OECD Health Policy Studies

The Heavy Burden of Obesity

THE ECONOMICS OF PREVENTION

OECD

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Foreword

It has been nearly a decade since the OECD published its flagship report on obesity, *Fit not Fat*. During the intervening years, countries have put in place innovative and, in some cases, ambitious policies to turn the tide on the obesity epidemic.

Unfortunately, though, the end is not in sight yet. Overweight and obesity rates have continued to climb to 58% of the adult population across OECD countries. Childhood and morbid obesity have gone from a rare event to a common occurrence. Obesity now poses an alarming burden on individuals, societies and economies in OECD countries and beyond.

This report demonstrates that there is a strong economic case for investing in prevention to tackle obesity. By linking its advanced microsimulation model with the OECD long-term projection model, this report simulates the impact of obesity on health expenditure and the wider economy in 52 countries to 2050. The analysis shows how obesity not only reduces life expectancy but also damages pupils' school performances, workforce productivity, and negatively impacts GDP.

But there is a good news. Every dollar spent on preventing obesity generates an economic return of up to six dollars – making prevention interventions an excellent investment. Different policy packages can reduce this burden while saving money.

This report is a clear illustration of how better policies can lead to better lives. By investing in prevention, policymakers have the opportunity to halt the rise in obesity for future generations, and benefit economies. There is no more excuse for inaction.

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Acronyms and abbreviations

ALSPAC	Avon Longitudinal Study of Parents and Children
AUD	Australian Dollar
BHBM	Be He@lthy, Be Mobile
BMI	Body mass index
BoP	Back of pack
CATCH	Coordinated Approach to Child Health in the United States
CFBAI	Children's Food and Beverage Advertising Initiative
CI	Confidence interval
CVD	Cardiovascular disease
C4F	Change4Life
DALY	Disability-adjusted life year
EDNP	Energy-dense, nutrient-poor
EBT	Electronic benefit card
EO	Economic outlook
EU	European Union
EU28	The 28 member states of the European Union
FDA	Food and Drug Administration
Fad	Food Advertising Regulation
FLab	Food Labelling
FoP	Front of pack
GBP	Great Britain Pound
GDA	Guideline daily amount
GDP	Gross domestic product
GP	General practitioner
GPA	Grade point average
G20	The Group of Twenty
HALE	Healthy life expectancy
HBSC	Health-Behaviours in School-based Children (survey)
HE	Health expenditure
HFCS	High-fructose corn syrup
HHFKA	Healthy, Hunger-Free Kids Act
HIP	Healthy Incentives Pilot
iDAT	Diet and Activity Tracker
IFBA	International Food and Beverage Alliance
ITU	International Telecommunication Union
HPB	Health Promotion Board
LY	Life year
LE	Life expectancy
MAp	Mobile application
MD	Mean difference
MLa	Menu labelling
MM	Mass media campaigns

NCD	Non-communicable disease
NHANES	National Health and Nutrition Examination Survey
NSC	National Steps Challenge
OECD	Organisation for Economic Co-operation and Development
OECD SPHeP NCDs	OECD Strategic Public Health Planning for NCDs
PA	Physical activity
PACE	Physical activity calorie equivalent
PaP	Physical activity prescription
PaSc	School-based programs
PaSe	Workplace programmes to reduce sedentary behaviour
PaTr	Expanding public transportation
PaW	Workplace wellness programmes
PHO	Partially hydrogenated oils
PISA	Programme for International Student Assessment
PNNS	Programme National Nutrition Santé
PPP	Purchasing power parity
R&D	Research and development
RII	Relative index of inequality
RR	Relative risk
SES	Socioeconomic status
SNAP	Supplemental Nutrition Assistance Program
SNBR	Syndicat National des Boissons Rafraichissantes
SSB	Sugar-sweetened beverage
UN	United Nations
USD	United States Dollars
WCRFI	World Cancer Research Fund International
WHO	World Health Organization

Infographic 1. The heavy burden of obesity and the economics of prevention

Being overweight has become a widespread issue

OECD average

Almost 60% of people are overweight...

...of which nearly 25% have obesity

Source: OECD analyses on the WHO Global Health Observatory, 2018

Unhealthy diets and lack of physical activity underpin rise in being overweight

50% of people have an unhealthy diet (measured against national guidelines)

40% of waking time is spent in sedentary activities (e.g. watching TV)

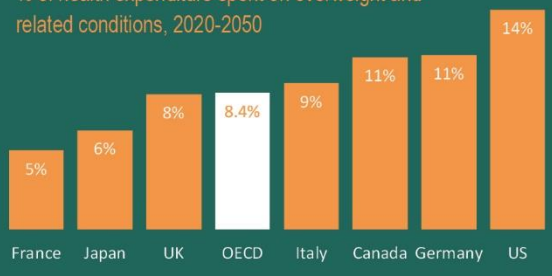
1 in 3 people do not do a sufficient amount of physical activity

2 in 5 individuals do not consume a sufficient amount of fruit and vegetables

Source: OECD analyses on national health and time use surveys

Obesity carries a significant economic burden

% of health expenditure spent on overweight and related conditions, 2020-2050



Source: OECD analyses based on the OECD SPHeP-NCDs model

Children with a healthy weight are more likely to perform well at school

Children are 13% more likely to perform well in school if they have a healthy weight

Source: OECD analyses on the 2013-14 HBSC survey

A 20% reduction of calorie content in energy-dense foods* could lead to...

*across 42 selected countries

1.1 million cases of noncommunicable diseases avoided per year

13.2 billion (USD PPP) saved every year due to reduced healthcare expenditure

1.4 million additional full-time workers per year

0.5% increase in GDP

Source: OECD analyses based on the OECD SPHeP-NCDs model

We need to lighten the burden

The prevalence of obesity & overweight is rising, with enormous negative economic effects

We should strengthen policies currently in place and close policy gaps, such as with food labelling, advertising policies & promoting food reformulation

Potential benefits outweigh the cost: Policy packages are effective and offer a positive return on investment

Executive summary

An increasing number of people are overweight across the OECD, and this will curb GDP by an estimated 3.3% on average. Health problems linked to expanding waistlines are pushing up workplace absenteeism and lowering productivity as we consume more calories without exercising more. Rising levels of overweight are also damaging our health, wealth and wellbeing, lowering school performance for children, and increasing the risk of unemployment and shortening life expectancy for adults.

In the next three decades, overweight will claim as many as 92 million lives in the OECD with obesity and overweight-related diseases reducing life expectancy by nearly 3 years by 2050.

This report analyses the economic, social and health costs of the rising number of people with obesity or overweight in up to 52 countries, including OECD, European Union (EU28) and Group of 20 (G20) countries. It makes an urgent economic case to scale up investments in policies to promote healthy lifestyles, examining expected expenditure, effectiveness and returns on investment in tackling a mounting health problem across the world.

The challenge of growing obesity

More than half the population is now overweight in 34 out of 36 OECD countries and almost one in four people is obese. Average rates of adult obesity in OECD countries have increased from 21% in 2010 to 24% in 2016, so an additional 50 million people are now living with obesity. Despite a drive in the last decade to deal with increased obesity, more needs to be done amid sedentary lifestyles and an almost 20% increase in calorie supply – i.e. calories available for consumption – in the OECD over the past 50 years.

Higher rates of overweight and obesity fuel social inequalities

Children in particular are paying a high price for obesity. Children who are overweight do less well at school, get lower marks, are more likely to miss school, and, when they grow up, they are less likely to complete higher education. They also show lower life satisfaction and are up to three times more likely to be bullied, which may contribute to lower school performance. Children with a healthy weight are 13% more likely to report good school performances than children with obesity.

In adulthood, individuals with at least one chronic disease associated with being overweight are 8% less likely to be employed the following year. When they have a job, they are up to 3.4% more likely to be absent or less productive. Adults with obesity are at greater risk of chronic illnesses and reduced life expectancy. In the EU28, women and men in the lowest income group are, respectively, 90% and 50% more likely to be obese, compared to those on the highest incomes, entrenching inequality.

Overweight damages population health, health budgets and the economy

From 2020 to 2050, overweight and related diseases will reduce life expectancy by about three years across the OECD, EU28 and G20 countries, according to the OECD analysis.

A rise in the number of people with high body-mass index (BMI) – a measure of whether someone is overweight or underweight based on their weight and height – is squeezing health budgets due to the high cost of chronic diseases linked to overweight, such as diabetes, cancers and heart disease. OECD countries will spend about 8.4% of their health budget to provide treatment for overweight-related diseases.

People with overweight use health care services more, undergo more surgery and have more than twice as many prescriptions compared to people with a healthy weight. On average in OECD countries, overweight will be responsible for 70% of all treatment costs for diabetes, 23% of treatment costs for cardiovascular diseases and 9% for cancers.

The OECD analyses estimates that treating the diseases caused by overweight will cost USD 425 billion a year, based on Purchasing Power Parity, in 52 countries analysed across the OECD, G20, EU28, OECD accession countries and selected partner countries.

Treating high BMI and associated conditions will cost more than USD 200 per person per year, on average, across the OECD.

Tackling overweight is an excellent investment for OECD, EU28 and G20 countries

Virtually all the OECD countries have a national action plan on obesity and most countries have a specific action plan to tackle obesity in children, as well as national guidelines to promote healthy diets and active lifestyles. But the response needs to be stepped up.

Every dollar spent on preventing obesity generates up to a six-fold economic return, OECD analysis shows.

The OECD identifies four categories of policies to tackle the problem and gauges the effect of three promising “policy packages” to help countries achieve greater impact and coherence in tackling the obesity epidemic. Food and menu labelling, regulation of advertising of unhealthy foods to children and the promotion of exercise, including by doctors and schools, are among the measures analysed.

One of the findings is that a 20% reduction in calorie content in energy-dense food would have significant benefits for the health of individuals and economies. Were such a plan implemented in 42 countries worldwide, the OECD model suggests that more than 1 million cases of chronic disease per year could be avoided, particularly heart disease.

1 The heavy burden of obesity

Michele Cecchini and Sabine Vuik

Despite policies and action plans put in place by countries at a global level, overweight continues to be a pressing public health issue and one of the key drivers of non-communicable diseases in OECD countries and beyond. This chapter brings together the main messages of this publication and describes the key policy implications from new OECD analyses on the health, social and economic burden of being overweight and its associated lifestyles, including poor diet, lack of physical activity and sedentary behaviour. The chapter presents trends and projections for up to 52 OECD (including accession and partner countries), Group of 20 (G20) and European Union (EU28) countries and makes a strong economic case for upscaling investment in policies that promote healthy lifestyles. The chapter concludes by presenting the expected effectiveness, impact on health expenditure and return of investment for ten such policies and analyses the potential implementation costs and approaches to mitigating such costs.

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

Key findings

- More than half of the population in 34 out of 36 OECD member countries is overweight and almost one in four people are obese. Rates of severe obesity – known as morbid obesity – are now growing at the same pace as milder forms of obesity.
- Little over half the population in OECD countries for which data is available consumes a healthy diet and even fewer eat sufficient fruit and vegetables. People spend, on average, half of their waking hours in sedentary activities.
- Obesity and its related diseases will reduce life expectancy by 0.9 years to 4.2 years, depending on the country. It is projected that by 2050 there will be around 92 million premature deaths from obesity-related diseases in OECD, G20 and EU28 countries.
- OECD countries will spend about 8.4% of their total health budget on treating obesity-related diseases. This is equivalent to about USD PPP 311 billion per year (or USD PPP 209 per capita per year).
- Children with a healthy weight are 13% more likely to perform well at school and are more likely to complete higher education. Children with obesity have less life satisfaction and are up to 3.8 times more likely to be bullied, which in turn may contribute to lower educational outcomes.
- Individuals with at least one chronic disease associated with being overweight are 8% less likely to be employed in the following year and, if employed, are up to 3.4% more likely to be absent or less productive. When all these effects are converted into an economic value, OECD countries will lose, on average, USD PPP 863 per capita per year.
- Overweight and its related conditions will reduce gross domestic product (GDP) by 3.3% in OECD countries and exact a heavy toll on personal budgets: about 1% of total tax revenue is spent on overweight, corresponding to a levy of USD PPP 360 per capita per year.
- Achieving a reduction of 20% in calories from relevant food groups would prevent the development of up to 1.1 million cases per year of cardiovascular diseases, diabetes and various types of cancer in the 42 countries included in the analysis. Food reformulation to reduce calorie content may also produce savings in health expenditure of up to USD PPP 13.2 billion per year in these countries.
- Interventions targeting the whole population, such as food and menu labelling displaying nutritional information and mass media campaigns produce the largest health gains: from 51 000 to 115 000 life years could be gained in the 36 countries included in the analysis. This is equivalent to preventing all road deaths in EU28 and OECD countries respectively. Economic savings would also be significant, with menu labelling alone saving up to USD PPP 13 billion between 2020 and 2050.
- Combining interventions in “prevention packages” would return even higher benefits. For example, an additional 205 000 life years could be saved annually across the 36 countries included in the analysis by investing in a communication package aimed at upscaling policies already in place in many OECD countries. This package would save USD PPP 26 billion by 2050 in health costs.
- Investing in prevention packages to tackle the issues related to overweight is a very good investment for countries. Overall, it is expected that for every USD PPP invested in any of the packages, economic benefits for countries will be between USD PPP 1.3 and USD PPP 4.6.

1.1. A growing obesity epidemic drives negative health and economic effects

Almost a decade after the publication of the first OECD report on obesity, "Obesity and the Economics of Prevention – Fit not Fat", overweight[1] continues to be a pressing public health issue despite the policy responses put in place by countries:

- Of the original 31 countries included for analysis in 2010, average rates of adult obesity in OECD countries have increased by 13%, from 21% in 2010 to 24% in 2016. This corresponds to about an additional 50 million people with obesity.
- In 34 out of 36 OECD member countries, more than half of the population is now overweight. In the last few years, there has also been a significant growth in morbid obesity.

In addition to being a public health concern, overweight poses a serious threat to the economy of countries and to the budgets of their citizens around the world. Overweight has significant negative effects on the health budgets of countries due to the high costs of treating patients with chronic diseases such as diabetes, cancer and cardiovascular diseases caused by high body-mass index (BMI). Up to USD PPP 425 billion per year is spent across OECD, G20 and EU28 countries on obesity. In addition, overweight and its associated chronic diseases negatively affect labour force productivity: individuals with at least one chronic disease are 8% less likely to be employed in the following year and, if employed, are more likely to be absent or less productive. Similarly, overweight children are less likely to perform well at school and are more like to have lower education attainment later on, creating conditions leading to lower levels of human capital in the future. All these factors concur in depressing the social welfare and economy of countries, resulting in a total economic burden of overweight ranging from 1.6% to 5.3% of GDP, depending on the country.

More can be done to tackle overweight. Fifty out of the 52 countries included in the analysis have national policies in place to tackle obesity, and 45 countries have strategies targeting childhood obesity. The vast majority of countries also have national dietary and physical activity guidelines in place often along with a comprehensive number of other policies. However, growing obesity rates show that there is the need to further scale up efforts. Too often, policy actions are implemented in forms that are ineffective or are not uniformly implemented throughout the country. In other cases, limited resources or practical problems limit their coverage.

By using its microsimulation model – the OECD Strategic Public Health Planning for non-communicable diseases (NCDs) or SPHeP-NCDs model[2] – the OECD has calculated that scaling up action by implementing highly effective "best practices" would have a significant impact on the health of the population and the economy. Greater results would be achieved by implementing packages of policies. For example, the most effective package would prevent 2.4 million cases of major chronic diseases, including cardiovascular diseases, diabetes, cancer and dementia, by 2050, leading to a gain of up to 205 000 life years (LYs) annually. Cumulative savings in health expenditure would equal around USD PPP 26 billion. A healthier population and reduction in governmental spending on health would also improve labour market outcomes and the broader economy. The resulting economic growth will create the conditions needed to reduce fiscal pressure. While some of these public health interventions carry direct implications and costs for the food and drink industry, strategies to minimise such costs do exist.

1.2. Unhealthy lifestyles are on the rise, and morbid obesity is growing

Overweight levels have been continuously growing over the last 40 years in all OECD, G20 and EU28 countries, reaching very high prevalence rates. Between 2005 and 2016, adult obesity rates grew by an average of 0.21 percentage points per three-year period. Almost three in five persons living in an OECD or EU28 country are overweight, with about 40% of these individuals at obesity levels and the remaining

60% at pre-obesity levels. In some countries, such as Saudi Arabia and the United States, the individuals with obesity outnumber those with pre-obesity.

Worryingly, growth in morbid obesity, the most severe form of obesity, is now similar to the growth in the milder form of obesity. In OECD, EU28 and G20 countries, mild obesity and morbid obesity rates have grown by an average of 0.19-0.23 percentage points per three-year period. In the most recent biennium for which data is available, morbid obesity growth accounted for up to half of the increase in total obesity rates. In some countries, such as the United States, Saudi Arabia, and New Zealand, morbid obesity accounted for more than 70% of total obesity growth.

In children aged 5-19, the prevalence of obesity has steadily increased since 1975, with similar patterns and growth rates for OECD, EU28 and G20 averages, and a yearly increase in childhood obesity of about 0.3 percentage points over the last decade. Most countries tend to display a steady rate of growth over time – such as Mexico, New Zealand, and Saudi Arabia. In other countries – such as China and South Africa – childhood obesity has grown dramatically, reaching figures comparable to those of OECD countries in the most recent years. For other countries, the rate of growth in childhood obesity has slowed over the past 20 years, particularly in Denmark and Japan. In the United States, the country with the highest prevalence of child obesity, the growth rate has more than halved, decreasing from a growth rate of 0.6 percentage points per year from 1995-2000 to 0.2 percentage points per year from 2011-16.

1.2.1. Poor diet, lack of physical activity and sedentary behaviour have contributed to the obesity epidemic

While multiple factors contribute to weight gain, including genetic predisposition and environmental influences, overweight primarily occurs due to the imbalance between an energy intake from diet and energy output through physical activity. Globalisation and urbanisation have been accompanied by a reduction in levels of physical activity and increased sedentary behaviour associated with office jobs and certain modes of transport. Total calorie supply has increased by nearly 20% in OECD, OECD accession and selected partner countries[3], EU28, and G20 countries, from 2 700 kilocalories per person per day to a little more than 3 200 kcal/capita/day.

Individuals living in OECD countries have increasingly unhealthy lifestyles, including a poor diet and an insufficient consumption of fruit and vegetables, a greater consumption of which has been associated with a reduced risk of obesity and other chronic diseases. In addition, people have self-reported insufficient levels of physical activity and spending a significant part of their time in sedentary behaviour involving very low energy expenditure, such as sitting or looking at a screen. More specifically, OECD analyses based on micro-level national data found that:

- A little more than half of the population of countries such as Chile, Italy, Mexico and Spain consume a healthy diet meeting national guidelines or international standards. In the United Kingdom, fewer than one in three people were found to consume a healthy diet.
- In 10 out of the 11 countries included in the analysis (Australia, Canada, Chile, England, France, Italy, Mexico, Spain, Hungary, and the United States), less than 40% of individuals met the recommended daily consumption of at least five portions of fruit and vegetables per day. In Korea about 60% of individuals meet such guidelines.
- Levels of physical activity remain too low. In 12 countries (i.e. Argentina, Brazil, Costa Rica, Colombia, Cyprus, Germany, Italy, Malta, New Zealand, Portugal, Saudi Arabia, and the United States), more than two in five people do not carry out a sufficient level of physical activity. Since 2005, this rate has increased by more than five percentage points in western high-income countries.

- On average, both men and women spend up to 40% of their waking time in sedentary activities. In addition, they are not sufficiently active during work periods and they tend to use motorised, rather than active, travel.

1.2.2. Individuals with a lower socio-economic status are more likely to be obese and to have unhealthy lifestyles

Individual and socio-cultural factors can influence the development of unhealthy lifestyles underpinning obesity.

- Men and women are equally likely to be obese but, overall, men are more likely to be overweight. On average, almost one in four men and women living in OECD countries and EU28 member states are obese. Conversely, rates of pre-obesity tend to be 10 percentage points higher in men compared to women (i.e. about 41% versus 30%). In G20 countries, women are slightly more likely than men to be obese (24% of women versus 19% of men) while the gap with pre-obesity is smaller (i.e. 27% in women and 35% in men).
- Consistently across countries, individuals in the lowest income group are more likely to be obese, with inequalities more significant in women than in men. In the EU28, women and men in the lowest income group are, respectively, 90% and 50% more likely to be obese, compared to peers in the highest income group. Inequalities are generally greater in western European countries and lower in central European countries.

The same population groups often have poor diet, physical inactivity and sedentary behaviour and, therefore, have the highest risk of developing chronic diseases:

- Men in general have less healthy lifestyles than women. In all the included countries, except the United States, men consistently report poorer diets and greater sedentary behaviour[4] than women. However, men are more likely to achieve the recommended amount of physical activity than women.
- Individuals with a lower level of education or socio-economic status are more likely to consume an unhealthy diet. Furthermore, individuals with a lower education are also less likely to be physically active, but they are less likely to demonstrate sedentary behaviour. Individuals with a high socio-economic status are more likely to report increased sedentary behaviour and are less likely to achieve the recommended level of physical activity. When all factors (i.e. both diet and physical activity) are taken into account, individuals with a high socio-economic status tend to demonstrate unhealthy lifestyles, due primarily to a lower level of physical activity and higher level of sedentary behaviour.
- Unhealthy lifestyles go beyond being overweight. Policies to tackle unhealthy lifestyles should not exclusively focus on individuals with overweight but rather target broader population groups. With the exception of the United States, pre-obesity and obesity are not strong predictors for an unhealthy diet, insufficient physical activity, or excessive sedentary behaviour and individuals with a healthy weight may also have unhealthy lifestyles, independent of their BMI.

1.3. Obesity and associated chronic diseases damage health and the economy

Overweight is among the leading risk factors contributing to both the disease burden and the economic burden of NCDs. A high BMI increases the risk of developing various chronic diseases, including type 2 diabetes, cardiovascular diseases, respiratory diseases, musculoskeletal disorders, several types of cancer, and depression. However, the impact of a high BMI is not limited to just the health of the general population. Obesity also has important personal, social and economic consequences. First, treatment of obesity and related chronic conditions increases health expenditure. Second, overweight is associated

with lower academic performance and, in the long run, lower educational attainment which negatively affects an individual's socio-economic status in adulthood and the human capital of countries. Third, obesity and its consequences affect individuals' productivity and workforce participation with a negative impact on labour market outputs. At a macroeconomic level, all these dimensions negatively affect the GDP of a country and create the conditions for increased fiscal pressure.

By using the most advanced techniques, the OECD has carried out a comprehensive assessment of the health and economic burden of obesity in 52 countries. More specifically, the OECD has used the OECD SPHeP-NCDs model and the OECD long-term economic model.

1.3.1. Overweight and associated chronic diseases worsen health and decrease life expectancy…

Individuals with a high BMI and its associated unhealthy lifestyles are more likely to develop chronic diseases that produce detrimental long-term consequences to their quality of life. In addition, many of these conditions cannot be cured and increase the probability of premature mortality.

- Over the period 2020 to 2050, overweight and its related diseases will reduce life expectancy by about 3 years across OECD, EU28 and G20 countries. In individual countries, life expectancy will be reduced by 0.9 to 4.2 years (Figure 1.1).
- As many as 92 million people will die prematurely due to overweight in OECD, EU28 and G20 countries from now to 2050. Across the OECD, 3 300 life years (LYs) per 100 000 population are lost every year due to overweight. The effect of overweight on mortality in EU28 countries is higher, with about 4 000 LYs lost per 100 000 population every year. G20 countries see a lower impact from overweight, at 2 600 LYs per 100 000 population annually.
- Obesity-related diseases greatly affect a person's quality of life. When taking into account the years that people live with disease and disability, countries in the OECD will lose nearly 4 000 disability-adjusted life years (DALYs) per 100 000 population every year due to overweight – similar to the cumulative burden caused by stroke and ischemic heart diseases. In comparison, EU28 countries lose 4 500 DALYs per 100 000 population and G20 countries 3 300 DALYs per 100 000 population.

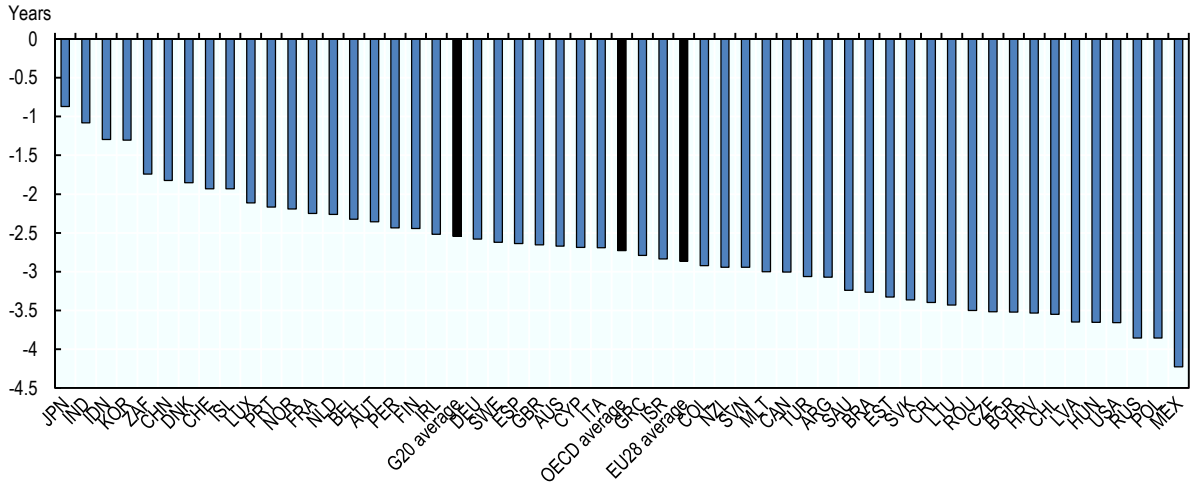
Not surprisingly, the health burden of obesity tends to be greatest in countries with very high prevalence rates of overweight (e.g. in Mexico and the United States) and lowest in countries with lower prevalence rates, such as Japan and Korea.

The effectiveness of national health care services at treating the medical consequences of a high BMI also influences the health burden of overweight. Effective health care systems can reduce complications (e.g. in the case of diabetes) and reduce fatalities, as in the case of certain cancers or cardiovascular diseases. For example, Australia, Norway or the Netherlands show a smaller burden compared to other countries with similar overweight prevalence rates, such as Argentina and Bulgaria.

A third element to take into account is the contribution of other diseases, not caused by obesity, (e.g. certain infectious diseases) in driving the total burden of disease in a country. For example, in South Africa, overweight reduces life expectancy by only 1.7 years, despite relatively high BMI levels in the population. Such a smaller burden of disease caused by overweight-related chronic diseases can be explained by a high prevalence of HIV (and other communicable diseases) that remains the top killer in the country, even in the complete absence of overweight.

Figure 1.1. The impact of overweight on life expectancy

The impact on life expectancy in years, average 2020-2050



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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1.3.2. … and have a negative impact on health budgets

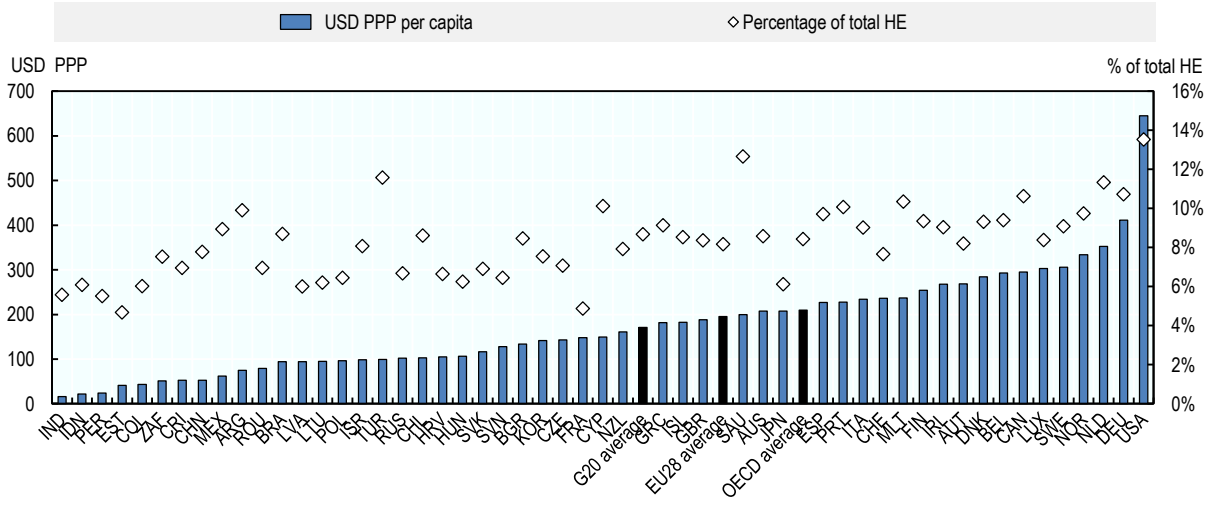
People with overweight use health care services more often, driving health expenditure. They have a greater number of primary care and outpatient specialty care visits and inpatient stays, undergo more surgery, and use more diagnostic and home health care services. People with obesity also have 2.4 times more prescriptions over healthy-weight individuals. They may see a higher cost per visit as they require more complicated and costlier care, or may experience longer hospitalisations.

Previous analyses, using different methods, concluded that the impact of overweight on health expenditure would range between 1.9% and 7.9% of a country's total health care budget. New OECD calculations, based on the most recent evidence and cross-country comparable data applied to the OECD microsimulation model, suggest that these figures were significantly underestimated. The OECD data show that under a business-as-usual scenario, across OECD countries:

- Treating the diseases caused by obesity will cost an average of 8.4% of total health care spending (net of spending for long-term care). The United States will spend nearly 14% of their health budget on obesity and overweight, while Estonia will spend less than 5% (Figure 1.2). In OECD, G20, EU28 and OECD accession and selected partner countries, obesity will cost a total of USD PPP 425 billion per year.
- Treating a high BMI with its related conditions will cost OECD countries on average USD PPP 209 annually per capita. The United States, Germany and the Netherlands spend the most on obesity, at USD PPP 645, USD PPP 411 and USD PPP 352 per capita, respectively (Figure 1.2).
- Overweight is responsible, on average, for 70% of all treatment costs for diabetes, 23% of treatment costs for cardiovascular diseases and 9% for cancers.

Figure 1.2. Health expenditure associated with overweight

Health expenditure due to overweight per year, in USD PPP per capita and as a percentage of total health expenditure, average 2020-2050



Note: Health expenditure measures the final consumption of health care goods and services for personal health care including curative care, rehabilitative care, preventative care, ancillary services and medical goods but not long-term care
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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Not all the cross-country variability in obesity-related health expenditure can be attributed to differences in obesity rates. Organisational arrangements in health systems including, for example, the price of delivering health care services, the mix of health care services used and the share of the population with access to effective health care services, all play a role in modulating total health expenditure. For example, Denmark, the Netherlands and Norway show a smaller obesity-related health burden compared to other OECD countries but, at the same time, they rank among the top countries in terms of obesity's impact on health expenditure. Conversely, Poland, Romania and the Russian Federation rank very high in terms of the health burden of overweight but show a smaller impact on health budgets.

1.3.3. Obesity negatively affects educational outcomes and human capital formation

The OECD has analysed micro-level data for children aged 11-15 in 32 countries and studied how a high BMI correlates with self-assessed performance at school. Compared to children with a healthy weight, overweight children perform less well at school demonstrated, for example, by lower marks, a higher probability of absenteeism and longer periods of absenteeism. In addition, children with overweight have a lower level of educational attainment and a higher probability of not completing higher education. These negative consequences hold true even after taking into account the effect of confounding factors such as family affluence. Specific findings suggest that:

- The higher the BMI in children, the lower the performance in school. On average, boys and girls with a healthy weight are 13% more likely to report good school performance, compared to their peers with obesity (Figure 1.3).
- France and Belgium have the largest inequalities among girls. In both cases, girls with a healthy weight are about 27% more likely to report good performance at school compared to girls with obesity. Conversely, Germany and Latvia show the greatest inequality among boys – with an

increased probability for boys with a healthy weight to report good educational performance of 24% and 23% respectively.

- Differences in educational performance have remained stable for both boys and girls. From 2002 to 2014, there were no significant trends in academic performance across BMI categories across OECD countries.

Obesity is also associated with higher risk of absenteeism from school and longer absences. In the United States, boys and girls aged 12-19 with obesity are three percentage points more likely to miss school compared to adolescents with a healthy weight (i.e. 69% of adolescents with obesity had missed school days in the past 12 months compared to 66% of adolescents with a healthy weight). When absent from school, adolescents in the United States with obesity have significantly longer absences than adolescents with a healthy weight. Adolescents in the United States aged 12-14 with obesity reported almost an additional day of absence (i.e. almost six days of absence per year compared to five days in adolescents with a healthy weight). This becomes an additional two days in the case of adolescents aged 15-19.

Obesity may also produce long-term consequences for educational outcomes. The analysis of longitudinal datasets from the United Kingdom, the United States and the Russian Federation suggests that, in the long term, obesity may lead to lower educational attainment. In the United States, girls with obesity at the beginning of the study were 38% less likely to complete higher education 14 years later than a person with a healthy weight. In the United Kingdom, boys were 58% less likely to have completed higher education by the age of 29 if they were obese at the age of 16. Similarly, in girls, each point increase in the BMI at age 16 was associated with a loss of approximately half a month in higher education.

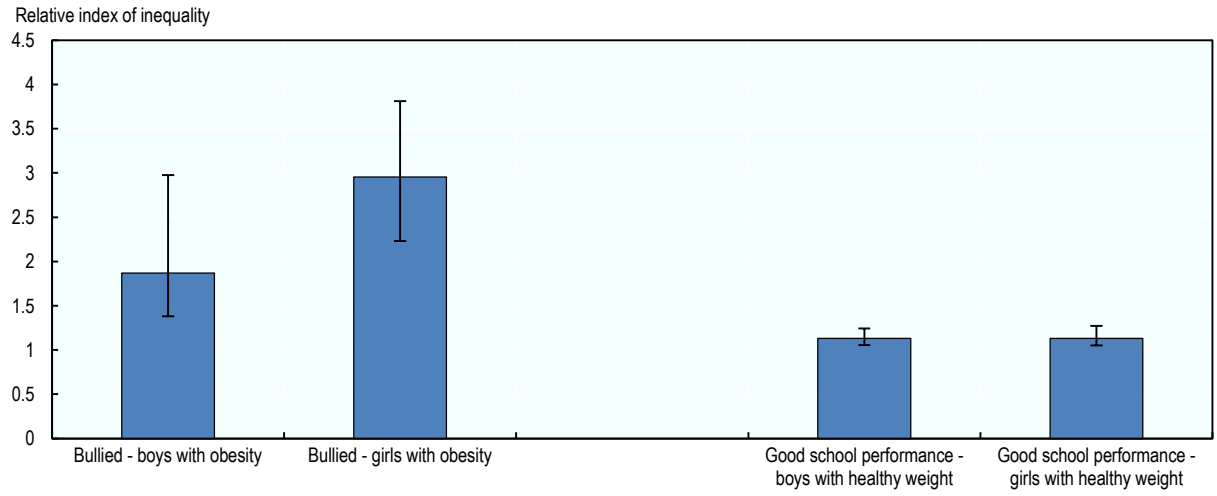
In the long term, lower educational attainment caused by obesity is likely to affect future individual socio-economic status, as individuals with a lower level of education are less likely to achieve higher-qualified occupations. More broadly, this negatively affects the society and the economy.

Academic performance and educational outcomes are key determinants for the formation of human capital and affect a country's economic growth. Improving the cognitive skills of the population can lead to significant economic gains as relatively small improvements to labour force skills have a large effect on the future well-being of a nation[5].

A number of causes may explain poor performances at school by children with overweight. Children and adolescents with overweight may be excluded from friendships and bullied by other children. As a result, these children may feel isolated, lonely or socially disconnected. They may also have lower self-esteem, poor well-being and suffer from emotional and mental health problems with deleterious effects on educational outcomes. Children who are bullied and socially excluded by others engage less in class: they step aside and refuse to speak up out of fear of bullying. Moreover, behavioural problems, such as disobedience and violence, may emerge.

Figure 1.3. Relative index of inequality for bullying and performance at school by sex in 32 OECD, G20 and EU28 countries

Average relative index of inequality across countries, with country range



Note: Boys and girls with obesity are, respectively, two and three times more likely to be bullied, compared to peers with a healthy weight. Boys and girls with a healthy weight are 13% more likely to report good school performance compared to peers with obesity. Whiskers show the range across the 32 countries included in the analysis (31 for bullying, as Switzerland did not have data on bullying).
Source: OECD analysis based on the Health Behaviour on School-aged Children (HBSC) survey 2013-14.

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The effect of obesity on life satisfaction and bullying in children aged 11-15 is confirmed by OECD analyses:

- Boys and girls with a healthy weight are 5% and 9% happier respectively than their peers with obesity. On a scale of 0 (lowest) to 10 (highest), the average life satisfaction is 7.4 in boys with obesity compared to 7.8 in boys with a healthy weight, and 6.8 in girls with obesity compared to 7.4 in girls with a healthy weight.
- Girls with obesity are three times more likely to be bullied than their peers with a healthy weight, compared to 1.8 in boys (Figure 1.3). Almost one in five girls with obesity report being a victim of bullying in OECD countries.
- Germany, the Czech Republic, and Italy have the largest obesity-related inequalities in bullying among girls: girls with obesity are almost 4 times more likely to be bullied compared to their peers with a healthy weight. Germany, Norway, Austria, and Malta show the largest inequalities among boys with obesity, who are up to three times more likely to be victims of bullying.
- Differences in bullying with regard to obesity have remained largely stable over the last decade in girls, while they have slightly increased in boys.

1.3.4. Obesity and associated chronic diseases damage labour force productivity, personal budgets and the economy

A significant part of the effect of obesity on the broader economy is linked to reduced labour force productivity and reduced human capital. Individuals with chronic diseases are more likely to be unemployed and to miss days of work and, when they are at work, are less likely to be productive than

healthy individuals. In addition, individuals with overweight are more likely to have a lower educational attainment with negative effects on their skillset.

Previous estimates of the impact of being overweight on GDP taking into account these factors concluded that, in four OECD countries, a high BMI would be responsible for a 0.5% to 1.6% loss in GDP. The new OECD analyses show that these figures were greatly underestimated.

The OECD extended the scope of previous analyses to produce a more comprehensive evaluation using data from longitudinal studies representative of European countries, Japan and Mexico. Results confirm that:

- Having at least one chronic disease is associated with a 8% decrease in the probability of being employed in the following year compared to individuals with the same age and level of education that do not report a chronic disease. The decrease in probability of being included in the labour force is particularly high in the case of stroke (up to 20% for men) and lowest for other cardiovascular diseases (4%). Individuals with at least two chronic diseases are about 17% less likely to form part of the labour force.
- If employed, individuals with a chronic disease will be absent from work for 1.5% more days over the rest of their working life. Diabetes has most detrimental effect causing an additional 3.4% days of absence from work in women. Individuals with overweight show a 1% increase in absences, due to other reasons.
- Individuals with at least one chronic condition are almost 20% more likely to retire early.

While in some cases these numbers may look small, the growth in overweight means that these figures apply to a greater portion of the population, resulting in a more significant impact. For example, 58% of the population in OECD countries is overweight. A 1% increase in absenteeism for such a large number of persons significantly affects the economy of a country. The OECD microsimulation model suggests that, in fact, overweight will have a significant effect on labour market outcomes:

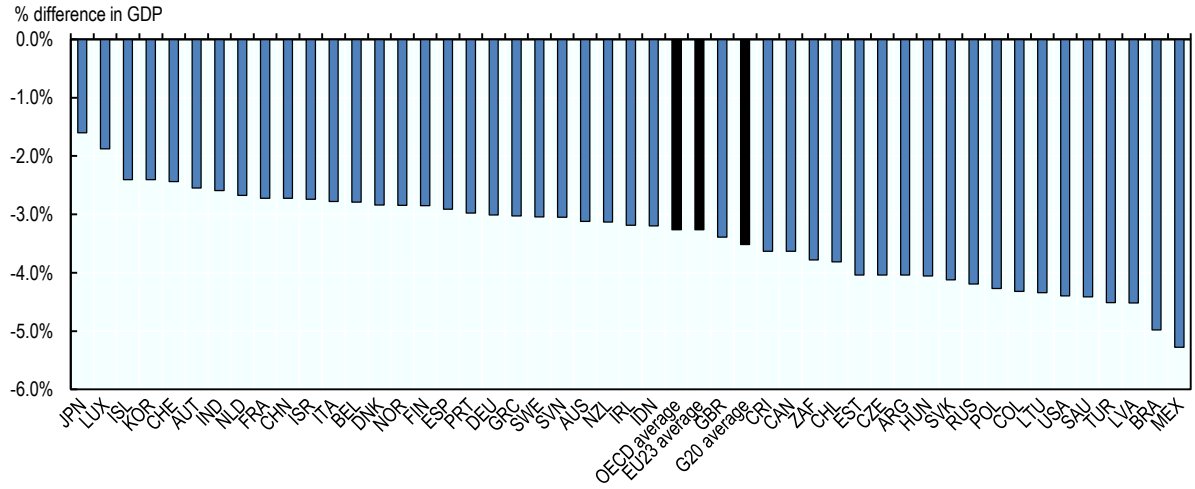
- Across the 52 countries included in this analysis, overweight effectively reduces the workforce by about 54 million people per year: 28 million due to reduced employment, 18 million due to presenteeism, and 8 million to absenteeism.
- When these effects are converted into an economic value, OECD countries will lose USD PPP 863 per capita per year on average.
- The economic impact of reduced labour market productivity is smaller in G20 and EU28 countries at USD PPP 658 and USD PPP 781 respectively.

At the macroeconomic level, overweight reduces GDP by 3.3% on average in both OECD countries and 23 EU member states, over the next 30 years (Figure 1.4). The impact on the G20 countries is slightly larger with a reduction in GDP of about 3.5%. Across all the 46 countries included in the analysis, overweight reduces GDP by about USD PPP 5.3 trillion from 2020-50, similar to the average annual GDP of Germany or Japan over that same period. The effect on GDP varies by country with Mexico (-5.3%), Brazil (-5.0%) and Latvia (-4.5%) being the most affected. Japan's economy is the least affected, with a reduction of GDP equal to -1.6%.

Obesity also exacts a heavy toll on personal budgets. Overweight is responsible for a 0.62 percentage point increase in total fiscal pressure, measured as government primary revenue as a share of GDP. This is equivalent to an increase in tax rate of USD PPP 360 per capita per year in OECD countries. In the United States, overweight costs more than USD PPP 1 300 per capita per year. Other countries in which overweight has a significant impact on fiscal pressure include Belgium, Denmark and Ireland.

Figure 1.4. The impact of overweight on GDP

Percentage difference in GDP due to overweight, average 2020-2050



Source: OECD analyses based on the OECD SPHeP-NCDs model & OECD long-term economic model, 2019.

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1.4. The policy response to obesity has been insufficient

The rationale for government intervention to tackle overweight is strong, with a wide range of policies potentially available. Many unhealthy lifestyles, including poor diet and physical inactivity are driven by social and environmental changes. In response to such trends, in 2011 the United Nations General Assembly adopted a declaration to address the social determinants of health, including preventing exposure to risk factors for chronic diseases. The UN declaration was followed, in 2013, by the setting of voluntary targets for risk factor reduction, including for physical inactivity, salt intake, obesity, high blood pressure and diabetes. In 2015, some of these targets were incorporated in the Sustainable Development Goals (SDGs) that also include a target to reduce premature mortality by one-third by 2030.

At the national level, the fight against obesity has advanced primarily around national action plans, sometimes developed taking as a basis the World Health Organization's (WHO) Global Strategy on Diet, Physical Activity and Health and relevant global action plans. The ability of governments to design, implement and monitor the effectiveness over time of wide-ranging prevention strategies combining the strengths of different policy approaches is critical to success, including for initiatives promoted in collaboration with the various stakeholders.

OECD countries have made substantial progress on policies to tackle unhealthy diets and lack of physical activity in the last decade. Virtually all OECD countries have a national action plan on obesity in place as of 2019, and a vast majority of countries have a specific action plan to tackle obesity in children as well as national guidelines to promote healthy diets and active lifestyles.

Most OECD countries have implemented a wide range of policy options to promote healthier lifestyles. Despite this, the growing overweight rates show that, so far, the response has not fully met the challenge. The implementation of policies "on the ground" and their effectiveness at the population level is hindered by a number of factors. In some cases, policies are implemented in forms that are not the most effective

or measures are not uniformly implemented throughout the country. In other cases, limited resources or practical problems end up limiting the number of individuals that would potentially benefit from the policy.

By reviewing available evidence and international datasets, OECD work has identified four categories of policies broadly implemented by countries:

- policies influencing lifestyles through information and education;
- policies widening the number of healthy choice options;
- policies to modify the cost of health-related choices; and
- policies to regulate or restrict the promotion of unhealthy choice options.

In general, the OECD review found that countries have been particularly active in putting in place policies falling into the first two categories (i.e. to provide information and to widen the number of healthy options), while measures falling into the other two categories (i.e. to modify the cost of health-related choices and to regulate promotion of unhealthy choices) are less likely to be implemented across OECD and G20 countries.

1.4.1. Policies influencing lifestyles through information and education

Communication-based approaches are among the most widely implemented interventions by OECD countries, and may take a number of forms. For example, they can help make informed food purchases by providing relevant information on food and menu labels. They can be employed as part of health promotion and social marketing campaigns, including through the use of mobile apps, aimed at changing behaviours adversely affecting health. They can also be used to support other disease prevention policies, such as aiding health education campaigns targeting schoolchildren, workers or primary care users.

An OECD review of communication-based policies concludes that almost all reviewed countries mandate some sort of nutrition labelling on packaged foods, but only four OECD countries (i.e. Chile, Finland, Israel and Mexico) mandate, or are in the process of implementing regulations to mandate, front-of-pack labelling, which is the most effective type of food labelling[6]. Mandatory back-of-pack labelling, which is less effective, is the predominant scheme, with 34 OECD countries endorsing this policy. In this group, 17 OECD countries also have a policy supporting voluntary front-of-pack labelling. Similarly, use of mass media campaigns, particularly to promote consumption of fruit and vegetables is widespread across OECD countries and beyond. However, campaigns tend to be limited in time and not necessarily repeated on a regular basis. A number of countries are also experimenting with the extension of mandatory menu labelling to restaurants, mainly in chain restaurants. For example, Australia, Canada and the United States have this type of policy in place, although, in some cases, the policy is implemented at the sub-national level.

Communication policies targeting high-risk individuals can also be very effective, but the implementation of these policies may be hindered by a number of factors. Counselling from primary care doctors, targeting high-risk individuals, has been widely implemented across OECD countries for many decades. A more recent variation of physician counselling entails the provision of a prescription of a suggested amount of physical activity at the end of the counselling session. This version of the intervention is currently implemented by at least a third of OECD countries. However, in practice, it is unlikely that many people in the target groups, potentially benefitting from this intervention, actually receive the counselling, as the additional professional and financial resources it involves as well as the challenges associated with the recruitment of physicians are likely to hinder its implementation.

1.4.2. Policies widening the number of healthy choice options such as changing urban settings and school-based programmes

Traditional policies under this heading include, for example, some workplace-based interventions, school-based programmes and changes in the urban setting such as measures to increase access to public transport and green areas. Often, the objective of these actions is to modify the environment in which people spend most of their time: schools, workplace, communities in which they live, and so on, to make it more conducive to healthier lifestyles, whether it is promoting physical activity or a healthier diet. While these policies have the potential to cover a significant share of the population, their implementation often relies on local administrations with limited incentives or support at a national level. This creates a risk that poorer communities are less likely to have sufficient resources to implement such measures.

Policies to widen the number of healthy choice options are widely implemented in OECD countries but, in many cases, they are difficult to identify and monitor. The vast majority of OECD countries have in place some school-based programmes not only entailing education activities on nutrition and/or physical activity but also aiming to improve the environment, for example by regulating the food sold in vending machines or the meals served in canteens. Thirty-three countries, including 24 OECD countries, have set mandatory nutrition guidelines for the food provided in schools. For instance, in Chile, the Ministry of Health and the Ministry of Education have joined forces to put in place a comprehensive programme based on 50 measures including improvements in the quality of food provided to students and behavioural interventions (e.g. based on gamification) to promote physical activity.

Similarly, a number of programmes in OECD countries aim to do the same in the workplace. However, in this latter case, their identification is more complex as workplace-based interventions are often carried out by the private sector, usually with little involvement of national governments. A notable exception is Japan, where the national government has in place a strategy to promote such policy through prizes and awards for particularly effective programmes.

Actions to modify the urban setting are even more difficult to identify and review in a systematic fashion as many of the relevant interventions in this category fall under the responsibility of local administration, rather than national governments. The C40 network, a group of 90 cities with more than 650 million people, represents a good example of how changes in the urban environment may promote an active lifestyle and a reduction of gas emissions, through the promotion of active travelling. Similarly, the 199 cities signatory to the Milan Urban Food Policy Pact are committed to developing sustainable food systems designed to provide access to healthy and affordable food to all people.

1.4.3. Policies to modify the cost of health-related choices such as price policies

While less common than other categories of policies, actions to modify the cost of health-related choices are gaining increasing attention internationally. The most well-known policy part of this category is the taxation of unhealthy food products, in the majority of cases, but not exclusively, sugar-sweetened beverages, under the principle that higher costs would lead to lower consumption. Other products that are taxed in OECD countries include food with high sugar, salt or fat content – such as chocolate, confectionary and ice cream. At least 14 OECD countries[7] as well as 4 non-members (India, Peru, Saudi Arabia and South Africa) have put in place some sort of taxation for sugar-sweetened beverages or other types of food.

Some countries have also put in place actions to lower the cost of healthier options, whether to encourage healthier food consumption, or to promote an active lifestyle. For example, the EU school fruit and vegetable scheme is an EU-wide programme providing schoolchildren with free fruit and vegetables. In the United States, Congress established the Healthy Food Financing Initiative in 2014 to make available grants to states to attract healthier retail outlets to under-served areas.

1.4.4. Policies to regulate or restrict actions promoting unhealthy choice options such as the advertising of unhealthy products and regulating nutritional content

This category of policies includes all the actions aiming to regulate the promotion of, or the access to, unhealthy choice options. In the case of overweight and related unhealthy lifestyles, this category of policies mainly consists of regulating advertising of unhealthy food products aimed at children. Despite the public health guidance put in place by the WHO, the OECD review concluded that relatively few countries (i.e. 17, including 14 OECD countries[8]) have implemented compulsory restrictions on television advertising of unhealthy foods aimed at children. In another 25 countries (including 19 OECD countries), selected food manufacturers have adopted self-regulation. Finally, eight countries (including three OECD countries) do not have any policy restricting food advertising on television targeting children. The response from governments lags even further behind in the case of restricting digital marketing aimed at children (i.e. through internet and social media) as only selected countries have in place some sort of regulation for non-broadcast media.

Other restrictions generally target specific ingredients with harmful properties, with trans fats being the most notable example. The United States and Canada have banned food containing partially hydrogenated oils, which are the primary source of trans fats. In the case of the United States, the ban came into force after a decade of working with the food industry to voluntarily reduce, and effectively eliminate, the use of artificial trans fats. The European Union as well as other countries like Chile have set strict very low limits on the amount of trans fats that can be contained in food. In the United Kingdom, several supermarkets pledged in 2012 to work towards voluntary removal of products containing artificial trans fats from their shelves and, more recently, the International Food and Beverage Alliance has pledged to phase out industrially-processed trans-fats from the global food supply by 2023.

