*, Vol. 41.3.

Cabinet Office of the United Kingdom (2004), *Work Stress and Health – The Whitehall II Study*, Cabinet Office, London, *ucl.ac.uk/whitehallII/findings/Whitehallbooklet.pdf.*

Groot, W. and H. Maassen van den Brink (2007), "The health effects of education", *Economics of Education Review*, Vol. 26, Elsevier, Amsterdam.

Grossman, M. (2006), "Education and Nonmarket Outcomes", in E. Hanushek and F. Welch (eds.), *Handbook of the Economics of Education*, North-Holland, Amsterdam.

G20 (2009), *Leaders' Statement. The Pittsburgh Summit*, 24-25September, Pittsburgh.

Heckman, J.J. and D.V. Masterov (2007), "The Productivity Argument for Investing in Young Children", Working paper, University of Chicago, Chicago, IL.

OECD (2007), *Understanding the Social Outcomes of Learning*, OECD Centre for Educational Research and Innovation, Paris.

OECD (2009), *Education at a Glance*, OECD, Paris.

Sen, A. (1979), "Utilitarianism and welfarism", *The Journal of Philosophy*, Vol. LXXVI.

Sen, A. (1985), *Commodities and Capabilities*, Oxford University Press, Oxford.

Stiglitz, J., A. Sen and J-P. Fitoussi (2009), *Report by the Commission on the Measurement of Economic Performance and Social Progress*, stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf.

UNDP (United Nations Development Programme) (2009), *Human Development Indicators* 2009, UNDP, New York.

Uslaner, E. M. (1997), "Voluntary organization membership in Canada and the United States", Working paper, *www.bsos.umd.edu/gvpt/uslaner/acsus97.pdf.*

World Health Organization (2008), *Closing the Gap in a Generation*, WHO, Geneva.

Chapter 2

The empirical framework

Don Kenkel and Koji Miyamoto [1]

*This chapter presents an empirical framework that has guided researchers who evaluate the performance of education in fostering the progress of societies. It includes methods that shed light on the features of education systems that have been successful in promoting health and social cohesion. In doing so, it describes well-established methodologies to evaluate whether certain indicators of the education system (*e.g. *years of education completed, qualifications attained and specific educational interventions received) exhibit causal effects on health and social cohesion. It also describes methodologies for evaluating the pathways through which education has an effect on health and social cohesion. The framework, which helps better interpret and evaluate the emerging literature on the social outcomes of learning, underlies the analyses presented in subsequent chapters.*

2.1. Introduction

This chapter presents various statistical methodologies aimed at addressing the following policy-relevant questions:

- *What is the average performance of education in promoting health and social cohesion?*
- *What are the features of the education system that work in promoting health and social cohesion?*
- *For whom does the education system work better for promoting health and social cohesion?*

The first question can be broadly addressed by evaluating whether education (*i.e.* year of schooling completed, or level of education attained) has causal effects on social outcomes and by assessing the scale of this impact. The second question can be addressed by evaluating whether specific educational interventions (*e.g.* curriculum reform and changes in the school environment) exhibit causal effects on social outcomes. Moreover, in order to evaluate the extent to which certain features of education (*e.g.* providing information, developing competences and raising income) relate to social outcomes, the relationship between education and social outcomes is assessed after taking into account these features of education. Finally, the third question can be addressed by evaluating whether the causal effects of education on social outcomes vary across population groups.

Statistical methods are by no means the only methods that can shed light on these policy questions. For instance, qualitative evidence such as case studies and interviews may well shed additional light on the impact of education or specific educational interventions. Moreover, qualitative results also help interpret quantitative results, as is done in Chapters 3 and 4. However, presenting quantitative evidence may render the analysis more credible to policy makers, researchers and practitioners in the fields of health and social policies (*i.e.* those who are more accustomed to evaluating quantitative statistical evidence) (OECD, 2007a). That being said, perhaps the most appropriate approach in presenting the evidence on the social outcomes of learning is the use of mixed research methods which combine quantitative and qualitative evidence, given the paucity of sound quantitative evidence in the literature.

This empirical framework is based on a long line of empirical research in labour economics which attempts to measure the earnings returns to education (Card, 2001). Health economists have extended this line of research to consider whether investments in education also pay off in the form of better health (Grossman and Kaestner, 1997; Grossman, 2000, 2006; Cutler and Lleras-Muney, 2010). An emerging line of research explores whether

education pays off for society in the form of civic and social engagement (CSE), such as voter turnout, political interest and volunteering (Dee, 2004; Milligan *et al.*, 2004). Moreover, the framework also exploits the rapidly growing literature on programme evaluations which are now widely adopted in the fields of economics, education, epidemiology, development, health and sociology.

This chapter describes a variety of statistical methodologies and is technical in nature. It does not provide an exhaustive list of methodologies but discusses those that are commonly adopted in the empirical literature and evaluated in Chapters 3 and 4.[2] Moreover, providing detailed accounts of each methodology goes well beyond the scope of this chapter. It instead presents brief descriptions of the empirical challenges and the basic ideas behind the methodologies. There is nothing in this chapter that would quench the thirst of advanced empirical researchers. It is instead designed to be useful for those who lack technical skills but are nonetheless interested in better interpreting and critically assessing the available empirical literature on the social outcomes of learning.

The rest of this chapter is organised around the three policy questions posed at the beginning. First, Section 2.2 describes how causal effects of education and non-linear effects of education can be estimated to evaluate the performance of education systems. Second, Section 2.3 describes how causal effects of educational interventions and analysis of pathways can be employed to identify features of the education systems that are likely to work. Lastly, Section 2.4 describes how heterogeneous treatment effects can be used to evaluate for whom is education likely to work better.

2.2. Evaluating the overall performance of education systems

Causal effects of education

For policy makers interested in mobilising education to improve social outcomes, the first (and perhaps most important) question is: Does education actually raise social outcomes? Unfortunately, answering this question is by no means an easy task, owing to the difficulty of implementing randomised control trials (RCTs) in which individuals are randomly assigned to either a control group or to a treatment group that is given more education.[3] With RCTs, comparisons of outcomes in the control and treatment groups would provide estimates of the causal effects of education on social outcomes. Although there are RCTs based on a treatment group receiving specific educational interventions, it is difficult to implement RCTs that specify a treatment group that receives an extra year of education.[4] Hence, the following describes the challenges and methodologies for addressing causal

relationships assuming that RCTs cannot be used and the methodologies adopted.

Challenges in assessing the causal effects of education

To precisely understand the challenges for establishing the causal effect of a year of schooling on social outcomes, it is useful to start with the following standard regression equation used in most studies of the returns to education:

$$Outcomes_i = \alpha + \beta \cdot Education_i + \gamma \cdot X_i + \varepsilon_i \qquad (1)$$

$Education_i$ is typically measured as the number of years of schooling completed by individual i by the time social outcomes are observed. The vector X_i provides other observable determinants of social outcomes such as demographic characteristics (*e.g.* gender, age and ethnicity) and parental background measures (*i.e.* parental education).[5] Unobservable determinants are captured by the random error term ε_i. If $Education_i$ is not related to unobserved variables, the ordinary least squares (OLS) regression coefficient $\hat{\beta}_{OLS}$ provides an unbiased estimate of the marginal effect of an additional year of schooling on outcomes. Literally hundreds of studies of the earnings returns to education estimate an equation along the lines of equation (1) (Card, 2001). Grossman and Kaestner (1997), Grossman (2006) and OECD (2007b) review the smaller but still extensive body of research that uses a similar approach to estimate the returns to education on health and CSE.

The coefficient β is interpreted as capturing the total effects (or net effects) of a year of schooling on outcomes. The total effect captures the effects of all learning experiences and contextual effects (*e.g.* school meals, cohesive peers, encouraging teachers and school norms) associated with the school experience individual i faces during the year. These experiences may, for instance, encourage individuals to invest more in health, seek more effective treatment, better comply with treatment regimens and adopt healthier diet and lifestyles. Note that β also captures any indirect effects on social outcomes that education may have through income or occupational characteristics.[6] The coefficient β reflects the combined effects of all of these pathways on health.

The key empirical challenge in estimating equation (1) is the possibility that $Education_i$ is an endogenous explanatory variable, *i.e.* that there is a correlation between $Education_i$ and the error term ε_i. Such a correlation violates the assumptions underlying the application of OLS to equation (1). In this situation, the estimated coefficient $\hat{\beta}_{OLS}$ is a biased estimate of the coefficient β, with the direction and size of the bias depending on the nature and strength of the correlation between $Education_i$ and the error term ε_i. There are three

reasons why education may suffer from endogeneity bias: (a) reverse causality, (b) hidden third variables and (c) measurement errors.

(a) Reverse causality

One source of endogeneity stems from the possibility that there is reverse causality, whereby poor health or low CSE reduces educational attainment. Poor health in youth might interfere with educational attainment by interfering with student learning because of increased absences and inability to concentrate. It may also lead to poor adult health, thus creating a correlation between education and adult health. Similarly, low CSE such as lack of trust and political interest might also reduce educational attainment. For example, a family with low CSE might reduce their involvement with schools, which might lead to poorer student outcomes.[7]

The bias due to reverse causality can be re-cast as an omitted variable problem after considering timing issues. Since health and CSE tend to persist over time, past health or CSE can be an important determinant of current health or CSE. Thus, past health or CSE is an omitted variable in equation (1) which is captured by the error term. The extent to which omitting past health or CSE will lead to an omitted variable bias depends on the extent to which past health or CSE is also correlated with the included variable $Education_i$. Because the current stock of education depends on past decisions about investments in education, reverse causality generates a correlation between past health or CSE and the individual's current stock of education.[8] If the estimated coefficient picks up the effect of past health or CSE, $\hat{\beta}_{OLS}$ will be biased towards overestimating the causal effect of education.

(b) Hidden third variables

The second source of endogeneity comes from the possibility that there might be one or more hard-to-observe hidden third variables which are the true causes of both educational attainment and health and CSE.[9] In the context of the education-earnings link, the most commonly mentioned hidden third variable is ability.[10] The long-standing concern in this line of research has been that people with greater cognitive ability are more likely to invest in more education, but even without more education their higher cognitive ability would lead to higher earnings (Card, 2001). More recently, non-cognitive abilities such as the abilities to think ahead, to persist in tasks, or to adapt to their environments have been suggested as important determinants of both education and earnings outcomes (Heckman and Rubinstein, 2001).

In the context of the education-health link, Fuchs (1993) describes time preference and self-efficacy as his favourite candidates for hidden third variables. People with a low rate of time preference are more willing to forego

current utility and invest more in both education and health capital that pays off in the future (Farrell and Fuchs, 1982, Fuchs, 1982). A classic example is the Stanford Marshmallow Experiment in which 4 year-olds were given the choice between eating the marshmallow now or waiting for the experimenter's return and getting a second marshmallow. When these children were tested again at age 18, Shoda *et al.* (1990) found a strong correlation between delayed gratification at age 4 and mathematical and English competence. Similarly, people with greater self-efficacy, *i.e.* those who believe in their ability to exercise control over outcomes, will be more likely to invest in schooling and health. Most studies of the schooling-health link use data sets that do not contain direct or proxy measures of time preference and self-efficacy. Consequently, these variables are typically omitted when estimating equation (1). The resulting omitted variable bias again implies that $\hat{\beta}_{OLS}$ will be biased towards overestimating the causal effect of education on health.

In the context of the education-CSE link, Milligan *et al.* (2004) suggest that the same parents who encourage their children to participate in civic activities might also instil in their children a stronger taste for education.[11] It also seems reasonable to suggest time preference and self-efficacy as candidates for hidden third variables behind the education-CSE link. As suggested by the term "social capital", education capital, health capital and CSE share some common features. In particular, a belief in self-efficacy is a potentially important determinant of civic participation and other aspects of investments in CSE. As in the education-health link, this type of omitted variable bias implies that $\hat{\beta}_{OLS}$ will be biased towards overestimating the causal effect of education on CSE.

A few recent studies have explored the issue of biases due to omitting measures of cognitive or non-cognitive skills in the context of the education-health link. Sander (1998) suggests that some of the negative correlation between attending college and smoking in the US can be attributed to differences in cognitive ability. Auld and Sidhu (2005) using the US Armed Forces Qualification Test (AFQT) scores suggest that cognitive ability accounts for roughly one-quarter of the association between education and self-reported health limitations. Kenkel *et al.* (2006) also use the AFQT score as a measure of cognitive skills and in addition include the Rotter index of the locus of control as a proxy for non-cognitive skills. They find that cognitive ability has strong associations with smoking, but weaker associations with being overweight. Their results for the Rotter index of locus of control[12] suggest that men who believe that what happens to them is outside their control are more likely to currently smoke and are less likely to be former smokers. Locus of control is more weakly associated with women's smoking and is not associated with the probability of being overweight or obese for either men or women. Hence, the empirical evidence from the United States suggests that cognitive and non-cognitive ability might be important omitted variables in

many previous studies of the education-health link. Omitting measures of ability once again means that $\hat{\beta}_{OLS}$ will be biased towards overestimating the causal effect of education.

(c) Measurement error

In addition to reverse causality and hidden third variables, a third problem is that there might be measurement error in self-reported $Education_i$ in equation (1). Classical measurement error in an explanatory variable leads to attenuation bias where $\hat{\beta}_{OLS}$ is biased towards zero, thus underestimating the causal effect of education on health and CSE.

An additional complication especially relevant for the education-CSE link is the possibility of non-random measurement error in the education variable. For example, Milligan *et al.* (2004) discuss in detail the possibility that "more educated individuals are more likely to feel the stigma of not having voted and therefore are more likely to over-report voting".[13] Non-random measurement error of this sort leads to a positive association between reported education and reported CSE so that the estimated coefficient $\hat{\beta}_{OLS}$ is biased towards overestimating the causal effect of education on CSE. In the context of the education-health link, the expected pattern of non-random measurement error is less obvious. However, the possible biases due to non-random measurement error in these studies should not be ignored, for example if education affects the self-reporting of health.[14]

In sum, reverse causality, hidden third variables, and measurement error mean that a simple approach to estimating equation (1) might lead to biased estimates of the coefficient of interest. In general it is hard to predict the direction and magnitude of the various biases that cause the estimated coefficient $\hat{\beta}_{OLS}$ to differ from the true coefficient. However, reverse causality and the most commonly suggested candidates for hidden third variables tend to create upward biases. On net, these empirical challenges probably mean that the estimated coefficient $\hat{\beta}_{OLS}$ will be biased towards overestimating the marginal causal effect of education on health and CSE.

Methods to better estimate the causal effects of education

Past efforts in empirical research have fortunately opened up various possibilities for addressing these challenges and evaluating the causal effects of education: (a) accounting for unobserved heterogeneity, (b) accounting for past health and CSE, (c) accounting for hidden third variables and (d) using instrumental variables (IVs).

(a) Accounting for unobserved heterogeneity across individuals

In the field of labour economics, a line of research on the earnings returns to education uses a strategy based on comparison between siblings and twins (Ashenfelter and Kruegar, 1994). The basic idea is that by comparing siblings or twins, a researcher can control for unobserved family and socioeconomic background, and even genetic factors (for twin samples).

This approach is, however, less likely to be viable in addressing the causal impact of education on social outcomes for two reasons. First, to implement the strategy requires large micro-data sets that include and identify siblings and twins. Such data do not seem to be widely available in many OECD countries, although there are exceptions. For instance, Australia and Sweden[15] have a twins registry which collects micro-data for a large number of twins. In particular, the Swedish Twin Registry includes measures of a wide range of health behaviours and outcomes, including measures related to obesity, depression and alcohol consumption. Second, it is less clear that this strategy will be useful in the context of the education-health and education-CSE links. Twins comparisons are particularly powerful for controlling for unobserved differences in cognitive ability, a central concern in studies of the education-earnings link. However, it is less clear that comparisons of twins will control for the hidden third variables most commonly discussed in the context of the education-health link, such as time preference and self-efficacy. On the other hand, siblings comparisons control for many family background differences, which might help address hard-to-observe hidden third variables behind the education-health and education-CSE links.

(b) Accounting for past health and CSE

To the extent possible, empirical studies should include controls for past health to reduce bias in estimates of health returns due to reverse causality from past health to education. Similarly, studies should include controls for past CSE, to reduce bias in estimates of CSE returns due to reverse causality from past CSE to education. However, the strategy of including controls for past health and CSE to reduce bias from reverse causality will often be limited by data availability. The ideal data set to implement this strategy would be from a longitudinal study which follows individuals from childhood, when educational decisions are made, into the adult years when health and CSE outcomes and behaviours manifest themselves.[16] Many OECD countries conduct high-quality longitudinal studies. However, most follow samples of adults and so cannot provide information on the individuals' health and CSE at the time in the past when they made their educational decisions. Moreover, information on past health and CSE is also lacking in many health and CSE data sets from high-quality cross-sectional surveys in OECD countries.

A second-best approach to account for past health and CSE is to use proxies for past health and CSE. For example, even cross-sectional data sets often include useful measures from retrospective reports of childhood health problems. Many data sets also contain measures of family background, such as parents' educational levels. Measures like these are also potentially useful proxies for capturing some of the heterogeneity in past health. These same family background measures might also proxy for the family's past CSE. In general, while some measures or proxies of past health are available in many data sets, it will probably be more challenging to find reasonable measures or proxies of past CSE.

Although studies of the causal effects of education on health and CSE should strive to control for past health and CSE, in most cases data limitations will mean that this strategy is less viable.

(c) Accounting for hidden third variables

To the extent possible, studies identifying the causal effects of education on health and CSE should include controls for hard-to-observe "hidden" third variables such as time preference, self-efficacy, and ability.[17] However, once again this strategy will be limited by data availability. The US Health and Retirement Study (HRS) includes a novel set of questions designed to elicit time and risk preferences (Barksy *et al*., 1997). The US National Longitudinal Survey of Youth 1979 includes measures of ability and self-efficacy. There are at least a few European data sets that include measures of ability. For example, a rich British panel data set – the National Child Development Survey – includes the outcomes of tests of reading and mathematics ability at age seven. Dearden (1999) uses these as control measures in a study of the earnings returns to education for Britain. Similarly, Uusitalo (1999) uses data from the Finnish Defence Forces Basic Ability Test to estimate the earnings returns to education for Finland. The International Adult Literacy Survey (IALS) and the related Adult Literacy and Lifeskills Survey (ALLS) provide measure of ability for selected OECD countries. However, there do not appear to be comparable data on time preference and self-efficacy across OECD countries.

One possible strategy is to include measures to proxy for hard-to-observe characteristics like time preference and self-efficacy. Komlos *et al.* (2004) point out that there are two general empirical approaches to measuring time preference: a structural econometric approach in which the rate of time preference is estimated from consumption and savings data through Euler equations; and survey questions like those included in the HRS. The assumptions required for structural estimation, as well as data requirements, make this option infeasible as a general strategy for studies of the marginal effects of education on health and CSE. Motivated by this approach, however, Komlos

et al. use proxy measures of time preference based on the savings rate and consumer debt in their study of obesity. Other empirical studies sometimes use consumer health behaviour, most often smoking, as a proxy for some combination of time, risk and health preferences. Khwaja *et al*. (2006) use data from the HRS to explore whether smokers have systematically different time, risk and health preferences from non-smokers. They find that smokers are more impatient and more risk-tolerant than non-smokers; but they do not appear to value health differently. Khwaja *et al*.'s results provide some support for the use of smoking as a proxy measure for time and risk preferences. The results also reveal a fundamental weakness of the strategy: because consumer health behaviour like smoking proxies for multiple differences, it is hard to interpret. More generally, many empirical economists are quite sceptical of the strategy of including endogenous choice variables such as savings rate, consumer debt and smoking as explanatory control variables. Including additional endogenous variables as explanatory variables in an equation like (1) raises a new set of econometric concerns. In this situation, it is not clear if this "cure" is better or worse than the original "disease" of omitting measures such as time preference and self-efficacy.

Although studies identifying the causal effect of education on health and CSE should strive to control for hidden third variables such as time preference, in most cases data limitations will severely limit the usefulness of this strategy.

(d) Using instrumental variables (IVs)

Where feasible, studies identifying the causal effect of education should consider using the method of instrumental variables (IV) and other approaches that rely on quasi-experimental designs that generate exogenous variation in education to identify its causal effect on health and CSE outcomes. When certain key assumptions hold, the method of IVs applied to non-experimental or observational data identifies the causal effect of an explanatory variable on an outcome. While this method is most widely used in econometrics, recent applications have been made in sociology (Winship and Morgan, 1999) as well as clinical and health services research (*e.g.* Permutt and Hebel, 1989, McClellan *et al*., 1994).

To study the links between education and health and CSE, the IV method relies on instrumental variables that satisfy exogeneity conditions (with education) but are not direct determinants of health or CSE. The method exploits the exogenous variation in the IVs as natural or quasi-natural experiments that create variation in education that is uncontaminated by the sources of bias described before. In any application, the use of the IV approach faces two challenges: the proposed IVs must be valid and strong (Murray, 2006). In other words, the IVs must not themselves be correlated with the error term ε_i

but must be sufficiently well correlated with the potentially endogenous variable $Education_i$.

Past research on this methodology suggests that the most promising IVs to assess the causal effects of education on health and CSE are variables based on educational policies and institutional features of education systems. As discussed in Card's (2001) detailed review of IV studies of the earnings returns to education: "Recently, much attention has focused on supply-side sources of variation in schooling, attributable to such features as the minimum school-leaving age, tuition costs, or the geographic proximity of schools." The arguments made in labour economics research that supply-side IVs based on educational policies are valid apply equally well to studies of the causal effects of education on health and CSE. Other than through their effect on education, it seems implausible that educational policies like those mentioned by Card directly determine health and CSE outcomes. Therefore, it is valid to exclude these variables from equation (1). Furthermore, variation in education attributable to educational policy IVs will not be contaminated by the problems reviewed in the previous section. Essentially, education is potentially endogenous in equation (1) because individual demand for education tends to be correlated with individual demand for health and CSE. Following Card's argument, the identification strategy is to use educational policies that shift the supply of education. The identifying variation in education will not be systematically related to an individual's past health or hidden third variables like the individual rate of time preference, self-efficacy and ability. The identifying variation based on educational policies will also not be systematically related to individual measurement error, removing this source of bias as well. As Murray (2006) notes: "Instrumental variable estimation can cure so many ills that economists might be tempted to think of it as a panacea."

While there is a good case for the validity of educational policy IVs, if they are not strong they might not be a useful cure after all. Despite the validity of the exclusion restriction in principle, in practice there may be incidental correlation between one or more of the instruments and unobserved determinants of health and CSE. If the explanatory power of the instruments is weak, even seemingly small incidental correlation can cause severe inconsistency in the IV estimator.

In light of the potential weak IV problem, studies of the causal effects of education should carefully consider sources of incidental correlation between the IVs and the error term ε_i in equation (1). The proposed identification strategy relies on variation in the educational policy environment within a country over time, and in some countries (like the United States) within the country at a point in time and across states. The identification strategy uses these sources of variation as natural or quasi-experiments. Commenting on

this common approach in empirical economics, Meyer (1995) emphasises that: "If one cannot experimentally control the variation one is using, one should understand its source." The educational policy environment and major schooling reforms result from or are influenced by the political process. As a result, they are not likely to be randomly distributed. However, it is not necessarily true that this creates problematic incidental correlation that biases IV estimates of the marginal effect of education on health and CSE. So-called "policy endogeneity" results in problematic incidental correlation only if unobserved factors drive both the educational environment and health and CSE.

Policies that are not part of more general reforms are potentially cleaner IVs for identifying the causal effects of education on health and CSE. In addition, studies can include controls to limit sources of contamination. For example, Lleras-Muney (2005) uses compulsory education laws to estimate the impact of education on mortality. She points out that "[C]hanges in the laws that took place during this period appear to have been exogenous to individuals. Although different states might have had different tastes for education, the regressions here include a very large set of controls (*e.g.* cohort dummies, state-of-birth dummies and region-of-birth × cohort interactions are included) which should capture these effects." She also stresses that: "There is no evidence that the laws included any clauses or restrictions that would have affected health independently." Thus, Lleras-Muney concludes that the compulsory education laws are not likely to be correlated with the error term ε_i in equation (1).

In another example, Dee (2004) uses child-labour laws as IVs for education to estimate the causal effect of education on CSE. The laws change the minimum amount of education required before a child can enter the workforce, and thus are expected to change educational attainment. Dee (2004) provides the following defence of these variables as IVs: "[S]uch laws played a relatively minor role in the dramatic 'high school movement' from 1910 to 1940, which suggests that these law changes were not part of substantive social changes that might have also influenced civic attitudes." Thus, Dee concludes that the child-labour laws are not likely to be correlated with the error term ε_i in equation (1) for CSE.

As in the studies by Lleras-Muney (2005) and Dee (2004), marshalling evidence from a variety of empirical sources including institutional details and historical studies is often a crucial part of making the case for the validity of an IV for education. IV studies should carefully consider policy-level factors that might lead to incidental correlation between the educational policy reforms used as IVs and health and CSE.

In addition to trying to control for sources of policy endogeneity and incidental correlation, IV studies of the marginal effects of education on

health and CSE should test for weak IVs. Stock *et al.* (2002) provide a useful survey of methods now available for detecting and handling weak IVs. They conclude that there are some useful methods that practitioners can adopt to address concerns about weak instruments. If indicated by such tests, studies of the causal effect of education should use one of the more robust methods they review: limited information, maximum likelihood; the Fuller-k estimator; bias-adjusted two-stage least squares; or the jack-knife instrumental variables estimator.

Given the potential for educational policy IVs to be weak, it might be tempting to consider other IVs for identifying the marginal effect of education on health and CSE. Some previous studies use family background variables. Although family background variables are often statistically stronger predictors of educational attainment, these variables are strongly criticised regarding the validity of the identifying exclusion restriction, *i.e.* the assumption that the IVs are not direct determinants of health or CSE and are not correlated with unobservable determinants of health or CSE. For example, in earlier studies by Berger and Leigh (1989), Sander (1995a, 1995b)), the authors assume that variables such as parents' schooling can be excluded from the health outcome equations. However, if more educated parents invest more in their children's health and stock of health knowledge, this exclusion restriction is invalid and the resulting estimates of the impact of schooling on health are biased. As standard practice in labour and health economics, using IVs based on family background is not a credible approach for estimating the causal effects of education on health and CSE.

Identifying appropriate instruments: Educational policies as IVs

The availability of supply-side IVs, such as educational reforms, depends on the quasi-experiments or natural experiments generated by the political process in different countries and over time. It is very hard to generalise about the availability of such IVs. However, many of the IVs already used in research on the earnings returns to education may be used to evaluate the marginal effects of education on health and CSE. Table 2.1 lists potentially suitable IVs based on educational reforms available in Austria, Canada, Denmark, France, Germany, Ireland, Italy, the Netherlands, Norway, Portugal, Sweden, Chinese Taipei, the United Kingdom and the United States.

To illustrate the use of educational policies in IV studies, it is useful to review three studies. First, Oreopoulos (2006a) uses an educational policy reform in Britain to estimate the earnings returns to secondary schooling. Historically, Britain has relatively high dropout rates. In 1947, Britain increased the minimum school-leaving age from 14 to 15 years. The policy is the source of a strong identification strategy: The fraction of 14-year-olds leaving school fell from 57% to less than 10%. Oreopoulos uses a regression

Table 2.1. **Instrumental variables (IVs) based on education policies**

Country	Educational policy used as IV for education	Reference IV study
Austria	School disruptions due to Word War II	Ichino and Winter-Ebmer (2004)
Canada	Variation in school-leaving ages and child labour laws	Oreopoulos (2006b)
Denmark	1958 reform: Lowered educational barriers 1975 reform: Raised compulsory schooling from 7 to 9 years, and removed distinction between two tracks during 8th to 10th forms	Arendt (2005)
France	1968: Educational reforms after student riots 1922, 1952: Zay and Berthoin reforms, which raised the minimum school leaving age to 14 and 16 years, respectively.	Maurin and McNally (2008) Albouy and Lequien (2009)
Germany	1940s: School disruptions due to Word War II 1950s: Abolition of secondary school fees	Ichino and Winter-Ebmer (2004) Reinhold and Jurges (2009)
Ireland	Mid-1960s: Introduction of free secondary education 1972: School-leaving age increased from 14 to 15	Callan and Harmon (1999)
Italy	1963: Transformation of two types of non-compulsory lower secondary school into a single compulsory system. After this reform, individuals were obliged to stay at school for 8 years instead of 5.	Di Pietro and Delprato (2009)
	1969: Possible for individuals who completed secondary education to enrol in college, regardless of curriculum chosen in secondary school	Brunello and Miniaci (1999)
The Netherlands	1982: Duration of university education decreased from 5 to 4 years	Webbink (2007)
Norway	1960s: Compulsory education increased from 7 to 9 years	Black et al. (2005)
Portugal	1956: Compulsory education increased from 3 to 4 years 1964: Compulsory education increased from 4 to 6 years	Vieira (1999)
Sweden	1960s Compulsory education increased from 7 or 8 to 9 years	Meghir and Palme (2005)
Chinese Taipei	1968: Compulsory education increased from 6 to 9 years Large expansion in junior high school construction (intensity varied across regions)	Chou et al. (2007)
United Kingdom	1947: Minimum school leaving age increased from 14 to 15 1973: School reform	Harmon and Walker (1999) Oreopoulos (2006a)
United States	Compulsory schooling law School entry age policies: Children must be 5 years old on 1 December (California) or 1 September (Texas).	Angrist and Kruger (1991) McCrary and Royer (2006)

discontinuity (RD) design to estimate the average returns to schooling. He compares educational attainment and adult earnings for students just before and just after the policy change. This approach is akin to the identification strategy in IV studies, in that the policy change is used as a source of quasi-natural experimental variation in education. Importantly, however, the RD design also controls for general trends over time in education and earnings.

Second, Arendt (2005) uses educational policy reforms in Denmark to estimate the impact of education on self-reported health, body mass index, and smoking. He uses two IVs to indicate whether individuals were affected by educational policy reforms enacted in 1958 and 1975. Arendt includes time trend variables to account for upward drifts over time in health that occurred for reasons other than increases in education. His analysis suggests that on top of a general increasing trend in educational attainment, there was a sharp jump after 1958, suggesting that this reform is a useful IV. However, the 1975 reform did not seem to have as much of an impact, which was not unexpected given the nature of the reform. Arendt conducts F-tests that suggest the IVs are somewhat weak. Arendt's conclusions are as follows: "For both men and women, a longer education is associated with better SRH [self-reported health]. When endogeneity is allowed for, this relationship increases in magnitude, but as is commonly found with IV methods, so do the standard errors. Therefore, it cannot be rejected that education is exogenous to SRH, nor can the null of no effect of education be rejected. Similar results are obtained when BMI is used as health outcome."

Third, Chou *et al.* (2007) use educational policy reforms in Chinese Taipei to estimate the effect of parental education on child health. In 1968, it increased compulsory education from six to nine years, and launched an expansion in junior high school construction. It also abolished a junior high school entrance examination, so all primary school graduates could continue their education. The percentage of primary school graduates who entered junior high school jumped from 62% in 1967 to 75% in 1968 and rose to 84% by 1973. Thus, the educational policy reforms appear to provide a powerful quasi-experiment. The school construction programme varied across regions, which created additional quasi-experimental variation. Chou *et al.* use interactions of cohort indicators and programme (school construction) intensity measures as IVs for education. The F-tests suggest that the study does not face a weak IV problem. The authors find that parental education improves child health outcomes. They also note that they cannot reject the null hypothesis that education is exogenous, but point out that the exogeneity test "may have relatively low power given the loss in efficiency associated with two-stage least squares."

In spite of the attractiveness of using education policies such as compulsory schooling laws as exogenous instruments, one needs to keep in mind

that a valid analysis rests on the assumption that either the timing of these laws is unrelated to state-specific trends (if the analysis uses cross-state differences in the timing of introduction of the reforms) or time-specific trends (if the analysis exploits time differences in individual exposure to reforms) in outcomes.[18] For instance, Mazumder (2007) suggests that the impact of education on health outcomes in the United States is sensitive to inclusion of state-specific trends. Moreover, IV estimates capture only the effect of the reform for the specific group affected by the reform and are not informative about the impact of education on the general population. The IV estimate is generally a weighted average of the causal effect of a year of education within a sub-group, where the weights depend on how much the sub-group is affected by the IV. As a result, the IV approach provides an estimate of a so-called local average treatment effect (LATE) (Angrist *et al*., 1996). Given that different subgroups react differently to policy reforms, the IV method measures the average treatment effect among those who increase a year of education due to the policy reform (Oreopoulos, 2006a).

This argument has an important implication for assessing the causal effect of education for domains in which only a higher level of education is likely to exhibit causal effects. For instance, if one assumes that only tertiary education confers causal effects on interpersonal trust, IV estimates using policy reforms such as changes in the compulsory schooling law or child labour law will most likely yield either a small or statistically insignificant estimate. This point should be kept in mind when interpreting and synthesising the evidence in Chapters 3 and 4.

Non-linear effects of education

Challenges in assessing the non-linear effects of education

The standard regression equation (1) and many previous studies assume a linear relationship between education and outcomes such as earnings, health or CSE.[19] In principle, it is straightforward to adopt different functional forms to describe the relationships between education and earnings, health and CSE. For example, Card's (2001) model of endogenous schooling implies a quadratic functional form:

$$Outcomes_i = \alpha + \beta \cdot Education_i + \delta \cdot (Education_i)^2 + \gamma \cdot X_i + \varepsilon_i \qquad (2)$$

In equation (2), economists generally expect that the estimated δ will be negative so that the relationship between the outcome and years of education is concave: the marginal effect of an additional year of education diminishes at higher levels of education. Across a wide range of outcomes, economists note that production functions display a diminishing marginal product. In addition to Card's (2001) model of the earnings-education relationship,

Grossman (2006) suggests that the marginal effect of education in improving health outcomes will diminish at higher levels of education. If education improves health through the causal pathway of information, it is reasonable to expect that elementary skills such as basic literacy have greater health payoffs than more advanced skills such as literary criticism. Similar arguments suggest that the relationship between CSE and education might also be concave.

An even more flexible specification is to treat the outcome-education relationship as a step function of years of education with a separate step for each year:

$$Outcomes_i = \alpha + \beta_1 \cdot Edu1_i + \beta_2 \cdot Edu2_i + \ldots + \beta_{18} \cdot Edu18_i \delta + \gamma \cdot X_i + \varepsilon_i \quad (3)$$

In equation (3), $Edu1_i$ is an indicator that the individual has completed exactly one year of education, $Edu2_i$ is an indicator that the individual has completed exactly two years, and so on through $Edu18_i$ (or whatever is the highest level of education observed in the data). Estimates of the parameters $\beta_1 \sim \beta_{18}$ show the effect of the specified number of years of education compared to no education (or whatever is the lowest level of education observed in the data). The marginal effect of changing from, say, 11 years of education to 12 years is given by the difference: $\beta_{12}-\beta_{11}$. Because the βs are free to vary, this specification imposes no restriction on how that marginal effect compares to the marginal effect at different levels of schooling. In contrast, the linear specification imposes the restriction that the marginal effect is always the same, so for example it would impose the restriction that $\beta_{12}-\beta_{11} = \beta_{13}-\beta_{12}$. In the quadratic specification with a negative δ, the marginal effect always diminishes so that $\beta_{12}-\beta_{11} > \beta_{13}-\beta_{12}$.

The flexible specification given by equation (3) is especially relevant for assessing whether there are "sheepskin effects" in the earnings-education relationship. A sheepskin effect exists if the marginal effect of an extra year of education on earnings is higher when that extra year also conveys a degree or certificate (traditionally called a sheepskin). Hungerford and Solon (1987) find substantial and statistically significant sheepskin effects in the earnings returns to education. Their results are consistent with economic models that assume that education can, in addition to possibly making workers more productive, provide credentials that signal them as being more productive. Heckman *et al.* (1995) also test and reject the conventional specification of linearity in the earnings-education relationship.

It is important to consider non-linearities in the relationships between health and CSE and education, but the choice of the functional form involves tradeoffs. It seems likely that the marginal effects of education diminish at higher levels of education, which can be captured by the quadratic specification of equation (2). The flexibility of a specification like equation (3)

is attractive in principle but makes strong demands on the data in practice. For example, even with a relatively large sample of over 15 000 workers, Hungerford and Solon's estimates of the coefficients on an equation like (3) are imprecise because most of the education categories contain very small fractions of the sample. Another consideration is that sheepskin effects seem unlikely in the health or CSE returns to education. It is not obvious that actually receiving a credential should improve health or CSE, except perhaps through effects due to social status as well as psychological effects on one's self-perception and identity. A version of equation (3) with fewer steps might often be a reasonable compromise. Data limitations sometimes force that compromise. For example, in some surveys education is reported in terms of broader categories or levels, such as primary, secondary and higher education. With such data, it is only possible to estimate a step function with a few steps. Moreover, non-linear specifications of the relationship between education and health or CSE increase the difficulty of dealing with endogeneity bias.

Methods to estimate the non-linear effects of education

In principle, the IV approach discussed above can be used to estimate the causal effects of education across all levels of education. In practice, however, addressing both causality and non-linearities brings the empirical analysis to the cutting edge of current research practice. Past research in labour and health economics has mostly focused on only one of these problems and neglects the other. However, a few studies in labour economics provide possible routes to addressing both problems.

For instance, Harmon and Walker (1999) estimate the effects of education on earnings, allowing for non-linearity for the United Kingdom. To capture the non-linearity at high levels of education they include the number of years of post-18 education in addition to the total number of years of education. To identify the causal effects at different levels of education, they use two sets of IVs: one set they regard as affecting education decisions at low levels; and another they regard as affecting education decisions at post-18 levels.

Skalli (2007) also uses an IV to estimate the effects of education on earnings without assuming any explicit form of non-linearity for France. In the first stage, he estimates an ordered probit of the probability of attaining nine levels of education: 10 years, 11 years, and up to 18 or more years. In the second stage, he estimates nine separate earnings equations which include a selectivity correction term from the first stage. This specification is similar to the step function described above by equation (3) because it allows for nine separate effects of education on earnings and does not impose any restrictions across the estimated effects.[20] Skalli finds a highly non-linear relationship

and concludes that the estimated marginal returns oscillate across educational levels.

Lastly, Moffitt (2007) proposes a nonparametric method of estimating marginal treatment effects in heterogeneous populations. He argues that in most previous studies that use only a binary IV "only one piece of the marginal return [to education] function can be nonparametrically identified". In his study, "a wider portion of the return function is estimated because multiple, multi-valued instruments are used".

Thus, previous research suggests that using multiple IVs that affect education at different levels is a viable way to identify non-linear effects of education. An example of a set of suitable IVs would be: compulsory schooling reform that affects educational attainment at low levels; and higher-education subsidies or tuition rates that affect college entrance and graduation rates. However, given the difficulty of identifying valid and strong instruments, in reality, most of the available studies that have estimated non-linear effects of education on social outcomes have not taken into account the causal effects, and only evaluate correlations between different levels of education and social outcomes. A prominent example is Cutler and Lleras-Muney (2010) for health outcomes. The analyses conducted in Chapters 3 and 4 only review studies that shed light on correlations.

2.3. Identifying features of the education systems that work

When policy makers learn that education has a causal effect on social outcomes, they would be interested in knowing the features of the educational system (*e.g.* reforms in curriculum, teaching methods and school organisation) that have been particularly important in raising social outcomes. Likewise, when policy makers find that education does not exhibit a causal effect on social outcomes, they would be interested in learning what features of the education system have not been conducive to promoting social outcomes. There are two ways in which a researcher could shed light on these matters. One is to evaluate the causal effects of specific educational interventions on social outcomes. This can provide information on educational interventions that work and on the size of the impact. An alternative approach is to evaluate the relative contributions of different pathways that explain the relationships between education and social outcomes. This can be done by assessing how the education gradient (or the correlation between education and social outcomes) changes after controlling for possible mediating factors in a regression setting.

Causal effects of educational interventions

Challenges for assessing the causal effects of educational interventions

There has always been strong interest in the policy community in objective evaluation of the effectiveness and efficiency of educational programmes, and researchers have in response made significant efforts to improve the methodologies of economic evaluations and their implementation. This is notably the case in the field of development, since educational interventions are considered to be indispensable drivers of poverty reduction and economic growth in developing countries.

The empirical literature on programme evaluations[21] has made explicit the challenges for identifying the causal effects of educational interventions on labour market and health outcomes.[22] To discuss the challenges, it is useful to consider the following simple statistical set-up of programme evaluations.

Assume $Education_i$ denotes individual i's participation in an educational programme. Hence, $Education_i = 1$ if individual i participates and $Education_i = 0$ if not. When individual i participates, her level of social outcomes will be SO_{1i} and if not, SO_{0i}. The causal effects (or the effectiveness) of the educational programme can then be expressed as:

$$E[SO_{1i} - SO_{0i} | Education_i = 1] = E[SO_{1i} | Education_i = 1] - E[SO_{0i} | Education_i = 1] \quad (4)$$

This is essentially the conditional mean impact of participating in an educational programme, which is often called the treatment effects in the literature. The challenge in estimating this treatment effect is that one does not know what $E[Outcomes_{0i} | Education_i = 1]$ is. In other words, one cannot observe what the outcome would have been if the individual who participated in the programme didn't participate. Researchers usually call this the counterfactual.

One may be tempted to assert the impact of the educational intervention by simply subtracting the mean outcomes of non-participants from the mean outcomes among participants, as indicated in the left hand side of equation (5). However, this would capture not only the causal effects of the educational interventions but also the bias as indicated in equation (5).

$$E[SO_{1i} | Education_i = 1] - E[SO_{0i} | Education_i = 0] = E[SO_{1i} - SO_{0i} | Education_i = 1] - [\text{Bias}] \quad (5)$$

This bias is likely to be non-negligible since most education interventions select individuals based on certain individual/household characteristics (*e.g.* income, residential area). This is typically called the selection bias. If programme participants were randomly assigned, the bias would disappear.[23]

This bias can arise from both observable and unobservable individual/household characteristics (Ravallion, 2001). The observable bias relates to the differences in the observed controls across treatment and comparison groups. If the observed controls are different across the two groups, there will be a bias in the results. However, the bias may still exist even if the observed controls are the same across the two groups if the distribution of the observable characteristics is not the same. Careful selection of the comparison group can eliminate this source of bias by choosing a comparison group with the same distribution of observed characteristics as the treatment group. The unobserved variables can also lead to a bias if they influence schooling and programme participation conditional on the observed variables in the data.[24]

Estimating the causal effects of educational interventions[25]

As mentioned above, the key challenges in estimating the effects of educational interventions come from the fact that most policy interventions target certain population groups, *i.e.* treatment groups are not selected randomly. There are various methods for reducing the biases due to non-random selection into educational interventions. The key idea is to tackle the problem arising from missing information on the hypothetical outcomes assuming that the programme participant did not participate in the programme. Hence, evaluation is ultimately a problem of missing data. The literature suggests that the viable approach would be to construct the comparison group to identify the counterfactual of what would have happened without the programme. The comparison group is designed to be very similar to the treatment group of participants with one key difference: the comparison group did not participate. There are four ways to do this:

1. Randomisation

The selection into the treatment group and comparison group can be considered random in some well-defined set of people. Therefore there will be no difference on average between the two groups besides the fact that the treatment group received the programme.

2. Matching

The goal of matching is to identify a comparison group from a larger survey. The comparison group is matched to the treatment group on the basis of a set of observed characteristics, or using the predicted probability of participation given observed characteristics (which is often called the "propensity score"). A good comparison group comes from the same economic environment as the treatment group and is administered the same questionnaire by similarly trained interviewers.

3. Double difference methods

Here one compares a treatment and comparison group (first difference) before and after a programme (second difference). This approach hypothesises that the effects of unobservable student (or, student's family) characteristics do not vary before and after the student is exposed to the intervention. If the unobserved characteristics remain constant over time, they can be differenced out by studying changes in outcomes over time.

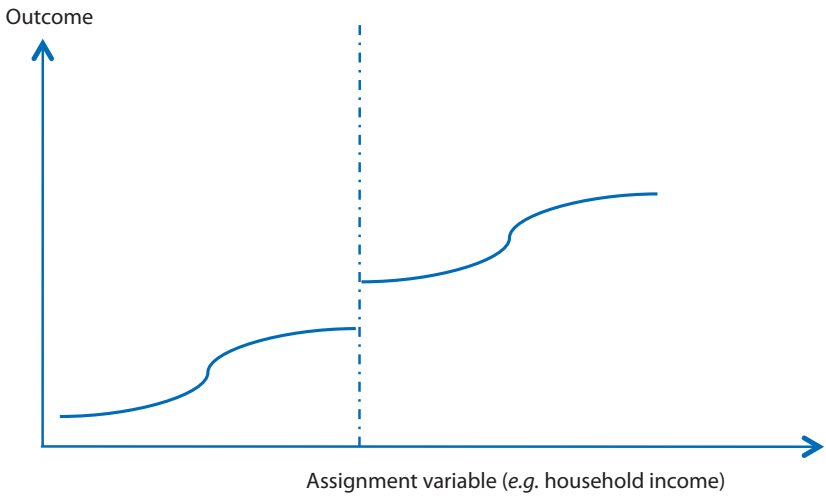
4. Instrumental variables (IV) methods

The logic is exactly the same as the IV discussed before. The key is to identify variables that matter to programme participation but not to outcomes following participation. If such variables exist, they identify a source of exogenous variation in outcomes attributable to the programme – recognising that its placement is not random but purposive. IVs are first used to predict programme participation; then one sees how the outcome indicators vary with the predicted values, conditional on other characteristics.

Another way to assess the impact of educational interventions is to use a method called regression discontinuity designs. Although this method was first introduced in the 1960s, its application in the fields of education and economics has been quite recent. Regression discontinuity (RD) designs make two important assumptions. First, selection into educational interventions is based on an observed variable which is normally called the assignment variable. This can, for instance, be household income thresholds, and participants with values above this threshold will be in the treatment group, while those with values before the threshold will be assigned to a control group. Second, the outcome variable is a continuous and smooth function of the assignment variable, especially near the threshold. Hence, this method cannot be applied when evaluating the effect of educational intervention on the incidence of volunteering, for example. However, it could be applied when evaluating the effect on the intensity of volunteering (*e.g.* number of days of volunteering during the past year).

Figure 2.1 illustrates the regression discontinuity design methods. Suppose household income is used to assign students to educational interventions (treatment group). Household income is the assignment variable, and the minimum household income is the threshold. The figure depicts the positive effect of eligibility, which is the jump at the threshold in the predicted outcome values. The RD estimate of the treatment effect (*i.e.* the jump) can be estimated using regression models along with tests of statistical significance. The RD provides an estimate of the impact of eligibility for the programme on outcomes, whereas the instrumental variable (IV) estimates mentioned above provides the impact of treatment (*i.e.* educational intervention) on outcomes.

Figure 2.1. **Regression discontinuity designs**



Analysis of pathways

Methods to estimate the causal effects of educational interventions rely on micro-data sets with an experimental design or those that allow for quasi-experiments. Such data are typically hard to obtain, particularly across a number of OECD countries. Moreover, it is very difficult to use this approach to compare the role of one causal pathway (*e.g.* raising basic competences via curriculum reform) to another (*e.g.* income effects).

A simple way to infer the role of different pathways is to evaluate the extent to which β in equation (1) changes when adding factors that are likely to capture a particular pathway.[26] For instance, the following possible causal pathways may explain the impact of education on social outcomes:

- directly by raising individual's level of cognitive skills;
- indirectly by raising the level of income.

To assess the contribution of each of these factors to the education gradient, it is sufficient to estimate the changes in the education gradient after accounting for these factors. More formally, consider a vector of explanatory factors: Z_i, which may capture one element of the above-mentioned causal pathways. To test the impact of this explanatory factor, it is necessary to re-estimate (1) after including the explanatory factor Z_i:

$$Outcomes_i = \alpha + \beta^* \cdot Education_i + \gamma \cdot X_i + \delta \cdot Z_i + \varepsilon_i \qquad (6)$$

The percentage decline in the coefficient of education from adding the explanatory factor, $1-\frac{\beta^*}{\beta}$, gives the estimate of the contribution of this factor to the education gradient. Cutler and Lleras-Muney (2010) estimate the contributions of a variety of causal pathways using micro-data from the United States and the United Kingdom. They show that information and measures of cognitive ability explain 30% of the education gradient, and that income, health insurance and family background also account for 30%.

2.4. Identifying for whom education is likely to have a stronger impact

The analyses described thus far implicitly assume that the impact of education does not vary across populations grouped *e.g.* by gender, age or ethnicity. However, education may well exhibit heterogeneous effects across these groups; this is what economists call heterogeneous treatment effects.[27] Given that there are typically significant inequalities in social outcomes across these groups (see Chapters 3 and 4), it would be of policy interest to know whether education helps to reduce/expand inequalities across population groups. This can easily be seen by evaluating how treatment effects vary across population groups.

Equation (7) modifies equation (1) to allow for heterogeneous treatment effects. Instead of a common marginal effect of education given by one parameter β, each individual i faces a different marginal effect β_i. So, instead of focusing on estimating the marginal effect of education, this extension shifts the focus of research to the properties of the distribution of treatment effects, for example the mean or average treatment effect (ATE). The education-health or education-CSE schedule can be reinterpreted as plotting out the ATEs for a defined population. If that population is defined in a way that is related to its level of education, the schedules of ATEs illustrate whether there are non-linearities in the effects of education on health and CSE.

$$Outcomes_i = \alpha + \beta_i \cdot Education_i + \gamma \cdot X\mathrm{i} + \varepsilon_i \qquad (7)$$

Different ATEs will be relevant for different education policies. For example, to estimate the health benefits of an educational reform aimed at disadvantaged segments of the population, the relevant ATE is the average effect of education on health for that sub-group of the population, which may differ substantially from the ATE for the entire population.

The IV method can yield multiple valid estimates of causal treatment effects, *i.e.* multiple valid estimates of the marginal returns to education for different sub-populations. The IV estimate is a weighted average of the causal effect of a year of education within a sub-group, where the weights depend on how much the sub-group is affected by the IV. As a result, the IV approach

provides estimates of a local average treatment effect (LATE) (Angrist *et al*., 1996). LATE is "the average treatment effect for those who change treatment status because they comply with the assignment-to-treatment mechanism implied by the instrument" (Inchino and Winter-Ebmer, 1999). Kling (2001) explains that IV strategies "often rely on observing individuals influenced to acquire more schooling through some rule or incentive that typically affects schooling decisions of a subgroup of the population. If the return to education is not constant across individuals, then equally valid identification strategies relying on different subgroups may generate different results." These different results correspond to different LATEs. While Kling's study focuses on the earnings returns to education, his logic also applies to the returns to health and CSE. For example, Grossman (2006) suggests that recent IV estimates of the health returns to education exceed OLS estimates because the IVs reflect policy interventions that affect choices of persons with low levels of schooling, where the LATE is large.