1.5. Innovative public health actions have a positive impact on population health and are an excellent investment for OECD countries

To tackle overweight and its associated risk factors effectively, countries should upscale their efforts by both implementing new policy options and by modifying policies currently in place. Drawing on available evidence, the OECD has used its microsimulation model to assess the impact on population health, health expenditure and the broader economy of a comprehensive set of highly effective policy actions (Table 1.1). The choice of policies modelled was based on a number of criteria, including the availability of solid quantitative evidence to feed the OECD model. In addition, these policies needed to be aligned with the WHO Global Strategy on Diet, Physical Activity and Health and relevant global action plans, including for the example, the recent Global Action Plan on Physical Activity 2018–2030, and to the extent possible form part of a country's policy priorities. In addition, actions were combined into three promising "policy packages" encompassing, respectively, communication policies, policies to promote physical activity and a "mixed" package containing actions that are less often implemented across countries. Finally, the OECD gauged the potential effect of a 20% reduction in calorie content in pre-packaged and calorie-dense food, achieved through reformulation. The analyses cover 36 countries including OECD countries in the European Region as well as Australia, Canada, Japan and Mexico, other non-OECD EU28 member states and South Africa. Analyses assessing reformulation were extended to other selected G20 and OECD accession and selected partner countries.

Table 1.1. Policy actions to tackle obesity included in the analysis

Health education and health promotion	Environmental changes	Regulation
Food labelling schemes	Workplace wellness programmes	Regulation of advertising of unhealthy food targeting children
Menu labelling schemes	Workplace sedentary behaviour programmes	
Mass media campaigns	Increase in access to public transport	
Prescription of physical activity by primary care doctors	School-based programmes	
Mobile apps to promote healthier lifestyles		

Source: OECD analyses on relevant literature.

1.5.1. Population-wide actions targeting adults are generally most effective in the short and medium terms

Substantial health gains may be achieved by scaling up many of the assessed policies to the national level. Population-wide actions, such as food labelling schemes, menu labelling schemes and a series of mass media campaigns are evaluated across countries as the most effective interventions. While these interventions may only promote small behavioural changes (e.g. about 0.4% long-term reduction in the BMI in the case of food labelling schemes), they cover a very large share of the population, in some cases virtually the whole population, producing overall a significant impact.

Conversely, actions targeting either specific individuals (e.g. prescription of physical activity by primary care doctors) or specific population groups (e.g. individuals employed in medium-sized and large-sized enterprises through workplace programmes) show a more limited effectiveness at the population level. These interventions generally target high-risk individuals and can produce significant behavioural changes in those who are exposed to the intervention. However, these interventions only cover a limited share of the population (e.g. 2.31-6.95% in the case of workplace-based interventions) therefore producing an overall limited impact.

Finally, actions targeting children generally show the smallest impact over a 30-year period. While some of these actions are effective (e.g. regulation of advertisement of unhealthy food to children), they generally require longer periods to produce significant health effects at the population level. The incidence of chronic diseases caused by obesity starts rising significantly only in individuals aged 50 and over. This means that, for example, an intervention targeting 10 year-old children cannot be expected to produce any significant effect on the incidence of diseases such as cancers, diabetes and cardiovascular diseases in the targeted group for at least 40 years. Nonetheless, previous OECD analyses showed that in the long term, these interventions become among the most effective and cost-effective. In addition, these actions perform well in terms of reducing labour market costs.

Findings from the OECD microsimulation model show that, overall, the assessed policies may significantly reduce the burden of disease caused by overweight and increase population health. The impact of actions on morbidity (measured in DALYs), taking into account how chronic diseases affect quality of life, is generally greater than their impact on mortality, suggesting that public health actions delay the development of chronic diseases to later in life, rather than preventing their development completely. In addition, public health actions to tackle obesity cause a small increase in the number of individuals developing medical conditions not directly linked to overweight, such as certain injuries, because they prolong life and hence increase the lifetime risk. Nonetheless, the overall effect on health is positive. More specifically, results show that:

- The most effective intervention, menu labelling, is predicted to prevent about 24 000 cases of cardiovascular disease, 11 000 cases of diabetes, and 1 900 cases of cancer per year. Mass media campaigns and food labelling schemes are also effective, producing results that are about three-quarters or half of those produced by menu labelling schemes.
- Labelling schemes and mass media campaigns can lead to a gain of between 51 000 and 115 000 additional LYs per year across all countries. Interventions targeting high-risk individuals could lead to a gain of 16 000 to 32 000 LYs per year. Countries in Central and Eastern Europe would be among those benefitting the most from the implementation of these interventions.
- In all countries, from 1.2 million DALYs up to 2.7 million DALYS can be gained cumulatively by 2050 thanks to the implementation of labelling schemes and mass media campaigns. All other interventions would instead produce gains in population health that would only be half or less than half the size.

An improvement in population health goes hand in hand with a positive impact on health expenditure. Although it might seem intuitive to expect that reducing the obesity burden will lead to the reduction in health expenditure, this is by no means guaranteed, since people avoiding obesity-related disease conditions may still suffer from other competing diseases, and/or accumulate additional health expenditure as a result of living longer. Nevertheless, the OECD model suggests that this is not the case for public health actions promoting a healthier diet and an active lifestyle and all the interventions modelled contribute to a reduction in health expenditure. More specifically, the OECD model suggests that:

- On average, USD PPP 0.99 per capita per year can be saved across the 36 countries included in the analysis by implementing menu labelling schemes, the interventions with the biggest impact on health expenditure. The other interventions produce average savings in health expenditure ranging from USD PPP 0.04 to USD PPP 0.97 per capita per year.
- Scaling up the results at the population level, the yearly savings in health expenditure across all countries vary from USD PPP 37 million for school-based programmes, to USD PPP 922 million for menu labelling interventions.

In addition to reduced health costs, the implementation of the assessed policies also leads to a reduction of costs caused by suboptimal productivity of the labour force. All the interventions show potential to increase labour force productivity, mainly through an increase in employment and reduction in absenteeism and presenteeism. It is calculated that mass media campaigns, the most effective action, would help bring an additional 28 000 people to the labour market through increased employment; while another 22 500 individuals would be “virtually” gained through decreased absenteeism and presenteeism. Overall, each year, this would correspond to up to USD PPP 1.92 billion in lost productivity that can be saved in all the countries combined for this intervention. Consistently across policies and countries, savings from avoiding reduced labour force productivity will considerably exceed the savings from reduced health expenditure.

Implementation costs vary substantially across interventions and countries. The cost of implementing the policy actions varies due to a number of factors, including whether the intervention is aimed to cover the whole population (e.g. mass media campaigns and use of mobile apps) or if it aims to target individuals (e.g. school-based programmes), with the latter generally being more costly on a per capita basis. Other factors such as the involvement of medical personnel (as in prescription of physical activity by primary care doctors) or of private sector to deliver the intervention (as in workplace-based programmes) may also have an impact on total costs. Low-resource interventions cost from as little as USD PPP 0.5 up to USD PPP 1.3 per capita per year. More resource intense interventions can cost up to about USD PPP 8 per capita per year.

When all the costs and savings are taken into account, the OECD model concludes that, consistently across interventions and geographical settings, all the considered policy actions are a good investment for countries. Results from the analyses show that most investments in these measures completely pay for themselves and, in many cases, produce an effect on the economy of the countries and on the budget of their citizens that is significantly greater than their implementation cost. Policies are generally expected to

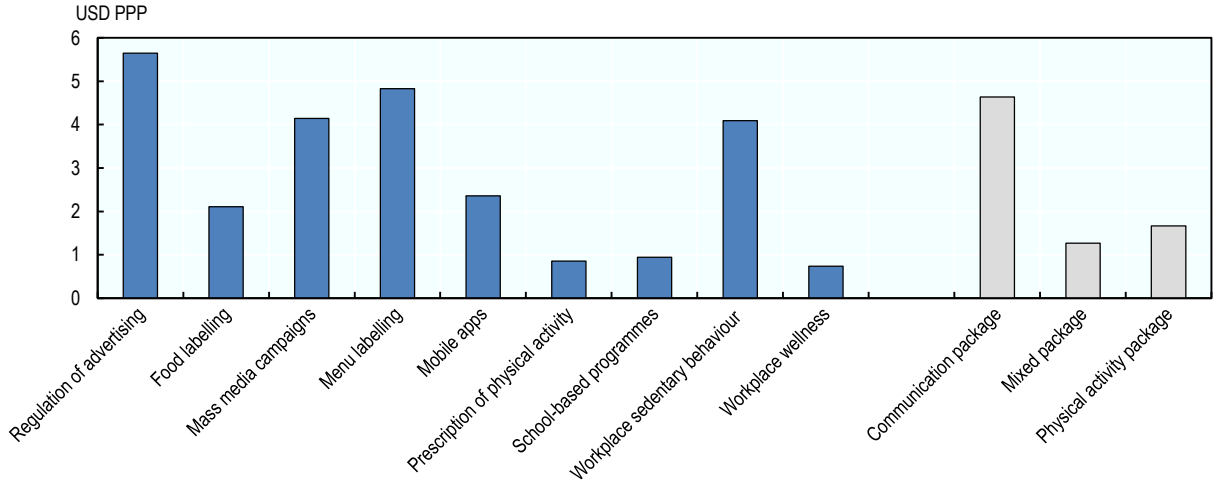
contribute to an increase in GDP above trend for the 36 countries analysed in the range of 0.005% to 0.021% annually, corresponding to an additional output of up to USD PPP 7.69 to USD PPP 27.86 per capita per year. At the same time, the OECD calculated that:

- The cost of implementing food advertising restrictions, mass media campaigns, menu labelling and workplace sedentary behaviour programmes is about 20% or less of the predicted benefit to the economy.
- The cost of implementing food labelling or mobile apps is about 40% of the benefit in terms of GDP.
- The investment in the most costly interventions such as workplace wellness, prescribing physical activity and school-based programmes corresponds roughly to their GDP benefit.

In other words, the OECD analyses conclude that for each USD PPP 1 invested in the prevention of obesity, there will be a return of up to USD PPP 5.6 in the form of total economic benefits (i.e. GDP) on average each year over the next 30 years (Figure 1.5). More importantly, all the assessed policies will prolong life, not just during a person's later years but also by keeping people healthy during the central part of their life and allowing them to do the things that they enjoy and that society needs.

Figure 1.5. Return on investment of policy actions and packages of policies to tackle overweight and related unhealthy lifestyles

USD PPP returned in GDP benefits for every USD PPP invested in the policy



Note: Up to USD PPP 5.6 could be returned for each USD PPP 1 invested in public health policies to tackle overweight. Estimates are calculated by dividing the increase in GDP produced by the intervention by the cost of implementing the intervention. Interventions with a comparatively lower impact on GDP (and effectiveness on population health) may have a higher return of investment if they have a low implementation cost.
Source: OECD analyses based on the OECD SPHeP-NCDs model & OECD long-term economic model, 2019.

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1.5.2. Combining policies into a coherent prevention strategy helps countries reach a critical mass with a greater impact

Combining public health actions into prevention packages provides multiple advantages. Causes of obesity are multifaceted and a number of different factors underpin the development of unhealthy lifestyles in the population. A first substantial advantage of combining single actions into prevention strategies is that packages of interventions can address multiple causes at the same time. In addition, packages can target

different population groups simultaneously producing better results to the whole population. Finally, policies within a package can interact with one another sustaining positive behavioural changes in a more than additive fashion. For example, there is some evidence that the combination of mass media campaigns and food labelling schemes would produce a greater impact if launched simultaneously, than the simple arithmetical sum of the two. Analyses carried out with the OECD model take into account these first two components but adopt a conservative assumption on the potential super-additivity of combining policies into packages.

The OECD gauged the effect of three promising policy packages (Table 1.2). A first package, the "communication package", focuses primarily on actions to increase awareness in the population. Actions included in this package are already implemented in many (but not all) countries included in the study but with a lot of variability in terms of implementation and design. A second package, the "mixed package" contains actions that are less often implemented across countries and provide a set of innovative options for countries. The third package, the "physical activity package" mainly encompasses environmental changes promoting an active lifestyle.

Table 1.2. Packages of policy actions to tackle obesity included in the analysis

Communication package	Mixed package	Physical activity package
Food labelling schemes	Menu labelling schemes	Increase in access to public transport
Regulation of advertising of unhealthy food to children	Prescription of physical activity by primary care doctors	Workplace sedentary behaviour programmes
Mass media campaigns	Workplace wellness programmes	School-based programmes
		Prescription of physical activity by primary care doctors

In general, the communication package and the mixed package produce similar results during the timeframe considered for the analysis (i.e. between 2020 and 2050). Conversely, the physical activity package would be about 60% less effective compared to the other two. More specifically, the OECD model calculates that:

- Overall, for each USD PPP invested in one of the policy packages, a return of USD PPP 1.3 to USD PPP 4.6 can be expected in the form of economic benefits (Figure 1.5).
- Up to USD PPP 26 billion can be saved across the health budgets of all the 36 countries included in the study by 2050, following the implementation of the communication package. The mixed package and the physical activity package would produce savings equal to USD PPP 23 billion, and USD PPP 17 billion, respectively.
- There will also be a substantial impact on GDP, with the communication package expected to increase GDP from 0.02% to 0.11% across the countries included in the study, with the other two packages producing a lesser effect, ranging from 0.01% to 0.06%.
- Each year, the total labour force of the 36 countries included in the analysis will increase by an equivalent of about 57 000 employees from the communication package; 40 000 from the mixed package and 35 000 from the physical activity package, due to increased employment. Overall, the output of the labour force will increase by between USD PPP 3.5 billion (physical activity package) and USD PPP 5.3 billion per year (communication package).
- The communication package, the mixed package and the physical activity package would lead to a gain of, respectively, 205 000, 160 000 and 70 000 LYs every year. The three packages would also save between 5.2 DALYs and 2 million DALYs in all modelled countries by 2050.

1.5.3. Achieving a 20% reduction in calorie content in energy-dense food would have a significantly positive effect on the health and economy of countries

In recent years, many OECD countries have shown a growing interest in policies promoting food reformulation. Much of this interest has been fostered by successful attempts to promote reductions in the salt content of pre-packaged food and the pressing need for countries to implement ambitious programmes to halt the rise in obesity and childhood obesity. Since the early 2000s, policy makers in OECD countries have been discussing with industry actions to promote reductions in calorie content or specific nutrients such as sugar or fat, mainly saturated fat. Among the various programmes rolled out by countries, the United Kingdom launched one of the most ambitious programmes. In 2018, Public Health England published a plan setting out details for the reformulation programme challenging the industry to reduce calories from "relevant foods" (i.e. high in sugar, salt, calories and saturated fat, such as ready meals, pizzas, snacks, sauces and dressings) by 20%, by 2024. More recently, in 2018, the OECD put forward to the G20 a proposal for a global deal between national governments and industry to scale up the United Kingdom's efforts to a global level.

Many different policies and measures need to be implemented to achieve a 20% reduction in calorie content in "relevant foods". Achieving significant reductions in calorie content is a challenging task, requiring the establishment of partnerships among all the various stakeholders to effectively address the technical, social and policy issues arising throughout this effort. Some of the policies that countries have put in place to promote food reformulation include food labelling and menu labelling, mass media campaigns, changes in portion sizes, price policies targeting nutrient content above a certain threshold (e.g. sugar content), incentives to research and development, among others.

While a global deal to reduce calorie content in relevant food by 20% would not address all the causes underpinning the obesity epidemic, including for example low levels of physical activity, the OECD model calculates that if such plan were to be implemented in 42 countries worldwide, it would have a significant impact on the health and the economy of countries. More specifically, the OECD model suggests that:

- Overall, the GDP of countries is expected to be above trend by 0.51% on average each year, generating an additional economic growth similar to the whole economy of Chile (i.e. about USD PPP 456 billion).
- Health expenditure would be decreased by about 0.21%, or about USD PPP 13.2 billion per year, ranging from 0.06% in Estonia to 0.33% in the Netherlands.
- Up to 1.1 million cases of chronic diseases per year would be avoided. Most of the gains in health would be achieved through a reduction in cardiovascular diseases (about 771 000 cases per year would be prevented) with additional reductions in diabetes, dementia and cancers.
- Almost 3.1 million LYs would be saved every year and population health would gain an additional 4.0 million DALYS every year. This would translate in an increase in life expectancy of about 2.9 months above trend, similar to the average gain in life expectancy experienced in OECD countries in the last 2.5 years.

1.6. Public health policies may affect industry revenues but countermeasures exist to minimise additional costs

Many of the policy options assessed in the OECD analysis carry direct implications for industry and business, particularly in the case of the food and drink industry. The food and drink industry, consisting of food manufacturers, restaurants, supermarkets and others, can be required to change their product, pricing, packaging, or marketing and advertising approach. This can result in implementation and compliance cost, or a change in the volume of sales. Conversely, other types of interventions including, for example, different types of subsidies promoting healthy products may have a positive impact on the

industry by providing additional revenue and generating public interest. The OECD analysed the main costs that may follow the implementation of innovative public health actions to tackle overweight and has identified countermeasures that countries can put in place to minimise such costs.

1.6.1. The main costs to industry include research and development costs, production and distribution costs, marketing and advertising costs and changes in sales

The OECD has assessed the evidence of the impact of the following set of interventions: product reformulation, changes in portion sizes, changes in food labelling policies, taxes on unhealthy food, advertising restrictions and introduction of healthy food subsidies. While each intervention has specific features which may trigger different costs, the following four factors have been identified as the major drivers of costs for industry: Research and development (R&D) of new or modified products; production and distribution costs; marketing and advertising costs and changes in sales.

Research and development of new or modified products.

Reformulation, changes in portion size as well as changes in food labelling and taxation of unhealthy nutrients are likely to induce R&D activity to comply with nutrient targets or to avoid a negative label or taxation. R&D costs are mainly one-off costs entailing idea generation, product development, product evaluation, consumer testing, and shelf-life studies. R&D costs for reformulation were estimated to vary from GBP 5 000 to GBP 450 000 (ca. USD 6 500 to USD 590 0000) in the United Kingdom and, in the United States, between USD 9 000 and USD 82 000 for minor, noncritical ingredients and between USD 89 000 and USD 660 000 for major ingredients. In the case of changes in portion size and food labelling, R&D activities also imply redesigning the packaging. For example, graphic design and prepress costs were evaluated at about USD 4 000 in a US study and at AUD 2 00 to AUD 3 000 (USD 1 400 to USD 2 100) in Australia.

Production and distribution costs

Reformulation, changes in portion size as well as changes in food labelling and taxation of unhealthy nutrients can change production and distribution costs, including fixed one-off costs as well as ongoing costs. One-off investments may be required to change the machinery and other production processes and include costs associated with downtime and implementation. For example, the cost of factory and transport re-tooling in response to a reformulated product was estimated to range between GPB 8 000 and well over GBP 100 000 (USD 10 500 to USD 130 000). The cost of the nutritional analysis to support the implementation of menu and food labelling was estimated at about USD 660 in the United States and at AUD 500 to AUD 900 (USD 360 to USD 640) in Australia. On average, this would result in a cost of USD 70 000 for one restaurant chain in the United States to implement menu labelling for each item on the menu. Ongoing costs generally include ingredient costs as well transport, storage or packaging costs. Ingredient costs may vary and, in some cases, the new ingredient may be cheaper than the old one. For example, artificial sweeteners may be cheaper to use than sugar because of the low volume needed to reach the same level of sweetness. However, the new ingredient may also shorten the shelf life of the product triggering higher re-stocking costs and, potentially, more wastage. The cost of implementing a new label depends on the size and colour of the logo but, in general it has been evaluated at USD 1 100 to USD 6 150 with higher costs if, for example, the colour of the logo is not already being used in the printing of the existing label.

Marketing and advertising costs

Some policies including, for example, reformulation, food labelling, price policies and regulation of advertising can result in cost for marketing and advertising. One-off costs include the design of new packaging and labels and, in the case of restaurants, of menus displayed on boards or hand-held menus.

Concerned companies may have to hire an advertising agency to re-design their marketing material. In addition, in many OECD countries, a new marketing campaign would need to be tested against regulations, which can involve a process called preclearance. However, the cost associated with this may be carried by the channels on which the advertisement is broadcast, and even for an express, same-day clearance the fees may be small. For example, in the United Kingdom the clearing process of a new advertisement was set at GBP 250 (USD 320). The new advertising strategy, particularly if induced by regulation, may carry a change in marketing costs due to a change in the media channel used to convey the message. This would result in an ongoing cost, should the change in channel result in higher costs.

Changes in sales

Finally, all the considered policies may affect sales, including a decrease in sales that would negatively affect the profits of producers. The review has identified three main reasons that may lead to a drop in sales: first, a decrease in the quality, including perceived quality by consumers, or the taste of the product; second, a worsening of the image of the product (e.g. following the introduction of artificial ingredients or due to a negative warning label); and third, a reduction in the value for money of the product. This may be actual value for money, for example if a price increases due to taxes or higher ingredient cost, or a perceived value for money, following a reduction in the portion size of pre-packaged food. A change in sales is the factor that has the potential to affect most industry's revenues, following the introduction of a public health policy aiming to steer consumption of specific products. At the same time, this is the aspect most difficult to quantify as multiple factors – not necessarily linked to the implementation of the public health policy – may modify sales. In some cases, as described below, it is even possible that sales of products (or other products produced by the same manufacturer) increase, following the introduction of public health policies.

1.6.2. Solutions exist to mitigate implementation and compliance costs

Governments can put in place a number of strategies to help minimise industry's implementation and compliance costs following the introduction of new public health policies to tackle unhealthy diets. More specifically, the OECD analyses have identified three key areas that, if taken into consideration during the planning and designing phase of any new public health action, would be able to decrease the economic burden for relevant businesses.

Allowing sufficient time to implement the new policy is the key factor in decreasing costs to the industry, particularly in the case of policies entailing product reformulation or changes in packaging. Most food producers reformulate their products every few years as part of their normal business, to improve quality, save cost or respond to changes in consumer preferences. Similarly, changes in packaging and labelling of products take place on a regular basis for many products to adapt to new trends. If the introduction of the policy can be coordinated with these regular changes, industry would be able to incorporate the new required standards, potentially with only marginal additional costs or with no additional cost. Available literature suggests that a period of 24-36 months may provide sufficient time for adaptation as more than 30% of products would be reformulated in any case and the vast majority of all products could be relabelled as part of planned changes. The choice of the transition period should take into account the delay in public health benefits caused by the postponement of the new policy's implementation.

Information campaigns run in parallel with the launch of the new policy may promote sales of healthier products, particularly in the case of new food labelling schemes. For example, the Eat Right-Live Well! supermarket intervention in the United States combined food labelling of healthy choices with an awareness campaign, increasing the sales of labelled and promoted healthy items by 28%. Similarly, a campaign aiming to increase awareness and use of the Keyhole logo among Danish men over 45 years old led to a 10% increase in the sale of foods with the logo. Conversely, in some cases, the use of a "stealth" approach may be more effective, particularly in the case of food reformulation and changes in

portion sizes. For example, a study of a Danish supermarket chain showed that stealth reformulations across a range of products reduced the total calories sold, while having either positive, zero or very moderate negative effects on sales.

Finally, businesses and industry may undertake a series of countermeasures to mitigate the potential consequences on profits produced by the implementation of new public health actions. For example, following a change in portion size, it has been shown that modifying the size of the package in multiple dimensions, as opposed to just one dimension, makes the change in volume less noticeable. Additionally, food vendors can use principles from behavioural economics including, for example, making the smaller portion the default size or changing the name of the portion sizes to nudge consumers to choose smaller portions.

1.7. Conclusions: tackling obesity and its related unhealthy lifestyles is an excellent investment

Overweight and obesity have been widely acknowledged as key risk factors to population health and the global economy for at least two decades. Despite certain policies put in place by countries around the world, the multifaceted causes underpinning the obesity epidemic are not yet fully addressed and, so far, new policies have not been able to stop the epidemic. The current and projected health burden of overweight and the chronic diseases it causes are enormous, as well as their costs to health systems and society, and the personal costs borne by the general population, through increased taxation, lower probability of being employed and lower educational attainment.

While some results have already been achieved, more needs to be done. Policy makers have a comprehensive menu of “traditional” public health interventions from which to choose. New technologies, advances in reformulation techniques and policies to modify the environment in which we live also offer exciting opportunities to promote healthier behaviour. More needs also to be done to promote an active lifestyle throughout the course of the day, from the workplace to commuting as well as leisure time. The OECD analyses show that these are all effective and cost-effective interventions with returns on investments of up to USD PPP 5.6 for each USD PPP invested.

Some of these interventions may also carry direct implications for industry and business by increasing production costs or influencing sales. Even considering these costs, taking a societal perspective, the benefits of public health actions are likely to outweigh costs; particularly if actions aimed at minimising the impact on business and industry are implemented.

Notes

[1] Throughout this chapter, the nutritional status of individuals is defined according to WHO guidelines and thresholds and uses body-mass index (BMI). Overweight is defined as a BMI higher than 25 kg/m^2; pre-obesity is defined as a BMI of 25-30 kg/m^2; and obesity is defined as a BMI higher than 30 kg/m^2. Obesity can be further divided into class I, class II and class III obesity. Class I obesity is the milder form of obesity and is defined as a BMI of 30-35 kg/m^2; class II obesity is defined as a BMI of 35-40 kg/m^2; while class III obesity is defined as a BMI over 40 kg/m2. Morbid obesity includes class II and class III obesity and is defined as a BMI higher than 35 kg/m^2. Further information can be found in Chapter 2 – Box 2.1. Using body mass index (BMI) to define levels of adiposity.

[2] A description of the OECD SPHeP-NCDs model can be found in Chapter 3, Box 3.2.

[3] OECD accession and selected partner countries include: Brazil (also a G20 country), China (also a G20 country), Colombia, Costa Rica, India (also a G20 country), Indonesia (also a G20 country), Peru and South Africa (also a G20 country).

[4] Lack of physical activity and sedentary behaviour are two different, but complementary factors independently affecting the development of chronic diseases such as cardiovascular diseases and cancers. Sedentary behaviour is defined as any waking behaviour involving low-energy expenditure, such as when an individual is lying, reclining, sitting, or standing. Physical inactivity, on the other hand, is defined as performing insufficient amounts of recommended moderate to vigorous physical activity. Individuals can be sedentary yet physically active, and vice-versa. As an example, individuals can sit for the majority of the week but still achieve 150 minutes or more of moderate-vigorous physical activity per week.

[5] For example, it has been evaluated that a modest goal of all OECD countries boosting their average PISA (Programme for International Student Assessment) scores by 5% (corresponding to 25 points) over the next 20 years would increase the GDP of OECD countries by USD 115 trillion over the lifetime of the generation born in 2010.

[6] At least one systematic review concludes that front-of-pack labelling is more effective than information positioned on the side or back of packages. Campos et al., 2011 – https://doi.org/10.1017/S1368980010003290.

[7] The list of countries with taxes on sugar-sweetened beverages include: Belgium, Chile, Finland, France, Hungary, Ireland, Latvia, Mexico, Norway, Portugal, Spain, United Kingdom and the United States (at the sub-national level).

[8] Note that, for the policy interventions regulating food advertising targeting children, the sum of the OECD member countries is 38 (and not 36 as on the 1 June 2019) as Latvia and Lithuania have mandatory restrictions on television advertising to children for energy drinks but voluntary restrictions for other products.

2 Overweight, poor diet and physical activity: Analysis of trends and patterns

Christina Xiao and Sahara Graf

This chapter presents patterns and trends for overweight and obesity in OECD countries, OECD accession and selected partner countries, EU28 countries, and Group of 20 (G20) countries. Overall, obesity prevalence is increasing in all countries analysed and severe or morbid obesity is also on the rise. These patterns are examined in both adults and children, and separate analyses are performed to determine whether rates of overweight and obesity vary among different population groups, such as by sex and socio-economic status, including income and education. Lastly, this chapter covers various determinants of obesity, such as diet, physical activity, and sedentary behaviour, in order to elucidate targeted health policy strategies.

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

Key findings

- Obesity continues to be a pressing public health issue. In 2016, more than one in three (35.1%) adults in OECD countries were considered pre-obese, with more than one in five (23.2%) adults considered obese.
- Prevalence of obesity is lower in children than in adults. About one in five children (18.7%) in OECD countries are considered pre-obese and one in ten children (9.9%) obese.
- Obesity rates have continuously grown over the few decades, with average increases between 46.7% and 59.0% in adult obesity observed in OECD, OECD accession and selected partner countries[1], EU28 and G20 countries between 1996 and 2016.
- Rates of adult obesity growth have been gradual, although in countries with high increases in obesity, morbid obesity accounts for more than half of the growth. The proportion of morbid obesity has been observed to represent as much as 70-80% of obesity growth, as is the case in the United States, Saudi Arabia, and New Zealand.
- Obesity rates are not uniform across all social groups; certain groups display higher rates of obesity depending on sex and socio-economic status. In general, there is a higher prevalence of women with obesity compared to men. For the majority of countries, individuals with the lowest incomes or least education are two to three times more likely to be overweight or obese than individuals in the highest income group or with high levels of education.
- A well-balanced healthy diet and physical activity are key in preventing overweight and non-communicable diseases (NCDs). However, trends in diet and physical activity have shifted towards unhealthy diets and more sedentary behaviour over the past few decades, due to urbanisation and changes in food and the environment.
- Only half of the population of certain countries (Chile, Italy, Mexico, and Spain) are observed to consume a healthy diet. In general, women are more likely to have a healthier diet and consume at least five servings of fruits and vegetables per day compared to men. The wealthier and more educated were also more likely to exhibit healthier dietary behaviour.
- Only one in three individuals are sufficiently active. Women are less likely to perform sufficient amounts of physical activity compared to men, as are persons with a lower education. However, women are less likely to demonstrate excessive sedentary behaviour.

2.1. Why is obesity a public health concern?

Obesity, defined as a body mass index (BMI) greater or equal to 30 kg/m^2 (see Box 2.1 for additional information), continues to be a pressing public health concern, as worldwide, obesity has nearly tripled since 1975. In 2016, more than 1.9 billion adults aged 18 years or older – representing 39% of the world's adult population – were considered overweight (i.e. a BMI greater or equal to 25 kg/m2); of these individuals, more than 650 million – representing 13% of the world's adult population – were considered obese (WHO, 2018[1]). Of the original 31 countries included for analysis in the 2010 OECD report on obesity, *Obesity and the Economics of Prevention: Fit not Fat* (OECD, 2010[2]), average rates of adult obesity in OECD countries have increased from 21.3% in 2010 to 24.0% in 2016, which corresponds to about an additional 50 million people with obesity. Overweight is also widespread among children; worldwide, 41 million children under the age of five classified as overweight or obese, and a further 340 million children and adolescents aged 5-19 are considered overweight or obese in 2016 (WHO, 2018[1]).

Overweight is a well-recognised risk factor for the development of various chronic diseases, including type 2 diabetes, cardiovascular diseases, respiratory diseases, musculoskeletal disorders, several types of cancer, and depression (Abdelaal, le Roux and Docherty, 2017[3]; Guh et al., 2009[4]). These risks also increase with corresponding increases in BMI. Increases in BMI can also have an indirect impact on mortality (Prospective Studies Collaboration et al., 2009[5]), as an estimated 2.8 million people die each year due to being overweight or obese (WHO, 2017[6]).

Adverse health effects due to overweight have also been observed during earlier life stages. Children and adolescents with obesity are at increased risk of developing breathing difficulties, insulin resistance, psychological effects, fractures, hypertension, and can display early markers of cardiovascular disease (WHO, 2019[7]; WHO, 2018[1]; Reilly, 2003[8]). The effects of childhood obesity can persist into adulthood, since children with obesity are more likely to stay obese as adults, are at higher risk of developing cardiovascular diseases such as diabetes, coronary heart disease, and hypertension later in life, and have premature mortality rates more than twice as high as individuals of normal weight (Reilly and Kelly, 2010[9]; WHO, 2019[7]; Maffeis and Tatò, 2001[10]).

In addition to being a public health concern, overweight poses a serious threat to the economy of countries around the world. As described in Chapter 3 and Chapter 4 of this publication, overweight has significant negative effects on the health budgets of countries, since it adversely affects educational outcomes and human capital formation as well as labour force productivity and the broader economy. Thus, health effects associated with overweight, combined with these other social and economic consequences, have contributed to a global economic and health burden.

2.1.1. Obesity: how do countries compare?

Rates of obesity among adults remain high while almost one in ten persons have morbid obesity

More than one in three persons are considered pre-obese (i.e. with a BMI of 25-29.9 Kg/m^2) and one in five persons are considered obese in OECD, OECD accession and selected partner countries, and EU28 and G20 countries (Annex Table 2.A.1). However, large differences exist when individual countries are considered, particularly for obesity rates (Figure 2.1). While prevalence of pre-obesity is broadly comparable across countries, with 46 out of 52 countries having rates of pre-obesity ranging between 31.3% and 38.6%, the analyses did find a nearly ten-fold variation in obesity rates in adults, with rates ranging from 3.9% in India to 36.2% in the United States. Similarly, in OECD countries, obesity rates range from 4.3% in Japan to 36.2% in the United States. In 19 countries, mainly located in North America and Europe, at least a quarter of the adult population is considered obese. A few countries, including Saudi Arabia and the United States, have a higher prevalence of obesity (36.2% and 35.4%, respectively) than that of pre-obesity (34.3% and 31.7%, respectively). On the other hand, rates are comparably lower in Asian countries such as India, Indonesia, China, Japan and Korea, where only 3.9% to 6.9% of the population are considered obese. Focusing on OECD countries outside Asia, the prevalence of adult obesity is also comparatively lower in some European countries such as Austria, Denmark, Italy, Slovakia, Slovenia, Sweden, and Switzerland, which have obesity rates around 20%.

Box 2.1. Using body mass index (BMI) to define levels of adiposity

BMI is the most widely used proxy for body adiposity to assess population-level rates of overweight, as it is easily derived from a person's weight and height. For adults 20 years of age and older, BMI is interpreted using standard weight categories, regardless of sex, body type, age and ethnicity (CDC, 2017[11]). Weight categories and the associated BMI thresholds are presented in the table below.

Table 2.1. BMI can be categorised by weight status

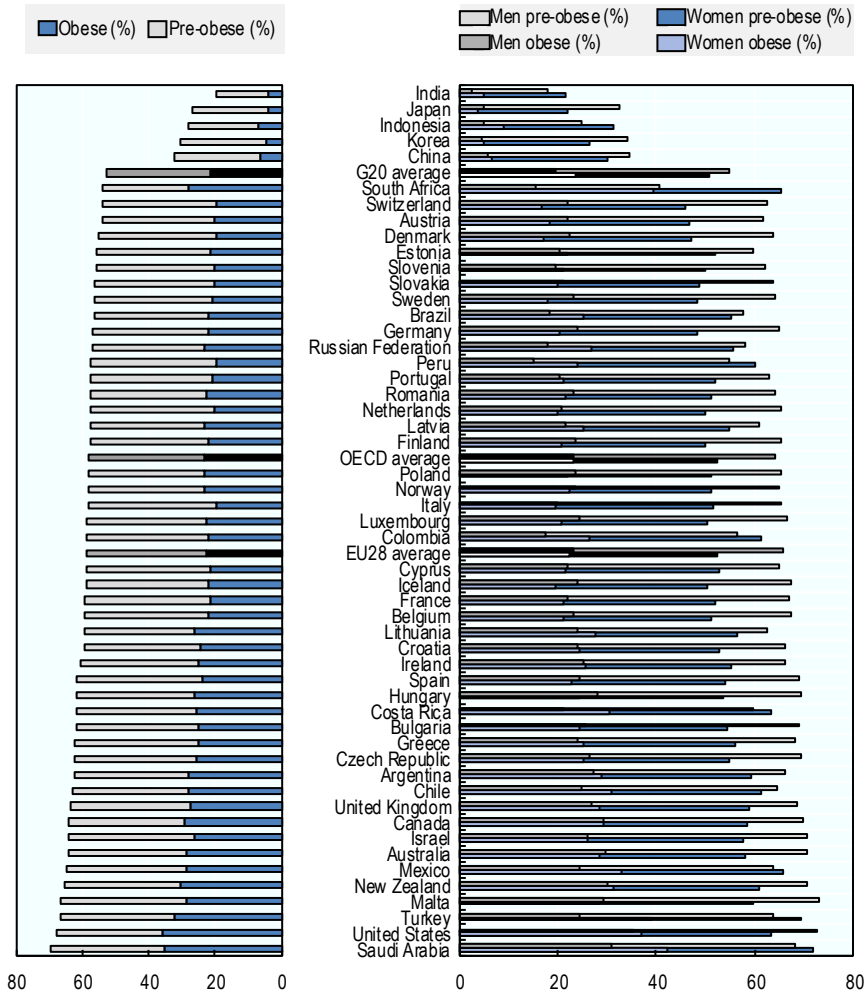
Weight Status	BMI thresholds
Underweight	< 18.5 Kg/m2
Normal or Healthy Weight	18.5-24.9 Kg/m^2
Overweight	≥ 25.0 Kg/m^2
Pre-obesity	25.0-29.9 Kg/m^2
Obesity	≥ 30.0 Kg/m^2
Class I Obesity	30-34.9 Kg/m^2
Severe/morbid obesity	≥ 35.0 Kg/m^2
Class II Obesity	35-39.9 Kg/m^2
Class III Obesity	≥ 40 Kg/m^2

Note: In some Asian countries such as China, Japan, and Korea, categories of pre-obesity and obesity are lower than those of other countries. For instance, Japan defines obesity as a BMI of more than 25 kg/m^2 (Kanazawa et al., 2002[12]). This is based on studies finding that East Asians are at higher risk for developing diseases such as diabetes and heart disease at a lower BMI than Africans and Caucasians (WHO Expert Consultation, 2004[13]).
Source: WHO (2019[14]), Body mass index – BMI, http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi

Calculation of BMI differs between children and adults

BMI thresholds used in children differ from those used in adults to take into account growth and development. For instance, in children under five years of age, overweight is determined as weight-for-height greater than two standard deviations above the WHO Child Growth Standards median, whereas obesity is considered as weight-for-height greater than three standard deviations above the WHO Child Growth Standards median. For children aged 5-19, overweight is defined as BMI-for-age greater than one standard deviation above the WHO Growth Reference median, and obesity is greater than two standard deviations above the WHO Growth Reference median (WHO, 2018[1]). In addition, in clinical practice, the International Obesity Task Force (IOTF) criteria are also widely used to determine BMI levels in children (Cole and Lobstein, 2012[15]).

Figure 2.1. Pre-obesity and obesity prevalence among adults in 2016



Notes: Data is age-standardised. Additional information on the comparability of this data with data in OECD.Stat can be found in Box 2.2.
Source: OECD analyses on the WHO Global Health Observatory (2018[16]) data, "Mean body mass index (BMI) trends among adults", https://www.who.int/gho/ncd/risk_factors/overweight_obesity/bmi_trends_adults/en/.

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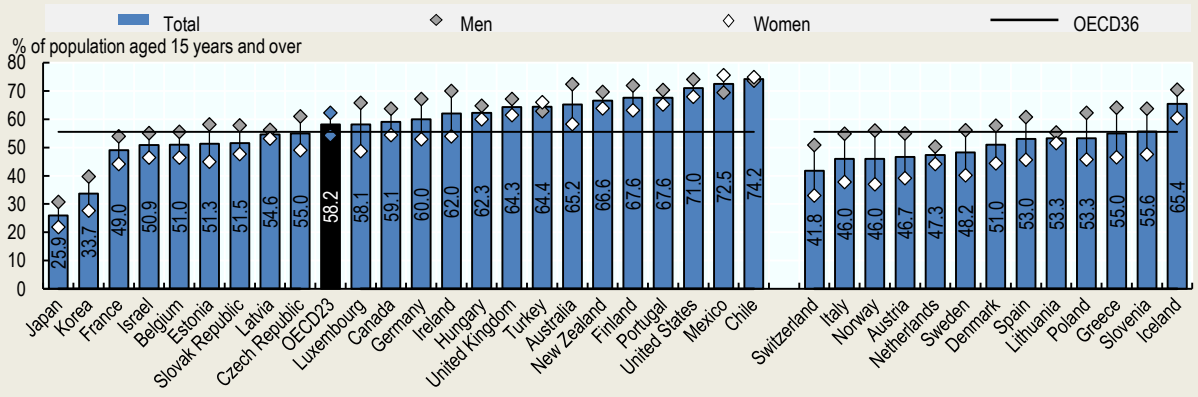
Individuals with morbid levels of obesity now comprise a significant share of the population in OECD, G20, and EU28 countries. In 2016, almost one-tenth (7.5%) of individuals in OECD countries were considered morbidly obese (Figure 2.3), which is defined as individuals with BMI levels above 35 kg/m^2 (or class II/III obesity). Similar rates were found for EU28 (6.9%) and G20 countries (7.8%). Among all OECD, G20, and EU28 countries, morbid obesity accounted for between 9.7% (Japan) and 48.1% (United States) of total obesity prevalence. Countries with the highest obesity rates tend to also have the highest levels of morbid obesity; these countries included Saudi Arabia (37.7% obesity prevalence, including 15.2% morbid obesity prevalence), the United States (37.3% obesity prevalence including 18.0% morbid obesity prevalence), and Turkey (33% obesity prevalence including 11.5% morbid obesity prevalence).

Box 2.2. OECD data on the prevalence of overweight

This report primarily reports prevalence data from the WHO Global Health Observatory (2018[16]). This dataset covers all the 52 countries analysed in this report, and provides age-standardised estimates using a range of data sources. Age standardization is a technique used to increase the cross-country comparability of data when the age profiles of the populations included in the analysis are different and when there are significant differences in the age group-specific prevalence rates of the dimension under consideration – as it is the case for overweight and obesity rates.

For its Health Statistics, the OECD also collects data on overweight and obesity prevalence (Figure 2.2). This data comes from national surveys, and is presented without any adjustment by age group, and split by measured and self-reported estimates. Due to the difference in data sources, and adjustments such as age-standardisation, the prevalence values of the two datasets can be different.

Figure 2.2. Overweight including obesity among adults by sex, measured and self-reported, 2017 (or latest year)



Note: Left- and right-hand side estimates utilised measured and self-reported data, respectively. OECD36 average includes both data types.
Source: OECD Health Statistics 2019.

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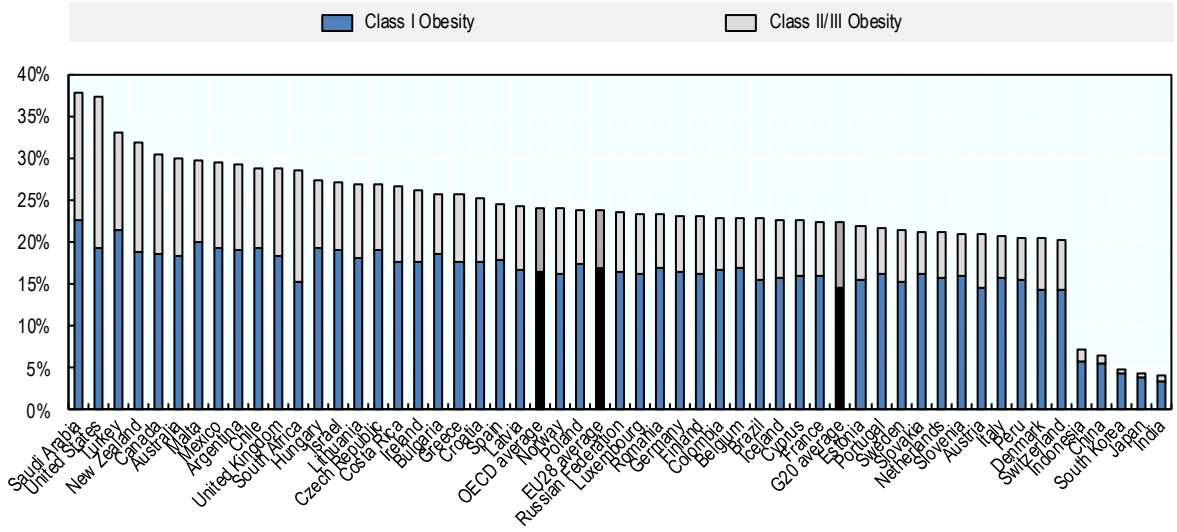
Figure 2.3. Prevalence of obesity and morbid obesity in adults in 2016



Note: Class I obesity is represented by BMI values between 30 and 35, whereas class II/III or morbid obesity is represented by BMI values greater than 35. Data is age-standardised. Additional information on the comparability of this data with data in OECD.Stat can be found in Box 2.2.

Source: NCD-RisC (2017[17]), "Adult body mass index: Evolution of BMI over time", http://ncdrisc.org/data-downloads-adiposity.html.

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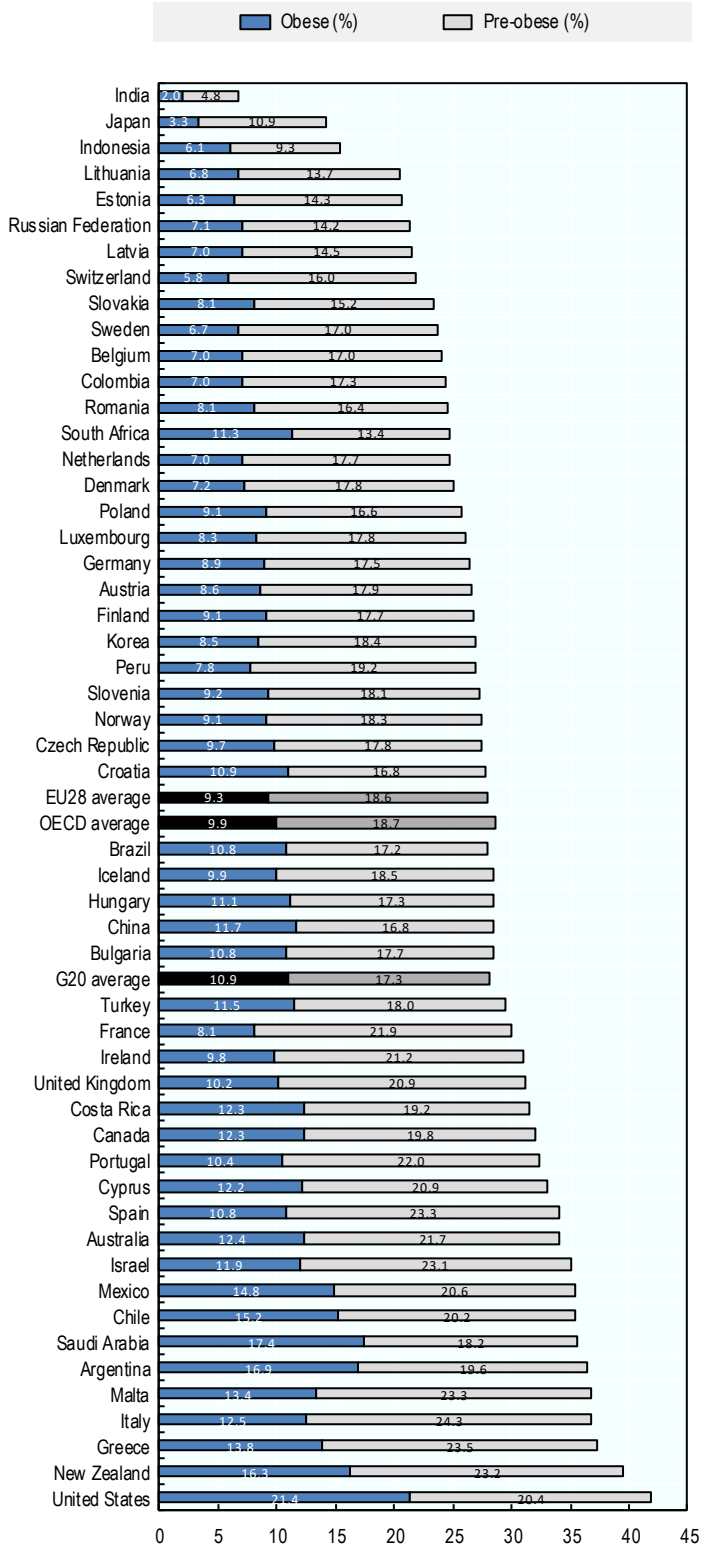
Childhood obesity rates follow adult patterns

Average rates of pre-obesity and obesity tend to be considerably lower in children compared to rates in adults (Figure 2.4). For instance, in 2016, the average rate of pre-obesity and obesity in children aged 5-19 years of age in OECD countries was 18.7% and 9.9%, respectively. Rates of pre-obesity and obesity are similar in EU28 (18.6% versus 9.3%) and G20 countries (17.3% versus 10.9%). Children in the United States have among the highest prevalence of pre-obesity and obesity, with rates of 20.4% and 21.4%, respectively. Conversely, children in India have lowest levels of pre-obesity and obesity, where the share is 4.8% and 2.0%, respectively. Overall, prevalence of pre-obesity is generally higher than the prevalence of obesity, except in the United States (20.4% versus 21.4%) and Saudi Arabia (18.2% versus 17.4%), where rates of pre-obesity and obesity are approximately equal. In nearly all countries (51 out of 52), boys have slightly higher rates of obesity than girls, with an OECD average of 11.9% for boys compared to 8% for girls, EU28 average of 11.4% for boys compared to 7.1% for girls, and G20 average of 12.6% for boys compared to 9.0% for girls (Annex Figure 2.A.1). Pre-obesity levels in boys and girls, on the other hand, are nearly equal in OECD (19.0% in boys versus 18.4% in girls), EU28 (19.2% in boys versus 17.9% in girls), and G20 countries (17.4% in boys versus 17.1% in girls).

Figure 2.4. Prevalence of pre-obesity and obesity in children in 2016



Note: Children between 5-19 years of age. Data is age-standardised.

Source: OECD analyses on WHO Global Health Observatory (2018[18]) data, "Prevalence of obesity among children and adolescents", https://www.who.int/gho/ncd/risk_factors/overweight_obesity/obesity_adolescents/en/.

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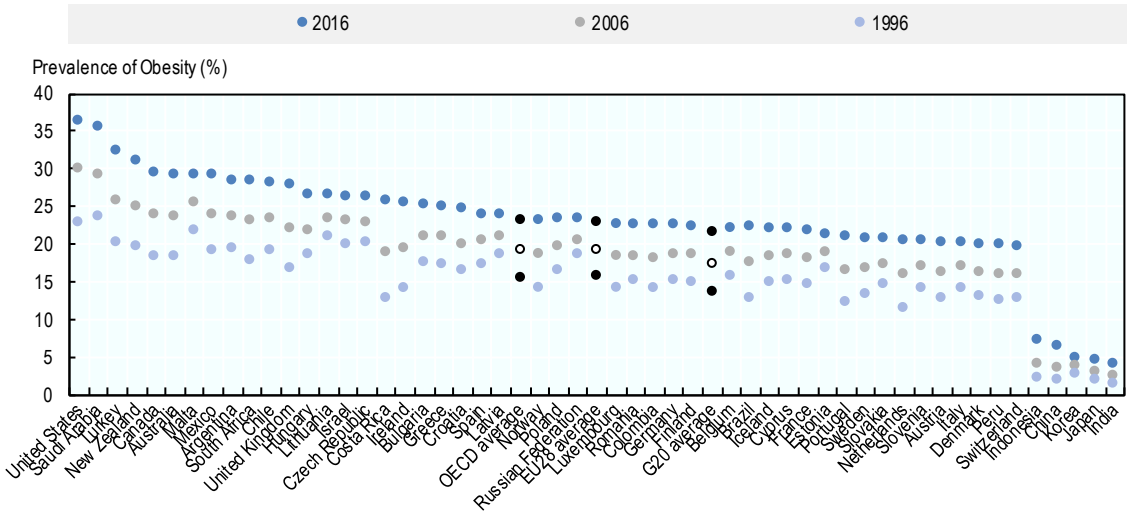
2.1.2. Are obesity levels rising or falling?

Trend analyses (Figure 2.5 and Annex Figure 2.A.2) demonstrate a persistent increase in overweight and obesity in adults in all OECD, OECD accession and selected partner countries, EU28 and G20 countries over the past 40 years (WHO Global Health Observatory, 2018[16]). Between 1996 and 2016, pre-obesity prevalence grew by 18.6% in OECD countries, 17.5% in EU28 countries, and 25.5% in G20 countries. During this same period, there was a much greater percentage increase in obesity prevalence, as obesity prevalence grew by 50.4% in OECD countries, 46.7% in EU28 countries, and 59.0% in G20 countries. These trends are expected to continue, as across many OECD countries, obesity rates are projected to rise unless effective policy actions are promptly put in place (Devaux et al., 2017[19]).

Figure 2.5. Obesity prevalence trends in adults between 1996 and 2016



Notes: Data is age-standardised. Additional information on the comparability of this data with data in OECD.Stat can be found in Box 2.2.
Source: OECD analyses on the WHO Global Health Observatory (2018[16]) data, "Mean body mass index (BMI) trends among adults", https://www.who.int/gho/ncd/risk_factors/overweight_obesity/bmi_trends_adults/en/.

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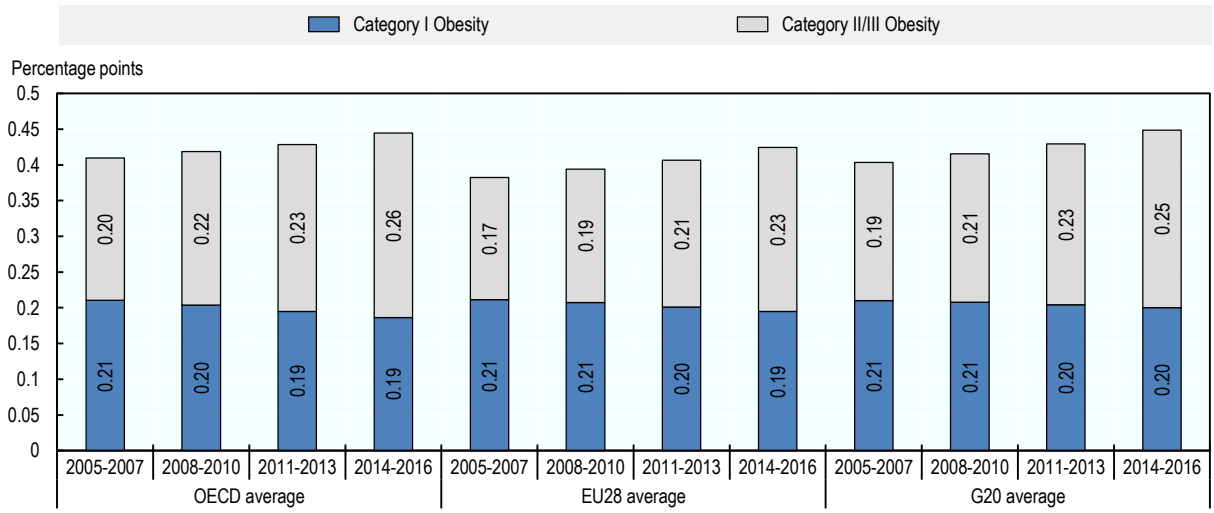
Morbid obesity is on the rise

The rate of increase in obesity prevalence reveals another important dimension of the obesity epidemic: growth in morbid obesity (class II and class III obesity) is now similar to the growth in class I obesity. Between 2005 and 2016, average morbid obesity growth rates gradually rose in OECD, EU28 and G20 countries, while class I obesity growth rates slowly declined (Figure 2.6). In OECD countries, class I obesity rates have grown by an average of 0.20 percentage points per three-year period between 2005 and 2016, whereas class II and III obesity rates have grown by an average of 0.23 percentage points per three-year period. Increases in class I and class II-III obesity rates between 2005 and 2016 are similar for both EU28 (0.20 and 0.20 percentage points per three-year period, respectively) and G20 countries (0.21 and 0.22 percentage points per three-year period, respectively). Morbid obesity growth accounts for around 50% of the increase in obesity rates in OECD, G20, and EU28 countries between 2014 and 2016. Broadly speaking, countries with the highest increases in total obesity rates, such as the United States (0.67 percentage points) and Saudi Arabia (0.66 percentage points) between the years 2014-2016, also have some of the highest average shares of morbid obesity growth. For example, in the United States and Saudi Arabia, respectively 79% and 74% of the growth in total obesity can be attributable to growth in

morbid obesity (Annex Figure 2.A.3). Conversely, countries with some of the lowest absolute increases in total obesity rates, including China, India, Japan, and Korea, have the lowest share of morbid obesity growth (between 13% and 27%). Moreover, there are some significant differences by sex, with growth rates for morbid obesity in men observed to be greater than those of women in 33 out of 52 countries.

Figure 2.6. Average change in adult obesity rates between 2005 and 2016



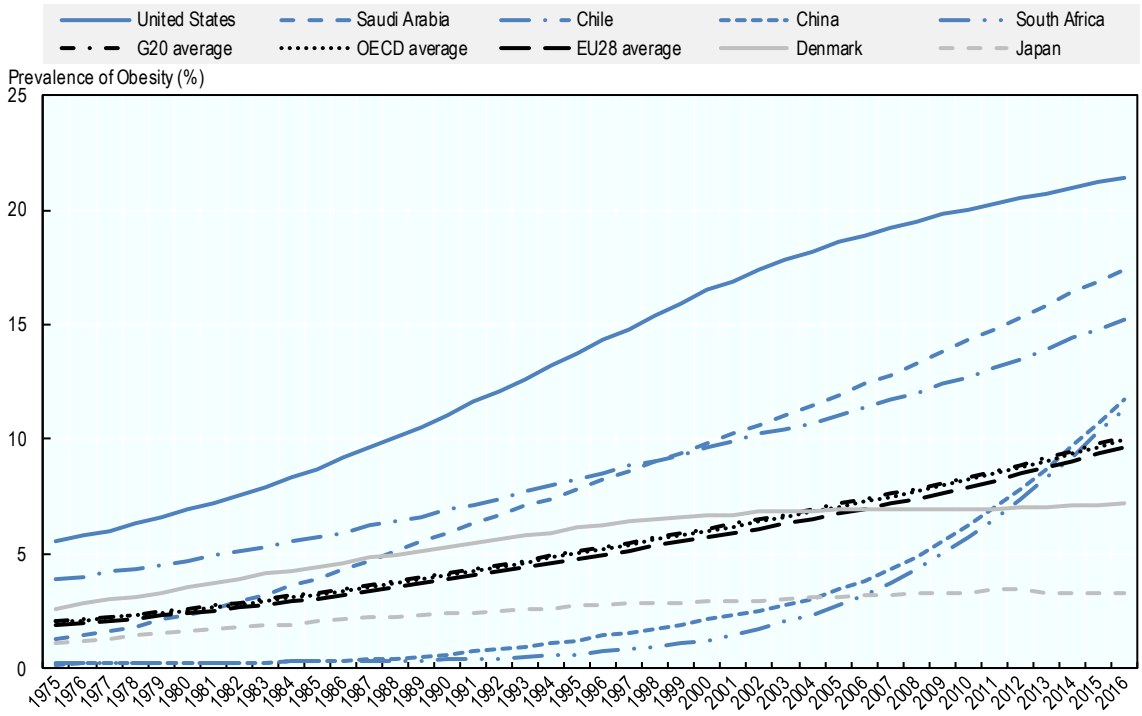
Notes: Data is age-standardised. Additional information on the comparability of this data with data in OECD.Stat can be found in Box 2.2.
Source: NCD-RisC (2017[17]), "Adult body mass index: Evolution of BMI over time", http://ncdrisc.org/data-downloads-adiposity.html.

StatLink https://doi.org/10.1787/888934006803

Childhood obesity continues to grow in some countries, slow in others

In children aged 5-19, obesity prevalence also steadily increased between 1975 and 2016, with similar patterns and rates of growth (an average 0.3 percentage points per year) found for OECD, EU28 and G20 countries (Figure 2.7). Among individual countries, however, there are different trends in rates of obesity over time. While most countries tend to display a steady rate of growth over time – such as in Mexico, New Zealand, and Saudi Arabia – others have accelerated, particularly in more recent years. For instance, China and South Africa have historically had a very low prevalence of obesity, but rates have been rising dramatically and are now comparable to those found in OECD countries. Conversely, in other countries, the rate of growth in obesity prevalence has been slowing over the past 20 years, such as in Denmark and Japan. For instance, the average change in obesity rate decreased by 70% in Denmark and 60% in Japan between 1996-2005 and 2006-16. In the United States, the country with the highest prevalence of child obesity, the rate of growth has more than halved, decreasing from a growth rate of 0.6 percentage points per year in 1995-2000 to 0.2 percentage points per year in 2011-2016.

Figure 2.7. Obesity trends in children aged 5 to 19 from 1975 to 2016



Note: Children 5-19 years of age. Data is age-standardised.
Source: OECD analyses on WHO Global Health Observatory (2018[18]) data, "Prevalence of obesity among children and adolescents", https://www.who.int/gho/ncd/risk_factors/overweight_obesity/obesity_adolescents/en/.

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2.1.3. What population groups are at highest risk for obesity?

Rates of obesity are not uniformly distributed across countries, as a number of individual and sociocultural factors can influence the development of obesity. Disparities in rates of overweight have been observed among individuals of different sexes and socio-economic status (SES), indicators of which can include income, education, and social class.

Overweight prevalence differs by sex

For the majority of OECD, EU28, and G20 countries, rates of obesity are relatively equal between men and women (Figure 2.1). For instance, within OECD countries, an average of 23.1% of women and 23.2% of men are considered obese. A similar pattern is found in EU28 countries, as 22.4% of women are obese compared to 23.4% of men. In G20 countries, however, there is a higher prevalence of obesity among women (23.6% of women versus 19.4% of men).

Conversely, rates of pre-obesity tend to be higher in men compared to women. The average rate of pre-obesity is about ten percentage points higher in men compared to women in both OECD (29.3% in women versus 41.0% in men) and EU28 countries (29.9% in women versus 42.2% in men). Among G20 countries, the gap is narrower (27.2% in women versus 35.4% in men). Countries with higher levels of obesity, including South Africa, Saudi Arabia, Turkey and the United States also have higher inequality levels between men and women. In these countries, there is about a 10-25% difference in obesity levels between men and women.

Disparities in obesity rates exist between income groups

Inequalities in income can be evaluated using the relative index of inequality (RII). RII is a statistical measure used to approximate the level of inequality in a health outcome (such as overweight and obesity) due to a socio-economic characteristic. According to OECD analysis, the majority of EU28 countries have higher rates of overweight and obesity among the bottom 20% or quintile of income-earners (hereafter referred to as the lowest income groups) compared to the top 20% or quintile of income-earners (hereafter referred to as the highest income groups) (Figure 2.8). For example, an RII or 1.5 suggests that individuals at the lowest quintile of income are 50% more likely to develop overweight or obesity than individuals at the highest quintile of income.

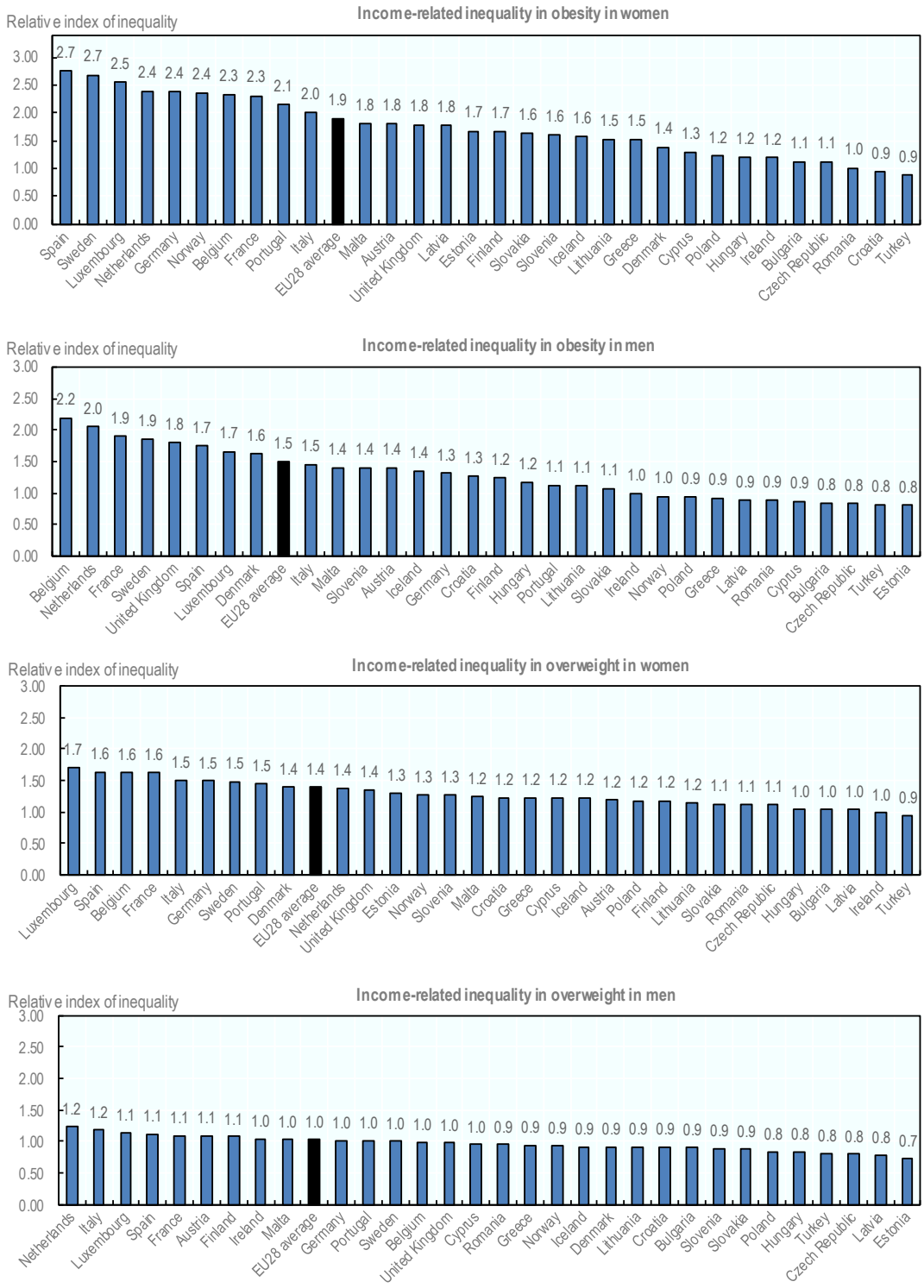
In general, women tend to have higher levels of income-related inequality in obesity compared to men, with the least-wealthy women being up to two to three times more likely to be obese than those with the highest level of income in ten countries. For instance, in ten countries, the least wealthy women are more than twice as likely to be obese compared to the wealthiest women. In men, there are only two countries where those at the lowest income group have double the risk of obesity, Belgium (RII=2.2) and the Netherlands (RII=2.0). Furthermore, in nine countries, men with higher levels of income are 10-20% more likely to be obese than men with lower levels of income.

In both sexes, relative inequalities in overweight are smaller than those in obesity. For 29 out of 31 countries, rates of overweight in women are higher in the lowest income group compared to the highest income group, as RII values ranged from 1.04 to 1.71. Income-related inequality in overweight rates is the highest among women living in Luxembourg, Spain, Belgium, and France (RII=1.63-1.71). On the other hand, men exhibit the opposite trend; half the countries analysed have rates of overweight that are higher in the wealthiest 20% of the male population, compared to the least wealthy group. Interestingly, countries with the lowest levels of overweight in men tend to have the highest RII values. This is seen in a similar, though lesser extent, in women. Moreover, inequalities in overweight are generally larger in western European countries compared to countries in central-eastern Europe.

Smaller gaps in both overweight and obesity prevalence between income groups are observed in men compared with women. For instance, on average, women and men in the lowest income group are, respectively, 90% and 50% more likely to be obese compared to individuals in the highest income group. Similar findings have been reported in other studies (Bilger, Kruger and Finkelstein, 2016[20]), and may be explained by theories and evidence positing that men in lower income groups are more likely to work at jobs that require manual labour and are thus more physically active (Lakdawalla and Philipson, 2009[21]). Another explanation that has been put forward is that women may be more likely to invest more energy and resources into looking thinner (Judge and Cable, 2011[22]), since they have been shown to be more affected by negative societal attitudes towards obesity (Puhl and Brownell, 2001[23]; Sattler et al., 2018[24]).

Social disparities in overweight and obesity are here assessed in relation to income levels. Another social marker, namely the education level, could be used to examine inequalities. An OECD report found that education-related inequalities in overweight are pronounced, especially among women, while inequalities are less clear-cut among men in OECD countries (OECD, 2019[25]). Overall, this pattern of inequality is consistent with the results presented in Figure 2.8, with only minor discrepancies for a small number of countries. Such differences can be explained by the fact that the distribution of the population across education levels varies from the distribution across income groups, and the marginal effects of education and income on overweight are unlikely to be identical.

Figure 2.8. Income-related inequality in obesity and overweight by sex



Note: Analysis includes EU28 countries and Turkey only.

Source: OECD analysis on Eurostat (2018[26]) data, "Body mass index (BMI) by sex, age and income quintile (%)", http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=hlth_ehis_de2&lang=en.

StatLink https://doi.org/10.1787/888934006841

2.2. Defining determinants of overweight: diet, physical activity, and sedentary behaviour

While multiple factors contribute to weight, including genetic predisposition and environmental influences, increase in the BMI level primarily occurs due to the imbalance between energy intake from diet and energy output through physical activity (Hill, Wyatt and Peters, 2012[27]). Greater exposure to obesogenic environments, whether they are built, social, or political, has been implicated along with unhealthy dietary habits and lack of physical activity as major drivers behind the rise of overweight and obesity levels along with their associated chronic diseases. As globalisation and urbanisation have grown in the past few decades, there has been a corresponding increase in the amount of energy-dense foods consumed and a reduction of physical activity levels due to sedentary behaviour associated with the shift towards office jobs and more inactive modes of transport (Costa-Font and Mas, 2016[28]; Popkin, 2006[29]). However, overweight and its associated chronic diseases are largely preventable (Hruby and Hu, 2014[30]), and as described in Chapter 5 of this publication, effective public health actions exist to promote healthier lifestyles.

The remainder of this section looks at some of the key determinants underpinning the global epidemic of overweight and its associated chronic diseases, placing a special focus on diet and lack of physical activity.

2.2.1. Diet quantity or quality: do people eat too much, too unhealthily, or both?

Demand for food and calories has been increasing over the past half century

Addressing calorie intake is widely considered as key to managing the obesity epidemic, since energy imbalance resulting from increased food intake and lower energy expenditure is associated with an increase in average population bodyweight. Over the past fifty years, total food supply has increased by nearly 20% in OECD, OECD accession and selected partner countries, EU28 and G20 countries, from 2 700 kcal/capita/day in 1961 to a little more than 3 200 kcal/capita/day in 2013 (Figure 2.10). Between 1961 and 2013 in OECD countries, total food supply grew by around 10%, or from 3 000 kcal/capita/day to 3 300 kcal/capita/day. Similarly, food supply in EU28 countries grew by approximately 8% (from 2 800 kcal/capita/day in 1961 to 3 000 kcal/capita/day). Growth in food supply was much greater in G20 and OECD accession and selected partner countries, where supply grew by around 22% (from 2 750 kcal/capita/day in 1961 to 3 350 kcal/capita/day in 2013) and 44% (from 2 000 kcal/capita/day in 1961 to 2 900 kcal/capita/day in 2013), respectively.

A better diet: Quality matters

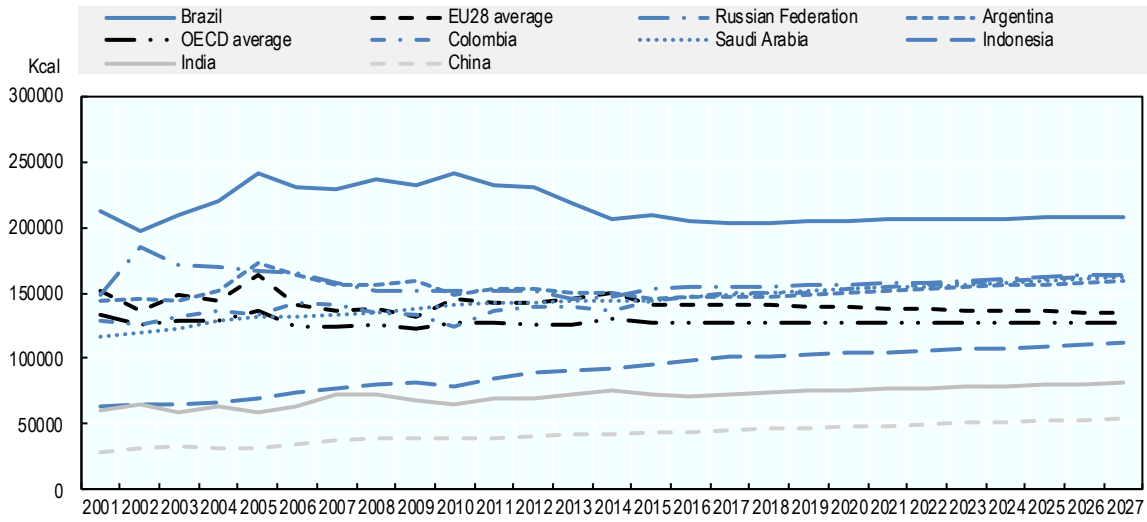
While it has been determined that the number of calories consumed contributes strongly to weight gain, food quality is also considered an important part of preventing weight gain. Weight gain has been associated with the consumption of processed foods that are higher in starches, refined grains, fats, and sugars, whereas weight loss was associated with consuming fruits and vegetables, whole grains, nuts, and yogurts (Mozaffarian et al., 2011[31]), even regardless of genetics or insulin-response to carbohydrates (tolerance for carbs or fat) (Gardner et al., 2018[32]). This lends support to the idea that diet quality, in addition to quantity, may play a role in determining individual's weight.

The quality of diet may be measured in different ways and according to a number of indicators. A first parameter is a sufficient consumption of healthy dietary elements including, for example, a sufficient consumption of fibre. A second factor is the intake of nutrients that, if consumed above certain quantities, would contribute to the development of health issues (e.g. free sugar). Finally, a number of indexes have been developed to gauge the quality of diet, taking into account all foods and nutrients consumed over a period of time.

Consumption of at least 400 grams, or five portions, of fruit and vegetables per day is one of the key elements of a healthy diet (WHO, 2018[33]). However, according to recent OECD analysis, daily fruit and vegetable consumption remains low for the majority of the 11 OECD countries analysed (Graf and Cecchini, 2017[34]). The prevalence of fruit and vegetable intake, measured as meeting either the recommended daily consumption of five fruits and vegetables or fibre intake, was measured to be below 40% for 10 out of the 11 countries included for analysis, namely, Australia, Canada, Chile, England, France, Italy, Mexico, Spain, Hungary, and the United States. The only exception was Korea, where the recommended daily consumption of fibre was just under 60%.

Consumption of free sugar is already high in OECD countries and is expected to grow further in the future. Consuming excessive amounts of free sugar is considered a risk factor for overweight (Bray and Popkin, 2014[35]; Te Morenga, Mallard and Mann, 2012[36]). This is because foods or drinks with free sugars, including sugar-sweetened beverages (Malik et al., 2013[37]), may facilitate excessive calorie consumption without adding specific nutrients (Popkin et al., 2006[38]; WHO, 2019[39]). Moreover, the consumption of sugar-sweetened beverages are a marker of an unhealthy diet, as drinkers tend to consume more calories, have a poor quality of diet, and exercise less (Ranjit et al., 2010[40]; Miller et al., 2019[41]; Khan and Sievenpiper, 2016[42]). Consumption of sugar through sugary foods, such as grain-based desserts (cakes, cookies, pies) and sodas is already high in OECD countries (Figure 2.9). In addition, according to an OECD-FAO joint report (OECD/FAO, 2018[43]), calorie intake derived from sugar consumption is expected to increase by up to approximately 10 000 kcal per capita in several countries by 2027 (compared to levels in 2015-2017). This corresponds to a respective 12% and 22% increase in China and India, two countries that have among the lowest rates of obesity. Furthermore, in the United States, the country with the highest levels of obesity, calorie intake from sugar is projected to increase by 6 000 kilocalories by 2027, or by more than 5%.

Figure 2.9. Trends and projections of annual sugar consumption per capita from 2001 to 2027



Source: OECD/FAO (2018[43]), *OECD-FAO Agricultural Outlook 2018-2027*, https://dx.doi.org/10.1787/agr_outlook-2018-en.

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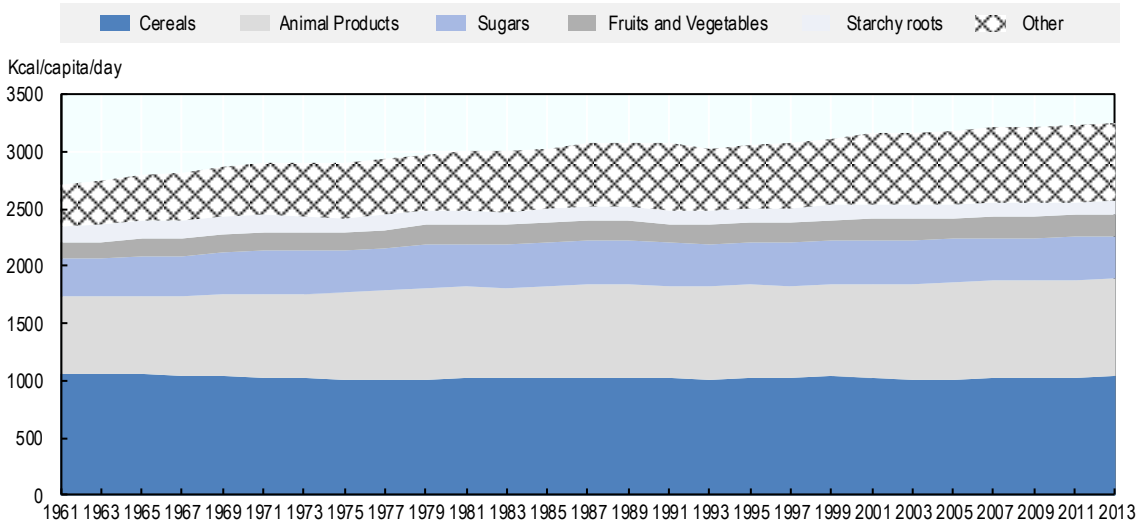
Other nutrients with the potential to support growth in overweight and its associated chronic diseases are also consumed in higher quantities. A large portion of the increase in calorie supply in OECD, EU28 and G20 countries is driven by an increase in production of animal products (from 672 kcal/capita/day in 1961 to 853 kcal/capita/day in 2013) (Figure 2.10). There was a great increase in animal product supply in OECD accession and selected partner countries (166%) and EU28 member states (74%), while G20 countries and OECD countries had smaller growth rates: 19% and 9% respectively, between 1961 and 2013.

Figure 2.10. Food supply in OECD, OECD accession and selected partner countries, EU28 and G20 countries from 1961 to 2013



Note: Animal products include animal meat, animal fat, offal, eggs, fish and seafood, and dairy.
Source: OECD/FAO (2018[43]), *OECD-FAO Agricultural Outlook 2018-2027*, https://dx.doi.org/10.1787/agr_outlook-2018-en.

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Finally, beyond fruit and vegetable consumption or consumption of specific nutrients, quality of diet can be measured in multiple other ways. The Mediterranean Diet Score, Healthy Food Index, and scores based on nutritional intake have all been used to assess diet quality (Burggraf et al., 2018[44]). By applying these composite indexes of food quality, an OECD analysis of 11 countries found that, in a number of countries (Chile, Italy, Mexico and Spain), a little more than half of the population consumes a healthy diet, as according to the national guidelines and international standards. In the United Kingdom, less than one in three persons were found to consume a healthy diet (Graf and Cecchini, 2017[34])

Who is at the highest risk of eating unhealthy foods?

Some population groups are more likely to have an unhealthy diet. According to the OECD analyses on national data of 11 countries, women are more likely than men to have a healthy diet and consume at least five fruits and vegetables per day in countries such as Australia, Canada, Chile, England, France, Italy, and Spain, whereas they are less likely to achieve the five portions a day threshold in Hungary, Korea, and the United States (Graf and Cecchini, 2017[34]). For instance, in Canada, the odds of consuming the recommended amount of fruits and vegetables are up to 2.3 times higher in women compared to men.

Individuals with different education and SES levels have different dietary patterns. Continuing with the OECD study based on 11 countries, those who are highly educated are more likely to consume recommended amounts of fruits and vegetables (odds ratio [OR] up to 2.1) and have a healthier diet (OR up to 1.4) compared to those with medium or low levels of education (Graf and Cecchini, 2017[45]). Nonetheless, there are some exceptions. For example, in Chile, Italy, and Korea, fruit and vegetable consumption are almost equal between education groups, whereas in Chile, Mexico, and Spain, the odds of consuming a healthy diet are also not significantly different. In general, individuals with a lower SES are less likely to consume a sufficient amount of fruit and vegetables or have a healthy diet, though fewer results are significant. This is consistent with studies reporting that the effect of education on quality of diet is at least as great or stronger than other socio-economic indicators, such as income (Monsivais and Drewnowski, 2009[46]; Si Hassen et al., 2016[47]). One study found that more highly educated individuals

reported higher quality and therefore more costly diets, regardless of income level (Monsivais and Drewnowski, 2009[48]).

2.2.2. Low levels of physical activity and excess sedentary behaviour also contribute to the energy imbalance

Overweight is often conceptualised using the energy balance equation, which states that weight gain occurs when energy intake exceeds energy expenditure, representing a positive energy imbalance. The opposite also holds true; weight loss is thought to occur when energy expenditure exceeds energy intake, representing a negative energy imbalance. Energy expenditure is comprised of several components, including resting metabolic rate, thermic effect of food (energy associated with the digestion and processing of food), and physical activity (Hall et al., 2012[49]). Physical activity, in particular, is the second largest component of daily energy expenditure (FAO, 2003[50]) following resting metabolic rate – i.e. the energy burnt by the body in a state of complete rest – and accounts for approximately 10-30% of calories burned every day (Westerterp et al., 1996[51]; Westerterp, 2013[52]). However, compared to resting metabolic rate, physical activity is more variable (Caudwell et al., 2013[53]; Westerterp, 2018[54]). Thus, interventions can be used to target and influence physical activity levels to increase energy expenditure, thereby promoting weight loss. In addition, more time spent on physical activity, which involves higher energy expenditure, means less time for sedentary behaviour (Box 2.3) and more opportunities to contribute to a negative energy imbalance. This is important because on average, adults spend more than half of their waking time in sedentary behaviour, at work, in leisure, or in transport (Clark and Sugiyama, 2015[55]).

Box 2.3. Sedentary behaviour

Alongside physical activity, another important dimension to consider is excessive sedentary behaviour, which should not be confused with lack of physical activity. Sedentary behaviour is characterised as any waking behaviour involving low-energy expenditure, such as when an individual is lying, reclining, sitting, or standing (Sedentary Behavior Research Network, 2017[56]). Physical inactivity, on the other hand, is defined as performing insufficient amounts of recommended moderate to vigorous physical activity (Bull, 2003[57]). Individuals can be sedentary yet physically active, and vice-versa (van der Ploeg and Hillsdon, 2017[58]). As an example of the former state, individuals can sit for the majority of the week but still achieve 150 minutes or more of moderate-vigorous physical activity per week. As an example of the latter, individuals with standing occupations can spend little of their time in a sedentary state and not complete any physical activity.

Sedentary behaviour is also distinct from physical activity as a risk factor for mortality, cardiovascular disease, certain cancers, hypertension, and diabetes (Rezende et al., 2014[59]; Thorp et al., 2011[60]). Independent of changes to physical activity, more time spent on sedentary behaviours, such as television viewing, has been associated with significant increases in waist circumference in both men and women (Wijndaele et al., 2010[61]; Wijndaele et al., 2010[62]). Significant detrimental effects of television viewing have also been observed with waist circumference, systolic blood pressure, and markers of metabolic risk, even among physically active men and women (Healy et al., 2008[63]).

In recognition of the detrimental effects of sedentary behaviours, the World Health Organization (WHO) has put forth recommendations on screen time for children under the age of five, such as not exposing children under the age of one to any screen time and that screen time should be limited to less than one hour per day for children between one and four years of age (WHO, 2019[64]).

Do people spend their time on physical activities or in sedentary behaviour?

An OECD analysis on use of time and domains of physical activity (Box 2.4) in Canada, France, Germany, and the United States (Figure 2.11) found that men and women spend between 80 minutes and 105 minutes per day on physical activity, which consists of sport, domestic physical activity, active travel, and occupational physical activity (Graf and Cecchini, 2019[65]). Moreover, men spend an average of 720 minutes per day on sedentary behaviour, which also includes work, and motorised travel, whereas women spend about 620 minutes per day on these same activities.

Box 2.4. Domains of physical activity

Four areas of daily living have been identified in which physical activity occurs (Bull et al., 2004[66]; Pratt et al., 2004[67]). These include the home, transport, workplace, and leisure time (Sallis et al., 2006[68]). Collectively, these areas are known as the domains of physical activity.

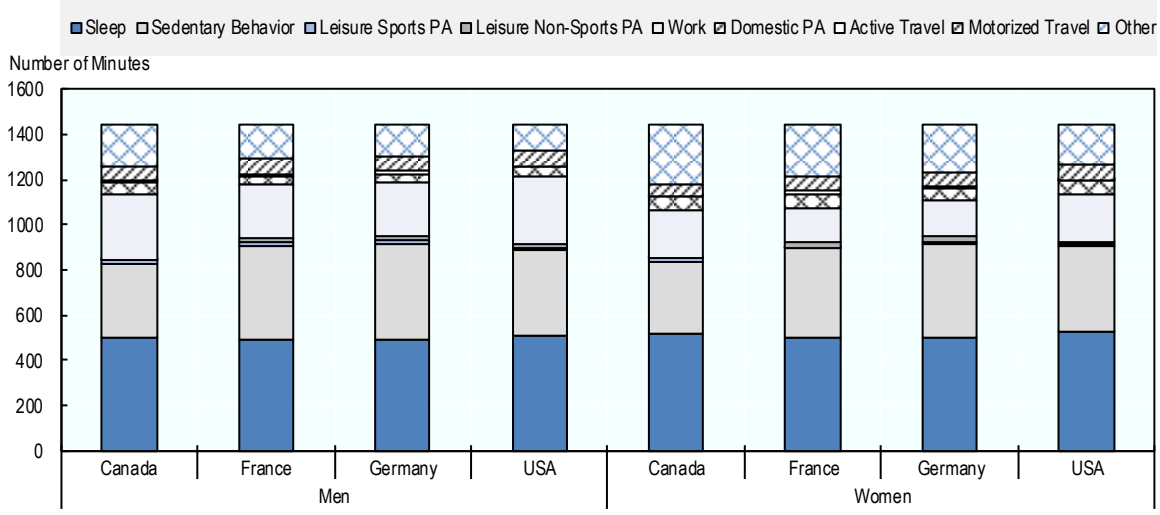
Table 2.2. Definitions and examples of physical activity domains

Physical activity domain	Definition or examples
Domestic	Can include household chores, gardening, child care, shopping, moving heavy objects, and incidental physical activity
Transport	Walking or cycling for transport, walking or climbing stairs to access public transport
Occupational	Work-related physical activity, may involve manual labour, walking, lifting or carrying objects
Leisure time	Includes various types of recreational activities, including hobbies, sports, and exercise

Differences involving time spent on physical activity and sedentary behaviour differs by sex and country (Graf and Cecchini, 2019[65]). Overall, women spend more time on total physical activity than men do, but some differences exist. Women report 15 additional minutes of domestic physical activity per day, compared to men (i.e. 57 minutes versus 41 minutes). Conversely, on average, men spend slightly more time on leisure sports (i.e. 17 minutes versus 13 minutes) than women do. Moreover, both men and women spend between 2 and 15 minutes in daily active travel. Time spent on domain-specific physical activity differs by country as well. Men and women in France spend the most time on active transport (12 and 15.7 minutes, respectively), followed by men and women in Germany (10 and 11 minutes, respectively), Canada (5.1 and 5.6 minutes, respectively), and the United States (3.3 and 2.5 minutes, respectively). Men in Canada and Germany spend the most time on leisure sports (20.4 and 18.8 minutes per day, respectively), which accounts for about 20% of their daily physical activity.

On average, men and women spend more than six hours a day on sedentary activities – approximately 40% of waking time. In general, women tend to spend less time on sedentary behaviours (375 minutes versus 382 minutes). Men in Germany and France have the highest levels of sedentary behaviour (423 and 414 minutes, respectively). In addition to this, men also spend more time working, as they spend about 270 minutes compared to women, who spend about 180 minutes. Both men and women also spend an average of around one hour on motorised travel, with men spending on average seven more minutes on motorised travel (i.e. 67 minutes versus 60 minutes) than women. Among these individuals, men in the United States and France spend the most time using motorised travel (73 and 70 minutes, respectively).

Figure 2.11. Number of minutes spent on activities per day by sex



Source: Graf and Cecchini (2019[65]), "Current and past trends in physical activity in four OECD countries: Empirical results from time use surveys in Canada, France, Germany and the United States", https://doi.org/10.1787/22cad404-en.

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The share of people meeting WHO physical activity thresholds and trends remains low

Regular physical activity (Box 2.5), and even light-intensity physical activity (Füzéki, Engeroff and Banzer, 2017[69]), has a number of health benefits, including the prevention of NCDs (such as cardiovascular disease, diabetes, and cancer), hypertension, obesity, depression, and premature mortality (Warburton and Bredin, 2017[70]; Warburton, Nicol and Bredin, 2006[71]; Reiner et al., 2013[72]). Despite these health benefits, in 2016, the prevalence of insufficient physical activity among adults was greater than 40% in 13 countries (Figure 2.12). In OECD countries, about one-third (32.1%) of individuals perform insufficient amounts of physical activity, whereas this value is slightly higher in EU28 (33.1%) and G20 (34.0%) countries. The highest levels of insufficient physical activity are found in Saudi Arabia, which had a prevalence of 53.1%, whereas the lowest levels are found in China, with a prevalence of 14.1%. Across all countries, except for China, Finland and Indonesia, rates of insufficient physical activity are higher among women compared to men. The disparity between the sexes is greatest in Costa Rica, India, Saudi Arabia, South Africa, Turkey, and the United States, with differences as high as 20 percentage points.

If current trends continue, then prevalence of insufficient physical activity is expected to rise. An analysis of trends in physical activity levels between 2001 and 2016 of 169 countries found that insufficient physical activity, defined as not meeting the physical activity recommendations as set out by WHO, increased by more than 5 percentage points in high-income Western countries but remained substantially stable in high-income countries in the Asia-Pacific region (Guthold et al., 2018[73]).

Box 2.5. Physical activity

The WHO global recommendations on physical activity for health were developed in order to promote physical activity as a primary prevention of NCDs at the population level (WHO, 2010[74]; WHO, 2019[64]). These guidelines are presented below.

Recommended levels of physical activity by age group

Infants (less than a year old):

- at least 30 minutes of physical activity.

Children aged 1-4:

- at least 180 minutes of physical activity in any intensity spread throughout the day.

Children and adolescents aged 5-17 :

- at least 60 minutes of moderate to vigorous intensity physical activity per day
- more than 60 minutes of daily physical activity may bring about additional health benefits
- most daily physical activity should be aerobic, and vigorous intensity physical activity should be performed at least 3 times per week.

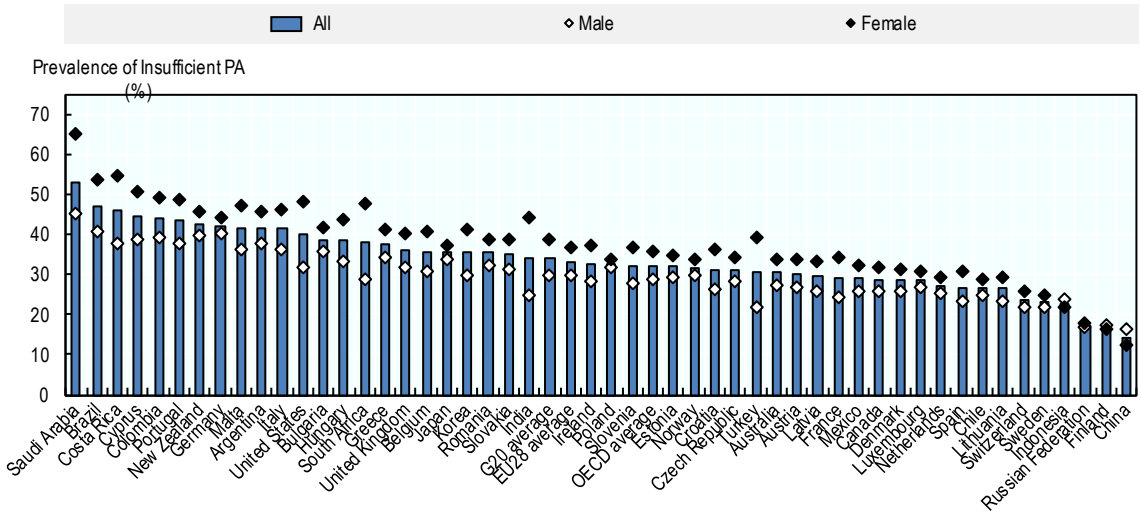
Adults aged 18-64:

- at least 150 minutes of moderate to vigorous intensity physical activity per week, or at least 75 minutes of vigorous intensity physical activity per week
- aerobic activity should be performed in bouts of at least 10 minutes
- to attain additional health benefits, moderate-intensity aerobic physical activity should be performed for 300 minutes per week. Adults can also engage in 150 minutes of moderate-to-vigorous or vigorous-intensity aerobic physical activity per week for more health benefits.

Adults aged 65 and above:

- at least 150 minutes of moderate aerobic exercise per week, or at least 75 minutes of vigorous aerobic physical activity per week.
- it is also recommended to perform aerobic activity in bouts of at least 10 minutes.
- for additional health benefits, adults aged 65 and above should perform moderate intensity aerobic physical activity for 300 minutes per week, or engage in 150 minutes of moderate-to-vigorous or vigorous intensity activity.

Figure 2.12. Prevalence of insufficient physical activity levels among adults in 2016



Note: Data unavailable for Iceland, Israel, and Peru. Data is age-standardised.
Source: WHO (2018[75]), "Prevalence of insufficient physical activity among adults", http://apps.who.int/gho/data/node.main.A893?lang=en.

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What are the population groups at highest risk of insufficient physical activity and excessive sedentary behaviour?

Just as there are gender and SES gaps in prevalence of overweight, there are also disparities between different groups in meeting recommended physical activity levels. According to an OECD analysis of 11 countries, women are less likely to achieve the amount of physical activity recommended by WHO (see Box 2.5 for further information on WHO thresholds) compared to men (Graf and Cecchini, 2017[34]). In general, men and those with higher levels of education are about 20-50% more likely to have sufficient levels of physical activity than those with low levels of education. Exceptions to this association include Chile, where level of education was found to minimally impact the amount of physical activity achieved (OR = 1.04), as well as Mexico, in which highly-educated individuals are less likely (OR = 0.73) to achieve the recommended physical activity levels compared to those with a low or medium level of education. The relationship between SES and sufficient physical activity is less clear. SES was not found to be significant in England, Korea, or Spain, while physical activity was positively associated with SES in Australia and the United States. For instance, in Australia, the odds of achieving sufficient amounts of physical activity are 60% higher in high-SES individuals compared to their lower SES counterparts.

In general, men are more likely to demonstrate excessive sedentary behaviour (see Box 2.3 for further information on the definition of sedentary behaviours) (Graf and Cecchini, 2017[34]). In Australia, Korea, Mexico, Spain, and the United States, those with higher levels of education are more likely to be sedentary than those with lower levels of education. Overall, high-SES individuals are about two to three times more likely to display sedentary behaviour compared to lower income groups in Australia, Chile, England, and Spain. The same relationship can be seen in Korea, Mexico, and the United States, though the difference is not as large (OR = 1.36, 1.62, and 1.82, respectively).

2.2.3 How are unhealthy lifestyles linked to obesity clusters?

Unhealthy lifestyles, including poor diet, physical inactivity and sedentary behaviours, tend to occur simultaneously in specific population groups that can be identified through their demographic and socio-

economic characteristics. These population groups should be considered a top priority for policy action to tackle unhealthy lifestyles, as they are at highest risk of developing chronic diseases.

Based on the results of an OECD analysis on the most recent waves of national health surveys from Brazil Chile, England, Korea, Mexico, Spain, and the United States, the following conclusions can be drawn (Graf and Cecchini, 2017[34]; Graf and Cecchini, 2018[76]):

- Men tend to have more unhealthy lifestyles than women. In all the included countries, except for the United States, men consistently report more unhealthy diets and more excessive sedentary behaviour than women. However, men are more likely to achieve the recommended amount of physical activity compared to women.
- The effect of education varies across different dimensions, such as diet and physical activity. Individuals with a lower level of education are more likely to consume an unhealthy diet. Furthermore, less-educated individuals are also less likely to be physically active, but they are also less likely to demonstrate sedentary behaviours.
- Individuals with low SES are also more likely to report an unhealthy diet. However, in the majority of countries, individuals with high SES are more likely to report higher sedentary behaviours. Moreover, individuals with higher SES (defined by taking into account occupation or income) are less likely to achieve the recommended level of physical activity. Overall, when all the dimensions (i.e. both diet and physical activity) are taken into account, individuals with high SES tend to have more unhealthy lifestyles, mainly due to the lower level of physical activity and higher level of excessive sedentary behaviour;
- Unhealthy lifestyles go beyond overweight. With the exception of the United States, overweight and obesity are not strong predictors for unhealthy diets, insufficient physical activity, or excessive sedentary behaviour. Thus, policies to tackle unhealthy lifestyles should not exclusively focus on individuals with overweight but should be based on a broader perspective.

2.3. Conclusions

Obesity continues to be a pressing global issue, as rates have grown over the past few decades in all OECD, OECD accession and selected partner countries, EU28 and G20 countries. Western countries that have historically had the highest rates of obesity continue to have the greatest prevalence of obesity, though non-western countries have also seen large increases in obesity prevalence over the past forty years. Particularly of note are trends in morbid obesity, where countries with some of the highest rates and largest increases in obesity also have a corresponding higher proportion of morbid obesity growth. Rates of childhood obesity growth are also worrisome – in countries such as China, Saudi Arabia, and South Africa, child obesity has grown significantly in the past few decades. As discussed in the next chapter, this has significant implications for the burden of disease and health costs for the years to come. Certain population groups including women, the less-educated, and lower-income groups are of particular concern as they are more likely to be obese.

Several factors have been identified as key drivers of the obesity epidemic, including diet, physical activity, and sedentary behaviour. These behaviours differ by geographical context, but several patterns have emerged. Firstly, calorie availability has been growing over the past half century and is expected to grow, particularly for certain nutrients, such as sugar. Secondly, rates of insufficient physical activity remain high particularly in women. Additionally, in general, more disadvantaged groups, including the less-educated and low-income individuals, were less likely to have a healthy diet or achieve sufficient levels of physical activity. All these unhealthy lifestyles can be tackled by effective and efficient policy options, as discussed in Chapter 5 and Chapter 6.

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Annex 2.A. Additional analyses

Annex Table 2.A.1 presents the list of countries included in the analysis and its affiliation to the various groups, including OECD countries, OECD accession and selected partner countries, EU28 member states and G20 countries. Countries can be part of multiple groups at the same time and contribute to the calculation of averages for all the group they are part of.

Annex Figure 2.A.1 details the prevalence of childhood pre-obesity and obesity by sex in OECD countries, OECD accession and selected partner countries, EU28 member states and G20 countries. This includes children between 5 and 19 years of age.

Annex Figure 2.A.2 shows adult overweight trends between the years 1996, 2006, and 2016 among OECD countries, OECD accession and selected partner countries, EU28 member states and G20 countries.

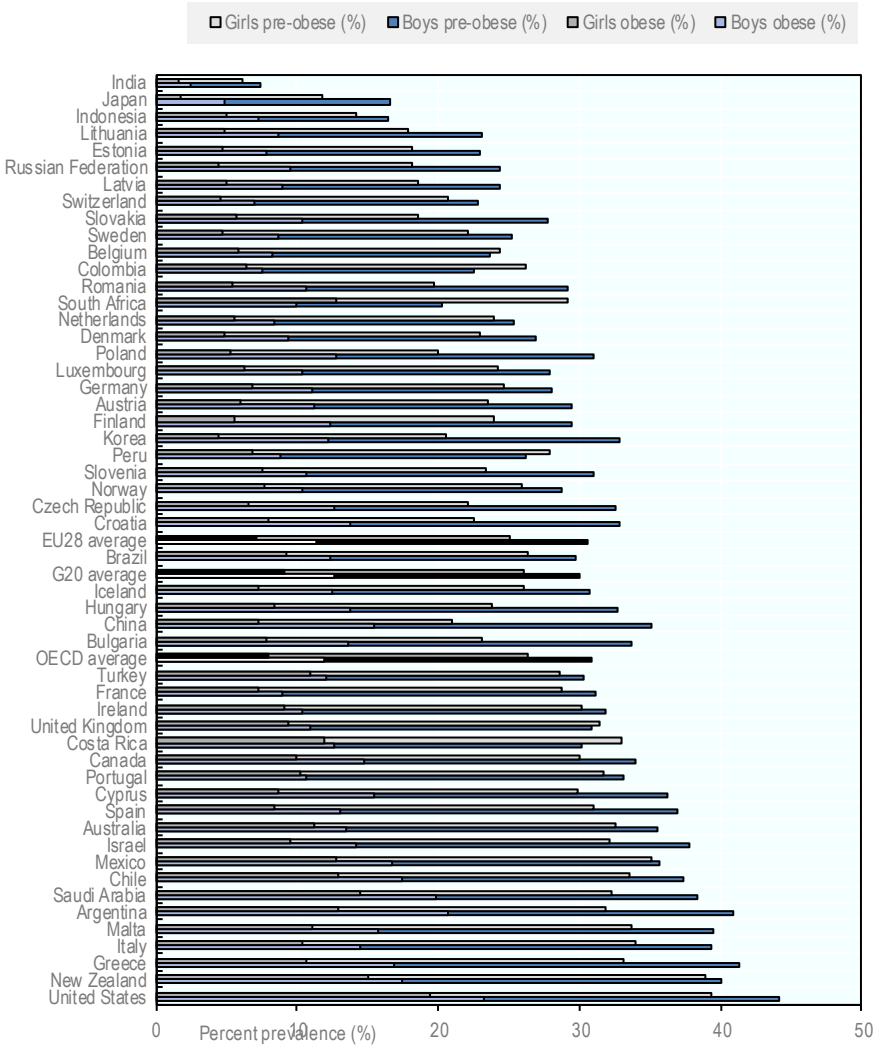
Annex Figure 2.A.3 represents country-specific trends of class I and class II/III (morbid) obesity between the years 2005 and 2016 via three-year averages. Percentages reflect the proportion of total obesity change that is change in morbid obesity.