It is important to consider the LATE when interpreting estimates of the marginal effects of education on health and CSE. With heterogeneous treatment effects, the IV approach does not necessarily provide estimates of the average marginal return to education. As Card (2001) emphasises: "For policy evaluation purposes, however, the average marginal return to schooling in the population may be less relevant than the average return for the group who will be impacted by a proposed reform. In such cases, the best available evidence may be IV estimates of the return to schooling based on similar earlier reforms."

2.5. Additional considerations

Comparisons of instrumental variables (IV) and ordinary least squares (OLS) estimates

The studies of the causal effect of education on health and CSE should follow the standard empirical practice and report and compare the IV results to benchmark OLS results. There are two key comparisons. First, is the point estimate from the IV approach of the marginal effect smaller or larger than the OLS point estimate? Second, how do the confidence intervals around the IV and OLS point estimates compare?

The empirical challenges discussed above tend to suggest that the benchmark OLS point estimate $\hat{\beta}_{OLS}$ will be biased towards overestimating the marginal causal effect of education on health and CSE. Because the IV approach should lead to an unbiased estimate $\hat{\beta}_{IV}$, the *a priori* expectation is that $\hat{\beta}_{OLS} > \hat{\beta}_{IV}$. In general, finding that $\hat{\beta}_{OLS} > \hat{\beta}_{IV}$ would tend to support the usefulness of the IV approach. However, previous studies in labour

and health economics often fail to find the expected pattern. Card's (2001) extensive review notes: "The recent literature that uses supply-side features to instrument schooling choices tends to find IV estimates of the return to schooling that are at least as big and sometimes substantially bigger than the corresponding OLS estimates." Grossman's (2006) summary of recent IV studies of the impact of education on health comes to a similar conclusion. For example, in her study of the impact of education on mortality, Lleras-Muney (2005) comments: "In all the IV estimations presented here, the effect of education is much larger than the OLS estimates suggest … At first, this could seem to be a surprising result: the a priori expectation was that OLS estimates would be too large."

Studies of the marginal effects of education on health and CSE should consider several possible explanations for why the IV estimate might exceed the OLS estimate. The following list of possible reasons is based on Card's (2001) discussion, extended to consider health and SCE. First, it could be that the biases in $\hat{\beta}_{OLS}$ from reverse causality and hidden third variables such as time preference are relatively small. Because $\hat{\beta}_{OLS}$ is also potentially biased downwards (towards zero) due to measurement error in the education variable, the different sources of bias may cancel out or even result in a downwardly biased $\hat{\beta}_{OLS}$. This could explain why $\hat{\beta}_{OLS} < \hat{\beta}_{IV}$. However, Card (2001) suggests that measurement error in education can only explain perhaps 10% of the gap between the OLS and IV estimates, so this explanation seems incomplete.

A second, more popular, explanation is that the studies that use educational policy IVs tend to recover LATE for subset of individuals with relatively high returns to education (Card, 2001; Grossman, 2006).

A third, more troubling, explanation is that the pattern in published results is due to specification searching. Researchers and the publication process tend to favour IV specifications that yield larger t-statistics. Because the IV approach increases the standard errors associated with the estimated coefficient, the publication bias towards larger t-statistics creates a tendency towards reporting and publishing only the larger point estimates of the marginal effects of education. Ashenfelter *et al.* (1999) conclude that: "Once the impact of the likelihood that a study result will be reported is controlled, there are relatively small differences among the estimates produced by the different estimation methods [such as OLS and IV]."

In addition to the point estimates of the marginal effects of education on health and CSE, it is important to compare the precision of the estimates. A general property of the IV approach is that it yields less precise estimates with larger standard errors and wider confidence intervals. Ashenfelter *et al.* (1999) report a meta-analysis of 96 estimates from 27 studies of the effect of education on earnings. While the average point estimate from the IV studies

is about 40% larger than the average point estimate from the OLS studies, the average standard error is about 400% (five times) larger. IV studies of the marginal effects of education on health and CSE which use the same identification strategy of relying on educational policies as IVs are likely to yield similarly imprecise estimates. It will be important to keep in mind the relative imprecision of IV estimates when interpreting the resulting estimates.

Although exogeneity tests provide formal statistical comparisons of OLS and IV estimates of the coefficient of interest, these tests might not be very informative for the proposed study of the marginal effects of education. The logic of the exogeneity test is that under the null hypothesis education is actually exogenous, and the OLS and IV estimates $\hat{\beta}_{OLS}$ and $\hat{\beta}_{IV}$ will differ only by sampling error. The statistical test of whether $\hat{\beta}_{OLS}$ and $\hat{\beta}_{IV}$ are significantly different thus provides a test of the null hypothesis of exogeneity. Rejecting the null hypothesis of exogeneity implies that education is endogenous; but failing to reject the null hypothesis is less informative. When the IV estimate is relatively imprecise, as is likely to be the case in an IV study of the marginal effects of education, exogeneity tests are not very powerful. The wide confidence interval around $\hat{\beta}_{IV}$ might include $\hat{\beta}_{OLS}$, so the null hypothesis that $\hat{\beta}_{OLS} = \hat{\beta}_{IV}$ cannot be rejected. But the wide confidence also means that the hypothesis that $\hat{\beta}_{OLS}$ is very different from $\hat{\beta}_{IV}$ can also not be rejected. An example of this situation is the results from the influential study by Lleras-Muney (2005) of the impact of education on mortality. She finds that the IV point estimate is substantially larger than the OLS point estimate, but that the exogeneity test cannot reject the null that the two estimates are the same. Despite this failure to reject exogeneity, most empirical economists would agree that her IV estimates that account for endogeneity are more reliable evidence on the effect of education on health.

Cross-country comparisons

The estimation should allow for the possibility of the size of the relationship between education and health to vary across countries. Cutler and Lleras-Muney (2006) propose that "gradients in health arise when there is knowledge and technology available to prevent or treat disease". Because the available knowledge and technology vary across countries, the relationship between education and health is also expected to vary. For CSE, cross-country variations are more likely to be due to country-specific cultural, political and institutional factors.

It may be sufficient to consider different education-health schedules across broad groups of countries: high-income countries, formerly socialist economies and low-income countries. In their meta-analysis of studies of the effect of education on earnings, Ashenfelter *et al.* (1999) find "little difference in the estimated returns by geographical region – countries in this non-US grouping

include Finland, Honduras, Indonesia, Ireland, Netherlands, Portugal, and the United Kingdom". However, Huang *et al.* (2009) show, on the basis of a meta-analysis that the returns to education on social trust and participation are significantly higher in the United States than other countries (mostly Europe).

General equilibrium effects

Studies of the marginal effect of education on health and CSE should explore whether accounting for general equilibrium effects is important when estimating the health and CSE returns to education. Both the standard approach described by equation (1) and the extensions described by equations (2) and (3) adopt an individual-level or partial equilibrium approach. The focus is on estimating how an individual's health, CSE or earnings will increase if he or she receives more education. The studies do not attempt to model or predict the general equilibrium effects when many individuals receive more education. In many US studies, the estimates are based on the quasi-experimental variation in education induced by state-level educational policy reforms. Heckman *et al.* (1998) argue that this approach is likely to be misleading for the analysis of a national education policy. The general problem is that "what is true for policies affecting a small number of individuals need not be true for policies that affect the national economy at large". In the context of the education-earnings link, an example of a general equilibrium effect is the possibility that if a tuition subsidy increases college enrolments, the increase in the number of college graduates will bid down their relative wages. In this example, the general equilibrium effect of a national education policy on earnings might be substantially weaker than that implied by estimates from studies that adopt an individual-level or partial equilibrium approach.

The relevance of general equilibrium effects for estimating the health and CSE returns is less obvious. The possibility that a general increase in education bids down wages should not matter so much, because the health and CSE returns to education do not depend solely on the impact of education on earnings.[28] General equilibrium effects also seem unlikely for some, but not all, of the causal pathways that link education to health and CSE.

As discussed in Chapter 4, perhaps the most obvious causal pathway is through information. Information on health and CSE has the property of being mainly non-rival in consumption: one person's learning about health or CSE does not prevent another person's learning (or consumption) of the same facts. As a result, if an educational policy increases the demand for such information, it does not seem likely that the price of information will be significantly bid up in general equilibrium.[29] However, there might be general equilibrium effects further downstream. Some research suggests that more educated and more informed patients interact differently with physicians and other health-care providers (*e.g.* Cutler *et al.*, 2006). Lleras-Muney

and Lichtenberg (2002) find that more educated patients use newer, and presumably more effective, pharmaceutical treatments. In general equilibrium, with a larger number of more-informed patients, competition for the scarce resources of physician time, the newest pharmaceutical products, and other medical care could bid up prices and reduce availability. In other words, while there might be large health advantages to being one of a few well-informed patients, the health advantages might be smaller when there are many other equally well-informed patients.

General equilibrium effects might also be relevant for the causal pathway from education through peer influences to health and CSE. For example, a tuition subsidy that substantially increases college enrolment might change the composition of college peer groups. One possibility is that newly enrolled college students who respond to the subsidy are drawn from a different segment of the population and enter college with stronger anti-health and anti-CSE attitudes. So at the same time that the newly enrolled students are exposed to pro-health and pro-CSE peer influences common in college peer groups, the newly enrolled students expose the other college students to their more anti-health and anti-CSE attitudes. In this example, the net or general equilibrium effect of a national educational policy could be substantially weaker than implied by estimates from partial equilibrium studies. However, it could also be stronger, as the new students are starting from a lower base.

2.6. Conclusion

This chapter describes a standard empirical framework that can be used to evaluate the effectiveness of education systems in raising social outcomes. It highlights the challenges for elucidating causal relationships, but also the importance of addressing differences in the relationships across education levels and other population sub-groups. In order to address causality in the absence of experimental data, it is important to account for both past health and civic and social engagement and hidden third variables. This chapter also suggests that the method of instrumental variables is a viable way to assess causality for a large number of OECD countries. Although this method has shortcomings,[30] the availability of large-scale micro-data as well as policy instruments across a large number of OECD countries makes this approach a viable one. This chapter also presents methods for addressing the features of education systems that are likely to matter. This can be done directly, by evaluating the effects of specific educational interventions. It can also be done indirectly, by assessing possible pathways through which education is likely to have an effect on social outcomes.

Notes

1. This chapter is based on a paper commissioned to Prof. Donald Kenkel (Cornell University and NBER) titled "Estimating the marginal effects of education on health and civic and social engagement: A feasibility study" (Kenkel, forthcoming).
2. For instance, Conti, Heckman and Urzua (2010) present a structural modelling approach which is not described in this section.
3. Randomised control trials (RCTs) are the "gold standard" for identifying causal effects of education. RCTs are generally very difficult to implement for ethical and financial reasons.
4. The authors are not aware of such RCTs.
5. This basic specification would normally include controls that determine education (*e.g.* genetic endowment and health conditions) but cannot be affected by it (*e.g.* income).
6. For instance, education will raise individual income which may consequently improve access to better health care, nutritious meals and healthy environment (*e.g.* sports clubs).
7. This example is consistent with Dee's suggestion that "individuals who grew up in cohesive families and communities that stressed civic responsibility may also be more likely to remain in school" (2004).
8. In a truly simultaneous equations model, health or CSE at time t is a determinant of education at time t, and *vice versa*. The different timing of decisions – choices made at time t and at time $t-1$ are not "simultaneous" – is why the problem may be better thought of as a problem of omitted variables.
9. Unobservable heterogeneity is a more general but less descriptive term for hidden third variables.
10. Some features or elements of abilities can be considered innate and others can be considered malleable through learning experiences. Of course, the concern here is the latter and how malleable competences that matter for social outcomes can be promoted via education.
11. See note above for a similar suggestion by Dee (2004).

12. Locus of control relates closely to self-efficacy. Locus of control refers to the extent to which individuals believe that they can control events that affect them. Those with a high internal locus of control generally have better control of their behaviour, and are more likely to attempt to influence their surroundings and others.

13. This is so-called social desirability bias. For health, it could mean that more educated individuals under-report behaviours such as smoking or drinking.

14. Using anchoring vignettes to test this hypothesis, Bago d'Uva *et al.* (2008) find that among older Europeans, more highly educated individuals have lower reporting for a given health level, which would lead to an underestimate of the correlation between "true" health level and education.

15. Isacsson (1999) uses data from the Swedish Twin Registry to estimate the earnings returns to education in Sweden. More recently, Webbink *et al.* (2009) use data from the Australian Twin Register to estimate the causal effect of education on obesity.

16. Because some recent research links adult health outcomes to *in utero* influences on the foetus, it could be argued that the ideal longitudinal data is from a study that follows individuals from before birth.

17. They should ideally be measured before education (or, educational intervention) takes place since education (or educational intervention) may have a direct effect on these variables.

18. Effectively, it assumes that the outcomes of these two groups (treatment and control groups) would not have differed in the absence of these laws.

19. Many labour economics studies assume that there is a linear relationship between the logarithm of earnings and years of completed schooling. This assumption means that an additional year of schooling yields the same percentage increase in earnings. Although the implied relationship between the level of earnings and years of education is non-linear, the log-linear functional form does not allow for other non-linearities, such as the possibility that the marginal returns of education fall (in either level or percentage terms) at higher levels of education.

20. Skalli (2007) uses a single IV based on a compulsory schooling law, but he provides evidence that this IV had an impact at all but the highest schooling levels. His argument is that after the compulsory schooling law: "At age 16, some individuals, among those who would have dropped out at 14, might find it worth holding the high school degree at a cost of two extra years of education. At age 18, some of these might now find it worthwhile to invest in tertiary education." However, he notes that a similar IV in a US study only affected education at low levels. This suggests that his strategy might not be generally useful.

21. Programme evaluations are also called impact evaluations.

22. To the best of the authors' knowledge, there have not been any programme evaluations performed to assess the impact on CSE.

23. If the selection into educational programmes is randomly determined, the appropriate methodology should follow those who are suitable for randomised experiments (or, randomised control trial).

24. Hence, this problem is similar to the hidden third variables problem.

25. This section draws from Ravallion (2001).

26. This approach is based on Cutler and Lleras-Muney (2010).

27. Note that heterogeneous treatment effects are identical to fixed and random effects estimated under hierarchical linear modelling (HLM) methods, a term more commonly used by researchers in the field of education.

28. One could however argue that an overall increase in education may lead to better access to (private) health-care packages. This may affect the prices of health treatments and thus health behaviours.

29. For example, while increases in education might increase consumer demand for popular science and news magazines and television shows, large increases in the price of these information sources seem unlikely.

30. After reviewing the much more extensive IV research base on the earnings returns to education, Card (2001) concludes: "In many cases the IV estimates are relatively imprecise, and none of the empirical strategies is based on true randomization. Thus, no individual study is likely to be decisive." One should not expect to find "the best estimate". A more reasonable goal is to produce bounds on the plausible ranges of estimates of the marginal effects of education on health and CSE.

References

Albouy, V. and L. Lequien (2009), "Does compulsory schooling lower mortality?", *Journal of Health Economics* Vol. 28, pp. 155-168.

Angrist J., G. Imbens and D. Rubin (1996), "Identification of Causal Effects Using Instrumental Variables", *Journal of the American Statistical Association*, Vol. 434, pp. 444-455.

Angrist, J. and A. Krueger (1991), "Does Compulsory Schooling Attendance Affect Schooling and Earnings?", *Quarterly Journal of Economics*, Vol. 106, pp. 979-1014.

Arendt, J.N. (2005), "Does Education Cause Better Health? A Panel Data Analysis using School Reforms for Identification", *Economics of Education Review*, Vol. 24, pp. 149-160.

Ashenfelter, O., C. Harmon and H. Oosterbeek (1999), "A Review of Estimates of the Schooling/ Earnings Relationship, with Tests for Publication Bias", *Labour Economics*, Vol. 6, pp. 453-470.

Angrist, J. and A. Krueger (1994), "Estimates of the Economic Return to Schooling from a New Sample of Twins", *American Economic Review*, Vol. 84, pp. 1157-1173.

Auld, M. and N. Sidhu (2005). "Schooling, Cognitive Ability, and Health", *Health Economics*, Vol. 14, pp. 1019-1034.

Bago d'Uva, T., O. O'Donnell and E. van Doorslaer (2008), "Differential Health Reporting by Education and Its Impact on the Measurement of Health Inequalities among Older Europeans", *International Journal of Epidemiology*, Vol. 37, pp. 1375-1383.

Barksy, R. *et al*. (1997), "Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study", *Quarterly Journal of Economics*, Vol. 112, pp. 537-579.

Berger, M. and J. Paul Leigh (1989). "Schooling, Self-Selection, and Health", *Journal of Human Resources*, Vol. 24, pp. 433-455.

Black, S., P. Devereux and K. Salvanes (2005), "Why the Apple Doesn't Fall Far: Understanding Intergenerational Transmission of Human Capital", *American Economic Review*, Vol. 95, pp. 437-449.

Brunello, G. and R. Miniaci (1999), "The Economic Returns to Schooling for Italian Men. An Evaluation Based on Instrumental Variables", *Labour Economics*, Vol. 6, pp. 500-519.

Callan, T. and C. Harmon (1999), "The Economic Return to Schooling in Ireland", *Labour Economics*, Vol. 6, pp. 543-550.

Card, D. (2001), "Estimating the Returns to Schooling: Progress on Some Persistent Econometric Problems", *Econometrica*, Vol. 69, pp. 1127-1160.

Chou, S.Y., J.T. Liu, M. Grossman and T. Joyce (2007), "Parental Education and Child Health: Evidence from a Natural Experiment in Taiwan", *NBER Working Paper 13466*.

Conti, G., J. Heckman and S. Urzua (2010), "The Education-Health Gradient", *American Economic Review: Papers and Proceedings*, Vol. 100, pp. 234-238.

Cutler, D., A. Deaton and A. Lleras-Muney (2006), "The Determinants of Mortality", *Journal of Economic Perspectives*, Vol. 20, pp. 97-120.

Cutler, D. and A. Lleras-Muney (2006), "Education and Health: Evaluating Theories and Evidence", *NBER Working Paper 12352*.

Cutler, D. and A. Lleras-Muney (2010), "Understanding Differences in Health Behaviours by Education", *Journal of Health Economics* Vol. 29, pp. 1-28,.

Cutler D., M.B. Landrum and K.A. Stewart (2006), "How do the better educated do it? Socioeconomic status and the ability to cope with underlying impairment", *NBER Working Paper 10240*.

Dearden, L. (1999), "The Effects of Families and Ability on Men's Education and Earnings in Britain", *Labour Economics*, Vol. 6, pp. 551-567.

Dee, T.S. (2004), "Are There Civic Returns to Education?", *Journal of Public Economics*, Vol. 88, pp. 1697-1720.

Di Pietro, G. and M. Delprato (2009), "Education and Civic Outcomes in Italy", *Public Finance Review*. Vol. 37, pp. 421-446.

Farrell, P. and V. Fuchs (1982), "Schooling and Health: The Cigarette Connection", *Journal of Health Economics*, Vol. 1, pp. 217-230.

Fuchs, V. (1982), "Time Preference and Health: An Exploratory Study", in *Economic Aspects of Health*, University of Chicago Press, Chicago, IL, pp. 93-120.

Fuchs, V. (1993), *The Future of Health Policy*, Harvard University Press, Cambridge, MA.

Grossman, M. (2000), "The Human Capital Model", in A.J. Cuyler and J.P. Newhouse (eds.), *Handbook of Health Economics*, North-Holland, pp. 349-408.

Grossman, M. (2006), "Education and Non-Market Outcomes", in E. Hanushek and F. Welch (eds.), *Handbook of the Economics of Education*, North-Holland, Amsterdam.

Grossman, M. and R. Kaestner (1997), "Effects of Education on Health", in J.R. Behrman and N. Stacey (eds.), *The Social Benefits of Education*, University of Michigan Press, Ann Arbor, MI, pp. 69-123.

Harmon, C. and I. Walker (1999), "The Marginal and Average Returns to Schooling in the UK", *European Economic Review*, Vol. 43, pp. 879-887.

Heckman, J.J., A. Layne-Farrar and P. Todd (1995), "The Schooling Quality-Earnings Relationship: Using Economic Theory to Interpret Functional Forms Consistent with the Evidence", *NBER Working Paper 5288*.

Heckman, J.J., L. Lochner and C. Taber (1998), "General Equilibrium Treatment Effects: A Study of Tuition Policy", *American Economic Review Papers & Proceedings*, pp. 381-386.

Heckman, J.J. and Y. Rubinstein (2001), "The importance of noncognitive skills: Lessons from the GED testing program", *American Economic Review Papers and Proceedings*, Vol. 91, pp. 145-149.

Huang, J., M. Henriette and W. Groot (2009), "A meta-analysis of the effect of education on social capital", *Economics of Education Review*, Vol. 28, pp. 454-464.

Hungerford, T. and G. Solon (1987), "Sheepskin Effects in the Returns to Education", *Review of Economics and Statistics*, Vol. 69, pp. 175-177.

Ichino A. and R. Winter-Ebmer (1999), "Lower and Upper Bounds of Returns to Schooling: An Exercise in IV Estimation with Different Instruments", *European Economic Review*, Vol. 43, pp. 889-901.

Ichino, A. and R. Winter-Ebmer (2004), "The Long-Run Educational Cost of World War II", *Journal of Labor Economics*, Vol. 22, pp. 57-86.

Isacsson, G. (1999), "Estimates of the Return to Schooling in Sweden from a Large Sample of Twins", *Labour Economics*, Vol. 6, pp. 471-489.

Kenkel, D. (forthcoming), "Estimating the Marginal Effects of Education on Health and Civic and Social Engagement: A Feasibility Study", OECD, Paris.

Kenkel, D. D. Lillard and A. Mathios (2006), "The Roles of High School Completion and GED Receipt in Smoking and Obesity", *Journal of Labour Economics*, Vol. 24, pp. 635-660.

Khwaja, A., F. Sloan and M. Salm (2006), "Evidence on Preferences and Subjective Beliefs of Risk Takers: The Case of Smokers", *International Journal of Industrial Organization*, Vol. 24, pp. 667-682.

Kling, Jeffrey R. (2001), "Interpreting Instrumental Variables Estimates of the Returns to Schooling", *Journal of Business & Economic Statistics*, Vol. 19, pp. 358-364.

Komlos, J., P.K. Smith, and B. Bogin (2004), "Obesity and the Rate of Time Preference: Is There a Connection?", *Journal of Biosocial Sciences*, Vol. 36, pp. 209-219.

Lleras-Muney, A. (2005), "The Relationship between Education and Adult Mortality in the United States", *Review of Economic Studies*, Vol. 72, pp. 189-221.

Lleras-Muney, A. and F. Lichtenberg (2002), "The Effect of Education on Medical Technology Adoption: Are the More Educated More Likely to Use New Drugs?", *NBER Working Paper 9185.*

Maurin, E, and S, McNally (2008), "Vive la Revolution! Long-Term Educational Returns of 1968 to the Angry Students", *Journal of Labor Economics*, Vol. 626, pp. 1-33.

Mazumder, B. (2007), "How Did Schooling Laws Improve Long-Term Health and Lower Mortality?", Federal Reserve Bank of Chicago, mimeo.

McClellan, M., B.J. McNeil, and J.P. Newhouse (1994), "Does More Intensive Treatment of Acute Myocardial Infarction in the Elderly Reduce Mortality?", *JAMA*, Vol. 272, pp. 859-66.

McCrary, J. and H. Royer (2006), "The Effect of Female Education on Fertility and Infant Health: Evidence from School Entry Policies Using Exact Date of Birth", *NBER Working Paper 12329.*

Meghir, C. and M. Palme (2005), "Educational Reform, Ability, and Family Background", *American Economic Review*, Vol. 95, pp. 414-424.

Meyer, B.D. (1995), "Natural and Quasi-Experiments in Economics", *Journal of Business & Economic Statistics*, Vol. 13, pp. 151-161.

Milligan, K., E. Moretti and P. Oreopoulos (2004), "Does Education Improve Citizenship? Evidence from the United States and the United Kingdom", *Journal of Public Economics*, Vol. 88, pp. 1667-1695.

Moffitt, R. (2007), "Estimating Marginal Returns to Higher Education in the UK", *NBER Working Paper 13534*, October.

Murray, M.P. (2006), "Avoiding invalid instruments and coping with weak instruments", *Journal of Economic Perspectives*, Vol. 20, pp. 111-132.

OECD (2007a), *Evidence in Education*, OECD, Paris.

OECD (2007b), *Understanding the Social Outcomes of Learning*, OECD, Paris.

Oreopoulos, P. (2006a), "Estimating Average and Local Average Treatment Effects of Education When Compulsory Schooling Laws Really Matter", *American Economic Review*, Vol. 96, pp. 152-175.

Oreopoulos, P. (2006b), "The Compelling Effects of Compulsory Schooling: Evidence from Canada", *Canadian Journal of Economics*, Vol. 39, pp. 22-52.

Permut, T. and J.R. Hebel (1989), "Simultaneous-Equation Estimation in a Clinical Trial of the Effect of Smoking on Birth Weight", *Biometrics*, Vol. 45, pp. 619-22.

Ravallion, M. (2001), "The Mystery of the Vanishing Benefits", *The World Bank Economic Review*, Vol. 15, pp. 115-140.

Reinhold, S. and H. Jurges (2009), "Secondary school fees and t he causal effect of schooling on health behaviour", *Health Economics Letters*, Vol. 19, pp. 994-1001.

Sander, W. (1995a), "Schooling and Quitting Smoking", *Review of Economics and Statistics*, Vol. 77, pp. 191-199.

Sander, W. (1995b), "Schooling and Smoking," *Economics of Education Review*, Vol. 14, pp. 23-33.

Sander, W. (1998), "The Effects of Schooling and Cognitive Ability on Smoking and Marijuana Use by Young Adults", *Economics of Education Review*, Vol. 17, pp. 317-324.

Shoda, Y., W. Mischel and P. Peake (1990), "Predicting adolescent cognitive and self-regulatory competencies from preschool delay of gratification: Identifying diagnostic conditions", *Developmental Psychology*. Vol. 26, pp. 978-986.

Skalli, A. (2007), "Are Successive Investments in Education Equally Worthwhile? Endogenous Schooling Decisions and Non-linearities in the Earnings-Schooling Relationship", *Economics of Education Review*, Vol. 26, pp. 215-231.

Stock, J.H., J.H. Wright and M. Yogo (2002), "A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments", *Journal of Business & Economic Statistics*, Vol. 20, pp. 518-529.

Uusitalo, R. (1999), "Return to Education in Finland", *Labour Economics*, Vol. 6, pp. 569-580.

Vieira, J.A.C. (1999), "Returns to Education in Portugal", *Labour Economics*, Vol. 6, pp. 535-541.

Webbink, D. (2007), "Returns to University Education: Evidence from a Dutch Institutional Reform", *Economica*, Vol. 74, pp. 113-134.

Webbink, D., N. Martin and P. Visscher (2009), "Does Education Reduce the Probability of Being Overweight?" *Journal of Health Economics, Vol.* 29, pp. 29-38.

Winship, C. and S.L. Morgan (1999), "The Estimation of Causal Effects from Observational Data", *Annual Review of Sociology*, Vol. 25, pp. 659-706.

Chapter 3

Education and civic and social engagement

Francesca Borgonovi and Koji Miyamoto

OECD countries have become increasingly interested in their citizens' civic and social engagement, not only because of its intrinsic value but also because of the potential benefits they bring to the society. Can education play a role in raising civic and social engagement? On the one hand, the available causal evidence suggests that secondary schools in the United States play a role in fostering political engagement, although in Europe the jury is still out. On the other hand, the evidence sheds little light on the potentially important role of higher education in promoting civic engagement, interpersonal trust and tolerance. The lack of robust causal evidence on the net effects of education may suggest that certain features of education matter more than others. The evidence indicates that providing information on democratic practices and institutions through civic education plays a limited role in promoting civic and social engagement. However, raising cognitive skills, developing social and emotional skills, and forming habits and attitudes towards active citizenship show promise in this respect. Schools can promote these competencies by mobilizing open classroom climate with a range of curricular and extra-curricular activities, and leveraging situated learning which provides children with a taste of what civic participation is all about. The family and the community can also play a role by providing children with an environment conducive to developing positive attitudes and values towards civic and social engagement.

3.1. Introduction[1]

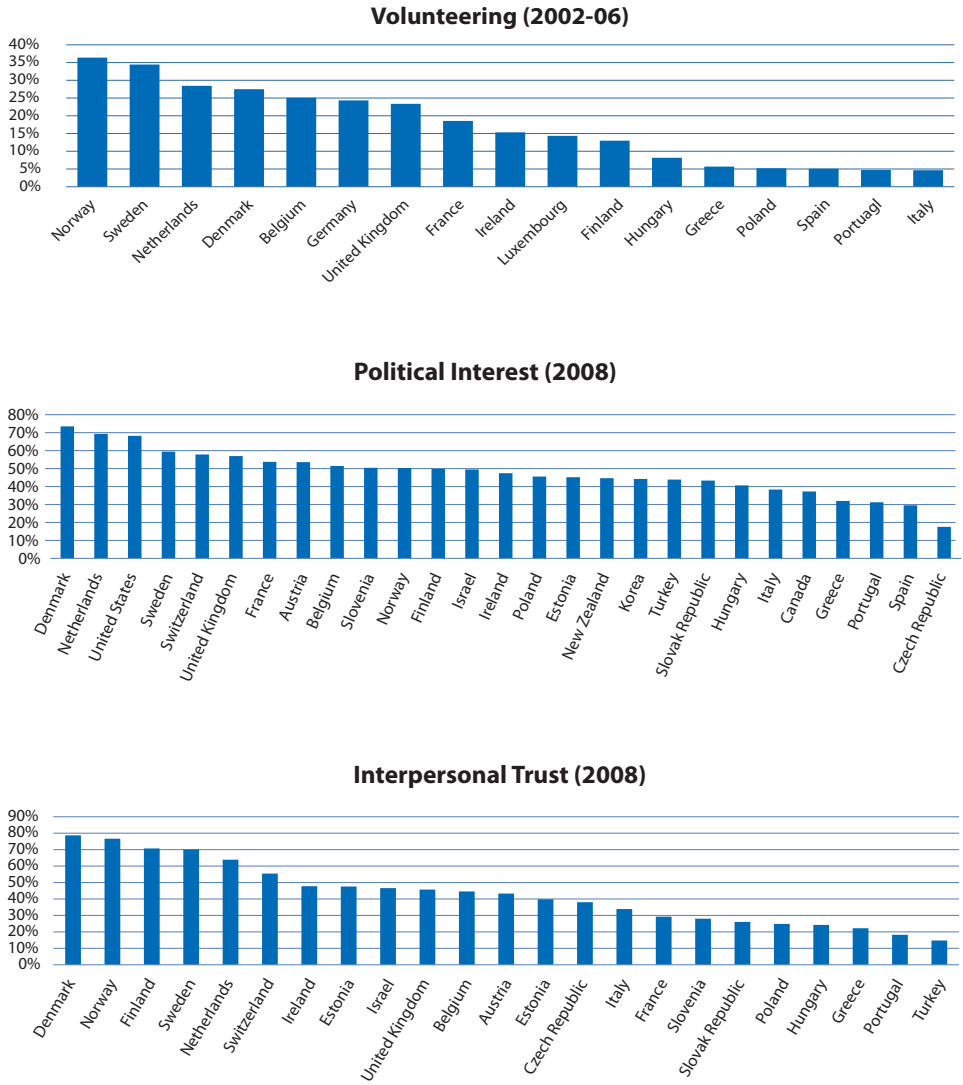
OECD countries are increasingly concerned about their civil society and social cohesion. In some countries, this is due to a decline over time in voting turnout, civic participation and trust,[2] while in others there is a perception that the current level of civic and political participation may be insufficient to maintain a vibrant society.[3] Trends in social structures and informal institutions are likely to heighten these concerns. For example, rapid increases in migration flows are challenging host populations' tolerance (OECD, 2006). In spite of the positive role immigrants can play in the labour market and society at large, the value of immigration is often inadequately understood by host residents whose attitude is generally negative (Davidov *et al*., 2008). The social climate is also reported to be less conducive to developing interpersonal trust because opportunities for people to engage in community relations are declining (Putnam, 2000).

There are also concerns regarding inequalities in the level of social cohesion across demographic and socioeconomic groups. For instance, Putnam (1993, 2000) and Alesina and La Ferrara (2000a) suggest that women in the United States participate in associations and groups significantly less than men.[4] Lowndes (2000) consider women's attitudes towards politics in the United Kingdom have been more negative than those of men, although for other dimensions of political engagement (*e.g.* voting) the gender difference has been considerably reduced. Denny (2003) shows that females are less likely to volunteer in Canada, Chile, the United States and European countries. There is also evidence indicating marked gaps in civic engagement and trust across racial, ethnic and socioeconomic groups and across geographic locations within a country.[5]

These concerns mirror general perceptions of the intrinsic value of a society based on social networks and the associated norms of reciprocity and trust. However, a cohesive society also brings concrete benefits. The literature indicates that civic engagement improves labour market outcomes, reduces crime and fosters well-functioning democratic institutions and health.[6] Empirical studies also highlight the positive role played by interpersonal trust in promoting economic growth and institutional efficiency as well as in reducing corruption.[7] Given the benefits of social cohesion and the potential threat represented by changes in social institutions and the environment, it is crucial to understand better the conditions that promote high levels of civic and social engagement (CSE).

What is the state of civil society and social cohesion in OECD countries?[8] Are there large variations across countries? Figure 3.1 suggests that indicators such as volunteering, political interest and interpersonal trust vary significantly across OECD countries. Cross-country variations are generally

Figure 3.1. **Cross-country differences in civic and social engagement**

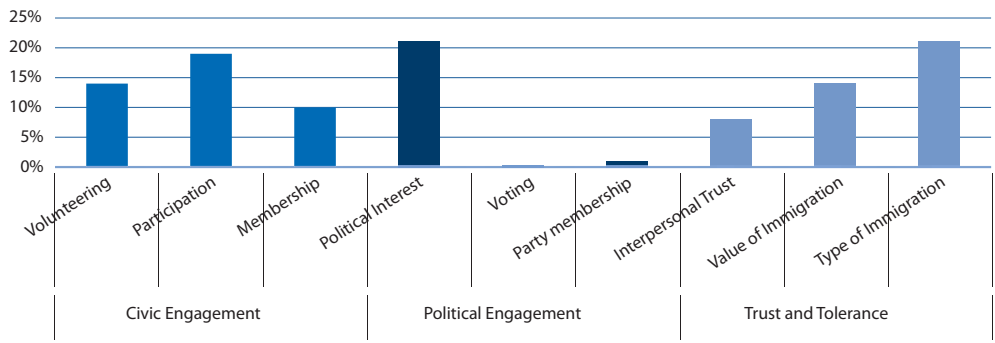


Sources: Volunteering: Borgonovi (2010). *Political interest* and *Interpersonal trust*: OECD (2010).

large across the three domains, with high-engagement countries exhibiting up to four to seven times the level of engagement of low-engagement countries. In Europe, Nordic countries tend to exhibit higher levels of engagement while southern and eastern European countries generally exhibit lower levels.[9] Variations in levels of engagement are likely to reflect cross-country differences in the level and distribution[10] of socioeconomic, political and institutional factors (Alesina and La Ferrara, 2000a; 2002; Costa and Kahn 2003; Borgonovi, 2008; Hoskins and Mascherini, 2009).

When confronted with such cross-country variations in the indicators of civic and social engagement, one may naturally wonder whether education helps to explain these cross-country differences. Figure 3.2 shows that individuals' education explains a sizeable portion of cross-country variations in outcomes: 14% of cross-country variations in volunteering rates, 21% of variations in the level of political interest and 8% of variations in the level of interpersonal trust. On the other hand, education appears to play a limited role in explaining cross-country variations in voting rates and membership in political parties or action groups.[11]

Figure 3.2. **Cross-country differences in civic and social engagement explained by individuals' education (Europe), 2002-06**



Source: Based on Borgonovi (2010). Data source: European Social Survey (ESS) Rounds 1-3 (2002-06).

Education policy makers would benefiut from understanding how education can help improve indicators of civic and social engagement. There are various ways in which it can help promote a vibrant civic society. First, it can help individuals make informed and competent decisions by providing relevant information, teaching basic competences and social skills, and imparting values, attitudes and beliefs.[12] These individual attributes may make it easier to gain access to various forms of civic and political activities[13] and to value social cohesion and diversity. Schools offer an ideal environment in which children can learn these skills

and traits, both through the curriculum and by experiencing democracy in action. A school environment (including its norms and ethos) which encourages students to express their opinions openly and to challenge teachers can help develop their sense of active citizenship. Second, education can help individuals obtain better jobs, higher earnings, social status, partners,[14] safer residential areas and useful social networks.[15] This may help individuals gain access to civic activities as well as to social and political power. It is important to realise that the effects of education usually mean the net effects, which include all the pathways through which education's effect may operate.[16] Policy makers would be interested in better understanding which pathways are most effective, as this information would point to measures to be adopted to raise social cohesion.

In addition, an individual's education can also have a positive effect on the health and social capital of others. For instance, educated parents may be better placed to offer a home environment that stimulates their child's civic and political interests.[17] Educated teachers may have better skills with which to enhance children's participatory spirit. Moreover, the societal/community level of education can affect the level of civic engagement and trust and reduce the level of crime.[18] Individuals may be more tempted to participate in community activities and feel a stronger sense of trust towards neighbours and immigrants if they are surrounded by people with a high level of education.

The empirical evidence is consistent with these potentially positive roles played by education. In OECD countries, better-educated individuals are on average more likely to exhibit higher levels of civic and social engagement than the less educated (Putnam, 2000; OECD, 2007, 2010). Better educated parents are more likely to stimulate their children's civic engagement, and an educated society tends to be more cohesive and have less crime. Moreover, an increasing number of studies show the existence of causal relationships.[19]

While the available evidence generally suggests that education can play a prominent role in promoting civic and social engagement, many questions remain unanswered. What is the level of schooling that matters most for fostering civic participation? Is education likely to matter more for fostering interpersonal trust in certain population groups (and why)? Unfortunately, many studies examining the relationship between education and indicators of social outcomes shed little light on these questions. They implicitly assume that the relationship is stable across different levels of education and population groups and that it is causal. These assumptions are challenged by addressing these questions through an econometric analysis of European and Canadian micro-data, and complementing the analysis with evidence from the literature.[20] As the literature is limited in terms of providing a comprehensive/coherent picture of viable causal pathways,[21] the gap is filled by synthesising the implications of the data analysis and the existing literature. In a nutshell, this chapter seeks to bridge the knowledge gaps in order to better

understand whether, to what extent, for whom, and how education is likely to foster civic and social engagement.

This chapter focuses on civic and social engagement.[22] CSE is a somewhat narrower term than social capital. The latter is an aggregate concept which captures social networks and the associated norms of reciprocity and trust, while CSE refers to a range of individual behaviours, attitudes and perceptions.[23] However, CSE and social capital are closely related and can be considered mutually reinforcing. For instance, Brehm and Rahn (1997) suggest that civic engagement affects trust, while Uslaner (1997) shows that trust in turn shapes civic participation.

CSE comprises civic engagement, political engagement, trust and tolerance. Civic engagement aims at promoting the public good through individual co-operation and involvement. In particular, this chapter sheds light on two indicators of civic engagement: formal volunteering and participation in groups and associations. Although the literature shows that volunteering and participation are correlated and share similar characteristics (Putnam, 2000), they are treated separately here because they differ in terms of their type and degree of involvement. Volunteers help to produce the collective goods and services provided by groups and organisations, while participants are mainly consumers of such goods (Wilson, 2000). However, both volunteering and participation foster the creation of social ties and networks that promote information exchange, social support, shared norms and moral obligations of trust (Putnam, 2000; Halpern, 2005).

Political engagement aims at influencing public policy directly, by selecting the individuals who serve in public office and by influencing the actions they take (Verba and Nie, 1972; Campbell, 2006). This chapter therefore looks at voting, membership in political parties or action groups, and interest in politics and political affairs (*i.e.* political interest). While all are expressions of political engagement, focusing only on one of these risks creating a partial picture. For example, uninformed votes do not represent positive political engagement. Voting can also be an activity that occurs only in the context of elections. By studying political interest, it is possible to try to determine what role education may play in terms of the quality of individuals' political engagement.

With respect to trust and tolerance, the focus is on interpersonal trust and on the value and type of immigration. Interpersonal trust concerns the degree to which individuals believe that others mostly look out for themselves, try to take advantage of others or can be trusted. The value of immigration concerns the extent to which immigration is considered a positive or a negative phenomenon. Finally, the type of immigration concerns the extent to which respondents welcome the arrival of different types of immigrants in their country.

The remainder of this chapter is organised as follows. First, the relationship between education and CSE is assessed with particular attention to differences in the relationship across levels of education, to differences in population groups and across countries, and to the causal effects of education. Second, viable causal pathways are evaluated by assessing separately the impact education may have on individuals and on their environment. The chapter ends by evaluating the state of the evidence base in order to shed light on knowledge gaps that may limit the ability of policy makers to make informed decisions to raise CSE.

3.2. The relationship between education and civic and social engagement

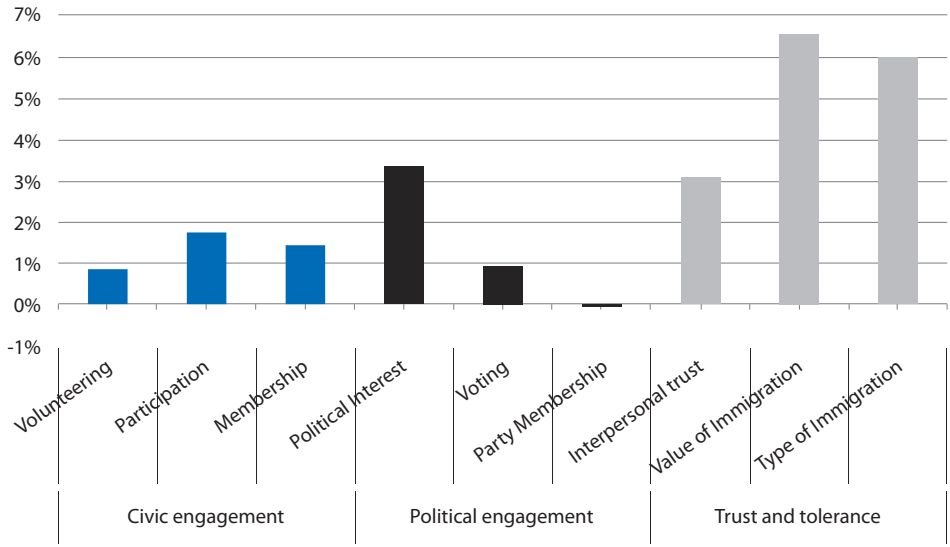
This section discusses whether, to what extent and for whom education is likely to promote CSE, based on an analysis of European and Canadian data and on the growing empirical literature on education and social capital from the fields of political science, economics and education.[24]

Does education relate to civic and social engagement?

A large body of evidence indicates that educated individuals exhibit higher levels of CSE than their less educated counterparts (Putnam, 2000; OECD, 2007, 2010). The positive relationship between education and CSE is due not only to underlying differences among individuals. That is, the probability of individuals' engagement increases with each additional year of schooling completed and each further academic qualification attained, even after accounting for individual differences in gender, age, socioeconomic status, family background and residential characteristics.

Figure 3.3 presents the correlation between years of schooling completed and CSE in Europe after accounting for differences in observed individual characteristics and country fixed effects. The results are consistent with the findings from the literature: education is associated with an increase in the likelihood of CSE. For instance, while about 48% of individuals in Europe are interested in politics, each additional year of schooling is associated with an increase of 3.4 percentage points in being interested. Similarly, some 17% of individuals volunteer in Europe, and each additional year of schooling is associated with an increase of 0.8 percentage points in the volunteering rates. This result is consistent with Denny (2003), who suggests, using data from 19 countries covering Europe, North America and Chile, that an additional year of schooling is associated with a 1 to 4 percentage point increase in the probability of participating in community or voluntary activities.[25]

Figure 3.3. **Education and civic and social engagement (Europe), 2002-06**



Note: The figure indicates correlations between education and civic and social engagement. For civic engagement and political engagement, the vertical axis measures changes in the probability of engaging, while for trust and tolerance, the axis measures changes in standard deviations the probability of exhibiting trust and tolerance. Data for political domains cover years 2002-2006. Others domains are based on 2002. All values except for Party Membership are statistically significant at 5%.

Source: Based on Borgonovi (2010). Data source: European Social Survey (ESS) rounds 1-3 (2002-06).

Figure 3.3 also presents a statistically significant correlation between years of schooling and a standardised index of trust and tolerance. For instance, it suggests that an extra year of schooling accounts for an increase in the level of interpersonal trust by 3.1% of its standard deviation.[26] This result is comparable to that of Huang *et al.* (2009) who use a meta-analysis of the literature on education and social capital[27] to assess the size effects of education. They suggest that one additional year of schooling increases interpersonal trust by 4.6% of its standard deviation. A study by Glaeser *et al.* (2000), using the World Values Survey (WVS), also suggests a statistically significant and large correlation between education and interpersonal trust in non-European countries including Canada, Japan and the United States.

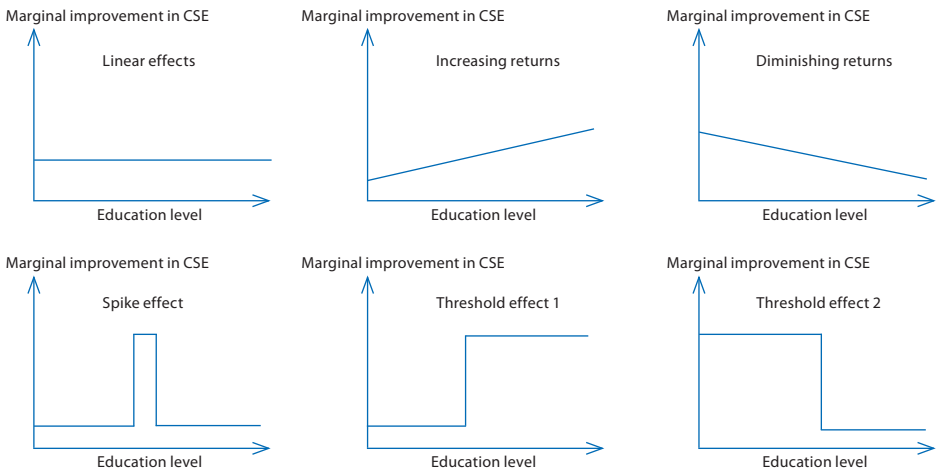
Overall, the size of the relationship between education and political interest, trust and tolerance is substantial, while the size of the relationship between education and civic engagement, voting and party membership is modest.

Does the relationship vary across education levels?

Although the above evidence suggests that years of education completed (or, levels of education attained) are associated on average with indicators of CSE, does this mean that each year/level of education attained is associated to the same extent with CSE? One may imagine that some base level of competence, such as literacy, is particularly important for CSE, and that it is sufficient to complete a certain level of education to develop it. If so, additional education beyond this threshold level is unlikely to improve CSE very much. Identifying the threshold level of education (if any) is important for policy purposes, since it points to the level of education that may yield the highest returns to CSE. Moreover, it suggests that certain features of the education system[28] at a particular level of education are strongly related to CSE.[29]

Figure 3.4 provides illustrative examples of varieties of possible relationships between education and CSE. First, the figure showing linear effects suggests that each year/level of education is related to CSE to the same degree. Most empirical evidence that sheds light on the relationship between education and CSE has implicitly assumed that the effects are linear. Second, the relationship may exhibit increasing or diminishing returns. Increasing returns may occur, for instance, if an individual progressively gains through education a variety of skills[30] that matter for CSE, each of which exhibits returns to CSE but also complements others and thus further boosts the returns to CSE. Third, there may be a spike effect in the relationship between education and CSE. This may happen if what students typically learn only at a particular level of education (*e.g.* information on how to vote) is what is crucial for CSE. Fourth, perhaps a more plausible scenario is that education

Figure 3.4. **Marginal effects: illustrative examples**



can only start showing a strong relationship with CSE after a certain threshold level. This may happen, for instance, if a minimal level of social skills is necessary to enable participation and incremental social skills also matter. Lastly, as described above, it may be that some base level of competences is important for CSE, but that anything beyond that will not raise CSE very much. In this case, there is a threshold level of education beyond which education will not exhibit positive returns.

Figures 3.5a, 3.5b and 3.5c describe how the relationship between education and CSE varies as individuals move from lower secondary to tertiary education in Europe and Canada.[31] For most aspects of CSE, the relationship between education and CSE varies significantly across levels of education; that is, it is not linear.

Education exhibits strong associations with volunteering and political engagement at the lower secondary level (Figures 3.5a and 3.5b). A possible reason is that specific courses (*e.g.* politics and democracy) and/or school practices (*e.g.* student councils and service learning) may have been particularly successful in promoting active citizenship. Alternatively, basic competences such as literacy and numeracy, which children typically gain at this level of schooling, may be the critical factor for fostering political engagement. This is consistent with a Canadian study which suggests that basic literacy is strongly related to volunteering (Canadian Council on Learning, 2008).

Education exhibits the strongest association with civic participation at the upper secondary level (Figure 3.5a). Alesina and La Ferrara (2000a) provide results for the United States suggesting that upper secondary as well as tertiary-level attainment can have statistically significant associations with civic participation.[32] Why is there a large marginal effect at this level of education? A possible reason may be that upper secondary education may confer on individuals a level of social status that gives easier access to (or higher benefits from) participating in civic groups and associations.[33] Alternatively, certain competences that one is likely to develop at the upper secondary level (*e.g.* advanced social and organisational skills) may also make access to civic participation easier.

Lastly, Figure 3.5c suggests that education has the strongest association with trust and tolerance at the tertiary level in Europe. Alesina and La Ferrara (2000b) also suggest for the United States that those who have attained tertiary education or more exhibit the strongest associations.[34] This is consistent with evidence based on a meta-analysis of studies covering Europe and other regions which suggests that the returns to education in terms of interpersonal trust are higher among those who have graduated from college (Huang *et al.*, 2009). Why might tertiary education make one more trustful and tolerant? One explanation is offered by social psychologists who consider that one's

Figure 3.5a. **Marginal effects of education on civic engagement (Europe and Canada), 2002-06**

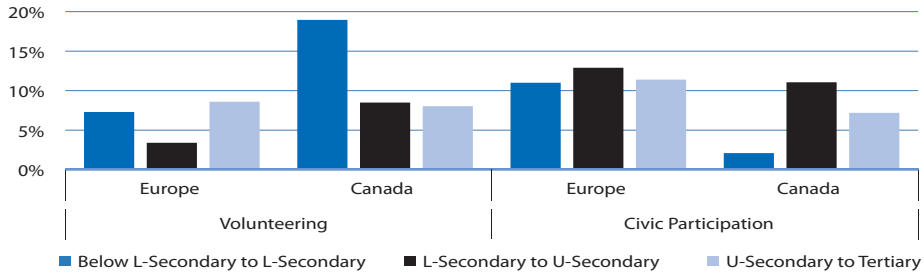


Figure 3.5b. **Marginal effects of education on political engagement (Europe and Canada), 2002-06**

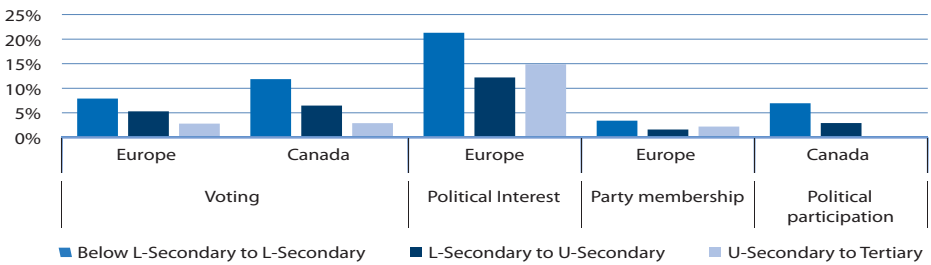
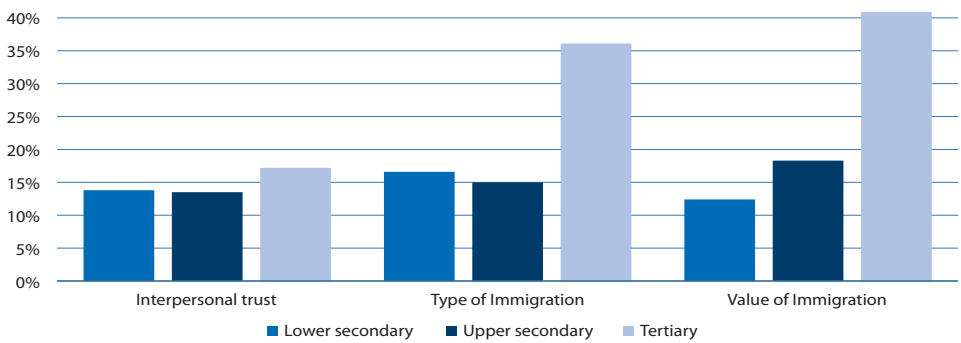


Figure 3.5c. **Marginal effects of education on interpersonal-trust and tolerance (Europe), 2002-06**



Note: European results are based on regression models controlling for age, gender, minority status, maternal and paternal education, country and year fixed effects. Canadian results are based on linear regression models controlling for age, gender, and maternal and paternal education.

Source: Based on Borgonovi (2010). Data Source: European Social Survey (ESS) Rounds 1-3 (2002-06) and Adult Literacy and Life skills Survey (ALLS) 2003 for Canada.

beliefs and values about how a society functions are largely formed between 18 and 25 years of age (Krosnick and Alwin, 1989; Giuliano and Spilimbergo, 2009). Huang *et al*. (2009) also suggest that the period late teens to early 20s may be a critical stage for learning to trust others and cultivate active civic behaviour. Moreover, one may be more tolerant of immigration when one better understands the economic value of migration and has experienced valuable interactions with foreign-born people, which is arguably more likely to happen at the tertiary level of education.[35] All these arguments suggest that students' sense of trust and tolerance is likely to develop when tertiary education promotes a curriculum and learning environment that is conducive to better understanding the benefits of social diversity and intercultural understanding.

These results broadly suggest that the relationship between education and political engagement exhibits diminishing returns, and that the relationship between education and trust/tolerance shows either increasing returns or threshold effects at the tertiary education level. There is no clear pattern in terms of the relationship between education and civic engagement.

Does the relationship vary across population subgroups?

The relationship between education and CSE may also vary depending on individual demographic and socioeconomic backgrounds. For instance, women may be less inclined to learn how governments and politics function in a country with strong traditional gender roles and family patterns.[36] On the other hand, if migrants are interested in quickly integrating into the host country's society, they might make extra efforts to be civically and politically engaged by learning how its society and politics function.

Figures 3.6a, 3.6b and 3.6c indicate how the relationship between education and CSE varies in Europe according to gender, paternal education and minority status.[37] First, the results suggest that gender does not play a very strong role: while being a woman enhances the association between education and civic engagement, political engagement and trust, the gender effect is quantitatively small. However, given that women are on average less likely to be engaged in civic and political activities,[38] education does help to reduce gender inequality in civic and political engagement.[39] On the other hand, given that women generally have a higher level of interpersonal trust than men,[40] education also increases gender inequality in interpersonal trust. Second, the results suggest that the relationship between education and trust/tolerance varies according to levels of paternal education: those with fathers who have attained post-secondary education are likely to benefit more from education. Given that those whose parents have low levels of education generally have a low level of trust/tolerance in the first place, increasing education is likely to raise intergenerational inequality in trust/tolerance. While

Figure 3.6a. **Impact of being female on the relationship between education and civic and social engagement (Europe), 2002-06**

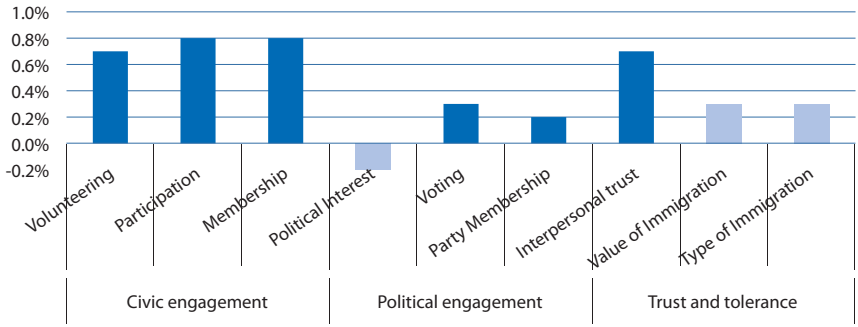


Figure 3.6b. **Impact of having an educated father on the relationship between education and civic and social engagement (Europe), 2002-06**

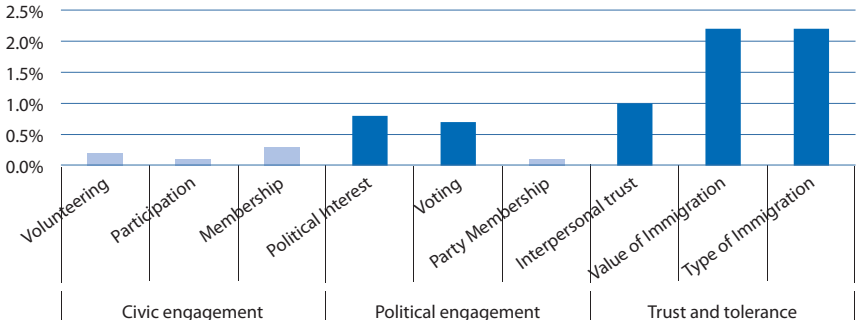
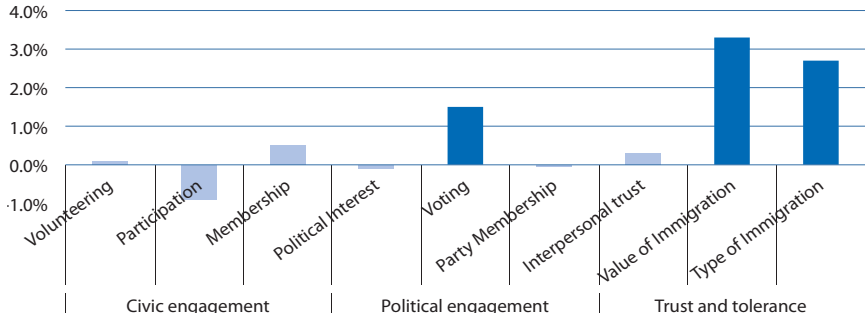


Figure 3.6c. **Impact of being a minority on the relationship between education and civic and social engagement (Europe), 2002-06**



Note: Based on regression models controlling for age, gender, income, minority status, labour market status, religiosity, social integration, social support, ideological position, paternal educational attainment, maternal educational attainment and health status. Light coloured bars represent statistically insignificant results at 5%.

Source: Based on Borgonovi (2010). Data Source: European Social Survey (ESS) Rounds 1-3.

Figure 3.6b suggests no difference in the relationship between education and civic engagement between those with an educated father and those without, a study by Brand (2009) using US data suggests that disadvantaged groups benefit more from tertiary education than those from other groups in terms of civic participation. Third, the analysis also suggests that the relationship between education and civic and political engagement varies very little by minority status. Hence, minority groups (including immigrants) do not seem to be more engaged than majority groups because of an extra year of education.[41]

Results based on the Canadian data give a more nuanced picture.[42] While for women education appears to be more strongly correlated with civic activities (as in Europe), the correlation for men appears stronger for volunteering, voting and political participation (contrary to the results for Europe). Interestingly, education is more strongly related to voting and political participation among those with a highly educated father, while education is more strongly related to civic engagement among those with a less educated father. Lastly, for immigrants, education seems to matter less for civic engagement and voting but more for membership in political organisations. In sum, the relationship between education and CSE across population groups differs between European countries and Canada.

Does the relationship vary across countries?

The relationship between education and CSE may well vary across countries owing to social, political, cultural and labour market characteristics that are specific to each country. Cross-country differences in the relationship may also be driven by cross-country differences in the content of state-regulated curricula and learning environments, as these may influence the effectiveness of education systems to foster CSE.

The available evidence indicates the possibility that the relationship between education and CSE differs between Europe and North America (Canada and the United States). First, Figure 3.5a suggests a difference between Europe and Canada in the level of education with the highest association with volunteering; the strongest association is with lower secondary education in Canada, but with tertiary education in Europe. Second, Huang *et al.* (2009) argue that the effect of education on civic participation and interpersonal trust is generally much stronger in the United States than in the rest of the world (*i.e.* mostly Europe in the study). Denny (2003) exploits comparable micro-data from 19 countries to show that the relationship between education and civic participation is 1.3 percentage point higher in English-speaking countries.[43] Milligan *et al.* (2004) find, when investigating the impact of education on voting, a strong effect in the United States but not in the United Kingdom.[44]

Why may the relationship between education and CSE vary across geographical/linguistic regions? Does this reflect regional differences in the content of education or in contexts that may interact with education? Unfortunately, the literature provides very little by way of explanation. For instance, Huang *et al*. (2009) conjecture that studies using US data may yield higher marginal effects (at the lower level of education) since American schools have been more active in encouraging students to engage in civic activities and to be tolerant towards ethnic diversity:

> "American schools are believed to be more active than schools in other countries in encouraging students into running student offices, participating in civic engagement and joining various associations. The melting pot theory can also help explain why Americans tend to receive a higher educational return on social capital. Encouraging tolerance of ethnic diversity and creating core values of a common American heritage are the main subjects of the social education programmes in American public schools. By exposing students to knowledge about ethnic diversity and the contributions of various groups to American civilization development, educators may change negative ethnic group stereotypes, reduce intolerance, and enhance cooperation for the common good." (Huang *et al*., 2009)

On the other hand, European schools may on average have been less effective on average in encouraging CSE owing to the large number of formerly communist European countries which have only recently made a political transition to democracy. If eastern European schools have only a short history of promoting democratic values and actions among students (Buk-Berge, 2006), the impact of a year of education on CSE in these countries is likely to be smaller than in countries such as Canada and the United States with their long tradition of democratic education. Indeed, Borgonovi (2010) shows that the relationship between education and political engagement and tolerance is generally lower in eastern Europe than in other European countries.[45]

The relationship between education and CSE may also vary across countries because of differences in the degree of income inequality and religious diversity and the degree to which schools in countries with a high level of economic/religious diversity tend to be particularly active in raising awareness of social inequality and diversity and in promoting tolerance for religious diversity. For European countries, Borgonovi (2010) suggests that income inequality and religious diversity have no effect on the relationship between education and civic engagement (such as volunteering and civic participation) and interpersonal trust. However, inequality and diversity have been shown to have significant effects on the relationship between education and political engagement (*i.e.* political interest and party membership).

Does education have an effect on civic and social engagement?

The evidence evaluated has shown that the relationship between education and CSE is generally statistically significant but that it varies across levels of education, populations groups and regions. For policy makers, it would be important to know whether these are causal relationships since the correlations may simply reflect the influence of unobserved individual, family and community characteristics.[46]

A growing number of studies have focused on the causal effects of education on various indicators of CSE such as voting, political interest, political participation, volunteering and civic participation. The literature generally suggests that the causal effect of education on CSE varies across the United States and Europe:[47] studies that have assessed data from the United States have generally identified causal effects of education on political engagement, while most studies that have used European data have found very limited evidence of causal effects on CSE.

Studies based on US data

Two studies suggest that education at the high-school level is likely to have an effect on political engagement but less likely to have an effect on civic participation and trust. Milligan *et al.* (2004) find that an extra year of schooling (induced by compulsory schooling and child labour laws) raised voter turnout as well as other measures of political engagement (*e.g.* following campaigns on TV and newspapers).[48] Dee (2004) also shows that an increase in a year of schooling completed (induced by changes in child labour laws) has a positive, albeit weak, effect on voting and measures of engagement (such as newspaper reading). However, Milligan *et al.* (2004) and Dee (2004) also suggest that an extra year of schooling induced by these policy reforms has little effect on civic participation, membership and trust. While these two studies suggest that a lower level of education has an effect on political engagement, studies that shed light on the effects of higher education (*i.e.* tertiary education) yield mixed results. Dee (2004), using college proximity as an instrument, finds that tertiary enrolment has a causal effect on voting,[49] while Brand (2009), using propensity score matching, finds that tertiary attainment affects civic participation. However, studies by Kam and Palmer (2008) and Henderson and Chatfield (2009), using a propensity score matching technique, conclude that participation in higher education has no causal effect on political participation.[50] Overall, a limited number of US-based studies suggest that a lower level of education is likely to have an effect on political engagement, but that the jury is out with respect to the impact of higher levels of education on engagement. US studies also suggest a limited effect of a lower level of education on civic engagement and trust.

Studies based on European data

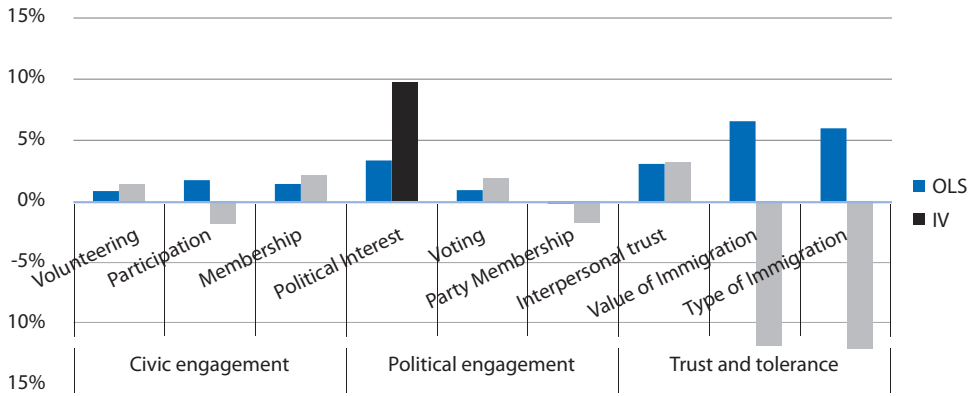
Evidence from Germany, Spain, Norway and the United Kingdom suggests that in Europe, lower secondary schooling *per se* is less likely to have a direct effect on political engagement. Siedler (2007) examines the impact of schooling in Germany on several indicators of political engagement: political interest, voting turnout, democratic values, political involvement and membership in political groups. While the study confirms that years of schooling are positively correlated with all engagement indicators, he finds that the exogenous increases in schooling stemming from mandatory schooling reforms are not associated with greater engagement. A finding based on Norwegian data examining voter turnout also suggests that an extra year of education induced by increases in mandatory schooling do not have a causal effect on the decision to cast a vote (Pelkonen, 2007).[51] Milligan *et al.* (2004) also fail to find evidence that schooling has a direct effect on voter turnout and political interest in the United Kingdom. Moreover, by exploiting changes in the discontinuity between the compulsory schooling age and the minimum employment age in Spain, Touya (2006) finds that the exogenous increase in schooling determined by changes in labour laws did not raise the level of political engagement. Finally, Denny (2003) provides evidence on the causal effect of education on civic engagement in Europe. Using micro-data from the United Kingdom, Ireland and Italy, Denny suggests that an extra year of schooling (induced by changes in compulsory schooling legislation) does not have a statistically significant effect on volunteering and civic participation. Hence, studies using European data suggest that a lower level of education is less likely to have an impact on political and civic engagement.

Contribution of the present analysis

To complement the limited evidence that sheds light on causal relationships, the causal effects of education on CSE were analysed for a large number of European countries.[52] The analysis used exogenous changes in the years of schooling completed induced by compulsory schooling reforms in European countries which affected individuals born at different periods differently in various countries.[53] Results from instrumental variable (IV) estimates (Figure 3.7) suggest that an extra year of schooling completed induced by the reform does not have a causal effect on civic engagement, voting, party membership, trust and tolerance. On the other hand, they suggest that an extra year of schooling has a causal impact on political interest. The effect on political interest is large at 9.7 percentage points.[54] That is, an individual with one extra year of education induced by the compulsory schooling law is 9.7 percentage points more likely to be interested in politics. Hence, this finding is consistent with the literature, which suggests that lower levels of education are less likely to affect civic engagement and voting in Europe. However, the finding that education has a causal effect on political interest in Europe is inconsistent with the literature.[55]

Figure 3.7. **The effect of education on civic and social engagement, 2002-06**

OLS and IV estimates (Europe)



Note: Results are based on ordinary least squares (OLS) and instrumental variables (IV) regression analyses. Minimum school leaving age reforms are used as instruments. Regression controls include age, gender, income, minority status, labour market status, religiosity, social integration, social support, ideological position, paternal educational attainment, maternal educational attainment and health status. Light-coloured bars represent statistically insignificant results at 5%.

Source: Based on Borgonovi (2010).Data Source: European Social Survey (ESS) Rounds 1-3.

To sum up, the available evidence on causal relationships suggests that an extra year of schooling (induced by structural reforms that are likely to affect the lower level of schooling) has an effect on political engagement in the United States. This may reflect the aforementioned hypothesis that American education has been particularly active in promoting democratic values and participation at the high school level.[56] The literature also suggests that an extra year of education (induced by structural reforms that are likely to affect the lower level of schooling) has a limited effect on civic engagement, tolerance and trust in Europe.[57] The latter point has three possible implications:

First, lower secondary schooling in Europe may on average have not been effective in promoting civic engagement, trust and tolerance. This may simply imply that certain features of schooling, *e.g.* past school curricula or modes of instructions adopted, have not been particularly successful at promoting civic engagement, trust and tolerance. It could also mean that certain school factors (*e.g.* teacher's characteristics, classroom climate and ethos) did not help students to acquire a sense of civic engagement, trust and tolerance. The next section provides discussions on how schools might better promote CSE.

Second, the ineffectiveness of education at the lower secondary level in promoting civic engagement, trust and tolerance in Europe may imply that

the early to mid-teens are not necessarily the best time to promote these types of engagement. As pointed out above, tertiary education is associated with higher returns to civic engagement, trust and tolerance, and findings from social psychologists point to the importance of ages 18 to 25 for developing one's beliefs and values about how a society functions. According to these arguments, it may be more efficient to reallocate resources for promoting civic engagement, trust and tolerance to the tertiary level of education.

Third, an individual's education may not matter for stimulating civic engagement, trust and tolerance. If social status (which can arguably be obtained through education) is the critical determinant of CSE, it may be that the relative level of education matters more than the absolute level. This hypothesis, as presented in Nie *et al.* (1996), Helliwell and Putnam (1999), Campbell (2006) and OECD (2007), is tested below.

3.3. Causal pathways

While establishing whether and to what extent additional schooling affects CSE is an important empirical exercise, even more challenging, and equally useful for policy makers, is an assessment of the channels through which such an effect might take place. It is only when policy makers understand viable causal pathways that effective policies and reforms can be better designed. This is particularly important because the net causal effects of schooling experiences on CSE are not necessarily positive. This shows the importance of identifying which pathways work and which do not. Unfortunately, the state of the evidence base provides limited information on the effects of different causal pathways. This section evaluates available quantitative and qualitative information to infer how schooling shapes CSE.

Do information, cognitive skills and socio-emotional skills matter?

The acquisition of civic knowledge is associated with school lessons in the United States (Niemi and Junn, 1998). Moreover, information acquired through schooling is linked to civic and political engagement. For instance, a review of the evidence on the role of information on political participation suggests that a minimum level of civic knowledge is required for active participation (Galston, 2001). In addition, higher levels of information are also correlated with political participation in the United States (Popkin and Dimock, 1999). The Civic Education (CivEd) study by the International Association for the Evaluation of Educational Achievement (IEA) demonstrated that, for a large number of OECD countries, there is a relationship between civic knowledge and the intention to vote and political interest, even after accounting for the influence of home background (Torney-Purta *et al.*, 2001). These results suggest that schools play a role in promoting CSE by

raising children's knowledge. However, there is mounting evidence to suggest that simply providing information on democratic values and political institutions has a rather limited role in promoting CSE (OECD, 2007; Hoskins, Janmaat and Villalba, 2009).

The literature suggests that education can affect CSE by providing a diverse set of cognitive skills, including basic cognitive skills (Nie *et al.*, 1996; Hauser, 2000; Denny, 2003), skills to interpret political communication (Torney-Purta *et al.*, 2001), bureaucratic and organisational skills (Wolfinger and Rosenstone, 1980), critical thinking and decision making (Verba *et al.*, 1995),[58] and civic competences (Hoskins *et al.*, 2008). In terms of basic cognitive skills and achievement, there is evidence, based on the British National Child Development Study (NCDS), that performance on general cognitive tests at the age of 11 is the strongest predictor of trust, tolerance and positive attitudes towards equality at the age of 33 (Schoon *et al.*, 2010). To the extent that schools can effectively raise these skills, cognitive skills can be considered an important causal pathway for the impact of education on CSE. Lauglo and Oia (2008) provide direct evidence on the role of schooling: children's grades in Norwegian language, English and mathematics are correlated with civic engagement in Norway, even after accounting for family background.

Education may also promote CSE by raising social and emotional skills such as patience, attitude towards risk, self-efficacy and sense of empowerment. Unfortunately, the empirical literature is limited on this causal pathway. The available evidence suggests that self-efficacy and a sense of control are important determinants of CSE (Bandura, 1993; Wilson, 2000; Blais, 2000; Whiteley, 2005; Benton *et al.*, 2008). Borgonovi (2010), using the European Social Survey, also suggests that self-determination is associated with higher levels of engagement, trust and tolerance.[59] For Norway, Lauglo and Oia (2008) also report positive relationship between social skills[60] and interest in political and social issues. While the evidence suggests that social and emotional skills can play an important role in fostering CSE, it is not clear that schools are the best place to develop them. Cunha and Heckman (2008) provide some evidence suggesting that skills such as self-determination, self-efficacy and social skills can be developed both at school and in the family.

The empirical literature provides limited evidence on the curricular approaches through which the knowledge, cognitive skills and socio-emotional skills that are pertinent for CSE are most effectively developed and applied to civic practices. Education may foster the development of those competences through general courses,[61] through content-specific modules within general courses (*e.g.* history and social science classes that examine the struggles for universal voting rights) and also through citizenship education designed specifically to foster civic and political engagement and

understanding of the importance of democratic values. Findings from studies examining the effectiveness of citizenship education in promoting CSE suggest that using teacher-centred methods and rote learning of content of citizenship education has only a small effect, if any, on engagement levels (Niemi and Junn, 1998; OECD, 2007; Hoskins, Janmaat and Villalba, 2009).[62] However, new research sheds light on the school environmental factors that are likely to promote habits and positive attitudes towards active citizenship: school ethos, classroom climate and opportunities for direct experience.

Do habits and attitudes matter?

The Council of Europe has collected qualitative research evidence from across Europe on effective education for democratic citizenship (Bîrzéa *et al.*, 2004, 2005). The evidence suggests that effective learning happens when there is a democratic *ethos* across the whole school and curriculum. They will most likely help students develop positive attitudes and dispositions towards citizenship participation. This approach will be tested quantitatively in the upcoming IEA International Civic and Citizenship Education Study which will explore the relationship between teachers and teaching practices across disciplines and students civic knowledge, skills, attitudes and dispositions.

Democratic practices can also be promoted by developing *norms* that create habits of engagement and a strong sense of community, group solidarity and civic duty. These findings are consistent with studies based on the Citizenship Education Longitudinal Study (CELS), a survey of approximately 10 000 schoolchildren which tracks the progression of the first cohort of young people receiving statutory citizenship education from the age of 11 (year 2001) in England. This study suggests that the extent to which citizenship education is successful depends on whether the school environment is a site for practicing democratic engagement and participatory practices, and by so doing fostering the development of skills and the acquisition of civic competences. The literature calls this approach *situated learning.*[63] The report concludes that schools that encourage student voice and engagement through small changes in classroom practices and curriculum design have the potential to empower students and increase their sense of personal efficacy, and thus promote civic and social engagement (Benton *et al*., 2008).

IEA's CivEd study also established that schools that both adopt democratic practices and encourage student voice are those that are most effective in promoting civic knowledge and engagement.[64] This can be done by creating an open classroom climate in which students openly and actively discuss issues that pertain not only to CSE-related matters but other curricular matters as well (Torney-Purta *et al*., 2001; Campbell, 2006[65]). Schools can also promote democratic participation by mobilising extra-curricular activities such as volunteering and by learning through real decision-making opportunities in

school councils (Hoskins, Janmaat and Villalba, 2009). By triggering open discussions and mobilising situated learning within a diverse range of schools activities, students may develop habits and interest in active citizenship.

Unfortunately, such an approach is not the norm in many OECD countries. Torney-Purta *et al.* (2001) note, based on the CivEd study, that only about one-quarter of students say that they are encouraged to voice their opinions during classroom discussions, and that another quarter say this rarely or never happens. The authors note the prevalence of teacher-centred methods of delivering civic-related classes with the use of textbooks, recitation and worksheets instead of more student-oriented activities.

Situated learning at schools

In an examination of social learning theory, Delli Carpini *et al.* (1996) and Fishkin (1991) find that situated knowledge is associated with specific attitudes. Delli Carpini *et al.* identify the relationship between the knowledge of "laws of free speech" and tolerance towards "freedom of expression for specific groups with extreme views". Fishkin used an opinion poll to discover whether providing evidence on the criminal justice system to the public increased the likelihood of people wishing criminals to have legal rights.

The evidence on effective civic education is dominated by qualitative research. The most recent example is the UK inspectors' report (Ofsted, 2010) compiled from observations in 91 secondary schools between 2006 and 2009. The inspectors observed students' ability to discuss topical and relevant issues, whether student actions brought about real changes, and the quality of teaching on citizenship courses. They established that just over half of the schools were considered good or outstanding and ten were inadequate. These findings demonstrate the diversity of the quality of citizenship education for young people. The key features for success were the presence in the school of citizenship teachers who were well trained, motivated specialists and sufficient time in the curriculum for the subject. The challenges highlighted were making sure that all young people, especially those with low abilities, are involved in participatory and decision-making activities in the school and that citizenship lessons also take account of the needs of this group.

Does income matter?

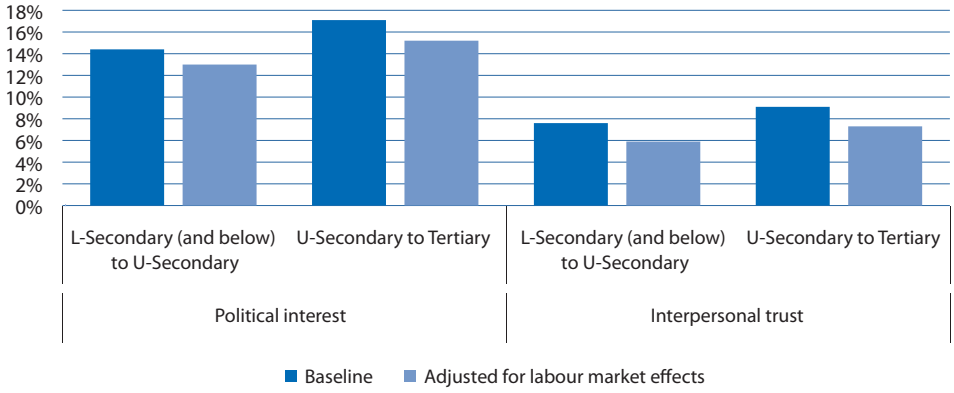
Schools may also indirectly affect CSE by improving children's labour market outcomes and access to social networks. Those with more education are more likely to earn higher incomes than their less educated counterparts, and are more likely to be in paid work and work in different types of occupations.[66] Depending on the types of groups and associations individuals are part of, voluntary work, participation and membership can constitute a means of establishing

horizontal social connections and networking which may have a relatively higher payoff for the well-off (*e.g.* Rotary Club). Furthermore, high-income earners are more likely to be able to use the market to cover everyday chores so that they can join the activities of groups and associations of their choice.

However, education may also discourage CSE due to higher labour market performance. As education levels, and thus income levels rise, the opportunity cost of time also increases; this should be associated with lower rates of time-consuming activities such as voluntary work, membership and participation in groups and associations. Given the low likelihood of an individual casting a decisive vote and higher opportunity cost of time, higher-income individuals should also be less likely to vote.[67] The more time-intensive activities are, the greater the opportunity cost and the more negative the indirect effect of education (Freeman, 1997). Finally, civic engagement may work as a form of informal insurance among those subject to relatively frequent shocks in economic resources due to unstable occupations and wages. Individuals with temporary and seasonal jobs and those who depend heavily on overtime work, who are unskilled or low-skilled due to lack of educational qualifications and adult training, might engage in civic activities, contributing to groups and associations when times are good in hopes of receiving help in times of need (Dehejia *et al.*, 2007).

Borgonovi (2010) provides evidence for Canada and European countries on the extent to which labour market participation and performance mediate

Figure 3.8. **Marginal effects of education adjusted for labour market effects,* 2006**



*Based on a sample of 21 OECD countries.

Source: Based on OECD (2009). Data source: European Social Survey (ESS) Rounds 2-3, Adult Literacy and Lifeskills Survey (ALL) 2003, International Social Survey Programme (ISSP) 2004, ISSP 2006, World Values Survey (WVS) 2005, European Social Survey (ESS) 2004, ESS 2006.

the relationship between education and CSE. It assesses the extent to which the association between educational attainment and CSE varies after accounting for income and the labour market. It suggests that changes in the relationship due to labour market effects are minimal. OECD (2009) also reports on the impact of household income on the relationship between education and both political interest and interpersonal trust for a larger set of countries (including five non-European countries), with the same result (Figure 3.8). It suggests that household income has a small impact on the relationship. Hence, education is less likely to affect CSE predominantly through labour market performance. In other words, the empirical results suggest that the relationship between education and CSE remains strong after accounting for income and labour market status.

3.4. The role of family and community

The previous section has shown that schools can play an important role in encouraging CSE by fostering competences and by developing habits and attitudes of democratic participation through an open classroom climate and by promoting situated knowledge. However, can schools effectively promote CSE in isolation? What about the role of the family and community? Previous literature sheds light on this issue.

Parents play an important role in fostering children's CSE. Having educated parents may raise children's level of CSE if the parents engage in civic and political activities and discuss them at home. Children with educated parents may also have a home environment that triggers civic interest *e.g.* civic-oriented books, newspapers, magazines and TV programmes. Indeed, a large number of studies suggest that parents' educational attainment matters for children's CSE (Helliwell and Putnam, 1999; Campbell, 2006, 2008; Feddersen and Pesendorfer, 1996; OECD, 2007; Gesthuizen *et al*., 2008). More recently, Borgonovi (2010) shows, using the European Social Survey, that parental education is significantly associated with several indicators of CSE. Individuals whose mother achieved post-secondary qualifications are more likely to volunteer, to be interested in politics, to trust others and to have positive views of migrants than individuals with mothers with lower qualifications. Similarly, paternal education is associated with several indicators of CSE, with sizeable effects at least in the case of participation in groups and associations and in the case of political interest: individuals whose fathers achieved post-secondary qualifications are 5% more likely to participate in groups and associations and be interested in politics than similar individuals whose fathers achieved secondary qualifications or less.[68] For Norway, Lauglo and Oia (2008) also find that home environment such as "having books at home" has a strong association with showing interest in politics and social issues.

A large number of studies also consistently suggest a strong association between young people's discussions with parents and friends about politics and social affairs and positive results for civic knowledge and skills and attitudes towards participation (Kahne and Sporte, 2008, for the United States; Lauglo and Oia, 2008, for Norway; Hoskins, Janmaat and Villalba, 2009, for England, Finland, Poland, Italy and Germany). Longitudinal research also demonstrates that civic attitudes and social behaviour patterns are transmitted from one generation to the next and that parents' and children's responses are very similar on an item-by-item basis (US Department of Education, 1999). In addition, Kahne and Sporte (2008) found a strong association between the amount of engagement in the surrounding community and the effect on young people's commitment to civic participation. These results suggest that learning happens through social interactions and by observing and modelling the actions of people in young people's close family and community. Moreover, school and community interactions may interact: in Norway children who talk about social and political issues with friends are more likely to do so with their parents and teachers (Lauglo and Oia, 2008).

Early experience of CSE promotes development of non-cognitive features that are important for later CSE

Volunteering when young has been proposed as a main pathway to continued community participation through adult life (Youniss and Yates, 1997). Various volunteering projects have been cited as evidence, including research in the United States on young volunteers helping black voters to enrol in the 1964 Freedom Summer. Young people who volunteered for this were much more likely to be volunteers and community leaders later in life than the control group that enrolled but failed to turn up in 1964 (McAdam, 1988). Crucial to their continued commitment was the identity they had formed as volunteers and the self-efficacy they developed in feeling that they were able to foster social change. Learning in the community and through volunteering can be tapped into and even enhanced through schooling and building good relationships between school and the community (US Department of Education, 1999). Kahne and Sporte's 2008 study highlighted a strong association between school service learning projects and commitment to civic engagement. This study builds on evidence concerning American youth volunteers in soup kitchens as part of a school course (Watts *et al*., 2008) and their future strong association with community engagement.

Understanding the effects of learning outside and inside the school and using the learning theories of Lave and Wenger (1991) and Bandura (1973) alongside the empirical evidence can help to build a successful approach to civic education in schools. The evidence as a whole suggests that giving children more abstract information on opportunities to engage or the value of

engagement will not promote their future engagement levels. Instead, learning citizenship takes place when knowledge is situated and mediated through social interaction with parents and peers and activities in which individuals work to develop their own understanding (Hoskins, Janmaat and Villalba, 2009). Real student voice and school democratic climate have been shown to be consistently effective and an example of situated learning and learning through social participation. Combining the theory with the findings also suggests that methods involving peer education within the school curriculum and bringing in parents who are actively engaged to discuss and develop school projects may be effective. In addition, carefully structured periods of placement in political and voluntary organisations, later reflected upon in citizenship classes, and building on young people's experiences gained outside the school are likely to be effective in enhancing the qualities needed for CSE.

Cumulative and relative effects of education

Family and community environments play an important role for promoting CSE in childhood, and being brought up by educated parents matters. Does the impact of having an educated person in the surroundings continue until adulthood? Plausibly, individuals may perceive a stronger sense of trust when surrounded by highly educated people. A community with a large proportion of educated individuals may provide more opportunities to engage in volunteering and civic/political activities. The literature suggests that a larger proportion of educated people in the community matters for civic participation and interpersonal trust (Helliwell and Putnam, 1999; OECD, 2007; Borgonovi, 2010). This is called the cumulative effects of education (Campbell, 2006; OECD, 2007). Borgonovi (2010) shows, for a large number of European countries, that volunteering, group membership, and interpersonal trust have sizeable cumulative effects.[69] Interestingly, the size of the cumulative effects of education on CSE is even stronger than the effect of increasing an individual's level of education.

3.5. The role of social status

Education can play a role in raising CSE by improving individual attributes directly and by raising the educational environment of the surroundings. This suggests that the long-term expansion of the education system should lead to an increase in the level of CSE. However, researchers have also noted that in certain countries, such as the United States, the rapid increase in levels of education during the past decades has, paradoxically, not necessarily been accompanied by a similar rise in political engagement (Nie *et al*., 1999). For Norway, Lauglo and Oia (2008) also report that a rapid expansion in tertiary

education was not accompanied by similar trends in voting turnout. It is plausible that contextual factors such as increased consensus in politics (Lauglo *et al*., 2008) may have driven these trends.

However, researchers have also suggested an alternative theory that is consistent with the paradox. The argument of Nie *et al*. was that education's principal role may be to raise individuals' social status, which in turn opens up access to civic/political resources that tend to be competitive and rival in nature (*e.g.* influencing politicians).[70] The lower costs of accessing civic/political resources may increase the incentives to become politically engaged. According to Campbell (2006):

> "those people with greater standing, or higher status, are more likely to get involved in socially competitive, zero-sum activities simply because they are more likely to "win" the competition. It is the voices of high-status individuals that get heard … The higher your level of formal education – *relative to others within your social environment* – the higher your social status. The higher your social status, the more likely you are to conclude that your voice will be heard above the din. The costs – in time and treasure – you incur in political engagement are outweighed by the likelihood of your receiving benefits from the effort expended".

This suggests that as education systems expand, the "tertiary education premium" diminishes and the costs of participating in political activities may increase, while the benefits of participation may diminish. This will give educated people (with higher social status) little incentive to engage in political activities. The role of social status may also apply to civic participation: those with high status may give preferential access to "exclusive" civic activities. These are examples of the so-called relative effects of education (Nie *et al*., 1999; Helliwell and Putnam, 1999; Campbell, 2006).[71]

Using the European Social Survey, Borgonovi (2010) tests the hypothesis of relative effects of education on civic and social engagement, trust and tolerance. It suggests that relative education appears to matter for political engagement, which is consistent with Campbell's argument. However, it finds little evidence on the relative effects of education on civic participation and interpersonal trust. This may mean that the civic activities available in many European countries are less likely to be competitive and rivalrous in nature, and "whether or not to trust others" depends more on one's surroundings than on one's social status in the community. The result is consistent with Helliwell and Putnam (1999) for the United States which finds no evidence of relative effects but finds cumulative effects for interpersonal trust.

3.6. Summary of findings: What we know and don't know

The analyses presented in this chapter are based on recent quantitative and qualitative studies. The aim was to clarify the state of knowledge on the relationship between education and CSE and to point out the areas in which more information is needed. Table 3.1 provides a summary of the findings.

The general conclusion is that education can significantly raise the level of civic and social engagement. Competences such as cognitive and socio-emotional skills matter in empowering individuals to engage actively in society. School norms, ethos and an open classroom climate that stimulates students to question and debate social issues also contribute to developing habits and raising values and attitudes regarding civic engagement. Situated learning provides opportunities for children to engage in "learning by doing". Civic competences, values and attitudes can be further enhanced when family and community environments are in line with the efforts of teachers and school administrators. Parents who discuss civic/political matters at home and have civic goods (*e.g.* books) at home are likely to trigger children's civic orientations. A community in which there are ample opportunities for children to be part of the society (*e.g.* volunteering, associations and sports events) can further promote the civic-mindedness nurtured at school. Parents, teachers, school administrators and community administrators may need to better understand their respective responsibilities, improve communications and ensure that the multiple contexts that children navigate every day are coherent and consistent.

Table 3.1. **The relationship between education and civic and social engagement**
Findings from the present study

	What we know	What we don't know
Causal effects of education	• Secondary education: Raises political engagement for the United States, but mixed results in a number of European countries. Generally limited causal effects found for civic engagement and trust. • Tertiary education: Mixed results for civic and political engagement for the United States; "potentially" important for trust/tolerance (but not based on causal evidence). • Adult education: Correlation studies suggest that adult literacy can help raise the level of civic engagement among the disadvantaged. • Implications on inequality: Expanding tertiary education for the disadvantaged may help reduce inequalities in civic participation, trust and tolerance.	• Limited causal evidence available in all domains, but particularly on trust and tolerance. • Causal evidence available predominantly for the United States and the United Kingdom. • Limited studies that shed light on the effects of early childhood education and tertiary education.
Causal pathways	• Knowledge: Relevant but limited. • Cognitive skills: Basic skills and higher-order skills are both relevant. • Non-cognitive traits: Self-efficacy and self-control are important. • Income: The mediating role of income is weak. • School environment is relevant: Individual attributes that foster engagement can be enhanced through situated learning in an open and democratic learning environment (including norms and ethos). • Implications for Inequality: Education can be a mechanism to propagate intergenerational inequality, since children with educated parents tend to develop individual attributes that foster CSE better. Early deficits in the learning environment need to be addressed. Schools may also help account for the early deficits.	• Evidence is limited on causal pathways, particularly for trust/tolerance. • Future work may shed more light on the role of social and emotional skills and how they can be best developed. • One mediating role of education, access to networks, is not yet well studied.
Contexts	• Family contexts are important: Educated parents, those who discuss civic/political matters at home, and have more books are more likely to nurture positive attitudes towards CSE among their children. • Community context matters: It provides an environment for "situated experience" which helps to deepen understanding and positive attitudes towards CSE.	• The role of workplace contexts in fostering CSE is not well researched.

Table 3.1. **The relationship between education and civic and social engagement**
Findings from the present study *(continued)*

	What we know	What we don't know
Social status	• Education may affect political engagement, trust and tolerance by raising individual's social status. • Implications for inequality: Expansion of educational systems may not necessarily increase the average level of political engagement, but is likely to reduce inequalities in political engagement.	• There are few studies that evaluate social status under different clusters of groups: i.e. local community, schools and regions.
Overall	• Educational expansion can raise the level of CSE and can also reduce inequalities in political engagement. • What works in education? Raising skills and developing habits and norms of engagement via open and situated learning settings are likely to be promising avenues. Families and communities can be an ideal context for situated learning. • An integrated approach can be promising given the interdependence of school, family and the community context in fostering situated learning and reinforcing civic norms and democratic attitudes.	• More causal evidence is needed on all three domains of CSE. This is particularly the case for interpersonal trust and tolerance. • Given the difficulty involved in data collection and estimation strategies to infer causality, it would be useful to mobilise qualitative data extensively. • The role of family and community in countries other than the United States and the United Kingdom (and European countries) needs to be better understood. This will shed light on how cross-country differences in norms/cultures relating to CSE affect the role of schooling in fostering CSE.

Notes

1. This chapter draws on analytical work on Canadian data by Satya Brink and Justin Bayard (Human Resources and Skills Development Canada) and on written contributions from Bryony Hoskins (Institute of Education, University of London).

2. Putnam (2000) suggests a rapid decline in various indicators of social capital in the United States since the mid-1960s, while Caul and Gray (2000) show a general decline in electoral turnouts in a number of OECD countries. However, not all indicators of social capital have declined over time. For instance, Schyns and Koop (2010) show that the level of interpersonal trust and membership in religious organisations has increased moderately in Denmark and the Netherlands since the 1960s. Offe and Fuchs (2002) suggest that Germany has not experienced a decline in social capital.

3. OECD (2007) provides a review of the debate over the issue of whether falls in traditional indicators of civic and social engagement correspond to a real deterioration or simply to a shift towards new forms of participation.

4. Gender differences in civic participation can however reflect differences in the nature/forms of participation. For instance, women are more likely to engage in informal associations that relate to issues involving children and family. The increase in female labour force participation may help equalise the gender difference in the nature of civic participation.

5. In the United States, Hispanics and foreign-born populations are less likely to participate in civic and political activities (Foster-Bey, 2008). Alesina and La Ferrara (2000a) report significant regional inequality in the level of trust and civic engagement within the United States, with the South generally exhibiting lower levels. They suggest that participation in social activities is significantly lower in more unequal and in more racially or ethnically fragmented localities. Denny (2003) shows that in 19 OECD countries people living in rural areas are more likely to volunteer.

6. Munshi (2003) and Edin *et al.* (2003) suggest a positive relationship between network members and labour market outcomes in the United States and Sweden. Beaman (2009) reports that between 30% and 60% of jobs in the United States are found through informal social networks. This is presumably because networks are important for addressing the market imperfections: job availability

and imperfect information about the quality of job candidates. Putnam (1993) use Italian cross-regional data to show that local governments are more efficient when civic engagement is greater. However, not all groups and networks lead to positive outcomes. Whether or not civic participation leads to positive outcomes may depend on the values and objectives that groups and networks possess. This is implicitly linked to how they perceive a well-functioning society and successful life.

7. When people trust each other, transaction costs in economic activities are reduced, and large organisations and governments are more efficient (Alesina and La Ferrara, 2000b). Arrow (1997) and Fukuyama (1995) suggest that the level of trust in a society predicts its economic success. Knack and Keefer (1997) argue that country-level trust predicts economic growth. La Porta *et al.* (1997) find that trust has a positive impact on judicial efficiency and government integrity.

8. Researchers have often used the concept of social capital to describe how civil society functions. According to Putnam (2000), social capital is an aggregate concept that refers to social networks and the associated norms of reciprocity and trust. Social capital is assumed to facilitate collective interactions that foster economic and social benefits.

9. Higher levels of engagement in Nordic countries are consistent with Pichler and Wallace (2007) which use the Eurobarometer Survey (2004) to assess regional differences in formal and informal social capital. Knack and Keefer (1997) also report that the five countries with the highest levels of trust are Norway, Finland, Sweden, Denmark and Canada, and that these countries rank among the highest for associational activity and norms of civic co-operation. Although southern and eastern European countries tend to have relatively lower levels of formal social capital (*e.g.* being a member of social clubs and voluntary organisations and exhibiting interpersonal trust) compared to Nordic countries, their level of informal social capital (*e.g.* frequently contacting friends, colleagues and neighbours) is comparable to that of Nordic countries.

10. Income inequality and religious/racial diversity are examples of distributional factors that might affect engagement rates. For instance, Borgonovi (2010) suggests that rates of civic and political engagement and levels of interpersonal trusts fall as income inequality rises. Moreover, individuals living in countries with a higher level of religious diversity tend to participate less in groups and associations, but have a higher level of interpersonal trust and tolerance. Alesina and La Ferrara (2000b) show that individuals living in racially and ethnically fragmented communities in the United States display a lower level of interpersonal trust.

11. This result is consistent with Verba *et al.* (1995) who demonstrate that voting is one of the most equal forms of participation.

12. Basic competences usually mean literacy and numeracy. Social skills include communication skills, negotiating skills and the capacity to co-operate. Some researchers have used a term called civic competences which encompasses dimensions such as knowledge; skills such as intercultural competence, ability to influence society and to work with others; attitudes such as resilience, respect for other cultures, interest; values such as democracy and gender equity; and identity, such as a sense of personal and community identity. Hoskins *et al.* (2008) developed a composite indicator of civic competences in European countries. These are assumed to enhance individual's capacity to understand the complex and abstract concepts found in civic and political matters. This understanding would raise the quality of the individual's judgements and decisions.

13. Education may reduce the costs and raise the benefits of civic participation (Dee, 2004). Increased levels of information and competences make it easier for individuals to process complex political information, and navigate the complicated bureaucratic and technical elements of civic participation. Education can also raise the "perceived" benefits of engagement by making individuals aware of the value and indirect rewards of participation.

14. Education may alter fertility and marriage decisions and thus have an indirect effect on civic and social engagement.

15. Individuals with stronger social networks may have better access to a range of civic and political activities. If the social networks are based on diverse racial and ethnic groups, this may promote trust and tolerance.

16. This means that certain pathways may have a positive impact while others may have a negative impact. A positive education effect implies that the net effects of all of these impacts are positive.

17. Better educated parents tend to have more books at home. They may be more likely to discuss civic and political matters with their children. Better educated parents may themselves be actively engaged in civic participation and hence act as role models.

18. In other words, those with higher levels of education are more likely to live and work among those with similar high levels of education, in environments which tend to have less anti-social behaviour and crime. The opposite is likely to be true for those with low levels of education.

19. This suggests that the total effects of education are likely to be positive.

20. Borgonovi (2010) provides a detailed account of the econometric analyses performed. Note also that the empirical analysis for Canada presented in this chapter was implemented by the Human Resource and Social Development (HRSD) Canada.

21. The fact that much of the available evidence focuses on the total effects of education makes it impossible to discern the viable pathways. It is important to know,

for instance, through which of the possible causal pathways education is most likely to have an effect on social cohesion.

22. See OECD (2006, 2007) for detailed descriptions of civic and social engagement (CSE).

23. Some economists have conceptualised individual social capital which captures the social capital investment decisions of individuals (Glaeser *et al*., 2000). This brings the concept of social capital much closer to CSE.

24. The analysis is based on Borgonovi (2010) which exploits the first three rounds of the European Social Survey (ESS), a Europe-wide survey that took place between 2002 and 2007, and the Canadian data from the Adult Literacy and Life skills Survey conducted in 2003. Analyses using the ESS are based on data from 21 countries which are currently OECD members and which took part in at least two of the three survey rounds. They are: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, The Netherlands, Norway, Poland, Portugal, Spain, the Slovak Republic, Sweden, Switzerland and the United Kingdom.

25. Denny (2003) uses the International Adult Literacy Survey (IALS) which contains micro-data from Belgium, Canada, Chile, the Czech Republic, Denmark, Finland, Germany, Great Britain, Hungary, Ireland, Italy, the Netherlands, New Zealand, Northern Ireland, Norway, Poland, Slovenia, Sweden, Switzerland and the United States.

26. This implies that one standard deviation of schooling years (approximately 2.5-3.3 years for most countries according to Huang *et al*., 2009) accounts for the variation in interpersonal trust by 15-18% of its standard deviation.

27. Huang *et al*. (2009) evaluate the role of education on social participation and trust based on 65 empirical studies using micro-data from Europe, the United States and other countries.

28. Features of the education system may include what children learn in school (*e.g.* civic education or history), the school environment (*e.g.* open school climate, teachers or peers) and labour market outcomes of education which may provide students with a better access to CSE.

29. However, one cannot be sure that the features of the school system raise CSE, unless one conducts analyses that explicitly address causality.

30. Such skills are probably not likely to be basic literacy and numeracy. Social skills, such as communication skills, and the capacity to collaborate and negotiate might be the type of skills that can be developed as one moves up the education ladder.