Annex Table 2.A.1. Categorisation of countries

Country	OECD	OECD accession and selected partner countries	EU28	G20
Argentina				X
Australia	X			X
Austria	X		X	
Belgium	X		X	
Brazil		X		X
Bulgaria			X	
Canada	X			X
Chile	X			
China		X		X
Colombia		X		
Costa Rica		X		
Croatia			X	
Cyprus			X	
Czech Republic	X		X	
Denmark	X		X	
Estonia	X		X	
Finland	X		X	
France	X		X	X
Germany	X		X	X
Greece	X		X	
Hungary	X		X	
Iceland	X			
India		X		X
Indonesia		X		X
Ireland	X		X	
Israel	X			
Italy	X		X	X
Japan	X			X
Korea	X			X
Latvia	X		X	
Lithuania	X		X	
Luxembourg	X		X	
Malta			X	
Mexico	X			X
Netherlands	X		X	
New Zealand	X			
Norway	X			
Peru		X		
Poland	X		X	
Portugal	X		X	
Romania			X	
Russian Federation				X
Saudi Arabia				X
Slovakia	X		X	
Slovenia	X		X	
South Africa		X		X
Spain	X		X	
Sweden	X		X	
Switzerland	X			
Turkey	X			X
United Kingdom	X		X	X
United States	X			X

StatLink https://doi.org/10.1787/888934006993

Annex Figure 2.A.1. Prevalence of pre-obesity and obesity in children by sex in 2016

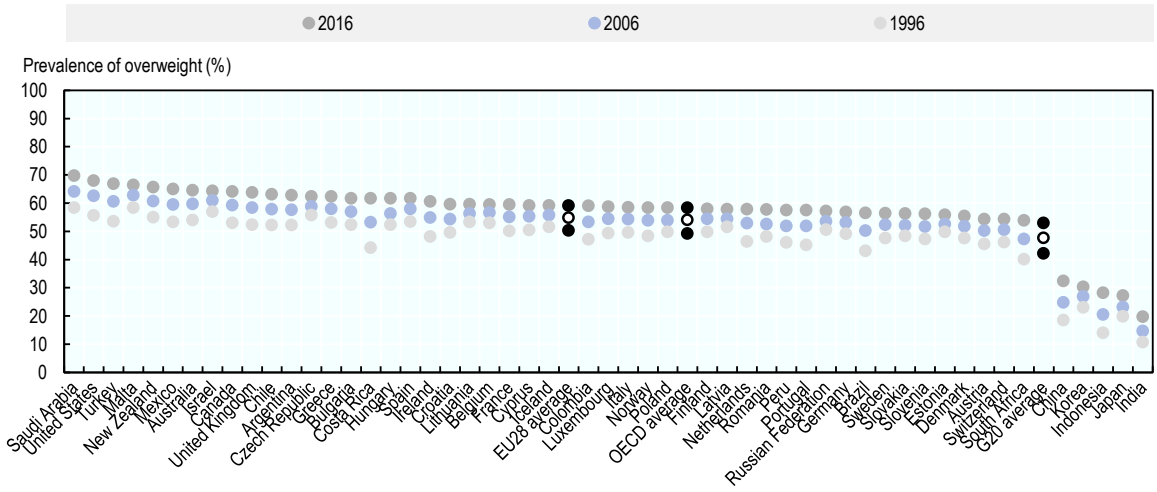


Note: Children between 5-19 years of age. Data is age-standardised.

Source OECD analyses on WHO Global Health Observatory (2018[18]) data, "Prevalence of obesity among children and adolescents", https://www.who.int/gho/ncd/risk_factors/overweight_obesity/obesity_adolescents/en/.

StatLink https://doi.org/10.1787/888934006936

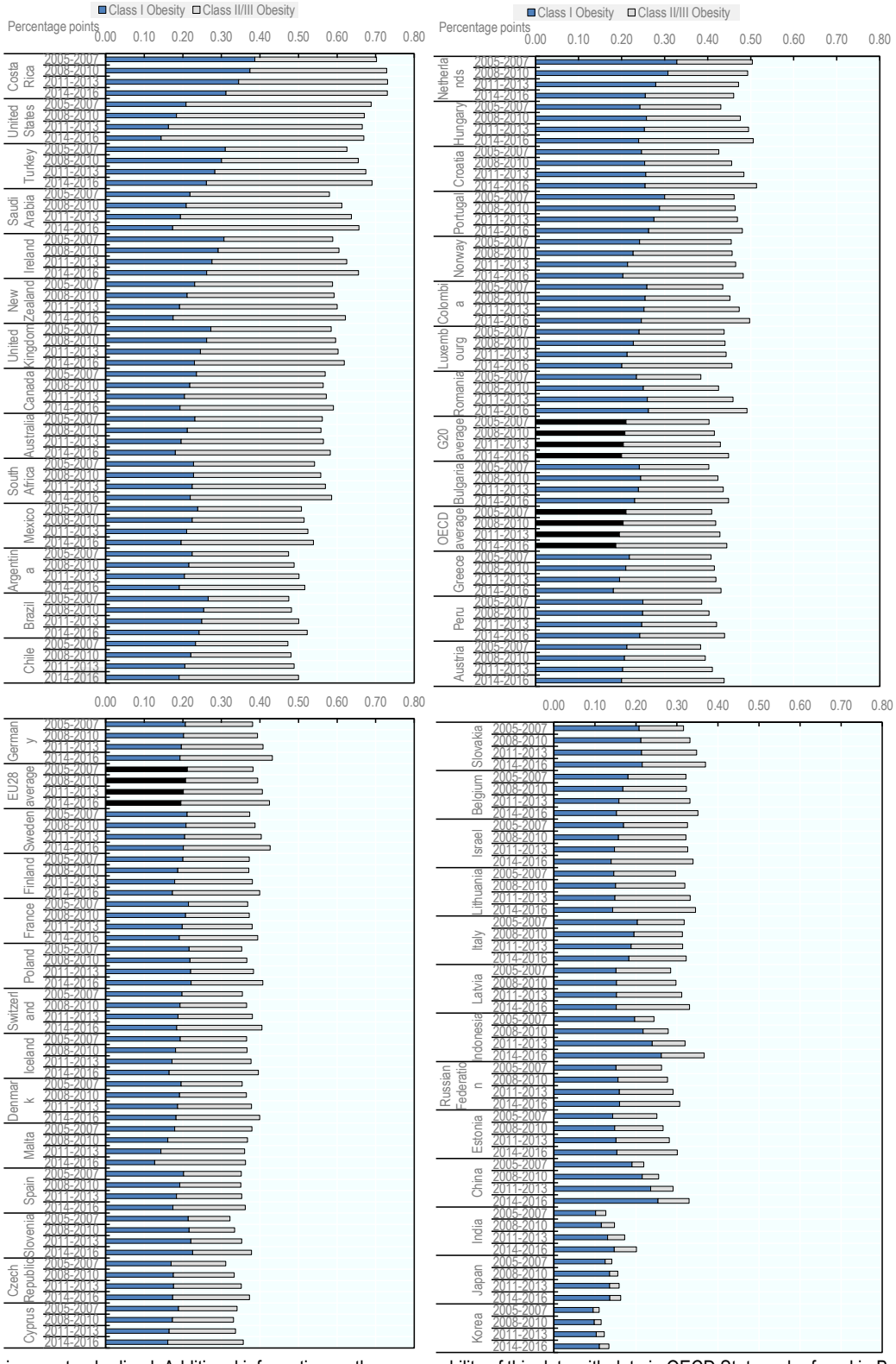
Annex Figure 2.A.2. Overweight prevalence trends in adults between 1996 and 2016



Note: Data is age-standardised. Additional information on the comparability of this data with data in OECD.Stat can be found in Box 2.2.
Source: OECD analyses on WHO Global Health Observatory (2018[16]) data, "Mean body mass index (BMI) trends among adults", https://www.who.int/gho/ncd/risk_factors/overweight_obesity/bmi_trends_adults/en/.

StatLink https://doi.org/10.1787/888934006955

Annex Figure 2.A.3. Trends in obesity and morbid obesity in adults from 2005 to 2016



Note: Data is age-standardised. Additional information on the comparability of this data with data in OECD.Stat can be found in Box 2.2.

Source: OECD analyses on the NCD-RisC (2017[17]) data, "Adult body mass index: Evolution of BMI over time", http://ncdrisc.org/data-downloads-adiposity.html.

StatLink https://doi.org/10.1787/888934006974

Note

[1] OECD accession and selected partner countries include: Brazil (also a G20 country), China (also a G20 country), Colombia, Costa Rica, India (also a G20 country), Indonesia (also a G20 country), Peru and South Africa (also a G20 country).

3 The economic burden of obesity

Sabine Vuik, Aliénor Lerouge, Yvan Guillemette, Andrea Feigl and Alexandra Aldea

This chapter provides an overview of the burden of obesity on population health and the economy. Based on the results of the OECD Strategic Public Health Planning for non-communicable diseases (SPHeP-NCDs) model, it presents the impact of obesity on life expectancy, morbidity and mortality, and on health expenditure in 52 countries – including OECD, EU28 and Group of 20 (G20) member countries. It also explores the impact of obesity on the labour market and the wider economy. Linking to the OECD long-term economic model, the impact of obesity on gross domestic product (GDP) and tax rate is assessed.

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

Key findings

Overweight will have a significant impact on population health in the next 30 years

- Nearly 60% of all new diabetes cases will be due to overweight, as well as 18%, 11% and 8% of all cases of cardiovascular disease, dementia and cancers, respectively.
- In the 52 countries in this analysis, there will be about 3 million premature deaths (between the age of 30 and 70) per year due to overweight.
- This is reflected in life expectancy: overweight and its related conditions will reduce life expectancy by 2.7 years on average in OECD countries. Obesity has the greatest impact in Mexico and Poland, where it reduces life expectancy by 4.2 years and 3.9 years, respectively.

This impact of overweight on population health translates into an increase in health expenditure

- OECD countries will spend on average USD PPP 209 per capita annually on treating high body mass index (BMI) and its related conditions. The United States, Germany and the Netherlands will spend the most on obesity, at USD PPP 645, USD PPP 411 and USD PPP 352 per capita, respectively.
- About USD PPP 311 billion will be spent every year by OECD countries to treat diseases caused by overweight. In total, overweight will cost the 52 countries USD PPP 425 billion per year.
- For OECD countries, this equates to 8.4% of total health spending – although this is highly variable across countries. While the United States will spend nearly 14% of its health budget on obesity and overweight, Estonia will spend less than 5%.
- This cost burden is mainly driven by treatment costs for diabetes, cardiovascular diseases (CVDs), dementia and cancer, with 70% of all health expenditure on diabetes being due to overweight.

Overweight will also affect the labour market

- Obesity reduces the employment rate, and increases early retirement, absenteeism and presenteeism. As a result, the workforce in the 52 countries will be reduced by the equivalent of 54 million full-time workers.
- When these effects are converted into lost labour market output using average wages, OECD countries will lose USD PPP 863 per capita per year on average. The cost of presenteeism makes up nearly half of this amount, with absenteeism and employment rates accounting for around a quarter each. The impact of early retirement is minimal.

Overweight decreases GDP and increases the overall tax rate

- Through the combined effects of overweight on life expectancy, health expenditure and the labour market, GDP will be 3.3% lower on average in OECD countries. Across all the 46 countries included in the analysis, this equates to a total of USD PPP 5.3 trillion over 2020-50, similar to the average annual GDP of Germany or Japan.
- Overweight will also increase the overall tax rate needed to stabilise the public debt ratio by 0.62 percentage points on average in OECD countries, which is similar to the average in 23 EU countries.
- The increase in the tax rate can be translated into an equivalent increase in taxes per person. On average in the OECD, every person would be subject to an additional USD PPP 359 per year in taxes due to overweight.

3.1. To make the economic case for investing in obesity prevention and treatment, its impact needs to be quantified

Health systems in all OECD countries are facing a number of challenges. Societies are rapidly aging, lifestyles are changing, chronic diseases are on the rise, and the threat of infectious diseases is constantly evolving. On the other hand, fiscal constraints in many countries mean that the financial resources to address these challenges are limited. Policies that target underlying risk factors such as obesity can help prevent chronic diseases, while reducing health care cost in the long-term (Sassi and Hurst, 2008[1]).

However, the upfront costs of preventive care and the intangibility of outcomes mean that, in many countries, it does not receive the attention it deserves. Currently, less than 3% of health spending in OECD countries is allocated to public health and prevention activities (Gmeinder, Morgan and Mueller, 2017[2]). Quantifying the burden of obesity on health and the economy helps make the economic case for investing in prevention.

The burden of overweight[1] on population health is well established. Obesity is one of the leading risk factors contributing to the burden of non-communicable diseases (NCDs), increasing the risk of developing type 2 diabetes, cardiovascular diseases, musculoskeletal disorders, several types of cancer, and depression. Moreover, an estimated 2.8 million people die each year due to being overweight (WHO, 2017[3]).

However, the impact of obesity is not limited to population health - it also has important consequences for the economy. Firstly, treatment of obesity and related chronic conditions increases health expenditure (see Box 3.1). Secondly, as obesity and its consequences affect an individual's productivity and workforce participation, it has an impact on the labour market. At a macroeconomic level, this affects the GDP of a country and increases fiscal pressure.

Several studies have estimated these two economic costs of obesity, but differences in methodology mean that results are difficult to compare, and the geographical scope of these studies is limited to a few countries.

Box 3.1. The multiplicative impact of obesity on the cost of health care

Obesity is associated with increased health care costs. The additional cost increases with BMI, so people with severe obesity face the highest health care costs (Effertz et al., 2016[4]).

This is driven in part by care utilisation. People with obesity are more likely to develop conditions such as heart disease, diabetes and cancer – all of which are associated with health care costs for their management and treatment. As a result, people with obesity have a higher utilisation of health care services: they have more primary care and outpatient specialty care visits and inpatient stays, undergo more surgeries, and use more diagnostic and home health care services (Cecchini, 2018[5]; Bertakis and Azari, 2005[6]; Andreyeva, Sturm and Ringel, 2004[7]). People with obesity also receive 2.4 times more prescriptions than people with a healthy weight (Cecchini, 2018[5]).

In addition to a greater utilisation of health care services, people with obesity may also face a higher cost per visit. A study in the United States found that emergency room treatment and hospitalisation charges were higher for people with obesity – potentially because they require more complicated and costlier care (Bertakis and Azari, 2005[6]). Another study showed that the impact of obesity and its comorbidities on the cost of a single inpatient or outpatient visit were additive – and in some cases more than additive (Padula, Allen and Nair, 2014[8]). For example, while the average visit for someone with obesity cost USD 1 908, and for someone with congestive heart failure USD 1 642, the average cost per visit for someone with both conditions was USD 5 276.

Even when accounting for comorbidities, which require additional services and may complicate treatment, people with obesity face higher health care costs. For example, obesity was shown to increase the cost and the length of stay of a total hip replacement (Kremers et al., 2014[9]) and total knee replacement (Kremers et al., 2014[10]), even when other comorbidities are taken into account. Similarly, health service usage and health care costs during pregnancy were found to increase with maternal BMI, even after adjusting for comorbidities (Morgan et al., 2014[11]).

3.1.1. Previous studies estimate the health care cost of overweight to be between 2% and 8% of total health expenditure

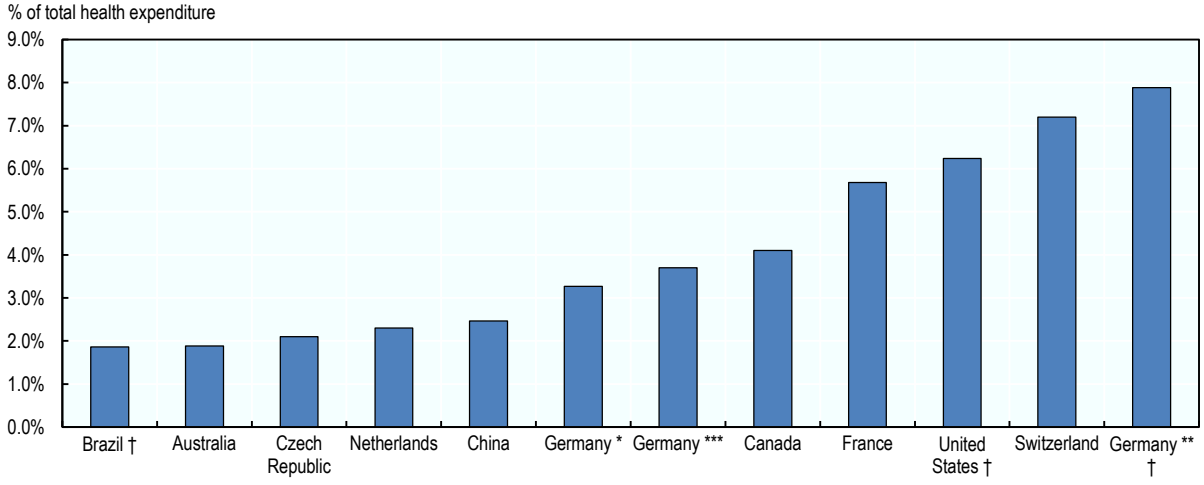
Previous estimates of the impact of obesity on health expenditure range from just under 2% of total health expenditure in Brazil, to 7.9% in Germany (see Figure 3.1). However, there is wide variation in the obesity-related conditions and health care settings that are included to calculate health care costs, the data sources underlying each study and the methods used to estimate excess cost due to overweight.

A US-based study estimated the obesity-related medical cost at USD 147 billion per year, using data from the Medical Expenditure Panel Surveys (Finkelstein et al., 2009[12]). A study for Germany obtained costs for various types of expenditures of inpatient and outpatient treatment, such as rehabilitation, health protection, ambulance, administration, research and education from a range of sources (Lehnert et al., 2015[13]). They estimated the health care cost of obesity and overweight at EUR 8 647 million (USD PPP 11 116), or 3.27% of total health expenditure. Another study in Germany, looking only at obesity and not overweight, was based on data from the German statutory health insurance system. This study put the annual health care cost of obesity at EUR 29 billion (USD PPP 38 billion), approximately 7.9% of total health expenditure (Effertz et al., 2016[4]).

Besides using different data sources and health care settings, studies also include different diseases in their analysis. While studies for Switzerland (Schneider and Venetz, 2014[14]), Brazil (de Oliveira, Santos and da Silva, 2015[15]) and Canada (Anis et al., 2010[16]) all include colorectal cancer, the studies for Brazil and Canada also look at breast, endometrial, oesophageal, kidney, ovarian and pancreatic cancer, amongst others. However, only the study for Switzerland includes the cost for depression and road traffic accidents due to sleep apnoea.

The methods used to estimate the cost attributable to obesity affect the results. The largest estimate of health expenditure associated with obesity – 7.9% of total health expenditure – was found by Effertz et al. (2016[4]). They used a bottom-up approach that relies on individual-level health and cost data to understand the excess cost of obesity, which is then extrapolated to the whole population. Studies that used a top-down approach, which estimates the share of disease-specific costs within a population attributable to obesity (by means of so-called population attributable fractions) resulted in relatively low estimates for Brazil, Australia, the Czech Republic and the Netherlands (de Oliveira, Santos and da Silva, 2015[15]; Access Economics, 2008[17]; Lette et al., 2016[18]). Top-down approaches may underestimate cost as they do not account for the health care cost of minor health impairments associated with obesity (e.g. heartburn), and often fail to account for the effect of comorbidities (see Box 3.1) (Effertz et al., 2016[4]; Lette et al., 2016[18]).

Figure 3.1. Estimates of the health expenditure associated with overweight or obesity



Note: †: Obesity (BMI>=30) only – the others are overweight including obesity (BMI>=25); Where cost were expressed as an absolute number, they were converted using OECD data on total health expenditure

Source: OECD analysis of : Netherlands, Czech Republic (Lette et al., 2016[18]), Germany * (Lehnert et al., 2015[13]), Germany** (Effertz et al., 2016[4]), Germany*** (Lette et al., 2016[18]), United States (Finkelstein et al., 2009[12]), France (Ministère de l'Économie et des Finances, 2016[19]), Switzerland (Schneider and Venetz, 2014[14]), Brazil (de Oliveira, Santos and da Silva, 2015[15]), Canada (Anis et al., 2010[16]), China (Qin and Pan, 2016[20]), Australia (Access Economics, 2008[17]).

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3.1.2. Existing studies suggest that the impact of obesity on the wider economy is between 0.5% and 1.6% of GDP

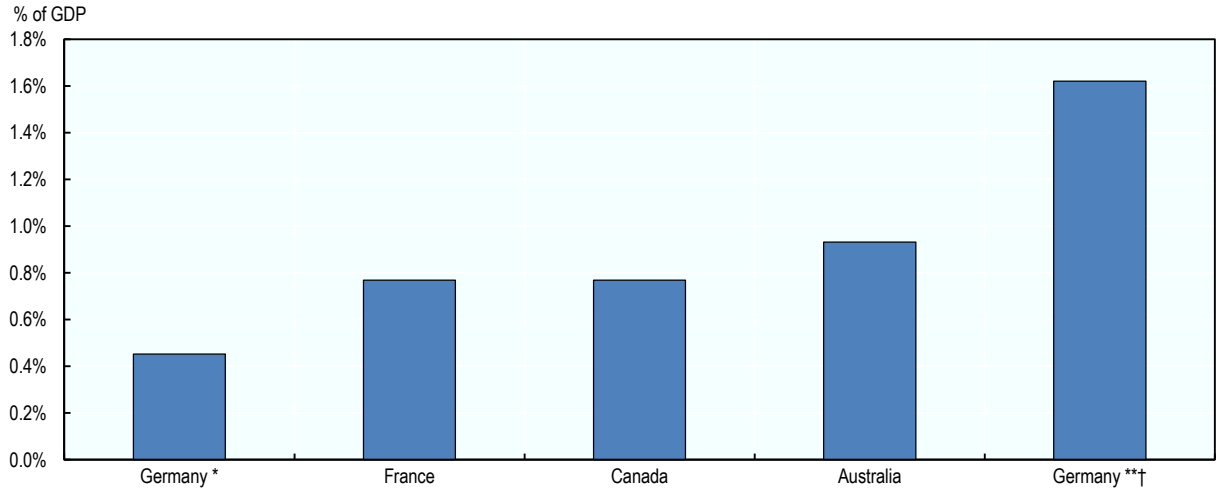
A number of studies go beyond health expenditure, and try to estimate the impact of overweight on the wider economy. Estimates of the impact of overweight on GDP range from 0.45% to 1.62% of GDP (see Figure 3.2). As with health expenditure, the concepts, data and methods vary widely – making comparisons between countries difficult.

A French study estimates the cost of obesity by looking at welfare payments, lost productivity and employment – but this is set off against revenue from nutrition taxes and the lower pension expenses due to obesity (Ministère de l'Économie et des Finances, 2016[19]). It estimates the total cost of obesity at EUR 20.4 billion (USD PPP 25 billion, approximately 0.8% of GDP). An Australian study also looks at carer cost and foregone taxes, and finds a total financial cost of AUD 8.3 billion (USD PPP 5.6 billion) for obesity (0.93% of GDP) (Access Economics, 2008[17]). In addition to the financial cost, the Australian study uses a value of statistical life approach to estimate the social cost of the burden of disease (not included in Figure 3.2). This approach puts a monetary value on disability and life-years lost due to obesity, usually based on willingness-to-pay (Biausque, 2012[21]).

Two German studies include similar concepts in their economic cost (mortality, early retirement, absenteeism), but the study by Effertz et al (2016[4]) also includes unemployment. This, in combination with a bottom-up approach rather than a top-down one, results in a larger estimate for the indirect cost of obesity.

Among the approaches to model the non-health care costs associated with obesity, the human capital approach was the most common one, a finding that echoes those of other systematic reviews (Tremmel et al., 2017[22]). The human capital approach measures lost productivity, morbidity or mortality in terms of lost earnings based on wages.

Figure 3.2. Estimates of the wider economic cost of overweight or obesity



Note: †: Obesity (BMI>=30) only – the others are overweight including obesity (BMI>=25); Costs have been converted to percentage of GDP based on the country GDP of the study year. All costs include health care cost.
Source: OECD analysis of : Germany * (Lehnert et al., 2015[13]), Germany** (Effertz et al., 2016[4]), France (Ministère de l'Économie et des Finances, 2016[19]), Canada (Anis et al., 2010[16]), Australia (Access Economics, 2008[17]).

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3.1.3. The OECD SPHeP-NCDs model estimates the health and economic burden of obesity

To quantify the impact of overweight on population health and the economy, the OECD developed the Strategic Public Health Planning for NCDs (SPHeP-NCDs) model. The model simulates the impact of major risk factors, such as obesity, on disease incidence, mortality, health expenditure[2] and the labour market (see Box 3.2 for more details on the model). The OECD SPHeP-NCDs model can be used to understand the cost of doing nothing to prevent obesity, as well as the potential impact of interventions. As the model applies a standardised approach to all countries, it also allows cross-country comparisons. This chapter presents the outputs of the OECD SPHeP-NCDs model and its estimates of the health and economic burden of overweight between 2020 and 2050.

Box 3.2. The OECD SPHeP-NCDs model

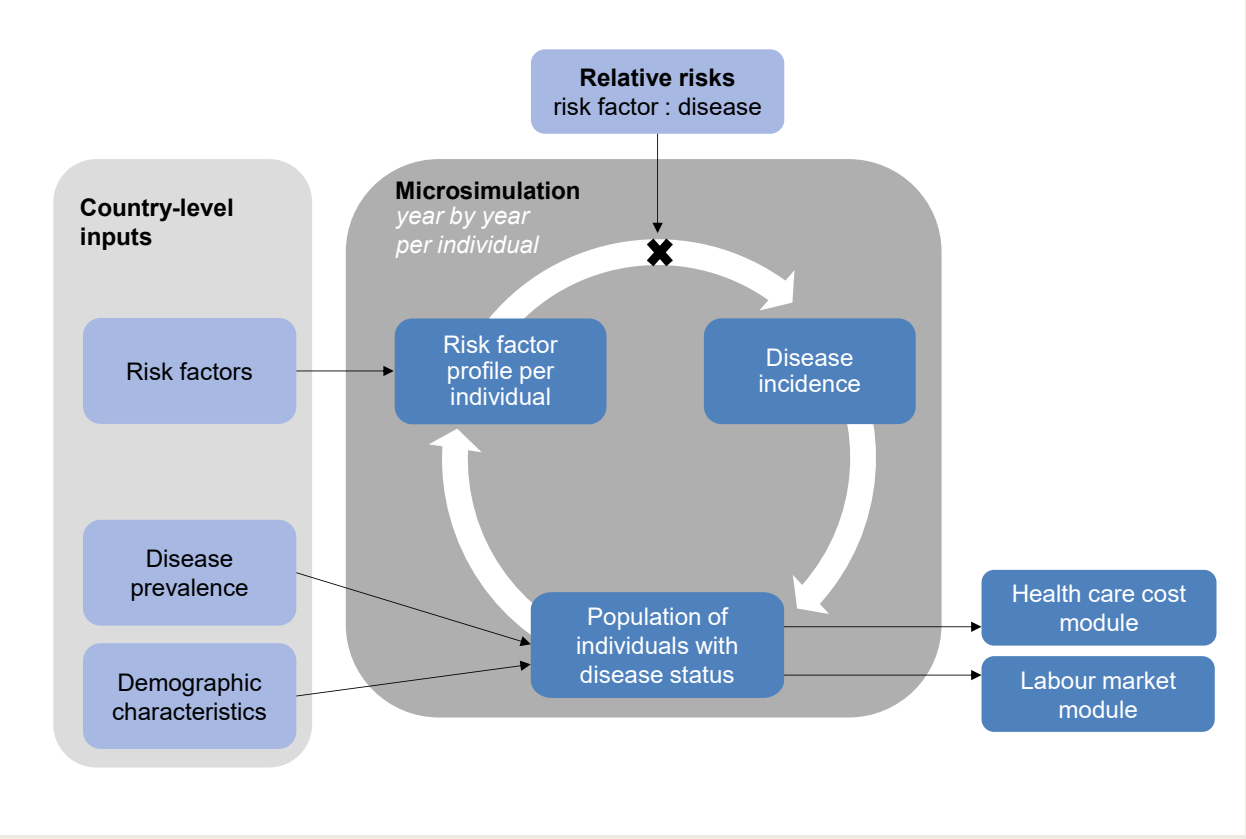
The OECD Strategic Public Health Planning for NCDs (SPHeP-NCDs) model is an advanced systems modelling tool for public health policy and strategic planning. The model is used to predict the health and economic outcomes of the population of a country or a region up to 2050. The model consolidates previous OECD modelling work into a single platform to produce a comprehensive set of key behavioural and physiological risk factors (e.g. obesity, physical activity, blood pressure, etc) and their associated NCDs.

The model covers 52 countries. These countries include OECD countries, G20 countries, EU28 countries, and OECD accession and selected partner countries: Brazil (also a G20 country), China (also a G20 country), Colombia, Costa Rica, India (also a G20 country), Indonesia (also a G20 country), Peru and South Africa (also a G20 country).

For each of the 52 countries, the model uses demographic and risk factor characteristics by age and gender-specific population groups from international databases (see Figure 3.3). These inputs are used to generate synthetic populations, in which each individual is assigned demographic characteristics and a risk factor profile. Based on these characteristics, an individual has a certain risk of developing a disease each year. These relative risks are based on the Global Burden of Disease study (Global Burden of Disease Study 2015, 2016[23]).

For each year, a cross-sectional representation of the population can be obtained, to calculate health status indicators such as life expectancy, disease prevalence and disability-adjusted life years (DALYs) using disability weights. Health care costs of disease treatment are estimated based on a per-case annual cost, which is extrapolated from national health-related expenditure data. The additional cost of multimorbidity is also calculated and applied. The labour market module uses relative risks to relate disease status to the risk of absenteeism, presenteeism (where even though they are physically present at work, employees are not fully productive), early retirement and employment. These changes in productivity and labour market participation are costed based on a human capital approach[3], using national average wages to calculate lost labour market outputs.

Figure 3.3. Schematic overview of the modules in the OECD SPHeP-NCDs model



Note: This schematic is highly simplified and focuses on the disease component – it does not reflect some other components of the model (including births, immigration, emigration, death, remission and fatality)
Source: OECD (2019). SPHeP-NCDs Technical Documentation. Available at: http://oecdpublichealthexplorer.org/ncd-doc

To understand the impact of overweight on population health and the economy, a hypothetical "No-overweight" scenario was compared to the "business-as-usual" scenario. The no-overweight scenario caps BMI at 25 kg/m^2 from 1880 onwards, to simulate a society without the impact of overweight. The business-as-usual scenario assumes no change in the current country, age and gender-specific rates of obesity. The difference in health and economic outcomes between the two scenarios is used to determine the burden of obesity in this chapter. All results are based on projections from 2020 to 2050.

For more information on the OECD SPHeP-NCDs model, please see the SPHeP-NCDs Technical Documentation, available at: http://oecdpublichealthexplorer.org/ncd-doc.

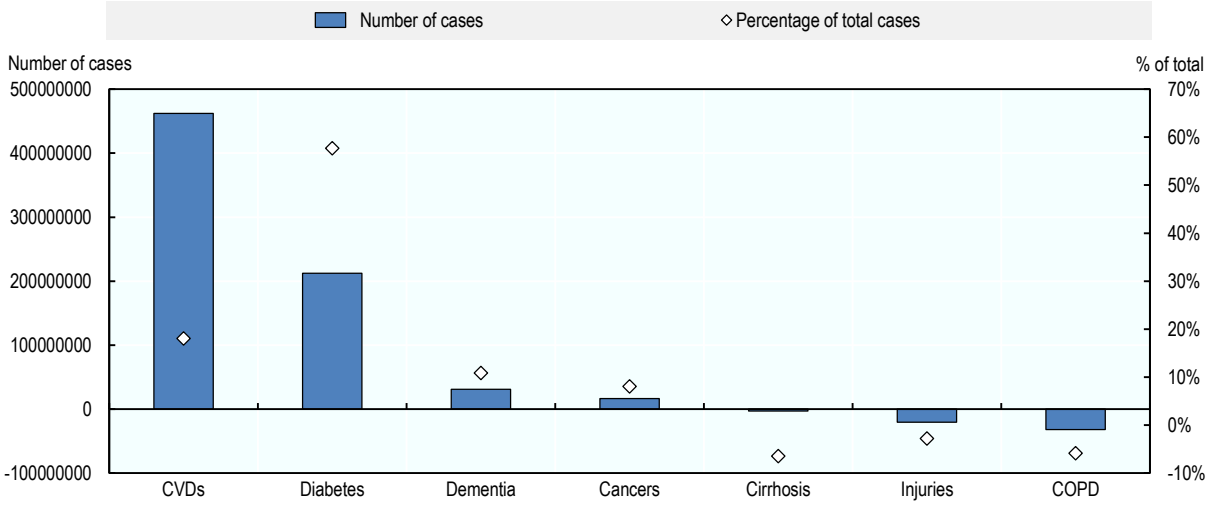
3.2. Overweight and related diseases will reduce life expectancy in OECD countries by 2.7 years

Overweight has a considerable impact on population health. Comparing the no-overweight scenario to the business-as-usual scenario shows that, over the next 30 years, overweight will result in 462 million new cases of cardiovascular disease in the 52 countries, and 212 million cases of diabetes (Figure 3.4). This accounts for 18% and 58% of all new cases, respectively. Overweight will also result in 31 million cases of dementia and 17 million cancer incidences.

However, as overweight reduces life expectancy, it also reduces the amount of time available to develop a disease or condition. As a result, overweight decreases the total number of some conditions, such as cirrhosis, injuries and chronic obstructive pulmonary disease (COPD). This effect can also be seen when looking at disease incidence by age group, which shows a decrease in the total number of new cases for people aged over 80 (see Annex Figure 3.A.1).

Figure 3.4. The impact of overweight on disease incidence

Number of new cases due to overweight, and as percentage of all new cases, total 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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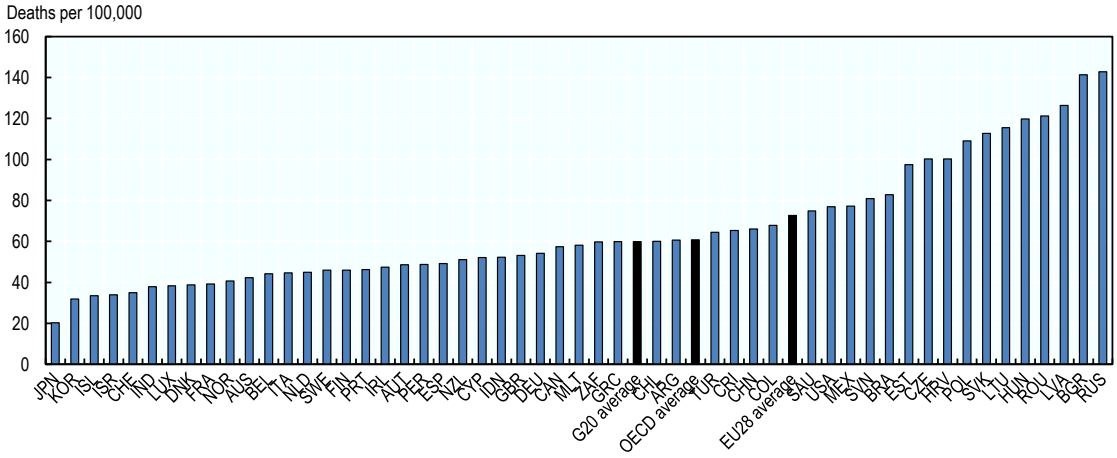
As overweight affects people's health and causes a range of conditions, it also leads to premature mortality. On average in the OECD, 61 people per 100 000 population will die prematurely each year due to overweight (defined as mortality of people aged 30 to under 70 (WHO, 2018[24])) (Figure 3.5). In EU28 countries, this average is higher at 73 per 100 000, driven by high premature mortality rates in Eastern European countries. Premature mortality is lower in countries where the overweight prevalence is low and life expectancy is high, such as Japan and Korea. In total, 3 million people will die prematurely every year in the 52 countries due to overweight in the next 30 years. This premature mortality carries considerable cost for society (see Box 3.3).

Figure 3.5. The impact of overweight on premature mortality

Annual number of premature deaths per 100 000 population, average 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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The impact of overweight on mortality can also be measured in years of life lost. In the OECD, countries will lose on average 3 291 life years per 100 000 population every year due to overweight, over the period 2020-50. The impact on DALYs is even greater, at 3 908 DALYs per 100 000 population every year. This is nearly 12% of the overall rate of DALYs lost due to disease globally – and similar to the cumulative burden caused by stroke and ischemic heart diseases (GBD 2017 DALYs and HALE Collaborators, 2018[25]). Nearly half of all DALYs will be lost in 60-80 year-olds (For more details on life-years lost and disability-adjusted life-years lost, please refer to Annex 3.A).

The impact of overweight on premature mortality translates into a decrease in overall life expectancy. On average over the 2020-50 period, life expectancy in OECD countries will be 2.7 years lower due to overweight (Figure 3.7). Importantly, this decrease in life expectancy is the average across the total population – not just for people with overweight. The average for G20 countries is lower, at 2.5 years, while the EU28 average is higher at 2.9 years. Countries with low overweight prevalence will see a smaller impact on life expectancy, with Japan losing less than a year, compared to Mexico where overweight reduces life expectancy by more than four years. Healthy life expectancy – which uses disease disability weights to calculate the number of years lived in perfect health – will be reduced even further, by 3.2 years on average in OECD countries, 3.0 in G20 countries and 3.3 in EU28 countries.

Box 3.3. The social cost of premature mortality: a "Value of Statistical Life" approach

This report uses a "Cost of Illness" approach to estimate the economic burden of obesity, looking at health expenditure and labour market cost. However, it does not put an economic cost on premature mortality, to reflect the costs of pain and suffering. The Value of Statistical Life (VSL) approach tries to measure the social cost of obesity based on willingness to pay (WTP) data. Since these values do not reflect actual cost, they should not be directly compared to or combined with Cost of Illness estimates.

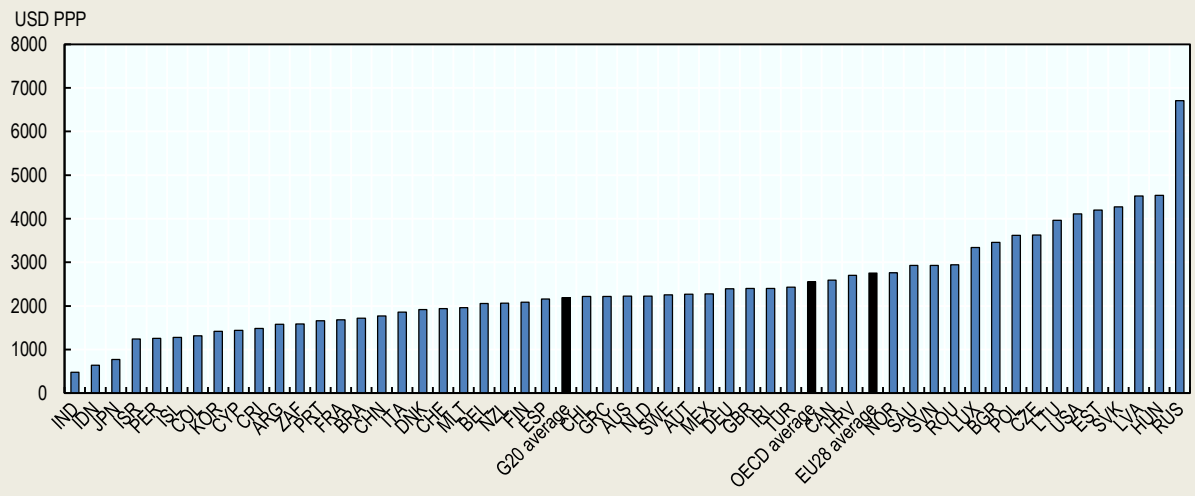
WTP methods estimate how much a person is willing to pay to reduce their risk of death, or how much premium they would require to accept additional risk. This determines the monetary value that a person assigns to their own life. This monetary value can then be multiplied by the number of premature deaths, resulting in the total statistical value of life lost due to obesity.

This report follows a methodology developed by the Environment Directorate of the OECD (OECD-ENV) (see (OECD, 2014[26]) and (Lindhjem, Analyse and Navrud, 2012[27])). It assumes a base value of USD 3 million per life in 2005, and an income elasticity of 0.8, being the mid-point of the 0.7-0.9 range established in OECD research. Figures are adjusted for purchasing power parity (PPP).

Using this approach, the social cost of overweight is estimated at USD PPP 2 554 per capita per year in OECD countries, USD PPP 2 189 in G20 countries and USD PPP 2 763 in EU28 countries (Figure 3.6).

Figure 3.6. The social cost of premature mortality due to overweight

USD PPP per capita per year, average 2020-50, using a VSL approach



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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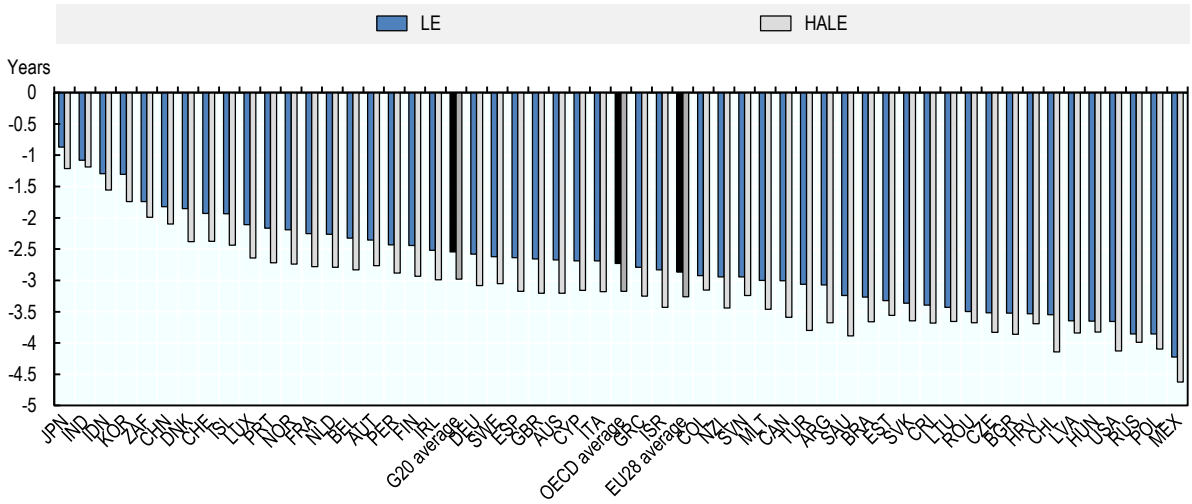
Figure 3.7. The impact of overweight on life expectancy

The impact on life expectancy (LE) and healthy life expectancy (HALE) in years, average 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

StatLink https://doi.org/10.1787/888934007107

In addition to overweight prevalence and underlying population health, the effectiveness of national health care services at treating the medical consequences of high BMI also influences the health burden of overweight. Effective health care systems can reduce complications (e.g. diabetes) and prevent fatalities (e.g. from cancers or cardiovascular diseases). For example, Australia, Norway and the Netherlands have a smaller burden compared to other countries with similar overweight prevalence rates, such as Argentina and Bulgaria.

3.3. Overweight will account for over 8% of total health expenditure in OECD countries

Since overweight is a major risk factor for several NCDS, on average people with overweight require health care services more often and for more complicated issues. As a result, the per capita health expenditure in the business-as-usual scenario is higher than in the no-overweight scenario. Overweight will cost OECD countries on average USD PPP 209 annually per capita in health expenditure, between 2020 and 2050 (Figure 3.8). Again, this number is the average across the entire population, and not just for people with overweight.

In the EU28, the average annual per capita health expenditure on overweight is USD PPP 195 and it is USD PPP 171 for G20 countries. These differences are partly driven by cross-country differences in health care cost. High health care costs and high overweight prevalence means that the United States will spend the most per capita, at USD 645. Other countries with high health care costs, such as Norway, the Netherlands and Germany, also see a high per capita spending on overweight.

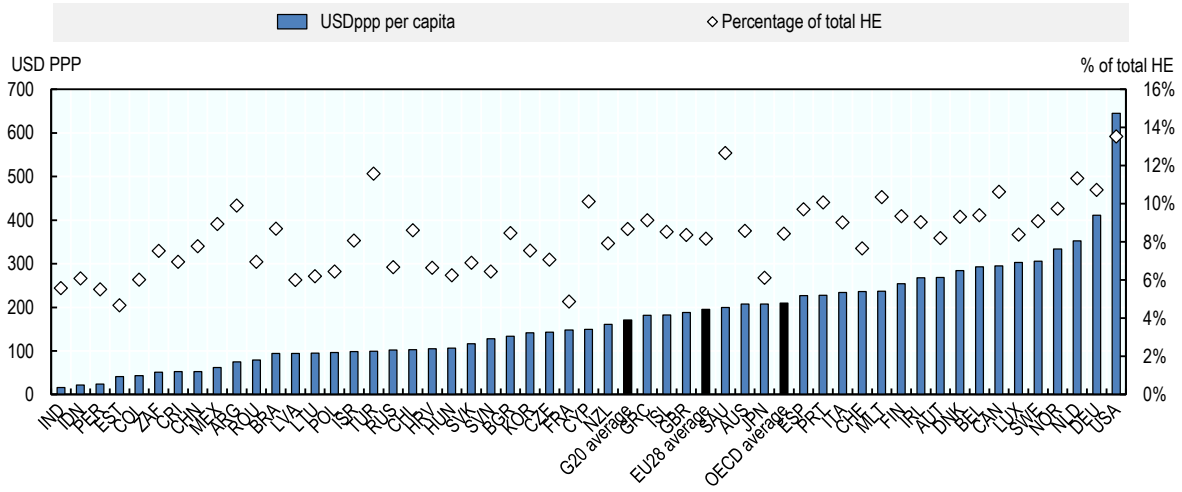
Countries with a lower overall health care budget but high overweight prevalence, such as Turkey and Saudi Arabia, will end up spending a high proportion of their health expenditure on overweight and related conditions. On average, OECD countries will spend 8.4% of their entire health budget on treating the

consequences of high body mass - but this is highly variable across countries. While the United States will spend nearly 14% of their health budget on overweight, Estonia will spend less than 5%.

In total, OECD countries will spend USD PPP 311 billion per year on treating overweight and related conditions. All 52 countries combined will spend USD PPP 425 billion per year over the period 2020-50 – equivalent to the GDP of Austria in 2018.

Figure 3.8. Health expenditure associated with overweight

Health expenditure due to overweight per year, in USD PPP per capita and as a percentage of total health expenditure, average 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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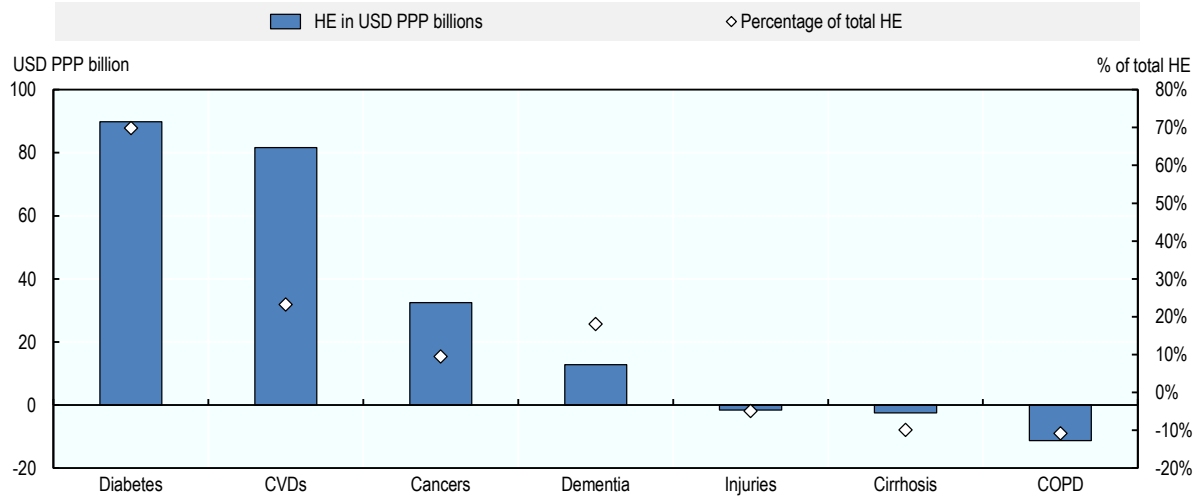
Since overweight is a risk factor for cancers, CVDs, dementia and diabetes, it increases the overall health expenditure on these conditions (Figure 3.9). Across all 52 countries, overweight will be responsible for 70% of all diabetes-related health expenditure. It will also account for 23% of CVD-related health expenditure, 9% for cancers and 18% for dementia. However, as overweight reduces life expectancy, it also reduces the health expenditure on other medical conditions. This is because the lower life expectancy means that there is less time to develop other conditions, reducing the overall expenditure on these conditions. This applies particularly to conditions less strongly associated with high BMI.

Not all the cross-country variability in overweight-related health expenditure can be attributed to the burden of overweight. Organisational arrangements in the health care systems including, for example, the price of delivering health care services, the mix of health care services used and the share of the population with access to effective health care services, all play a role in modulating total health expenditure. For example, Denmark, the Netherlands and Norway show a smaller overweight-related health burden compared to other OECD countries but, at the same time, they rank among the top countries in terms of the impact of overweight on health expenditure. Conversely, Poland, Romania and the Russian Federation rank very high in terms of health burden of overweight but show a smaller impact on health care budgets.

Figure 3.9. The impact of overweight on disease-related health expenditure

Annual health expenditure (HE) due to overweight, in USD PPP billions and as a percentage of total HE for the disease, average 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

StatLink https://doi.org/10.1787/888934007145

3.4. Overweight has a negative impact on the labour market, through absenteeism, presenteeism, unemployment and early retirement

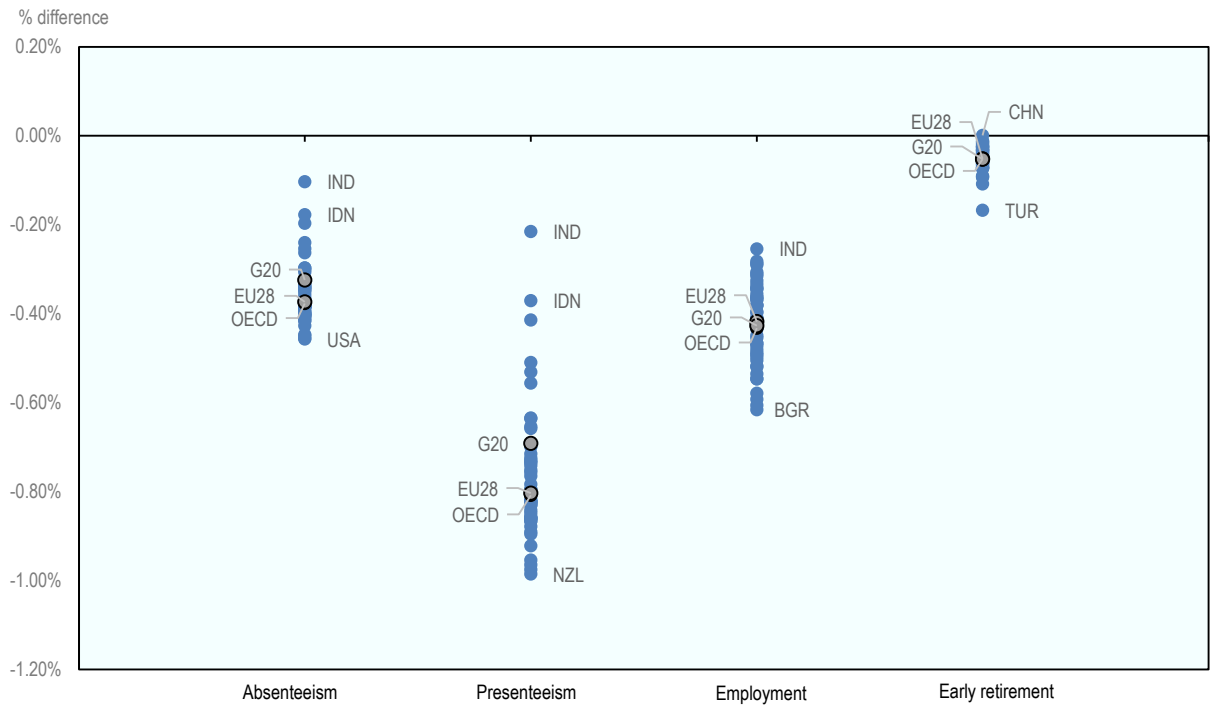
Overweight and related NCDs have a negative impact on the labour market and the economy (Feigl et al., 2019[28]). For this report, analyses on longitudinal datasets covering 27 European countries, Japan, the United Kingdom and Mexico were combined to understand these impacts. It was found that having at least a chronic disease is associated with a 8% decrease in the probability of being employed in the following year compared to individuals with the same age and level of education that do not report a chronic disease. The probability of not being in the labour force is particularly high in the case of stroke (up to -20% for men) and lowest for other cardiovascular diseases (-4%). Individuals with at least two chronic diseases are about 17% less likely to be in the workforce.

If employed, individuals with a chronic disease have a 1.5% higher absenteeism rate. Diabetes has the most detrimental effect, increasing absenteeism by 3.4% in women. Individuals with overweight show an additional 1% in absences. Individuals with at least one chronic condition are almost 20% more likely to retire early.