31. While the analysis presented in this section focuses on the level of education attained, the results are very similar when using years of schooling completed (Borgonovi, 2010). Note also that the patterns in the relationships (*i.e.* the shape

of the curve) do not change substantially after taking into account individual differences in labour market participation, income, religiosity, social integration, social support, ideological position, paternal educational attainment and health status.

32. According to Alesina and La Ferrara (2000a), those with less than 12 years of education are 12.2 percentage points less likely to be members of civic groups, while those with more than 16 years of education are 14.4 percentage points more likely to be members. These results are obtained after taking into account batteries of individual demographic and socioeconomic characteristics.

33. An upper secondary education may also affect the residential area which one decides to live in, and this may influence the availability and desirability of taking part in civic groups and associations.

34. According to Alesina and La Ferrara (2000b), those with less than 12 years of education are 13.8 percentage points less likely to express interpersonal trust, while those with more than 16 years of education are 18.0 percentage points more likely to express trust. These results are obtained after taking into account batteries of individual demographic and socioeconomic characteristics.

35. One could also argue that tertiary education makes individuals increasingly politically correct and affected by social desirability.

36. However, the argument might also go in the opposite direction. Women might be more inclined to stand up and engage in political movements that would trigger changes in norms and customs.

37. Due to data limitations, minority status (*i.e.* whether the respondent is a member of a minority group in the country) is only assessed for Europe, and immigration status is assessed only for Canada.

38. Other things being equal, the probability of a male with ten years of education volunteering is 36%, of being a member of a group or association is 88%, and of voting in national elections is 93%. Comparable figures for women are 19% for volunteering, 76% for membership and 90% for voting.

39. This result contrast with that of Huang *et al.* (2009) who find that the impact of education on social trust and participation is smaller among women, on the basis of a meta-study of 65 empirical studies covering North America and Europe.

40. OECD (2009) shows for 21 OECD countries that women tend to have a higher level of interpersonal trust than men.

41. This is not the case for the relationship between education and labour market outcomes. Empirical studies for Australia, Canada, Germany, Israel, the United Kingdom and the United States suggest that labour market returns to schooling are smaller for immigrants than for the native-born (Chiswick and Miller, 2009).

42. Results are presented in OECD (2010). The Canadian data use immigrant status instead of minority status.

43. Denny (2003) used the International Adult Literacy Survey (IALS). English-speaking countries include Canada (English speaking regions), New Zealand, the United Kingdom and the United States.

44. However, the results from the United States and the United Kingdom cannot be compared directly owing to differences in the features of the micro-data and estimation methods. Moreover, the difference in the results may be due to the difference in voting registration procedures. In the United States, registering to vote rests mainly on individual responsibility (Milligan *et al*., 2004), while in the United Kingdom, individuals are legally responsible and actively helped to register. More generally, certain countries have compulsory voting. It is enforced in Australia for state and national elections, Switzerland for certain cantons and Turkey and not enforced in Belgium and France for senate elections.

45. On average, the relationship between education and political interest and tolerance was 4-7 percentage points lower in eastern Europe. However, this is not the case for all of the impacts of education on CSE. For instance, the relationship between education and volunteering and party membership were higher in Eastern Europe.

46. See Chapter 2 for a formal argument on why correlation does not mean causality.

47. There do not appear to be studies assessing the causal effects of education on CSE for countries other than the United States and European countries.

48. Following campaigns on TV and newspapers also suggests that individuals have more political information.

49. According to Dee (2004), college attendance raises the probability of voting by 22 percentage points and turning out at the polls by 17 percentage points.

50. Kam and Palmer (2008) suggest that college attendance proxies various previous life experiences that may affect both college entrance and political participation. Both Kam and Palmer (2008) and Henderson and Chatfield (2009) use a propensity score matching technique to control for the non-random selection into tertiary education. See Chapter 2 for an explanation of the propensity score matching methods.

51. However, when separately assessing male and females, Pelkonen finds a significant and large causal effect of additional schooling for males but not for females.

52. This analysis is presented in Borgonovi (2010). Because the instrument used (*i.e.* compulsory schooling laws) is likely to change behaviour predominantly among individuals at the lower end of the educational distribution, the models on the effect of years of schooling on CSE are only replicated on the sample of individuals who achieved less than post-secondary qualifications. The findings are, however, similar to those obtained for the full sample: education appears to have an effect only on political interest.

53. Significant changes in legislation occurred in many European countries throughout the 20th century and led, among other things, to significant increases in the number of years of compulsory schooling children are required to attend.

54. The finding that estimated effects of education on political interest obtained in the IV framework are significantly higher than similar estimates based on OLS is surprising as OLS estimates would be expected to be upwardly biased. Because compulsory schooling reforms only affect the educational attainment of "compliers", *i.e.* individuals who stayed in education longer because of schooling reforms, IV estimates may capture a local average treatment effect (LATE). The LATE will be higher than the average treatment effect (ATE) whenever the political returns to schooling are more important for compliers. See Chapter 2 for more details on LATE.

55. There is however, one exception. Di Petro and Delprato (2009) assess the causal effect of education on political interest using Italian data. They show that an extra year of education induced by the Italian schooling reform of 1962 (which obliges students to stay in school from 5 years to 8 years) exhibited causal effects on the likelihood of being interested in politics.

56. This may, however leave unanswered the question as to why the lower level of schooling did not affect civic engagement and trust.

57. The lack of causal effect of an increase in the lower level of education is consistent with the results on marginal effects presented above for Europe: the marginal effects of attaining lower secondary education are relatively small for civic engagement, trust and tolerance.

58. Denny (2003) provides evidence on the role of literacy in volunteering. He finds that measures of literacy (based on prose, documents and quantitative items in the International Adult Literacy Survey) have a significant effect on volunteering. When including this measure, the impact of schooling diminishes by around half or more. This was particularly the case in Chile, Denmark, the Netherlands, and Slovenia, countries for which it was not possible to reject the hypothesis that years of schooling have no impact. Denny concludes that the direct effect of education is typically rather small when accounting for functional literacy.

59. However, Borgonovi (2010) also finds that the relationship between education and CSE is not mediated by self-determination. Does this mean that education cannot raise CSE by fostering self-determination? This is not necessarily the case. It may be that past educational practices have been ineffective for developing a sense of self-determination. Alternatively, it may be that families and community experience may play a more important role in this respect.

60. Lauglo and Oia (2008) use (lack of) discipline problems to capture social skills. Discipline problems are assessed by the items: "swearing at a teacher", "quarrelling furiously with a teacher", "having been sent to the principal's office (for an offence)", "being told to leave a classroom (for misbehaviour)", and "being absent without legitimate reason" (Lauglo and Oia, 2008). While those who are not

interested in politics and social issues are generally more likely to have discipline problems, problems are also more frequent among those who express a strong interest in politics and social issues than among those with a moderate interest. This suggests that the relationship between psychosocial features of individuals and CSE is likely to be nonlinear and nuanced.

61. General courses would include language, history and mathematics classes.

62. See Whiteley (2005), OECD (2007) and Benton *et al.* (2008) for a review on various approaches school can use to promote CSE. Hoskins, Janmaat and Villalba (2010) suggest that increasing the number of hours of school instruction in history or civic education and social sciences has no consistently positive effect in any of the countries for knowledge and skills regarding civic and participatory attitudes.

63. The field of political socialisation provides theories which help to explain how civic and social engagement is learned. Two which have been found useful are *Social Learning Theory* (Bandura, 1993) and *Situated Learning* (Lave and Wenger, 1991). These theories, which differ considerably from cognitive and acquisition-based models of learning, emphasise the importance of the effects of the environment on learning and highlight learning that occurs through social participation in the form of observation and modelling and social interaction within different communities. Lave and Wenger also demonstrate, through anthropological research, how learning takes place when knowledge is situated in a relevant context.

64. The CivEd study is based on data from 28 countries: Australia, Belgium (French Community), Bulgaria, Chile, Colombia, Cyprus, the Czech Republic, Denmark, England, Estonia, Finland, Germany, Greece, Hong Kong (China), Hungary, Italy, Latvia, Lithuania, Norway, Poland, Portugal, Romania, the Russian Federation, the Slovak Republic, Slovenia, Sweden, Switzerland and the United States.

65. Campbell (2006) shows that school ethos (an aggregate measure of classroom climate, school participation and citizenship norms) has small but significant effects on various measures of CSE.

66. See Card (2001) for reviews of labour market benefits of education.

67. Indeed Blais (2000) finds for Canada that a higher cost of voting is generally associated with lower turnout rates and that in practice most individuals perceive the opportunity cost of voting to be nil or very small.

68. The effect of parents' education on children's CSE can be small if the effect is mainly through higher level of children's education. Given that children's education is already accounted for in the analysis, the remaining variations that can be explained by parents' education might be small.

69. Owing to data limitations, OECD (2007) only tests the cumulative effects of education at the country level.

70. Participation can be rivalrous and/or involve competition for scarce resources: one person's participation lowers another person's benefit from participating and there are only a limited number of opportunities to participate.

71. An important empirical question would be: "How can we define the area in which the average education will be compared to one's education." In other words, to what population is my "relative education" relative (Helliwell and Putnam, 1999)? This could range from country-wide (as in Nie *et al.* (1996) to cohorts within a country, region or local district. According to Helliwell and Putnam, results can be sensitive to the choice of the area.

References

Alesina, A. and E. La Ferrara (2000a), "Participation in Heterogeneous Communities", *Quarterly Journal of Economics*, Vol. 115, pp. 1203-1228.

Alesina, A. and E. La Ferrara (2000b), "The Determinants of Trust", *NBER Working Paper* 7621, Cambridge, MA.

Alesina, A. and E. La Ferrara (2002), "Who Trusts Others?", *Journal of Public Economics*, Vol. 85, pp. 207-234.

Arrow, K.J. (1997), "The Benefits of Education and the Formation of Preferences", in J.R. Behrman and N. Stacy (eds.), *The Social Benefits of Education*, University of Michigan Press, Ann Arbor.

Bandura, A. (1973), "Social Learning Theory of Aggression", in J. Knutson (1973) (ed.), *The Control of Aggression: Implications from Basic Research*, Aldine, Chicago.

Bandura, A. (1993), "Perceived Self-Efficacy in Cognitive Development and Functioning", *Educational Psychologist*, Vol. 28, pp. 117-148.

Beaman, L.A. (2009), "Social Networks and the Dynamics of Labor Market Outcomes: Evidence from Refugees Resettled in the U.S", mimeo, Northwestern University.

Benton, T., E. Cleaver, G. Featherstone, D. Kerr, J. Lopes and K. Whitby (2008), *Citizenship Education Longitudinal Study (CELS): Sixth Annual Report. Young People's Civic Participation in and beyond School: Attitudes, Intentions And Influences*, DCSF Research Report 052, Department for Children Schools and Families, London.

Bîrzéa, C. *et al.* (2005), *Tool for Quality Assurance of Education for Democratic Citizenship in Schools.* Council of Europe, Strasbourg.

Bîrzéa, C., D. Kerr, R. Mikkelsen, I. Froumin, B. Losito, M. Pol and M. Sardoc (2004), *All-European Study on Education for Democratic Citizenship Policies*, Council of Europe, Strasbourg,.

Blais, A. (2000), *To Vote or Not to Vote. The Merits and Limits of Rational Choice Theory*, University of Pittsburgh Press, Pittsburgh, PA.

Borgonovi, F. (2008), "Doing Well by Doing Good. The Relationship between Formal Volunteering and Self-Reported Health and Happiness", *Social Science & Medicine*, Vol. 66, pp. 2321-2334.

Borgonovi (2010), "The Relationship between Education and Civic and Social Engagement", mimeo, OECD, Paris.

Brand, J. (2009), "Heterogeneous Effects of Higher Education on Civic Participation: A Research Note", *UCLA California Centre for Population Research On-Line Working Paper 021*, UCLA, California.

Brehm, J., and W. Rahn (1997), "Individual-Level Evidence for the Causes and Consequences of Social Capital", *American Journal of Political Science*, Vol. 41, pp. 999-1023.

Buk-Berge, E. (2006), "Missed Opportunities: The IEA's Study of Civic Education and Civic Education in Postcommunist Countries", *Comparative Education*, Vol. 42, pp. 533-548.

Campbell, D.E. (2006), *Why We Vote*, Princeton University Press, Princeton, NJ.

Campbell, D.E. (2008), "Voice in the Classroom: How an Open Classroom Climate Fosters Political Engagement among Adolescents", *Political Behavior*, Vol. 30, pp. 437-454.

Canadian Council on Learning (2008), *Health Literacy in Canada: A Healthy Understanding*, Canadian Council on Learning, Ottawa.

Card, D. (2001), "Estimating the Return to Schooling: Progress on Some Persistent Econometric Problems", *Econometrica*, Vol. 69, pp. 127-160.

Caul, M. and M. Gray (2000). "From Platform Declarations to Policy Outcomes", in R. Dalton and M. Wattenberg (eds.), *Parties without Partisans*, Oxford University Press, Oxford, pp. 208-237.

Chiswick, B. and P. Miller (2009), "The International Transferability of Immigrants' Human Capital", *Economics of Education Review*, Vol. 28, Issue 2, April, pp. 162-169.

Costa, D.L. and M.E. Kahn (2003), "Civic Engagement and Community Heterogeneity: An Economist's Perspective", *Perspectives on Politics*, Vol. 1, pp. 103-111.

Cunha, F. and J.J. Heckman (2008), "Formulating, Identifying and Estimating the Technology of Cognitive and Noncognitive Skill Formation", *The Journal of Human Resources*, Vol. 4, pp. 738-782.

Davidov, E., B. Meuleman, J. Billiet and P. Schmidt (2008), "Values and Support for Immigration: A Cross-Country Comparison". *European Sociological Review*, Vol. 24, pp. 583-599.

Dee, T.S. (2004), "Are There Civic Returns to Education?", *Journal of Public Economics*, Vol. 88, pp. 1697-1720.

Dehejia, R., T. DeLeire and E.F.P. Luttmer (2007), "Insuring Consumption and Happiness through Religious Organizations", *Journal of Public Economics*, Vol. 91, pp. 259-279.

Denny, K. (2003), "The Effects of Human Capital on Social Capital: A Cross-Country Analysis", *The Institute for Fiscal Studies Working Paper WP03/06*.

Di Pietro, G. and M. Delprato (2009), "Education and Civic Outcomes in Italy", *Public Finance Review*. Vol. 37, pp. 421-446.

Edin, P., P. Fredriksson and O. Aslund (2003), "Ethnic Enclaves and the Economic Success of Immigrants: Evidence from a Natural Experiment", *Quarterly Journal of Economics*, Vol. 118, pp. 329-357.

Feddersen, T. and W. Pesendorfer (1996), "The Swing Voter's Curse", *American Economic Review*, Vol. 86, pp. 408-424.

Fishkin (1991), *Democracy and Deliberation: New Directions for Democratic Reform*, Yale University Press, New Haven, CT.

Foster-Bey, J. (2008), "Do Race, Ethnicity, Citizenship and Socio-economic Status Determine Civic Engagement?", The Center for Information & Research on Civic Learning & Engagement, *CIRCLE Working Paper* 62, Boston, MA.

Freeman, R.B. (1997), "Working for Nothing: The Supply of Volunteer Labor", *Journal of Labor Economics*, Vol. 15, p. 140.

Fukuyama, F. (1995), *Trust*, Free Press, New York.

Galston, W. (2001), "Political Knowledge, Political Engagement and Civic Education". *Annual Review of Political Science*, Vol. 4, pp. 217-234.

Gesthuizen, M., T. van der Meer and P. Scheepers (2008), "Education and Dimensions of Social Capital: Do Educational Effects Differ Due to Educational Expansion and Social Security Expenditure?", *European Sociological Review*, Vol. 24, pp. 617-632.

Giuliano, P. and A. Spilimbergo (2009), "Growing Up in a Recession: Beliefs and the Macroeconomy", *NBER Working Paper No. 15321*, Cambridge, MA.

Glaeser, E.L., D.I. Laibson, J.A. Scheinkman and C.L. Soutter (2000), "Measuring Trust", *The Quarterly Journal of Economics*, Vol. 115, pp. 811-846.

Grossman, M. (1972), "On the concept of health capital and the demand for health", *Journal of Political Economy*, Vol. 80, pp. 223-255.

Halpern, D. (2005), *Social Capital*, Polity Press, Cambridge.

Hauser, S. (2000), "Education, Ability, and Civic Engagement in the Contemporary United States", *Social Science Research*, Vol. 29, pp. 556-582.

Helliwell, J.F. and R.D. Putnam (1999), "Education and Social Capital", *NBER Working Paper No. W7121*, Cambridge, MA.

Henderson, J. and S. Chatfield (2009), "Who Matches? Propensity Scores and Bias in the Causal Effects of Education on Participation", 24 April, *http://ssrn.com/abstract=1409483*.

Hoskins, B. and M. Mascherini (2009), "Measuring Active Citizenship through the development of a Composite Indicator", *Social Indicator Research*, Vol. 90, pp. 459-488, http://dx.doi.org/10.1007/s11205-008-9271-2.

Hoskins, B., B. d'Homber and J. Campbell (2008), "The Impact of Education on Active Citizenship", *European Education Research Journal*, Vol. 7, No. 3, pp. 386-402.

Hoskins, B. *et al*. (2008), "Measuring Civic Competence in Europe: A Composite Indicator Based on IEA Civic Education Study 1999 for 14 Year Olds in School", *CRELL Research Paper EUR 23210*, European Commission, Ispra.

Hoskins, B., J.G. Janmaat and E. Villalba (2009), "Learning Citizenship through Social Participation Outside and Inside School: A 5 Country, Multilevel Analysis of Young People's Learning of Citizenship", Conference paper delivered at the European Conference on Education Research, Vienna, 28 September, 2009.

Hoskins, B., J.G. Janmaat and E. Villalba (2010), "Learning Citizenship through Social Participation Outside and Inside School: A 5 country, Multilevel Analysis of Young People's Learning Using the IEA CIVED data", Conference paper delivered at the OECD Conference on Education, Social Capital and Health, February 25-26, 2010.

Huang, J., M. Henriette and W. Groot (2009), "A Meta-Analysis of the Effect of Education on Social Capital", *Economics of Education Review*, Vol. 28, pp. 454-464.

Kahne, J. and S. Sporte (2008), "Developing Citizens: The impact of Civic Learning opportunities on students' Commitment to Civic Participation", *American Educational Research Journal*, Vol. 45, pp. 738-766.

Kam, C.D. and C.L. Palmer (2008), "Reconsidering the Effects of Education on Political Participation", *Journal of Politics*, Vol. 70, pp. 612-631.

Knack, S. and P. Keefer (1997), "Does Social Capital have an Economic Payoff? A Cross-Country Investigation", *Quarterly Journal of Economics*, Vol. 112, pp. 1251-1288.

Krosnick, J.A. and D.F. Alwin (1989), "Aging and Susceptibility to Attitude Change", *Journal of Personality and Social Psychology*, Vol. 57, pp. 416-425.

La Porta, R., F. Lopez-de-Silanes and A. Shleifer (1997), "Trust in Large Organizations", *The American Economic Review*, Vol 87, pp. 333-338.

Lauglo, J. and T. Oia (2008), "Education and Civic Engagement among Norwegian Youth", *Policy Futures in Education*, Vol. 6, pp. 203-223.

Lave, J. and E.Wenger (1991), *Situated Learning: Legitimate Peripheral Participation*, Cambridge University Press, Cambridge.

Lowndes, V. (2000), "Women and Social Capital: A Comment on Hall's 'Social Capital in Britain'", *British Journal of Political Science*, Vol. 30, pp 33-540.

McAdam, D. (1988), *Freedom Summer*, Oxford University Press, Oxford.

Milligan, K., E. Moretti and P. Oreopoulos (2004), "Does Education Improve Citizenship? Evidence from the United States and the United Kingdom", *Journal of Public Economics*, Vol. 88, pp. 1667-1695.

Munshi, K. (2003), "Networks in the Modern Economy: Mexican Migrants in the US Labor Market", *Quarterly Journal of Economics*, Vol. 118, pp. 549-599.

Nie, N., J. Junn and K. Stehlik-Barry (1996), *Education and Democratic Citizenship in America*, University of Chicago Press, Chicago, IL.

Niemi, R.G. and J. Junn (1998), *Civic Education: What Makes Students Learn?*, Yale University Press, New Haven, CT.

OECD (2006), *International Migration Outlook 2006*, OECD, Paris.

OECD (2007), *Understanding the Social Outcomes of Learning*, OECD, Paris.

OECD (2009), *Education at a Glance 2009*, OECD, Paris.

OECD (2010), *Education at a Glance 2010*, OECD, Paris.

Offe, C. and S. Fuchs (2002), "A Decline of Social Capital? The German Case", in R. Putnam (ed.), *Democracies in Flux: The Evolution of Social Capital in Contemporary Society*, Oxford University Press, New York, NY, pp. 189-245.

Ofsted (2010), *Citizenship Established? Citizenship in Schools 2006/09*, Ofsted, London.

Pelkonen, P. (2007), "Education and Voter Turnout in a Quasi-Experimental School Reform", mimeo, University College London.

Pichler, F. and C. Wallace (2007), "Patterns of Formal and Informal Social Capital in Europe", *European Sociological Review*, Vol. 23, pp. 425-435.

Popkin, S.L. and M.A. Dimock (1999), "Political Knowledge and Citizen Competence", in S.K. Elkin and K.E. Soltan (eds.), *Citizen Competence and Democratic Institutions*, Penn State University Press, University Park, PA.

Putnam, R. (1993), *Making Democracy Work*, Princeton University Press, Princeton, NJ.

Putnam, R. (2000), *Bowling Alone: The Collapse and Revival of American Community*, Simon & Schuster, New York.

Schoon, C., H. Cheng, C. Gale, D. Batty and I. Deary (2010), "Social Status, Cognitive Ability, Educational Attainment As Predictors of Liberal Social Attitudes and Political Trust", *Intelligence*, Vol. 38, pp. 144-150.

Schyns, P. and C. Koop (2010), "Political Distrust and Social Capital in Europe and the USA", *Social Indicators Research*, Vol. 96, pp. 145-167.

Siedler, T. (2007), "Schooling and Citizenship: Evidence from Compulsory Schooling Reforms", *ISER Working Paper 2007-2*, University of Essex.

Torney-Purta, J., R.H. Lehmann, L.H. Oswald and W. Schulz (2001), *Citizenship and Education in Twenty-Eight Countries: Civic Knowledge and Engagement At Age Fourteen*, IEA, Amsterdam.

Touya, D.M. (2006), *Can We Teach Civic Attitudes?* Estudios Sobre la Economía Española, mimeo.

US Department of Education (1999), *The Civic Development of 9th-Through 12th-Grade Students in the United States: 1996*, National Center for Education Statistics, Washington, DC.

Uslaner, E.M. (1997), "Voluntary Organization Membership in Canada and the United States", Paper presented at the 1997 Biennial Meetings of the Association for Canadian Studies in the United States, Minneapolis, MN.

Verba, S. and N.H. Nie (1972). *Participation in America: Political Democracy and Social Equality*, Harper and Row, New York, NY.

Verba, S., K.L. Schlozman and H.E. Brady (1995). *Voice and Equality: Civic Voluntarism in American Politics*, Harvard University Press, Cambridge, MA.

Watts, R. *et al*. (2008), *Findings on a theory of youth socio-political development*, Paper presented at the Annual Meeting of the American Educational Research Association, New York, NY.

Whiteley, P. (2005), "Citizenship Education Longitudinal Study second literature review. Citizenship education: the political science perspective", *DCSF Research Report 631*, Department for Children Schools and Families, London.

Wilson, J. (2000), "Volunteering", *Annual Review of Sociology*, Vol. 26, pp. 215-240.

Wolfinger, R.E. and S.J. Rosenstone (1980), *Who Votes?*, Yale University Press, New Haven, CT.

Youniss, J. and M. Yates (1997), *Community Service and Social Responsibility in Youth: Theory and Policy*, Chicago University Press, Chicago, IL.

Chapter 4

Education and health

Koji Miyamoto and Arnaud Chevalier

In spite of rapid increases in life expectancy, OECD countries remain concerned about the deterioration in lifestyle habits and the sharp rise in chronic health problems. Can education play a role in addressing these health challenges? The literature suggests that education can help improve health by raising cognitive and socio-emotional skills and developing health related habits and attitudes. There is significant scope for education to improve children's health, but can it fulfil this role in isolation? Evidence suggests that essential cognitive and socio-emotional skills can be most effectively developed in the family environment during early childhood. With a strong start, children are better able to capitalise on their school experience. Community environment can also complement the efforts made in school and the family. To ensure the effectiveness, efficiency and sustainability of education's contribution to health, it is critical for schools to focus on enhancing what works, addressing what does not, and ensuring that the family and community environments are in harmony with school initiatives. Policy makers can support this by promoting policy coherence across sectors and stages of education.

4.1. Introduction

Despite rapid increases in life expectancy, health remains an important policy concern in OECD countries. There have been significant changes in the nature of health problems, with a sharp rise in conditions related to chronic debilitating conditions such as diabetes and severe depression and the deterioration of health-related behaviour in the areas of diet, exercise and drinking. In addition, the success of previous policies in increasing life expectancy has led to a growing share of the population at risk of "old-age conditions". Moreover, there are significant concerns related to health inequalities, as certain demographic and socioeconomic groups face significantly worse health circumstances (WHO, 2008). This chapter examines the role education can play in reducing health risks and inequality. While covering evidence on various health behaviours and outcomes, this chapter sheds light on three health domains: obesity, mental health and alcohol consumption.

Obesity rates have increased dramatically in the last 30 years so much so that the World Health Organization (WHO) deems it has reached epidemic proportions.[1] Approximately 1.6 billion adults around the world are overweight, including at least 400 million clinically obese (Rosin, 2008; WHO, 2009a). Obesity relates to serious chronic diseases,[2] disability, reduced quality of life, and shortened life expectancy.[3] Moreover, obesity has social and psychological dimensions and is associated with negative effects on the labour market in terms of wages and employment (Cawley, 2004; Rosin, 2008).

Mental health accounts for over a third of the burden of illness in western Europe (WHO, 2004). Depression, a common form of mental disorder, is the leading cause of disability and the fourth leading contributor to the global burden of disease in 2000; it is projected to reach second place in the ranking of DALYs[4] by 2020. The share of people reporting mental disorders range from 9% in Italy, Japan, Spain and Germany, to between 12% and 15% in Belgium, Mexico and the Netherlands, to 18% in France and 26% in the United States (OECD, 2009a). Mental, neurological and behavioural disorders cause immense suffering, reduced quality of life and increased mortality.[5]

The WHO estimates that about 76.3 million people suffer from diagnosable alcohol use disorders (WHO, 2004). These have caused approximately 1.8 million deaths (3.2% of total deaths) and a loss of 58.3 million DALYS (4% of total). Alcohol consumption is associated with numerous harmful consequences not only for the individual's health but also for relatives and the general population owing to its association with accidents and violent behaviour. Although the level of alcohol consumption in OECD countries declined by 15% between 1980 and 2005,[6] alcohol consumption remains high, with a yearly per capita consumption of almost 10 litres of pure alcohol. In

several OECD countries consumption increased during this period.[7] Alcohol consumption has also become more polarised.

Future generations are also at risk. In nine OECD countries, more than 15% of children aged 11 to 15 are either overweight or obese (OECD, 2009a), and the WHO reports that 20% of children and adolescents have mental health disorders. Alcohol use is also an increasing issue among adolescents. Kuntsche, Rehm and Gmel (2004) report that in 18 OECD countries about half of 15-year-olds had increased their binge drinking between 1995 and 1999.[8]

OECD countries face challenges involving health inequalities across demographic and socioeconomic groups. Various studies have shown significant gaps in life expectancy across diverse demographic and socioeconomic groups in OECD countries. For instance, in 2002, African Americans' life expectancy was 5.4 years less than that of white Americans (Cutler, Deaton and Lleras-Muney, 2006). In 1980, Americans and Mexicans at the bottom 5% of the income distribution had a 25% lower life expectancy at all ages than those in the top 5% of the income distribution (Rogot *et al*., 1992; Smith and Goldman, 2007, respectively). Mortality rates are lower among those with a higher occupational rank in the United States (Cutler, Lleras-Muney and Vogl, 2008). In England and Wales in 1997-2001, male manual workers could expect to live 8.4 years less than professionals, a gap that has been increasing since the early 1970s (Office of National Statistics, 2005). Moreover, health inequalities exist by occupational status even within white collar occupations (Marmot *et al*., 1991).

Significant inequalities in obesity and excess alcohol consumption also exist across demographic and socioeconomic groups. For instance, obesity is more common among low-income families and minorities (Baum and Ruhm, 2007)[9] and among women from a lower social class (Sobal and Stunkard, 1989). In most studies, men are more likely than women to engage in excessive alcohol consumption (Kuntsche, Rehm and Gmel, 2009). The prevalence of binge drinking is highest among adolescents and young adults, and in most countries alcohol consumption declines with age.[10] Socioeconomic conditions also significantly affect the propensity of adolescents and adults alike to engage in binge drinking (Kuntsche, Rehm and Gmel, 2009). People with low incomes, with less education and living in deprived neighbourhoods are generally more likely to suffer from mental health problems than the general population (Lorant *et al*., 2003). For most health outcomes, including mortality, one of the most significant health inequalities is found across education groups (Cutler and Lleras-Muney, 2010).

Poor health is a major burden for the affected individual[11] but also has significant financial consequences for governments. For instance, approximately 1-8% of national health expenditures in a number of developed countries can be accounted for by obesity (Morris, 2007).[12] The economic

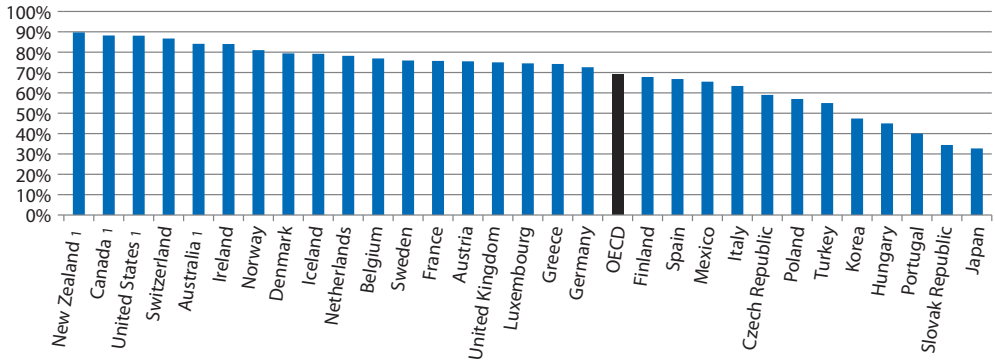
cost of mental health problems – including treatment and the indirect costs of lost productivity and absence from work – are estimated at more than 2% of GDP in the United Kingdom and slightly less in Canada (OECD, 2009a). The social and economic costs of alcohol abuse are also high, ranging from 1.1% of GDP (Canada) to 5-6% in Italy (WHO, 2004). Overall levels of health expenditure have increased to 8.9% of GDP in 2007, up from 3.9% when the OECD was founded in 1961 and are likely to increase further due to the ageing of the population (OECD, 2007; OECD, 2009b).[13]

What is the current state of indicators of health behaviour and outcomes in OECD countries? Figure 4.1 presents the distribution of self-reported health status[14] and suggests large variations across countries. North Americans, New Zealanders and Australians report the highest level of health. In Europe, Nordic countries (Norway, Denmark and Sweden) exhibit higher levels of self-reported health than southern (Spain, Italy and Portugal) and eastern European (Czech Republic, Poland, Hungary and Slovak Republic) countries.

Focusing on specific health outcomes reveals different rankings across OECD countries. On average, the incidence of obesity, as measured by the body mass index (BMI)[15] is high, at 15% of the adult population (Figure 4.2). This figure is relatively high in English-speaking countries and low in Asia (Korea, Japan) and Nordic countries (Denmark, Sweden and Norway). Figure 4.3 points to the relatively high prevalence of lifetime mental health problems in selected OECD countries (18% to 47% of the adult population) and shows wide variations across countries. Two English-speaking countries, the United States and New Zealand, have a high incidence of mental health problems, while in Japan and Italy the incidence is low. Lastly, Figure 4.4 shows alcohol consumption (in litres of pure alcohol per year) for a large number of OECD countries. Alcohol consumption in European countries such as Luxembourg, Ireland, Hungary, France and Austria is relatively high; it is much lower in non-European countries such as Canada, Korea, Japan, Mexico and Turkey.

Tackling the high incidence and inequalities of these health challenges has risen on policy agendas, partly owing to the high public costs associated with these health outcomes. Policy makers have a variety of tools at their disposal either directly, through health intervention, taxation and regulation, or indirectly, through education. This chapter considers whether education can contribute to the efforts made in the health and other sectors to tackle these health challenges. It looks at the total effects of education as well as the pathways through which education's effects operate, so as to assess the most effective policies and approaches for improving health behaviours and outcomes.[16] As this chapter suggests, there is indeed an important role for education to play. First, education may help individuals make informed and competent decisions by increasing knowledge, basic competences and

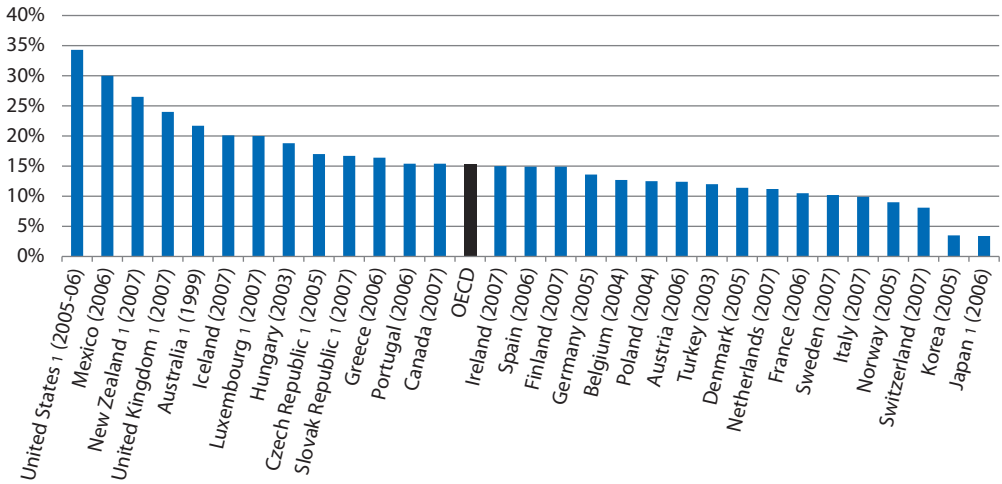
Figure 4.1. **Self-reported health status in OECD countries, 2007**



Note: Percentages of adults reporting to be in good health. Results for countries marked "1" are not directly comparable with those for other countries, due to methodological differences in the survey questionnaire resulting in an upward bias.

Source: OECD (2009b), *Health at a Glance* 2009, OECD, Paris.

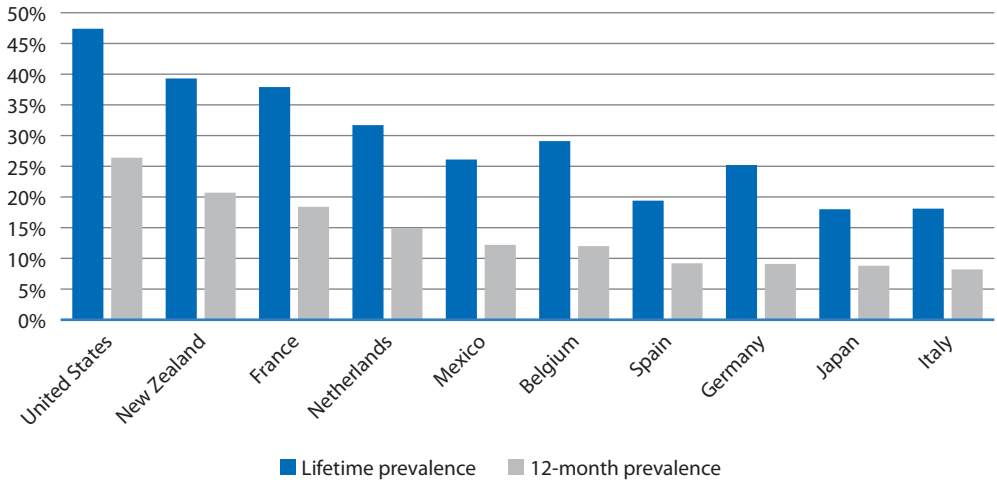
Figure 4.2. **Obesity in OECD countries, 2007**



Note: Percentages of adults aged 15 and above with body mass index (BMI) over 30. Results for countries marked "1" are based on health examination surveys, rather than health interview surveys.

Source: OECD (2009b), *Health at a Glance* 2009, OECD, Paris.

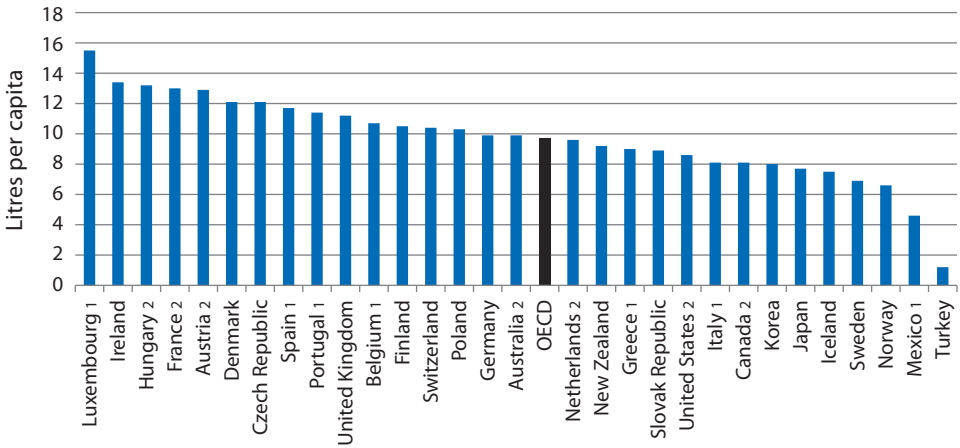
Figure 4.3. **Mental health problems in OECD countries, 2003**



Note: Prevalence of mental health problems, as a percentage of total population, 2003 or latest available year.

Source: OECD (2009c), Health Data 2009, OECD, Paris.

Figure 4.4. **Alcohol consumption in OECD countries, 2003**



Note: Litres per capita of alcohol consumption (15 years and over), 2007. Results for countries marked "1" are data for 2003, results for countries marked "2" are data from 2006.

Source: OECD (2009c), *Health Data* 2009, OECD, Paris.

socio-emotional skills, strengthening attitudes to risk as well as resilience and self-efficacy, and in so doing, help individuals choose healthier lifestyles and better manage illness.[17] Second, education helps individuals obtain better jobs, higher earnings, partners, safer residential areas and useful social networks which improve their living environment and access to health care.[18] Third, schools may provide an ideal environment in which children can develop healthier habits and lifestyles.[19] Fourth, an individual's education can also positively affect the health of others. For instance, educated parents may be better able to take good care of children's health conditions. The societal/community level of education may also affect individuals' health behaviour.[20] This creates a social multiplier to the effect of education.

The empirical evidence is consistent with this potential role of education. In OECD countries, better educated individuals are on average more likely to exhibit better health than the less educated, even after controlling for a variety of individual background characteristics (Grossman and Kaestner, 1997; OECD, 2007; Cutler and Lleras-Muney, 2010). Parental education is also associated with children's health behaviours. Some evidence suggests that the effect on health is causal.

Education can also reduce health inequalities by focusing interventions on disadvantaged groups (Grossman and Kaestner, 1997), by improving content so that education addresses more effectively and efficiently the health challenges of the disadvantaged population, and by fostering the contribution of family and community contexts. Meara, Richards and Cutler (2008) suggest that "larger and better-targeted efforts to push successful health interventions into less-educated groups may be needed to achieve the goal of reducing socioeconomic disparities in health".

Unfortunately, the available studies shed limited light on the issues of heterogeneity: *i.e.* which level of schooling matters most for fostering better health, and does education affect population groups differently? Moreover, the existing literature is limited in terms of providing a picture of viable causal pathways.[21] This chapter aims at reducing these knowledge gaps in order to better understand whether, to what extent, for whom, and how education is likely to raise health outcomes.

This chapter focuses particularly, though not exclusively, on three domains of health, namely obesity, mental health and alcohol consumption. BMI is the measure most frequently used to capture weight in relation to height. Following the classification of the WHO, an adult is considered overweight if the BMI ranges between 25 and 30. Adults with a BMI over 30 are considered obese. The empirical literature uses a variety of indicators of mental health conditions such as prevalence of mental health problems, share of people receiving treatment, experience of major depression and life satisfaction. In synthesising relevant evidence from the literature, this

study's original empirical analysis of mental health is operationalised using indices of mental distress, life satisfaction and happiness.[22] To capture alcohol consumption, the literature employs indicators that reflect quantity and frequency of drinking, as well as the degree of problem drinking.[23] This chapter sheds more light on problem drinking rather than moderate drinking since it is not clear whether moderate drinking poses health challenges, while the evidence that problem drinking such as binge drinking poses health challenges appears to be clear.

The rest of the chapter is organised as follows. First, the relationship between education and health is assessed with particular attention to differences in the relationship across levels of education, population groups and countries, and the causality of the effect. Second, diverse causal pathways are evaluated in order to clarify the probable ones. Third, the role of family and community is considered. This chapter ends by outlining the main findings as well as the knowledge gaps.

4.2. The relationship between education and health

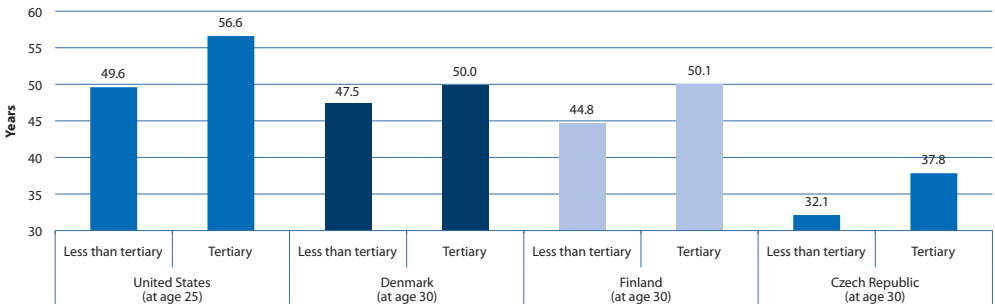
This section evaluates whether or not education relates to health behaviours and outcomes. It considers how the relationship vary across demographic and socioeconomic groups. The analysis is based on the existing literature and the original empirical analyses conducted by the OECD.[24]

Does education relate to health?

The relationship between education and health is most strikingly seen by assessing whether more-educated people live longer (Figure 4.5). In the United States, 25 year-olds with tertiary education are expected to live approximately seven years longer than those without. The comparative results for 30 year-olds in Demark, Finland and the Czech Republic are 2.5, 5.3 and 5.7 years longer, respectively. Moreover, the gap in life expectancy by tertiary attainment has increased over time for all these countries (Schkolnikov *et al.*, 2006 and Bronnum-Hansen and Baadsgaard, 2008; Meara, Richards and Cutler, 2008). In the United States, in particular, educational differentials in life expectancy increased by 30% between 1990 and 2000.

Consistent with this evidence, a large number of empirical analyses suggest that years of formal schooling completed is the most important correlate of good health outcomes (Grossman and Kaestner. 1997; OECD, 2007; Cutler and Lleras-Muney, 2010).[25] This result also holds across demographic groups, time periods and most OECD countries (Kitagawa and Hauser, 1973; Grignon, 2008; Meara, Richards and Cutler, 2008; OECD, 2010).

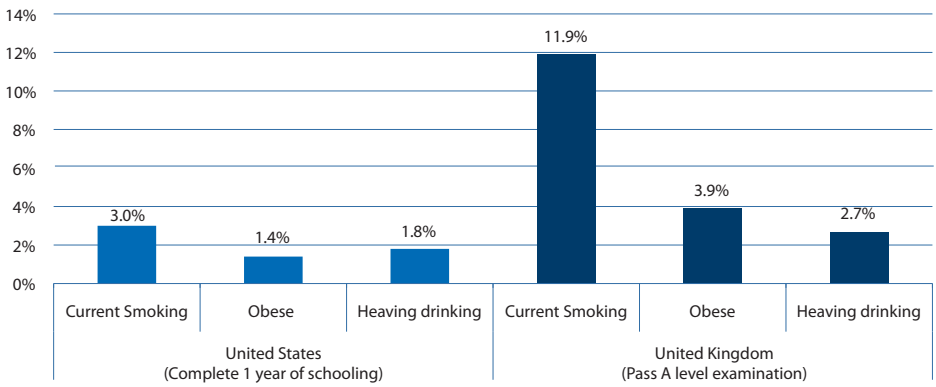
Figure 4.5. **Life expectancy and tertiary attainment, 1998-2000**



Note: Figure presents life expectancy at age 25 (in 2000 for the United States), and at age 30 (in 2000 for Denmark, 1998 for Finland and 1999 for the Czech Republic). Data for Denmark, Finland and the Czech Republic are based on authors' calculation using data presented in the sources.

Source: Meara, E.R., S. Richards and D.M. Cutler (2008), "The Gap Gets Bigger: Changes in Mortality and Life Expectancy, by Education, 1981-2000", *Health Affairs*; Schkolnikov, V.M. *et al.* (2006) "The Changing Relation between Education and Life Expectancy in Central and Eastern Europe in the 1990s", *Journal of Epidemiology and Community Health* and Bronnum-Hansen, H. and M. Baadsgaard (2008), "Increase in Social Inequality in Health Expectancy in Denmark", *Scandinavian Journal of Public Health.*

Figure 4.6. **Correlation between education and measures of health (United States and United Kingdom), 1999-2000**



Note: The vertical axis presents the magnitude of associations. The National Health Interview Survey covers age 25 and up, while the National Child Development Study covers ages 41-42.

Source: Cutler, D. and A. Lleras-Muney (2010), "Understanding Differences in Health Behaviours by Education", *Journal of Health Economics.* Data source: National Health Interview Survey 2000 (United States); National Child Development Study 1999-2000 (Wave 6).

An important reason for these strong and persistent associations between education and health outcomes is likely to be differences in health behaviours across education groups (Cutler and Lleras-Muney, 2010).[26] According to the WHO, the ten leading risk factors of death include behavioural factors such as tobacco use, physical inactivity, low fruit and vegetable intake and alcohol use.[27] The leading risk factors also include those that are related to behavioural factors such as overweight and obese. In most countries there are significant education gradients for several of these risk factors (OECD, 2007; Cutler and Lleras-Muney, 2010).[28] Figure 4.6 shows strong correlations between education and being a current smoker, obese and a heavy drinker.[29] For example, a year of schooling in the United States is associated with a 1.8 percentage point lower probability of being a heavy drinker. Likewise, in the United Kingdom, those with A-level qualification are 12 percentage points less likely to be smokers than less educated individuals.

Does the relationship vary across population subgroups?

The relationship between education and health may vary depending on demographic and socioeconomic characteristics. This may be due, for instance, to the differential health returns to investing in education: individuals with lower life expectancy (*e.g.* male, poor) may face lower incentives to invest in their health. Individuals who face higher foregone earnings when ill may invest more in preventive measures. It may also be due to the differences in the quality of schools that each group attends.

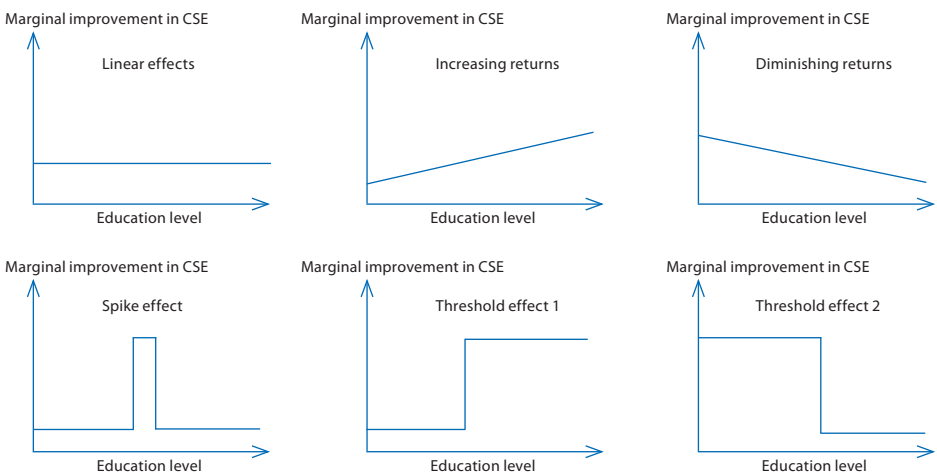
The relationship between education and health varies by gender: the effect of education is generally greater for women in terms of mortality, self-reported health, mental health and BMI.[30] The reverse is true for heavy alcohol consumption.[31] The association between education and health in the United States generally starts to decline during old age.[32] Cutler and Lleras-Muney (2006) also show that the benefits of education with regard to mental distress drop after 50 years of age.[33] Socioeconomic background also affects the education gradient. In the United States the health of the non-poor is more correlated with education than that of the poor (Cutler and Lleras-Muney, 2006). Similarly, education is more strongly correlated with reduced probability of being in mental distress among individuals from a higher social class (Borgonovi, 2010).[34] These results suggest complementarity between education and income in the production of health, and that education widens socioeconomic disparities in health outcomes. Hence, educational interventions targeted at disadvantaged groups may help reduce inequality. Indeed, Cunha and Heckman (2008) show that early interventions targeted at disadvantaged groups in the United States improve health outcomes such as reducing the incidence of smoking, crime and promiscuous pregnancy. Cutler and Lleras-Muney (2006) and Borgonovi (2010) find no difference by race across a large

number of health behaviours and outcomes, including mental health, in the United States and Europe.[35] However, Sassi *et al.* (2009) report a stronger gradient in obesity for white men in England. For BMI, the health gradient also appears to be stronger for migrants than for natives in the United States as well as in Australia (Seo and Senauer, 2009; Sassi *et al.*, 2009).

Does the relationship vary across education levels?

Although the evidence suggests that on average education is associated with better health, does this mean that each year of education completed (or each level of education attained) is equally associated with health? If not, identifying the level of education that yields the highest returns is important for policy.[36] Figure 4.7 provides illustrative examples of how the relationship between education and health may vary across levels of education. First, linear effects imply that each level/year of education has the same marginal effect on health.[37] Second, increasing returns may occur, for instance, if one progressively gains through education a variety of competences which further boost health returns. Decreasing returns occur when additional knowledge generates progressively fewer health gains. The spike effect occurs when what students typically learn at a particular level of education critically affects certain health behaviours but further education has no impact. It may be that a given level of education boosts health, and that after this point the health gradient remains high. Alternatively, it may be that some base level of competences is quite important but that anything beyond that only raises health modestly.

Figure 4.7. **Relationships between education and health: illustrative examples**



Kitagawa and Hauser (1973) and later Pappas *et al*. (1993), found a linear relationship between years of education and mortality among adults in the United States. Cutler and Lleras-Muney (2006, 2010) also report a linear relationship between education and mortality.

For other health outcomes, the education effect may not be linear.[38] Regarding self-reported health, OECD (2010) suggests that the relationship is stronger for those attaining upper secondary education compared with those attaining tertiary education.[39] In the Netherlands, the effect is also particularly marked for those attaining both lower and upper secondary levels of education (Hartog and Oosterbeek, 1998).[40] Cutler and Lleras-Muney (2006, 2010) also report a higher drop in the probability of reporting being in poor health among those who have completed upper secondary education than among those who have completed other levels of education. Hence, studies showing the marginal effects between education and self-reported health broadly suggest a threshold effect at the upper secondary level.

The education gradient for obesity increases after high school completion in the United States (Cutler and Lleras-Muney, 2006, 2010) while in Australia (for men only), Canada and Korea it increases with tertiary education (Sassi *et al*. 2009).[41] This suggests that the marginal effects between education and obesity are likely to be strongest at the tertiary level. The few studies on the education gradient for mental health suggest that the marginal effects is strongest at the upper secondary level (Chevalier and Feinstein, 2007; Cutler and Lleras-Muney, 2010; Borgonovi, 2010). Similarly, the health benefit of education with respect to excessive alcohol consumption tends to be strongest around secondary education (Cutler and Lleras-Muney, 2010, for the United States; Droomers *et al*., 2004, for the Netherlands; and Health Promotion Agency of Northern Ireland, 2002). The effect of tertiary education is minimal. The limited evidence suggests that upper secondary education is most strongly associated with better self-reported health and mental health conditions as well as reduced likelihood of excessive drinking, while tertiary education is most strongly associated with reduced incidence of obesity.[42]

Does education have a causal effect on health?

Correlations between education and health may simply reflect reverse causality or the confounding influence of unobserved individual, family or community characteristics on education and health.[43] It is important to measure the causal effects of education in order to determine whether education policies can help improve health.

The gold standard for establishing causal relationships is arguably the use of randomised control trials (RCTs) which are based on experimental data. Given the difficulty of obtaining (large-scale) experimental data on education

and health, the literature has generally used alternative methods and micro-data to evaluate causal relationships. The first and most commonly adopted method is the "natural experiment" in which specific policy changes (*e.g.* increase in the minimum schooling age) create an exogenous increase in the education of a select group of the population. The challenge is to find a credible policy change that increases the level of education (for a given population group) but does not directly affect health behaviours or health outcomes.[44] The second approach is to use longitudinal data that follow individuals over time. Such longitudinal data exist in few countries (*e.g.* the United States and the United Kingdom) but are still very rare. Such data enable researchers to control for individual characteristics that are not observable but may be assumed to be constant over time. Moreover, they also allow researchers to control for important factors (*e.g.* health status before entering schools) that are likely to affect both education and health outcomes during adulthood. The third approach is to use micro-data for identical twins so as to eliminate genetic and early environmental effects which are likely to affect both education and health outcomes. However, as in the case of longitudinal data, such data rarely exist, and when they do the sample size is small and does not necessarily collect health variables of interest.

Cutler and Lleras-Muney (2006) and Grossman (2006) review the literature on causality and conclude that schooling leads to better health. This chapter, which covers a number of recent studies, is more nuanced. While education is likely to have a positive causal effect on physical health, mental health and excessive alcohol consumption, the results with respect to mortality and self-reported health are mixed. Studies using data from the United States tend to find causal effects for mortality and self-reported health while studies using European data tend to show inconclusive results. This may have to do with the public provision of health in Europe, as explained below. Lastly, limited evidence is found on the causal effect of education on measures of obesity. For studies that suggest that education has a causal effect, the size of the effect tends to be large.[45]

Mortality

Using changes in schooling laws, Lleras-Muney (2005) and Glied and Lleras-Muney (2008) suggest that an increase in a year of schooling completed reduces mortality. Deschenes (2007) confirms these results using exogenous variations in cohort size as an instrument for education.[46] However, Mazumder (2006) shows that Lleras-Muney's results become statistically insignificant when accounting for time trends that are specific to each States (in the United States). In Europe, changes in compulsory schooling laws have also been used as instruments for education. Positive causal effects of education on mortality are found in Italy (Cipollone and Guelfi, 2006) but not in the United Kingdom or France (Clark and Royer, 2008, and Albouy and Lequien, 2009, respectively).

Self-reported health

As in the case of mortality, studies using micro-data from the United States suggest causal effects of education while evidence from Europe is mixed. Relying on changes in compulsory schooling laws, Adams (2002) and Mazumder (2006) report that in the United States education has a significant effect on self-reported health. This is confirmed by Lundborg (2008) who uses a sample of twins. Similar results are found by Oreopoulos (2006) and Silles (2009) for the United Kingdom and Groot and van den Brink (2007) for the Netherlands. However, other studies using the same identifying strategy do not find that education has a causal effect on self-reported health in the United Kingdom (Doyle, Harmon and Walker, 2007; Clark and Royer 2008), or Denmark (Arendt, 2005). Finally, Leuven, Oosterbeek and Wolf (2008), using lotteries for attending medical schools, report no causal effect of medical education on self-assessed health.

The differences between US and European evidence may have to do with Europe's public health provision which guarantees access to health care for all. While a number of studies using European data show no causal effects, those that do report that the size of the effect is large. For Europe, an increase of a year of schooling raises the probability of men reporting being in good health by 3.2 to 4.5 percentage points (Oreopoulos, 2006; Groot and van den Brink, 2007). In the United States, the effect is even larger with Mazumder (2006) estimating that an additional year of schooling reduces the probability of being in fair or bad health by 8.2 percentage points.

Physical health conditions

Arkes (2003) shows that an extra year of education, induced by intra-state differences in unemployment rates, reduces the probability of having a work-limiting condition among older adults in the United States. Adams (2002), for older adults, and Oreopoulos (2006) also show that compulsory schooling in the United States improves both "physical or mental health disability that limits personal care or mobility" and "disability that limits mobility". Similarly, an extra year of schooling (instrumented by parental education, father's occupation and local unemployment rate) has a large effect on reducing work limitations due to health for those with low levels of schooling and low cognitive ability (Auld and Sidhu, 2005).

In Europe, an additional year of schooling (induced by changes in the compulsory schooling law) reduces the reporting of bad health conditions (Spasojevic, 2003, for Sweden; Oreopoulos, 2006, and Silles, 2009, for the United Kingdom). Oreopoulos (2006) reports that an additional year of compulsory schooling lowers the likelihood of reporting "physical or mental health disability that limits personal care" by 1.7 percentage points, and also lowers the likelihood of reporting "disability that limits daily activity" by

2.5 percentage points. Adams reports that an extra year of schooling increases the likelihood of the ability to climb flights of stairs, stoop, kneel or crouch, or walk a block by 2-4 percentage points at ages 51 to 61.

Obesity

The number of studies evaluating the impact of education on obesity is increasing. They cover three regions: North America (United States), Europe (Denmark, Finland, Germany, the Netherlands, Sweden and the United Kingdom) and Asia-Pacific (Australia and Korea). Most use quasi-experimental methods (*e.g.* changes in compulsory schooling age, high school graduation requirements and school availability), while some use rich longitudinal data or twins samples.

Using reform of the minimum school leaving age, Spasojevic (2003), Arendt (2005) and Grabner (2008) found that schooling reduces BMI in Sweden, Denmark and the United States, respectively, or the probability of being overweight for European women (Brunello *et al.*, 2009). Webbink Martin and Visscher (2009) using twin data found that an additional year of schooling reduced the probability of being overweight for men in Australia. However, other studies suggest statistically insignificant evidence on the causal effects of obesity: Arendt (2005) for women in Denmark; Reinhold and Jurges (2009) for Germany; Leuven *et al.* (2008) for the Netherlands; Clark and Royer (2008) and Sassi *et al.* (2009) for the United Kingdom; Lundborg (2008) and Kenkel, Lillard and Mathios (2006) for the United States.

Overall, it is unclear what role education plays in reducing obesity.[47] Even when the effect is positive, the size of the impact is quite modest. Brunello *et al.* (2009), for example, report that an additional year of schooling reduces the BMI of European women by about 2%.

Mental health

A limited number of studies suggest that education helps improve mental health conditions in the United Kingdom. Oreopoulos (2006) and Chevalier and Feinstein (2007) show that an extra year of schooling (induced by changes in the compulsory schooling laws or students' rate of time preference) raises measures of mental health conditions such as life satisfaction and happiness and reduces the risk of poor mental health. The effect on depression is strongest for women with low-mid levels of qualifications. The size of the effect of schooling is quite large. Oreopoulos shows that an extra year of schooling, induced by compulsory schooling laws, increases the likelihood of being satisfied overall by 5.2 percentage points, and increases the likelihood of being very satisfied by 2.4%. Chevalier and Feinstein (2007) suggest that having a secondary education qualification reduces the risk of adult depression (at age 42) by 5-7 percentage points.

Alcohol consumption

A very limited number of studies have investigated the causal relationship between education and excessive drinking.[48] Using longitudinal datasets these studies suggest that education reduces excessive drinking. For instance, Häkkinen *et al.* (2006) find that an extra year of schooling reduces drinking on average by 0.77 grams per day in Finland. Droomers *et al.* (2004) estimate that, over a six-year period, the less educated were three times more likely to engage in excessive drinking than the most highly qualified. Leuven *et al.* (2008), exploiting the "lottery" feature of selection into medical university in the Netherlands, suggest that entrance to medical studies reduces the probability of excessive drinking (*i.e.* more than 14 drinks per week) by 1.2 percentage points. For Korea, Park and Kang (2008) do not report any causal effect of education on drinking behaviour. With the exception of the study of Droomers *et al.* (2004) the effect of education on drinking behaviour appears rather small.

Why is there a lack of robust results on causal effects?

The previous section suggests that the effect of education on obesity, drinking behaviour, mortality and self-reported health appears either mixed or modest. Does this mean that education has a limited role to play on these domains of health? Three arguments suggest that this is not necessarily the case.

First, the instruments used to identify the causal effects of education (*e.g.* changes in school leaving age) often only affect individuals at the margin of dropping out of secondary education. If another level of education (*e.g.* tertiary education) is important for raising a particular health domain, those instruments are less likely to be appropriate to evaluate the causal effects.

Second, the lack of causal effects implies that the total effect of education is statistically insignificant. Certain causal pathways that are strong and positive may be offset by the effects of other causal pathways that are equally strong but negative. For instance, education fosters cognitive and socio-emotional skills which may be important for curbing heavy eating and drinking, but it also raises occupational status, which may tend to encourage these activities.

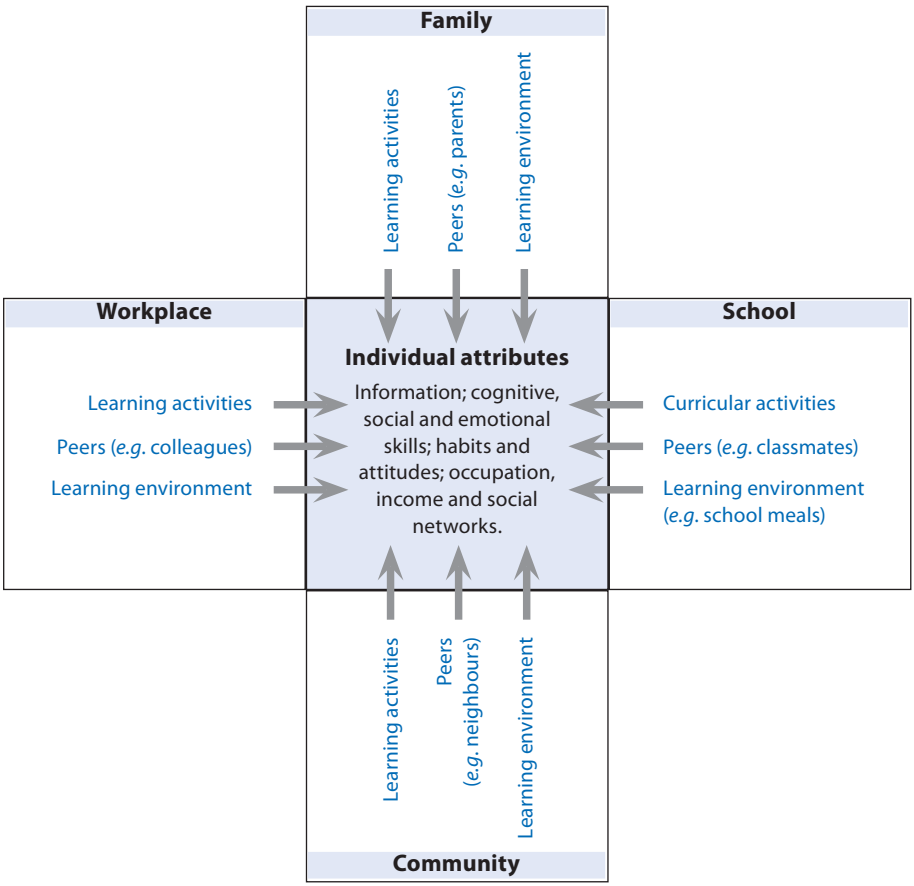
Third, education may confer positive health effects only under certain conditions. For instance, it may only have a positive effect when the family and community environments also encourage better health outcomes. The large variations in the effects reported so far may well be driven by differences in the family and community environments which interact with the effect of formal education. The environment may also explain the differences in estimates between countries.

The second and third arguments provide motivations to evaluate the role of causal pathways and the role of contexts.

4.3. Causal pathways

Evaluating the causal impact of an additional year of schooling is clearly an important exercise as they indicate the net impact of schooling on health.[49] Although more challenging, it is also useful for policy makers to understand how this learning experience translates into better health behaviours and outcomes. The arrows shown in Figure 4.8 describe pathways through which learning is likely to affect individual attributes that matter for health: learning activities, peers interactions and the learning environment. This framework highlights four contexts under which individual attributes are developed in the lifecycle: school, family, workplace and the community. The key individual attributes considered include information; cognitive, social and emotional skills; occupation, income and social networks.

Figure 4.8. **Causal pathways: contexts and learning shaping individual attributes**



For a child, for example, the most relevant contexts are the school and family. The figure suggests that an important role of these contexts is to raise the level of information as well as cognitive, social and emotional skills that can empower them to engage in healthy behaviour and achieve better health outcomes. Schools and the family can also be places in which individuals learn health-promoting habits, values and attitudes through peer interactions. On the one hand, parents have enormous potential to shape children's health-related values by themselves being (healthy) role models and encouraging children to follow healthy lifestyles. Classmates, on the other hand, can have a detrimental effect on children by encouraging smoking and under-age drinking. Finally, family and school can also create an important learning environment in which children directly absorb habits of healthy diet and lifestyles. For instance, the quality of food served at school and home every day may shape children's taste for a healthy diet.

For adults, the key contexts are family, workplace and community. The workplace can raise the worker's level of health-related information and skills directly if firms offer health-related training programmes and regular health checks. The workplace may also provide stable jobs and incomes which permit individuals to purchase health care and the means to maintain healthy lifestyles. Living in a community with a large proportion of educated people may discourage people from engaging in risky health behaviours such as binge drinking and excessive smoking.

Figure 4.8 suggests that individuals receive health benefits from learning through various means: intentionally (*e.g.* by obtaining information through formal learning), informally (*e.g.* by changing lifestyles through exercise) and unintentionally (*e.g.* by peer influence). This underlines the role diverse forms of learning (*i.e.* formal, informal and non-formal learning) play in promoting health.

Although not explicitly presented in the figure, contexts may interact, resulting in learning complementarities. For instance, school-based efforts to promote physical exercise may be reinforced by limiting sedentary practices at home. There may however be negative interactions. School efforts to promote healthy eating habits and behaviours can be undermined by family environments in which excessive amounts of high-calorie and low-nutrition meals are served. This points to the importance of ensuring consistencies across contexts.

The simplified figure does not show the dynamic interactions which are important features of education's effect on health behaviours and outcomes. One dimension of this interaction is the intergenerational effect of education. When schools and families successfully foster children's cognitive and socio-emotional skills, these children may further foster the cognitive and socio-emotional skills of the next generation. Another dimension is the lifecycle effect of education; cognitive and socio-emotional skills developed during early childhood mean more benefits from future investments in those skills: Skills beget skills (Cunha and Heckman, 2008).

Another feature implied by the figure is the role of social status. Educated individuals are likelier to have a higher occupational rank; this may reduce the level of work-related psychological stress and thus lower the mortality rate (Marmot *et al.*, 1991). Those with more education than others in the community may have easier access to scarce resources that promote health. Social status is not only an issue for adults; within-school hierarchies that determine popularity can also have consequences for children's mental and physical well-being.

It is important to note that certain pathways may well have negative effects. Although education raises income, the effect of income on health can be negative if having more income leads to excessive consumption of health-harming goods (*e.g.* cigarettes and alcohol). As mentioned, school attendance does not guarantee that children will develop health improving habits and attitudes when there are negative peer effects. Raising the average level of education in the community can also mean that some would lower their social status, resulting in more stress and limited access to health-promoting resources. Perhaps the variations in causal relationships are explained by differences in the effect of negative pathways across countries and domains.

The following section describes how learning activities, peers and learning environment affect health by shaping individual attributes such as knowledge, cognitive and socio-emotional skills; peer influence and school environment; and access to jobs, income and social networks.

Do information, cognitive skills and socio-emotional skills matter?

Arguably, one of the most important roles of learning experience is to develop diverse set of skills that empower individuals to be better informed, to better understand and to better follow healthy lifestyles.

Information

Schools can be an ideal place to teach essential health-related information. Such information may help students minimise health risks and promote good health. Alternatively, those with more schooling are more likely to obtain health-related information which may lead to better health.

What does the evidence say about the role of information in promoting better health? First, evaluations of school-based interventions that provide health-related information directly suggest a limited impact on health behaviours. For instance, Di Censo *et al.* (2002) review evidence on 26 policies to reduce early pregnancies and conclude that they had no impact on any of the outcomes of interest, such as initiation of sexual intercourse, use of birth control and teenage pregnancies. A review of the effectiveness of school interventions targeting alcohol, tobacco or

marijuana use found only a small effect which dissipated over time (White and Pitts, 1998). A recent review on interventions to prevent obesity also concluded that not enough evidence is currently available to assess their effectiveness (Katz *et al*., 2005). Second, a number of studies also suggest that information has a small role to play in explaining the relationship between education and health (see for instance Cutler and Lleras-Muney, 2010). Hence, the evidence on school-based interventions and pathways suggest that simply providing information does not seem to be very effective in improving health behaviours.[50]

The modest role of information may mean that it is making sense of the information or translating the information into action that is the real driver for improving health. If this is the case, schools might play an important role by raising cognitive and socio-emotional skills. Two examples from the United States are consistent with this hypothesis. First, after the Surgeon General of the United States warned the general public on the danger of smoking, smoking declined more dramatically among the more educated (De Walque, 2004). Second, after the introduction of mandatory calorie posting in New York, the purchase of calories in Starbucks outlets reduced more in neighbourhoods with highly educated people than in neighbourhoods with less educated people (Bollinger *et al*., 2010).[51] Lastly, Anderberg *et al*. (2008) find that the health scare regarding the safety of the measles, mumps and rubella vaccine resulted in more variation in vaccination rates in the most educated neighbourhood. These examples suggest that education enables individuals to better absorb information that promotes healthy behaviours. They also suggest that education can increase health inequalities.

Cognitive skills

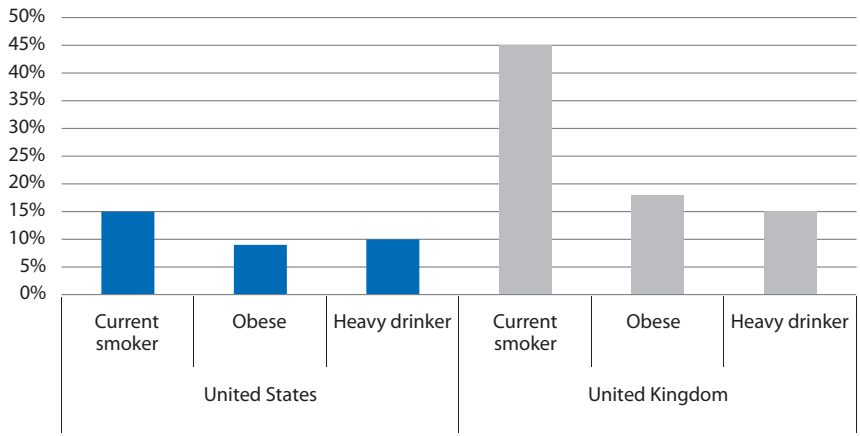
Schools can play an important role in raising cognitive skills such as reading and scientific literacy,[52] which may help people better digest information and successfully follow recommendations contained in the instructions. The Surgeon General's warning and Starbucks' posting of information highlight that it is the depth of understanding and the response to knowledge that play a critical role in shaping health behaviours. Moreover, cognitive skills such as the capacity to learn[53] may help individuals cope with health challenges. For instance, Lleras-Muney and Lichtenberg (2005) find that more educated individuals are more likely to use drugs more recently approved by the US Food and Drug Administration, but only if they repeatedly purchase drugs for a given condition (*i.e*. hence this applies to those who have an opportunity to learn). Case *et al*. (2005) find that the health gradient is steeper for chronic diseases, where learning is possible, than for acute diseases.

The literature suggests that cognitive skills play an important role. Low literacy is generally associated with a variety of adverse health outcomes, including mortality, long-term illness, self-perceived health, and respiratory and coronary heart disease (Hemmingsson *et al*., 2006; Batty *et al*., 2006).

There is evidence suggesting that reading skills help individuals cope with health treatments,[54] and that maths, reading and general ability skills lower the probability of engaging in risky health behaviours during childhood and adulthood (Heckman, Stixrud and Urzua, 2006; Carneiro, Crawford and Goodman, 2007). Canadian evidence also suggests strong correlations between health literacy and a range of health risks such as diabetes, drinking, high blood pressure, injuries, stress and asthma (Canadian Council on Learning, 2008).[55]

The literature has also evaluated the mediating role[56] of cognitive skills such as reading literacy, scientific literacy and higher-order processing in explaining the relationship between education and health.[57] Kenkel, Lillard and Mathios (2006) and more recently Cutler and Lleras-Muney (2010) show how basic cognitive skills explain the relationship between education and a variety of health indicators for the United States and United Kingdom.[58] Figure 4.9 presents results for smoking, obesity and heavy drinking. In the United States, ability measures are associated with a reduction in the education gradient for smoking by 15%, for obesity by 9% and for drinking by 10%. In the United

Figure 4.9. **Relationship between education and health explained by cognitive skills**



Note: Data represent the marginal reduction (in percentage points) in the regression coefficient of the marginal effects of education on health indicators after taking into account the effect of cognitive skills. NSLY 1979 (United States) include test scores for ten subjects: science, arithmetic, mathematical reasoning, word knowledge, paragraph comprehension, coding speed, numeric operations speed, auto and shop information, mechanical competence and electronic information. NCDS (United Kingdom) include test scores on math and drawing (age 7), reading, math, verbal, non-verbal and drawing (age 11) and math, and reading comprehension (age 16).

Source: Cutler and Lleras-Muney (2010). Data source: National Longitudinal Survey of Youth (NSLY) 1979 (United States); UK National Child Development Study (NCDS) 1999-2000 (Wave 6).

Kingdom, they reduce the education gradient for smoking by 45%, for obesity by 18% and for drinking by 15%. Furthermore, Cutler and Lleras-Muney find a significant mediating role for maths scores (for the United Kingdom) and higher-order processing (for the United States), but none for memory.[59] The authors also suggest, using complementary analyses based on longitudinal data, that education is more likely to be causally related to health because of its impact on cognitive skills.[60] In summary, cognitive skills are likely to play an important role in explaining the effects of education on health.

Social and emotional skills

Education may also affect individual's psycho-social traits such as social and emotional skills, which may help translate intentions (*e.g.* to follow healthy lifestyles) into actions. Those with higher social and emotional skills typically exhibit friendliness, empathy and self-esteem. They are also less likely to express hostility, anxiety and inconsequential behaviours. Such individual features will help reduce the likelihood of developing mental and behavioural disorders. Social and emotional skills may also help establish positive relationships with family, friends and the community and thus help reduce the likelihood of engaging in unhealthy lifestyles such as excessive drinking. Once individuals face health problems, persistence, self-efficacy and self-regulation may help them look for medical attention, comply with treatment[61] and deal with the psychological difficulties and inconveniences associated with sickness or illness. Previous studies have addressed how non-cognitive skills relate to health behaviour and outcomes (see Box 4.1).

Box 4.1 suggests that social and emotional skills may be important for shaping health-related behaviours and outcomes although the available evidence is limited and sometimes mixed.

Box 4.1. **Non-cognitive skills and health**

Resilience: Resilience refers to features that determine how adversity and stressful conditions are dealt with. More resilient individuals are more likely to respond to adversity in ways that are less damaging to their physical and mental health. Riley and Schutte (2003) find that poor psychological coping is correlated with drug-related problems, but not with alcohol-related problems. Barnfather and Ronis (2000) also report that higher levels of psychological development are related to positive health. Peyrot, McMurry and Kruger (1999) show that diabetes sufferers better manage their condition when their coping style is "self-control" rather than "emotional response". Although the evidence on the impact of resilience on health is limited and sometimes inconclusive, resilience is considered an important element in the ability of individuals to achieve better health outcomes or manage ill health (Feinstein *et al.*, 2006).

Box 4.1. **Non-cognitive skills and health** *(continued)*

Locus of control: Locus of control refers to the extent to which individuals believe that they can control events that affect them. Kenkel, Lillard and Mathios (2006), using the Rotter index of the locus of control, estimate that men with low locus of control are more likely to smoke and to be former smokers. Locus of control is more weakly associated with women's smoking and is not associated with the probability of being overweight or obese for either men or women. According to Brunello *et al.* (2008) weight gains are mostly related to lower level of self-control rather than a lack of information. Locus of control is likely to be related to an individual's tendency to act on impulse. For instance, Kuntsche, Rehm and Gmel (2009) report that impulsiveness is an important risk factor for drinking and that weak self-control in the seventh grade is linked to heavy drinking in the twelfth grade. Lastly, Heckman, Stixrud and Urzua (2006) also show that locus of control (using the Rotter index) explains a variety of risky behaviours including smoking and alcohol use.

Self-esteem: Social-learning theorists define self-esteem in terms of a stable sense of personal worth or worthiness (Rosenberg, 1965). A variety of evidence points to a strong relationship between high self-esteem and better health. Emler (2001), after reviewing the evidence on the relationship between self-esteem and eating disorders, concludes that low self-esteem predicts later indications of eating disorders. Moreover, numerous studies find a relationship between low self-esteem and suicide attempts in a variety of age and cultural groups. Lastly, self-esteem is closely associated with other measures of psycho-social features such as feelings about self, depression, negative effects, hopelessness, fatalism and locus of control (Feinstein *et al*., 2006).

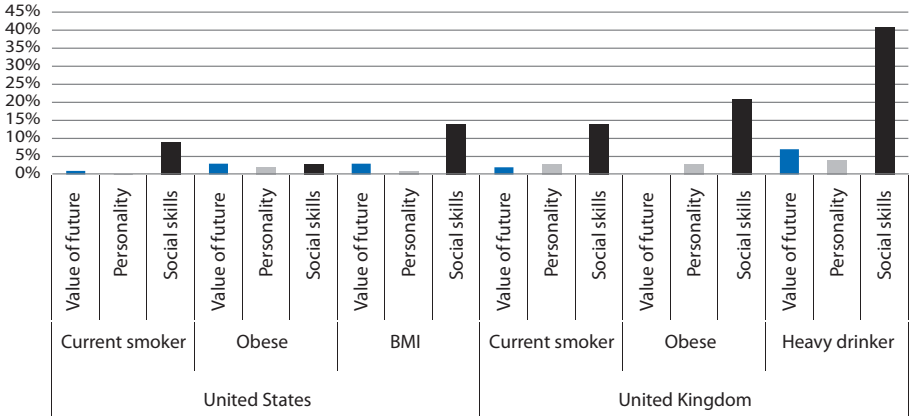
Social skills: Social skills are individual traits that facilitate interaction and communication with others. Carneiro, Crawford and Goodman (2007) find that these traits are strong predictors of adolescent social outcomes (*e.g.* lower probability of smoking at age 16 and teenage pregnancy), as well as adult social outcomes (poor or fair health and mental health problems).[62] For instance, they show that a one standard deviation increase in social skills is associated with 2.8 percentage point decrease in the probability of having mental problems at age 42. Almquist (2009), using Swedish longitudinal studies, reports that children's peer status in schools (which is presumably related to children's social skills) matters for subsequent health outcomes. The steepest gradients were found for behavioural disorders (*e.g.* alcohol abuse and drug dependence), external causes (*e.g.* suicide) and life-style related diseases (*e.g.* ischemic heart disease and diabetes).

Patience: Patient individuals are more likely to follow healthy lifestyles (or to reduce unhealthy practices) in order to stay healthy in the long term. Farrell and Fuchs (1982) find that the rate of time preference explains differences in the probability of smoking at age 24. Sander (1998) shows for the United States that time preference has a positive effect on the likelihood of quitting smoking. However, Cutler and Glaeser (2005) do not find this correlation among older individuals possibly because longevity issues become more salient. Using a representative panel of Dutch adults and more precise measures of discount rate, Borghans and Golsteyn (2006) fail to find evidence that discount rate is related to BMI or that changes in discount rate are a major factor in explaining the increase in BMI over time. Hence the evidence is mixed in terms of the role patience plays in health-related behaviours.

Cutler and Lleras-Muney (2010) evaluate the mediating role non-cognitive skills play in explaining obesity, drinking, mental health and smoking.[63] For the United States, value of future explains very little about the relationship between education and smoking and obesity (Figure 4.10).[64] Moreover, for the United States personality traits such as self-esteem (based on the Rosenberg self-esteem score), self-control (based on the Pearlin score), sense of control over one's life (based on the Rotter scale), depression and shyness (at age 6) have minimal effects on the relationship between education and smoking, drinking and obesity. However, Cutler and Lleras-Muney suggest that social skills (captured by indicators of social ties, social contributions, positive/negative relations with spouse and friends) explain a significant portion of the relationship between education and health outcomes. For instance, they explain 9% of the relationship between education and smoking, and 24% of the relationship between education and being overweight.[65]

For the United Kingdom, Cutler and Lleras-Muney also find value of future and personality traits such as self-efficacy[66] explain very little of the relationship

Figure 4.10. **Relationship between education and health explained by non-cognitive skills**



Note: The data represent the marginal reduction (in percentage points) in the regression coefficient of the marginal effects of education on health indicators after taking into account the effect of cognitive skills. The National Survey of Midlife Development (NSMD) 1995-96 (United States) includes measures of patience, personality and social integration (scales for social ties, social contributions, positive and negative relations with spouse, positive and negative relations with friends). The National Child Development Study (NCDS) (United Kingdom) includes measures of patience, personality and social integration (parents are alive, whether the respondent sees parents, whether they frequently eat together as a family, visit relatives, go out as a family, spend holidays as a family, go out alone or with friends, attend religious services).

Source: Cutler and Lleras-Muney (2010). Data source: National Survey of Midlife Development 1995-96 (United States); National Child Development Study 1999-2000 (Wave 6).

between education and smoking (Figure 4.10). When the authors focus their attention on the role of social skills,[67] the results are similar to those found when using the data from the United States. Measures of social and family ties explain a sizeable portion of the relationship between education and smoking (14%), being overweight (16%), obesity (21%) and heavy drinking (41%).

Cutler and Lleras-Muney's results suggest that, among the non-cognitive skills, social skills explain a sizeable portion of the relationship between education and health, while other non-cognitive measures (*i.e.* patience, self-efficacy, etc.) do not seem to play an important role. This result is consistent with Carneiro, Crawford and Goodman (2007) who show, using data from the United Kingdom, that social skills at age 7-11 are strong predictors of risky behaviour during adolescence (*i.e.* smoking and pregnancy) and adult health outcomes (*i.e.* self-assessed health, depression and mental health problems).

While social skills appear to be important for improving health behaviours, there is limited evidence suggesting that these skills are developed through school experience.[68] It may well be that families play a prominent role in developing social skills before children enter schools,[69] and that these skills remain constant. However, emerging evidence from economics suggests that non-cognitive skills are malleable later in life. These results are also consistent with evidence from neuroscience that the prefrontal cortex, which is known to regulate emotions and self-control, remains malleable after early childhood and into the early 20s (Knudsen *et al.*, 2006). Given that schools are an important place for students to make social interactions, it is plausible that the school environment may help foster the development of social skills, and that those skills affect health outcomes.

Do habits and attitudes matter?

Children can learn habits and norms of healthy lifestyles in school. They generally spend more time in school than in any other environment away from home. The characteristics of fellow students (peers) may have a bearing on mental health conditions as well as engagement in risky activities such as smoking, drinking and substance use. Healthy school meals and adequate amounts of physical education may promote a balanced diet and lifestyle. However, exposure to vending machines with highly calorific snacks and beverages may be health-deteriorating.

Peer influence

Much of the literature shows that individuals with friends who smoke, drink, do drugs or commit suicide are more likely to engage in the same activities (Cutler, and Lleras-Muney, 2006). In general, establishing the influence of one student on another (*i.e.* peer effects[70]) is very difficult since

peer effect is typically confounded with numerous forms of selection, as individuals may choose peers with characteristics and preference similar to their own.[71] However, studies which have attempted to address the selection problem show that peers alter health-related behaviours such as smoking and drinking, and that the size effect is considerable. Some of these studies suggest that peer effect tends to be more frequent among men.

Fletcher (2009) and Clark and Lohéac (2007), using the Add Health survey from the United States, show that school peers[72] have a significant effect on use of tobacco, alcohol and marijuana. The peer effect is particularly strong for boys. For girls, they only identified peer effects from friends. The impact of an increase in a peer's smoking by 25% on individual smoking is about 2.2 percentage points. Similar results are found by Pertold (2009) for secondary school pupils in the Czech Republic.[73] Lundborg (2008) uses Swedish data on classmates and school-grade fixed effects to report a large peer influence among children aged 12 to 18 on the decision to binge drink, smoke or use illicit drugs.[74] De Simone (2007) also estimates that participation in fraternities increases the probability of binge drinking among American college students by 9 percentage points. Trogdon *et al.* (2008) using Add Health data, control for peer group endogeneity and provide evidence of the effect of social interactions on BMI, especially for females and adolescents with high BMI. Renna *et al.* (2008) also used Add Health data and found that having friends with higher BMI increases girls' BMI. Finally, Fowler and Christakis (2008) show that an adolescent's and an adult's chances of becoming obese increase if he/she had a friend who became obese in a given time period.[75]

All told, health related habits developed through peer effects are likely be an important pathway that explains the role of education on health.

School meals

School meals can raise the level of nutritional intake and help children acquire healthy and balanced eating habits. These benefits may also result in better cognitive, social and emotional development and further improve health outcomes, both in the short and long run. This is particularly the case for disadvantaged groups which are less likely to receive balanced and nutritious food elsewhere. Previous studies have shown that policies that promote quality school breakfast and lunch programmes can improve school performance, nutrition status and health outcomes (Brown *et al.*, 2008; Jaime *et al.*, 2009; Story *et al.*, 2009; Belot and James, 2009). While many of these studies focus on the impact of particular policy interventions which alter existing school meals (*e.g.* increasing fruits and vegetables), the evidence on the overall impact of school meals is rather thin.

One of the few studies available on the impact of large-scale school lunch programmes relates to the National School Lunch Program (NSLP) in the United

States.[76] Studies suggest that programme participants have generally raised their intake of vitamins and minerals at lunch compared to non-participants.[77] However, Schanzenbach (2009) also finds that participants who consume school lunches are substantially more likely to be obese than non-participants.[78] Another prominent school meal programme in the United States is the School Breakfast Program (SBP).[79] Bhattacharya *et al.* (2006), using a difference-in-difference strategy to account for unobserved differences between schools with and without the programme, find that the SBP leads to better dietary habits without increasing total calories consumed or the frequency of eating breakfast. The SBP increases scores on the healthy eating index, reduces the percentage of calories from fat, and reduces the probability of low fibre, iron and potassium intake. In addition, SBP reduces the prevalence of vitamin and mineral deficiencies. After accounting for selection into NSLP and SBP, Millimet *et al.* (2008) conclude that "the SBP is a valuable tool in the current battle against childhood obesity, whereas the NSLP exacerbates the current epidemic" (p. 3).

In terms of physical exercise, limited evidence suggests that it helps reduce the incidence of obesity. For example, in the United States, the odds of becoming an overweight adult decreased by 5% for each weekday that adolescents of normal weight participated in physical education (Menschik *et al.*, 2008). The literature generally suggests that participation in curricular and extra-curricular activities at school can contribute to children's overall engagement in physical activities of moderate and vigorous intensity (Wechsler *et al.*, 2000; Verstraete *et al.*, 2006; Haerens *et al.*, 2009b). However, since time allocated to physical education classes is generally limited and insufficient (McKenzie *et al.*, 2000, cited in Haerens *et al.*, 2009b), more attention has been given to extra-curricular activities. Wechsler *et al.* (2000) provide a review of the literature on the role of extra-curricular factors in the school environment that influence physical activity[80] and find support for their health-enhancing value. Moreover, they also suggest that the psycho-social environment such as school norms can enhance physical activities (Wechsler *et al.*, 2000). While norms such as fitness and healthy eating can be developed in part by physical activities and nutrition programmes, they can also be communicated by the messages students receive from school officials and staff about the importance of the behaviours being promoted (Wechsler *et al.*, 2000).[81]

Increasing the amount of time spent on sports could possibly have negative consequences for academic outcomes owing to the reduction of time spent on academic studies and excessive tiredness. Past research suggests that this is not likely to be the case. A review of previous studies suggests that up to an hour of physical activity can be added to a school curriculum by taking time from other subjects without compromising student's academic outcomes (Trudeau and Shephard, 2008). Moreover, replacing time for physical education with academic subjects does not enhance students' grades in these subjects or their physical fitness (Marsh, 1992).

Vending machines

Past research suggests that the availability of low-nutrition, energy-dense food in vending machines at schools is strongly related to higher intakes of total calories, soft drinks and saturated fat as well as lower intakes of fruits and vegetables, milk and key nutrients (Kubik *et al*., 2003; Story *et al*., 2009). In contrast, in schools with food policies that restrict access to less nutritious high calorie foods, students consume less of these foods during the school day (Hartstein *et al*., 2008). Anderson and Butcher (2006) find that a 10 percentage point increase in access to vending machines is associated with a 2.2 percentage point increase in the BMI index of students with overweight parents. Anderson and Butcher also find that the introduction of vending machines may have some impact on obesity rates among high school students. Unhealthy food is frequently introduced as part of a school's fund-raising schemes and classroom rewards. According to Kubik, Lytle and Story (2005), there is a strong association between such practices and BMI. Students' BMI increased by 0.10 BMI units for every additional food practice permitted in their school. These studies, albeit solely based on US evidence, suggest that exposure to such "competitive food" at schools may increase students' risk of obesity.

In sum, peers, the quality of food available and opportunities for exercise can play an important role in developing habits and attitudes towards healthy diet and lifestyles. This may be a significant factor in the relationship between education and health.

Do income and social networks matter?

School's roles are not limited to raising skills and developing habits and attitudes that would help individuals manage healthy lifestyles better. Education would also indirectly raise income and widen social networks, which could improve access to better health care and also reduce the risk of engaging in unhealthy lifestyles.

Income

While it is well established that education has a causal effect on income (see Card, 1999, for a review), does income have an effect on health? The vast literature on the socioeconomic gradient of health suggests that there are strong correlations between income and a battery of health indicators such as mortality, self-assessed health status,[82] smoking, heavy drinking and obesity (Cutler, Lleras-Muney and Vogl, 2008; Cutler and Lleras-Muney, 2010; OECD, 2010) and even mental distress (Fletcher and Frisvold, 2009). However, the evidence of causality is mixed. The difficulty in estimating a causal effect is that individuals' unobserved characteristics may affect both health and income; additionally, the causation may be reversed, *i.e.* from health to income.

Surprisingly, only a handful of studies find that income has a positive causal effect on health in the United States. They include Meer, Miller and Rosen (2003), who use changes in income due to inheritance and Halliday (2009) who relies on longitudinal data to account for individual heterogeneity. Estimates using longitudinal data such as Adams *et al.* (2003) or Smith (2007) suggest that causality runs from health to wealth. Moreover, Snyder and Evans (2006) and Evans and Moore (2009) find that mortality increases with income.[83] Similarly, Ruhm (2000, 2006) estimates that recessions improve adult health, as individuals engage in healthier lifestyles during downturns: they exercise more and drink and smoke less.

In other countries, the results are also ambiguous. East Germans reported only small improvement in health satisfaction after the positive income shock created by reunification (Frijters *et al.*, 2005).[84] Lottery winners are reported to have better health and longevity in Sweden (Lindahl, 2005) and improved mental health (GHQ score) in the United Kingdom (Gardner and Oswald, 2007). However, Adda *et al.* (2009) report that an increase in permanent income is associated with an increase in the consumption of cigarettes and alcohol in the United Kingdom.[85]

In sum, despite the strong positive correlation between the two variables, the evidence suggests that the causal effect is potentially negative in the short run and ambiguous in the longer run.

Access to social networks

The correlation between social support and health outcomes is also well documented. Individuals with limited access to social networks are more likely to engage in excessive drinking (Droomers *et al.*, 2004). Lack of social support may in itself cause stress, resulting in loneliness or lack of identity for which excessive drinking may be a reaction or coping mechanism (Thoits, 1995). Indeed, Borgonovi (2010) shows that social support (*i.e.* having friends and emotional support) is an important factor mediating the relationship between education and mental distress. In addition, those who can rely on social support generally are less affected by stress (Kessler and Cleary, 1980; Johnson and Pandina, 1993; Murrell and Norris, 1991, cited in Droomers *et al.*, 2004; Hemmingsson *et al.*, 2006). It is however unclear whether the relationship between social support and health is causal.

4.4. The role of family and community

The focus so far has been on how schools empower individuals to prevent and manage potential health challenges. Do schools play these roles in isolation, or do family and community also play a critical role? During the

early years of life, when their brain is at its most malleable, children typically spend a significant amount of time at home and develop skills, habits and attitudes that matter for health. Family also comes into play during adolescence and adulthood, albeit to a lesser degree compared to pre-adolescence. The larger community may also have a bearing on health. An individual living in a highly educated community may feel the social pressure that would lower the temptation to engage in heavy drinking and substance abuse. A child living in a community with easy access to high-calorific and unhealthy food, and limited opportunity to engage in exercise would have little incentive to follow a healthy lifestyle.

Nurturing critical skills in the family

Cognitive, social and emotional skills play a significant role in improving health behaviours and outcomes. When should these skills be developed? The emerging research on lifecycle models of skill formation points to the importance of early parental investment in children's cognitive and non-cognitive skills (Cunha and Heckman, 2008). Heckman *et al.* (2006) show that low cognitive and non-cognitive skills during early childhood explain risky behaviours such as smoking and pregnancy by age 18 in the United States. Carneiro, Crawford and Goodman (2007) suggest that low cognitive and non-cognitive skills at age 11 affect teenage pregnancy, depression and low self-assessed health at age 42 in the United Kingdom.

Family plays a prominent role in fostering children's cognitive, social and emotional skills. Heckman, Stixrud and Urzua (2006), Carneiro, Crawford and Goodman (2007) and Cunha and Heckman (2008) show that parental investment is significantly related to skills development during early age, and that the higher these skills, the more they develop in the following period.[86] Hence, skills beget skills. In particular, Cunha and Heckman (2008) suggest that early intervention programmes have a high payoff primarily from the social skills and motivation they impart to the child.

Social and emotional skills are particularly useful in the sense that they leverage the positive role of cognitive skills (Carneiro, Crawford and Goodman, 2007; Cunha and Heckman, 2008). For instance, Carneiro, Crawford and Goodman show that higher cognitive skills "raise" smoking at age 16 if children have low non-cognitive skills but that when non-cognitive skills are fixed at a high level, the likelihood of smoking at age 16 decreases in line with cognitive skills. It is likely that non-cognitive skills enable individuals to benefit more from cognitive skills. The complementary nature of these skills may help further boost the economic and social returns to skills.

Family and community features that matter

Educated parents

Maternal education levels are strongly associated with infant and child health in a number of OECD countries. For instance, Currie and Moretti (2004) find for the United States that women living in counties with colleges were more likely to attend college and had healthier babies. Similar results are found by Chevalier and O'Sullivan (2007) and Chou *et al*. (2007) for the United Kingdom and Chinese Taipei (respectively).[87]

The effect of parental education on child health may persist to adulthood. Classen and Hokayem (2005) estimate that children of university-educated mothers in the United States are 7% less likely to be overweight or obese as adults than children of high school dropouts. Case, Fertig and Paxon (2005) find that the education gradient opens up with age in the United Kingdom. Roos *et al*. (2001) and Vereecken, Keukelier and Maes (2004), using data from Finland and Belgium, respectively, show that maternal education is associated with the quality of food consumed during adulthood. However, there is also evidence suggesting no significant effects of parental education. Doyle, Harmon and Walker (2007) show that compulsory schooling laws affecting mothers' levels of education in the United Kingdom did not affect children's self-reported health and long-term chronic illness. Kenkel, Lillard and Mathios (2006) find for the United States that despite correlations between parental schooling and children's BMI[88] the relationship is not causal.[89] Borgonovi (2010) also suggests that individuals with fathers who achieved post-secondary qualifications tend to have higher levels of distress than individuals with fathers with secondary qualifications or less.[90] Hence, while the evidence suggests that parental education has an effect on infant's health this effect does not necessarily persist until adulthood.

Why does parental education matter for children's health? One possible reason is that educated mothers are more likely to follow healthier practices during pregnancy which would have a bearing on babies' post-natal health conditions.[91] Educated mothers may also have more resources to invest in each child since they are more likely to be married at the time of birth, have fewer children (Currie and Moretti, 2004) and have higher income (Card, 1999). This would enable them to purchase more and better health-related goods and services for their children. The evidence suggests that there is a significant association between family income and various measures of child health in the United States, Canada and to a lesser extent in the United Kingdom (Case *et al*., 2002; Currie and Stabile, 2003; Currie *et al*., 2007).[92] Moreover, there is also causal evidence on the impact of family income on child outcomes, Mulligan and Stabile (2008) estimate that a USD 1 000 increase in family income (due to changes in child benefits) is associated with reduced anti-social behaviour and physical aggression as well as improvements in height.[93]

Parental education may also matter if educated parents are better at developing children's cognitive, social and emotional skills. Indeed an increasing number of studies suggest that more able and engaged parents help foster children's cognitive and non-cognitive skills (Carneiro and Heckman, 2003; Cunha *et al*., 2005; Heckman and Masterov, 2007). For the United Kingdom, Carneiro, Crawford and Goodman (2007) show that parental education strongly affects cognitive and social skills, and that these skills are the key determinants of smoking, teenage pregnancy and mental health.[94] For the United States, Cunha and Heckman (2008) suggest that maternal education and cognitive skills are important determinants of cognitive and non-cognitive skills.[95]

Educated spouse

Research shows that who you live with matters (Ross, Mirowsky and Goldsteen, 1990; Macintyre, 1992; Joung *et al*., 1996). Recently, researchers have investigated the health impact of living with a spouse with different levels of educational attainment. Indeed they suggest that one's partner has a lasting influence on several dimensions of health. Bosma *et al*. (1994) found that men whose spouses had little education had increased risk of mortality from all causes, even controlling for their own educational level.[96] Monden *et al*. (2003), using a large dataset on Dutch couples, find that the partner's education is significantly associated with smoking and self-assessed health for both men and women (after accounting for own education). The authors argue that the partner's education affects material circumstances and psychosocial factors (social network, stress, social support and coping) which in turn affect health. Finally, Borgonovi (2010), using the European Social Survey, reports that individuals living with an educated partner tend to be happier and less likely to suffer from high levels of stress.[97]

Home environment

Given the large amount of time children spend at home, the home environment is likely to influence children's mental and physical well-being.

Cunha and Heckman (2008) show that "having books, newspapers and musical instruments at home" and "child receiving lessons and going to museums and theatre" raise children's cognitive and non-cognitive skills. Carneiro, Crawford and Goodman (2007) suggest that parents' reading habits and interest in the child's education matter for developing children's social skills.[98] According to their calculation, changing maternal interest in the child's education from low to some would be associated with an increase of nearly half a standard deviation in social skills at age 7.

Television viewing may also matter for children's development. Gortmaker *et al*. (1999) present an evaluation of a school-based integrated health intervention

(Planet Health) to tackle obesity among children attending grades 5 and 8 in Massachusetts, United States.[99] The intervention increased physical activity, reduced TV watching, increased consumption of fruits and vegetables and resulted in an incremental reduction in total energy intake (among girls). Moreover, a reduction of TV viewing reduced the prevalence of obesity for girls. Although the study only covered a limited set of potential influences in the home learning environment, it suggests that both the physical environment (having books at home, reducing TV hours) and parental engagement (showing interest in children's education, and actively participating in reading) are important in the context of children's health.

Average level of education in the community

The neighbourhood's educational level may have a strong influence on the social norms of the community. The community may also provide "positive role models" and "social connections" which help to prevent and deal with health-related issues. However, living among highly educated people may also have negative effects if this leads to competition with advantaged peers or discrimination that may affect the mental well-being of individuals.

There is limited evidence that appropriately evaluates the impact of community/country level education on health outcomes.[100] One such evidence is based on a social experiment called Moving to Opportunity which operates in five cities in the United States: Baltimore, Boston, Chicago, Los Angeles and New York. This experiment randomly allocates vouchers to poor families to allow them to move to a different neighbourhood.[101] Kling *et al*. (2007) find large positive effects for both physical health (reduction in the risk of being obese) and mental health (improvements in calmness and peacefulness, reduction of psychological distress). The level of anxiety and physiological stress improved among the youth and alcohol consumption declined for girls. The effect of better neighbourhoods on mental health is large and "comparable to that found in some of the most effective clinical and pharmacological mental health interventions".