Four effects on the labour market are taken into account in the OECD SPHeP-NCDs model: absenteeism, presenteeism, employment rate and early retirement. Comparing the business-as-usual and no-overweight scenarios, it was found that, on average across OECD countries, labour market output (which combines workforce participation, employment, and productivity when employed) will decrease by 0.38% due to overweight-related absenteeism (Figure 3.10). Presenteeism – where employees are present at work but less productive – will decrease the labour market output of individuals by 0.81% on average. As overweight reduces the likelihood of being employed, OECD countries will see, on average, a 0.43% decrease in labour market output due to overweight-related unemployment. Overweight also increases the number of people who retire early, decreasing the labour market output by 0.05% average in OECD countries. These effects are similar in EU28 and G20 countries, though the impact of overweight on presenteeism in the G20 is slightly lower, at -0.69%.

Figure 3.10. The impact of overweight on the labour market

Percentage difference in labour market output due to overweight and its impact on absenteeism, presenteeism, employment and early retirement, per capita, average 2020-50



Note: Labour market output includes workforce participation, employment rate, and productivity when employed, and is calculated for the working-age population.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

StatLink https://doi.org/10.1787/888934007164

While these numbers may appear small at an individual level, translating them to the population level highlights that overweight has a considerable impact on the labour market. Overweight will effectively reduce the workforce by the equivalent of 54 million full-time workers on average per year across the 52 countries. Combined with changes in the population size due to overweight, increases in presenteeism account for an equivalent of 18 million fewer full-time workers, reduced employment accounts for 28 million, and increased absenteeism reduces the workforce by the equivalent of 8 million full-time workers. In the EU28, the equivalent of 6 million full-time workers is lost due to overweight, with 1 million due absenteeism, and about 2.5 million each due to presenteeism and reduced employment.

The reduction in labour market participation and productivity due to overweight carry costs for the economy. In the case of absenteeism and presenteeism, wages are paid without a return in productivity. In the case of unemployment and early retirement, productive workers are lost from the workforce. All four factors can be expressed as lost labour market output through a human capital approach. The human capital approach uses future earnings to put a monetary value on lost productivity (Jo, 2014[29]). In this report, average country wages adjusted for projected changes in productivity were applied.[4]

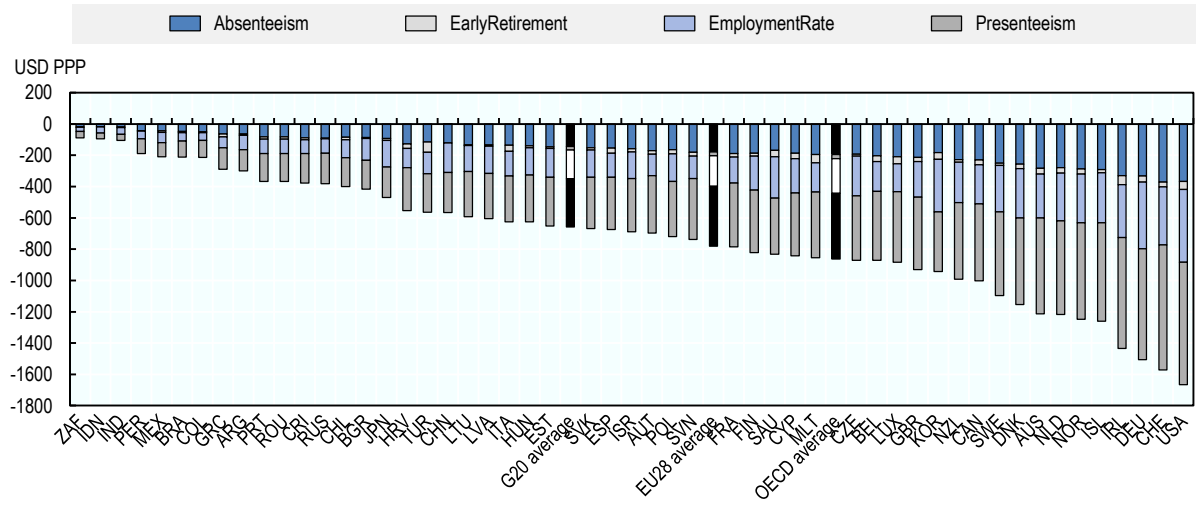
On average, OECD countries will lose USD PPP 863 per capita per year in labour market output due to overweight (Figure 3.11). The averages for EU28 countries and G20 countries are lower. These differences are partially driven by wage differences between countries – with lower wages in countries such as India, Indonesia and South Africa reducing the lost overall output for G20 countries. Presenteeism

has the greatest economic impact on the labour market, and accounts for nearly half of the lost output. Absenteeism and employment rate account for roughly a quarter each.

The economic impact of overweight on the labour market varies greatly between countries. In the United States, overweight will cost the economy USD PPP 1 667 per year per person. This is 19 times more than in South Africa, where the labour market costs are only USD PPP 88 per year per person. In addition to the differences in overweight and disease prevalence, this is for a large part driven by the wage differential.

Figure 3.11. Economic impact of overweight on the labour market

Impact on per capita labour market output based on average wages, per year, in USD PPP, average 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

StatLink https://doi.org/10.1787/888934007183

3.5. At a macroeconomic level, GDP in OECD countries will be 3.3% lower due to overweight

The impact of overweight on life expectancy, health expenditure and labour market productivity can be combined into one overall macroeconomic effect. To model this, the outputs of the business-as-usual and no-overweight scenarios from the OECD SPHeP-NCDs model were fed into the OECD long-term economic model (see Box 3.4). This model was used to understand the impact of overweight on GDP and on the overall tax rate.

On average in OECD countries, GDP will be 3.3% lower each year due to the impact of overweight (Figure 3.13). The impact in G20 and 23 EU countries is similar, at 3.5% and 3.3%, respectively. The GDP impact varies by country: from 1.6% in Japan to over 5% in Mexico. Across all the 46 countries included in the analysis, this equates to a total of USD PPP 5.3 trillion from 2020-50, similar to the average annual GDP of Germany or Japan. Importantly, these results do not take into account that an increase in life expectancy due to no overweight may mean that people will work for longer and retire later. If the retirement age is increased by two-thirds of a year for every year of additional life expectancy, the impact of overweight on GDP would be doubled, with the average for OECD countries going from 3.3% to 6.8% (see Annex 3.A for more details).

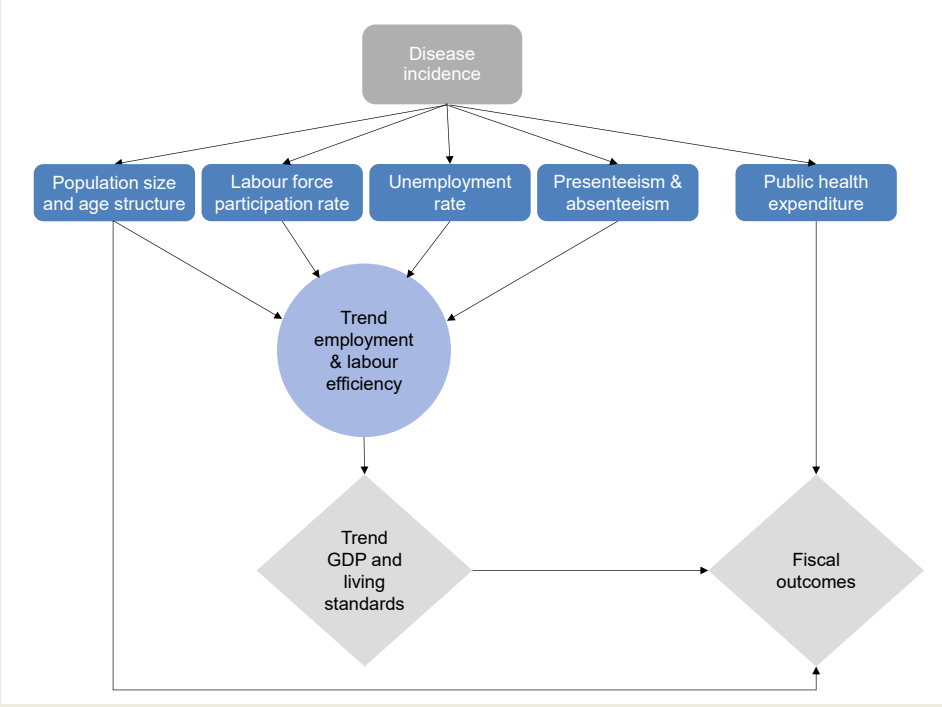
Box 3.4. Linking the OECD SPHeP-NCDs model with the OECD long-term economic model

The impact of overweight on the larger economy was evaluated using the OECD long-term economic model (see Box 1 in Guillemette and Turner (2017[30])). The OECD long-term economic model extends the short-run projections of the twice-yearly OECD Economic Outlook (EO) out to 2060 (OECD, 2018[31]). The EO includes historical estimates and short-run projections of potential output for each country based on a Cobb-Douglas production function with trend input components, namely trend labour efficiency, trend employment and the productive capital stock. This same production function sits at the core of the long-term model.

The OECD SPHeP-NCDs model was used to model the employment rate, productivity, population dependency ratio (dependency ratio is the ratio of dependents [people younger than 15 or older than 64] to the working-age population), increase in life expectancy, and health care cost for the business-as-usual scenario and the no-overweight scenario. These outputs were then used as inputs for the OECD-ECO model to obtain the overall impact on GDP and fiscal pressure (see Figure 3.12). Fiscal pressure is measured as government primary revenue needed to stabilise the public debt ratio as a % of GDP. This is equivalent to an overall tax rate, which is what is reported in this chapter.

Each scenario is run with and without an adjustment for the effective retirement age. In the adjusted scenarios, the impact of overweight on life expectancy is assumed to also affect the effective retirement age. For the results presented in the report the conservative, non-adjusted scenarios were used. The results with the adjustment can be found in Annex Figure 3.A.4 and Annex Figure 3.A.5.

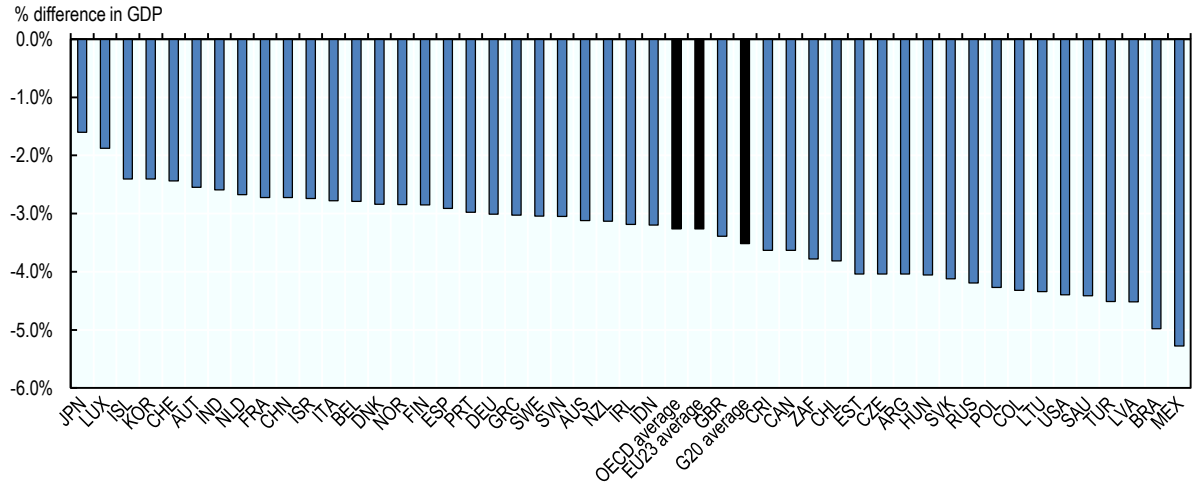
Figure 3.12. Link between the OECD SPHeP-NCDs and the OECD long-term economic models



Source: OECD (2019). SPHeP-NCDs Technical Documentation. Available at: http://oecdpublichealthexplorer.org/ncd-doc.

Figure 3.13. The impact of overweight on GDP

Percentage difference in GDP due to overweight, average 2020-50

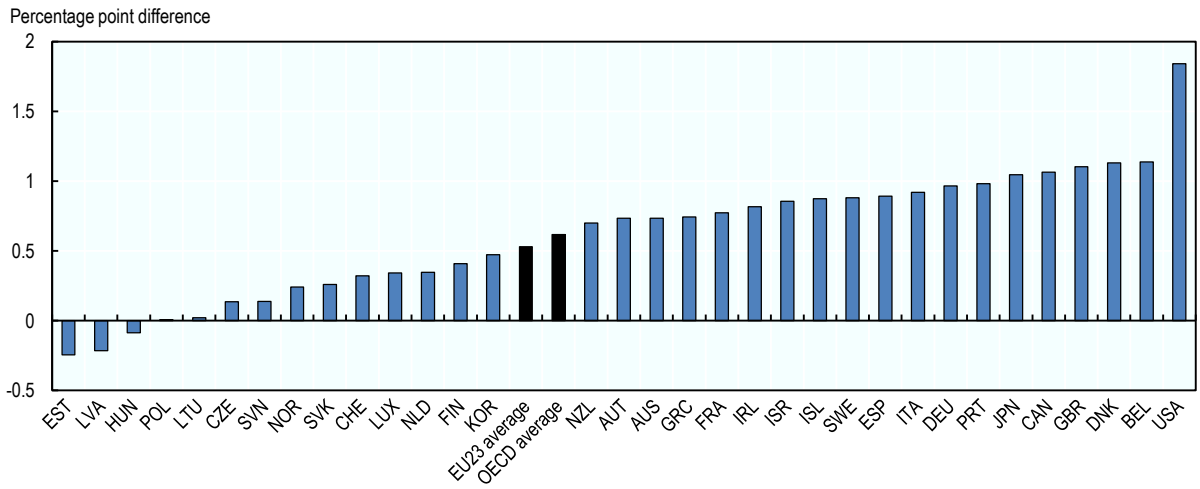


Source: OECD analyses based on the OECD SPHeP-NCDs model & OECD long-term economic model, 2019.

StatLink https://doi.org/10.1787/888934007202

Figure 3.14. The impact of overweight on the overall tax rate

Percentage point difference in government primary revenue as percentage of GDP due to overweight, average 2020-50



Note: The impact is expressed in percentage points. For example, an impact of 0.77 in France reflects an increase of government primary revenue needed to stabilise the public debt ratio from 55.58% to 56.63% of GDP
Source: OECD analyses based on the OECD SPHeP-NCDs model & OECD long-term economic model, 2019.

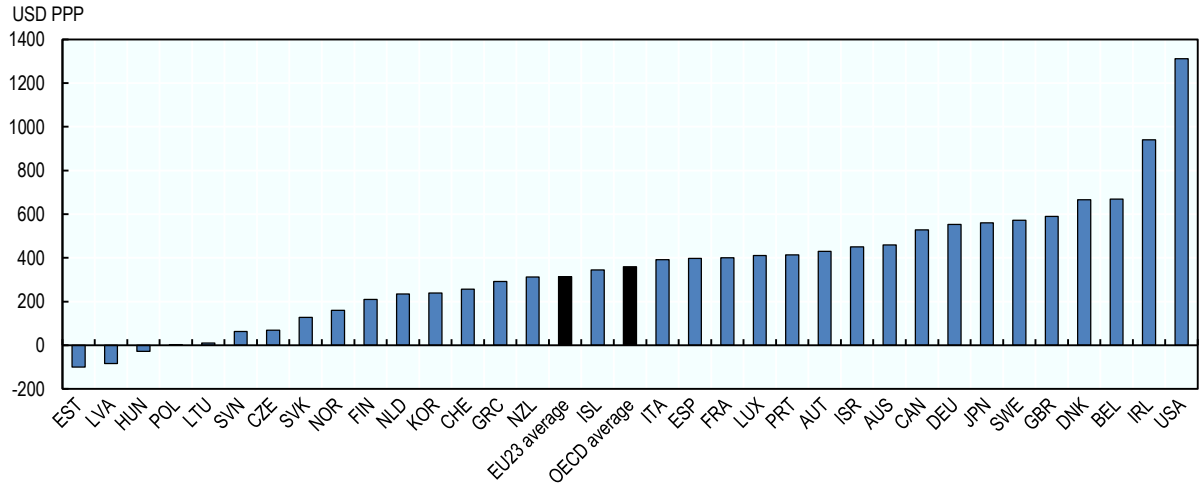
StatLink https://doi.org/10.1787/888934007221

Another measure explored in the analysis of the long-term macroeconomic burden of overweight is fiscal pressure. Fiscal pressure is measured as government primary revenue (as percentage of GDP) needed to stabilise the public debt ratio, and is equivalent to an overall tax rate (under the assumption that governments respond to rising fiscal pressure by raising additional revenue). Due to overweight the tax rate will be 0.62 percentage points of GDP higher in the OECD on average, which is similar to the EU23 average (Figure 3.14). In a number of smaller European countries the impact is negative. This is partially a result of the large impact of overweight on life expectancy in those countries: as obesity lowers life expectancy, there are fewer elderly people, which lowers the dependency ratio and, with it, the tax rate.

The impact of overweight on the overall tax rate can be translated into an equivalent impact on per capita taxes for the public. On average in the OECD, every person will be subject to USD PPP 359 per year in additional taxes due to overweight (Figure 3.15).

Figure 3.15. Equivalent per capita tax increase due to overweight

Per capita annual tax needed to cover the increased fiscal pressure due to overweight, in USD PPP, average 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model & OECD long-term economic model, 2019.

StatLink https://doi.org/10.1787/888934007240

3.6. Investment in the prevention and treatment of overweight is needed to reduce its impact on health and the economy

Overweight carries considerable cost to both individuals and society over the next 30 years. Overweight is associated with a number of NCDs, and will reduce population-wide life expectancy by up to four and half years. Countries will spend around 8% of their health care budget on treating overweight and related conditions. Overweight will also have an impact on the labour market, effectively reducing the workforce by 54 million people across the 52 countries. In the OECD, this will cost countries on average USD PPP 863 per capita per year in lost labour market output. Combined, the impact of overweight on life expectancy, health expenditure and labour market output will result in a 3.3% lower GDP on average in OECD countries. As the overall tax rate increases, individuals face an equivalent tax of USD PPP 359 per year.

In addition to these economic costs, overweight has an impact on education – as described in Chapter 4 – which may result in further long-term effects on labour market productivity. It is therefore crucial to invest in the prevention and treatment of overweight and reduce its burden on individuals and society. Countries have started to implement a number of policies and interventions to prevent and reduce overweight, which are described in Chapter 5. Chapter 6 of this report uses the OECD SPHeP NCDs model to test the cost-effectiveness of a number of these policies to understand their impact on the economic burden of overweight.

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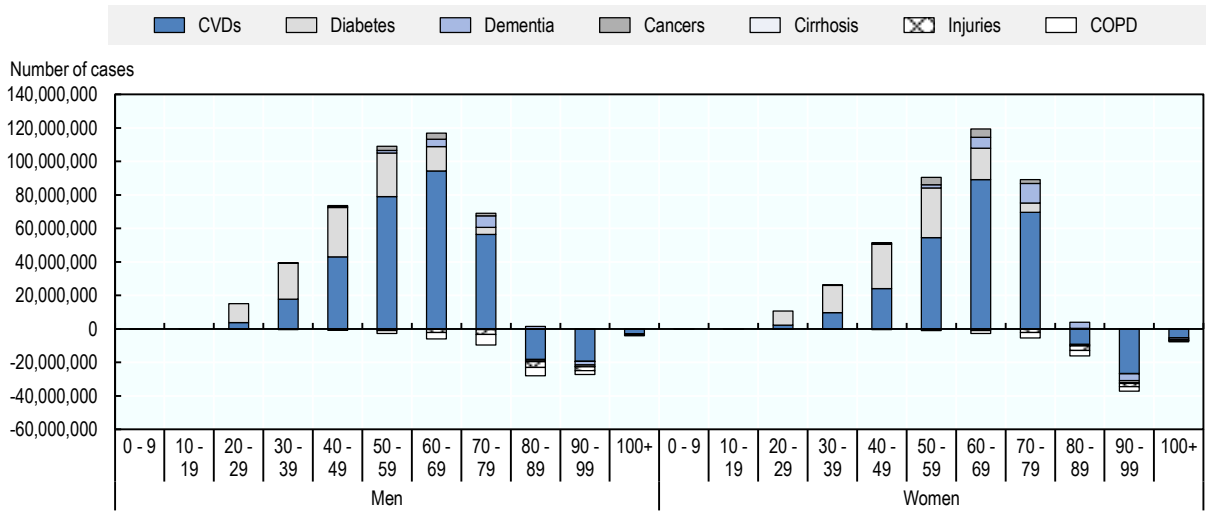
Annex 3.A. Additional analyses

Disease incidence by age group and sex

As overweight reduces life expectancy, it decreases the over 80 year-old population group and thus the number of new diseases that this group will develop (Annex Figure 3.A.1). Due to this effect, overall disease incidence due to overweight of some conditions – mostly those less associated to overweight – decreases.

Annex Figure 3.A.1. The impact of overweight on disease incidence by age group and sex

Total number of cases due to overweight, by sex and 10-year age group, total 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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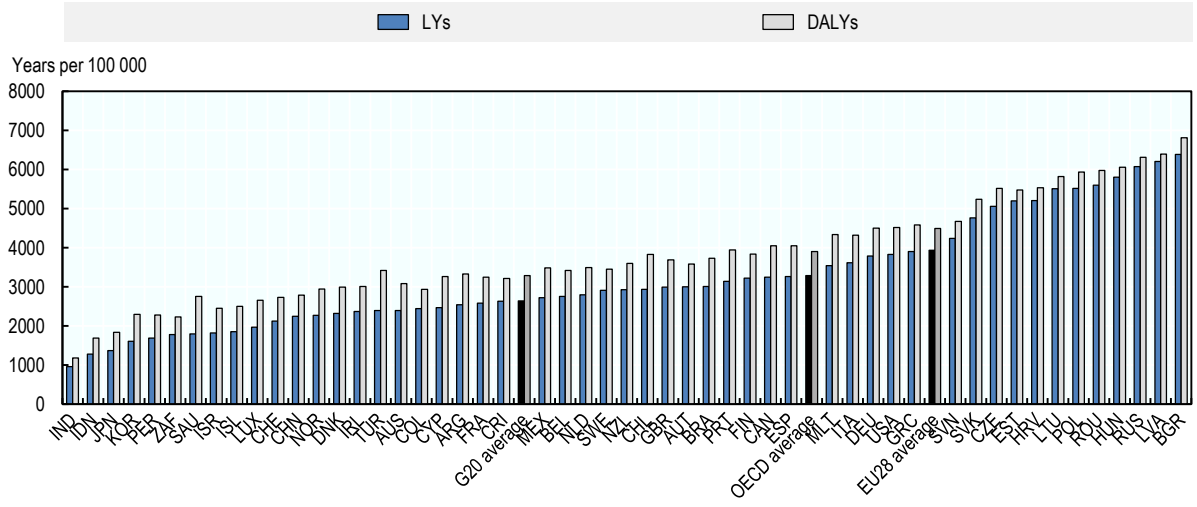
Life-years and disability-adjusted life-years lost

OECD countries will lose on average 3 291 life years per 100 000 population every year due to overweight, over the period 2020 to 2050 (Annex Figure 3.A.2). This rate is higher in EU28 countries, which will lose 3 935 life years per 100 000 every year. In addition to its impact on mortality, obesity also increases the number of years lived with disease or disability. These two effects can be combined and measured as disability-adjusted life-years (DALYs). On average, countries in the OECD will lose 3 908 DALYs per 100 000 population every year due to overweight. Eastern European countries see a relatively high impact of overweight on life-years lost.

Annex Figure 3.A.2. The impact of overweight on life-years lost

Life-years (LYs) and disability-adjusted life-years (DALYs) lost per year per 100 000 population due to overweight, average 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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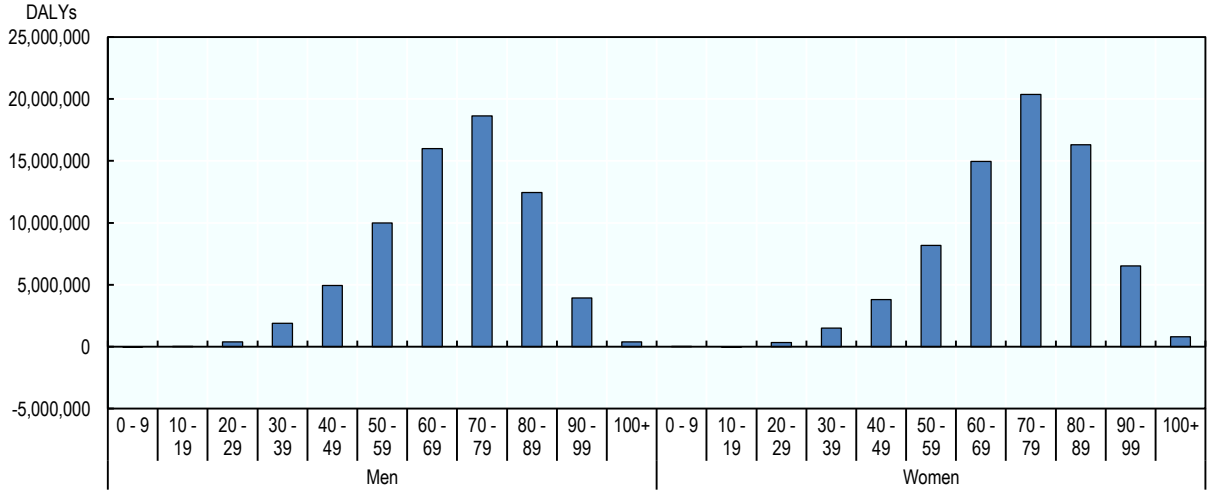
This is roughly in line with the results from the Global Burden of Disease study (The GBD 2015 Obesity Collaborators, 2017[32]). They found that high BMI was associated with 1 630 DALYs per 100 000 globally, including lower income countries. Looking specifically at the regions considered in this report, GBD estimated the impact of overweight, for 2017, at 2 587 DALYs per 100 000 for OECD countries, 2 614 for the EU28 and 2 082 for G20 countries (IHME, 2018[33]). The OECD SPHeP-NCDs model, at 3 908, 4 495 and 3 289 DALYs respectively, is higher as they look at the average impact over the next 30 years, rather than the current burden. For example, the OECD model takes into account that, in the next 30 years, the population in OECD, EU28 and G20 countries is expected to live longer and become older. This will cause an increase in the incidence of NCDs. Nevertheless, the OECD and the GBD estimates are in the same order of magnitude. Moreover, both studies find that the impact in EU28 countries is greater than for OECD countries, and smallest in G20 countries. The SPHeP-NCDs Technical Documentation (available at http://oecdpublichealthexplorer.org/ncd-doc) describes in more detail the verification of our results against other studies.

Across all 52 countries, the large majority of DALYs are lost in the 50-90 age group, with almost half (49%) being lost between the ages of 60-80 (Annex Figure 3.A.3).

Annex Figure 3.A.3. The impact of overweight on DALYs lost by age group and sex

Total disability-adjusted life-years (DALYs) lost per year due to overweight, average 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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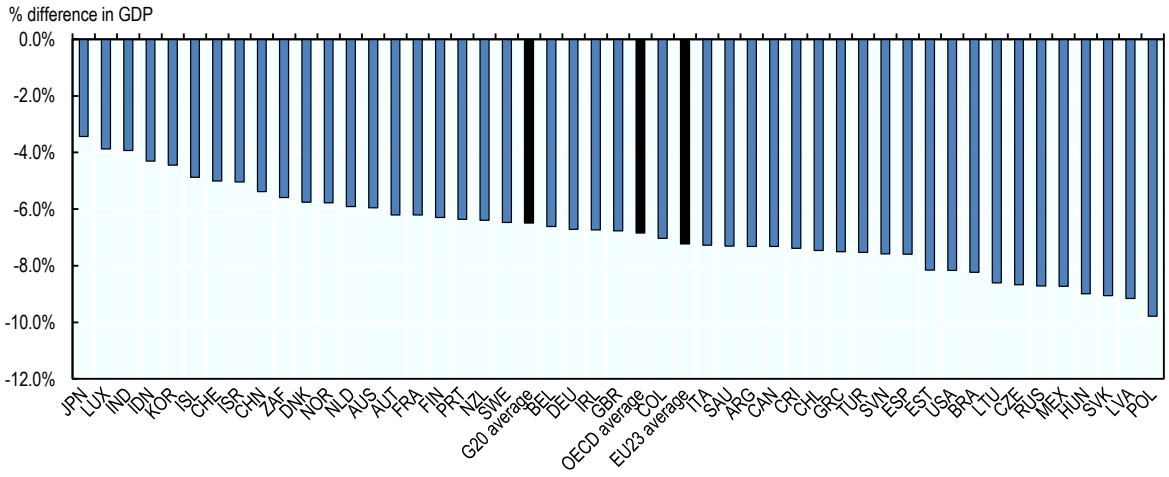
Macro-economic impacts adjusted for changes in the retirement age

In a society without overweight (the “no overweight” scenario), life expectancy would be one to four years higher than in the business-as-usual scenario. In such a scenario, the effective retirement age would likely be higher. This possibility is taken into account in alternative calculations of GDP and fiscal pressure: for each year of increased life expectancy, the legal retirement age is assumed to be two-thirds of a year higher.

Adjusting for a higher retirement age, the impact of overweight on GDP is doubled: the average impact for OECD countries goes from -3.3% to -6.8% (Annex Figure 3.A.4). The estimated impact of overweight on the overall tax rate is also affected by the retirement age adjustment: the average impact in OECD countries increases from 0.62 percentage points of GDP to 1.75 percentage points of GDP (Annex Figure 3.A.5).

Annex Figure 3.A.4. The impact of overweight on GDP, adjusted for higher retirement age

Percentage difference in GDP due to overweight, average 2020-50



Note: Assumes a two-third year increase in legal retirement age for every one year increase in life expectancy.
Source: OECD analyses based on the OECD SPHeP-NCDs model & OECD long-term economic model, 2019.

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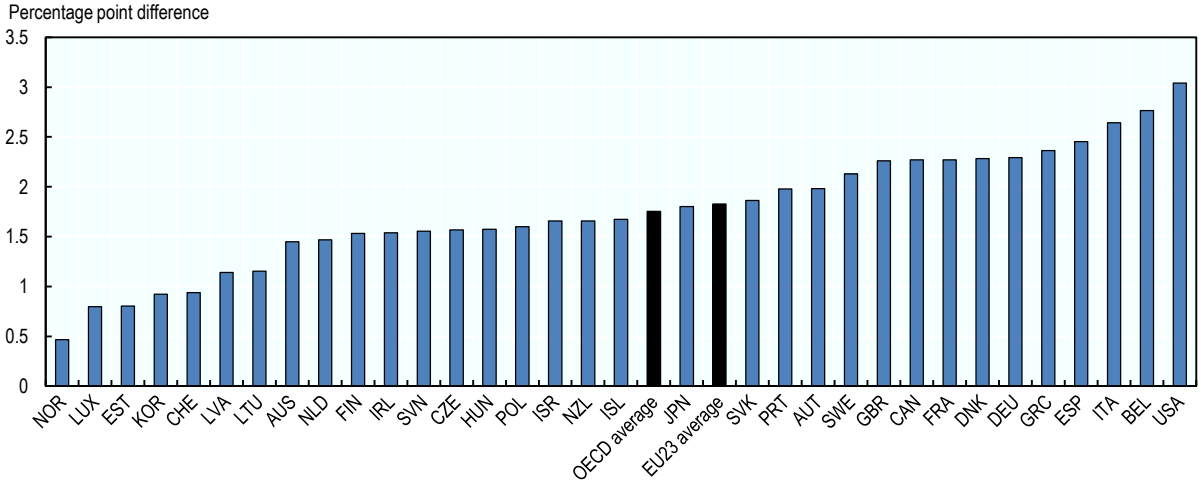
Annex Figure 3.A.5. The impact of overweight on the overall tax rate, adjusted for higher retirement age

Percentage point difference in government primary revenue as percentage of GDP due to overweight, average 2020-50



Note: Assumes a two-third year increase in legal retirement age for every one year increase in life expectancy.
Source: OECD analyses based on the OECD SPHeP-NCDs model & OECD long-term economic model, 2019.

StatLink https://doi.org/10.1787/888934007335

Notes

[1] Throughout this chapter, the nutritional status of individuals is defined according to WHO guidelines and thresholds and uses body-mass index (BMI). Overweight is defined as a BMI higher than 25 kg/m2; pre-obesity is defined as a BMI of 25-30 kg/m2; and obesity is defined as a BMI higher than 30 kg/m2. Obesity can be further divided into class I, class II and class III obesity. Class I obesity is the milder form of obesity and is defined as a BMI of 30-35 kg/m2; class II obesity is defined as a BMI of 35-40 kg/m2; while class III obesity is defined as a BMI over 40 kg/m2. Morbid obesity includes class II and class III obesity and is defined as a BMI higher than 35 kg/m2. Further information can be found in Chapter 2 – Box 2.1. Using body mass index (BMI) to define levels of adiposity.

[2] Health expenditure measures the final consumption of health care goods and services for personal health care including curative care, rehabilitative care, preventative care, ancillary services and medical goods but not long-term care.

[3] The human capita approach is based on assumptions simplifying the economic dynamics leading to economic losses including, for example, assumptions on reserve labour force, friction costs, and the impact on reserve wages.

[4] Another approach to costing the impact of overweight on the labour market is to use welfare payments (sick leave, unemployment and disability payments) and retirement cost. However, as policies on these payments vary considerably across countries, the resulting cost becomes a reflection of welfare and pension policy as much as of the cost of overweight. In addition, it is difficult to combine these different costs together with lost output for presenteeism into one metric. For these reasons, this report has used lost output as based on wages for all elements of labour market impacts.

4 The relationship between childhood obesity and educational outcomes

Marion Devaux and Sabine Vuik

This chapter investigates the relationship between childhood obesity and a variety of educational outcomes. A data analysis covering 32 countries explores the association between performance at school and obesity in children aged 11 to 15, and assesses the degree of inequality across countries. A longitudinal analysis investigates a potential causal relationship between childhood obesity and academic performance as well as education attainment in five countries. Finally, the chapter discusses the broader consequences of the relationship between obesity and educational outcomes, for individuals and the economy.

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

Key findings

- Obesity and educational outcomes are interrelated, and mediated by biological (e.g. diseases), behavioural (e.g. lack of physical activity), emotional and mental health factors (e.g. low self-esteem, poor social connection).
- An analysis of Health-Behaviours in School-based Children (HBSC) data shows that children with obesity have lower life satisfaction, and are more prone to being bullied by schoolmates. This can lead to lower class participation and reduced educational performance.
- The relationship between obesity and bullying is more pronounced in girls than in boys. In OECD countries, girls with obesity are 3 times more likely to be bullied than are healthy-weight girls, while this ratio is 1.8 times in boys.
- The association between obesity and poor academic performance is well established in the 32 studied countries, after controlling for confounders. Healthy-weight children are 13% more likely to report good performance at school than children with obesity.
- Analysis of longitudinal data from national surveys suggests that this relationship may be causal, as the presence of obesity at a young age appears to affect academic performance and education attainment later on in life.
- Childhood obesity has long-lasting effects, including health-threatening consequences over the life course. In addition, the relationship between childhood obesity and educational outcomes can constrain the formation of human capital and future socio-economic status. As such, it affects the individual as well as society and the economy.
- Policy makers should invest in a wide range of policy interventions aimed to tackle childhood obesity, reduce the obesity stigma, reduce bullying, and improve the wellbeing and mental health of overweight children.

4.1. The relationship between childhood obesity and educational outcomes is mediated by different factors

4.1.1. The evidence points to a significant relationship between childhood obesity and educational outcomes

Obesity[1] rates among children have substantially increased over the past decades, similar to the rising obesity rates in adults (see Chapter 2). Childhood obesity rates will continue to rise if nothing is done to tackle the obesogenic factors (OECD, 2010[1]; OECD, 2017[2]). The consequences of overweight in childhood are important and widespread: they affect individuals in their early life and may have an impact over their entire life course; including deteriorating health and well-being, emotional and mental health problems, bullying, and poor educational outcomes. This chapter seeks to shed light on the relationship between childhood obesity and educational outcomes.

Overall, a great number of studies published in the literature converge to show a significant association between childhood obesity and poor academic performance. These studies provide evidence for a variety of educational outcome measures (such as school grades, absences, engagement, repeating a grade), and for different age groups. For instance, high body weight is associated with lower academic performance, as measured by grades, in United States university students (Anderson and Good, 2017[3]). Obesity in the Unites States is also related to more school problems and less school engagement in

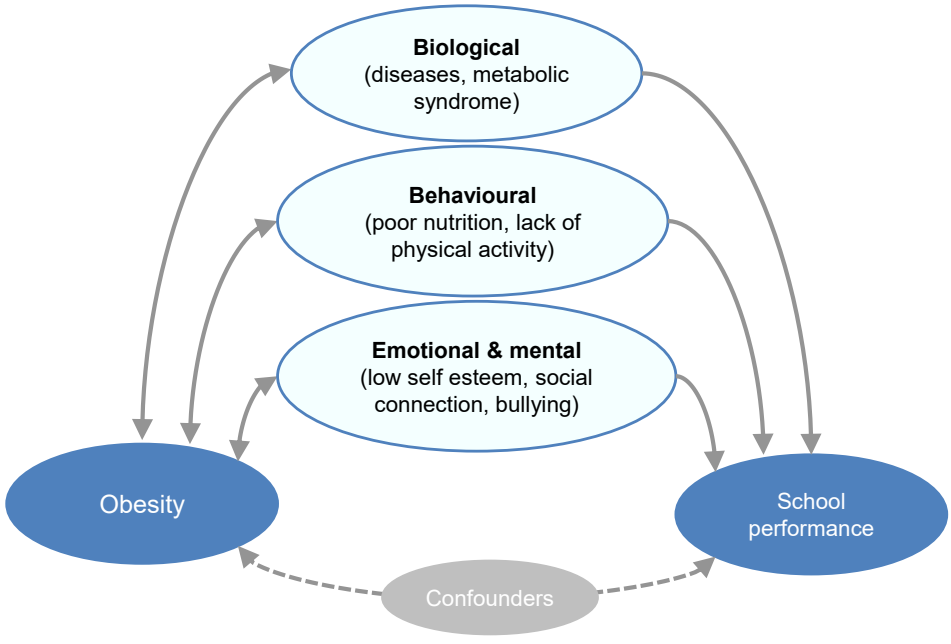
adolescents (Carey et al., 2015[4]), and to more absence from school in children aged 6 to 11 (Li et al., 2012[5]), as well as in adolescents aged 12 to 17 (Pan et al., 2013[6]; Carey et al., 2015[4]).

However, some of these studies reach different conclusions once they controlled for confounders[2] and mediating factors. For instance, while obesity in US schoolchildren appeared to be related to the likelihood of repeating a grade, the relationship disappeared when controlling for confounders (Carey et al., 2015[4]). Similarly, in Spain, the relationship between obesity and test scores in children aged 9 to 11 vanished once controlled for confounders (Torrijos-Niño et al., 2014[7]). This exposes the complexity of the relationship between obesity and educational outcomes, which is influenced by and related to many other factors.

4.1.2. The relationship between obesity and educational outcomes is mediated by biological, behavioural and emotional factors

There are different pathways through which obesity is linked to educational outcomes. These pathways involve various mediating factors as described in Figure 4.1: biological factors (e.g. diseases), behavioural factors (poor nutrition and lack of physical activity), and emotional and mental health factors (e.g. low self-esteem, poor social connection).

Figure 4.1. Relationship between obesity and educational performance



Source: OECD analysis.

Biological factors may adversely affect both body weight and cognitive functions

Obesity and its related diseases, such as metabolic syndrome, may have a direct effect on cognitive functions and concentration at school. For instance, metabolic syndrome was found to have an impact on cognitive functions and brain structure through physiological impairments (Yates et al., 2012[8]). Another study found a direct link between childhood obesity and lower cognitive performance, independently of physical activity, sleep, and diet (Hjorth et al., 2016[9]).

Behaviour may be associated with childhood obesity and lower concentration

There exists an interrelationship between unhealthy behaviours, obesity and educational outcomes. Behavioural risk factors, such as poor nutrition and lack of physical activity, may directly play a role on both obesity and low concentration at school, resulting in poor performance at school. For example, insufficient levels of physical activity can be both a cause and a consequence of obesity, and can lead to lower concentration (Bustillo et al., 2016[10]).

A clear relationship between physical activity and cognition has been documented. A recent systematic review of 64 studies found that physical activity has a positive influence on cognitive functions as well as brain structure and function (Donnelly et al., 2016[11]). Similarly, a meta-analysis of 44 studies showed that physical activity has a positive association with cognition in children (Sibley and Etnier, 2003[12]).

Regarding the effect of physical activity on school achievement, a systematic review of 14 longitudinal studies found evidence for a significant longitudinal positive relationship between physical activity and academic performance, although the dose-response relationship needs further investigation (Singh et al., 2012[13]). In a Cochrane review, physical activity interventions produced small yet significant improvements in mathematics achievements (mean difference (MD) of 3 points on a scale of 0 to 100, P-value=0.008), executive function (MD 3, P-value=0.04), and working memory (MD 3, P-value=0.02) (Martin et al., 2014[14]). However, there was no evidence to suggest an effect on reading, vocabulary and language achievements, attention, inhibitory control and simultaneous processing. Hence, while the association between physical activity, cognitive function and school achievement is evident, the best way to incorporate physical activity within schools to improve academic achievement (e.g. activity breaks versus active lessons) is less clear (Donnelly et al., 2016[11]).

Emotional and mental health problems, related to bullying and stigma, can lead to poor academic performance

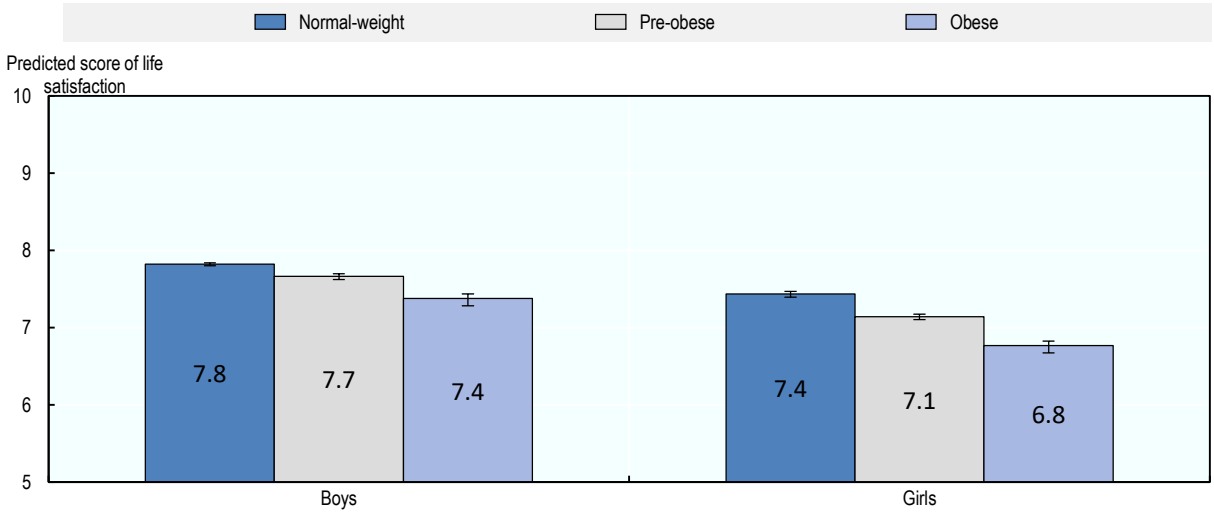
Emotional and mental health problems can also mediate the relationship between obesity and education performance. Overweight children and adolescents may often be excluded from friendships and bullied by other children. Because of this, overweight children may feel isolated, lonely or socially disconnected, they may have lower self-esteem, poor well-being and suffer from emotional and mental health problems (Russell-Mayhew et al., 2012[15]; Strauss, 2000[16]).

These problems may have deleterious effects on educational outcomes. Children who are bullied and socially excluded by others engage less in class: they step aside and refuse to speak up for fear of being bullied (Ladd, Ettekal and Kochenderfer-Ladd, 2017[17]). Moreover, behavioural problems in schools, such as disobedience and violence, may emerge.

OECD analysis of the Health-Behaviours in School-based Children (HBSC) survey 2013-14 points to a significant association between obesity and emotional and mental health problems (see data and methods in Box 4.1). In the HBSC survey, children aged 11-15 were invited to rate their life satisfaction from 0 (lowest) to 10 (highest). The average life satisfaction was 7.4 in boys with obesity compared to 7.8 in boys with a healthy-weight, and 6.8 in girls with obesity compared to 7.4 in girls with a healthy-weight, all other things being equal (Figure 4.2).

Figure 4.2. Life satisfaction by BMI category, children aged 11-15, OECD countries, 2013-14

Predicted score of life satisfaction, with 95% confidence interval



Note: Analysis adjusted for age, family affluence, smoking and drunkenness in lifetime. OECD countries only.
Source: OECD analysis based on HBSC 2013-14.

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Bullying and obesity are also strongly associated. OECD analysis shows that 16% of the 11-15 year-old boys who had obesity were bullied by schoolmates, compared to 9% in healthy-weight boys. This gap is even larger in girls (19% versus 8%) (Figure 4.3). This relationship was adjusted for family affluence and life satisfaction, meaning that a high BMI has a direct relationship with bullying, not mediated by socio-economic status or emotional health. A country-specific analysis confirms the obesity-related differences in the probability of being bullied in each country studied (Annex Figure 4.A.1).

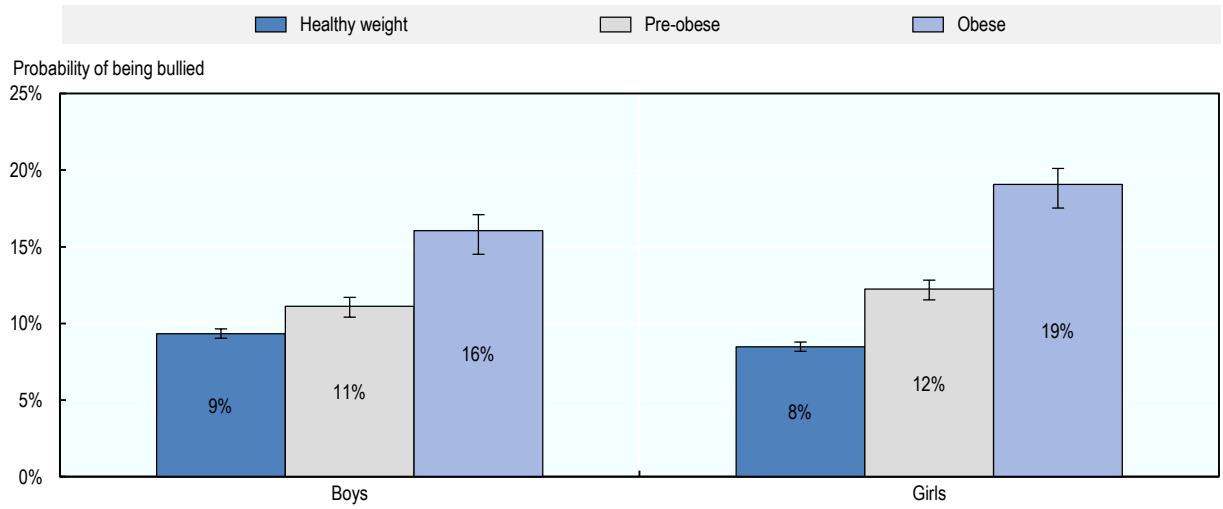
Italy, Czech Republic and Germany have the largest obesity-related inequalities in bullying among girls, while Germany, Malta, Austria and Norway show the largest inequalities among boys (Figure 4.4). The relationship between obesity and bullying is much more pronounced in girls than in boys in all countries. On average in OECD countries, girls with obesity are 3.1 times more likely to be bullied than their healthy weight counterparts, compared to 1.8 times in boys. This difference between sexes is especially marked in Iceland, the Czech Republic, Israel and the Russian Federation, where the effect of obesity on bullying is almost two times larger in girls than in boys.

Differences in bullying with regard to obesity have remained stable over the last decade in girls, while they have increased in boys, on average in OECD countries (Annex Figure 4.A.2). A time-trend analysis showed that the probability of being bullied in boys has significantly decreased in boys with a healthy-weight and pre-obesity compared to boys with obesity, widening inequalities. By contrast, bullying has not significantly changed in girls, on average in OECD countries.

Emotional and mental health consequences in children and adolescents are comparable to the well-known effects of the obesity stigma in adults. Weight bias and obesity stigma are associated with poor body image, low self-esteem, loneliness, suicidal thoughts and acts, depression, and anxiety (WHO Europe, 2017[18]). Obesity stigma leads to exclusion and marginalisation of persons with obesity, and to inequities. For example, people with obesity may not receive adequate health care or may be discriminated against in the workplace or in educational settings (WHO Europe, 2017[18]).

Figure 4.3. Probability of being bullied by BMI category, children aged 11-15, OECD countries, 2013-14

Predicted probability of being bullied, with 95% confidence interval



Note: Analysis adjusted for age, family affluence, smoking and drunkenness in lifetime. OECD countries only.
Source: OECD analysis based on HBSC 2013-14.

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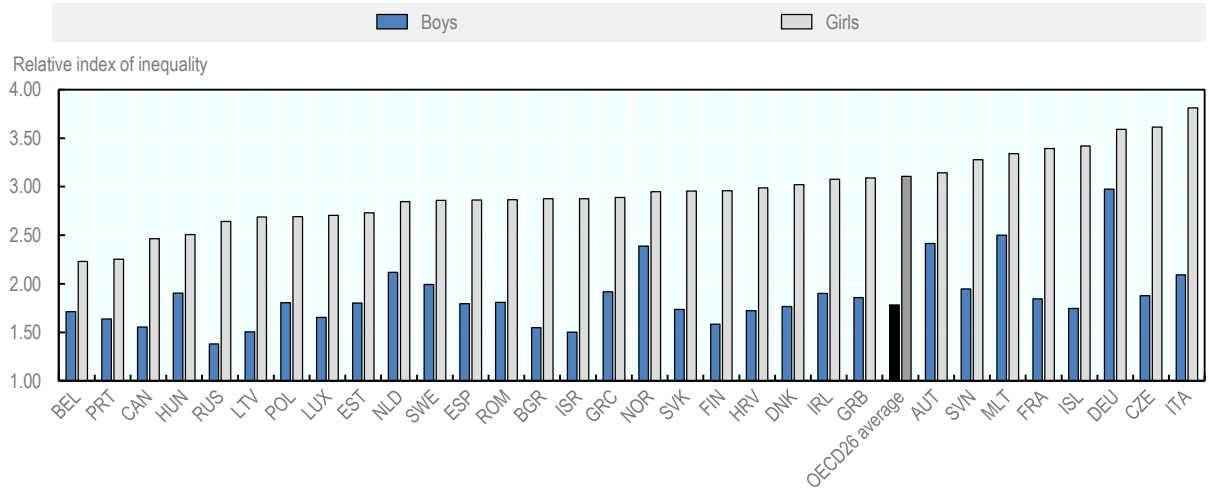
Figure 4.4. Relative index of inequality for being bullied by BMI category, children aged 11-15, 2013-14, by sex and by country



Note: The RII is calculated as the ratio between the probability of children with obesity being bullied divided by the probability for healthy-weight children, taking into account the average BMI in each group. An RII greater than one means that the likelihood of being bullied increases with BMI. The higher the RII, the larger the inequality across BMI categories. For example, in Italy, the most obese girls are 3.8 times more likely to be bullied than healthy-weight girls. Data on bullying for Switzerland is missing. The OECD average is derived from a pooled countries analysis weighted by the national sample size.
Source: OECD analysis based on HBSC 2013-14.