Borgonovi (2010), using the European Social Survey, presents the relationship between the average education in the country and mental health.[102] It suggests that the greater the proportion of individuals who have attained post-secondary education in the country, the happier and more satisfied with their lives people tend to be.[103]

Other community environmental factors

Other community environmental factors may also directly contribute to health behaviours. A typical example is access to health-enhancing facilities such as sports clubs and hospitals. A review of the literature on

environmental factors associated with adults' participation in physical activity concludes that accessibility of health-improving facilities is correlated with physical activity (Humpel *et al*., 2002). However, this result does not hold for adolescents. Haerens *et al.* (2009a) report that perceived accessibility of facilities is unrelated to engagement in sports, while availability of sedentary (*e.g.* Play stations and TVs) and physical equipment at home is related.

As mentioned, not all community characteristics are health-promoting. For example, fast food restaurants are often blamed for increasing BMI. The increased availability of fast food restaurants has probably made it easier for children to consume on the way to and from school, possibly undermining school-based programmes or home rules. Two recent studies shed light on the causal effects of fast food restaurants, and suggest that they do indeed raise the incidence of obesity and weight gain. Brennan and Carpenter (2009) estimate that students whose school is within half a mile of a fast food restaurant are more likely to be overweight or obese than youth whose schools are not near such restaurants.[104] They also find that those students also consumed fewer servings of fruits and vegetables and consumed more servings of soft drinks. Currie *et al.* (2010) also find that a fast food restaurant within 0.1 miles of a school results in a 5.2 percentage point increase in obesity rates.[105] Note, however, that much of the evidence linking fast food restaurants and obesity is not strong.

Other characteristics, such as pollution, can have negative effects on child health. Currie and Walker (2009) find that a reduction in traffic (due to toll collection) reduces the probability of low birth weight by 12%.[106]

4.5. The role of social status

Another important indirect effect of education may come from the social status it confers. The nature of social status depends on the domains of social interactions that individuals choose to inhabit. Those higher in the job hierarchy obviously have a higher occupational status, while those whose relative level of education compared to one's neighbours is higher are likely to have a higher social status. Social status also exists in schools and have a bearing on who is popular and who is prone to being bullied. The idea behind the effects of social status is that being at a lower social rank generates stress which leads to worse health outcomes for these individuals.[107]

Occupational rank

The Whitehall study of British civil servants documents that lower ranking civil servants have higher mortality rates for all causes with behavioural precursors including obesity, propensity to smoke and lower propensity to

exercise and eat fruits and vegetables (Marmot *et al*., 1991). A lower rank in the hierarchy was associated with less sense of control over one's health and work, lower job satisfaction, limited social support and more stressful life events. Studies from the United States (Operario *et al*., 2004) and Chinese Taipei (Collings, Goldman and Rodriguez 2008) show that similar patterns prevail.

Among the limited studies that shed light on the causal effects of ranking on health outcomes, Rablen and Oswald (2007) compares the mortality of Nobel-prize winners and nominees. Although not precisely a representation of occupational ascent, obtaining a Nobel-prize constitutes increase in the ranking within the academic or political communities. Winning, which can be seen as a random event among this highly selective group, increases life by up to two years compared to simply being nominated. Thus, ranking even among very similar individuals can also matter.

Educational rank

The level of education in the community may matter to individuals because it determines the position of an individual's education relative to that of others. This is so-called "relative effects" of education (OECD, 2007).[108] Given that education can be an important marker of social status/rank, it is probable that relative position may affect health behaviours and outcomes. Two studies conducted by the OECD shed light on this.

Sassi *et al*. (2009) suggest that relative effects of education on obesity come into play in Australia, Canada and England. Its effects appear to be larger than the effect of individuals' education. Borgonovi (2010) using the European Social Survey, looks at the impact of education on a battery of measures of mental health (including indicators of distress and dissatisfaction), and finds no evidence suggesting the relative effects of education on any measures.[109]

Popularity in schools

Almquist (2009) sheds light on the role of children's status in schools. Evidence based on the Stockholm Cohort Studies suggests that the lower the childhood peer status (*i.e*. popularity), the higher the incidence of mental disorders, alcohol abuse and diabetes in adulthood.[110] Almquist also finds that the impact of peer status varies significantly in terms of health behaviours and outcomes. Some of the steepest gradients are found for mental and behavioural disorders (*e.g.* alcohol abuse and drug dependence), external causes (*e.g.* suicide) and various lifestyle-related diseases (*e.g.* ischemic heart disease and diabetes).

4.6. Interventions that address multiple pathways and contexts simultaneously

The previous sections have looked at how learning improves health behaviours and outcomes by describing probable causal pathways and underlying contexts in which education may matter for health. It would be useful to see if these contextual factors have a significant effect when combined through integrated policies. In the United States, Head Start[111] provides an opportunity to evaluate the effectiveness of a coherent policy which combines educational, nutritional and medical interventions for children with education and complementary support for parents.[112] This programme, which targets low-income parents, has been one of the largest federal investments in human capital since the launch in 1965. It has covered approximately 900 000 preschool-aged children (mainly aged 3 to 5) and their families.[113] The current programme provides multi-sectoral interventions, including education, health, nutritional and social services delivered through classroom programmes (full or half day),[114] health check-ups,[115] nutritious meals,[116] and family support.[117]

Evaluations of Head Start suggest mixed results, ranging from small to large impacts in the short run to non-existent or small effects in the long run. However, recent studies are more positive. For instance, Frisvold (2007) finds that programme participation reduces the probability that an African-American participant will be obese later in life.[118] Frisvold and Lumeng (2009) estimate that participation in the full-day Head Start programme reduces the likelihood of obesity by 17.6 percentage points. Similarly, Carneiro and Ginja (2008) find that participation reduces the incidence of obesity and of depression among teenagers. A randomised controlled trial evaluation of Head Start estimates a positive impact on short-term outcomes in the areas of cognitive skills, non-cognitive skills, health and parenting, but not in the long term (US Department of Health and Human Services, 2010).[119] The evaluation made at the end of kindergarten suggests that positive and statistically significant outcomes are only found for the vocabulary measures, closer relationship with parents, self-assessed health and coverage of health insurance, and authoritarian parenting, spanking and absences in kindergarten.

The results of the randomised controlled trial does not necessarily provide the impact of participating in early childhood education and care (ECEC) programmes since a large fraction of children in the comparison groups participated in other ECEC programmes.[120] Moreover, while the long-term impact on the Head Start group over the control group was very small, its impact on the quality of education received was shown to be much greater. This may suggest that the educational component matters only when other components of the Head Start programme are appropriately provided. For

instance, some ECEC programmes may have offered better quality school meals and family assistance programmes.

There is evidence on the impact of integrated interventions for older children. Gortmaker *et al.* (1999) use a small-scale randomised controlled trial on secondary school children (grades 6 to 8) in Massachusetts, United States, to evaluate the impact of a school-based integrated health intervention on obesity.[121] They find that obesity among girls was reduced compared to controls (with odds-ratio 0.47) although there was no difference among boys.

Overall, the assessment of the literature on interventions that simultaneously tackle various pathways and contexts suggests that policy coherence (or integrated delivery) can be an important way to effectively and efficiently improve health-related behaviours.

4.7. Summary of findings: What we know and don't know

This chapter has extensively documented the relationship between education and health. It focused on the evidence that the effect of education is causal and discusses the most prominent pathways. Table 4.1 provides a summary of the key findings and identifies the gaps in the knowledge base. It suggests that the knowledge base generally covers a wide range of domains, countries, levels of education, causal pathways and contexts. However, it also points to a limited depth of coverage which inhibits drawing inferences that are useful for policy.

The general conclusion is that education can certainly help improve health behaviours and outcomes. This can be done in part by raising cognitive, social and emotional skills, and early launching of these competences would not only be an efficient way to improve individual health but also an effective way to reduce health inequalities when targeted at disadvantaged groups. However, the power of education hinges on the extent to which family and community environments are in line with efforts made by teachers and school administrators. Policy makers can support this by promoting policy coherence across sectors and stages of education.

Table 4.1. **The relationship between education and health**
Findings from the present study

	What we know	What we don't know
Causal effects of education	• Early childhood education: US-based programmes targeted to the disadvantaged reduced obesity and risky health behaviours, and improved mental health in the short run. • Secondary education: Improved mental health in the United Kingdom. Ambiguous effects on obesity in many countries including the United States and Europe. • Tertiary education: No effects found on obesity for Germany (women) and the Netherlands. However, correlational studies suggest a potentially important effect of tertiary education on obesity. • Adult education: Correlational studies suggest that adult literacy can help raise the level of health among the disadvantaged. • Average effects: Reduced obesity in Australia, increased exercise in the United States and Finland. Reduced drinking in the Netherlands and Finland.	• Causal evidence is generally limited for all three domains of social outcomes, but particularly for mental health and drinking. • Causal evidence exists predominantly for the United States and the United Kingdom. Further evidence from other countries is needed to validate results and assess whether cross-country differences are due to variations in provision of public health and social welfare. • Causal evidence remains limited for early childhood, tertiary and adult education. It would be interesting to know if early childhood education has a positive effect on health (e.g. daycare vs. parenting). • Causal evidence that differentiates types of schooling (vocational vs. academic; humanities vs. science) is also non-existent; however, it is challenging to fully account for the effect of self-selection into different types of education.
Causal pathways	• Information: Modest effect. • Cognitive skills: Strong for literacy, numeracy and higher-order processing. Weak for memory skills. Early investment is important. • Social and emotional skills: Strong for social skills. Social and emotional skills are important when developed early. Although early investment is important, social and emotional skills are malleable during later childhood. • Income: Income effects are very weak. • School environment: obesogenic environment in schools (school lunch, vending machines) may affect children's diet and lifestyles at least in the short-run. • Implications for inequality: Education can be a mechanism to propagate intergenerational inequality since children from educated parents tend to develop healthy lifestyle and habits better. Early interventions that raise cognitive, social and emotional skills among the disadvantaged population are likely to be most effective. Raising adult literacy is also likely to help reduce adult health inequalities. On the other hand, provision of more information may exacerbate inequality, since the more educated are likely to benefit most.	• Evidence is limited on causal pathways, particularly among school-aged children and adults. • Evidence does not shed clear light on the relative impact of different pathways. • Most evidence is from the United States and the United Kingdom. • Limited evidence on the long-term effects of an obesogenic environment on health behaviours and outcomes (e.g. BMI).

Table 4.1. **The relationship between education and health** *(continued)*
Findings from the present study

	What we know	What we don't know
Contexts	• Family contexts: Parental education and home environment are likely to affect children's development of cognitive and social skills, as well as health-related lifestyles and habits. • Community contexts: Community characteristics, such as peers, have consequences for health behaviours and outcomes. • Interventions that address multiple contexts simultaneously are likely to render each interaction more effective. Early childhood intervention provides promising examples.	• There is limited evidence showing how multiple contexts interact except for those that focus on early childhood interventions.
Social status	• Social status: Some evidence suggesting the role of occupational status for mortality and educational status for obesity. • Implications for inequality: Expansion of education may reduce health inequality if education affects health by raising social status.	• Only a handful of studies exist on the role of social status. This type of work should be expanded, given that the expansion of education systems (i.e. a viable policy tool) can have a direct impact on social status. In doing so, it is necessary to better understand the boundaries of social status as perceived by individuals (status within the community? status within country cohorts?). • Limited understanding of why educational status may affect health outcomes (e.g. obesity).
Overall	• Educational expansion can raise the level of individuals' health and can also help reduce health inequalities. • Among the various roles of education, raising cognitive, social and emotional skills are likely to be promising. • Implications for health inequality: Educational expansion targeted to the disadvantaged group is likely to reduce inequalities. Focusing on interventions that work can make this even more effective/efficient. • Family and community contexts matter, and may complement efforts at school. • An integrated approach which aims at simultaneously raising individual attributes as well as school and family environments is likely to be effective. • Early childhood education programmes, or other programmes that simultaneously improve cognitive, social and emotional skills, as well as contextual factors may be a promising way forward.	• More causal evidence is needed for all three health areas, particularly for early childhood and tertiary education. • Better understanding is needed of the contexts in which education (or specific educational intervention) would work better. • More information is needed on integrated approaches, and on whether integrated approaches work beyond early childhood education.

Notes

1. In 15 OECD countries, more than half of the adult population is either overweight or obese.
2. Most notably, diabetes, cardiovascular disease and some forms of cancer.
3. Obesity may soon overtake tobacco as the leading cause of avoidable deaths in the United States (Mokdad *et al*., 2004).
4. DALY stands for disability-adjusted life years. The WHO defines DALY as the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability.
5. One of the key problems is that most mental disorders go untreated. The proportion of mental disorders receiving treatment varies from 8% in Italy to 26% in the United States (OECD, 2009b).
6. The global consumption of alcohol is decreasing, but it is rapidly increasing in low- and middle-income countries.
7. Finland, Iceland, Japan, Luxemburg, Mexico, Norway and the United Kingdom saw average alcohol consumption increase.
8. This is based on the European School Survey Project on Alcohol and Drugs (ESPAD).
9. For instance, 23% (14%) of white women (men) with family incomes greater than 400% of the poverty line were obese between 1999-2002, compared to 40% (34%) of their poor counterparts in the United States (Chang and Lauderdale, 2005, cited in Baum and Ruhm, 2007). Moreover, Baum and Ruhm report that 31% of non-Hispanic whites aged 20+ were obese in 2003-04, compared to 37% of Hispanics and 45% of non-Hispanic blacks (Ogden *et al*., 2006, cited in Baum and Ruhm, 2007).
10. In Switzerland, however, the volume of drinking increases until retirement age.
11. Health challenges do not only arise when individuals reach adulthood. For instance, child obesity is a major health issue in the United States and the United Kingdom. Mental health problems also occur early in life. According to the WHO, approximately half of mental health problem start before the age of 14. Moreover, OECD (2009a) reports that a large fraction of children aged 13-15 had

been drunk at least twice during the past year. The figure was particularly high for the United Kingdom (33%) and Denmark (31.6%).

12. In the United States, the annual medical burden related to obesity had risen to almost 10% of all medical spending in 2001, a 27% increase in health spending since 1987 (Finkelstein *et al*., 2009).

13. The ratio of health expenditures to GDP is even higher for certain countries. For example, the United States spent 16% of GDP on health care in 2007 (OECD, 2009). The high share of GDP allocated to health is a result of a rapid growth in health spending over the last ten years, which was faster than the growth in GDP. Moreover, the ratio of health expenditures to GDP is significantly higher than that of educational expenditures which only amount to 5.7% of GDP (OECD, 2009b). Health expenditures are particularly high for governments, with an average of 6.4% of GDP in 2007.

14. Self-reported health status is usually collected based on a commonly asked question such as: "How is your health in general?" and responses can be highly subjective. Although studies suggest that indicators of self-reported health status are a good predictor of people's future health care use and mortality (Idler and Benyamini, 1997; OECD, 2009c), cross-country differences in self-reporting may arise due to country-specific norms for assessing health.

15. The body mass index (BMI) is a commonly used measure of overweight and obesity, and is calculated as an individual's weight in relation to the height (weight/height squared).

16. Certain pathways may exhibit positive impacts while others might show negative impacts. A positive education effect implies that the net effects of all these impacts are positive.

17. This pathway is consistent with education's role in raising productive efficiency and allocative efficiency (Grossman, 1972). Productive efficiency implies that education makes individuals more efficient in producing health. Allocative efficiency implies that education helps improve individuals' choice of the inputs that are used to produce better health.

18. To the contrary, one could argue that education may lead to occupations with a high level of responsibility and possibly stress. Moreover, such occupations might involve social interactions that are conducive to high levels of alcohol consumption.

19. For instance, in 2004, the TV chef Jamie Oliver successfully campaigned in the United Kingdom to reduce the amount of fat and sugar in school meals. Family settings in which children are exposed to stress and bad nutrition might counteract the positive effects of schools. Community environments with high incidence of crime, easy access to unhealthy food, and a lack of sport facilities might counteract school-based efforts to curb teenage drinking and smoking, promote healthy meals and exercise.

20. Students are also often surrounded by different types of peers and this may have different impacts on their health environment. For instance, peers during university years may be more or less prone to consuming large amounts of alcohol, using illegal substances or smoking.

21. As much of the available evidence focuses on the total effects of education it is not possible to discern the viable pathways.

22. This is shown in Borgonovi (2010). Following Ross and van Willigen (1997) indicators of distress are distinguished from indicators of dissatisfaction. Mental distress, characterised by a state of depression and malaise, results from deprivation while dissatisfaction results from deprivation relative to expectations (Mirowsky and Ross, 1989): "reported net satisfaction is a function of perceived discrepancies between what one has and wants, relevant to what others have, the best one has had in the past, expected to have 3 years ago, expects to have after 5 years, deserves and needs" (Michalos, 2008). The mental distress index combines individual responses to a number of questions aimed at eliciting states of emotional and physical distress. Feeling sad, depressed, anxious, restless and unhappy are examples of emotional distress while feeling that everything is an effort, feeling tired, without energy, having trouble sleeping or concentrating are components of physical distress. Life satisfaction reflects to what extent individuals are content with what they have achieved.

23. One widely used instrument to screen lifetime drinking problems is the CAGE (Cut-down, Annoyed, Guilt and Eye-opener) questionnaire (Maggs *et al*., 2008; Caldwell *et al*., 2008; Huerta and Borgonovi, 2010). CAGE is based on the following questions: "Have you ever felt you should Cut down on your drinking?", "Have people ever Annoyed you by criticizing your drinking?" "Have you ever felt bad or Guilty about your drinking?"; "Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (Eye opener)?"

24. They include Sassi *et al.* (2009), Borgonovi (2010) and Huerta and Borgonovi (2010).

25. For instance, Cutler and Lleras-Muney (2010) reports for the United States that the average predicted mortality rate is 11%. Relative to this average, their results show that every year of education lowers the mortality risk by 0.3 percentage points, or 24%, through reduction in risky behaviours (drinking, smoking and excess weight).

26. Cutler and Lleras-Muney (2010) note however that observed health behaviours do not explain all of the differences in health outcomes by education.

27. Ten leading risk factor of death among high-income countries are: tobacco use, high blood pressure, overweight and obesity, physical inactivity, high blood glucose, high cholesterol, low fruit and vegetable intake, urban outdoor air pollution, alcohol use and occupational risks (WHO, 2009b).

28. For instance, Cutler and Lleras-Muney (2006) reports that those with four more years of schooling are 11% less likely to smoke, drink seven fewer days of five or more drinks per year, are 5% less likely to be obese and 10% more likely

to obtain mammograms. The literature on education and alcohol consumption generally suggests that education raises moderate drinking and reduces harmful drinking. Kuntsche *et al.* (2009) also report that many studies have shown that years of schooling are negatively related with "extreme alcohol use", with examples from the Netherlands and Finland.

29. The results account for individual differences in gender, age and ethnicity. Those who report having an average of five or more drinks when drinking are considered heavy drinkers. For the United States, ethnicity was taken into account by controlling for African American and Hispanic origin. See Cutler and Lleras-Muney (2010) for more details.

30. See for example Zajacova and Hummer (2009), Adams (2002), Chevalier and Feinstein (2007), Borgonovi (2010), Cutler and Lleras-Muney (2010), Sassi *et al.* (2009), Grabner (2008) on the effect of education on mortality among Europeans, self-reported health among older adults in the United States, mental health in the United Kingdom, distress in Europe, depression in the United States, or obesity in Australia, Canada, England and Korea or the United States, respectively. However, Webbink, Martin and Visscher (2010) using Australian twins show that education has a stronger effect on reducing obesity among men but not women.

31. For example, Häkkinen *et al.* (2006), using longitudinal data on a cohort of children born in 1966 in northern Finland, report small effects of education on self-reported alcohol consumption among men. A one year increase in education decreases alcohol consumption by 0.8 grams a day for men and half of this amount for women.

32. The relationship between education and five year mortality, self-reported health, smoking and seat belt use falls continuously with age, while the relationship between education and functional limitations, depression and colorectal screening increases with age until middle age and then starts to fall. In all cases, the effect of education starts to fall between ages 50 and 60 (Cutler and Lleras-Muney, 2006).

33. Cutler and Lleras-Muney suggest that the decline in the education gradient after age 50 is due to selective survival of the less educated, cohort effects (*i.e.* education may have become more important for younger cohorts) or simply because education might matter less after retirement with stable incomes and universal insurance coverage.

34. Borgonovi (2010) also evaluates whether social class affects the education gradient for happiness and life satisfaction. Contrary to the findings for mental distress, they find that those from a lower social class (individuals whose fathers achieved less than upper secondary qualifications) are significantly more likely to be happy and satisfied with their life with more education.

35. The same results hold for happiness and life satisfaction.

36. For instance, if there is a threshold effect at lower secondary education and beyond this level health returns are very small, this may point to the importance

of basic cognitive skills such as literacy and numeracy which children typically acquire at this level of schooling.

37. Most empirical evidence assumes linear effects and as such estimates the average effect across the population.

38. The gradient may be underestimated if the more educated use different norms to self-report their health. Bago d'Uva *et al*. (2008) test this hypothesis among older Europeans using anchoring vignettes. Respondents' ranking of typical health status is used to identify the implicit threshold they used to assess self-reported health and to correct for differences in these thresholds by education level. After correction, they report an even larger education gradient.

39. The result is robust when adding controls for age, gender and household income.

40. This study controls for socioeconomic background and measures of IQ. Hartog and Oosterbeek mention that this "non-monotonicity may have some relation to occupational hazards, which may be correlated with schooling level and type".

41. Note however that Sassi *et al*. (2009) also report that the marginal effect of education on obesity in Korea is surprisingly small and almost non-existent.

42. Caution must be used in interpreting these results, as most of the evidence presented involves marginal associations rather than marginal effects. Hence, the particular shapes of the curves may be driven by reverse causality and hidden third variables. However, some studies suggest that the shape of the curve is fairly robust even after including a battery of confounding variables (OECD, 2009b; OECD 2010).

43. See Chapter 2 for a formal argument on why correlations do not reflect causality. Typically, any individual characteristics which are not observed and affect both health and education may generate the observed correlation. Additionally, the causality may well be reversed, with children in bad health reducing their educational investment (Case *et al*., 2005). This may drive the correlation if early health problems lead to adult health problems. The WHO states that 20% of children and adolescents in the world have mental health problems, so the reverse causality effect may be quite substantial. Currie and Stabile (2007), for example, using sibling data show that children suffering from Attention Deficit Hyperactivity Disorder (ADHD) have lower test scores and educational attainment. A similar conclusion was reached by Gregg and Machin (1998) in the British National Child Development Study.

44. This is what economists usually call the "exclusion requirement". To be more precise, the exclusion requirement is the assumption that the instruments that are correlated with schooling can be excluded from the health equation. In other words, the instrumental variables (IVs) cannot be direct determinants of health and are not correlated with unobservable determinants. The assumption cannot be tested. Another potential problem with IVs is the weak instruments problem, in which the correlation between the IVs and schooling is low.

45. Note however that one must be cautious in evaluating the size effects, as most of the studies used instrumental variables (IVs) based on policy reforms. As described in Chapter 2, IV estimation using policy reforms does not yield the average causal effects of education, but local average treatment effects (LATE), which, depending on the population affected by the instrument, may be larger or smaller than the average effects.

46. However, cohort size may not satisfy the exclusion requirement, as cohort size will put different strains on the health services and thus have a direct effect on the outcome of interest.

47. Education may also alter lifestyle factors such as diet and exercise. In Korea, an extra year of schooling increases the probability of engaging in regular exercise by 7-11 percentage points (Park and Kang, 2008). For Finland, an extra year of schooling raised the time spent on heavy training by 9.3 minutes and lowered the probability of engaging in unhealthy diet by 8.8% of a standard deviation for men. For women, the corresponding figures were 2.9 (exercise) and 4.7 percentage points.

48. A larger number of studies have however estimated the reverse relationship of alcohol consumption on educational attainment; see Koch and Ribar (2001) for an example, using sibling fixed effects. On another risky behaviour, Grimard and Parent (2007) show evidence of the causal effect of education on smoking in the United States using the Vietnam draft as an instrument for education.

49. This means overall/average effect of various pathways.

50. However, one should be cautious in interpreting these results. For instance, Cutler and Lleras-Muney (2010) warns that cognitive dissonance may be the reason behind these results: smokers or heavy drinkers may be more likely to report that they do not know about the harmful effects (although they in fact do know).

51. Since the effect was also found for commuters to other states (where calorie postings were not implemented) this suggests a change in behaviour following the release of information.

52. Knowledge of science may help people believe health-related information (which is often scientific in nature) and new medical technologies. Cutler and Lleras-Muney (2006) suggest that the more educated are more likely to trust science since they are more likely to understand the nature of scientific inquiry. According to a 1999 National Science Foundation (NSF) survey, 71% of those with a college degree or higher thought that the benefits of new technologies strongly outweigh the harmful effects, whereas only 25% of those with less than a high school degree thought so. Lleras-Muney and Lichtenberg (2005) suggest that the more educated are more likely to use newer drugs. Glied and Lleras-Muney (2008) show that more educated people in the United States are better able than the less educated to take advantage of technological advances in medicine.

53. Researchers also refer to the term "learning to learn".

54. Those with poor reading skills were less likely to understand discharge instructions after emergency room visits (Spandorfer *et al*., 1995), less likely to know about their asthma condition or use their inhalers correctly (Williams *et al*., 1998). Rozenzweig and Schultz (1989) show that contraceptive success rates are identical for all women for "easy" contraception methods such as the pill, but the rhythm method is much more effective for educated women. Goldman and Smith (2002) report that the more educated are more likely to comply with AIDS and diabetes treatments, both of which are very demanding. Goldman and Lakdwalla (2005) Lleras-Muney (2005) suggest that the more educated are better able to manage chronic conditions.

55. Using the Canadian component of the Adult Literacy and Life Skills (2003), this study finds health literacy to be a function of prose literacy, document literacy and numerical skills and largely correlated with current reading habits. Individuals with the lowest level of health literacy are 2.5 times more likely to report being in fair or poor health than those with the highest literacy level.

56. In addition to the above evidence that describes the role of cognitive skills on health, one could also argue the relevance of this causal pathway by examining whether education raises cognitive skills. There is in fact evidence that suggests schooling causally affects cognitive skills. For example, Neal and Johnson (1996), Winship and Korenman (1997), Hansen *et al.* (2004) and Behrman *et al.* (2008) find that an extra year of schooling increases cognitive skills.

57. Higher-order processing can be evaluated by assessing abstract reasoning (*e.g.* each respondent is given seven pairs of words and asked to describe the way in which the items are alike, ability to read maps, follow instructions or use computers (Cutler and Lleras-Muney, 2010).

58. For the US data, Cutler and Lleras-Muney (2010) use the Armed Forces Vocational Aptitude Battery (ASVAB) contained in the National Longitudinal Survey for Youth (NSLY) 1979. The test covers ten subjects: science, arithmetic, mathematical reasoning, word knowledge, paragraph comprehension, coding speed, numeric operations speed, auto and shop information, mechanical competence and electronic information. For the UK data, they use the National Child Development Survey (NCDS) which includes various tests of cognitive ability administered at age 7 (maths and drawing), age 11 (reading, maths, verbal, non-verbal and drawing) and age 16 (maths and reading comprehension).

59. Memory skills were captured by the ability to recall a list of words (for the US data), and vocabulary and spelling test scores at age 16 (for the UK data).

60. Brunello *et al.* (2009) report a causal effect of cognitive ability on BMI among European women.

61. Cutler and Lleras-Muney (2010) also suggest that personality traits such as self-esteem, self-control, depression and shyness may affect the psychological capacity to make behavioural changes. They refer to psychological theories which

posit that individuals need to be ready to change, feel able to do so, and have less hindrance to change. Hence it is importance to take into account the capacity to translate intentions into actions.

62. They use the Bristol Social Adjustment Guide (BSAG) to measure social maladjustment at ages 7 and 11. Among the 12 indicators of social maladjustment, they find that "hostility towards adults" at age 11 is an important determinant of adolescent behaviour.

63. The advantage of this study is that it applies the same empirical methodology for the United States and the United Kingdom using a battery of available data (hence multiple data source per country).

64. Cutler and Lleras-Muney (2010) also show that risk aversion is not consistently related health behaviours.

65. It also explains 3% of the relationship between education and obesity.

66. Self efficacy is captured by assessing whether the respondent gets what they want out of life, how much control they have over life and whether they can run their life how they want and the malaise index (which measures mental health and stress).

67. Cutler and Lleras-Muney (2010) use the term social integration instead of social skills. For the United States, social integration is measured by scales for social ties, social contributions, positive and negative relations with spouse, positive and negative relations with friends. For the United Kingdom, scales for social ties is measured by parents are alive, whether the respondent sees parents, whether they frequently eat together as a family, visit relatives, go out as a family, spend holidays as a family, go out alone or with friends, attend religious services. Social skills are likely to affect these measures of social integration.

68. Heckman, Stixrud and Urzua (2006) show that schooling affects both cognitive and non-cognitive skills. Oreopoulos and Salvanes (2009), in their recent review of the returns to education, state that education has a substantial impact on non-cognitive skills such as critical skills, patience and social skills.

69. Carneiro, Crawford and Goodman (2007) show that parental social class, interest in their child's education and reading behaviour at home is a strong predictor of children's social skills at age 7.

70. Peer effect is defined as "the effect that any student has on any other student, regardless of the channel by which the effect operates" (Hoxby, 2008).

71. One way to tackle selection is to use random assignment data. Sacerdote (2001) used random assignment of dormitory roommates at Dartmouth College (United States) to show that both roommates and dorm-mates influenced the decision to join a fraternity. Kremer and Levy (2008) use the random assignment of roommates and estimate that students allocated to drinkers obtained a lower grade point average.

72. Clark and Lohéac (2007) construct peers in three ways: same school year within the school, those in the school year above that of the respondent within the same school, and the respondent's friends.

73. Pertold (2009) accounts for selection by using information on an individual's pre-secondary school behaviour and the prevalence of smoking among older school mates.

74. The Swedish school system allows one to address the issue of sorting, since pupils cannot decide which school or class to participate in. However the authors note that parents can still sort by making residential choice based on the quality and reputation of schools.

75. Fowler and Christakis used the Framingham Heart Study Social Network and Add Health data to find that obese persons formed clusters in the network and that these clusters extended to three degrees of separation: a person's friend's friend's friend. Social norms may also affect adults' health decisions. Etile (2007) and Oswald and Powdthavee (2007) suggest that individuals revise their perceptions of their own weight after comparing it with their group weight. Referring to a social norm to adapt one's behaviour would also explain the cognitive dissonance reported by Brunello *et al.* (2008) among young adults in the United States, where 45% of obese men report their weight as being "right or underweight".

76. The NSLP is a government-run lunch programme which is served in almost all public schools and has involved almost 30 million children. This is approximately 60% of the total student population (Schanzenbach, 2009). School lunches are served free or at a reduced price for a large fraction of participating students (about 59%) from low-income families (Story *et al*., 2009).

77. See Schanzenbach (2009) for references.

78. After controlling for children's obesity rates when they enter kindergarten, students eating a school lunch consume on average an extra 40 calories per day during school lunch. This could cause a measurable difference in obesity rates in children and suggests the need to make school lunch less caloric.

79. SBP is offered in about 80% of the schools that provided school lunch during the 2002/03 school year. SBP, like the NSLP, is served free or reduced price for a large fraction of participating students (81%) coming from low-income families (Story *et al*., 2009).

80. They include recess periods, intramural sports, physical activity programmes, physical activity facilities and psycho-social support for physical activity. Wechsler *et al.* (2000) also look at the role of foods and beverages available at school outside of the school meals programme, and psychosocial support for physical activity and healthy eating.

81. These messages are transmitted via school policies, ongoing administrative support, role modelling by school staff, and incentives established in the school setting.

82. Johnston *et al.* (2009) compare survey responses of self-reported and objective measures of hypertension.

83. Snyder and Evans (2006) compare the mortality of cohorts of Americans affected by different tax regimes. The cohort benefiting from larger transfers suffers from increased mortality. Evans and Moore (2009) estimate that benefit receipt is associated with an increased mortality on benefit pay day, some of the short-term effect is due to mortality displacement, the receipt hastening the death of those who would have soon died.

84. Obviously, other characteristics of the environment also changed, so the experiment is not completely informative on the effect of income on health. Moreover, the income transfers are extremely large and out of scale with usual social transfers.

85. Adda *et al.* (2009) use changes in the wage structure over time to estimate the effect of permanent income shock on health. Overall, permanent income shocks are associated with a small but significant increase in mortality, and no change in reported health, cardiovascular health or respiratory diseases.

86. Cunha and Heckman show that the impact of parental home environment on cognitive skills is more important during the earlier period (age 6/7-8/9) than during the later (ages 10/11-12/13).

87. The two studies identify maternal education effect using reforms (*i.e.* instrumental variables) which changed the school leaving age. Note however that Lindeboom *et al.* (2009), using a regression discontinuity design around the reform of the minimum school leaving age, find insignificant maternal education effect.

88. This was especially the case with the mother's education and the daughter's BMI.

89. They suggest that the association may have stemmed from habits and weight gained earlier in life under their parents' influence, and that the "individual's later investments in schooling cannot undo the past". Borgonovi also find that individuals with highly educated parents are not more likely to be happy and satisfied with their lives than individuals with less educated mothers and fathers.

90. Perhaps this is because educated fathers' high aspirations for their children can lead to mental distress.

91. See Currie and Moretti (2004). Educated mothers may also follow healthier practices after pregnancy. For instance, Vereecken, Keukelier and Maes (2004), using children's data from eight pre-school kindergartens in Leper, Belgium, show that the associations between the mother's level of education and the quality of food consumed by the children is entirely explained by the mother's consumption of fruits and vegetables and other food practices.

92. In North America, the correlation becomes stronger with age. For England, Burgess *et al.* (2004) only find a weak relationship between family income and the child's subjective general health status, and no relationship with objective

health measures. This discrepancy in results may be due to the provision of universal health care in the United Kingdom.

93. However, there was no effect on weight, hyperactivity or emotional disorders.

94. Apart from parental education, parental occupation, parental interest in child's education and whether parents read news and books are also determinants of cognitive and social skills.

95. Apart from maternal education and maternal cognitive skills, availability of books (number), musical instruments and newspapers as well as whether the child receives special lessons or goes to museums and theatres have been shown to determine children's cognitive and non-cognitive skills. Note that the impact was stronger for non-cognitive skills.

96. The relative risks were high: *i.e.* 1.57 in Kaunas and 2.15 in Rotterdam.

97. These results should, however, be interpreted with caution, since they may be biased owing to the non-random selection of partners. As more educated individuals tend to marry more educated individuals, education increases between-household health inequalities.

98. Using the UK National Child Development Survey, Carneiro, Crawford and Goodman (2007) show that "mother/father showing little interest in children's education" and "mother/father reads news most days and books most weeks" have strong impacts on social skills (at age 7) and on cognitive skills (at age 11).

99. The aim of this intervention was to reduce obesity by altering physical activity and dietary risk factors, including TV viewing.

100. Evaluating the effect of community characteristics on individual outcomes is challenging, as individuals normally select the neighbourhood in which they live. This choice will be correlated with some of the unobserved characteristics of the individuals and neighbourhood and can thus lead to spurious relationships. One way to avoid these difficulties is to use experimental data which randomly assigns people to different residential districts.

101. They can only move to an area of the city in which less than 10% of the population is classified as poor, typically a more highly educated neighbourhood.

102. While aggregating individuals at country level diminishes the policy interest of evaluating the local community effects of education, this approach arguably minimises the selection problem. Selection problems nonetheless remain, to the extent that people can choose to live in another country.

103. An increase in 10% of the proportion of population with post-secondary qualifications results in a 12% increase in the probability that individuals report being satisfied with their lives, and a 16% increase in the probability that individuals report being happy. However, no relationship was observed between the proportion of individuals who have attained post-secondary education in the country and mental distress.

104. Using the 2002-05 California Healthy Kids Survey which covers 500 000 middle and high school children.

105. Based on children in grade 9 in California; non-fast food restaurants and future openings of fast food restaurants are not correlated with weight outcomes.

106. Currie and Walker estimate that air pollution in New Jersey (exposure to CO_2) during the third trimester of pregnancy has a significant impact on child health. The identification stems from time variations in pollution levels between sibling's gestations. For example a one-unit increase in CO_2 increases the probability of low birth weight by 8%.

107. The idea that relative position matters can be seen as an extension of the literature on the biological effect of social rank on stress (see Sapolsky, 2004, on ranking in baboons) or the economic literature on the effect of relative income on life satisfaction (Clark and Oswald, 1996).

108. There is little convincing evidence on the "relative effects" of income on health outcomes. Lorgelly and Lindley (2008) find no support for either the income inequality hypothesis or the relative income hypotheses in a longitudinal study of the British population, contrary to Kaplan *et al.* (1996) who identified these hypotheses at the state level in the United States. Deaton and Paxson (2004) also show no correlation between mortality and trends in income inequality in the United States or the United Kingdom.

109. However, this result may be driven by the level of aggregation chosen, or it may be due to a selection effect whereby more educated people living in countries with low average education migrate into countries with high average education.

110. This result holds even after accounting for differences in childhood social class.

111. Head Start is a national programme that promotes school readiness by enhancing the social and cognitive development of children through the provision of educational, health, nutritional, social and other services to enrolled children and families (US Department of Health and Human Services, 2010).

112. A similar programme is the United Kingdom's Sure Start. While evaluations of Sure Start exist, they are limited owing to the short history of this programme.

113. Head Start includes a variety of related programmes that target younger age or population groups: Early Head Start, Family and Community Partnerships, Migrant and Seasonal Head Start and American Indian-Alaska Native Head Start.

114. This is based on curriculum that emphasises age-appropriate literacy, numeracy, reasoning, problem-solving and decision-making skills (Office of Head Start, 2006, cited in Frisvold, 2007). Note that parents are encouraged to assist in creating the curriculum and the child's individual developmental strategy (Frisvold, 2007).

115. They include nutritional screening based on the assessment of height, weight and haemoglobin/haematocrit tests. This information, complemented by information on child/family eating habits, will determine nutritional needs and hence affect school meals (Frisvold, 2007).

116. At the beginning of the day, children who have not received breakfast prior to their arrival at a Head Start centre are given a nutritious breakfast. Children in a full-day programme receive meals and snacks that provide one-half to two-thirds of their daily nutritional needs (Frisvold, 2007).

117. Parents also receive training through classes and informal discussion on food preparation and nutrition (Frisvold, 2007). Family advocates also work with parents and assist them in accessing community resources.

118. Frisvold (2007) uses the Panel Study of Income Dynamics (PSID) and its Child Development Supplement to estimate the impact of participation in Head Start. The advantage of the estimate is that it is based on direct measurement of height and weight (and not self-reports) and that family background characteristics are available during the early childhood ages.

119. Benefits of Head Start (compared to non-participants) include: higher cognitive and non-cognitive skills in the short run, better health outcome (health status and dental care) in the short run, higher non-cognitive skills in the long run (socio-emotional skills: closer and more positive relationships with parents), better health outcomes (health status and health insurance coverage) in the long run.

120. A sizable fraction of those in the control group eventually joined the Head Start programme. Between 13.8% and 49.6% of the control group (depending on the cohort) joined Head Start after the control group was selected, since it was deemed unfeasible and unethical to prevent families from seeking out alternative care programmes for their children (US Department of Health and Human Services, 2010). While such an evaluation is still valid when assessing the impact of Head Start versus that of other ECEC programmes (which may also be comprehensive), it does not address the relevance of providing a comprehensive approach interventions that is only school-based.

121. This intervention involved sessions that were included in existing curricula using classroom teachers in four major subjects and physical education. Sessions include improving the home environment (decreasing television viewing) and improving eating habits and lifestyles at home and in school (*i.e.* decreasing consumption of high-fat foods, increasing fruit and vegetable intake, and increasing moderate and vigorous physical activity).

References

Adams, P. *et al*. (2003), "Healthy, Wealthy, and Wise? Tests for Direct Causal Paths between Health and Socioeconomic Status", *Journal of Econometrics*, Vol. 112, pp. 3-56.

Adams, S. (2002), "Educational Attainment and Health: Evidence from a Sample of Older Adults", *Education Economics*, Vol. 10, pp. 97-109.

Adda, J., J. Banks and H.M. von Gaudecker (2009), "The Impact of Income Shocks on Health: Evidence from Cohort Data", *Journal of the European Economic Association*, Vol. 7, pp. 1361-1399.

Albouy, V. and L. Lequien (2009), "Does Compulsory Education Lower Mortality?", *Journal of Health Economics*, Vol. 28, pp. 155-168.

Almquist, Y. (2009). "Peer Status in School and Adult Disease Risk: A 30-Year Follow-up Study of Disease-Specific Morbidity in a Stockholm Cohort", *Journal of Epidemiology and Community Health*, Vol. 63, pp. 1028–1034.

Anderberg, D., A. Chevalier and J. Wadsworth (2008), "Anatomy of a Health Scare: Education, Income and the MMR Controversy in the UK", *IZA Discussion Paper 3590*.

Anderson, P. and K. Butcher (2006), "Reading, Writing and Refreshments: Are School Finances Contributing to Children's Obesity?", *Journal of Human Resources*, Vol. 41, pp. 467-494.

Arkes, J. (2003), "Does schooling improve adult health", *RAND Working Paper 3051*, Rand Corporation, Santa Monica, CA.

Arendt, J.N. (2005), "Does Education Cause Better Health? A Panel Data Analysis using School Reforms for Identification", *Economics of Education Review*, Vol. 24, pp. 149-160.

Auld, M.C. and N. Sidhu (2005), "Schooling, cognitive ability and health", *Health Economics*, Vol. 14, pp. 1019-1034.

Bago d'Uva, T., O. O'Donnell and E. van Doorslaer (2008), "Differential Health Reporting by Education and Its Impact on the Measurement of Health Inequalities among Older Europeans", *International Journal of Epidemiology*, Vol. 37, pp. 1375-1383.

Barnfather, J. and D. Ronis (2000), "Test of a Model of Psychosocial Resources, Stress, and Health among Undereducated Adults", *Research in Nursing and Health*, Vol. 23, pp. 55-66.

Battacharya, J., J. Currie and S. Haider (2006), "Breakfast of Champions? The School Breakfast Program and the Nutrition of Children and Families", *Journal of Human Resources*, Vol. 41, pp. 445-466.

Batty, G.D. *et al*. (2006), "Does IQ Explain Socioeconomic Inequalities in health? Evidence from a Population Based Cohort Study in the West of Scotland", *British Medical Journal*, Vol. 332, pp. 580-584.

Baum, C. and C. Ruhm (2007), "Age, Socioeconomic Status and Obesity Growth", *NBER Working Paper 13289*, Cambridge, MA.

Becker, G.S. (1965), "A Theory on the Allocation of Time". *Economic Journal*, Vol. 75, pp. 493-517.

Behrman, J.B., D.R. Ross and R. Sabot (2008), "Improving Quality versus Increasing the Quantity of Schooling: Estimates of Rates of Return from Rural Pakistan", *Journal of Development Economics*, Vol. 85, pp. 94-104.

Belot, M. and J. James (2009), "Healthy School Meals and Educational Outcomes", University of Oxford, mimeo.

Bjorklund, A., M. Lindahl and E. Plug (2006), "The Origins of Intergenerational Associations: Lessons from Swedish Adoption Data", *Quarterly Journal of Economics*, Vol. 121, pp. 999-1028.

Black, S., P. Devereux and K. Salvanes (2005), "Why the Apple Doesn't Fall Far: Understanding Intergenerational Transmission of Human Capital", *American Economic Review*, Vol. 95, pp. 437-449.

Bollinger, B., P. Leslie and A. Sorensen (2010), "Calorie posting in chain restaurants", *NBER Working Paper 15648*, Cambridge, MA.

Borghans, L. and B. Golsteyn (2006), "Time Discounting and the Body Mass Index. Evidence from the Netherlands", *Economics and Human Biology*, Vol. 4, pp. 39-61.

Borgonovi, F (2010), "The Relationship between Education and Mental Health", mimeo, OECD, Paris.

Bosma, H. *et al*. (1994), "Differences in Mortality and Coronary Heart Disease between Lithuania and the Netherlands: Results from the WHO

Kaunas-Rotterdam Intervention Study (KRIS)", *International Journal of Epidemiology*, Vol. 23, No. 1, Oxford University Press.

Brennan, D. and C. Carpenter (2009), "Proximity of Fast Food Restaurants to Schools and Adolescent Obesity", *American Journal of Public Health*, Vol. 99, pp. 1-6.

Brofenbrenner, U. (1979), "Contents of Child Rearing", *American Psychologist*, Vol. 34, pp. 844-850.

Bronfenbrenner, U. (1986), "Ecology of the Family as a Context for Human Development: Research Perspectives", *Developmental Psychology*, Vol. 22, pp. 723-742.

Bronnum-Hansen, H. and M. Baadsgaard (2008), "Increase in Social Inequality in Health Expectancy in Denmark", *Scandinavian Journal of Public Health*, Vol. 36, pp. 44-51.

Brown, J.L., W.H. Beardslee, and D. Prothrow-Stith (2008), "Impact of school breakfast on children's health and learning – An analysis of the scientific research", A report Commissioned by the Sodexo Foundation.

Brunello G., D. Fabbri and M. Fort (2009), "Years of Schooling, Human Capital and the Body Mass Index of European Females", *IZA Working Paper 4667.*

Brunello, G. Michaud, P-C. and Sanz-de-Galdeano, A. (2008), "The Rise in Obesity across the Atlantic: An Economic Perspective", *IZA* Discussion Paper *3529.*

Burgess, S., C. Propper and J. Rigg (2004), "The Impact of Low-Income on Child Health: Evidence from a Birth Cohort Study", *Centre for Analysis of Social Exclusion (CASE) paper 85.*

Caldwell T.M. *et al.* (2008), "Lifecourse socioeconomic predictors of midlife drinking patterns, problems and abstention: findings from the 1958 British Birth Cohort Study", *Drugs and Alcohol Dependence*, Vol. 95, pp. 269-278.

Canadian Council on Learning (2008), *Health Literacy in Canada: A Healthy Understanding*, Canadian Council on Learning, Ottawa.

Card, D. (1999), "The Causal Effect of Education on Earnings", in O. Ashenfelter and D. Card (eds.), *Handbook of Labor Economics*, Vol. 3A, North Holland, Amsterdam.

Card, D. (2001), "Estimating the Returns to Schooling: Progress on Some Persistent Econometric Problems", *Econometrica*, Vol. 69, pp. 1127-1160.

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

Carneiro P., C. Crawford and A. Goodman (2007), "Impact of Early Cognitive and non-Cognitive Skills on Later Outcomes", *Centre for the Economics of Education Working Paper 92*.

Carneiro, P., C. Meghir and A. Parey (2007), "Maternal Education, Home Environments and the Development of Children and Adolescents", *Institute of Fiscal Studies Working Paper 1507.*

Carneiro, P. and R. Ginja (2008), "Preventing Behaviour Problems in Childhood and Adolescence: Evidence from Head Start", University College London, mimeo.

Case, A., A. Fertig and C. Paxson (2005), "The Lasting Impact of Childhood Health and Circumstance", *Journal of Health Economics*, Vol. 24, pp. 365-389.

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

Cawley, J. (2004), "The Impact of Obesity on Wages", *Journal of Human Resources*, Vol. 39, pp. 451-474.

Chang, V. and D. Lauderdale (2005), "Income Disparities in Body Mass Index and Obesity in the United States, 1971-2002", *Archives of Internal Medicine*, Vol. 165, pp. 2122-2128.

Chevalier, A. and L. Feinstein (2007), "Sheepskin or Prozac: The Causal Effect of Education on Mental Health", *IZA Discussion Paper 2231.*

Chevalier, A. and V. O'Sullivan (2007), "Mother's Education and Birth Weight", *IZA Discussion Paper 2640*.

Chou, S.Y., J.T. Liu, M. Grossman and T. Joyce (2007), "Parental Education and Child Health: Evidence from a Natural Experiment in Taiwan", *NBER Working Paper 13466*.

Cipollone, P. and A. Guelfi (2006), "The Value of Flexible Contracts: Evidence from an Italian Panel of Industrial Firms", *Temi di discussione 583*, Banca d'Italia, Rome.

Clark, A. and A. Oswald (1996), "Satisfaction and Comparison Income", *Journal of Public Economics*, Vol. 61, pp. 359-381.

Clark, A. and Y. Lohéac (2007), "'It wasn't Me, It Was Them!' Social Influence in Risky Behavior by Adolescents", *Journal of Health Economics*, Vol. 26, pp. 763-784.

Clark, D. and H. Royer (2008), "The Effect of Education on Adult Mortality and Health: Evidence from the United Kingdom", University of Florida, Gainesville, FL, mimeo.

Classen, T. and C. Hokayem (2005), "Childhood Influences on Youth Obesity", *Economics and Human Biology*, Vol. 3, pp. 165-187.

Collings A., N. Goldman and G. Rodriguez (2008), "Is Positive Well-Being Protective of Mobility Limitations among Older Adults?" *Journal of Gerontology*, Vol. 63B, pp. 321-327.

Cunha, F. and J.J. Heckman (2008), "Formulating, Identifying and Estimating the Technology of Cognitive and Noncognitive Skill Formation", *The Journal of Human Resources*, Vol. XLIII, pp. 738-782.

Cunha, F., J. Heckman, L. Lochner and D. Masterov (2005), "Interpreting the Evidence of Life Cycle Skill Formation", *IZA Working Paper 1675.*

Currie, J. and E. Moretti (2004), "Mother's Education and the Intergenerational Transmission of Human Capital: Evidence from College Openings and Longitudinal Data", *Quarterly Journal of Economics*, Vol. 118, pp. 1495-1532.

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

Currie, J., M.A. Shields and P.S. Wheatley (2007), "The child health/family income gradient: evidence from England", *Journal of health Economics*, Vol. 26, pp. 213-232.

Currie, J. and M. Stabile (2007), "Mental Health in Childhood and Human Capital", *NBER Working Paper 13217.*

Currie, J. and R. Walker (2009), "Traffic Congestion and Infant Health: Evidence from E-Zpass", *NBER Working Paper 15413.*

Currie, J. *et al.* (2010), "The Effects of Fast Food Restaurants on Obesity" *American Economic Review*, forthcoming.

Cutler, D. and A. Lleras-Muney (2008), "Education and Health, Evaluating Theories and Evidence", in R. Schoeni, J. House, G. Kaplan and H. Pollack (eds.), *Making Americans Healthier: Social and Economic Policy as Health Policy*, Russell Sage Foundation, New York.

Cutler, D. and E. Glaeser (2005), "What Explains Differences in Smoking, Drinking and Other Health Related Behaviours?", *American Economic Review*, Vol. 95, pp. 238-242.

Cutler, D., A. Deaton and A. Lleras-Muney (2006), "The Determinants of Mortality", *Journal of Economic Perspectives*, Vol. 20, pp. 97-120.

Cutler, D. and A. Lleras-Muney (2006), "Education and Health: Evaluating Theories and Evidence", mimeo, National Poverty Center, University of Michigan.

Cutler, D. and A. Lleras-Muney (2010), "Understanding Differences in Health Behaviours by Education", *Journal of Health Economics* Vol. 29, pp. 1-28.

Cutler, D., A. Lleras-Muney and T. Vogl (2008), "Socioeconomic Status and Health: Dimensions and Mechanisms", *NBER Working Paper 14333*.

De Walque, D. (2004), "Education, Information and Smoking Decisions: Evidence from Smoking Histories, 1940-2000", *World Bank, Policy Research Working Paper Series 3362*.

Deaton, A. and C. Paxson (2004), "Mortality, Income and Income Inequality over Time in Britain and the United States", in D. Wise (ed.), *Perspectives on the Economics of Aging*. National Bureau of Economic Research, Boston, MA.

Deschenes, O. (2007), "The Effect of Education on Mortality: Evidence from the Baby-Boom Generation", University of California at Santa Barbara, mimeo.

DeSimone, J. (2007), "Fraternity Membership and Binge Drinking", *Journal of Health Economics*, Vol. 26, pp. 950-967.

DiCenso, A., G. Guyatt, A. Willan and L. Griffith (2002), "Interventions to Reduce Unintended Pregnancies among Adolescents: Systematic Review of Randomised Controlled Trials", *British Medical Journal*, Vol. 324, pp. 1-9.

Doyle, O., C. Harmon and I. Walker (2007), "The Impact of Parental Income and Education on Child Health: Further Evidence for England", University College Dublin, *Geary Institute Working Paper 06/07*.

Droomers, M., C. Schrijvers and J. Mackenbach (2004), "Educational Differences in Starting Excessive Alcohol Consumption: Explanations from the Longitudinal GLOBE Study", *Social Science and Medicine*, Vol. 58, pp. 2023-2033.

Emler, N. (2001), *Self Esteem: The Costs and Causes of Low Self Worth*, York Publishing Services, York.

Etile, F. (2007), "Social Norms, Ideal Body Weight and Food Attitudes", *Health Economics*, Vol. 16, pp. 945-966.

Evans, N., and T. Moore (2009), "The Short-Term Mortality Consequences of Income Receipt", *NBER Working Paper 15311.*

Farrell, P. and V. Fuchs (1982), "Schooling and Health: The Cigarette Connection", *Journal of Health Economics*, Vol. 1, pp. 217-230.

Feinstein, L. *et al.* (2006), "What Are the Effects of Education on Health?" in *Measuring the Effects of Education on Health and Civic Engagement: Proceedings of the Copenhagen Symposium*, OECD, Paris.

Finkelstein, E.A. *et al.* (2009), "Annual Medical Spending Attributable to Obesity: Payer And Service Specific Estimates", *Health Affairs*, Vol. 28, pp. 822-831.

Fletcher, J. (2009), "All in the Family: Mental Health Spillover Effects between Working Spouses", *BE Journal of Economic Analysis and Policy*, Vol. 9. pp. 1-19.

Fletcher, J. and D. Frisvold (2009), "Higher Education and Health Investments: Does More Schooling Affect Preventive Health Care Use?", *Journal of Human Capital*, Vol. 3, pp. 144-176.

Fowler, J. and N. Christakis (2008), "Estimating Peer Effects on Health in Social Networks", *Journal of Health Economics*, Vol. 27, pp. 1386-1391.

Frijters, P., J. Haisken-DeNew and M. Shields (2005), "The Causal Effect of Income on Health: Evidence from German Reunification", *Journal of Health Economics*, Vol. 24, pp. 997-1017.

Frisvold, D. (2007), "Head Start Participation and Childhood Obesity: Does Investing in Early Childhood Education Reduce Obesity?", University of Michigan, mimeo.

Frisvold, D. and J. Lumeng (2009), "Expanding Exposure: Can Increasing the Daily Duration of Head Start Reduce Childhood Obesity?", *Emory University Working Paper 09-06*.

Gardner, J. and A. Oswald (2007), "Money and Mental Wellbeing: A Longitudinal Study of Medium-Sized Lottery Wins", *Journal of Health Economics*, Vol. 26, pp. 49-60.

Glied, S. and A. Lleras-Muney (2008), "Health Inequality, Education and Medical Innovation", *Demography*, Vol. 45, pp. 741-761.

Goldman, D. and D. Lakdawalla (2005), "A Theory of Health Disparities and Medical Technology", *Contributions to Economic Analysis and Policy*, Vol. *4, Paper 8*.

Goldman, D. and J. Smith (2002), "Can Patient Self-Management Help Explain the SES Health Gradient?", *Proceedings of the National Academy of Sciences*, Vol. 99, pp. 10929-10934.

Gortmaker, S.L. *et al.* (1999), "Reducing Obesity via a School-Based Interdisciplinary Intervention Among Youth – Planet Health", *Archive of Pediatric Adolescent Medicine*, Vol. 153, pp. 409-418.

Grabner, M. (2008), "The Causal Effect of Education on Obesity: Evidence from Compulsory Schooling Laws", University of California, Davis, mimeo.

Gregg, P. and S. Machin (1998), "Child Development and Success or Failure in the Labour Market", Centre for Economic Performance, London School of Economics, *Working Paper 0397.*

Grignon, M. (2008), "Les cadres d'analyses de la performance des systèmes de santé : forces et limites", in *Bilan des réformes des systèmes de santé*, Santé, Société et Solidarité (OFQSS), No. 2, pp. 163-169.

Grimard, F. and D. Parent (2007), "Education and Smoking: Were Vietnam War Draft Avoiders Also More Likely to Avoid Smoking?", *Journal of Health Economics*, Vol. 26, pp. 896-926.

Groot, W. and H. Maasen van den Brink (2007), "The Health Effects of Education", *Economics of Education Review*, Vol. 26, pp. 186-200.

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

Grossman, M. (2006), "Education and Non-Market Outcomes", in E. Hanushek and F. Welch (eds.), *Handbook of the Economics of Education*, North-Holland, Amsterdam.

Grossman, M. and R. Kaestner (1997), "Effects of Education on Health", in J.R. Behrman and N. Stacey (eds.), *The Social Benefits of Education*, University of Michigan Press, Ann Arbor, MI, pp. 69-123.

Haerens, L. *et al.* (2009a), "The Contribution of Home, Neighbourhood and School Environmental Factors in Explaining Physical Activity among Adolescents", *Journal of Environmental and Public Health*, Vol. 2009, pp. 1-9.

Haerens, L. *et al.* (2009b), "Effectiveness of a computer tailored physical activity intervention in adolescents compared to a generic advice", *Patient Education and Counseling*, Vol. 77 (1), pp. 38-41.

Häkkinen, U. *et al.* (2006), "Health, Schooling and Lifestyle among Young Adults in Finland", *Health Economics*, Vol. 15, pp. 1201-1216.

Halliday, T. (2009), "Income Volatility and Health", *IZA Discussion Paper 3234*.

Hansen, K., J. Heckman and K. Mullen (2004), "The Effect of Schooling and Ability on Achievement Test Scores", *Journal of Econometrics*, Vol. 121, pp. 39-98.

Hartog, J. and H. Oosterbeek (1998), "Health, Wealth and Happiness: Why Pursue a Higher Education?", *Economics of Education Review*, Vol. 17, pp. 245-256.

Hartstein, J., K. Cullen, K. Reynolds, J. Harrell, K. Resnicow and P. Kennel (2008), "Impact of Portion-Size Control for School a la Carte Items: Changes in Kilocalories and Macronutrients Purchased by Middle School Students", *Journal of the American Dietetic Association*, Vol. 108, Issue 1, pp. 140-144.

Health Promotion Agency of Northern Ireland (2002), *Adult drinking patterns in Northern Ireland*, Health Promotion Agency for Northern Ireland, Belfast.

Heckman, J. and D. Masterov (2007), "The Productivity Argument for Investing in Young Children", *NBER Working Paper 13016*.

Heckman, J., J. Stixrud and S. Urzua (2006), "The Effects of Cognitive and Noncognitive Abilities on Labor Market Outcomes and Social Behavior", *Journal of Labor Economics*, Vol. 24, pp. 411-482.

Hemmingsson, T. *et al.* (2006), "The Association between Cognitive Ability Measured at Ages 18–20 and Mortality during 30 Years of Follow-Up: A Prospective Observational Study among Swedish Males Born 1949–1951", *International Journal of Epidemiology*, Vol. 35, pp. 665-670.

Hoxby, C.M. (2008). "School Spending, Income, and Inequality: The Efficient Redistribution Hypothesis", Stanford University, manuscript.

Huerta, M.C. and F. Borgonovi (2010), "Education, alcohol use and abuse among young adults in Britain", *Social Science and Medicine*, Vol. 71, pp. 143-151.

Humpel, N., N. Owen and E. Leslie (2002), "Environmental Factors Associated with Adults' Participation in Physical Activity: A Review", *American Journal of Preventive Medicine*, Vol. 22, pp. 188-199.

Idler, E. and Y. Benyamini (1997), "Self Rated Health and Mortality: A Review of 27 Community Studies", *Journal of Health and Social Behaviour*, Vol. 38, pp. 21-37.

Jaime, P.C., and K. Lock (2009), "Do school based food and nutrition policies improve diet and reduce obesity?", *Preventive Medicine*, Vol. 48, pp. 45-53.

Johnson, V., and R. Pandina (1993), "A Longitudinal Examination of the Relationships Among Stress, Coping Strategies, and Problems Associated with Alcohol Use", *Alcoholism: Clinical and Experimental Research*, Vol. 17, pp. 696-702.

Johnston, D., C. Propper and M. Shields (2009), "Comparing Subjective and Objective Measures of Health: Evidence from Hypertension for the Income/Health Gradient", *Journal of Health Economics*, Vol. 28, pp. 540-552.

Joung, I.M.A. *et al.* (1996), "The Contribution of Specific Causes of Death to Mortality Differences by Marital Status in the Netherlands", *European Journal of Public Health*, Vol. 6, pp. 142-149.

Kahn, M. E. (1998), "Education's role in explaining diabetic health investment differentials", Economics of Education Review, Vol. 17, pp. 257-266.

Kaplan, G. A. *et al.* (1996), "Inequality in income and mortality in the United States: analysis of mortality and potential pathways", *BMJ Journal*, Vol. 312, pp. 999-1003.

Katz, D. *et al.* (2005), "Public Health Strategies for Preventing and Controlling Overweight and Obesity in School and Worksite Settings", *Morbidity and Mortality Weekly Report*, Vol. 54, pp. 1-8.

Kenkel, D. (1991), "Health Knowledge and Schooling", *Journal of Political Economy*, Vol. 99, pp. 287-305.

Kenkel, D. D. Lillard and A. Mathios (2006), "The Roles of High School Completion and GED Receipt in Smoking and Obesity", *Journal of Labour Economics*, Vol. 24, pp. 635-660.

Kessler, R. and P. Cleary (1980), "Social Class and Psychological Distress", *American Sociological Review*, Vol. 45, pp. 463-478.

Kitagawa, E. and P. Hauser (1973), *Differential Mortality in the United States: A Study in Socioeconomic Epidemiology*, Harvard University Press, Cambridge, MA.

Kling, J., J. Liebman and L. Katz (2007), "Experimental Analysis of Neighbourhood Effects", *Econometrica*, Vol. 75, pp. 83-119.

Knudsen, E. I. *et al.* (2006), "Economic, neurobiological, and behavioral perspectives on building America's future workforce", *Proceedings of the National Academy of Sciences*, Vol. 103, pp. 10155-10162.

Koch, S. and D.Ribar (2001), "A Siblings Analysis of the Effects of Alcohol Consumption Onset on Educational Attainment", *Contemporary Economic Policy*, Vol. 19, pp. 162-174.

Kremer, M. and D. Levy (2008), "Peer Effects and Alcohol Use among College Students", *Journal of Economic Perspectives*, Vol. 22, pp. 189-206.

Kubik *et al*. (2003), "The association of the school food environment with dietary behaviors of young adolescents", *American Journal of Public Health*, Vol. 93, pp. 1168-1173.

Kubik, M. L. Lytle and M. Story (2005), "Schoolwide Food Practices are Associated with body Mass Index in Middle School Students", *Archive of Pediatrics and Adolescent Medicine*, Vol. 159, pp. 1111-1114.

Kuntsche, Rehm and Gmel (2004), "Characteristics of binge drinkers in Europe", *Social Science and Medicine*, Vol. 59, pp. 113-127.

Leuven, E., H. Oosterbeek and I. Wolf (2008), "The Effects of Health Education on Health Outcomes: Evidence from a Natural Randomized Experiment", University of Amsterdam, mimeo.

Lindeboom, M., A. Llena-Nozal and B. van der Klaauw (2009), "Parental Education and Child Health: Evidence from a Schooling Reform", *Journal of Health Economics*, Vol. 28, pp. 109-131.

Lindhal, M. (2005), "Estimating the Effect of Income on Health and Mortality Using Lottery Prizes as an Exogenous Source of Variation in Income", *Journal of Human Resources*, Vol. 40, pp. 144-168.

Lleras-Muney, A. (2005), "The Relationship between Education and Adult Mortality in the United States", *Review of Economic Studies*, Vol. 72, pp. 189-221.

Lleras-Muney, A. and F. Lichtenberg (2005), "The Effect of Education on Medical Technology Adoption: Are the More Educated More Likely to Use New Drugs?", *Annales d'Economie et Statistique*, Vol. 79/80 Numéro Spécial.

Lorant, V. *et al*. (2003), "Socioeconomic Inequalities in Depression: A Meta Analysis", *American Journal of Epidemiology*, Vol. 157, pp. 98-112.

Lorgelly, P and J. Lindley (2008), "What is the Relationship between Income Inequality and Health? Evidence from the BHPS", *Health Economics*, Vol. 17, pp. 249-265.

Lundborg, P. (2008), "The Health Returns to Education: What Can We Learn from Twins?", *IZA Discussion Paper 3399.*

Macintyre, S. (1992), "The Effect of Family Position and Status on Health", *Social Science and Medicine*, Vol. 35, pp. 453-464.

Maggs, J.L. *et al.* (2008), "Childhood and adolescent predictors of alcohol use and problems in adolescence and adulthood in the National Child Development Study, *Addiction*, Vol. 103, pp. 1-6.

Marmot, M. *et al.* (1991), "Health Inequalities among British Civil Servants: The Whitehall II Study", *The Lancet*, Vol. 337, pp. 1387-1393.

Marsh, H.W. (1992), "Extracurricular Activities: Beneficial Extension of the Traditional Curriculum or Subversion of Academic Goals?", *Journal of Educational Psychology*, Vol. 84, pp. 553-562.

Mazumder, B. (2006), "How Did Schooling Laws Improve Long-Term Health and Lower Mortality?", Federal Reserve Bank of Chicago, mimeo.

McKenzie, T. *et al.* (2000), "Leisure Time Physical Activity in School Environments: An Observational Study Using SOPLAY", *Preventive Medicine*, Vol. 30, pp. 70-77.

Meara, E. (2001), "Why is health related to socioeconomic status? The case of pregnancy and low birth weight", *NBER Working Paper 8231.*

Meara, E.R., 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, pp. 350-360.

Meer, J., D. Miller and H. Rosen (2003), "Exploring the Health-Wealth Nexus", *Journal of Health Economics*, Vol. 22, pp. 723-730.

Menschik, D., S. Ahmed and M. Alexander (2008), "Adolescent Physical Activities as Predictors of Young Adult Weight", *Archives of Pediatrics and Adolescent Medicine*, Vol. 162, pp. 29-33.

Michalos, A.C. (2008), "Education, Happiness and wellbeing", *Social Indicators Research*, Vol. 87, pp. 347-366.

Milligan, K. and M. Stabile (2008), "Do Child Tax Benefits Affect the Wellbeing of Children? Evidence from Canadian Child Benefit Expansions", *NBER Working Paper 14624.*

Millimet, D., R. Tchernis and M. Husain (2008), "School Nutrition Programs and the Incidence of Childhood Obesity", *NBER Working Paper 14297.*

Mirowsky, J. and C. Ross (1989), "Explaining the Social Patterns of Depression: Control and Problem Solving – or Support and Talking?", *Journal of Health and Social Behavior*, Vol. 30, pp. 206-219.

Mokdad, A.H. *et al*. (2000), "Actual Causes of Death in the United States", *The Journal of the American Medical Association*, Vol. 291, pp. 1238-1245.

Monden, C. *et al*. (2003), "Partner's and Own Education: Does Who You Live With Matter for Self-Assessed Health, Smoking and Excessive Alcohol Consumption?" *Social Science and Medicine*. Vol. 57, pp. 1901-1912.

Morris, S. (2007), "The Impact of Obesity on Employment", *Labour Economics*, Vol. 14, pp. 413-433.

Murrell, S. and F. Norris (1991), "Differential Social Support and Life Change as Contributors to the Social Class Distress Relationship in Older Adults", *Psychology and Aging*, Vol. 62, pp. 223-231.

Neal, D. and W. Johnson (1996), "The Role of Premarket Factors in Black-White Wage Differences", *The Journal of Political Economy*, Vol. 104, pp. 869-895.

OECD (2006), *Society at a Glance*, OECD, Paris.

OECD (2009a), *Society at a Glance* 2009, OECD, Paris.

OECD (2009b), *Health at a Glance* 2009, OECD, Paris.

OECD (2009c), *Health Data* 2009, OECD, Paris.

OECD (2010), *Education at a Glance* 2010, OECD, Paris.

Office of National Statistics (ONS), United Kingdom (2005), "Trends in life-expectancy by social class 1972-2001", *ONS Longitudinal Study, England and Wales*, London, ONS.

Ogden, C. *et al*. (2006), "Prevalence of Overweight and Obesity in the United States, 1999-2004", *Journal of the American Medical Association*, Vol. 295, pp. 1549-1555.

Operario, D., N. Adler, and D. Williams (2004), "Subjective Social Status: Reliability and Predictive Utility for Global Health", *Psychology and Health*, Vol. 19, pp. 237-246.

Oreopoulos, P. (2006), "Estimating Average and Local Average Treatment Effects of Education When Compulsory Schooling Laws Really Matter", *American Economic Review*, Vol. 96, pp. 152-175.

Oreopoulos, P. and K. Salvanes (2009), "How Large are Returns to Schooling? Hint: Money Isn't Everything", *NBER Working Paper 15339*.

Oswald, A. and N. Powdthavee (2007), "Obesity, Unhappiness and the Challenge of Affluence: Theory and Evidence", *Economic Journal*, Vol. 117, pp. 441-454.

Pappas, G. *et al.* (1993), "The Increasing Disparity in Mortality between Socioeconomic Groups in the United States, 1960-1986", *The New England Journal of Medicine*, Vol. 329, pp. 103-109.

Park, C. and C. Kang (2008), "Does Education Induce Healthy Life Style?", *Journal of Health economics*, Vol. 72, pp. 1516-1531.

Pertold F. (2009), "Sorting into Secondary Education and Peer in Youth Smoking", Cerge-Ei, Prague, mimeo.

Peyrot, M., J. McMurry and D. Kruger (1999), "A Biopsychosocial Model of Glycemic Control in Diabetes: Stress, Coping and Regimen Adherence", *Journal of Health and Social Behavior*, Vol. 40, pp. 141-158.

Rablen, M. and A. Oswald (2007), "Mortality and Immortality", *IZA* Discussion Paper *2560*.

Reinhold, S. and H. Jurges (2009), "Secondary school fees and the causal effect of schooling on health behaviour", *Health Economic Letters*, Vol. 19, pp. 994-1001.

Renna, F., I. Grafova and N. Thakur (2008), "The Effect of Friends on Adolescent Body Weight", *Economics and Human Biology*, Vol. 6, pp. 377-387.

Riley, H. and N. Schutte (2003), "Low Emotional Intelligence as a Predictor of Substance Use Problems", *Journal of Drug Education*, Vol. 33, pp. 391-398.

Rogot, E. *et al.* (1992), "A Mortality Study of 1.3 million Persons by Demographic, Social, and Economic Factors: 1979-1985 follow-up", National Institutes of Health (NIH) Publication No 92-3297, National Institutes of Health, Bethesda, MD.

Rosenberg, M. (1965). *Society and the Adolescent Self-Image*, Princeton University Press, Princeton, NJ.

Rosin, O. (2008), "The Economic Causes of Obesity", *Journal of Economic Surveys*, Vol. 22, pp. 617-647.

Roos, E.B. *et al.* (2001), "Household educational level as a determinant of consumption of raw vegitables among male and female adolescents", *Preventive Medicine*, Vol. 33, pp. 282-291.

Ross, C. and M. van Willigen (1997), "Education and the Subjective Quality of Life", *Journal of Health and Social Behavior*, Vol. 38, pp. 275-297.

Ross, C., J. Mirowsky and K. Goldsteen (1990), "The Impact of the Family on Health: The Decade in Review", *Journal of Marriage and Family*, Vol. 52, pp. 1059-1078.

Rozenzweig, M. and P. Schultz (1989), "Schooling, Information and Nonmarket Productivity: Contraceptive Use and Its Effectiveness", *International Economic Review*, Vol. 30, pp. 457-477.

Ruhm, C. (2000), "Are Recessions Good for Your Health?" *Quarterly Journal of Economics*, Vol. 115, pp. 617-650.

Ruhm, C. (2006), "A Healthy Economy can Break Your Heart", *NBER Working Paper 12102*.

Sacerdote, B. (2001), "Peer Effects with Random Assignment: Results for Dartmouth Roommates", *Quarterly Journal of Economics*, Vol. 116, pp. 681-704.

Sander, W. (1998), "The Effects of Schooling and Cognitive Ability on Smoking and Marijuana Use by Young Adults", *Economics of Education Review*, Vol. 17, June, pp. 317-324,.

Sapolsky, R. (2004), "Social Status and Health in Human and Other Animals", *Annual Review of Anthropology*, Vol. 33, pp. 393-418.

Sassi, F. *et al*. (2009), "Education and Obesity in Four OECD Countries", *OECD Education Working Paper Series 39*, OECD, Paris.

Schanzenbach, D. (2009), "Do School Lunches Contribute to Childhood Obesity?", *Journal of Human Resources*, Vol. 44, pp. 684-709.

Schkolnikov V.M. *et al*. (2006), "The Changing Relation between Education and Life Expectancy in Central and Eastern Europe in the 1990s", *Journal of Epidemiology and Community Health*, Vol. 60, pp. 875-881.

Seo, B. and B. Senauer (2009), "The Effect of Education on Health among US Residents in Relation to Country of Birth", *Health Economics*.

Silles, M. (2009), "The Causal Effect of Education on Health: Evidence from the United Kingdom", *Economics of Education Review*. Vol. 28, pp. 122-128.

Smith, J.P. (2007), "The Impact of Socioeconomic Status on Health over the Life-Course", *Journal of Human Resources*, Vol. XLII, pp. 739-764.

Smith, P. (1999), "Healthy Bodies and Thick Wallets: The Dual Relation between Health and Economic Status", *Journal of Economic Perspective*, Vol. 13, pp. 145-166.

Smith, K.V. and N. Goldman (2007), "Socioeconomic differences in health among older adults in Mexico", *Social Science and Medicine*, Vol 65, pp. 1372-1385.

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

Sobal, J. and A. Stunkard (1989), "Socioeconomic Status and Obesity: A Review of the Literature", *Psychological Bulletin*, Vol. 105, pp. 260-275.

Spandorfer, J.M. *et al.* (1995), "Comprehension of Discharge Instructions by Patients in an Urban Emergency Department", *Annals of Emergency Medicine*, Vol. 25, pp. 71-74.

Spasojevic, J. (2003), "Effect of Education on Adult Health in Sweden: Results from a Natural Experiment", *PhD dissertation*, City University of New York, New York.

Story, M. *et al.* (2009), "Schools and Obesity Prevention: Creating School Environments and Policies to Promote Healthy Eating and Physical Activity" *The Milbank Quarterly*, Vol. 87, pp. 71-100.

Thoits, P (1995), "Stress Coping and Social Support Processes: Where Are We? What Next?", *Journal of Health and Social Behaviour*, Vol. 35, pp. 53-79.

Trogdon, J., J. Nonnemaker and J. Pais (2008), "Peer Effects in Adolescent Overweight", *Journal of Health Economics*, Vol. 27, pp. 1388-1399.

Trudeau, F. and R.J. Shephard (2008), "Physical Education, School Physical Activity, School Sports and Academic Performance", *The International Journal of Behavioral Nutrition and Physical Activity*, Vol. 5, pp. 1-12.

US Department of Health and Human Services (2010), *Head Start Impact Study Final Report*, Office of Planning, Research and Evaluation.

Vereecken, C.A., E. Keukelier and L. Maes (2004), "Influence of mother's educational level on food parenting practices and food habits of young children", *Appetite*, Vol. 43, pp. 93-103.

Verstraete, S. *et al.* (2006), "Increasing Children's Physical Activity Levels during Recess Periods in Elementary Schools: The Effects of Providing Game Equipment", *European Journal of Public Health*, Vol. 16, pp. 415-419.

Webbink, D., N. Martin and P. Visscher (2010), "Does Education Reduce the Probability of Being Overweight?" *Journal of Health Economics*. Vol. 29, pp. 29-38.

Wechsler H. *et al.* (2000), "Environmental Correlates of Underage Alcohol Use and Related Problems of College Students", *Journal of Preventive Medicine*, Vol. 19 pp. 24-29.

White, D. and M. Pitts (1998), "Educating Young People about Drugs: A Systematic Review", *Addiction*, Vol. 93, pp. 1475-1487.

Williams, G.C. *et al*. (1998), "Autonomous Regulation and Long-Term Medication Adherence in Adult Outpatients", *Health Psychology*, Vol. 17, pp. 269-276.

Winship C. and S. Korenman (1997), "Does Staying in School Make You Smarter? The Effect of Education on IQ in the Bell Curve", in B. Devlin, S. Fienberg, D. Resnick and K. Roeder (eds.), *Intelligence, Genes, and Success: Scientists Respond to The Bell Curve*, Copernicus Press, New York, pp. 215-234.

World Health Organization (2004), *Global Status Report on Alcohol 2004*. World Health Organization, Geneva.

World Health Organization (2008), *Closing the Gap in a Generation*, WHO, Geneva.

World Health Organization (2009a), *NMH Fact Sheet*. World Health Organization, Geneva.

World Health Organization (2009b) *Global Health Risks: Mortality and burden of disease attributable to selected major risks*, WHO, Geneva.

Zajacova, A. and R. Hummer (2009), "Gender Differences in Education Effects on All Cause Mortality for White and Black Adults in the United States", *Social Science and Medicine*, Vol. 69, pp. 529-537.

Chapter 5

Improving health through cost-effective educational interventions

Fareen Hassan and Michele Cecchini [1]

This chapter presents an assessment of the cost-effectiveness of educational interventions – school-based, work-based and mass media – in reducing obesity-related disabilities. Results indicate that educational interventions via the mass media are the most cost-effective in the short run. In the long run, however, all interventions become cost-effective, especially in comparison to other health-related interventions such as physician counselling and food advertisement regulations.

5.1. Introduction

The previous chapter examined the relationships between education and health, including whether such relationships can be considered causal and which are the pathways through which education may operate. While the findings shed light on policy-relevant questions such as whether, to what extent, how and to some extent what type of education is likely to promote good health, they do not help to discriminate among different policy levers on the basis of cost-effectiveness considerations. In light of the pressures for accountability facing the governments of OECD countries, it has become increasingly important to appraise the cost-effectiveness of specific reforms, whether these involve policies that raise overall educational attainment or more targeted interventions.

This chapter reviews the state of knowledge with respect to the cost-effectiveness of educational interventions for improving health. It addresses the limited available evidence that allows for comparison of multiple interventions by developing an empirical framework for estimating the cost-effectiveness of three classes of interventions – school-based interventions, work-based interventions and mass media interventions – for improving health by reducing behavioural risk factors such as unhealthy diets and sedentary lifestyles. Findings based on European data suggest that a range of educational interventions have favourable cost-effectiveness ratios in the long run.

5.2. Economic evaluation and policy making

The primary focus of economic evaluation is to assess a range of alternative options and find the one that most efficiently maximises welfare (Folland *et al*., 2007). Two types of economic evaluation are generally used in policy decision making: cost-benefit analysis and cost-effectiveness analysis. Both are considered more useful for policy decision making than conventional effectiveness analysis since they take into account both the effectiveness and the costs of implementing policies.

An important characteristic of cost-benefit analysis is that it values costs and benefits in monetary terms so that the results are readily interpretable in terms of value for money. The uniformity of cost and benefit measures also makes cost-benefit analysis useful when comparing resource allocation alternatives[2] for different health interventions or industries. In practice, however, it is often difficult to express benefits in monetary terms; this form of analysis is therefore more limited than it initially seems. Moreover, there are ethical issues associated with assigning monetary value to certain benefits. The health-care industry offers an example, as monetising the benefits of alternative health interventions involves putting a monetary value on human life and the quality of life (Folland *et al*., 2007).

Cost-effectiveness analysis is a tool for comparing interventions when monetary valuation of benefits is not possible. Cost-effectiveness analysis only requires that the benefits of interventions under consideration be valued in a common unit. The drawback of the cost-effectiveness approach is that, because the benefits are not expressed in monetary terms, only projects leading to the same outcome can be compared, since the measure of a project's "effectiveness" will depend on the outcome. However, for a given outcome, cost-effectiveness analysis is ideal; it can compare the costs of various options which aim to achieve the same quantifiable non-monetary objective: in the case of health, for example, this may take the form of cost per disability-adjusted life years (DALY)[3] saved.

In spite of the usefulness of cost-effectiveness analysis and cost-benefit analysis in decision making, they have provided very limited information on the health impacts of educational interventions. This chapter addresses this knowledge gap through an assessment of the cost-effectiveness of school-based, work-based and mass media educational interventions in improving health outcomes. It looks at educational interventions that may reduce chronic diseases associated with unhealthy diets, sedentary lifestyles and obesity and estimates the costs associated with gains in DALYs resulting from each intervention (see Box 5.1 for a description of the hypothetical educational interventions considered in the analysis).

Box 5.1. **Typology of educational interventions**

School-based interventions

Schools provide access to a substantial cohort of youth from all backgrounds since enrolment is almost universal in OECD countries (Gortmaker *et al*., 1999). Children worldwide are increasingly affected by obesity, mostly because of the rapid deterioration of healthy lifestyle habits among the young. The use of school-based educational interventions is increasingly being considered to reduce childhood obesity and halt rapidly rising obesity rates in adulthood. As food preferences are formed during childhood, helping children to develop a taste for healthier foods may affect their diets into their adult lives.

The school-based intervention targets all children attending school in the age group 8-9, but it is assumed that just over 60% will participate fully in the activities which constitute the intervention. The intervention entails the integration of health education into the existing school curriculum with support from indirect education and minor environmental changes such as healthier food choices in cafeterias. The main component is an additional 30 hours per school year (*i.e.* about one hour a week) of health education focused on the benefits of a healthy diet and an active lifestyle. This is associated with an opening lecture by a guest speaker and further activities during ordinary teaching hours (*e.g.* science) with the support of school nurses. Indirect education consists of the distribution of brochures or posters, while environmental changes are pursued by renegotiating food service contracts and re-training staff.

Box 5.1. **Typology of educational interventions** ***(continued)***

Worksite-based interventions

Many adults fail to respect recommended dietary intakes and to engage in regular physical activity. Estimates of the consumption of acceptable levels of dietary intake range from as few as one in five adults in the United States to fewer than one in ten in Australia (Sorenson *et al*., 1998; Dresler-Hawke, 2007). Appropriate levels of physical activity are met by only four in ten adults in Canada and three in ten in Australia (Chan *et al*., 2004; Heart Foundation and Zurich, 2008). Because changes in lifestyle habits can have a positive effect on the health of adults even late in life (WHO, 2004), health education interventions targeting adult populations have the potential to generate significant health gains. Working adults spend a large part of their time at the workplace, where they are exposed to factors that may influence their lifestyles and health habits. Existing evidence suggests that health education, peer pressure and changes in the work environment contribute to changing lifestyles and preventing certain chronic diseases.

The intervention targets individuals between the ages of 18 and 65 working for companies with at least 50 employees. It is assumed that 50% of employers and 45% of their employees will participate in the programme. The intervention involves an introductory lecture by a guest speaker and a series of 20-minute group sessions with a nutritionist every two weeks for 20 months. Messages are reinforced by the distribution of information materials and posters in common areas and cafeterias. Other activities are co-ordinated by volunteers who also act as peer educators and organise "walk clubs" or similar initiatives. As part of the intervention, catering staff are retrained to prepare healthy dishes and food service contracts are renegotiated.

Mass media interventions

The mass media can reach vast audiences rapidly and directly. Health promotion campaigns broadcast by radio and television may raise awareness of health issues and increase health information and knowledge in a large segment of the population. The World Health Organization (2006) has described mass media interventions as having an important role in spreading the message about healthy lifestyle habits to counter the trends in obesity. Dixon *et al*. (1998) concluded that educational mass media interventions can have a significant impact on dietary habits for a relatively small budget.

The hypothetical campaign is assumed to be broadcast on television and radio channels at the national and local levels and to follow a two-year pattern alternating six months of intensive broadcasting with three months of less intensive broadcasting. During the more intensive phases, television and radio channels broadcast 30 second advertisements six times a day, seven days a week. In the less intensive phases they broadcast 15 second advertisements 3 times a day, 7 days a week. Advertisements contain messages on both diet and physical activity. Broadcast messages are supported with the distribution of printed material, which is assumed to reach 10% of households.

5.3. The cost-effectiveness of educational interventions on obesity

Causal evidence on the effectiveness of educational participation or attainment on health outcomes is mixed, with some studies indicating a statistically significant and quantitatively important effect while others report only strong associations (see Chapter 4). The limited evidence on the impact of years of schooling or educational qualifications also means that cost-effectiveness calculations based on such studies are likely to be subject to a large margin of error.[4]

While the evidence on the effect of educational attainment[5] is limited, a substantial body of research supports the hypothesis that educational interventions have a positive impact on obesity or risk factors leading to obesity.[6] For instance, health education interventions in Finland and Japan resulted in population-wide reductions in cholesterol levels and translated into sharp declines in coronary heart disease and stroke rates (WHO, 2004). Interventions based on nutritional education have, on average, increased the intake of fruits and vegetables by young people and adults by 8.4% and 9.7%, respectively, and decreased fat intake by 1.6% and 2.2%, respectively, to meet daily recommended intake amounts (Gortmaker *et al*., 1999; Perry *et al*., 1998; Reynolds *et al*., 2000; Buller *et al*., 1999; Sorenson *et al*., 1996, 1998 and 1999; Luepker *et al*., 1998).[7] Interventions that emphasise the importance of active lifestyles[8] have seen an increase in physical activity (*e.g.* Emmons *et al*., 1999).

In a review of 108 educational interventions[9] targeting obesity and related risk factors, the WHO indicates that they generally resulted in positive behavioural changes linked to obesity (WHO, 2007). Findings from the effectiveness studies reviewed by the WHO form the basis for computing the cost-effectiveness of educational interventions described in the next section.

Background

The focus of the cost-effectiveness analysis conducted for this chapter is educational interventions as opposed to educational participation or attainment targeting obesity and related risk factors.[10] The assessment compares a "do nothing" scenario – the null scenario – with the outcomes from implementing a school-based, work-based or mass media intervention. The aim is to assess the cost-effectiveness of these interventions and to identify which of the three provides the greatest value for money. The analysis is based on a methodology well-established in the health literature. It involves calculating incremental cost-effectiveness ratios (ICER) which take into account relative costs and effects/benefits (Drummond *et al*., 2005). The ICER provides a measure of the cost per healthy life year gained due to an intervention.

Box 5.2 describes the four steps followed to compute the ICER. In brief, the first step calculated the average effectiveness outcome for each and every health intervention. This was done through a synthesis of past interventions, as reported in WHO (2007). Next, the effectiveness of each intervention in terms of the total number of DALYs saved was assessed. The epidemiological model described in Annex 5.A1 was then applied to the total population of 22 European countries.[11] The model relates lifestyle habits to chronic diseases via the effects of these habits on weight. Therefore, the effect of an intervention on the prevalence of obesity (and ultimately on obesity-related diseases) can be traced by noting changes that occur in dietary habits and/or physical activity following the intervention under consideration. The resulting incidence and prevalence of obesity-related diseases are then used to calculate the total number of DALYs gained due to the intervention.

Box 5.2. **Methodology: The study design**

Synthesis of existing interventions: A synthesis of interventions aimed at reducing obesity rates was conducted to gather data on the features and characteristics of different typologies of interventions and to design the components of standard educational interventions to be used in the cost-effectiveness analysis exercise: school-based, work-based and mass media interventions (see Box 5.1). A preliminary selection of studies was evaluated to assess which components should contribute to the standard intervention and what effects to expect. The selection came from a report by the WHO (2007), which reviewed and categorised 261 interventions targeting health behaviour described in studies published between 1994 and 2006. For the purpose of this project, all studies of school- and work-based and mass media interventions were reviewed. Interventions using education and learning which were appraised by the WHO as either strongly or moderately effective were selected as pivotal for behavioural changes. Discarded from the selection were all studies reporting effectiveness in very general terms, such as intention to change fruit and vegetable intake rather than a specific change in consumption of number of fruit and vegetable servings. The selected studies were reviewed with a view to highlighting successful commonalities in the intervention methods and resulting health gains. These studies (divided by typology) were used to determine average compliance rates, key drivers of costs, expected average results (effectiveness outcomes) and the core methods necessary to achieve those results. These components were brought together to create the three standard interventions appraised in the epidemiological model.*

The epidemiological model: The model, called CDP (Chronic Disease Prevention), was jointly developed by the OECD Health Division and by the WHO. It relates the onset of disease to a chain of behaviours and lifestyles that alter individuals' risk factors for a selected number of chronic diseases. Data from a WHO publication (Ezzati *et al*., 2004) was used to construct a definition of risk factors and to identify the thresholds used to pinpoint individuals at risk. The model explicitly accounts for three groups of chronic diseases: stroke, ischemic heart disease and cancer (including lung, colorectal and breast cancer). OECD (2009) describes the model

Box 5.2. **Methodology: The study design** *(continued)*

and its related input and output variables. Briefly, to assess the impact of an intervention, the prevalence and the incidence of risk factors affected by the intervention are considered. Differences in results obtained from an intervention and from the "null scenario" represent the health effect generated by the intervention (expressed in terms of the change in total DALYs). An illustrative representation of the model can be found in Annex 5.A1.

Cost model: This model is used to assess the total net costs of interventions. It combines the costs of implementing the intervention with the costs of treating and/or managing the obesity-associated health outcomes and diseases over the entire period of the simulation.

Incremental cost-effectiveness ratio (ICER): The ICER, which provides the final unit of comparison between the interventions, is calculated by dividing the difference in total costs between the null scenario and the respective intervention by the difference in effects between the null and the intervention scenario. The resulting ratio is read as the cost per DALYs gained from the intervention. In other words, for every extra DALY that results from the intervention, the cost is the amount of the ICER. The lower the ICER the better, because the lower figure indicates that a smaller cost is associated with increasing the total DALYs of the population by one year.

---

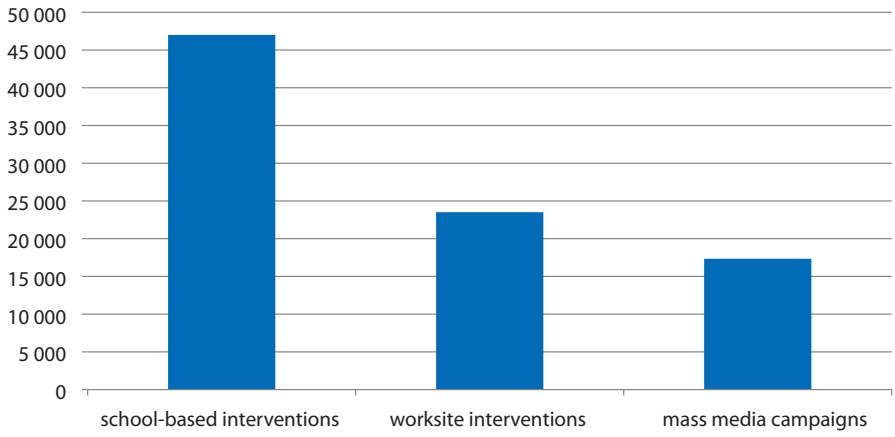
* The "effectiveness outcomes" of the three interventions established in the first step come from a wide range of sources, not constrained to specific countries. The epidemiological model, however, is based on region-specific trends for prevalence, incidence and remission rates of obesity and its evolution into related diseases. The relevant WHO region (ERU-A) includes: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Norway, Portugal, Sweden, Slovenia, Spain, the Netherlands, Switzerland and the United Kingdom.

The next step is to calculate the total associated costs of the intervention. This is done by multiplying the incidence of each disease by its respective treatment and/or management cost, and adding to this the full cost of treatment (and/or management) of all the diseases with the one-off cost of implementing the intervention. The costs and effects of each intervention are then compared to the costs and effects under the null scenario, which simply assumes current trends, in terms of both treatment and disease progression, for the duration of the cost-effectiveness simulation. Finally, the incremental difference in costs and effects between the intervention and null scenarios is used to calculate the respective ICERs which provide the incremental cost per DALYs gained under each intervention.

Findings

Figure 5.1 provides the overall results from the cost-effectiveness analysis in terms of ICERs.[12] It shows that mass media interventions are the most cost-effective of the educational interventions. A government would need to invest USD 17 300 in purchasing power parities (PPPs) for each DALY gained through mass media interventions. The price tag increases significantly under the work-based and school-based interventions scenario to USD 23 500 (PPPs) and USD 47 000 (PPPs), respectively. This may come as a surprise since Chapter 4 suggests that cognitive, social and emotional skills promote individual's capacity to prevent health problems and better manage them when they occur. One may imagine that school-based interventions are likely to be more effective in developing such skills than work-based and mass media interventions, which tend to focus more on transmission of information. However, especially in the case of school-based interventions, resources have to be made available upfront while health benefits (and savings in health expenditure) begin to materialize only decades later when children grow up and start developing chronic diseases.

Figure 5.1. **Incremental cost-effectiveness ratio (ICER) by type of educational intervention in Europe, 2005**



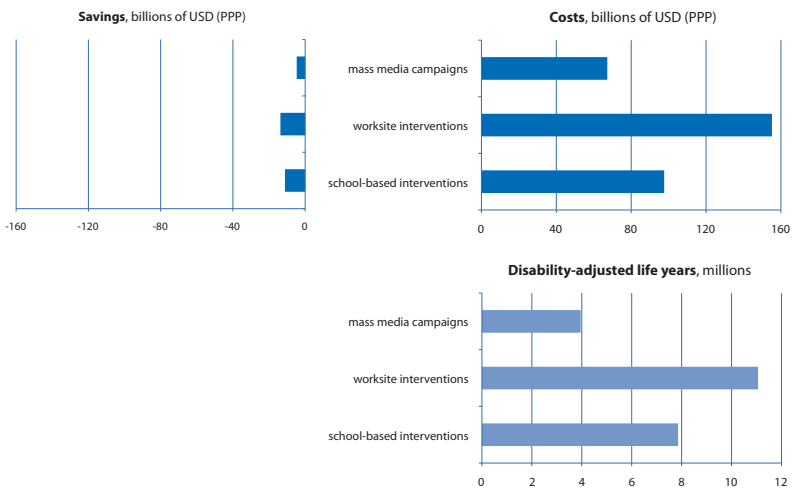
Source: OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", OECD Health Working Papers No. 48, OECD, Paris.

Difference between intervention cost and savings in health expenditure

Figure 5.2 illustrates costs and DALYs gained by class of intervention, with costs divided into direct costs and savings.[13] By presenting the data broken down into costs and health gains, it is possible to get a sense of whether one intervention is relatively more cost-effective because it provides very high comparative gains or because it involves lower costs or a combination of both.

The upper-right figure presents the direct costs of educational interventions while the upper-left figure presents savings in health-care expenditures due to the interventions.[14] The lower figure presents DALYs gained due to the interventions; it suggests that work-based interventions confer the largest benefits, while the benefit is modest for the mass media interventions. Overall, the figure suggests that mass media interventions, in spite of the low gains in DALYs and savings in health expenditure, are the most cost-effective. Although work-based interventions confer the highest gains in DALYs, they are relatively less cost-effective owing to the high direct costs of implementation. Finally, school-based interventions are considered the least cost-effective since the gains in DALYs are not high in spite of the large direct costs and small savings in health expenditure. Hence, despite the modest impact on DALYs, mass media interventions are considered to offer the greatest value for money owing to the low operating costs.

Figure 5.2. **Intervention costs, impact on health expenditure and DALYs gained by intervention, 2005**



Source: OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", OECD Health Working Papers No. 48, OECD, Paris.

Time frame to assess cost-effectiveness

The time frame for calculating the ICER is an important factor to consider. So far the results reported were computed on the assumption that the benefits of the intervention will accrue for 100 years after the first intervention. A period of 100 years was chosen as the baseline model to ensure that all individuals affected by the three interventions will reach the age at which the full effectiveness of interventions is achieved – referred to as the steady state (see Box 5.3).

Box 5.3. **Time frame for assessing cost-effectiveness**

The three standard interventions reach their respective steady states of full effectiveness at different points in time. This is why it is important to consider how changes in the time frame used to evaluate the cost-effectiveness of interventions might affect the calculations. To illustrate the importance which this fact might have for policy makers and to show how it depends on the target population for the three interventions, consider the following example involving school-based interventions and work-based interventions.

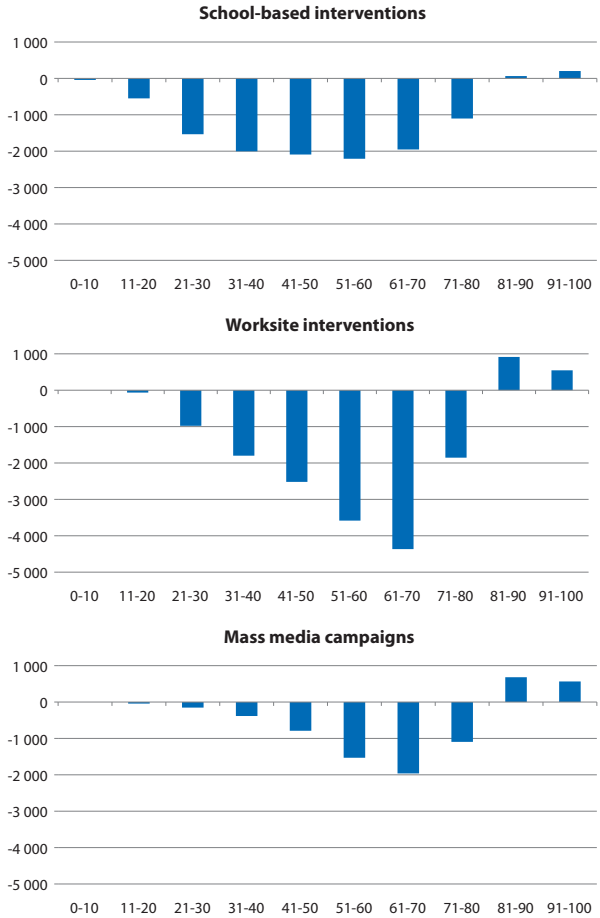
In the simulation, the school-based intervention targets 8-9-year-olds. In year 0 of the simulation, all 8-9-year-olds are exposed to the intervention. In year 1, those who were 7-8 years old in year 0 have reached the target age and are exposed to the intervention. This continues every year until year 100. Although more and more people are exposed to the intervention over time, the effect of the intervention is not realized in full until those exposed to the intervention reach the ages at which obesity-related conditions, such as heart disease, are likely to be prevalent, namely from their late 40s.

Figure 5.3* presents the health-care costs by age group for each intervention (under the 100-year scenario) with negative values representing cost savings. Figure 5.3 shows the cost-savings (from better health) until ages 71-80 and then the increased health expenditure due to people living longer and therefore using health-care resources. In the school-based intervention, the 8-9-year-olds who were first exposed (in year 0) must go through the simulation until year 100 to see the full effect of the intervention – this takes 91 years. It is for this reason that the school-based intervention does not reach the point at which its full effectiveness can be assessed until year 91.

Using similar arguments, the work-based intervention, targeting 18-65 year olds, does not reach steady state until year 35. For the mass media intervention, steady state is reached at the outset since everyone is targeted by this intervention in year 0. Since each intervention reaches its respective steady state at different points in time, their cost-effectiveness is compared at year 100 when all three have had the opportunity to reach their steady state.

*This figure can be directly compared with Figure 5.2 because the sum of the cost savings (the bars which are negative) for each intervention is represented by the bar to the left in Figure 5.2.

Figure 5.3. **Costs by age group, 2005**
Billions of US dollars (PPPs)



Note: Interventions are "cost-saving" in most age groups but become "costly" in the age group 81-100. The main cause is the increased life expectancy of the population resulting from the overall positive impact of each intervention; the number of individuals and, accordingly, the number of individuals with a disease, are higher in the intervention scenarios than in the "do nothing" scenario and, consequently, the costs for treating people affected increase as well.

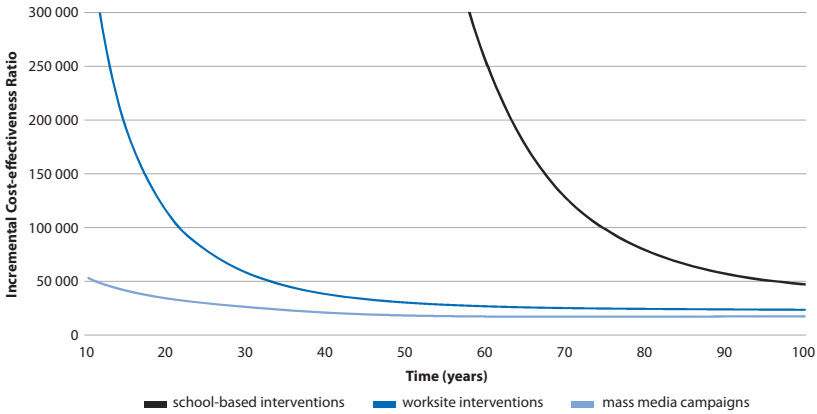
Source: OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", *OECD Health Working Papers* No. 48, OECD, Paris.