StatLink https://doi.org/10.1787/888934007392

Discrimination against people with obesity has also been observed for young people. A study in the United States provides evidence that interviewers for graduate programmes favoured thinner applicants, which could be due to a (conscious or unconscious) bias against applicants with obesity. However, it is also possible that stereotype threat or social identity threat led the applicant to under-perform (Burmeister et al., 2013[19]).

4.2. There is a clear association between childhood obesity and school performance in OECD countries

An OECD analysis based on HBSC data (Box 4.1) shows that children with obesity have significantly lower performance at school than their healthy weight counterparts, and teenagers with obesity are more often absent from school. These relationships remain significant after controlling for mediating and confounding factors such as family affluence, life satisfaction, and bullying.

Box 4.1. Data and methods for the analysis on obesity and educational outcomes

Analyses are based on the 2013-14 Health-Behaviours in School-based Children survey (HBSC) which collects information on school students aged 11, 13 and 15 years old every four years. School and health information are self-reported by children (e.g. school performance compared to classmates, bullying, life satisfaction, height and weight, smoking and alcohol drunkenness). Body mass index (BMI), calculated from height and weight, was categorised into healthy-weight, pre-obese and obese, using the WHO age- and sex-specific BMI cut-off points for children (de Onis et al., 2007[20]). Analyses presented cover 32 HBSC countries: 26 European Union countries plus Canada, Iceland, Israel, Norway, Switzerland, and the Russian Federation.

A pooled-country multivariate logistic regression analysis was performed to assess the probability of being bullied and a linear model was used for the assessment of life satisfaction. Country-specific analyses of the probability of being bullied and having good performance at school were performed using a mixed logit model with random effects on the intercepts and the BMI coefficient at the country level, while controlling for individual characteristics. Predicted probabilities of being bullied and of self-perceived good performance at school were estimated for each BMI category. The relative index of inequality, which is a summary measure of inequality, was used to gauge obesity-related inequalities in bullying and school performance across countries.

Trends analysis

Four waves of the HBSC survey (2001-02, 2005-06, 2009-10, 2013-14) were combined for the trends analysis. A pooled-country logistic model of the probability of good performance at school was used to assess the effect of BMI categories, survey year (continuous), and their interaction term, while controlling for age, smoking status, drinking status and socio-economic background. Separate models were run for boys and girls. The overall statistical difference in the trends coefficient for the three BMI categories was tested. A similar approach was used for the probability of being bullied.

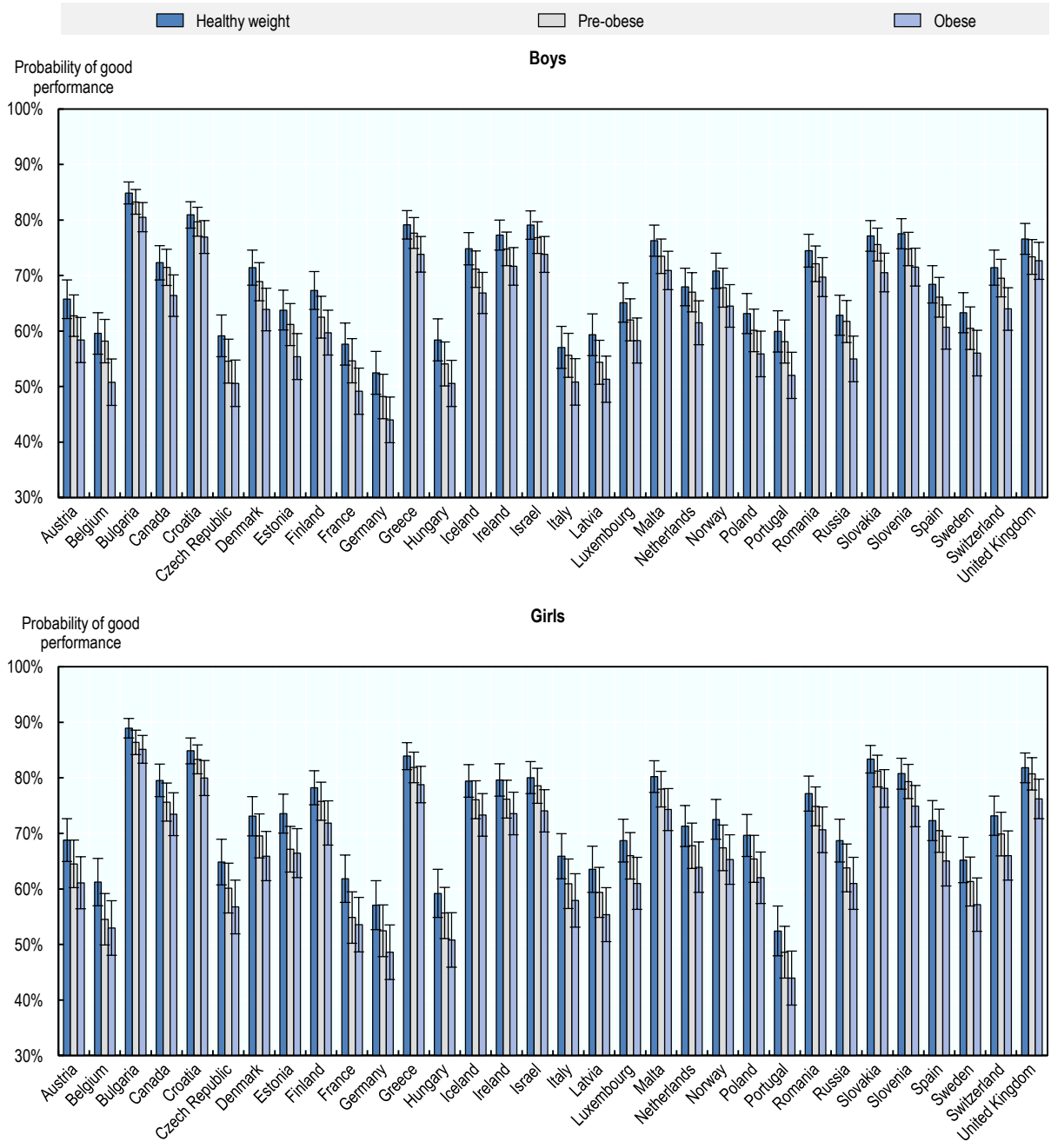
School absence analysis

The United States' NHANES data was used to study school absence. Four waves of NHANES, from 2001-02 to 2007-08, collect information on missed days of school. The analysis focused separately on children aged 6-11 and teenagers aged 12-19. BMI categories were defined using the WHO age- and sex-specific BMI cut-off points for children (de Onis et al., 2007[20]).

Multivariate logistic regression analysis was performed to assess the probability of missing school days according to BMI category, while adjusting for age, sex, ethnicity and socio-economic status. A negative binomial model was used for the number of days of absence.

Figure 4.5. Probabilities of good performance at school by BMI level, children aged 11-15, 2013-14, by sex and by country

Predicted probability of good performance at school, with 95% confidence intervals



Note: Mixed model with random slope. Adjusted for age, family affluence, smoking and drunkenness in lifetime. Covariates are set at fixed values (Age 13, Middle family affluence, Never drunk, Never smoke).
Source: OECD analysis based on HBSC 2013-14.

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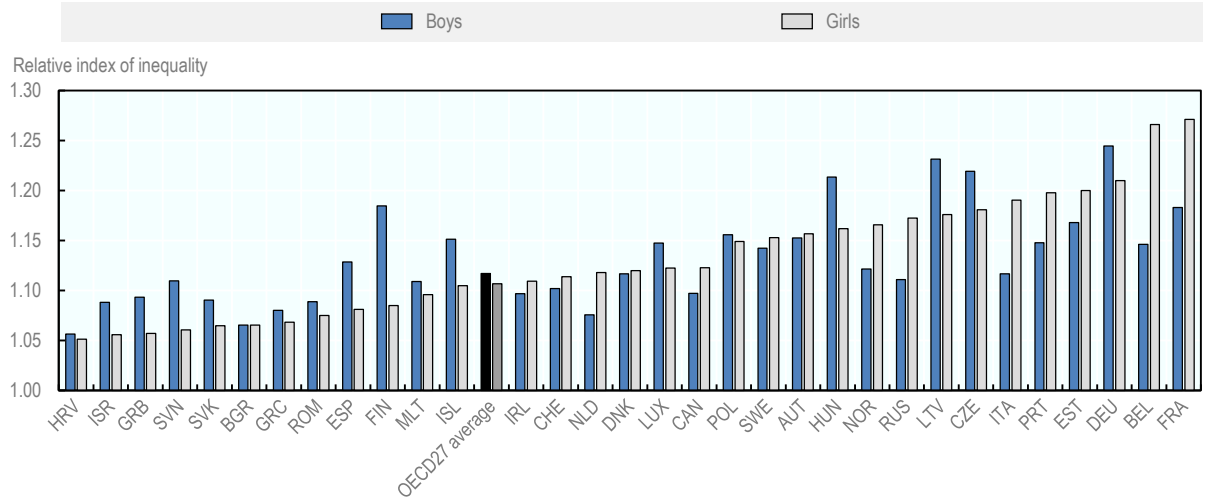
4.2.1. Children with obesity have lower performance at school than children with a healthy-weight

The analysis of HBSC data shows that high BMI levels in 11-15 year-olds are associated with poorer self-perceived school performance in the 32 countries studied (Figure 4.5). The strength of the relationship varied across countries. For instance in Italy, 57% of healthy-weight boys are likely to rate their performance above the class average compared to 51% of boys with obesity. The gradient is steeper in France, where 58% of healthy-weight boys perform above average compared to 49% of boys with obesity. Girls have better school performance than boys in all countries studied but Portugal.

The gradient of inequalities – as measured by the relative index of inequality – confirms that the higher the BMI in childhood, the lower the performance at school, in all countries (Figure 4.6). On average across all 32 countries in the analysis, boys and girls with a healthy weight are 13% more likely to report good school performance, compared to their peers with obesity. When the OECD countries are pooled, boys with a healthy weight are 12% more likely to report good school performance and girls 11%.

Obesity-related inequalities in school performance are greater for boys in 18 countries and for girls in 14 countries. France and Belgium have the largest inequalities among girls. In both cases, girls with a healthy weight are about 27% more likely to report good school performance compared to girls with obesity. Germany and Latvia display the largest inequalities among boys, with an increased probability for boys with a healthy weight to report good school performances of 24% and 23%, respectively.

Figure 4.6. Relative index of inequality for good performance at school by BMI category, children aged 11-15, 2013-14, by sex and by country



Note: The RII is calculated as the ratio between the probability of good school performance for children with obesity divided by the probability for healthy-weight children, taking into account the average BMI of each group. An RII greater than one means that the likelihood of good performance at school decreases with BMI. The greater the RII, the larger the inequality across BMI categories. For example, in France, healthy-weight girls have 27% more chance of performing well at school than the most obese girls. The OECD average is derived from a pooled countries analysis weighted by the national sample size.
Source: OECD analysis based on HBSC 2013-14.

StatLink https://doi.org/10.1787/888934007430

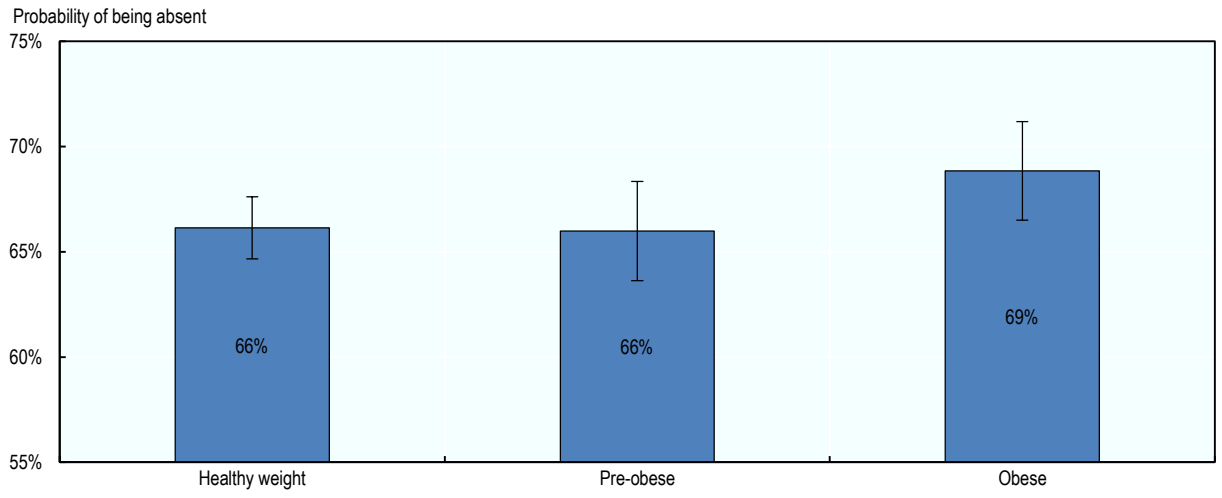
Differences in school performance have slightly increased in boys and slightly narrowed in girls over the last decade. A time-trend analysis showed that from 2002 to 2014 there was a significant increase in school performance in healthy-weight boys over time, while the trends have remained stable in those who were pre-obese and obese, on average across OECD countries. In girls, there was a significant decrease in school performance in healthy-weight girls over time, while the trends have remained stable in those who were pre-obese and obese, narrowing inequalities (Annex Figure 4.A.3).

4.2.2. Teenagers with obesity are more likely to miss school

Analysis based on the NHANES data shows that teenagers with obesity, aged 12-19, are more likely to miss school (Figure 4.7). In the previous 12 months, 69% of adolescents with obesity had missed school days compared to 66% of healthy-weight adolescents. The difference is not significant in children aged 6-11. The pattern is similar for boys and girls, and results are therefore presented together.

Figure 4.7. School absence and BMI categories, children aged 12-19, United States, 2001-08

Predicted probability of absence, with 95% confidence interval



Note: Analysis adjusted for age, sex, ethnicity and socio-economic status.
Source: OECD analysis based on US NHANES 2001-2008.

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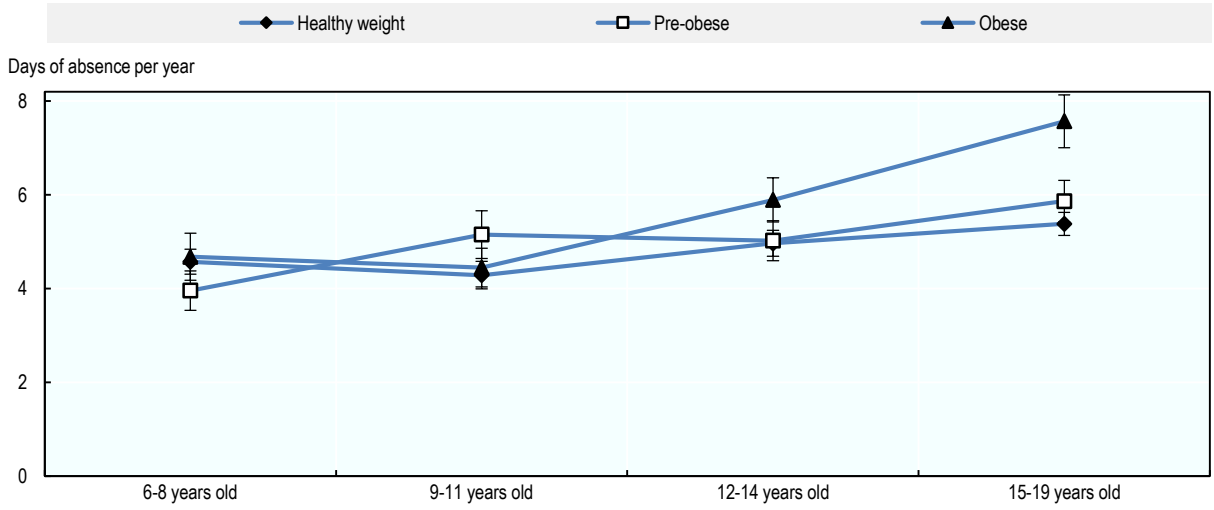
When absent from school, adolescents with obesity had significantly more days of absence than healthy-weight adolescents aged 12 and above (Figure 4.8). Among those aged 12-14, adolescents with obesity reported 5.9 days of absence per year compared to 5.0 days in healthy-weight adolescents. Adolescents aged 15-19 with obesity or a healthy weight reported 7.6 days versus 5.4 days of absence, respectively.

Figure 4.8. Average number of days of absence, by age group and BMI category, United States, 2001-08

Number of days of absence per year



Note: Analysis adjusted for age, sex, ethnicity and socio-economic status.
Source: OECD analysis based on US NHANES 2001-2008.

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4.3. A potential causal effect of childhood obesity on educational outcomes is found in five countries

From a policy perspective, it is important to understand the nature of the association between obesity and educational outcomes. If the relationship is causal, public health policy could help improve not only child health, but also educational outcomes such as bullying at school, absence, academic performance, and education attainment.

4.3.1. The literature presents mixed evidence for the causal effect of obesity on education

A number of studies have looked at the causal effect of obesity on educational outcomes, but with mixed results emerging. While some studies found a temporal association between obesity and educational outcomes, studies looking at younger children found no relation between obesity and educational outcomes, and yet others found different results for boys and girls.

A retrospective cohort study found a causal relationship between overweight and future academic performance among female high school students in Saudi Arabia. Girls who were overweight in 10th grade had 3.73 higher odds of experiencing a decline in grades between the 10th and 12th grade over healthy-weight students (Adaili, Mohamed and Alkhashan, 2017[21]). Similar evidence from Sweden suggests that male obesity may lead to lower educational attainment. Swedish men who had obesity at age 18 had 70% less chance of completing at least 15 years of education than healthy-weight subjects, even when adjusting for intelligence and socio-economic factors (Karnehed et al., 2006[22]).

Among younger children, evidence for a causal relationship is lacking. At least two studies found no significant relationship between child obesity and educational performance in primary school. A Dutch birth cohort study found no statistical association between the number of years that children were overweight

and final year test scores or teacher assessment (Ruijsbroek et al., 2015[23]). Likewise, a Taiwanese study following elementary school children over six years found that BMI changes were not significantly associated with changes in academic performance (Chen et al., 2012[24]). Regarding education attainment, an analysis of the 1970 British Cohort Study found no significant relationship between obesity at 10 years old and educational attainment at 30 years old, after adjusting for confounders such as social class, parental BMI and education (Viner and Cole, 2005[25]).

Two studies found evidence for a causal association in girls, but not in boys. A UK study based on the ALSPAC cohort showed an impact of overweight on future test scores in girls. Obesity at age 11 decreased the English marks of girls at age 13 and 16, compared to healthy-weight girls, even after controlling for confounders. However, the effect was not significant for boys (Booth et al., 2014[26]). Similarly, a US study highlighted that becoming overweight between kindergarten entry and third grade was associated with reductions in test scores and teacher ratings of social-behavioural outcomes and approaches to learning for girls, but no such effects were found for boys (Datar and Sturm, 2006[27]).

4.3.2. An OECD analysis points to a negative causal relationship between obesity and educational outcomes in five countries

An OECD analysis based on longitudinal data available in five countries suggests that the relationship between obesity and educational outcomes may be causal. The data and methods are described in Box 4.2.

Box 4.2. Description of the longitudinal analyses

The objective of this analysis was to identify a potential causal relationship between obesity and educational outcomes. To investigate whether the relationship is causal, longitudinal datasets were used. By measuring obesity in one wave, and the educational outcomes in a later wave, temporal precedence can be established – one of the requirements for causality (Oppewal, 2010[28]). Lagged regression models were used to test this relationship.

The results in this section are based on data from longitudinal cohort studies in the United Kingdom (the 1970 British Cohort Study), the United States (the National Longitudinal Study of Adolescent to Adult Health, or Add Health), the Russian Federation (Russia Longitudinal Monitoring Survey, or RLMS), Germany (The German Health Interview and Examination Survey for Children and Adolescents, or KiGGS) and the Netherlands (The Prevention and Incidence of Asthma and Mite Allergy, or PIAMA). These longitudinal cohorts were selected as they included school-aged children and collected data on obesity and educational performance or attainment.

Educational outcomes were measured as educational performance and educational attainment. Educational performance is the performance of a student during his or her time in school. This included, for example, grades obtained in school subjects, teacher's assessment of performance relative to other students, or tests scores. Educational attainment is the level of education ultimately achieved. This was measured as the number of years spent in full-time education, or whether the student completed any degree-level higher education.

An effort was made to standardise the analyses across the different country datasets. However, due to differences in the collected and reported data, different variables and concepts were used per country. Obesity was deduced from body mass index (BMI) using the child cut-off values defined by WHO (de Onis et al., 2007[20]). To correct for confounders, the models were adjusted for age, ethnicity or minority status, social class and/or income, and alcohol consumption - depending on the availability of data.

For more details on the datasets and the methods, please refer to OECD Health Working Paper No. 109 (Vuik, Devaux and Cecchini, 2019[29]).

Childhood obesity is associated with lower educational performance later on

In the United States, Russia and the Netherlands, a lagged relationship between obesity and educational performance was found (see Table 4.1). In the US study, there was a statistically significant relationship between BMI or obesity and grade point average (GPA) a year later, even when correcting for confounders such as age, sex, family income and ethnicity (note that all results presented here are adjusted for confounders). The GPA of girls with obesity was 0.26 points lower than that of girls with healthy weight. This equates to a student with a median GPA of 2.75 dropping to the 45th percentile. For boys, obesity was associated with a 0.11 point lower GPA a year later – a smaller but still significant effect. Similarly, a point increase in BMI was associated with 0.009 points (95% CI: 0.0001 to 0.0178) decrease in GPA for boys; and 0.021 points (95% CI: 0.015 to 0.028) for girls.

Table 4.1. Lagged relationship between obesity and educational performance

Country	Outcome	Method	Exposure	Boys	Girls
United States	GPA (1 to 4)	Lagged linear regression	Obesity (vs healthy weight)	**Coefficient: -0.11***	**Coefficient: -0.26*****
			Pre-obesity (vs healthy weight)	Coefficient: -0.00	**Coefficient: -0.15*****
			BMI	**Coefficient: -0.009****	**Coefficient: -0.021*****
			BMI (quadratic)	**Coefficient: -0.0002****	**Coefficient: -0.0004*****
Russian Federation	Average grade (1 to 5)	Lagged linear regression	Obesity (vs healthy weight)	Coefficient: 0.03	**Coefficient: -0.11*****
			Pre-obesity (vs healthy weight)	Coefficient: 0.03	Coefficient: -0.02
			BMI	**Coefficient: 0.007****	**Coefficient: -0.007*****
			BMI (quadratic)	**Coefficient: 0.0001***	**Coefficient: -0.0001****
Germany	Average grade (6 to 1; *NOTE: lower grade is better performance)*	Lagged linear regression	Obesity (vs healthy weight)	Coefficient: 0.08	Coefficient: 0.05
			Pre-obesity (vs healthy weight)	Coefficient: 0.06	Coefficient: -0.02
			BMI	Coefficient: 0.005	Coefficient: -0.010
			BMI (quadratic)	Coefficient: 0.0162	Coefficient: -0.0002
Netherlands	High level of high school	Lagged logistic regression	Overweight (vs healthy weight)	**Risk ratio: 0.80*****	Risk ratio: 0.89
			BMI	**Odds ratio: 0.91*****	**Odds ratio: 0.94***
			BMI (quadratic)	**Odds ratio: 0.997*****	**Odds ratio: 0.998***
	High school level below teacher assessment level	Lagged logistic regression	Overweight (vs healthy weight)	Risk ratio: 0.79	Risk ratio: 0.82
			BMI	Odds ratio: 0.98	Odds ratio: 1.003
			BMI (quadratic)	Odds ratio: 0.999	Odds ratio: 1.00002

Note: ***: significant at 0.1 level; **: significant at 0.05 level; ***: significant at 0.01 level**
Results shown are adjusted for age, ethnicity or minority status, social class and/or income, and alcohol consumption (United States only). The coefficients of linear regression models can be interpreted as the increase in outcome for each unit increase in exposure; relative risks show how much more or less likely one group is to experience the outcome, with a value greater than one signifying a higher likelihood; odds ratios are similar to risk ratios but are based on odds rather than risk.
Source: OECD analysis of the US National Longitudinal Study of Adolescent to Adult Health, the Russia Longitudinal Monitoring Survey, the German Health Interview and Examination Survey for Children and Adolescents, and the Dutch Prevention and Incidence of Asthma and Mite Allergy data.

StatLink https://doi.org/10.1787/888934007544

In the Russian data sample, BMI was also associated with lower grades for girls, by 0.007 (0.002-0.012) points per point BMI. There also was a significant effect of BMI on grades for boys, but the effect was in the opposite direction: a one-point increase in BMI was linked to a 0.007 (0.001-0.012) point increase in average grade a year later.

In the Netherlands, performance was measured based on the different levels of high school that exist. The analysis showed that boys who were overweight at age 11 were 20% less likely to attend a higher level of high school at the age of 17 (RR: 0.80, 0.65 to 0.95), while the effect for girls was not significant. However, when looking at performance relative to the teacher's assessment at age 11, there was no significant effect of overweight or BMI in either sex.

In Germany, no significant relation was found between obesity and educational performance six years later.

Childhood obesity during school years is associated with lower educational attainment

OECD analysis based on longitudinal data available in three countries points to a negative impact of obesity on educational attainment in the United States and the United Kingdom, while no significant relationship was found in Russia (see Table 4.2).

Table 4.2. Results of obesity and educational attainment analyses

Country	Outcome	Method	Exposure	Boys	Girls
United States	Any higher education	Lagged log-binomial regression	Obesity (vs healthy weight)	Risk ratio: 0.88	**Risk ratio: 0.72*** **
			Pre-obesity (vs healthy weight)	Risk ratio: 0.97	**Risk ratio: 0.79*** **
			BMI	Risk ratio: 1.00	**Risk ratio: 0.98*** **
			BMI (quadratic)	Risk ratio: 0.9999	**Risk ratio: 0.9995*** **
United Kingdom	Any higher education	Lagged log-binomial regression (or logistic regression for odds ratio)	Obesity (vs healthy weight)	**Risk ratio: 0.42** **	Risk ratio: 1.02
			Pre-obesity (vs healthy weight)	Risk ratio: 0.83	Risk ratio: 0.86
			Overweight (vs healthy weight)	**Risk ratio: 0.76** **	Risk ratio: 0.88
			BMI	**Odds ratio: 0.95** **	**Risk ratio: 0.98* **
			BMI (quadratic)	**Odds ratio: 0.9987** **	**Risk ratio: 0.9996** **
	Age left full-time education	Lagged linear regression	Obesity (vs healthy weight)	**Coefficient: -0.91* **	Coefficient: -0.35
			Pre-obesity (vs healthy weight)	Coefficient: -0.19	**Coefficient: -0.35* **
			Overweight (vs healthy weight)	Coefficient: -0.33	**Coefficient: -0.35* **
			BMI	**Coefficient: -0.045* **	**Coefficient: -0.044** **
			BMI (quadratic)	**Coefficient: -0.0008* **	**Coefficient: -0.0010** **
Russian Federation	Any higher education	Lagged log-binomial regression	Overweight (vs healthy weight)	Risk ratio: 0.73	Risk ratio: 0.94
			BMI	Risk ratio: 1.04	Risk ratio: 0.98
			BMI (quadratic)	Risk ratio: 1.0009	Risk ratio: 0.9995

Note: ***: significant at 0.1 level; **: significant at 0.05 level; ***: significant at 0.01 level**
Results shown are adjusted for age, ethnicity or minority status, social class and/or income, smoking status (except for the United States), and alcohol consumption. The coefficients of linear regression models can be interpreted as the increase in outcome for each unit increase in exposure; relative risks show how much more or less likely one group is to experience the outcome, with a value greater than one signifying a higher likelihood; odds ratios are similar to risk ratios but are based on odds rather than risk.
Source: OECD analysis of the US National Longitudinal Study of Adolescent to Adult Health, the 1970 British Cohort Study and the Russia Longitudinal Monitoring Survey data.

StatLink https://doi.org/10.1787/888934007563

While neither obesity nor BMI in Wave 1 predicted whether a boy would complete higher education in the United States, both variables were significant predictors for girls. A girl who had obesity in Wave 1 was 38% less likely to complete higher education 14 years later than someone of healthy weight (RR: 0.72, 0.59 to 0.88).

Conversely, in the United Kingdom, the relationship between obesity and educational attainment was significant only for boys, who were 58% less likely to have completed higher education at the age of 29 if they had obesity at age 16 (RR: 0.42, 0.16 to 0.95). However, a higher BMI did have a significant effect in girls: for each point increase in BMI at age 16, girls spent 0.044 (0.004 to 0.085) years less in higher education – approximately half a month.

In Russia, no significant relationship was found between obesity and educational attainment using lagged regression models.

Comparing effect sizes across countries is complicated by differences in survey data. The diverging results that were found across countries may be the result of the national context; but they may also be caused by differences in the data. All cohorts collected data at different ages and at different intervals. While efforts were made to standardise the variables used for analysis, the data collected in each cohort was not always fully comparable. In particular, the type of variables available on socio-economic status and ethnicity/minority status varied across datasets, and may have caused differences in the results. Moreover, the known difference between self-reported and measured BMI may have also contributed to differences between the countries (Devaux et al., 2011[30]).

4.4. The short-term and long-term consequences of childhood obesity are of concern for individuals and societies

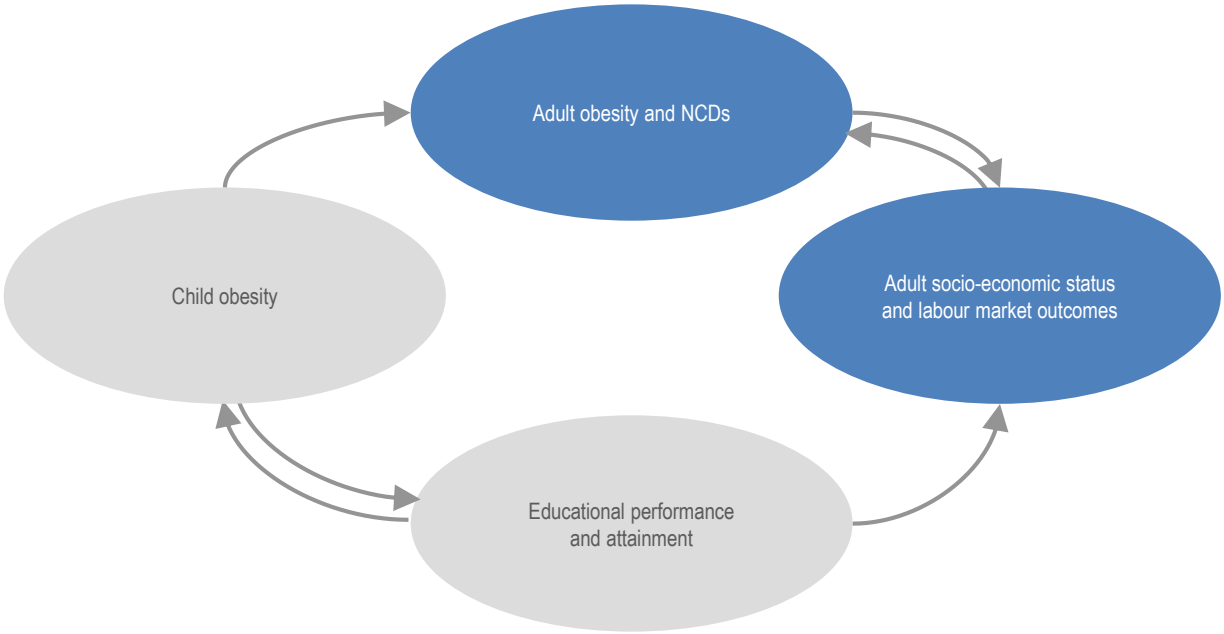
The consequences of overweight in children are important because they affect the entire life span. Childhood obesity may have short-term direct effects on physical and mental health, and educational outcomes such as bullying, school absence, low concentration, and poor grades, as discussed in the previous sections. In addition to this, long-term consequences may emerge, affecting both health and economic outcomes. Figure 4.9 depicts the potential consequences of childhood obesity on adult economic outcomes. In particular, it highlights the double burden: (a) through obesity in adulthood, which in turn affects labour market outcomes, and (b) through potentially lower educational outcomes, which in turn affect adult socio-economic status.

Obesity in childhood has long-lasting health consequences. Children with obesity are more prone to be obese as adults, and they have a higher risk of developing non-communicable diseases such as diabetes, cardiovascular diseases and musculoskeletal disorders (Kelsey et al., 2014[31]). As the age of onset and the duration of obesity matter for NCDs, young children with obesity are more at risk of premature death and disability in adulthood (Abdullah et al., 2011[32]).

In addition to the health implications, obesity also carries adverse labour market outcomes. Childhood obesity is a leading determinant for adult obesity and related diseases, which in turn, have consequences on employment and work productivity. People who suffer from obesity and its related chronic diseases have a lower chance of being employed, are more absent from work, and retire earlier (Devaux and Sassi, 2015[33]). Further evidence is provided in Chapter 3.

As shown in the analyses contained in this chapter, overweight in childhood is clearly linked to educational outcomes. In addition to disadvantaging the individual, this effect also multiplies the negative impact of obesity on society and the economy at large.

Figure 4.9. The double burden of childhood obesity on poor economic outcomes



Note: Grey bubbles refer to childhood and adolescence, while blue ones refer to adulthood.
Source: OED analysis.

First, school performance and educational outcomes are key determinants for the formation of human capital. As such, reduced school performance may affect a country's economic growth. An OECD report using Programme for International Student Assessment (PISA) data shows that improving the cognitive skills of the population can lead to significant economic gains and that relatively small improvements to labour force skills can largely impact the future well-being of a nation (OECD, 2010[34]). A modest goal of all OECD countries boosting their average PISA scores by 5% (25 points) over the next 20 years would increase OECD gross domestic product (GDP) by USD 115 trillion over the lifetime of the generation born in 2010 (OECD, 2010[34]).

Second, differences in health and health behaviours can reinforce existing social inequalities, which in turn affect a country's social welfare. Differences in health at a young age perpetuate into adulthood, generating further inequalities in health status in adulthood but also social inequalities such as job prospects and income gaps (Michael Marmot, Peter Goldblatt, Jessica Allen, 2010[35]). Inequalities and social injustice can jeopardise a nation's social welfare. This is a main concern for European countries, which have recently agreed on the European Pillar of Social Rights that seeks to guarantee new and more effective rights to citizens. These range from equal opportunities and access of the labour market to fairer working conditions and social protection and inclusion (Tajani and Juncker, 2017[36]).

4.5. Reducing childhood obesity will help build better future lives and stronger societies

A significant association exists between childhood obesity and educational outcomes. This relationship is driven through mediating factors such as disease, poor diet, physical inactivity, and emotional and mental health problems. An OECD analysis based on longitudinal data from five countries suggests that the presence of obesity at a young age can, in some cases, affect school grades and educational attainment

later on in life. As education is a determinant of the formation of human capital, future individual socio-economic status and GDP, this effect can exacerbate the negative impact of obesity on society and the economy.

This chapter describes the implications of childhood obesity on well-being and mental health, educational outcomes, and furthermore, on the economy and the welfare of societies. Policy makers should invest in a wide range of policy interventions aimed at tackling childhood obesity, reducing the obesity stigma, tackling bullying, and improving the well-being and mental health of overweight children. Such interventions have the potential to improve the lives of children by improving educational performance and attainment, future labour market prospects and overall health and wellbeing.

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- The National Longitudinal Study of Adolescent to Adult Health (Add Health), managed by the Carolina Population Center, University of North Carolina at Chapel Hill, and accessed through the CPC Dataverse.
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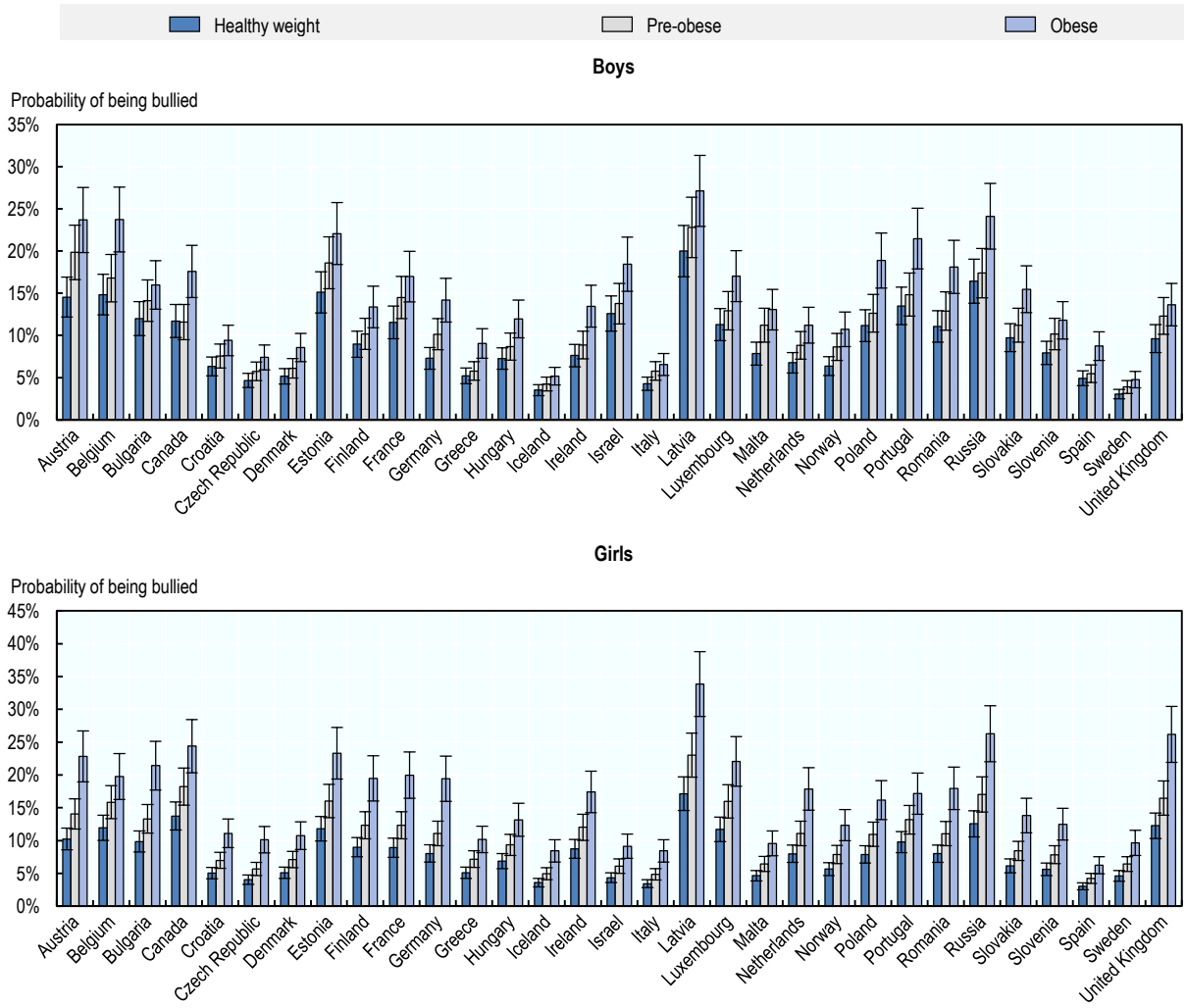
Annex 4.A. Further analyses on inequality

Annex Figure 4.A.1. Probability of being bullied, by BMI level, children aged 11-15, 2013-14, by sex and by country

Predicted probability of being bullied, with 95% confidence intervals

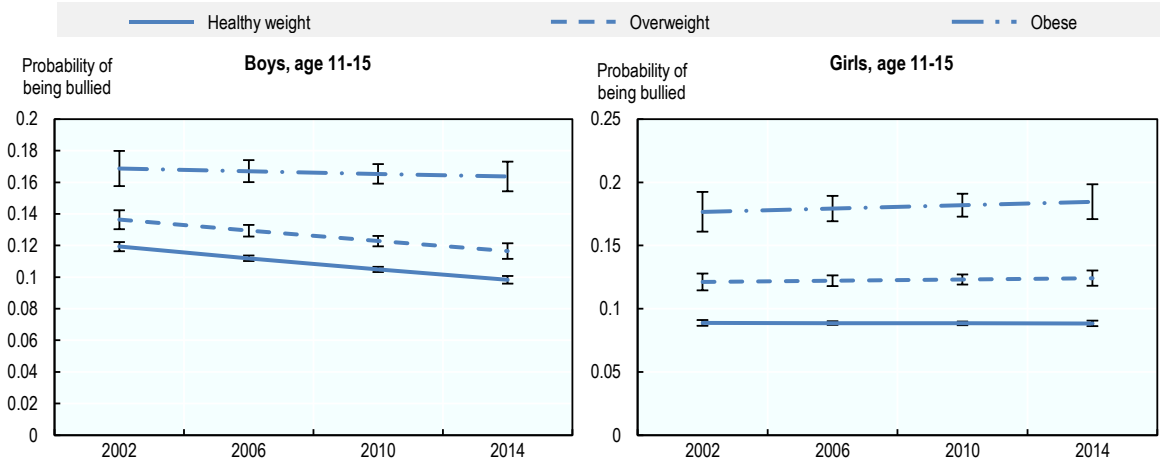


Note: Mixed model with random slope. Adjusted for age, family affluence, smoking and drunkenness in lifetime. Covariates are set at fixed values (Age 13, Middle family affluence, Never drunk, Never smoke).
Source: OECD analysis based on HBSC 2013-14.

StatLink https://doi.org/10.1787/888934007487

Annex Figure 4.A.2. Time evolution of the probability of being bullied, by BMI category and by sex, children aged 11-15, OECD countries, 2013-14

Predicted probability of being bullied, with 95% confidence intervals

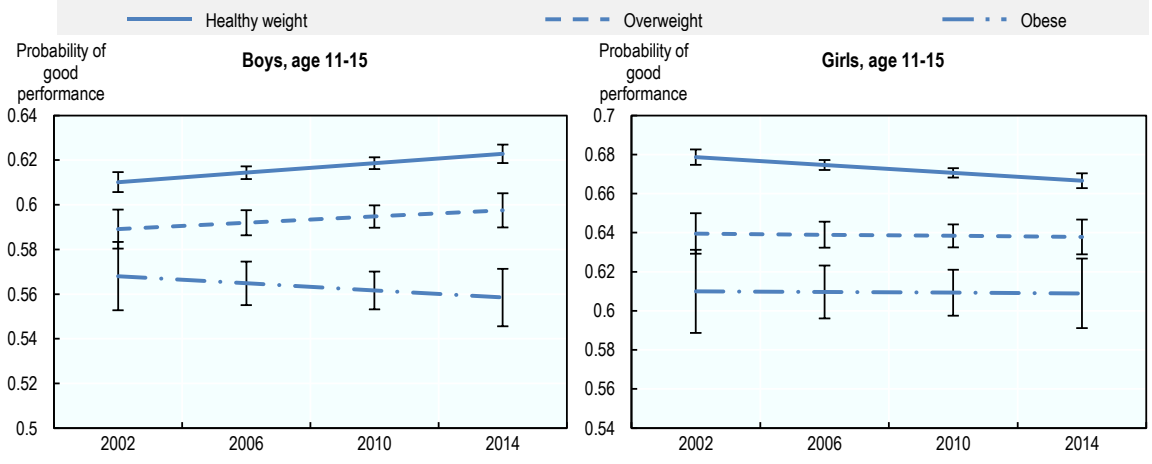


Note: Predicted probabilities obtained from logistic model, and adjusted for BMI categories, survey year, and their interaction term, as well as age, smoking status, drinking status and family socio-economic background.
Source: OECD analysis based on four waves of HBSC survey.

StatLink https://doi.org/10.1787/888934007506

Annex Figure 4.A.3. Time evolution of the probability of good school performance, by BMI category and by sex, OECD countries, 2013-14

Predicted probability of good performance at school, with 95% confidence intervals



Note: Predicted probabilities obtained from logistic model, and adjusted for BMI categories, survey year, and their interaction term, as well as age, smoking status, drinking status and family socio-economic background.
Source: OECD analysis based on four waves of HBSC survey.

StatLink https://doi.org/10.1787/888934007525

Notes

[1] Throughout this chapter, the nutritional status of individuals is defined according to WHO guidelines and thresholds and uses body-mass index (BMI). Overweight is defined as a BMI higher than 25 kg/m2; pre-obesity is defined as a BMI of 25-30 kg/m2; and obesity is defined as a BMI higher than 30 kg/m2. Obesity can be further divided into class I, class II and class III obesity. Class I obesity is the milder form of obesity and is defined as a BMI of 30-35 kg/m2; class II obesity is defined as a BMI of 35-40 kg/m2; while class III obesity is defined as a BMI over 40 kg/m2. Morbid obesity includes class II and class III obesity and is defined as a BMI higher than 35 kg/m2. Further information can be found in Chapter 2 - Box 2.1. Using body mass index (BMI) to define levels of adiposity.

[2] A confounder is a variable that influences both the dependent variable (educational outcomes) and independent variable (obesity), causing a spurious (false, or fake) association.

5 Promoting healthier diets and active lifestyles: Policies and best practices

Yevgeniy Goryakin, Sabine Vuik and Michele Cecchini

Overweight is a serious public health problem requiring a co-ordinated, multi-sectoral response. This chapter provides a broad overview of existing policy approaches, both national and international, aimed at improving diet and encouraging physical activity in OECD, EU28 and Group of 20 (G20) countries. Particular attention is paid to policies that are either innovative, or have a solid evidence base for their effectiveness, including policies that aim to influence lifestyle choices through information and education; policies that expand healthy choice options; policies designed to modify the costs of health-related choices, and policies aimed at regulating or restricting unhealthy options. Both the opportunities presented by the introduction of the selected policies, as well as the challenges associated with their implementation, are discussed.

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

Key findings

- All the countries considered in this analysis, except one, currently have a national action plan to address adult overweight; seven countries do not yet have a national childhood obesity plan.
- A large majority of countries already implement mandatory back-of-pack nutrition labelling, but only four countries have implemented front-of-pack labelling, which is recognised as the most effective option. There is still a lack of action in such areas as mandatory labelling of restaurant menus.
- Many countries strictly regulate content of certain harmful foods (e.g., trans fats and partially hydrogenated oils). Four countries have implemented taxation of foods high in calories, in particular sugar-sweetened beverages.
- Only a few countries have implemented compulsory restrictions for advertising that target children, with the majority of countries having voluntary regulations in place.
- More needs to be done to promote physical activity and a healthy diet in primary care, especially among those at risk for developing overweight-related non-communicable diseases (NCDs). About one in three OECD countries have such a policy in place, but a number of challenges may hinder its effectiveness.
- A number of innovative policies have emerged recently. Several countries have taken advantage of both traditional and new media to implement mass media campaigns to promote healthy lifestyles.
- Recognising the importance of a healthy workforce, a limited number of public and private sector employers have started to implement various workplace wellness programmes on their premises. However, such interventions can be expensive, and a cost-effectiveness analysis for them (preferably taking into account productivity benefits) should be undertaken.
- A number of improvements in urban infrastructure with the potential of benefiting both human health and the environment have been implemented. These include introducing cycle lanes and bike-sharing schemes; increasing public transport options and expanding the amount of green space However, more cross-sectoral co-operation is needed, as policies originating from other sectors may have a significant impact on population health.

5.1. Introduction

In an attempt to tackle some of the key social and environmental determinants of overweight[1] and its underlying unhealthy lifestyles, countries around the world have significantly up-scaled their policy actions. At an international level, greater impetus for action was initiated in 2011 with the first United Nations (UN) High-level Meeting on non-communicative diseases (NCDs), and continued with the adoption of an internationally agreed set of commitments and targets (Box 5.1). At a national level, the fight against overweight has advanced mainly around national action plans, sometimes developed based on the World Health Organization's (WHO) Global Strategy on Diet, Physical Activity and Health and other relevant global action plans.

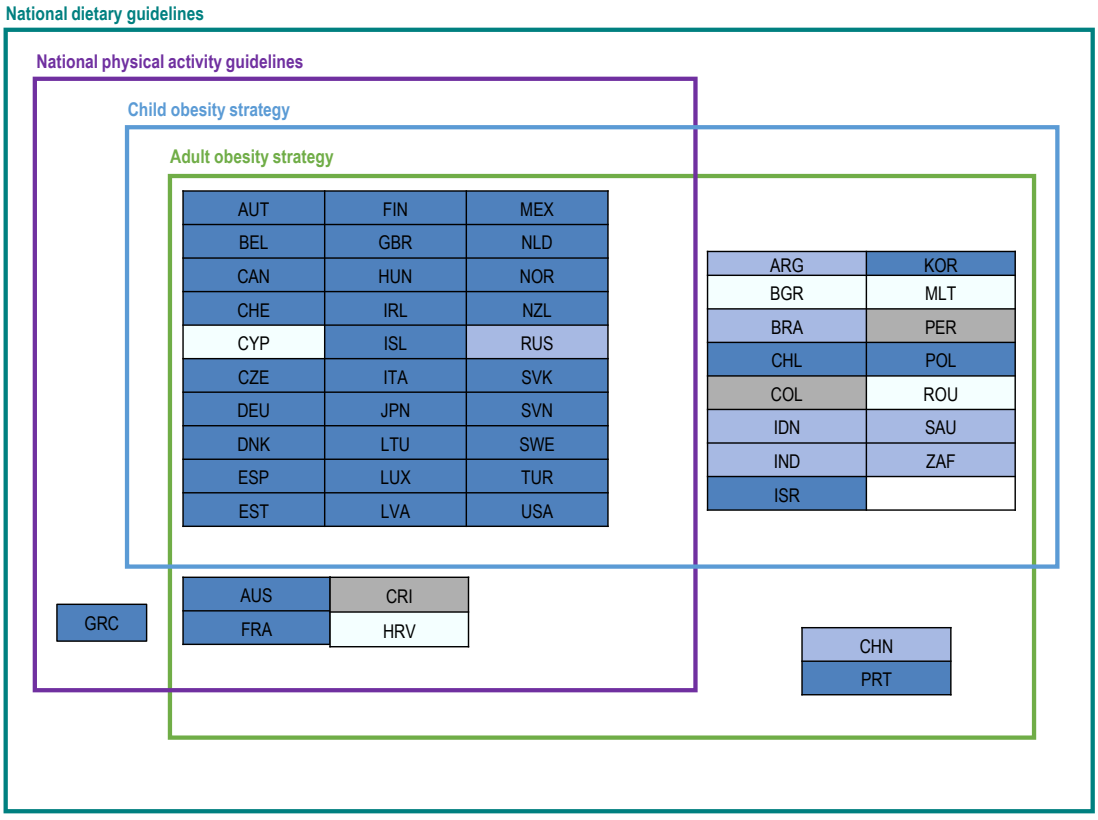
Box 5.1. Key international policy developments to tackle NCDs during the last twenty years

Since the early 2000s, there has been increasing recognition of the importance of overweight-related NCDs as a determinant of sustainable human development, as well as of the need for international co-operation to tackle the burden of NCDs. Action in this field has significantly intensified since 2011, with the first UN High-level Meeting on NCDs. Following the UN High-level Meeting, countries have committed to achieving a number of targets and goals indicated below. Previous OECD analysis concluded that reaching these targets would produce significant economic benefits (Devaux et al., 2019[1]).

- 2011: the United Nations General Assembly adopts a declaration calling to go beyond health system strengthening and to address the social determinants of health, including preventing exposure to risk factors for NCDs.
- 2013: the NCD Global Action plan is adopted by WHO, aiming to increase priority for actions to prevent and control NCDs locally and internationally. Six objectives were established, including initiatives to strengthen national capacity, governance, multi-sectoral action, health-promoting environments, people-centred primary health care and universal health coverage.
- 2013: countries agree a set of voluntary targets for risk factor reduction by 2025 compared to baseline levels in 2010, in the framework of the "Global monitoring framework on NCDs" which tracks the implementation of the WHO NCD Global Action Plan, including:
  - a 25% relative reduction in the overall mortality from cardiovascular diseases, cancer, diabetes, or chronic respiratory diseases
  - halting the rise in diabetes and obesity
  - a 10% relative reduction in prevalence of insufficient physical activity
  - a 25% relative reduction in the prevalence of raised blood pressure.
- 2015: Sustainable Development Goals (SDGs) are adopted, including a target to reduce premature mortality by one-third by 2030.
- 2018: A Global Action Plan on Physical Activity is agreed by WHO, including a target of a 15% relative reduction by 2030, using the baseline of 2016, in the global prevalence of physical inactivity in adults and adolescents.

Virtually all the OECD, EU28 and G20 countries have comprehensive policy frameworks to tackle major determinants of overweight. As of 2019, all countries included in this analysis, but one, have adopted a national action plan to address adult obesity. Seven countries so far have not implemented national obesity strategies specifically aimed at children. In many cases, countries have also developed national guidelines to promote physical activity and multi-sectoral nutritional plans, with the latter present in all the reviewed countries (Figure 5.1)[2].

Figure 5.1. National obesity action plans among OECD and other G20 and EU28 countries



Note: OECD countries in dark blue; other G20 non-OECD countries in light blue; other EU non-OECD countries in white; other countries partnering with the OECD in grey.
Source: WCRFI (2016[2]), "NOURISHING-framework" http://www.wcrf.org/int/policy/nourishing-framework; Development Initiatives (2018[3]), 2018 Global Nutrition Report: Shining a light to spur action on nutrition, https://globalnutritionreport.org/d7447a; WHO (2012[4]), Global database on the Implementation of Nutrition Action (GINA), https://www.who.int/nutrition/gina/en/; WHO (2018[5]), "Physical activity country factsheets", http://www.euro.who.int/en/health-topics/disease-prevention/physical-activity/data-and-statistics/physical-activity-fact-sheets/physical-activity-country-fact-sheets.

5.2. Multi-sectoral response is needed to target overweight determinants

While the vast majority of countries do have national plans, their portfolios of actual policy responses, as well as the level of implementation vary a lot, giving scope to further upscale action at a country level. This chapter reviews the existing national policy landscape, placing a particular focus on a limited set of policies that are either recognised as particularly innovative, or for which there is a well-developed body of evidence on their effectiveness.

In line with the OECD framework (Sassi and Hurst, 2008[6]), public health policies, including policies to tackle overweight and to promote healthier lifestyles can be categorised into the following four broad groups (also see Figure 5.2):

- policies influencing lifestyles through information and education
- policies widening the set of healthy choice options
- policies modifying the cost of health-related choices, and
- policies regulating or restricting actions promoting unhealthy choice options.

While some policies may be very effective, none of them is sufficient in isolation. For example, policy actions aiming to influence lifestyle choices through information or education are important, but not sufficient for someone living in a community where it is difficult to purchase healthy foods, or where exercise options are limited. In such cases, action plans to widen the set of healthy options are essential, such as the provision of certain infrastructure or food retail improvements. Lifestyles can also be influenced by the marketing of calorie-dense and/or ultra-processed foods, regardless of where one lives. Therefore, a certain amount of regulation may be needed, for example in the form of limiting marketing practices (especially advertising targeting children), taxation or even banning certain foods or nutrients (e.g. trans fats).

However, even these policies may not be sufficient unless other causes of the recent increase in overweight rates are addressed, such as rising income inequality or poverty (Pickett et al., 2005[7]; Drewnowski and Specter, 2004[8]). At the very least, such policies should pay particular attention to the needs of the lower socio-economic status (SES) groups, who are often the least resilient to the influence of the obesogenic environments in which they live.

Figure 5.2. Overweight policy framework and selected policy examples

Source: Broadly based on Sassi and Hurst (2008[6]), "The Prevention of Lifestyle-Related Chronic Diseases: an Economic Framework", https://dx.doi.org/10.1787/243180781313.
Note: The policy actions shown in this figure are only examples, and do not aim to represent all the options that could be implemented by countries.

5.2.1. Population-level versus targeted approach: which one is preferable?

Both population-level and targeted polices are needed to address the underlying causes of overweight. The former group includes interventions affecting different population groups without distinction, such as food labelling or environmental changes including, for example, those following the implementation of a regulation. On the other hand, targeted policies aim to affect a distinct population group, particularly those at higher risk for developing chronic diseases, such as high-risk individuals in working-age populations, or those needing primary care, or with a particularly high risk of developing overweight. Of great interest are policies designed to protect children, who are particularly vulnerable to outside influences such as advertising, which may affect their preferences well into adulthood (Connell, Brucks and Nielsen, 2014[9]).

In general, prevention policies with the most attractive cost-effectiveness profile are those reaching the largest number of individuals (Chokshi and Farley, 2012[10]), although even they should take into account various population characteristics (Hawkes et al., 2015[11]). At the same time, more targeted policies can also make a strong impact, although their cost-effectiveness is typically improved when higher-risk groups

are targeted (Rose, 2001[12]). For instance, well-designed primary care-based interventions to identify adults with overweight or other risk factors, followed by lifestyle counselling have been shown to be cost-effective and affordable for health care systems in OECD countries (OECD, 2010[13]).

A distinction potentially more important than the population or target group dichotomy is between policies that target behaviours, and those that aim to make changes to the overall environment including, for example, widening a set of choices to buy healthy food or to do more physical activity (Lean, Astrup and Roberts, 2018[14]). This distinction can be particularly important as policies in these two categories often produce unequal effects on different SES population groups. For example, mass media campaigns can target behavioural change by providing information on ways to improve diet quality, while reformulation policies aim to affect overall food supply. While both policies are population-level, and both aim to achieve similar goals, mass media campaigns may benefit educated people more, as the effectiveness of campaigns may depend on general literacy and the ability to process information quickly. Indeed, some evidence indicates the potential for mass media campaigns to generate such inequalities (Lorenc et al., 2013[15]). On the other hand, reformulation policies may have a stronger effect on the overall food system, and thus lead to a more equitable effect on health. Therefore, policies should be designed carefully to ensure that they do not lead to the exacerbation of health inequalities.

5.2.2. Inter-sectoral collaboration is key to success and may help overcome barriers to overweight prevention and control

Better coordination of actions across multiple sectors, including public-private sector collaboration, may help tackle not only overweight, but also other key public health priorities. For example, policies that reduce overweight can also help deal with such issues as climate change (OECD, 2017[16]), poverty and income inequality (Nugent et al., 2018[17]), economic productivity, absenteeism and presenteeism (Feigl et al., 2019[18]). At the same time, policies in other areas, not necessarily aiming to tackle overweight, can contribute to improved diet and physical activity. For example, actions to improve the quality of the urban built environment and air quality, such as through increasing the number of accessible parks and recreational areas, may lead to a greater amount of physical activity and better overall health, therefore lowering overweight levels (Swinburn et al., 2019[19]). Another example of synergetic policies are the actions which may simultaneously reduce congestion and pollution on the roads, as well as increase population-level physical activity, such as sustainable public transport options (Xiao, Goryakin and Cecchini, 2019[20]), or bike-sharing schemes and cycle lanes.

While potential synergies in cross-sectoral collaboration may appear obvious at first, in practice the amount of such collaboration will depend on the degree of mutual understanding of the benefits by all stakeholders. For example, urban planners, or environmental agencies, may be receptive to the health-promoting potential of public transport systems, active travel options or of green space areas, as they may already support such policy actions for other reasons. In other cases, establishing multi-sectoral collaboration can be more challenging, and may require going beyond demonstrating the health benefits of a given policy. For example, achieving necessary changes to agricultural policies or food systems is not easy, but the policy process may benefit from the evidence that such changes will also be good for the environment (Willett et al., 2019[21]), or that they can result in greater economic productivity and additional tax revenues. Likewise, there may be resistance to introducing advertising regulation, or pricing policies, but showing that they can lead not only to better health outcomes, but also to greater educational achievement, better productivity and a positive impact on public finances, may help generate the will for political action.

Finally, carefully designed collaboration between the public and private sector can be an additional lever to influence the determinants of overweight (Box 5.2). Often, the industry may be concerned that some public health actions may impose costs of doing business. There are however, ways for the industry to minimise such costs (see Chapter 7), while enjoying the benefits of more socially responsible corporate image.

Box 5.2. Potential for public-private collaboration

Carefully designed public-private partnerships (PPPs) in public health can be advantageous to all stakeholders, including industry, government and consumers. For industry, working with governments in this area can create new opportunities and market niches for healthier products. For example, in the last few years, soft drinks producers have started diversifying their portfolios to introduce products that consumers see as being a healthier choice, with the main aim being to offset the declines in the soft drinks market (Daniel B. Kline, 2018[22]). Another rationale, from the industry's point of view, is to forestall stronger legislative action by the government. For example, the United Kingdom's sugar reduction programme specifically states that if the voluntary reformulation programme with food producers does not result in sufficient progress, alternative levers will need to be used (Department of Health & Social Care, 2016[23]). Finally, this collaboration can help industry support their corporate social responsibility efforts and improve public image, while contributing to population health. For example, in Japan, the government runs a contest for company wellness schemes, rewarding the most successful ones with "excellence awards" and public recognition (OECD, 2019[24]). In Spain, the government recognises the food and beverage industry players with the NAOS Strategy Awards (Strategy for Nutrition, Physical Activity and Obesity Prevention) for their initiatives whose objectives contribute to obesity prevention through the promotion of healthy diet and/or regular physical exercise (Aecosan, 2019[25]).

From the governmental point of view, working together with the industry can mobilise more resources. In addition, by engaging with the industry and understanding their concerns and limitations, governmental institutions can develop programmes that are attractive to all participants. For instance, in Chile, the Ministry of Agriculture works with the National Federation of Independent Street Markets (covering 60% of all street traders) to provide access to healthy foods in underserved areas and to disseminate information on healthy diets (OECD, 2019[26]). In Australia, the Healthy Food Partnership Reformulation Working Group is developing reformulation targets in consultation with the industry to gauge technical feasibility (Healthy Food Partnership, 2018[27]). In Spain, a new reformulation action was initiated in 2016, involving 20 agreements with food sector associations representing more than 398 companies.

However, establishing successful PPPs to achieve public health goals is not easy, as was shown, for example, in a study on the effectiveness of self-regulation of food marketing to children (Galbraith-Emami and Lobstein, 2013[28]). Therefore, when designing such programmes, any potential for the conflict of interest should be considered and minimised, with clear objectives and accountability processes set out from the beginning. The governments should also be resistant to the use of such partnerships as purely a marketing opportunity for the industry, without actually implementing effective actions.

5.3. Policy toolkit: what options work?

As mentioned above, the set of available policies targeting the burden of overweight can be categorised into those influencing lifestyles through information and education; those widening the set of healthy choice options; those modifying the cost of health-related choices, and, finally, those regulating or restricting actions promoting unhealthy choice options. This section provides a more detailed overview of the existing policy environment.

5.3.1. Policies influencing lifestyles through information and education

Communication-based approaches through the provision of information and education represent a significant share of disease prevention policies put in place by OECD countries, and may take a number of forms. For example, they can help consumers make informed food purchases by providing relevant information on food and menu labels. They can be employed as part of health promotion and social marketing campaigns aimed at changing behaviours adversely affecting health, including through the use of mobile apps. They can also be used to support other disease prevention policies, such as aiding health education campaigns targeting schoolchildren, workers or primary care users. Although these interventions do not generally target a particular group, their effectiveness in some cases may depend on factors like the SES of the population. For example, it was found that restaurant menu labelling leads to greater calorie reduction in areas where residents are more educated and have higher incomes (Borgmeier and Westenhoefer, 2009[29]; Sinclair, Cooper and Mansfield, 2014[30]).

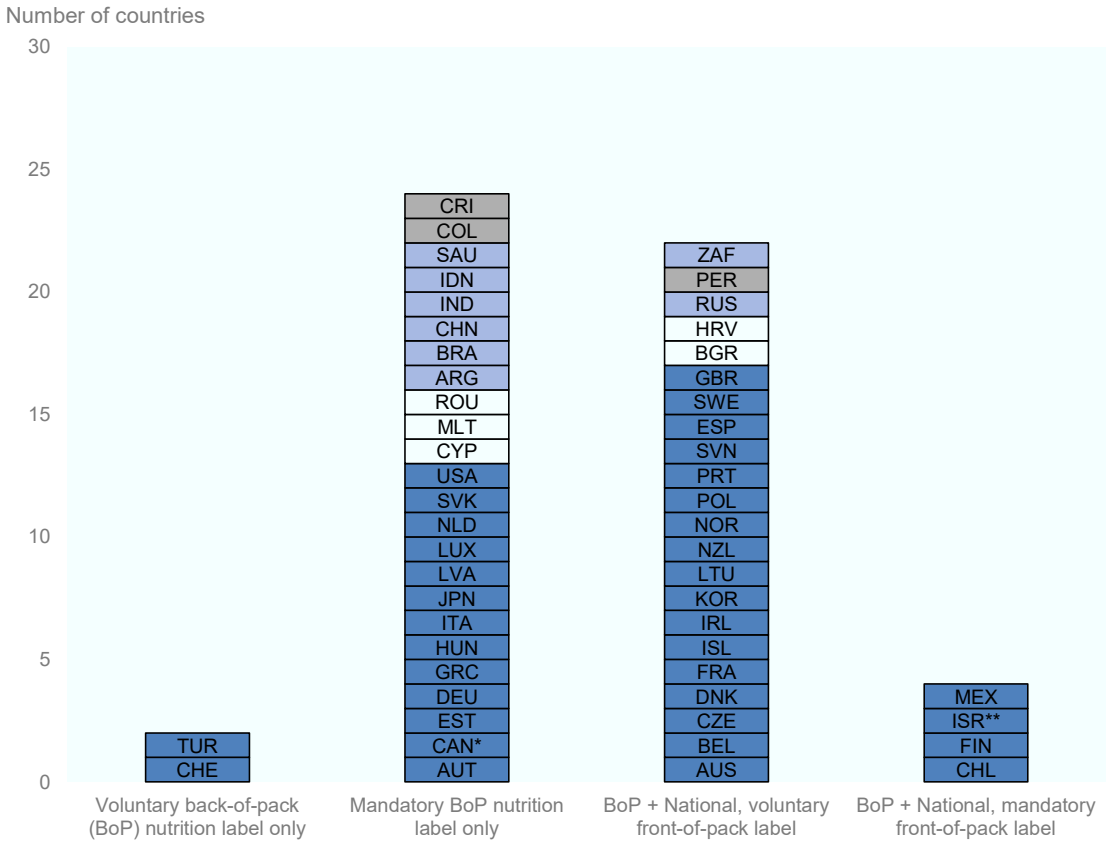
Food labelling

Food labels on pre-packaged foods aim to inform consumers about the nutritional value of foods. They can include “informative” labels containing a list of nutrients, usually put on the back, or clearly visible “interpretive” labels providing nutritional information in a more easy-to-understand format, usually put on the front. In addition, front-of-pack (FoP) labels may aim to warn about nutrients that should be consumed in limitation or avoided altogether, e.g. salt, sugar, saturated fats content, or highlight positive aspects such as dietary fibre content.

Food labels can be an effective and credible source of information for shoppers (Campos, Doxey and Hammond, 2011[31]; Sacks et al., 2011[32]). For example, a review of 58 studies conducted from 2003-2006 in the EU15 countries concluded that there was widespread consumer interest in use of nutritional information on food packages. Up to 50-60% of consumers checked nutritional labels at least occasionally in countries such as Ireland, the United Kingdom, France and Sweden (Grunert and Wills, 2007[33]). Previous OECD work has also concluded that food labelling was associated with an 18% increase in the number of people selecting healthier food products (Cecchini and Warin, 2016[34]). In Spain, high correlation was found between nutritional label use and healthier food purchases (Barreiro-Hurlé, Gracia and De-Magistris, 2010[35]). Regarding specific labelling types, it appears that FoP labels are more effective than back-of-pack (BoP) labels (Grunert and Wills, 2007[33]; Campos, Doxey and Hammond, 2011[31]). Likewise, there is evidence that multiple traffic light systems providing color-coded information about the amount of key nutrients, usually put at the front, may be more effective compared to other alternatives including, for example, guideline daily amount (GDA) labels (Hawley et al., 2013[36]).

Almost all reviewed countries require some sort of nutrition labelling on packaged foods. Mandatory BoP label is the most common form of labelling, as it is mandatory in 34 OECD countries (Figure 5.3). Conversely, mandatory FoP informative labels are still rare, as only four OECD countries implement them (Figure 5.3). Finally, in two OECD countries, BoP labelling is mandatory only in specific cases. In Turkey, BoP labelling is mandatory only when a health claim is made, while Switzerland also only has voluntary BoP labelling, unless exporting to the European Union. In the European Union, Regulation 1169/2011 on the "Provision of Food Information to Consumers” has required that the following nutrients be listed at the back-of-pack of most pre-packaged foods from 2016 onward: energy value; the amounts of fat, saturates, carbohydrates, sugars, protein and salt.

Figure 5.3. Nutrition labelling policies for pre-packaged foods among OECD (including OECD accession and selected partner countries), other G20 and EU28 countries



Note: OECD countries in dark blue; other G20 non-OECD countries in light blue; other EU non-OECD countries in white; other countries partnering with the OECD in grey.
* Canadian legislation on mandatory FoP labelling is the subject of a proposal; ** Mandatory FoP label to come into force in 2020;
Source: WCRFI (2016[2]), "NOURISHING-framework" http://www.wcrf.org/int/policy/nourishing-framework; WHO (2012[4]), Global database on the Implementation of Nutrition Action (GINA), https://www.who.int/nutrition/gina/en/; Kelly and Jewell (2018[37]), "What is the evidence on the policy specifications, development processes and effectiveness of existing front-of-pack food labelling policies in the WHO European Region?", EUFIC (2018[38]), Global Update on Nutrition Labelling.

StatLink https://doi.org/10.1787/888934007582

Box 5.3. Mandatory warning label in Chile

In 2016, Chile introduced a mandatory labelling system for pre-packaged foods, to signal to consumers products that do not meet certain criteria in terms of nutritional content. It is hoped that this system will stimulate reformulation by the industry.

Specifically, four black and white labels are used to indicate whether a certain foodstuff is high in calories, salt, sugar or fat (OECD, 2019[26]). If the food exceeds the mandated thresholds set by the government, which are among the strictest in the world, warning signs have to be placed on the package, which read "high in" followed by calories, saturated fat, sugar or sodium, as well as "Ministry of Health". If a product exceeds more than one limit, more than two signs have to be placed on the package. The thresholds have been gradually tightened over time, and are currently set at the following levels:

- Sodium (mg/100 g or ml): 400 for solid foods; 100 for liquids
- Sugar (g/100g or ml): 10 for solid foods; 5 for liquids
- Saturated fats (g/100g or ml): 4 for solid foods; 3 for liquids
- Energy (kcal/100g or ml): 275 for solid foods; 70 for liquids.

Figure 5.4. Mandatory food labels in Chile

In addition to mandatory schemes, some voluntary initiatives have also been adopted. One prominent example is the Keyhole logo, a voluntary scheme implemented in several, mostly Nordic, countries. Participating businesses can put a keyhole logo on the front of the packages of the food they sell, when it has less fat, sugar or salt, dietary fibre and whole grains, compared to other foods in the same category. One study found that about 95% of consumers were aware of the Keyhole Logo in Sweden, and that its purpose was broadly understood (Grunert and Wills, 2008[39]). Another example is the voluntary FoP summary label recently adopted in France, based on an intuitive colour scheme (Box 5.4).

Box 5.4. Nutri-Score voluntary label in France

In October 2018, France introduced a FoP label called Nutri-Score. It is used on a voluntary basis by about 90 companies including several major retailers and food processors in France and Belgium, with Spain also recently approving the use of the label (van der Bend and Lissner, 2019[40]). It is based on a five-colour scale that summarises the healthiness of a product, and provides a single, compound score, which may aid interpretation by the consumers. On the other hand, consumers who prefer to have more information about a specific ingredient (e.g. the amount of sugar), may prefer a system like the traffic light labelling in the United Kingdom, which provides separate assessments for four ingredients.

To select the most appropriate FoP label design, a randomised experiment was undertaken in France in 2016, with particular attention paid to purchasing decisions made by low-income households (Ministère des Solidarités et de la Santé, 2017[41]). The experiment took place in 60 retail stores and concerned 1 300 food products from four food categories: freshly prepared foods, pastries, breads, and canned prepared meals. Four types of FoP nutritional information systems were tested: Nutri-Score; multiple traffic lights; simplified nutritional labelling system and modified reference intakes. The Nutri-Score was found to have the strongest effect on the overall quality of the shopping cart, compared to the other labels (Ministère des Solidarités et de la Santé, 2017[41]). In addition, several experimental studies conducted in the virtual supermarket settings showed similar results (Chantal and Hercberg, 2017[42]).

Figure 5.5. Nutri-Score food label in France

Menu labelling

Restaurant menu labelling involves listing information on the calorie content, as well as on the content of other nutrients, such as salt and sugar, of items on the menu at points-of-purchase of restaurants and cafeterias. This can be done with or without contextual information like recommended daily calorie intake, or interpretive information such as a traffic light system design. It can also be done with the help of PACE (physical activity calorie equivalent) labels that indicate the number of minutes of exercise needed to burn off the calories consumed.

Emerging evidence indicates that menu labelling can positively affect consumer behaviour, and that there is strong public support for it (Mah et al., 2013[43]; Pulos and Leng, 2010[44]; Morley et al., 2013[45]). A recent systematic review and meta-analysis (Sinclair, Cooper and Mansfield, 2014[30]) of mostly mandatory initiatives found that participants who received menus with labels consumed 41 fewer calories per purchase, compared to the control group. The same study also found that contextual or interpretive labels were more effective, by reducing calorie consumption by 81 kcal. Emerging evidence also suggests that menu labelling with the exercise component (i.e. so-called PACE labelling) can be as effective as calorie labelling at reducing the number of calories ordered at fast food outlets (Antonelli and Viera, 2015[46]; Seyedhamzeh et al., 2018[47]). Similar to what has been shown for food labelling, there is tentative evidence that mandatory menu labelling, besides influencing consumer behaviour, might also encourage restaurants to reformulate their menus by offering lower calorie content (Block and Roberto, 2014[48]; Bleich et al., 2015[49]).

The introduction of menu labelling can produce unequal behavioural changes across population groups. Available evidence suggests that menu labelling may be more effective in women (Afshin et al., 2015[50]; Nikolaou, Lean and Hankey, 2014[51]); those with a higher level of education (Fernandes et al., 2016[52]); and in people who already prefer to eat healthily (Vyth et al., 2011[53]). In addition, certain barriers may hinder their impact (Thomas, 2016[54]). For example, businesses, and especially smaller establishments, may lack expertise, time or other resources to correctly estimate the amount of the nutrients to put on the menu. As a result, some businesses are concerned about potential libel risk arising from incorrect estimation of nutritional information (Thomas, 2016[54]). Nutritional information also has to be carefully presented to be both readable and aesthetically pleasing to consumers.

Mandatory menu labelling initiatives are relatively recent and therefore implemented in a limited number of settings. In the United States, all chain restaurants with at least 20 outlets have been required to show calorie information on their menus since 2018 (Cleveland, Simon and Block, 2018[55]), although several municipalities and states had implemented related legislation even earlier. In one evaluation conducted in Washington State, such legislation resulted in a per purchase decrease of calories by 38 kcal after 18 months of implementation (Krieger et al., 2013[56]). In addition, from mid-2018, these regulations have also covered operators of at least 20 types of vending machines in the United States (Dell, 2018[57]). In Australia, several states introduced legislation between 2011-18 requiring restaurant chains with more than 20 outlets in the state (or more than seven in the Australian Capital Territory), or 50 or more in the whole of Australia, to display the energy content of their menu items (Niven et al., 2019[58]). In Ontario, Canada, all food service chains, with at least 20 locations, have been required to list calorie counts on their menus since January 2017 (Ontario.ca, 2018[59]).

Mass media campaigns

Health-promoting mass media campaigns have the potential to reach many people, while affecting multiple overweight risk factors at the same time. Such campaigns can be implemented through both traditional (television, radio, newspaper) or new media (online marketing, social networks [e.g. social media]) and are often implemented at the national level, although, in some cases, they can be launched by local authorities.

Mass media campaigns are often implemented as part of a policy package, which makes evaluation of their effectiveness complicated (Afshin et al., 2017[60]). Still, a limited number of studies assessing their effectiveness do exist. For example, the "2&5" mass marketing campaign in Western Australia resulted in a population-wide increase in the mean intake of fruit and vegetable servings by about 0.2 servings per day over three years (Pollard et al., 2008[61]). In the United Kingdom, following the introduction of the Change4Life social marketing campaign (see Box 5.5) 58% people switched to lower-fat dairy products compared to 26% in the comparison group (Wrieden and Levy, 2016[62]). An OECD review of studies assessing mass media campaigns to promote an active lifestyle estimated that within one month of the intervention starting, mass media campaigns can result in a 60% increase in the number of people who are considered at least moderately active, with the effect disappearing after about 3 years (Goryakin et al., 2017[63]).

Most, if not all OECD countries, already have, or have had in the past, at least one nationally run mass media campaign to encourage healthier lifestyles. For example, there is almost universal governmental promotion of fruit and vegetable consumption, not only of the well-known "5-a-day" target (e.g. in Chile, Germany, Italy, Mexico, New Zealand, Spain) but also of other types, e.g. "6-a-day" in Denmark (Haraldsdóttir, 1999[64]), or the "2&5" campaign in Western Australia which promotes eating two servings of fruit and five servings of vegetables a day (Pollard et al., 2008[61]). There are also examples of governmental programmes encouraging physical activity, such as the "Eat Move" campaign in France or Change4Life campaign in England and Wales (see Box 5.5).

Increasingly, such campaigns are provided through innovative channels, such as the "Choose to Live Healthily" campaign in Chile (*Elige vivir sano*) which is distributed with the help of an online component, e.g. using a web-based tool to calculate calorie intake and to create an agenda for health events. In the Netherlands, the Nutrition Centre has been in charge of several online public health campaigns encouraging healthier food choices, for example by providing recipes and tips for healthier eating through a dedicated website, mobile apps and an online tool (Wammes, Oenema and Brug, 2007[65]).

When designing mass media campaigns, it is important to take into account a number of challenges. For example, they are usually time-limited and not necessarily repeated on a regular basis. In addition, while innovative approaches to disseminating information may offer promising avenues to reach out to certain population groups, especially to the younger population, it is important to make sure that such policies do not create digitally-driven inequalities in health (Neter and Brainin, 2012[66]). Therefore, the use of more traditional channels, such as television and printed media, should also be maintained. More generally, mass media campaigns should be designed while keeping the needs of all people, and especially those living in the economically and socially underprivileged communities, in mind. Thus, promotion of healthy lifestyles should go hand in hand with ensuring that sufficient healthy options are available for those wishing to take advantage of them.

Box 5.5. The Change4Life mass media campaign in England and Wales

Change4Life (C4L) is an ongoing social marketing campaign established in 2009 to tackle the overweight problem in England, through the promotion of healthy food choices and physical activity (Levy, 2013[67]). C4L is a preventative policy designed to provide healthy lifestyle advice, also with tips for reducing alcohol intake and helping families to find local sports activities. Both children and adults are targeted through press, radio advertisement campaigning and a website.

Change4Life promotes healthy weight through a programme of eight behavioural changes:

1. reducing intake of fat, particularly saturated fat (Cut Back Fat)
2. reducing intake of added sugar (Sugar Swaps)

3. controlling portion size (Me Size Meals)
4. eating at least five portions of fruit and vegetables per day (5 a Day)
5. establishing three regular mealtimes each day (Meal Time)
6. reducing the number of snacks (Snack Check)
7. doing at least 60 minutes of moderate-intensity activity per day (60 Active Minutes)
8. reducing time spent in sedentary activity (Up and About).

The Government decided to avoid a visible involvement in the campaign, to guarantee the idea of a bottom-up movement where the main actors are children and their families. According to one evaluation (Wrieden and Levy, 2016[62]), three weeks after the start of the campaign, 32% of the intervention group had purchased a lower-sugar drink compared with 19% of the comparison group; and 24% had made a change to a lower-sugar cereal compared with 12% of the comparison group.

New technologies

More recently, a number of countries have shown increasing interest in testing new electronic tools designed to promote various health-related behavioural changes (Leahey et al., 2016[68]; Schippers et al., 2017[69]; Semper, Povey and Clark-Carter, 2016[70]). Among them are applications, which can help individuals count the numbers of steps they walk in a day, or estimate calories consumed. Individuals can also take advantage of various technological options, which can, for example, link calorie information to product barcodes that can be scanned by phones; generate charts on trends in calorie consumption and physical activity levels; provide information on nearby health and wellness events/facilities; and promote health behaviours through various rewards programmes. In the simplest form, such tools can deliver health information as text messages (Hall, Cole-Lewis and Bernhardt, 2015[71]), or they can operate as more complex E-health behavioural interventions, including, for example, mobile health apps, computer-assisted personalised feedback, web-based courses and interactions over social media (Hutchesson et al., 2015[72]; Oosterveen et al., 2017[73]).

Emerging evidence indicates the potential of such technologies to positively affect health outcomes. For example, a recent systematic review and meta-analysis concluded that the use of mobile phone applications is related to a significant decrease in body mass index (BMI) of about 0.43 kg/m^2 (Mateo, Granado-Font et al. 2015). Nevertheless, the uptake and usage of most apps can also be quite low (Yoganathan and Kajanan, 2013[74]; Neubeck et al., 2015[75]). For example, a US study estimated that over half of all health apps on the iTunes store were downloaded no more than 550 times (Neubeck et al., 2015[75]). The uptake of mobile apps may depend on various factors, such as the spread and intensity of the marketing campaigns promoting their use, as well as privacy-related concerns (Neubeck et al., 2015[75]).

There are already some examples of such technologies in practice. In Austria, an online tool enables the comparison of sugar, salt, fat and energy content of foods across different product categories (lebensmittellupe.at, 2019[76]). Likewise, in Estonia, the National Institute for Health Development implemented a web-based tool to help households calculate the amount of salt and sugar in their diet, and software to check the nutritional value of products by name or brand (Toitumine.ee, 2019[77]). In England, the family-oriented Change4Life campaign ran the targeted “Smart Swaps” campaign in 2014 to help reduce sugar, saturated fat and salt consumption by providing healthy tips and recipes through a dedicated website and mobile apps. They also promoted the “Be Food Smart” app that provides sugar, saturated fat and salt content in packaged products by scanning the barcode. Some other examples of such technologies are shown in boxes Box 5.6 and Box 5.7.

Box 5.6. Mobile app platform for overweight prevention in Singapore

The Health Promotion Board (HPB) is a governmental organisation that implements health promotion campaigns and disease prevention programmes in Singapore. HPB launched a mobile app called Diet and Activity Tracker (iDAT) in 2011, which helps individuals count their calorie intake by recognising components of over 1 000 dishes and beverages, and also helps them track their physical activity levels (Goryakin et al., 2017[63]). In 2016, iDAT was replaced by Healthy 365, a platform complementing the extension to the National Steps Challenge (NSC) programme, encouraging individuals to attain more steps every day. NSC leverages the use of technologies such as a steps tracker and HPB's Healthy 365 mobile app, to nudge participants towards a more active lifestyle. For example, anyone who downloads Healthy 365 and chooses to participate in the National Steps Challenge (NSC) can be ranked on their physical activity performance through a mobile tracking mode system. Participants can also earn various rewards, thanks to commercial agreements with sport centres, wellness companies, or food and beverage industries. In March 2016, 156 000 sign-ups for the National Steps Challenge were recorded through Healthy 365 (Goryakin et al., 2017[63]). It was also found that 58% of participants were still active over a four-month period.

Box 5.7. Be He@lthy, Be Mobile joint venture between WHO and ITU

The "Be He@lthy, Be Mobile" (BHBM) is a joint initiative between the International Telecommunication Union (ITU) and the WHO established in 2013. BHBM is the first UN initiative to use population-wide mobile health (mHealth) prevention services at scale, and claims to be the largest-scaled mHealth initiative for NCDs in the world.

The main goal of BHBM is to encourage and facilitate partnerships between Ministries of Health, Ministries of Information and Communication Technology, academia and local civil society, with the goal of scaling up national mHealth programmes for NCD prevention and management. Specifically, the initiative aims to leverage the power of mobile technology to deliver a number of public health messages. In addition, other mediums for information dissemination are being considered for the future, including interactive voice response systems, web-based messaging platforms, audio systems, and tablet devices. BHBM programme is also exploring opportunities afforded by artificial intelligence and big data for health promotion and disease prevention, for example by improving diagnosis and treatment decision-making processes.

BHBM now works mostly in low and middle-income countries: India, Philippines, Senegal, Zambia, Tunisia, Egypt and Costa Rica, and is in a preparatory phase in Sudan and Burkina Faso. It is also active in two OECD countries, Norway and the United Kingdom. So far, more than 3.5 million people have received messages through BHBM programmes. Independent impact evaluations have confirmed, for example, that there was a 19% quit rate amongst participants in the mTobaccoCessation programme. In Zambia, mCervicalCancer programme resulted in a 6% increase in cervical cancer screenings.

Currently, the focus of the programme is on helping people to stop smoking, exercise and eat healthy. It also aims to increase awareness about diabetes, breast and cervical cancer. BHBM and WHO have started collaborating with a leading internet company to facilitate sharing health advice through new and innovative platforms. For example, WHO considers reaching out to more people through an app for fitness to share its physical activity recommendations (WHO, 2019[78]).

Prescription of physical activity by primary care doctors

Physicians may be in a good position to provide advice on proper nutrition (Ockene et al., 1999[79]), including diet, or better yet, to combine the prescription of physical activity with a nutrition education component (Elliot and Hamlin, 2018[80]). Primary care settings also present an obvious opportunity to provide information and advice on healthy lifestyles and to encourage physical activity, especially among the at-risk population groups. In developed countries, up to 80% of the population visit their general practitioner (GP) at least once a year (Sanchez et al., 2015[81]), implying that GPs may be ideally suited to provide advice on adequate physical activity levels. Such advice can take the form of general behavioural counselling (Grossman et al., 2017[82]), or more formal prescribing (Goryakin, Suhlrie and Cecchini, 2018[83]).

There is already good evidence that prescribing physical activity in primary care settings may increase the physical activity levels of sedentary patients, at least in the short-term (Orrow et al., 2012[84]; Campbell et al., 2015[85]; Sanchez et al., 2015[81]; Lin et al., 2010[86]). According to a recent systematic review and meta-analysis, prescribing physical activity for people at risk of developing chronic diseases may increase physical activity by about 56 extra minutes of moderate-level exercise per week, which can account for about a third of the 150 minutes per week of moderate exercise recommended by WHO (Goryakin, Suhlrie and Cecchini, 2018[83]). There is also evidence that counselling by dieticians can contribute to improving the quality of diet (Hebert et al., 1999[87]).

Physical activity on prescriptions programmes exist in at least one-third of OECD countries. For example in the United Kingdom, they were introduced as early as 1990s, and in Scandinavian countries- in the 2000s (for a Swedish example, see Box 5.8). They have also been introduced in Germany, the Netherlands (Box 5.9), Austria, Belgium, Spain, Portugal, the United States, Canada, New Zealand and Australia (Arsenijevic and Groot, 2017[88]). The programme design varies. For example, in some countries, prescriptions are given by GPs, while in others by nurses or other health professionals. Prescribed physical activity can be facility, home-based, or both, and may be limited to aerobics, or include other activity types, such as walking, swimming or gardening. Programme duration can also vary (Arsenijevic and Groot, 2017[88]).

Such policies should be designed carefully to take into account a number of challenges. For example, although they are generally more effective when the meetings between physicians and patients are frequent (Goryakin, Suhlrie and Cecchini, 2018[83]), this also implies greater programme cost. In addition, community support, including, for example, access to local walking clubs and aerobic classes, may be needed for better programme effectiveness (Estabrooks, Glasgow and Dzewaltowski, 2003[89]), which again may imply the need for additional resources. Recruitment of physicians may be challenging, with some studies citing their lack of interest, time constraints and concerns about understaffing levels, among the causes hindering the implementation of this intervention (Aittasalo et al., 2006[90]). Programme implementation may also be hindered by lack of health literacy among patients and by various barriers to sustaining behavioural change over time (WHO, 2016[91]). At the same time, medical professionals mention such constraints as lack of dedicated clinical guidelines, especially in relation to risk assessment, inadequate referral schemes and lack of coordinated patient pathways, as well as insufficient financial mechanisms incentivising prevention (WHO, 2016[91]). In some countries, medical curricula may also inadequately emphasise the benefits of prevention (Allan et al., 2004[92]). Therefore, in practice, many of the target individuals, potentially benefitting from this intervention, may not actually receive the counselling in the countries in which prescription of physical activity is currently implemented.

Box 5.8. Prescribing physical activity in Sweden

The Swedish physical activity on prescription programme was selected as a best practice example by the European Commission (European Commission, 2019[93]). This is a patient-centred counselling programme, in which patients at risk of developing NCDs receive written individualised prescriptions from a medical worker (who may be any qualified licensed health care practitioner, and not necessarily a medical doctor), for both everyday physical activities, as well as for aerobic fitness, strength and flexibility training. The prescription also specifies duration, frequency and intensity of the exercise. There is also a formal follow-up procedure, the results of which go into the patient's medical record. The ultimate aim of this scheme is to help patients integrate physical activity into their daily lives (Kallings, 2016[94]). An evaluation concluded that the programme significantly contributed not only to increases in self-reported moderate physical activity level at least once a week, from 19% to 36%, but also to better quality of life (Kallings et al., 2008[95]).

Box 5.9. Prescribing physical activity in the Netherlands

Since 2002, physically inactive patients at higher risk of cardiovascular diseases (CVDs), hypertension or type two diabetes who live in the Netherlands can be enrolled into the exercise on prescription programmes. Before issuing a prescription, GPs talk to patients to evaluate their commitment to participating in the programme as well as to pay a one-time fee of up to 100 euros. If this commitment is obtained, GPs issue a formal written prescription, which the patients then take to the exercise clinics, where they undergo a health assessment, and attend a counselling session (Sørensen et al., 2011[96]). An evaluation of the programme established that after four months of participation, up to 30% of patients increased their physical activity levels, and up to 25% experienced improvements in their quality of life (Sørensen et al., 2011[96]).

5.3.2. Polices designed to widen choices

Although policies influencing lifestyles through information and education are important, they may not be sufficient if the local environment presents limited opportunities to engage in healthy lifestyles. For example, prescribing physical activity may be ineffective if there is a lack of safe, walkable and green spaces. Likewise, encouraging people to eat more fruits and vegetables through mass media campaigns may be of limited value if the opportunities to buy healthy food are limited, or if food preparation skills are lacking. Although a systematic, multifaceted response is needed to achieve favourable long-term outcomes, with one promising example being the Milan Urban Food Policy Pact (see Box 5.10), initially the changes to the community environment do not necessarily have to be drastic. For example, there is evidence from four cities in South and North America that the policies of closing streets to traffic even temporarily to encourage physical activity can be highly cost-beneficial (Montes et al., 2012[97]).

Box 5.10. Milan Urban Food Policy Pact

As more than 50% of the world's population currently lives in urban areas (with the proportion expected to increase significantly in the coming years), ensuring an equitable and environmentally sustainable supply of healthy food in urban areas is critically important. The Milan Urban Food Policy Pact is a voluntary international protocol committing the parties to the agreement to develop resilient, inclusive, diverse and sustainable food systems designed to provide healthy, accessible and affordable food to all people, while protecting biodiversity and reducing food waste (Milanurbanfoodpolicypact, 2019[98]). The protocol was announced in 2014 in Johannesburg during a C40 meeting (see Box 5.15), and signed in 2015 in Milan, by mayors of more than 100 cities at the time of EXPO 2015. Currently, almost 200 cities are signatories to the Pact, benefiting from information and standards sharing, as well as from various relevant joint actions. Although the Pact is voluntary, a number of cities are interested in monitoring their progress in meeting various relevant indicators reflecting six main focus areas of the pact: food governance; sustainable diets and nutrition; social and economic equity; food production; food supply and distribution; food waste. The Food and Agricultural Organization supports this initiative by developing performance indicators to measure progress, as well as by helping disseminate relevant best practices (Milanurbanfoodpolicypact, 2019[98]).

School-based and other environmental policies that can influence children

As children are in early stages of their lives, they are only just beginning to develop critical thinking skills and learning to exercise self-control, which makes them particularly vulnerable to outside influences. For example, they share their parents' diet and acquire exercise-related habits from them. Children's food learning can also be affected in other ways, and as early as when they go to nursery school. In school, they may be affected both by the food options that surround them, and by their peers. Their choices are also influenced by the broader environment in which they live. For example, some communities may provide accessible options to exercise or buy healthy food, while others may be described as "food deserts" or "food swamps" (Saunders, Saunders and Middleton, 2015[99]). Therefore, the health-related behaviours of children can be affected not only through policies that specifically target them, but in many other ways, too (see Box 5.13).

There are various interventions designed to encourage healthy lifestyles among children (Wang et al., 2015[100]; Nooijen et al., 2017[101]). A meta-analysis of studies combining intensive classroom physical activity lessons led by trained teachers, moderate-to-vigorous physical activity sessions, distribution of nutritional education materials and provision of healthful foods, found that such interventions can reduce BMI by an average of 0.3 kg/m^2 (Wang et al., 2015[100]). However, although creating right conditions in schools is important, it is alone unlikely to achieve a long-term impact without the involvement of other family members, or improving community environment as a whole. For example, one review found stronger evidence for school-based programmes including the involvement of other family members or a community, compared to the purely school-based ones (Van Sluijs, McMinn and Griffin, 2008[102]). In addition, family-based programmes, where education is provided to parents on the value of physical activity in their children, as well as on the practical steps of achieving it, can increase physical activity by a standardised mean difference of 0.41 (Brown et al., 2014[103]).

Some concrete examples of such policies include the EU School Fruit Scheme, launched in 2009 (Box 5.11). Another example is the Coordinated Approach to Child Health in the United States (CATCH), a comprehensive intervention to promote healthy eating in school cafeterias, and encourage physical activity by providing, for example, necessary physical equipment in elementary schools (Coleman et al., 2005[104]). In Australia, a programme called Crunch&Sip® promotes consumption of fruit, vegetables and water during class time (Nathan et al., 2012[105]), by providing a daily classroom break that allows students

to eat fruits and vegetables, as well as by distributing various educational resources. In Slovenia, the "Kids to kids" programme teaches primary school pupils to prepare healthy meals (Kuhnapato.si, 2019[106]). In Chile, schoolchildren benefit from a comprehensive "Contrapeso" ("Against Overweight") programme provided by the Ministries of Health, Education, Sports and Agriculture, which includes improvements in the quality of food provided to students in school, as well behavioural interventions (e.g. based on gamification) to promote physical activity (OECD, 2019[26]).

Box 5.11. EU school fruit, vegetables and milk scheme

The EU school fruit and vegetable scheme was launched in 2009, with the view to encouraging healthy eating habits among children at school. It distributed fruit and vegetables to schools throughout the European Union, using funding from the EU Common Agricultural Policy. In 2017, the programme was replaced with the broader scheme, which also added the separate milk component. More recently, the EU High Level Group on Nutrition and Physical Activity has recommended that the Member States only fund the distribution of products with no added sugar under this scheme (European Commission, 2018[107]). Following on this recommendation, an additional two Member States have decided to only subsidise milk without added sugar in their primary schools (European Commission, 2019[108]).

The programme has several guiding principles, including the provision of fresh, seasonable fruit and vegetables and exclusion of products with added sugar, salt, fat and artificial sweeteners. The EU budget for the scheme is EUR 250 million annually, including EUR 150 million for fruit and vegetables, and EUR 100 million for milk (EC, 2019[109]).

School-based programmes may also include certain regulations. Thus, in 35 reviewed countries, there are already mandatory nutritional standards for schools, while in another 15 such standards are voluntary (Figure 5.6). For example, in the United States, a nation-wide US Healthy, Hunger-Free Kids Act (HHFKA) was introduced in 2010. One of its aims is to limit the amount of saturated fat, salt and added sugars that is permitted in food sold on school premises (Schneider et al., 2012[110]). Other examples include local area bans on vending machines in elementary schools in Arkansas, the District of Columbia, Florida, Indiana and Texas (bridgingthegapresearch.org, 2013[111]); advertising restrictions in schools (Palakshappa et al., 2016[112]); or healthier food procurement requirements for school nutrition programmes, as in Slovenia, where governmental dietary guidelines for food provided in schools are complemented by food procurement standards (Gregorič et al., 2015[113]). For more information about public procurement in schools, see Box 5.12.

Box 5.12. Public procurement in schools

Procurement mechanisms can be a useful tool to encourage healthier food consumption among schoolchildren, especially given a large share of the total social food service market accounted for by the educational sector (estimated to be around 30% in Europe) (Caldeira et al., 2017[114]). As lunch meals can account for about 35% of the total daily energy (Caldeira et al., 2017[114]), such policies can bring about not only health benefits, but also contribute to better school performance and therefore to long-term human capital accumulation. Property executed food procurement schemes may also reward businesses that are driven not just by the profit motives, but are also cognisant of the broader societal consequences of their practices.

Public procurement of school meals may apply both to the purchases of raw food materials to be prepared subsequently in the school cafeterias, and to the partial or full contracting out of food catering services to the third parties (Caldeira et al., 2017[114]). Despite the potential benefits of well-designed

procurement programmes, there are substantial challenges to implementing them in practice. For example, it may be difficult to translate the nutritional guidelines into actionable procurement requirements, especially given a number of other criteria that need to be taken when contracts are awarded (e.g. price; quality; non-discrimination; environmental sustainability). Evaluation of bids and monitoring the compliance with the procurement requirements may also be expensive and time-consuming. Recognizing this, the European Commission has recently prepared a tool aimed at helping schools draft better food catering contracts (European Commission, 2019[108]). There may also be difficulties in bringing the chefs and the kitchen staff on board, as they may have alternative views on the food they would like to prepare. In some cases, specific mandatory school food standards may be unclear or even absent (Caldeira et al., 2017[114]).

Figure 5.6. School-based nutrition standards

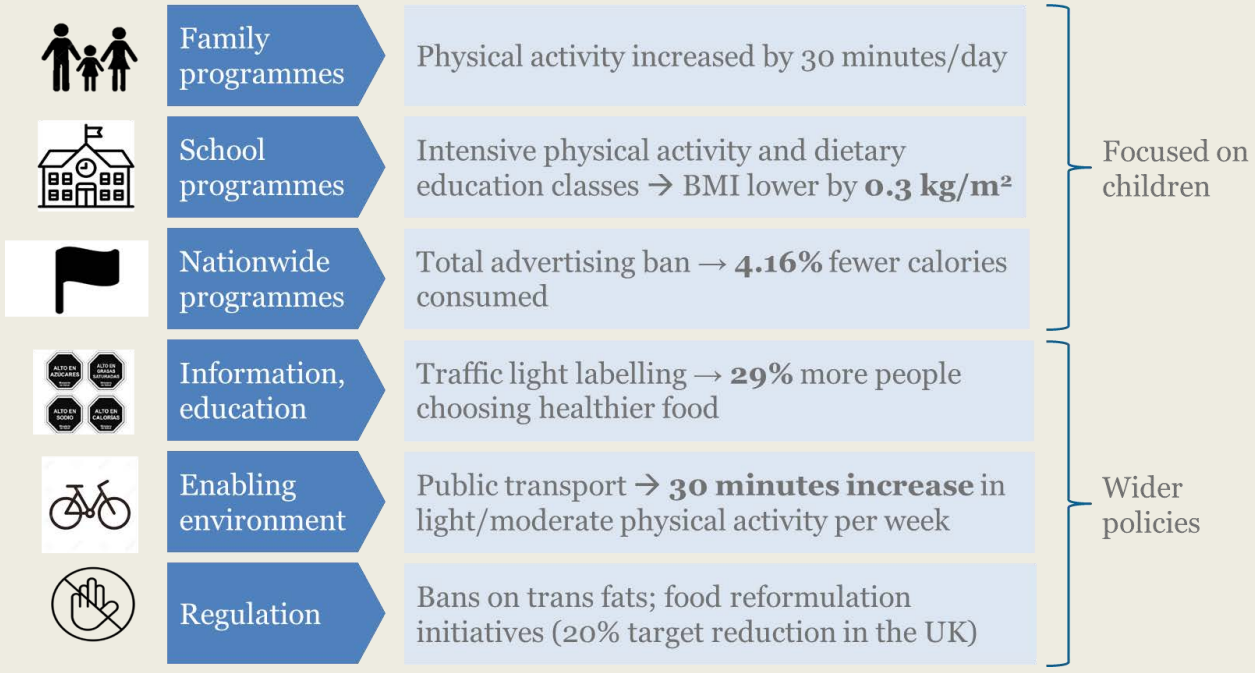
Note: OECD countries in dark blue; other G20 non-OECD countries in light blue; other EU non-OECD countries in white; other countries partnering with the OECD in grey.
Source: WCRFI (2016[2]), "NOURISHING-framework" http://www.wcrf.org/int/policy/nourishing-framework; WHO (2012[4]), Global database on the Implementation of Nutrition Action (GINA), https://www.who.int/nutrition/gina/en/; EU-JRC (2015[115]), School food policy country factsheets; WHO (2019[116]), WHO European Database on Nutrition, Obesity and Physical Activity (NOPA); FAO (2019[117]), Nutrition guidelines and standards for school meals: a report from 33 low and middle-income countries.

StatLink https://doi.org/10.1787/888934007601

Box 5.13. Overweight prevention in children

In addition to policies that are designed to target children, such as family and school-based programmes and advertising restrictions, there are other polices that have the potential to reach this population group. For example, food and menu labelling, improving the urban environment and regulatory changes such as taxations, reformulations, or even bans on certain unhealthy ingredients can all affect children directly or indirectly through their parents.

Figure 5.7 Types of programmes that can prevent obesity in children



Source: Brown et al. (2014[103]), "Family-based interventions to increase physical activity in children: A meta-analysis and realist synthesis protocol", http://dx.doi.org/10.1136/bmjopen-2014-005439; Wang et al. (2015[100]), "What childhood obesity prevention programmes work? A systematic review and meta-analysis", http://dx.doi.org/10.1111/obr.12277; Goryakin et al. (2017[63]), "The Role of Communication in Public Health Policies: the Case of Obesity Prevention in Italy", http://www.salute.gov.it/imgs/C_17_pubblicazioni_2647_allegato.pdf; Cecchini and Warin, (2016[34]), "Impact of food labelling systems on food choices and eating behaviours: a systematic review and meta-analysis of randomized studies", http://dx.doi.org/10.1111/obr.12364; Xiao, Goryakin and Cecchini (2019[20]), "Physical Activity Levels and New Public Transit: A Systematic Review and Meta-analysis", http://dx.doi.org/10.1016/j.amepre.2018.10.022; Tedstone et al. (2018[118]), Calorie reduction: The scope and ambition for action.

Workplace policies

As adults spend a large portion of their lives in employment, workplace-based actions are increasingly considered as a potentially effective tool to influence choices favouring healthier lifestyles. For example, such policies can achieve dietary improvements through changes in the selection of daily menus and snacks provided in workplace cafeterias (Geaney et al., 2016[119]; Allan et al., 2017[120]), or can promote physical activity and reduce sitting time through the provision of sit-stand workstations (Chu et al., 2016[121]). As a complementary action to changes in the working environment, employers have started implementing workplace wellness programmes, which may provide various educational materials, classes, seminars, group activities and individual counselling sessions encouraging healthy lifestyles, as well as give incentives such as bonuses and reimbursements to encourage participation (Baicker, Cutler and Song, 2010[122]).

From the employers' point of view, such programmes may be attractive for at least two reasons. First, the implementation of such programmes can generate reductions in absenteeism-related costs while increasing productivity among employees (Baicker, Cutler and Song, 2010[122]). Second, companies implementing such programmes are generally favourably seen by potential and current employees, which helps improve their corporate image and their ability to attract and retain talent (OECD, 2019[24]).