However, 100 years would be a relatively long time period in the context of policy decisions on the allocation of resources. Policy decisions are usually made with a much shorter-term perspective. For this reason, Figure 5.4 provides alternative estimates of ICERs based on a continuum of timeframes ranging from 10 to 100 years.[15]

Figure 5.4 suggests that mass media interventions are consistently the most cost-effective regardless of the time frame. School-based and work-based interventions are more costly in terms of their benefits both in the short and long term. However, as the time frame increases, school-based and work-based interventions gradually become more cost-effective options. Thus, while school-based and work-based interventions are significantly more costly than the mass media interventions in the short run, their cost-effectiveness improves significantly in a perspective of over 70-80 years.

Figure 5.4. **ICER by intervention from 10 to 100 years, 2005**

Thousands of USD (PPPs)



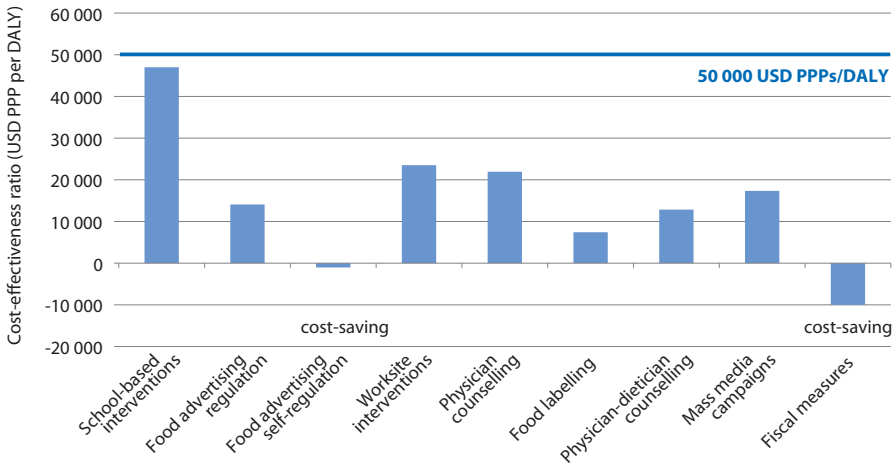
Source: OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", *OECD Health Working Papers* No. 48, OECD, Paris.

Educational interventions versus other interventions targeting obesity

Figure 5.1 implies that for each DALY gained through mass media, work-based and school-based interventions, a government needs to invest about USD 17 300 (PPPs), USD 23 500 (PPPs) and USD 47 000 (PPPs), respectively. Do these interventions provide good value for money? Are these interventions relatively cost-effective compared with other interventions aimed at tackling obesity-related health disabilities? Figure 5.5 presents findings on how different classes of interventions aimed at reducing obesity and obesity-related disease rates perform in terms of ICERs.

Figure 5.5 shows that all three educational interventions fall below the USD 50 000 (PPPs) mark that is sometimes used as a guideline to assess the cost-effectiveness of health related interventions (Devlin and Parkin, 2004). Hence, educational interventions can be considered viable options even compared to more conventional health interventions such as physician and dietician counselling and regulation of food advertising.

Figure 5.5. **Incremental cost-effective ratios: Comparison of selected educational and non-educational interventions**



Source: OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", *OECD Health Working Papers* No. 48, OECD, Paris.

Further studies have assessed the cost-effectiveness of interventions aimed at tackling obesity by calculating the cost per quality-adjusted life year (QALY). This measure is broadly comparable to the DALY measure employed in this chapter. A challenge for comparing the results of this study with QALY-based studies is that the interventions reported in the latter are generally responsive interventions targeting populations at risk rather than the general population (the case in this chapter). With this in mind, it was found that the use of the drug Orlistat for obese individuals cost GBP 45 881 (approximately USD 71 800) per QALY (O'Meara, 2000), the use of other drugs and/or surgery for high-risk individuals has a cost per QALY of no more than GBP 13 000 (approximately USD 20 340) (Avenell *et al.* 2004), while a physician-led diet and exercise programme aimed at obese individuals with impaired glucose tolerance is estimated to have a cost per QALY of GBP 13 389 (approximately USD 20 950) (Avenell *et al.* 2004).

5.4. Conclusion

Obesity has dominated public health concerns in recent years, not least because of the rapid rise in obesity rates worldwide and forecasts predicting acceleration in current trends in the years to come. Despite the importance of the obesity epidemic in public health discourse and practice, there is little evidence upon which to base solid conclusions on the cost-effectiveness of different strategies. This analysis represents a first step towards filling the knowledge gap.

The assessment of the cost-effectiveness of three educational interventions – mass media, work-based and school-based – suggests that all three can be considered cost-effective interventions for tackling obesity.[16] Moreover, it finds that mass media interventions are consistently highly cost-effective over time and are the most cost-effective of the educational interventions examined (whatever the time frame chosen) with an average ICER of USD 17 300 (PPPs) per DALY gained. Work-based interventions are initially less cost-effective but can become cost-effective and viable in the long term for an average ICER of USD 23 500 (PPPs) per DALY gained. Lastly, school-based interventions require a much longer time period to reach their full potential because they target children. However, once they reach steady state, they also prove to be relatively cost-effective, for an ICER of USD (PPPs) 47 000 per DALY gained.

Does this suggest that more resources should be allocated to mass media interventions since these confer "value for money" both in the short and the long run? This may not necessarily be the best approach if equity in health outcomes needs to be addressed. Chapter 4 suggests that the more educated are better able to understand and respond to health-related information. This implies that broadcasting campaigns may increase health inequalities unless they are accompanied by measures to ensure that disadvantaged groups make better use of the information. For their part, school-based interventions may help reduce health inequalities to some extent since many school-based interventions are targeted to the disadvantaged population in the first place.[17] Moreover, school-based interventions may also help address health inequality challenges across age groups. For countries that are concerned about rapidly increasing obesity among youth, school-based interventions may be the preferred policy choice.

It is important to note that this chapter has not taken into account externalities such as intra-household effects, whereby positive changes in lifestyle choices adopted by one household member may positively affect the habits of others. In Chapter 4, it is also suggested that community-level networks may have a powerful impact on obesity. Therefore, educational interventions may have much smaller ICERs if they shape not only the lifestyle and habits of the target of the intervention but also those of other children, classmates, co-workers, friends and others in the community.

Policies that change the environment around individuals will not be effective unless people embrace those changes by practising healthy lifestyles. It is important to understand that policy and legislation alone can only go so far; they cannot control the food choices people make or the amount of physical activity they take part in. It is in this area that educational interventions must be used because education is the key means of providing individuals with the knowledge needed to live a healthier life and thus ultimately reduce the burden of obesity through prevention.

The current evidence base indicates a need for studies that place greater emphasis on the costing component of obesity prevention efforts (Summerbell *et al*., 2005). The need for further costing assessment is not confined to studies on prevention of obesity, but is also necessary for inventions relating to drinking and mental health. Future studies must give equal importance to the assessment of the benefits (effectiveness) as well as the cost of alternative policy options.

Notes

1. Michele Cecchini provided the results for this chapter. These analyses were carried out as part of the OECD Health Division project on the Economics of Prevention.
2. The alternative scenarios would include "no intervention".
3. The World Health Organization (WHO) defines disability-adjusted life years (DALYs) as the sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability. The diseases covered are: ischemic heart disease, stroke, colorectal cancer, lung cancer and breast cancer (for females).
4. See for example Feinstein and Chevalier (2006).
5. There is also limited evidence on the effect of a year of education completed.
6. Some of this research is presented in Chapter 4. There is considerable evidence showing the benefits of educational interventions on the risk factors related to fat intake, fibre intake (measured using fruit and vegetable intake), and participation in sufficient levels of physical activity.
7. Such changes may appear minor at first glance; their importance is best understood when translated into their effect on obesity rates. However, research focused

on the further impact of these interventions on obesity rates is lacking. This study addresses this missing link by modelling how changes in lifestyle habits affect obesity rates and ultimately how they affect survival and quality of life.

8. These interventions have focused on educating adults about the benefits of physical activity on health and means to achieve it.

9. Out of a total of 261 interventions reviewed by the WHO, 108 constitute educational interventions as defined in Box 5.1.

10. The rationale for concentrating efforts on obesity, and not on one of the other domains reviewed in this report, is two-fold. First, the countries participating in the Social Outcomes of Learning (SOL) project overwhelmingly expressed great interest in understanding the ways in which education can reduce obesity. Obesity has become a global epidemic. While it is already one of the main causes of preventable deaths and disabilities worldwide, forecasts indicate that it will play an increasingly central role in contributing to the global burden of chronic disease and disability (WHO, 2006). The second reason for focusing on obesity is that, of the three health domains central to the SOL research initiative, obesity constitutes the easiest test case owing to a rich literature on the specific impact of educational interventions. Furthermore, because obesity appears to be strongly tied to lifestyle habits, health education and information are more likely to prove useful policy tools than in the other cases.

11. The 22 European countries are part of the WHO EUR-A region. They include Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Norway, Portugal, Sweden, Slovenia, Spain, the Netherlands, Switzerland and the United Kingdom.

12. Figure 5.1 assumes that the benefit of the interventions will accrue for the next 100 years and a discount rate of 3%. Implications of shortening the period of accrual are described in the following section.

13. Figure 5.2 reports the total prevention costs, total savings in health expenditure and overall effectiveness assuming the benefit of the interventions will accrue for the next 100 years.

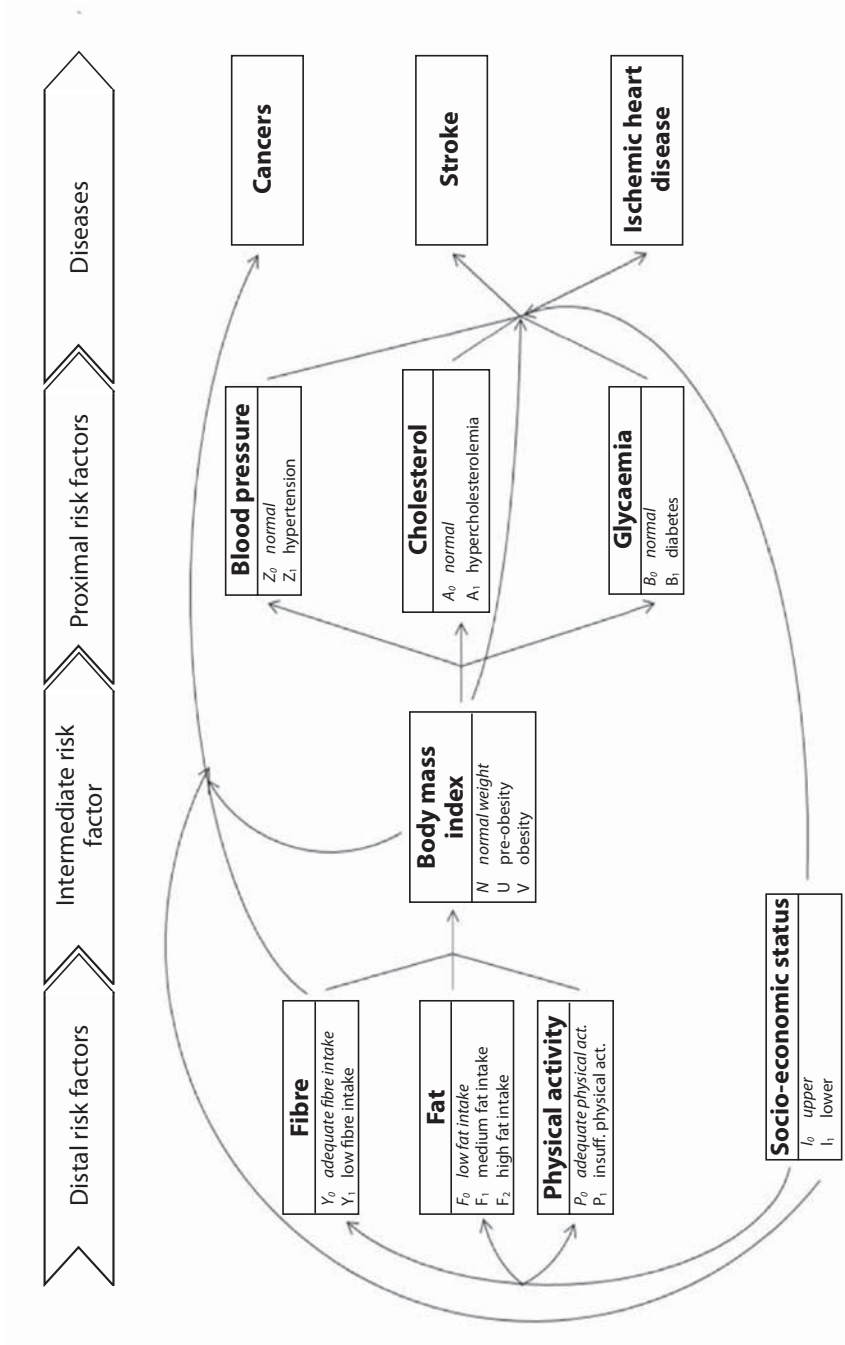
14. As mentioned before, these are savings due to reduced expenditures on cancer, ischemic heart disease, stroke, diabetes, high cholesterol and high systolic blood pressure.

15. The ICERs in Figure 5.4 have been calculated assuming a discount rate of 3% a year.

16. However, if governments need to base their policy decisions on a short-term perspective, mass media interventions are likely to be the only cost-effective and viable option.

17. Chapter 4 also suggests that the interventions may also help reduce health inequalities if they help to raise cognitive and non-cognitive traits, especially among disadvantaged children.

Annex 5.A1
The Epidemiological Model



Note: states written in *italic* are considered the reference state (*i.e.* relative risk equal to 1) in the evaluation of the relative risks.

Annex 5.A2

The WHO-CHOICE Model

The **CHOICE** (**CHO**osing **I**nterventions that are **C**ost-**E**ffective) project is a WHO initiative developed in 1998 with the objective of providing policy makers with the evidence to implement interventions and programmes that maximize health given certain budgets. To achieve this, WHO-CHOICE reports the costs and effects of a wide range of health interventions in the 14 epidemiological sub-regions (world divisions made based on geographical location and epidemiological profiles). The results of this cost-effectiveness analysis are assembled in regional databases, which policy makers can adapt to their specific country setting.

The objectives of WHO-CHOICE

- To develop a standardized method for cost-effectiveness analysis that can be applied to all interventions in different settings
- To develop and disseminate tools required to assess intervention costs and impacts at the population level
- To determine the costs and effectiveness of a wide range of health interventions, conducted with probabilistic uncertainty analysis
- To summarize the results in regional databases that will be available on the Internet
- To assist policy makers and other stakeholders to interpret and use this evidence
- To develop country contextualisation tools.

The added value of the model

Generalized cost-effectiveness analysis forms the basis of the WHO-CHOICE approach. Uniquely, this method allows existing and new interventions to be analysed at the same time. Previous cost-effectiveness analyses have been restricted to assessing the efficiency of adding a single new intervention existing sets, or replacing one existing intervention with an alternative. WHO-CHOICE allows comparison of current interventions together with interventions being considered for implementation. It takes into account synergies between interventions on the costs and effectiveness from a health system perspective.

By using WHO-CHOICE, the analyst is no longer constrained by what is already being done, and policymakers can revisit and revise past choices if necessary and feasible. Thanks to WHO-CHOICE they will also have solid evidence upon which to allocate and reallocate resources between interventions.

Source: World Health Organization (2009), *www.who.int/choice/en/.*

References

Avenell, A. *et al.* (2004), "Systematic review of the long-term effects and economic consequences of treatments for obesity and implications for health improvement", *Health Technology Assessment*, Vol. 8, No. 21.

Buller, D. *et al.* (1999), "Randomized Trial Testing the Effect of Peer Education at Increasing Fruit and Vegetable Intake", *Journal of the National Cancer Institute*, Vol. 91, pp. 1491-1500.

Chan, C., D. Ryan and C. Tudor-Locke (2004), "Health Benefits of a Pedometer-Based Physical Activity Intervention in Sedentary Workers", *Journal of Preventive Medicine*, Vol. 39, pp. 1215-1222.

Chevalier, A. and L. Feinstein (2006), "Sheepskin or Prozac: The Causal Effect of Education on Mental Health", Discussion Paper, Center for Research on the Wider Benefits of Learning, London.

Devlin, N., and D. Parkin (2004), "Does NICE Have a Cost-Effectiveness Threshold and What Other Factors Influence Its Decisions? A Binary Choice Analysis", *Health Economics*, Vol. 13, pp. 437-452.

Dixon, H, R. *et al.* (1998), "Public Reaction to Victoria's '2 Fruit 'n' 5 Veg Every Day' Campaign and Reported Consumption of Fruit and Vegetables", *Journal of Preventive Medicine*, Vol. 27, pp. 572-581,.

Dresler-Hawke, E. (2007), *Take Five: The Cost of Meeting the Fruit and Vegetable Recommendations in New Zealand*, Foundation for Advertising Research, Dunedin.

Drummond, M. *et al.* (2005), *Methods for the Economic Evaluation of Health Care Programmes*, Oxford University Press, Oxford.

Emmons, K., L. Linnan, W. Shadel, *et al.* (1999), "The Working Healthy Project: A Worksite Health-Promotion Trial Targeting Physical Activity, Diet, and Smoking", *Journal of Occupational and Environmental Medicine*, Vol. 41, pp. 545-555.

Ezzati, M., A. Lopez, A. Rodgers, *et al.* (2004), *Comparative Quantification of Health Risks*, World Health Organization, Geneva.

Folland, S., A. Goodman and M. Stano (2007), *The Economics of Health and Health Care, Fifth Edition*, Pearson Prentice Hall, NJ.

Gortmaker, S., L-W-Y. Cheung, K. Peterson *et al*. (1999), "Impact of a School-Based Interdisciplinary Intervention on Diet and Physical Activity among Urban Primary School Children", *Archives of Paediatrics and Adolescent Medicine*, Vol. 153, pp. 975-983.

Heart Foundation and Zurich (2008), "Heart Health Index: Australians Not as Healthy as They Seem", Media Release, 15 October, New Zealand.

Luepker, R., C. Perry, V. Osganian *et al*. (1998), "The Child and Adolescent Trial for Cardiovascular Health (CATCH)", *Journal of Nutritional Biochemistry*, Vol. 9, pp. 525-534.

O'Meara, S., R. Riemsma, L. Shirran *et al*. (2001), "A rapid and systematic review of the clinical effectiveness and cost-effectiveness of orlistat in the management of obesity", *Health Technology Assessment*, Vol. 5, No. 18.

OECD (2009), "Improving Lifestyles, Tackling Obesity: The Health and Economic Impact of Prevention Strategies", *OECD Health Working Papers No. 48*, OECD, Paris.

Perry, C., D. Bishop., G. Taylor *et al*. (1998), "Changing Fruit and Vegetable Consumption among Children: The 5-a-Day Power Plus Program in St. Paul, Minnesota", *American Journal of Public Health*, Vol. 88, pp. 603-609.

Reynolds, K., F. Franklin, D. Binkley *et al*. (2000), "Increasing the Fruit and Vegetable Consumption of Fourth-Graders: Results from the High 5 Project", *Preventive Medicine*, Vol. 30, pp. 309-319.

Sorenson, G., B. Thompson, K. Glanz *et al*. (1996), "Worksite-Based Cancer Prevention: Primary Results from the Working Well Trial", *American Journal of Public Health*, Vol. 86, pp. 939-947.

Sorenson, G., A. Stoddard, M. Hunt *et al*. (1998), "The Effects of a Health Promotion-Health Protection Intervention on Behaviour Change: The WellWorks Study", *American Journal of Public Health*, Vol. 88, pp. 1685- 1690.

Sorenson, G., A. Stoddard, K. Peterson *et al*. (1999), "Increasing Fruit and Vegetable Consumption through Worksites and Families in the Treatwell 5-a-Day Study", *American Journal of Public Health*, Vol. 89, pp. 54-60.

Summerbell, C. E. Waters, L. Edmunds *et al*. (2005), "Interventions for Preventing Obesity in Children", *Cochrane Database of Systematic Reviews*, Issue 3, Art. No. CD001871.

World Health Organization (2004), *Obesity: Preventing and Managing the Global Epidemic*, WHO, Geneva.

World Health Organization (2006), *Obesity and Overweight: Fact Sheet No. 311*, WHO, Geneva.

World Health Organization (2007), *Interventions on Diet and Physical Activity: What Works*, WHO, Geneva.

World Health Organization *(2009), Choosing Interventions that are Cost Effective*, WHO, Geneva, *www.who.int/choice/en/.*

Chapter 6

Conclusion: policy messages and future agenda

Koji Miyamoto and Ricardo Sabates

This chapter presents policy messages derived from this report. Education is not a silver bullet. However, it has a significant potential to promote health and social cohesion by fostering cognitive, social and emotional skills as well as positive attitudes, habits and norms that can help trigger healthy lifestyles and active citizenship. Promoting these competencies is most likely to be fruitful when home and community environments are in line with education-based efforts. This calls for ensuring policy coherence across sectors and stages of education. Early childhood education and care offers particular examples of how integrated and co-ordinated actions can be effectively made and extended to other levels of education. The challenge is no doubt immense, but the returns to well-being and social progress from improving education can be significant.

6.1. Introduction

The idea that education produces social benefits is not new. Early philosophers such as Aristotle and Plato pointed out that education was central to the moral fulfilment of individuals and the well-being of the society in which they live (Barnes, 1982; Hare, 1989). In more recent times, however, education has been increasingly regarded as an investment with economic returns. It was not until the mid-1980s that social scientists started to observe that individuals with higher levels of education tended to live longer, commit less crime and engage more in society than those with lower levels of education. Educated parents were more engaged with their children's school progress than less educated parents, and children who had experienced rich learning environments were more cohesive and less prone to risky behaviour. The idea that education was a key ingredient in generating such benefits began to emerge in the literature (Haveman and Wolfe, 1984).

The previous chapters have synthesised the knowledge base on this issue. The report started by describing the recent emergence of global initiatives to foster well-being and social progress. In doing so, it showed how the OECD's Social Outcomes of Learning (SOL) project related to this trend. The report has also delved into the extensive and fast-growing literature on this topic to examine whether and to what extent education makes a difference in people's health and civic and social engagement, how this can be achieved and under what conditions. At the end of this long journey, this chapter recapitulates the research results by translating evidence into policy messages and presenting a way forward in terms of future research and policy dialogues.

6.2. Policy messages

Policy message 1: Education can improve health and social cohesion by empowering individuals with knowledge, cognitive skills and socio-emotional skills and by instilling positive values, attitudes and norms.

The main conclusion of the OECD's Social Outcomes of Learning (SOL) project is that education matters. It has significant potential to raise the level of an individual's health, civic participation and trust and to foster the collective social cohesion of communities and society at large. The power of education lies in its capacity to improve knowledge, cognitive skills and socio-emotional skills; strengthen attitudes to risk as well as resilience and self-efficacy; and shape values, norms and habits. These competences can be produced and strengthened over the course of a lifetime through various forms of learning – formal, non-formal and informal. In contemporary societies, education is one of the most powerful ways to improve social outcomes and foster social progress.

However, the education system is not necessarily organised to produce these positive outcomes effectively. The relevant policy question, then, is: How can the positive social impact of education be improved and strengthened? The Social Outcomes of Learning (SOL) project shows that it is necessary to look into specific pathways and strategies. There are some very powerful examples of effective educational interventions. For instance, schools have successfully promoted active citizenship using situated learning so that students learn "democracy in action" by engaging directly in local democracy. Schools have also promoted healthy diet and lifestyles by promoting extra-curricular sports activities and improving students' access to healthier food (*e.g.* school meals and vending machines).

Policy message 2: Early childhood education and care has significant potential to improve health and civic and social engagement more efficiently

Promoting early childhood education and care has recently gained prominence on the education agenda. Chapter 4 suggests that early childhood education and care can foster the development of cognitive, social and emotional skills that have been shown to raise short-term and long-term health outcomes (Carneiro *et al.*, 2007; Cunha and Heckman, 2008). Chapter 3 points out that these skills also drive civic and political participation. Numerous studies suggest that early development of these skills can make further investment in them more efficient: "Skills beget skills" (Cunha and Heckman, 2008). The family plays an important role in initiating these skills while early childhood education and care and schools (along with further family inputs) can enhance and build on them to improve health and civic outcomes. In sum, starting early appears to promote efficiency in raising social outcomes.

Policy message 3: Compulsory primary and secondary education can do more to promote health and civic and social engagement

The evidence on the contribution of the past decades of expansion in compulsory education to better health and civic and social engagement is mixed. This does not mean that schools play a limited role. Chapters 3 and 4 present studies showing that education can make a difference by raising children's cognitive skills (*i.e.* literacy, numeracy and higher-order processing) and socio-emotional skills (*i.e.* self-efficacy, self-esteem and social skills), and by developing norms and habits of active participation and healthy lifestyles. However, the effects of schools are found to be modest when the schools only provide abstract information, *e.g.* through health and citizenship curricula, or when they simply encourage students to eat nutritious food or volunteer. Schools do better when they develop norms of healthy lifestyles and active citizenship and provide an open classroom climate and situational learning (Torney-Purta *et al.*, 2001; Benton *et al.*, 2008;

Trudeau and Shephard, 2008). Students are more likely to learn the values of active citizenship by engaging in real-life projects. They can also learn more about the health benefits of a balanced diet and a healthy lifestyle by eating well-balanced school meals and engaging in extensive extra-curricular physical activities.

Policy message 4: A rise in tertiary attainment may further help to raise the level of health and civic and social engagement

The tertiary education system is expanding in many OECD countries (OECD, 2010). Chapters 3 and 4 suggest that tertiary education is more strongly associated than primary and secondary education with improvements in trust and tolerance and a lessening of obesity, although it is difficult to establish causal links. There is indirect evidence suggesting that tertiary education matters. For instance, a study based on data from the United Kingdom shows that advanced competences – those requiring higher-order abstract thinking – explain a sizeable part of the relationship between education and obesity (Cutler and Lleras-Muney, 2010). Better access to social networks, which tertiary graduates tend to enjoy, has also proved to be an important pathway in terms of the relationship between education and obesity. Moreover, social psychologists suggest that ages 18 to 25 are among the most important years for forming beliefs and values about how a society functions (Krosnick and Alwin, 1989; Giuliano and Splimbergo, 2009). Attending tertiary education during this period may also promote a stronger sense of interpersonal trust and tolerance towards immigrants if individuals learn about the social and economic benefits of living in a socially and culturally diverse community. In sum, the current expansion of tertiary education systems is likely to help improve health and civic and social engagement.

Policy message 5: Education can contribute to reducing inequalities in social outcomes

Significant inequalities in health and civic and social engagement exist across demographic and socioeconomic groups (Verba *et al*., 1995; CSDH, 2008) and across educational groups as well. The expansion of tertiary attainment may offer an opportunity to reduce inequalities if disadvantaged groups benefit more from increased educational opportunities than those in other groups. Inequalities can also be tackled through direct educational interventions targeted at disadvantaged groups. Targeted interventions designed to raise cognitive, social and emotional skills have been shown to help reduce inequalities.

Inequalities usually appear at the beginning of the life cycle. Since “skills beget skills”, the effectiveness of targeted interventions in reducing inequalities can be enhanced by starting early. For instance, early childhood education and care programmes in the United States have shown positive and sizeable health effects among treated disadvantaged groups.

Policy message 6: Policy coherence across sectors and levels of education raises the effectiveness, efficiency and sustainability of efforts to promote health and civic and social engagement

School-based efforts to foster health and CSE are likely to be more effective when the home and community environments are in line with what children experience at school. Chapter 4 shows that school-based efforts to promote healthy lifestyles and habits are less likely to be effective when children are allowed to engage in sedentary activities at home or to find fast-food restaurants on their way home from school (Gortmaker *et al.*, 1999; Currie *et al.*, 2010). Peer effects also matter. Having friends who engage in risky health behaviour such as under-age drinking and smoking has a negative effect on children's health outcomes (Clark and Loheac, 2007; Lundborg, 2008). This points to the importance of adopting a coherent approach, which can be facilitated by integrated delivery of services. Early childhood education and care programmes in the United States and the United Kingdom provide useful insights into how an integrated approach involving multiple stakeholders can work. However, evaluation studies from the United States suggest that integrated approaches may sometimes yield only short-term benefits to children if the treated children then return to poor quality schools (Currie and Thomas, 2000). This suggests the importance of ensuring policy coherence across levels of education.

It is important to stress that policy coherence is not only about sharing information, although this is an important first step. Coherent policy action often requires significant changes in stakeholder behaviour, and this is a challenge. For example, improving the nutritional content of food served at home requires changes in the way parents prepare food and may also involve an increase in household expenditures. Banning or reducing the number of snacks with high fat and sugar content in school vending machines is likely to be difficult if schools count on the revenue generated from the machines. Even more difficult will be changing school-age children's access to TV advertisements and fast-food restaurants. However, there are other ways to address these problems. For instance, improvements in school meals can be accompanied by parental counselling on home food preparation. Vending machines and fast-food restaurants can introduce healthier options.[1] This may in turn leave much of the challenges to be addressed via children's psychosocial features, such as self-control and self-efficacy, which can be developed through the family and school.

Policy coherence requires governments to promote strong linkages both horizontally (*i.e.* across ministries of education, health, family and welfare), vertically (*i.e.* across central, regional and local levels of government) and dynamically (*i.e.* across different levels of education).[2] This will be challenging as OECD governments have limited experience in fostering such

linkages. Governments may consider enhancing governance and management structures as well as policy instruments to improve horizontal and vertical collaboration and adopt a "whole of government" approach to social progress.

Policy message 7: Much more can be done to improve health and social cohesion by better mobilising existing educational resources

After recognising the various ways in which education might contribute to improving health and civic and social engagement, it is logical to ask how much extra funding is necessary in order for education to make its contribution to fostering social outcomes. It is important to stress that education will be provided for regardless of any consideration of its effect on health and civic and social engagement. The question is not whether countries need more education to raise social outcomes, but rather how they organise their educational systems so that they also leverage health and civic and social engagement. Certain approaches such as comprehensive early childhood education and care programmes are likely to be resource-intensive, although the long-term returns are likely to be high.[3] Raising the quality of the compulsory schooling environment in terms of the norms, ethos and climate that are conducive to healthy lifestyles and active citizenship probably requires far fewer resources. Tertiary education is also an area that only calls for limited additional resources, since the contribution of this level of education to social outcomes is likely to be through its role in fostering higher-order competences and social skills, as well as through its contribution to creating social networks.

A further concern might involve the extra time needed to improve healthy lifestyles in school, which might affect the amount of time spent on academic subjects. Chapter 4 suggests that up to an hour of physical activity can be added to a school curriculum by taking time from other subjects without compromising students' academic outcomes (Trudeau and Shephard, 2008).

Policy message 8: Education is not a silver bullet for tackling challenges relating to health and civic and social engagement but its net impact is likely to be high after externalities are taken into account

Education is not likely to be the solution to the diverse challenges regarding health and civic and social engagement in OECD countries. Nonetheless, this report suggests that the impact of education on health and civic and social engagement can be significant when the diverse externalities it may promote are taken into account. Educated parents have been shown to raise not only the cognitive and non-cognitive skills of their children, but also their early life health circumstances (Currie and Moretti, 2002; Carneiro *et al.*,

2007; Cunha and Heckman, 2008). A more educated wife has been shown to be associated with a reduced risk of the husband's death or coronary heart disease (Bosma *et al.*, 1994). The presence of a large number of educated people has been shown to be associated with a higher level of trust and tolerance in the community (OECD, 2010). Considering all these externalities, the productive value of education can be considered more significant than what is usually in the minds of policy makers.

6.3. Implications for research

Working towards a coherent framework for evaluating the social outcomes of learning

Major progress has been made in the area of social outcomes of learning on both the theoretical and empirical fronts. The work has generally been undertaken independently by researchers across a range of disciplines: education, economics, public health, epidemiology, political science, sociology and psychology. The challenge for the SOL project was to locate and exploit the vast knowledge bases available in each of these research fields, in order to generate a holistic picture of the relationship between education and social outcomes. The first phase of the SOL project attempted to develop a coherent conceptual framework using "self-in-context" and "absolute, relative and cumulative (ARC)" models based on theories in the fields of developmental psychology and political science. The second phase of the SOL project derived implications from these models, and used empirical analyses to evaluate the viability of different hypotheses. The empirical framework is presented in this report in order to make clear the type of empirical evidence used and how it can be interpreted. Although the framework has become more transparent, coherent and holistic, there is a need for further efforts in this direction. In the absence of such a framework,[4] it would be difficult to enhance intersectoral research collaboration. Without enhanced research collaboration, it would be difficult to take full advantage of the rich knowledge base in diverse areas of research.

Expanding the focus to other domains of social outcomes

This report focused on three domains of health, *i.e.* obesity, mental health and alcohol consumption, and three domains of civic and social engagement, *i.e.* civic participation, political participation and trust/tolerance. These were chosen on the basis of their policy relevance and because they are likely to have significant effects on other key indicators of well-being and social progress.[5] In evaluating the relationship between education and these domains, this report highlights the general lack of relevant research, so that the question

of whether and how education raises these outcomes cannot be adequately answered. While this calls for more research, the good news is that the areas in which the evidence base is weak have been identified. These points are addressed in Chapters 3, 4 and 5. However, other domains also deserve in-depth analysis. They include crime, religion, patriotism and ecological behaviour. Researchers in various disciplines are already tackling many of these issues. It will be important to gain an overall picture of the relationship between education and these domains as well.

Determining causal effects and pathways

This report shows that there is rather limited evidence of causal links. This is in part due to the lack of sufficient data to make causal inferences and identify causal pathways.[6] It is also due to the difficulties in identifying and estimating parameters of structural models (*i.e.* theoretical models) of decision-making (Heckman, 2010). While there is a significant amount of information on the causal effects of education at the secondary school level, few studies have evaluated the causal effects of education at the tertiary or pre-compulsory school levels. This is because valid instruments that can be applied to implement quasi experiments at these levels of education are rarely available. This is unfortunate, since an increasing number of studies suggest that early childhood education and care is likely to be important for fostering children's cognitive, social and emotional skills, and, consequently, their health outcomes. There is also indirect evidence suggesting that tertiary education is more strongly related to some domains of social outcomes than education at other levels. This points to the importance of identifying strategies to evaluate the causal impact of education at both ends of the formal education cycle. In the absence of experimental data and longitudinal data for a large number of countries, it may be useful to consider options for making the best use of cross-sectional data. This would also involve systematically collecting policy information from many countries in order to carry out policy analysis empirically, which involves identifying counterfactual states.[7]

The literature increasingly generates evidence on causal pathways, primarily by evaluating specific policy interventions. While this evidence is very useful, in general it is not grounded in economic models that are formulated to answer the policy question or intervention (Heckman, 2010). In addition, this evidence does not provide information about the relative impacts of different causal pathways. For policy makers, it is important to understand what works, why it works and what works better. Heckman (2010) suggests a new innovative way of conducting policy analysis empirically that combines the features of the programme evaluation literature (which aims at estimating the effects) with the structural approach (which aims at estimating the parameters of the theoretical model). With this new approach, it would be possible to clarify what works

and why it works. In order to address the question of what works better, one approach is to conduct cost-effectiveness (or cost-benefit) analyses of different interventions. This is done in Chapter 5, which evaluates the cost-effectiveness of various educational interventions on obesity. Another way is to evaluate the contribution of each causal pathway in explaining the relationship between education and social outcomes. Cutler and Lleras-Muney (2010) provide evidence using the latter method based on rich longitudinal and cross-sectional data from the United Kingdom and the United States. Both types of analysis can be usefully extended to other domains of social outcomes and across countries, although the extent to which this can be done well depends on the availability of quality data.

Understanding contexts that matter

Epidemiology, public health and sociology provide a significant knowledge base on family and community factors that matter, not only directly for health and civic and social engagement, but also for how efficiently schools contribute to health and civic and social engagement. While this report could not fully account for the diverse evidence available, it is clear that these contexts play a significant role and need to be taken more seriously when explaining the relationship between education and social outcomes. The evidence base appears to be strong in the field of health, possibly owing to the availability of quality data. However, there is not enough information available to evaluate how contexts matter for fostering the role of schools in promoting civic and social engagement. A recent European study on the social determinants of vocational education and training (VET), for example, evaluates how the social benefits of VET depend on the availability of welfare services (Sabates *et al*., 2010).

Evaluating other types of learning

This report shows that most empirical studies shed light on the role of formal schooling and early childhood education and care, but that there is still very limited knowledge about the role of adult education in fostering social outcomes. If a policy goal is to empower not only children but also adults to better tackle health and civic and social engagement issues, it is necessary to know how adults develop skills, attitudes and habits that lead to better social outcomes. A Canadian study suggests that the returns to health and civic participation from raising adult literacy are significant, and that the simple practice of reading magazines and newspapers daily can lead indirectly to better health outcomes (Canadian Council on Learning, 2008). A similar study carried out for a larger set of countries could yield a significant amount of policy-relevant information.

Using micro-data that raises analytical power

In order to understand causal relationships, it is preferable to use large-scale longitudinal micro-data that follow individuals over time. For health, this report has highlighted research using the US National Longitudinal Survey of Youth (NLSY) 1979 and the UK National Child Development Survey (NCDS). For civic and social engagement, the UK Citizenship Education Longitudinal Study (CELS) is among the few sources available for evaluating the effects of education (or of citizenship education) on civic and social engagement. It is not possible to overstate the importance of promoting this type of data collection for other domains of social outcomes and other OECD countries in spite of the high cost and painstaking efforts involved. The long-term returns to such an investment are likely to be high given the amount of policy information such data provide. In the absence of such data, an alternative approach may be to make better use of available cross-sectional data and compare outcomes across countries.

OECD (2007b) suggests that qualitative research may complement quantitative analyses based on longitudinal data. This approach collects relevant background information about the family, school and community environments that accompany the lives of individuals. Such information may reveal contexts and pathways underlying education's influence that it is not possible to discern using quantitative analyses. It can also be used to better interpret or validate related analyses based on quantitative analyses. Moreover, system-level information on school organisation, teacher quality and school facilities may also add significant insights.

6.4. The role of the OECD

The difficulty in pushing forward these policy and research agendas is tremendous, and it would no doubt involve a long period of time and considerable efforts by stakeholders working in different disciplines. The OECD, and in particular the Centre for Educational Research and Innovation (CERI), can make a useful contribution in various areas.

Intersectoral policy dialogue

One of the key messages stemming from this report is the need to foster policy coherence across various sectors, including education, health, family/social policies and agriculture. This list will no doubt expand as it becomes clearer how policies in other government sectors interact with policies in the fields of education and health and play a prominent role in shaping the context for learning and health-related behaviour. With better policy coherence, the effectiveness, efficiency and sustainability of policies and school practices are likely to be enhanced and result in better health and civic and

social engagement outcomes for citizens and reduced expenditures for governments. CERI is well positioned to foster policy dialogue by mobilising data, information and policy experience in member countries and to elucidate and promote best practices.

Intersectoral research dialogue

This report was prepared using evidence principally from the areas of education and economics. The scope of the project did not permit full exploitation of the rich evidence available in fields such as epidemiology, medicine, political science and sociology. In discovering the range of evidence available in other sectors, it was apparent that the research for such work needs to be intersectoral. Future work needs to take this into consideration and to take a more holistic approach to identifying appropriate evidence and evaluating its implications. One way to do this would be to establish research panels consisting of representatives from different areas of research. The panel members' role would be to ensure that the conceptual framework and empirical strategies take account of the wealth of knowledge available across the different research areas.

Analysis

CERI is also well placed to contribute to the knowledge base. Its comparative advantage lies in its access to expertise, micro-data[8] and information on policies and institutions in different sectors. CERI can usefully mobilise these resources to address some of the key areas of SOL research for which there is still a shortage of robust evidence.

Education and health

This report examined a number of studies that evaluate causal relationships (mostly using quasi-experiments) and identify causal pathways. Unfortunately, these studies were conducted on different countries and areas and are inconsistent. This makes it difficult to extract the common features of education systems that work and to identify the conditions that drive differences in the performance of education systems across countries. This calls for a consistent and systematic empirical analysis across a large set of OECD countries. It may not be realistic to use rich longitudinal data owing to the limited availability of such data in many OECD countries. It is however feasible to conduct analyses based on cross-sectional data. Although use of cross-sectional data significantly reduces explanatory power, it may still be possible to appraise possible causal relationships using instruments that capture policy reforms.[9] Alternatively, analyses could break down the relative importance of different causal pathways. This would indicate the areas on which policy interventions might focus.

Education and civic and social engagement

Compared to the health domains, much less work has been done on the civic and social engagement domains in OECD countries. Among the most prominent work in this area is the civic education (CivEd) study conducted by the International Association for the Evaluation of Educational Achievement (IEA). This study used cross-sectional micro-data on 14 year-olds from a large number of countries. The limiting factors in the study were the difficulty in evaluating how schools and contexts shape civic participation and the lack of information on citizenship participation.[10] A study by Denny (2003) shows, using the International Adult Literacy Survey (IALS) data for a number of OECD countries, that education has a causal effect on volunteering and civic participation. The limitation of Denny's work is that IALS lacked good indicators for social and emotional skills which have been shown to have a potentially important role in shaping attitudes and actual civic participation. CERI could undertake a similar analysis by exploring the micro-data to be generated through the OECD Programme for the International Assessment of Adult Competencies (PIAAC) which will cover diverse sets of competences, including a range of cognitive and non-cognitive skills.

Education and other social domains

SOL work has thus far focused on health and civic and social engagement. There are obviously many other areas with which education is likely to have a relationship. Recent recommendations by the Stiglitz-Sen Commission (Stiglitz *et al.*, 2009) point to the numerous domains of well-being and social progress that are of high priority in OECD countries. It would be useful to assess this list carefully and identify those that deserve further analysis, such as disease prevention, crime and ecological behaviour.

6.5. Conclusion

Since the start of the first phase of the SOL project in 2005, a conceptual model has been developed to describe the complex mechanisms through which education is likely to play a role in shaping two measures of social progress: health and civic and social engagement. This report has built on this framework to present an empirical synthesis by gathering the fruit of emerging research in this field and providing a further contribution. While the weakness of the evidence base and the need to advance the research frontier is fully acknowledged, a number of important policy conclusions have been drawn and presented in this chapter. These conclusions should do justice to the present state of the knowledge base on the social outcomes of learning; they must be constantly questioned and challenged through continued research efforts and meaningful policy debates.

Notes

1. WHO (2008) suggests encouraging "schools to replace energy-dense, micronutrient-poor products with milk, yoghurts without added sugar, water, fruit juices without added sugar, sandwiches, fruits, nuts or vegetables".
2. Sabates and Feinstein (2008) show how co-ordinated policy delivery is more effective in reducing crime compared with policies that are implemented separately by different ministries.
3. For example, Currie (2001) suggests that a simple cost-benefit analysis shows that Head Start, a prominent early childhood education and care programme in the United States, would pay for itself in terms of cost savings to the government if it produced even a quarter of the long-term gains of model programmes.
4. As emphasised in OECD (2007b), such a framework does not necessarily need to be composed of a single unified model, but can be a coherent portfolio of testable models.
5. For instance, civic participation and trust have been shown to affect economic growth and the smooth functioning of democracy.
6. Large-scale longitudinal data, experimental data or twins' samples are rarely available. The challenges in making casual inferences are also due to the difficulties in identifying and estimating parameters of structural models (*i.e.* theoretical models) of decision-making (Heckman, 2010).
7. This could be achieved by having information on the same individual under two alternative educational interventions and comparing outcomes from these interventions. Heckman (2010) suggests that causal comparisons are possible when contrasting the outcomes in alternative states holding other factors the same for the individual.
8. Micro-data may be collected at the level of individuals (*i.e.* children and adults) as well as schools.
9. It would be of particular interest to identify policy reforms that capture access to tertiary education.
10. The CivEd study instead used intended participation.

References

Barnes, J. (1982), *Aristotle*, Oxford University Press, Oxford.

Benton, T., E. Cleaver, G. Featherstone, D. Kerr, J. Lopes and K. Whitby (2008), *Citizenship Education Longitudinal Study (CELS): Sixth Annual Report. Young People's Civic Participation in and beyond School: Attitudes, Intentions and Influences*, DCSF Research Report 052, Department for Children, Schools and Families, London.

Bosma, H. *et al.* (1994), "Differences in Mortality and Coronary Heart Disease between Lithuania and the Netherlands: Results from the WHO Kaunas-Rotterdam Intervention Study (KRIS)", *International Journal of Epidemiology*, Vol. 23, Oxford University Press, Oxford.

Canadian Council on Learning (2008), *Health Literacy in Canada: A Healthy Understanding*, Canadian Council on Learning, Ottawa.

Carneiro, P., C. Crawford and A. Goodman (2007), "Impact of early cognitive and non-cognitive skills on later outcomes", *Centre for the Economics of Education Working Paper*, London School of Economics, London.

Clark, A. and Y. Lohéac (2007), "'It wasn't me, It was them!' Social Influence in Risky Behavior by Adolescents", *Journal of Health Economics*, Vol. 26, pp. 763-784.

CSDH (Commission on Social Determinants of Health) (2008), *Closing the gap in a generation: health equity through action on the social determinants of health*. Final Report of the Commission on Social Determinants of Health, World Health Organization, Geneva.

Cunha, F. and J.J. Heckman (2006), "Formulating, Identifying and Estimating the Technology of Cognitive and Noncognitive Skill Formation", *The Journal of Human Resources*, Vol. XLIII, University of Wisconsin, Madison.

Currie, J. (2001), "Early Childhood Intervention Programs: What Do We Know?", *Journal of Economic Perspectives* Vol. 15, Spring, pp. 213-238.

Currie, J. and E. Moretti (2002), "Mother's education and the intergenerational transmission of human capital: Evidence from college openings and longitudinal data", *NBER Working Paper* 9360, National Bureau of Economic Research, Cambridge, MA.

Currie, J. and D. Thomas (2000), "School Quality and the Longer-Term Effects of Head Start", *The Journal of Human Resources*, Vol. 35, pp. 755-774.

Currie, J. *et al.* (2010), "The Effects of Fast Food Restaurants on Obesity", *American Economic Review*, forthcoming.

Cutler, D. and A. Lleras-Muney (2010), "Understanding differences in health behaviours by education", *Journal of Health Economics*, Elsevier.

Denny, K. (2003), "The effects of human capital on social capital: A cross-country analysis", *The Institute for Fiscal Studies Working Paper series WP03/06*, Dublin.

Giuliano, P. and A. Spilimbergo (2009), *NBER Working Papers 15321*, National Bureau of Economic Research, Cambridge, MA. http://ideas.repec.org/p/nbr/nberwo/15321.html.

Gortmaker, S.L. *et al.* (1999), "Reducing Obesity via a School-Based Interdisciplinary Intervention Among Youth – Planet Health", *Archives of Pediatrics and Adolescent Medicine*, Vol. 153, pp. 409-418.

Hare, R.M. (1989), *Plato*, Oxford University Press, Oxford.

Haveman, R. and B. Wolfe (1984), "Schooling and economic well-being: The role of nonmarket effects", *The Journal of Human Resources*, Vol. 19, pp. 377-407.

Heckman, J.J. (2010), "Building Bridges Between Structural and Programme Evaluation Approaches to Evaluating Policy", *Journal of Economic Literature*, Vol. 48, pp. 356-398.

Krosnick, J.A. and D.F. Alwin (1989), "Aging and susceptibility to attitude change", *Journal of Personality and Social Psychology*, Vol. 57, pp. 416-425.

Lundborg, Petter (2008), "The Health Returns to Education – What Can We Learn from Twins?" *Tinbergen Institute Discussion Paper No. TI 08-027/3*, http://ssrn.com/abstract=1113685.

Meara, E.R., 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, pp. 350-360.

OECD (2007a), *Evidence in Education: Linking Research and Policy*, OECD, Paris.

OECD (2007b), *Understanding the social outcomes of learning*, Centre for Educational Research and Innovation, OECD, Paris.

OECD (2010), *Education at a Glance* 2010, OECD, Paris.

Sabates, R. and Feinstein, L. (2008). "Effects of Government Initiatives on Youth Crime", *Oxford Economic Papers*, Vol.60: 462-483.

Sabates, R. *et al*. (2010), *Social Benefits of Vocational Education and Training for Individuals: Concepts, Contexts and Empirical Results*, CEDEFOP, Thessaloniki.

Stiglitz, J., A. Sen and J-P. Fitoussi (2009), *Report by the Commission on the Measurement of Economic Performance and Social Progress, http://stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf.*

Torney-Purta, J. *et al*. (2001), *Citizenship and education in twenty-eight countries: civic knowledge and engagement at age fourteen*, IEA, Amsterdam.

Trudeau, F. and R.J. Shephard (2008), "Physical Education, School Physical Activity, School Sports and Academic Performance", *The International Journal of Behavioral Nutrition and Physical Activity*, Vol. 5, pp. 1-12.

Verba, S., K.L. Schlozman and H.E. Brady (1995), *Voice and equality: civic voluntarism in American politics*, Harvard University Press, Cambridge, MA.

World Health Organization (2008), *School Policy Framework*, WHO, Geneva.

OECD PUBLISHING, 2, rue André-Pascal, 75775 PARIS CEDEX 16
PRINTED IN FRANCE
(96 2010 08 1 P) ISBN 978-92-64-08630-2 – No. 57568 2010

Improving Health and Social Cohesion through Education

Today's global policy climate underlines the importance of better addressing non-economic dimensions of well-being and social progress such as health, social engagement, political interest and crime.

Education plays an important role in shaping indicators of progress. However, we understand little about the causal effects, the causal pathways, the role of contexts and the relative impacts that different educational interventions have on social outcomes.

This report addresses challenges in assessing the social outcomes of learning by providing a synthesis of the existing evidence, original data analyses and policy discussions. The report finds that education can promote health as well as civic and social engagement by fostering cognitive, social and emotional skills and promoting healthy lifestyles, participatory practices and norms. These efforts are most likely to be successful when family and community environments are aligned with the efforts made in educational institutions. This calls for ensuring policy coherence across sectors and stages of education.

Further reading

Understanding the Social Outcomes of Learning (OECD, 2007)

The full text of this book is available on line via these links:
www.sourceoecd.org/education/9789264086302
www.sourceoecd.org/socialissues/9789264086302

Those with access to all OECD books on line should use this link:
www.sourceoecd.org/99789264086302

SourceOECD is the OECD's online library of books, periodicals and statistical databases.
For more information about this award-winning service and free trials, ask your librarian, or write to us at **SourceOECD@oecd.org**.

OECD*publishing*
www.oecd.org/publishing

ISBN 978-92-64-08630-2
96 2010 08 1 P

9 789264 086302