The evidence on the effectiveness of such programmes is still limited, but results from selected studies, including some meta-analyses, appear to be promising, at least in relation to short-term outcomes. For example, a two-year multicomponent workplace programme which included actions to promote a healthy diet, including through information events and education awareness campaigns, was found to increase consumption of fruit and vegetables by 0.3 servings a day (Afshin et al., 2015[50]). Similarly, workplace interventions involving changes in the surrounding environment to encourage less sitting time, for example through the provision of sit-stand workstations and treadmill desks, were found to reduce sitting time by 72.78 min per eight hour workday (Chu et al., 2016[121]). A workplace wellness programme, entailing such components as health risk assessment for employees, group activities and individual counselling about healthy lifestyles, as well as provision of various incentives such as performance-related bonuses or reimbursements to encourage participation, was found to reduce BMI by up to 0.64 kg/m^2 at the 12 month mark (Penalvo et al., 2017[123]). On the other hand, questions remain about long-term effectiveness and sustainability of such programmes, especially in smaller companies (McCoy et al., 2014[124]).

Although interest in such programmes is growing, they are still relatively infrequently implemented in OECD countries, and when they are, there are usually no evaluations of their effectiveness. One notable exception is Japan, where such programmes are very popular (Box 5.14). Another example of an incentive-based multicomponent workplace programme is the one managed by the Vitality Group in South Africa, with the emerging evidence suggesting its effectiveness not only in terms of encouraging such behaviour as healthy eating, but also in relation to reducing health expenditure (see Box 5.15). In Ireland, a National Workplace Wellbeing day was launched in 2015 with the stated aim to promote physical activity and better nutrition in the workplace, with more than 700 companies participating in 2019 (Civil Service Employee Assistance Service, 2018[125]).

Box 5.14. Workplace health programmes in Japan

Central and local governments in Japan provide various incentives, usually in the form of awards, for employers, both public and private, to implement workplace health promotion programmes. These programmes often focus on affecting such risk factors as unhealthy diet, physical inactivity, harmful alcohol consumption, smoking and mental well-being (OECD, 2019[24]). The activities are often carried out in small teams so that people can better motivate each other.

In general, the scope and comprehensiveness of such programmes is directly proportional to the size of the company, although as a rule, they comprise both targeted (e.g. health check-ups to identify people at higher risk of NCDs), and population-level approaches (e.g., menu labelling and healthier foods offers in canteens, provision of pedometers and installation of standing desks to encourage physical activity).

The participation rates in such programmes are usually very high, which may be due to both cultural reasons, as well as owing to the provision of various incentives. For example, rewards such as money, additional leave or other benefits may be given to participating employees based on meeting various targets, such as walking a minimum number of steps, or reaching a certain BMI threshold.

While promising, there is still a lack of data on the long-term effectiveness of such programmes, with some companies reporting improvements in health outcomes, reduction in absenteeism as well as savings in health expenditure. Conversely, some other companies failed to identify any positive changes, which may partly be due to the methodological limitations in the analyses.

Box 5.15. Privately managed health prevention programme in South Africa

Discovery Health, a private health insurer, has developed and has been running one of the most well-known examples of a privately-managed health prevention programme. The Vitality programme was first rolled out in South Africa to be subsequently extended to other markets, including the United Kingdom, the United States and China (Lambert and Kolbe-Alexander, 2013[126]). Participation in the programme is voluntary and membership is offered for a nominal fee equivalent to about USD 20 per month. However, in some cases, the fee paid by the participant is significantly smaller. For example, in the United States, almost 90% of the membership fee for the Vitality programme is covered by the employers (Lambert and Kolbe-Alexander, 2013[126])

This incentive-based programme rests on four pillars: assessment and screening, healthy choices, health knowledge and physical activity. Beneficiaries are encouraged to participate in different health-related activities such as health checks, exercising and eating healthy. Those who are sufficiently active are given bonus points, which can be exchanged for various rewards, such as upgrade in Vitality health status, free beverages or movie tickets, or discounts at various participating businesses. In addition, gym memberships are subsidised, and fruit and vegetable purchases are eligible for a cash rebate. It was found that the cash rebate has been effective in increasing expenditure on healthy foods by 9.3%, and decreasing spending on less healthy food by 7.2% (Sturm et al., 2013[127]). The Vitality programme was also found to reduce medical care costs, which created an additional incentive for private insurers to invest in prevention. For example, compared to Vitality members not participating in the programme, participants have about 15% lower hospital-related costs for cancer, 21% lower hospital costs for endocrinal and metabolic syndrome, and 7% lower for cardiovascular diseases (Patel et al., 2010[128]).

Policies promoting active transport and walking

There are numerous examples of policies designed to make it easier for people to integrate physical activity into their daily lives through active travel and walking. They can include, for example, access to dedicated cycle lanes and bike-sharing schemes. Other actions can also include urban planning to increase the number of parks, recreational areas and green spaces, as well as expanding access to convenient public transport options to encourage people to switch from car use and to walk more to reach their destinations.

Active travel options, such as travelling by bicycle, can increase physical activity and decrease the need for passenger vehicles, and ultimately improve physical (Martin et al., 2015[129]; Otero, Nieuwenhuijsen and Rojas-Rueda, 2018[130]) and mental health (Martin, Goryakin and Suhrcke, 2014[131]). The evidence on the effectiveness of interventions to encourage greater bicycle use is still emerging, although some early results are promising. For example, three years after a walking and cycling route was built in a city in Brazil, those living less than 500 meters away from it increased their walking and moderate-to-vigorous physical activity by about 50 minutes per week, compared to almost no change in those who lived 1 000-1 500 meters away (Pazin et al., 2016[132]). Physical activity can also be encouraged by better access to public transport. For example, for each person living in a community exposed to a newly available public transport system, walking increases by about 30 minutes per week (Xiao, Goryakin and Cecchini, 2019[20]). Active travel, walking and physical activity in general can be encouraged by better access to parks, green space areas and recreational facilities. For example, in the United States, living near parks and playgrounds is associated with a statistically significant reduction in childhood obesity, by 0.47 kg/m^2 and 0.27 kg/m^2 among boys and girls, respectively (Fan and Jin, 2014[133]).

There are numerous best practices in this area, including dedicated cycle lanes and bike-sharing schemes in cities such as Copenhagen, London, Amsterdam, Paris, Vienna and New York. As an added benefit, riding bicycles can also contribute to reduced air pollution, as in Barcelona, where the scheme was linked

to the reduction of yearly CO_2 emissions by about 9 000 tonnes (Rojas-Rueda et al., 2011[134]). On a global level, C40 is the network of the world's largest cities that collaborate to take action on climate change while improving the quality of urban life (Box 5.16). Other policies of note include: closing central parts of the cities to traffic on certain days of the week in Latin America (Sarmiento et al., 2016[135]); the introduction of electric (or zero emission) buses in the cities, with China being the leading producer and user of such buses in the world (Bloomberg New Energy Finance, 2018[136]); or community programmes to encourage leisure-time physical activity, such as the Bewegt Im Park programme in Austria providing free yoga, pilates and fitness classes to people of all ages and fitness levels in public parks or other open spaces (bewegt-im-park.at, 2019[137]).

While these policies have the potential to positively affect the health of many people, their implementation often relies on local administrations, which may have limited incentives or support at a national level. This creates a risk that poorer communities are less likely to have sufficient resources to implement such actions. Without appropriate intergovernmental fiscal transfers, there is a threat of increasing health inequalities driven by such disparities in financing (OECD, 2019[24]).

Box 5.16. C40: the world's largest cities collaborate to take action on climate change while supporting active lifestyles

Urban areas are one of the most important contributors of greenhouse gas emissions, with a large share accounted for by transport. Recognising this, the C40 Cities Climate Leadership Group was established in 2005 to promote sustainable urban development (C40, 2019[138]). The group serves as a network for knowledge and best practice sharing, as well as for technical assistance. Originally, the network was supposed to be open only to megacities based on such criteria as having a population size of at least three million people. However, it gradually opened up to the other city categories, for example "innovator cities", as exemplified by implementing internationally recognised environmental work, and "observer cities", which currently cannot join the network formally, but nevertheless can significantly benefit from participation. Currently, the network includes around 90 of the world's largest cities located on all continents, except Antarctica.

The network shares various good practices to help tackle climate change and encourage sustainable urban development. Many of these practices also promote active travelling and, more in general an active lifestyle. For example, there are case studies of Istanbul's Metrobüs system in Turkey, which provides about 600 000 passenger trips a day, while simultaneously reducing CO2 emissions by 167 tons/day (C40Cities, 2016[139]), or Mexico City's cycle lanes, which were estimated to result in USD 65 million in monetary benefits since 2007, with almost 70% of this benefit coming from improved physical fitness (C40Cities, 2016[140]). Another example are urban actions to adapt to future climate change events, including more severe rainfalls, as in the Space to Grow programme launched in Chicago in 2013 to redesign school playgrounds into green storm water areas, with the view to reducing the flood risk, promote environmental education and physical activity (C40Cities, 2016[141]).

5.3.3. Policies to modify the costs of health-related choice

The traditional economic rationale for fiscal policies targeting foods and beverages depends on whether their prices fully reflect social and economic consequences of their consumption (OECD, 2010[142]). For example, it has been argued that soft drink prices may not take into account the costs associated with the medical conditions caused by overweight, including, among the others, higher cost of medical care, and losses in productivity among people who develop such conditions (Brownell et al., 2009[143]). Thus, from the social point of view, the amount of consumption of such foods may be too high. Conversely, consumption of healthy foods such as fruits and vegetables may be socially suboptimal if their prices do

not reflect the positive economic effects associated with their consumption and its positive effects on the health of the population. Economic incentives, including price interventions, may be used as a useful tool to promote changes in dietary behaviours to encourage a more balanced diet.

Price policies

Governments can affect food-related consumer behaviour by implementing targeted price policies. Most policy action in this field has focused on increasing the price of products high in sugar, saturated fats or salt. Such policies may also include targeted price reduction for healthier foods sold in shops (Horgen and Brownell, 2002[144]).

Among the various price policies, taxation of sugar-sweetened beverages (SSBs) is gaining particular attention. In general, evaluations of such policies have found that they do have an intended effect on consumption, with one recent systematic review and meta-analysis concluding that a 10% SSB tax was related to a 10% decline in SSB purchases and dietary intake (Teng A, Jones A, Mizdrak A, Signal L, Genç M, 2019[145]). It is also clear that the magnitude of the tax effect varies depending on the programme design, on the size of the tax and the extent of its pass-through to consumers (i.e. extent to which producers pass the tax to consumers through an increase in the price of the taxed product). For example, in Mexico, an SSB tax in the amount of 1 peso/L (about 0.05 USD/L) was almost entirely passed to the consumers, resulting in a 10% increase in the price of SSBs (Caro et al., 2018[146]) and a 6-12% drop in per capita purchases (Colchero et al., 2016[147]). In Chile, an 8% tax difference between two SSB categories, containing high and low amounts of sugar, resulted in a price difference of 3.3%, equivalent to an additional 15 pesos (about 0.04 USD/L) for a typical 500 ml beverage (Nakamura et al., 2018[148]). As a result, monthly purchased volume was reduced as well, although the estimated effect varied between 4-21%, depending on the methodology used (see Box 5.17). In the United States, the city of Berkeley levies tax at a rate of USD 0.01 per ounce (0.34 USD/L), equivalent to a price increase of about 8% after a pass-through of about 47% of tax, which resulted in a 21% decline in sales of SSBs in low-income neighbourhoods (Falbe et al., 2016[149]). Evidence on the long-term effect of these taxes, especially on health-related outcomes, is still based on modelling studies. For example, OECD (2010[142]) and Cecchini and Sassi (2015[150]) have both estimated that the savings from such policies are greater when a long-term perspective is taken.

Among reviewed countries, a large majority (35) do not have any health-related food taxes in place (Figure 5.8). Seventeen countries, including 13 OECD countries, tax SSBs or other foods. Some examples of taxation policies include “soda taxes” in France (Berardi et al., 2016[151]), Chile (Nakamura et al., 2018[148]; Caro et al., 2018[146]), Mexico (Colchero et al., 2016[147]), the United Kingdom (Pell et al., 2019[152]), the city of Berkeley, (Falbe et al., 2016[149]) and the State of Pennsylvania in the United States (Zhong et al., 2018[153]) (for further details on soft drink tax policy in the UK, see Box 5.18). Other examples include a tax on food high in saturated fats in Denmark (abolished in 2013) (Bødker et al., 2015[154]), or on ready-to-eat meals in Hungary (Bíró, 2015[155]).

The design of price policies should take into account potential multiple challenges. First, there should be a sufficient pass-through of the tax in the form of a price increase, as minimal changes in price are unlikely to significantly modify purchasing patterns. Second, any potential substitution effect should be taken into account as well. For example, if SSBs are taxed, people may switch to other high-calorie drinks (e.g. high-fat milks, or juices) (Jou and Techakehakij, 2012[156]; Sassi, Belloni and Capobianco, 2013[157]), increase their consumption of non-beverage foods high in sugar, or even increase purchases of alcoholic beverages (Quirmbach et al., 2018[158]). Third, if the demand curve is inelastic, then there may be little change in consumption, although, on a positive side, low elasticity may also imply little substitution with other calorie-dense foods or beverages (Sassi, Belloni and Capobianco, 2013[157]). There is also concern about the adverse economic effect of such taxes, especially on low-income groups. However, previous OECD analyses suggest that health improvements resulting from such actions may disproportionately benefit the

poor (Sassi et al., 2009[159]; Sassi, Belloni and Capobianco, 2013[157]). In addition, revenues generated from the application of such taxes may be designed to benefit primarily low-income households (Sassi et al., 2018[160]).

Box 5.17. Soft drink tax in Chile

In 2014, an SSB tax was introduced in Chile for beverages with a sugar concentration of 6.25 grams per 100 ml or more. Specifically, the tax was increased from 13% to 18% for SSBs above this threshold, while for drinks below the threshold, the tax was decreased from 13% to 10%, effectively producing an eight percentage point tax difference (OECD, 2019[26]). Unlike Mexico, where there was almost complete pass-through of the tax, in Chile the resulting price difference between the two SSB groups was considerably smaller, of about 2-3%. In addition, in Mexico, where taxation is by volume, in Chile the tax only applies to a baseline price, and therefore there is a weaker link between the amount of sugar in a purchased drink and the amount of tax applied.

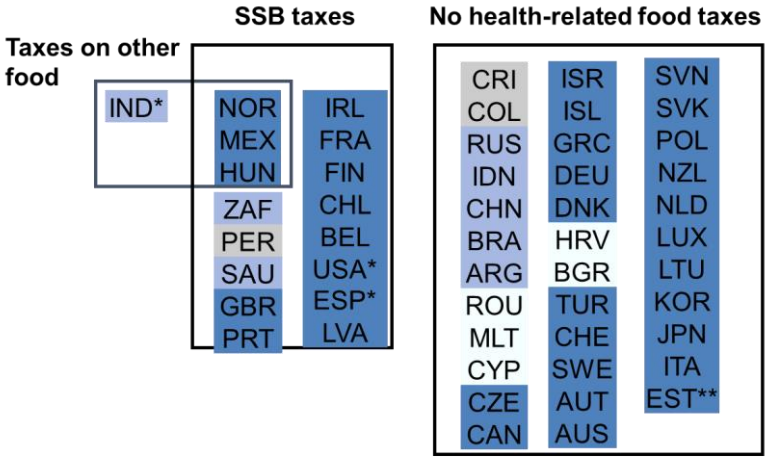
Two evaluations found a statistically significant positive effect on monthly purchased volume, with population-level effectiveness of the tax varying between 3.4% and 21%, depending on the methodology used (Caro et al., 2018[146]; Nakamura et al., 2018[148]). At the lower end of this estimate, this equates to a reduction of about 108 ml/capita per month (Caro et al., 2018[146]), and at the higher end to 766 ml per person per month (Nakamura et al., 2018[148]). Assuming that a litre of SSB contains about 400 calories, this equates to a monthly reduction of 43-306 calories per person.

Box 5.18. Soft drink tax in the United Kingdom

In 2018, the United Kingdom implemented a Soft Drinks Industry levy targeting all pre-packaged soft drinks containing at least 5 grams of added sugar per 100 ml of drink.

The UK tax combines features of several tax designs. For example, as with Chile, different tax rates apply depending on the amount of sugar in a given beverage: in drinks where sugar content ranges between 5-8 g per 100 ml, a tax rate is equal to 18 pence (USD 0.23) per litre, while in drinks containing more than 8 g per 100 ml, a tax rate of 24 pence (USD 0.30) per litre applies. Similar to Mexico, it charges a set amount per litre of a beverage so that there is direct link with volume. The UK tax does not target any potential substitute of SSBs including, for example, milk-based drinks, artificially-sweetened beverages, pure fruit juices, or any other foods potentially high in calories/sugar.

Figure 5.8. Fiscal policies



Note: OECD countries in dark blue; other G20 non-OECD countries in light blue; other EU non-OECD countries in white; other countries partnering with the OECD in grey.
* Sub-national laws; ** The Estonian Parliament has approved legislation taxing soft drinks, but this was not implemented by the government.
Source: WCRFI (2016[2]), "NOURISHING-framework" http://www.wcrf.org/int/policy/nourishing-framework; Development Initiatives (2018[3]), 2018 Global Nutrition Report: Shining a light to spur action on nutrition, https://globalnutritionreport.org/d7447a.

Healthy food subsidies for health purposes

While much less common than other price policies, some countries also provide targeted subsidies for foods considered healthy by their nutritional profile. Some of the most widespread forms of food subsidies include vouchers for healthy meals (McFadden et al., 2014[161]) or discounts for healthier foods purchases through governmental assistance programmes (Lu et al., 2016[162]).

There is tentative evidence that price discounts and vouchers can encourage healthier food purchases, including consumption of fruits and vegetables, and low-fat and low-calorie foods, in such settings as supermarkets, university and school cafeterias, farmers' markets and restaurants (An, 2013[163]), However, the evidence on the long-term effectiveness of such policies is still lacking.

Most of these programmes are designed to benefit specific, generally low-income population groups. For example, in New York City, the Health Bucks programme provides Supplemental Nutrition Assistance Program (SNAP) recipients with a USD 2 coupon for every USD 5 spent on fresh fruits and vegetables at participating farmers' markets. It was found that daily sales were higher at the markets that offered this incentive to the SNAP benefit recipients, compared to markets that did not (Baronberg et al., 2013[164]). In Philadelphia, the SNAP users of a similar healthy foods subsidy programme were about 2.4 times more likely than non-users to report increased consumption of fruit and vegetables (Young et al., 2013[165]). In Canada, the Nutrition North Canada governmental programme provides subsidies to improve access for people living in isolated communities to nutritious perishable foods, including fruits and vegetables (Fieldhouse and Thompson, 2012[166]), although the programme was criticised for not ensuring that the food is affordably and equitably priced because of the lack of price caps (Galloway, 2017[167]). Another example is the US federally funded Special Supplemental Nutrition Program for Women, Infants, and Children (Box 5.19).

Similar to price policies, certain conditions have to be met for such subsidies to be effective. Most importantly, they should lead to sufficient price and consumption responses, so that such incentives do not simply translate into greater company profits. In addition, it is important to ensure that such programmes do not actually increase health inequalities (Darmon et al., 2014[168]).

Box 5.19. Special Supplemental Nutrition Program for Women, Infants, and Children in the United States

Special Supplemental Nutrition Program for Women, Infants, and Children is funded by the United States federal government and is administered by all 50 states. The programme provides vouchers to buy nutritious foods, for example baby foods, fruits and vegetables, eggs, cheese, whole wheat bread and other whole wheat foods, dried and canned beans/peas at participating stores, to eligible women and their children. The eligibility criteria include being a low-income pregnant, breastfeeding or non-breastfeeding postpartum woman. In addition, the programme provides access to health screenings, nutrition and breastfeeding counselling.

The programme has existed since 1972, but was amended in 2009 by the US Department of Agriculture, to take into account the nutritional recommendations for the American Academy of Paediatrics, the American Academy of Family Physicians, and the Institute of Medicine (Lu et al., 2016[162]). The package was revised to include more nutrient-dense foods and beverages, and to limit the provision of foods high in added sugar and saturated fats. One study concluded that the 2009 changes have resulted in significant improvements in the availability and variety of healthy foods in participating stores (Andreyeva et al., 2012[169]).

Changes in nutritional community environment through economic incentives

There has been growing interest in the impact of economic incentives, mainly positive incentives, on the quality of the local community nutritional environment (Bowen, Barrington and Beresford, 2015[170]). Policies of this kind typically go beyond taxation of specific food items or subsidies to the individual consumers, and target food retailers. For example, there can be incentives for retailers to improve availability, accessibility and affordability of food options in their stores, or to increase the density of healthier food outlets/farmers' markets, especially in underserved neighbourhoods.

There are important methodological challenges in consistently measuring the quality of the community food environment across different studies (Glanz et al., 2016[171]; Caspi et al., 2012[172]). However, emerging evidence indicates that the community nutritional environment is an important determinant of diet and health. For example, in a US study, the prevalence of obesity was lower for people who live in areas with easier access to food outlets that may have a greater number of healthy food options, such as supermarkets and fruit and vegetable markets (Rundle et al., 2009[173]). Likewise, in Italy, a greater density of the farmers' markets was associated with lower BMI (Bimbo et al., 2015[174]).

A number of local initiatives designed to improve the quality of the local nutrition environment have been implemented recently. For example, the Healthy Food Financing initiative was established in 2014 in the United States, which provides financial incentives for healthier food outlets to be located in underserved neighbourhoods (Block and Subramanian, 2015[175]). In Singapore, food and beverage companies receive various incentives to provide healthier food options inside stores through the Healthier Dining Programme established in 2014 (HPB, 2019[176]).

5.3.4. Policies to regulate or restrict actions promoting unhealthy choice options

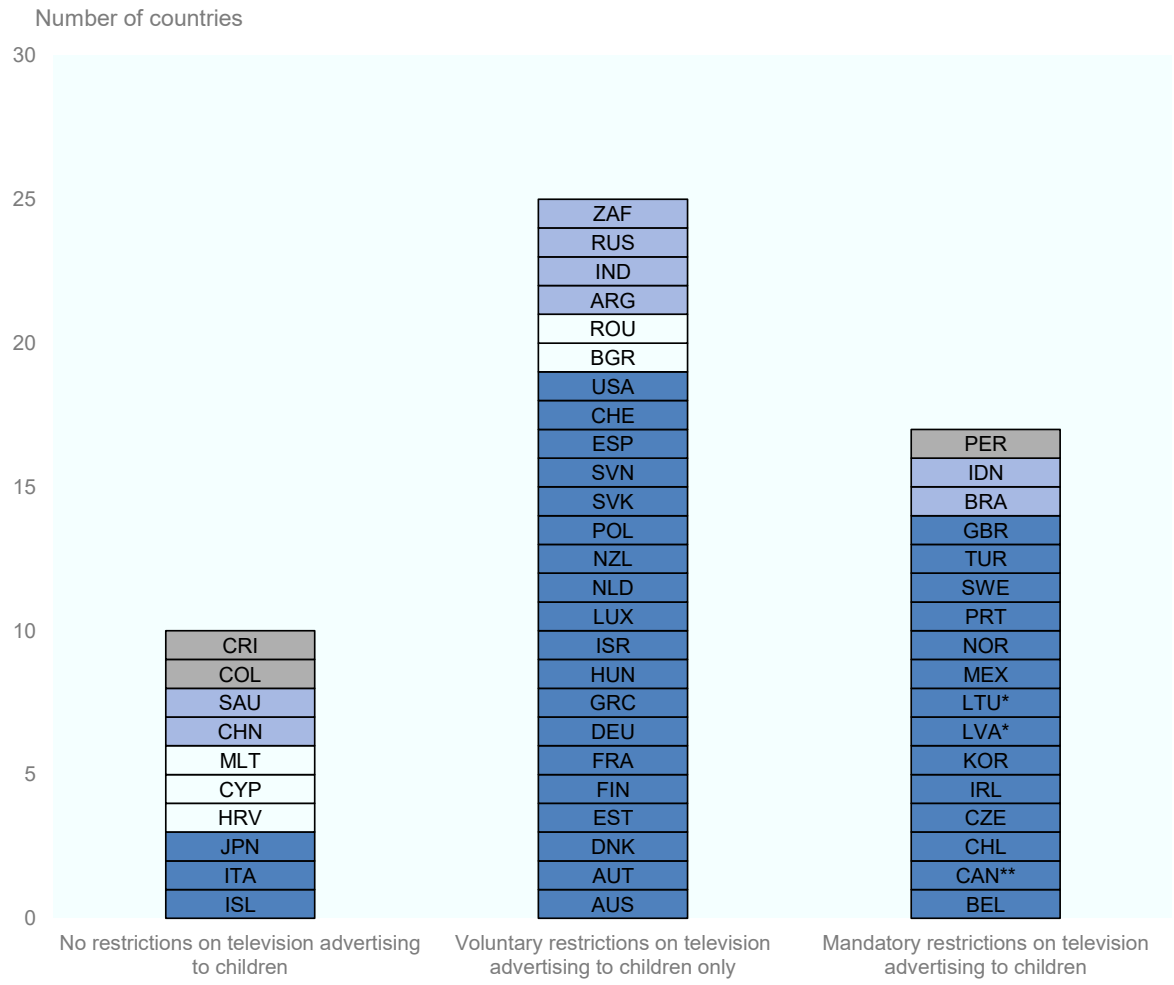
Regulation of advertising

Food marketing represents a key factor incentivising the consumption of high-calorie and nutrient-poor foods through persuasive messages (Adams et al., 2012[177]). Advertising restrictions typically take the form of a ban on commercial advertising for certain products during peak viewing time for children, although

the target age of the affected children can vary (e.g., under 12 years of age in Sweden, or 14 years of age in Chile).

Studies suggest that statutory restrictions on commercial food advertising and promotion can have a significant effect on dietary intake. For example, in Quebec, the implementation of this policy was followed by a reduction in calorie consumption at fast-food restaurants of between 5.6 billion and 7.8 billion per year (Dhar and Baylis, 2011[178]). Another study in Australia concluded that banning television advertising for energy-dense food during children's peak viewing times was highly cost-effective (Magnus et al., 2009[179]). On the other hand, a systematic review concluded that voluntary pledges to restrict high-calorie advertising may not be as effective in reducing exposure of children to advertisements, which may be due to the lack of enforceability or penalties for non-compliance (Galbraith-Emami and Lobstein, 2013[28]).

Figure 5.9. Policies restricting television advertising targeting children



Note: OECD countries in dark blue; other G20 non-OECD countries in light blue; other EU non-OECD countries in white; other countries partnering with the OECD in grey.

* Mandatory regulation only applies to energy drinks; ** Province-level regulation (Quebec). In addition, voluntary industry framework applies across the whole country.

Source: WCRFI (2016[2]), "NOURISHING-framework" http://www.wcrf.org/int/policy/nourishing-framework; WHO (2012[4]), Global database on the Implementation of Nutrition Action (GINA), https://www.who.int/nutrition/gina/en/; Boyland et al. (2018[180]), "Evaluating implementation of the WHO Set of Recommendations on the marketing of foods and non-alcoholic beverages to children".

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Despite the public health guidance put in place by WHO (2010), relatively few countries (17) have implemented statutory advertising restrictions concerning diet targeting children, while in ten countries there are no restrictions whatsoever (Figure 5.9). In some countries, for example Chile, Korea, and Brazil, advertising restrictions extend to non-broadcast media as well, e.g. social media and the internet in general. France has established that any potentially unhealthy food and beverage advertising must be accompanied by a message emphasising principles of dietary education (Hawkes, 2007[181]).

The largest group of countries (25) has instead preferred to let food manufacturers adopt self-regulation, although it has been argued that this approach usually does not go far enough (Galbraith-Emami and Lobstein, 2013[28]). For example, in Denmark, a self-regulation code has been in place since 2008 through "The Forum of Responsible Food Marketing Communication" (see also Box 5.20). In Norway, the government restricts advertising targeting children on broadcast channels, but restriction of advertising on other channels, such as cinemas, internet and the press is only on a voluntary basis (Hawkes, 2007[181]). In the European Union, a voluntary pledge was launched in 2007 to commit the food industry to not advertise calorie-dense food on media channels where children under the age of 12 make up at least 35% of the audience (Galbraith-Emami and Lobstein, 2013[28]). In addition, the Audiovisual Media Services Directive is expected to come into force soon in the European Union, setting out the framework for the EU-wide cooperation on national legislation in a number of areas covering all audiovisual media, including protecting children from inappropriate advertising of foods high in salt, sugar and fat (European Commission, 2019[182]).

Box 5.20. The Forum of Responsible Food Marketing Communication in Denmark

In 2008, the Forum of Responsible Food Marketing Communication implemented the Danish Code of Responsible Food Marketing Communication, a co-operation between Danish food and beverage industries, and the retail and media sectors. The code targets the marketing of products with a high content of sugar, fats and salt to children via television, printed media and the internet (Kelly et al., 2015[183]).

The Code is a self-regulatory initiative, targeting food and beverage marketing for children aged 13 and under. According to the Code, products which exceed guideline limits for salt, sugar and fat content in ten food categories should not be marketed, with the responsibility to observe the code resting on food manufacturers themselves, and the compliance checked by the secretariat of the Forum. Members of the Forum of Responsible Food Marketing Communication meet two to three times a year to discuss progress, coordinate activities and evaluate potential violations.

There has been some criticism in relation to the voluntary nature of the code, and in particular on the relatively low age limit applicable to such advertisements, 13 years old. To compare, in the United Kingdom the limit is 16 years old and in Ireland it is 18 years old (WHO, 2010[184]). Another criticism is that certain forms of advertising are excluded, such as sponsorships and outdoor advertising (Cathaoir, 2017[185]). Nevertheless, it was reported that the number of advertisements in the media covered by the agreement and for relevant products has fallen markedly since the establishment of the code (Chafea, 2016[186]).

Other restrictions

In some cases, there may be a need for more stringent regulatory restrictions. Typically, such restrictions will apply to specific foods with potentially harmful properties, such as foods containing trans fats, especially industrially-produced ones (see Box 5.21). In general, trans fats are not present in foods in their natural form, but are added for other reasons, such as to enhance food taste, texture and shelf life. Trans fats also have attractive properties from the food-manufacturing point of view, as they can be solid at room temperature and melt when cooking. The main issue with trans fats is not that they promote overweight, although some tentative evidence indicates that it may be a risk factor (Astrup et al., 2008[187]), but rather that there is a direct link between trans fat consumption and such outcomes as heart disease (Stender and Dyerberg, 2004[188]). Therefore, there is a strong need for policies requiring industrial reformulation of foods that currently contain trans fats.

Starting from 2018, US and Canadian food manufacturers and restaurants can no longer produce foods containing partially hydrogenated oils (PHOs), which are primary sources of trans fats. In the case of the United States, the ban came into force after a decade of working with the food industry to voluntarily reduce, and eliminate, the use of artificial trans fats. Several other countries, for example, Chile, also have strict limits on the amount of trans fats, such as no more than 2% of the total fat content. In the European Union, recently adopted Regulation 2019/649 stipulates that industrially produced trans fats in foods intended for final consumption shall not exceed 2g per 100g of fat (European Commission, 2019[189]). There are also examples of voluntary initiatives such as in the United Kingdom, where several supermarkets pledged in 2012 to work towards voluntary removal of products containing artificial trans fats from their shelves. One evaluation found that the effect of such voluntary policy was negligible (Knai et al., 2017[190]). On the other hand, a study attributed a reduction in CVD mortality rates observed in Denmark in recent years to the mandatory policy implemented in 2004 which restricted the content of artificial trans fats in certain food products (Restrepo and Rieger, 2016[191]).

There are also examples of community regulations restricting the availability of calorie-dense foods. In a number of cities in California, restaurants are required to offer plain, sparkling or flavoured water, with no added natural or artificial sweeteners, milk or non-dairy milk alternatives as the default beverage in children's meals (Natlawreview.com, 2019[192]). In France, unlimited offers of sweetened beverages have been banned in schools and restaurants since 2017 (BBC, 2017[193]). In the United Kingdom, a number of local authorities have developed planning restrictions to exclude hot food takeaways less than 400 meters away from target locations such as schools (London.gov.uk, 2017[194]).

Box 5.21. Phasing out trans fats

Recently, the International Food and Beverage Alliance (IFBA) has committed to phasing out industrially-processed trans fats from the global food supply by 2023. IFBA was founded in 2008, with one of its stated aims being to support WHO's efforts to improve global public health. IFBA has made a series of other core commitments over the years, including to support WHO's 2004 Global Strategy on Diet, Physical Activity and Health and the 2011 UN Declaration on the Prevention and Control of NCDs.

Specifically, IFBA has declared that its member companies will commit not to exceed 2 g of industrial trans fats per 100 g fat/oil in their products worldwide by 2023. Eliminating artificial trans fats from the global food supply is one of the WHO's current priority targets (WHO, 2019[195]).

5.4. Conclusion

Countries have made substantial progress in setting up and implementing a variety of policy measures to address overweight, largely by tackling poor diet and nutrition and lack of physical activity. As of 2019, virtually all OECD countries have a national action plan on obesity in place, and a vast majority of countries has a specific action plan to tackle obesity in children as well as national guidelines to promote healthy diets and active lifestyles. Most OECD countries have also implemented a wide range of policy options to promote healthier lifestyles. Despite this undeniable progress, the still rising overweight rates point to the fact that the response has not yet been up to the challenge. The implementation of policies "on the ground" and their effectiveness at the population level is hindered by a number of factors. In a number of cases, policies are implemented in non-effective ways or actions are not uniformly implemented throughout the country. In other cases, limited resources or practical problems end up restricting the number of individuals who could potentially benefit from the policy.

Public health interventions often represent good value for money, but resource allocation tends to favour treatment-related approaches. The reasons for these are often political (e.g., it may be more popular to promise spending on hospitals or on doctors, than to increase taxes on calorie-dense and/or ultra-processed foods). However, there should be an honest discussion on the long-term sustainability of this approach. In addition, there should be better understanding of the economic benefits of prevention (which will include not only saved costs from treatment, but also economic benefits from better productivity). Moreover, the implementation of effective prevention interventions can help relieve the long-term pressure facing the health care sector, allowing it to focus on more complex medical issues. Health care interventions can still be appropriate for people with severe obesity, but the right balance between prevention and treatment must be found for the other groups.

Moving forward, there is a need to prioritise resources going into prevention, which, as discussed in Chapter 6, is often a highly cost-effective investment. In addition, better understanding of which specific design feature of policies works best is needed. To ensure policy inception and implementation, it is important to work extensively with multiple stakeholders, both in other governmental and non-governmental agencies, and in the private sector, as appropriate. Broadly speaking, even though win-win solutions will not always be attainable, cross-sectorial co-operation addressing co-benefits and return on investments into obesity prevention policies are crucial for successful policy implementation.

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Notes

[1] Throughout this chapter, the nutritional status of individuals is defined according to WHO guidelines and thresholds and uses body-mass index (BMI). Overweight is defined as a BMI higher than 25 kg/m2; pre-obesity is defined as a BMI of 25-30 kg/m2; and obesity is defined as a BMI higher than 30 kg/m2. Obesity can be further divided into class I, class II and class III obesity. Class I obesity is the milder form of obesity and is defined as a BMI of 30-35 kg/m2; class II obesity is defined as a BMI of 35-40 kg/m2; while class III obesity is defined as a BMI over 40 kg/m2. Morbid obesity includes class II and class III obesity and is defined as a BMI higher than 35 kg/m2. Further information can be found in Chapter 2 - Box 2.1. Using body mass index (BMI) to define levels of adiposity.

[2] OECD accession and selected partner countries include: Brazil (also a G20 country), China (also a G20 country), Colombia, Costa Rica, India (also a G20 country), Indonesia (also a G20 country), Peru and South Africa (also a G20 country).

6 Impact of obesity policies on health and the economy

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This chapter presents results from modelling the implementation of ten policy actions including food labelling; menu labelling; mass media campaigns promoting physical activity; prescribing physical activity in primary care; mobile apps promoting healthy lifestyles; workplace wellness programmes; workplace sedentary behaviour programmes; school-based programmes; expanded public transport and statutory bans on advertising targeting children. In addition, the impact of three policy packages is shown, including a package of mostly existing, communication-based policies; a package of physical activity-based policies; as well as a mixed package of policies that are still relatively rarely implemented in OECD countries, but nevertheless show significant promise. Results are presented for 36 countries, including OECD countries in the European Region as well as Japan, Mexico, Canada, and Australia, together with other non-OECD EU28 member states and South Africa. A particularly innovative aspect of this analysis is its focus not only on health outcomes, but also on economic outcomes, including the policy impact on health spending, on the employment and productivity of workers, as well as on the gross domestic product (GDP) of countries.

Key findings

- Population-wide interventions such as food labelling, menu labelling and mass media campaigns will produce the largest health gains, resulting in between 51 000 and 115 000 life years (LYs) gained annually in the 36 countries included in the analysis. Menu labelling performs the best overall.
- Menu labelling will help avoid the largest number of cancers annually in all the modelled countries (1 900); cardiovascular diseases (CVDs) (24 000); diabetes (11 000). Mobile apps will generally have the weakest effect on disease incidence.
- The effect of interventions on disability-adjusted life years (DALYs) is larger than on life years (LYs). This is especially true for interventions targeting children, as the modelling period is not long enough to capture the effect on the young cohort.
- Most interventions will make a significant impact on health expenditure, cumulatively saving between USD PPP 13 billion (menu labelling intervention) and 0.5 billion (school-based programmes) between 2020 and 2050.
- Most interventions are predicted to make a significant impact on labour market outputs and productivity. For example, 21 000 more people will be in employment as a result of menu labelling intervention, while mass media campaigns will help add 28 000 people. On a per capita basis, the effect of mass media campaigns will be felt the most in Estonia, with up to 10 people per 100 000 gaining employment annually, who would otherwise be unemployed, followed by Bulgaria (9.8 per 100 000) and Hungary (9.1 per 100 000).
- The labour market gains produced by the interventions are usually several times larger than the corresponding reductions in medical expenditure. When health expenditure savings and labour market gains are combined, they will be larger than the costs of running the interventions in most cases.
- Investing in prevention packages to tackle overweight is a very good investment for countries. For every USD PPP invested in four out of nine interventions, countries will see a return of at least USD PPP 4-5 in the form of economic benefit each year.
- There are regional differences in policy effect, but they are outcome-dependent. For example, the policy which performed the best overall, menu labelling, will make a larger impact on the population-standardised health burden in Central and Eastern European countries due mainly to higher prevalence of overweight there. On the other hand, its effect on population-standardised health expenditure will be stronger in Japan and in Western European countries (even after adjusting for PPP), due primarily to the higher medical costs in these countries.
- Combining interventions in prevention packages will return higher benefits. Investing in a communication package to upscale policies already in place in many OECD countries will result in a gain of 205 000 LYs per year across all the 36 countries included in the analysis and will save about USD PPP 26 billion cumulatively by 2050.
- The communications package is also expected to prevent almost 3 360 cases of cancer annually in all countries analysed (about 500 of which will be in Japan); 40 000 of CVD (6 300 of which in Mexico); 5 100 of dementia; 27 000 of diabetes and 11 000 cases of mental illnesses.
- A “mixed package” containing policies which are still rarely implemented, but which show promise will produce similar results (i.e. almost 160 000 LYs will be gained annually and USD PPP 23 billion will be saved cumulatively by 2050).
- A package to promote physical activity will produce smaller, but still significant effects, by producing a gain of 70 000 LYs annually and by saving USD PPP 17 billion cumulatively by 2050.

- The prevention packages also have a significant effect on the labour market and the economy. All the three packages will save between USD PPP 3.5 billion and USD PPP 5.3 billion per year in labour market costs in all countries due to lower rates of absenteeism, presenteeism and early retirement, and higher employment.

6.1. Introduction

Overweight[1] and its related conditions are the cause of large health and economic costs. Findings presented in Chapter 3 show how overweight is responsible for a reduction in life expectancy of 2.7 years across OECD countries and how treating overweight-related diseases costs, on average, 8.4% of the health budgets of these countries. The burden of disease caused by overweight also has an impact on the broader economy: a reduction in workforce size and in productivity affects GDP and leads to an increase in fiscal pressure.

Many effective policy options exist to scale up national policy action to deal with the rising obesity burden. As shown in Chapter 5, OECD, EU28, G20 and OECD accession and selected partner countries have been very active in the last decade and have implemented a rich set of policy actions to tackle overweight by promoting heathier diets and an active lifestyle. However, policy gaps still remain either because, as available evidence suggests, some of the policies currently in place would be more effective if they were redesigned, for instance, food labelling schemes or advertising regulations, or because countries can now choose to implement additional policy actions such as menu labelling schemes. This chapter reports the findings of an analysis (Box 6.1) developed to help countries close these policy gaps. The analysis presented in this chapter assesses and compares the health and economic impact of a number of public health actions aligned with various relevant global action plans such as the World Health Organization's (WHO) Global Strategy on Diet, Physical Activity and Health and the Global Action Plan on Physical Activity 2018–2030.

The main objective of the analysis is to evaluate if the implementation of a selected number of policy actions, scaled up to national levels, can reduce the health and economic burden of overweight, the extent of that reduction and whether those actions would represent a good investment for governments. The choice of the options to be modelled is based on a number of criteria, including the availability of high-quality quantitative evidence to feed the OECD SPHeP-NCDs model (for more information see Chapter 3, Box 3.2). The effects of each action are presented, along with the possible impact of combining different policies. Results are presented for 36 countries including OECD countries in the European Region as well as Japan, Mexico, Canada, and Australia, together with other non-OECD countries that are EU28 member states and South Africa[2]. All the policies are modelled on the assumption that they are implemented in 2019, and their effectiveness is assessed over the period 2020-2050.

Box 6.1. Calculating the return on investment from policies to tackle overweight using the OECD SPHeP-NCDs model

Whether a particular policy will work in a given context depends on a number of factors, some of which can be location-specific. For example, the return of investment of a policy may depend not only on its general efficacy, but also on the local medical costs of treating related diseases and complications; demographic structure; epidemiological burden and the cost of intervention implementation. Within the OECD Strategic Public Health Planning for NCDs (SPHeP-NCDs) model, policies are modelled with respect to the following four key parameters:

- Effectiveness of interventions at the individual level. This parameter captures how individual behaviour changes, following exposure to the interventions. As far as possible, this evidence is borrowed from peer-reviewed meta-analyses, preferably from randomised control trials.
- Time to the maximum effectiveness achieved and effectiveness over time. The effects of an intervention can be time-limited and/or time-dependant, with the relationship generally at first becoming stronger, and then fading out. This parameter describes changes in the effectiveness of interventions over time.
- Intervention coverage, including description of eligible populations, as well as their exposure. For example, some interventions may only affect a subset of a population (e.g., individuals in certain age groups or with particular risk factors). In addition, in some cases, only a proportion of the eligible population may be exposed, such as only those who visit primary care providers and are willing to participate.
- Implementation cost. The implementation of a public health action may entail a number of costs including, for example, costs related to its planning, administration, monitoring and evaluation and so on. In addition, interventions may involve providing some form of equipment or material to be delivered to the target population (e.g. brochures, or stand-up desks). The intervention costs are estimated based on the WHO-Choice methodology (WHO, 2003[1]) taking into account differentials in relative prices (as measured by differences in PPPs and exchange rates). All the costs are expressed in 2015 USD PPPs.

To gauge the population-level effectiveness and the return of investment of public health policies designed to promote healthy diets and an active lifestyle, actions are evaluated against a "business-as-usual" scenario in which no new policy is put in place and the provision of preventive and health services is implemented at the current levels, specific to a country. The comparison between the business-as-usual and the policy scenario corresponds to the impact of a policy, and it is carried out by considering all the relevant dimensions including, for instance, differences in health, health costs, labour market productivity and so on, which provides all the needed information to carry out a return on investment analysis.

For more information on the OECD SPHeP-NCDs model, please see the SPHeP-NCDs Technical Documentation, available at: http://oecdpublichealthexplorer.org/ncd-doc.

6.2. Policies to tackle overweight and to promote healthy lifestyles: innovative policy options to upscale efforts

The analysis presented in this chapter considers ten actions that are categorised into three of the four policy domains, following the OECD framework described in Sassi and Hurst (2008[2]):

- Policies influencing lifestyles through information and education, specifically food labelling, menu labelling, mass media campaigns promoting physical activity, prescribing physical activity in primary care settings, and mobile apps promoting healthy lifestyles.
- Policies widening the number of healthy choice options, specifically workplace wellness and workplace sedentary programmes, school-based programmes as well as expanded public transport.
- Policies to regulate or restrict actions promoting unhealthy choice options. In this group, one policy was modelled: statutory bans on advertising targeting children.

6.2.1. Policies influencing lifestyles through information and education

Food labelling

The modelled intervention consists of statutory policy changes, requiring all manufacturers or retailers to provide information on the nutritional composition of foods sold in stores and supermarkets. Such information should be clearly visible, as well as easy to understand and intuitive. Currently, almost all the OECD countries require some sort of labelling on processed foods, which may be attached to the front of the package (i.e. front-of-pack labelling - FoP), but is more often only attached to the back (i.e. back-of-pack labelling - BoP) of the packaged foods. While BoP labels tend only to inform about the nutrient content of foods, and sometimes may be difficult to read and understand, FoP labels are usually more visually appealing and intuitive. Available evidence concludes that FoP labels, such as the Nutri-Score labels in France, or warning labels in Chile, are more effective than BoP labels (Cecchini and Warin, 2016[3]; Campos, Doxey and Hammond, 2011[4]). Nevertheless, currently only four OECD countries implement mandatory FoP labels with virtually all the other OECD countries having mandatory guidelines only for BoP (for more information, see Chapter 5's overview of obesity policy approaches).

In the simulation, intuitive FoP labels are assumed to decrease average daily calorie intake by 1.16%. This effectiveness parameter is primarily based on an update to a recent meta-analysis (Cecchini and Warin, 2016[3]) concluding that the implementation of food labelling for pre-packaged processed foods from industrial production can reduce average calorie intake by 2.21%. The analysis presented in this chapter, assumes that this effect represents a lower bound of the effects of FoP labels, as they are generally found to be the most effective label type (Cecchini and Warin, 2016[3]; Campos, Doxey and Hammond, 2011[4]). Furthermore, account is taken of the fact that only a fraction of all calories come from the consumption of processed foods sold in stores and supermarkets. More specifically, evidence from the United States (Lin, Guthrie and Frazão, 1999[5]) and Canada (Nardocci et al., 2019[6]) suggests that only 80% of the total calorie intake comes from food that would be covered by this intervention (e.g. food sold in supermarkets or grocery stores). Furthermore, the policy is assumed to affect only the consumption of processed foods, and therefore will not change the consumption of foods such as as fruit, vegetables, legumes and meat. Based on Monteiro et al (2018[7]), processed and highly processed foods account for about 65-66% of all calories consumed. The resulting change in calorie intake is converted into changes in body-mass index (BMI), by using the methodology developed by Hall and colleagues (2011[8]) and assuming an achievement of the maximum reduction after 100 days followed by a constant BMI thereafter (Strychar, 2006[9]).

The intervention is assumed to target the whole population aged at least one year old as children are likely to be affected through the food bought by their parents. However, following previous evidence (Grunert et al., 2010[10]), only 15% of the target population is assumed to be affected by the intervention as not everyone is likely to read and consider the information on the nutrition label.

The cost of setting up a new food labelling programme includes expenses on policy administration, planning and enforcement in the form of food inspections. This cost estimates vary between USD PPP 1.15 and USD PPP 1.30 annually per capita across the countries included in the analysis. Conversely, the analysis does not account for the additional costs associated with designing and printing nutrition labels or for the potential cost associated with the reformulation of certain foods, likely to be borne by the private sector. The general discussion of the potential costs for the industry is provided in Chapter 8 of this report. For example, graphic design and prepress for new labels can cost around USD 4 000 per item. In addition, there may be associated printing material costs (up to USD 6 100 per product) and labour costs (about USD 5 800 per product).

Menu labelling

This scenario models a statutory menu labelling policy implemented in restaurants and other food service establishments (e.g., fast food outlets). As mentioned in Chapter 5, this policy is currently implemented in

very few OECD countries, for example in the United States and Australia, so it could be the next major policy action after the full roll-out of a food labelling policy. The implementation of this action would also make it compulsory to provide contextual information on the menus, such as recommended daily calorie intake, or interpretive information such as a traffic light system or PACE (physical activity calorie equivalent) labels that indicate the number of minutes of exercise needed to burn off the calories consumed.

Based on the evidence produced by Sinclair and colleagues (2014[11]), menu labelling with contextual or interpretive information is expected to lead to a reduction in the calories consumed (per purchase) of about 81 kcal. This number is further converted into a change in BMI using the same methodology as for the food labelling intervention, based on Hall et al (2011[8]). Maximum reduction in calories (and BMI) is assumed one year following the beginning of the intervention, which approximately corresponds to 100 days of cumulative exposure, assuming people eat out about two times a week. Once reduced, the BMI is modelled to continue on a parallel lower trajectory.

The minimum eligibility age is set at five years old, as children can also be affected via their parents when they eat out together. Among those eligible, it is assumed that, across countries, at least 80% of the population occasionally have meals in restaurants or fast food places potentially targeted by this policy. For example, previous evidence found that four out of five Italians eat out at least two times a week (Censis Coldiretti, 2010[12]). In the United Kingdom, a survey found that 78% of people eat out once a month, or more often (Worsfold, 2006[13]). Finally, in line with the food labelling intervention assumption, it is assumed that about 15% of the population read and act upon menu labelling information. Thus, about 12% of those eligible are assumed to be exposed to this intervention (Grunert et al., 2010[10]).

The intervention programme costs include governmental expenses on policy administration, planning and enforcement in the form of food inspections, and varies between USD PPP 1.15 and USD PPP 1.30 per capita annually across the countries included in the analysis. Costs do not account for the additional expenditure associated with designing and printing menu labels and for the nutritional analysis costs, likely to be borne by the private sector. For example, as mentioned in Chapter 8, the cost of the nutritional analysis to support the implementation of food labelling was estimated to be about USD 660 per food item in the United States. There can also be some installation costs to replace the menu boards, estimated to be about USD 550 in the United States (Food and Drug Administation, 2014[14]).

Mass media campaigns

This intervention entails the implementation of a campaign via traditional media (e.g. radio, television and newspapers/magazines) to promote an active lifestyle in the population. The modelled intervention includes two 15-second television paid commercials, as in the mass media campaign to promote physical activity in the state of New South Wales, Australia (Bauman et al., 2001[15]). In addition, the TV commercials can be combined with some other resources, such as advertisements in printed media, posters, leaflets, postcards, web sites and public relations events, as in the Active For Life campaign in the United Kingdom (Hillsdon et al., 2001[16]).

According to the available evidence (Goryakin et al., 2017[17]), within one month of the beginning of the intervention, the mass media campaign results in a 60% increase in the number of people who are considered at least moderately active. This proportion halves by the end of the first year and, then, goes to zero after another two years. In the model, it is assumed that for the less inactive individuals, the probability of moving into the new physical activity category is higher.

The campaign is modelled to cover all adults aged 18 years or older. The intervention runs in six waves, with each wave lasting for three years: between 2020 and 2022; between 2025 and 2027; between 2030 and 2032; between 2035 and 2037; between 2040 and 2042 and between 2045 and 2047. In line with the reviewed evidence, the coverage is assumed to be 100% (Goryakin, Suhlrie and Cecchini, 2018[18]), with people repeatedly exposed to the intervention in all waves.

The cost consists only of the programme costs. Almost two-thirds of the cost is for the purchase of broadcasting time for the advertisements on national and local radio and television channels and to produce and distribute flyers and leaflets. The remaining resources are mainly devoted to hiring personnel to design, run and supervise the programme. This cost varies between USD PPP 1.93 and USD PPP 2.18 per capita annually across the countries included in the analysis.

Prescribing physical activity

This intervention involves brief advice given by a primary care specialist to an individual at high risk for chronic diseases linked to sedentary behaviour and lack of physical activity, followed by additional formal steps, such as a prescription for a minimum weekly amount of physical activity, a referral to an exercise referral scheme, or follow-up personalised counselling.

The intervention is modelled based on findings from a recent systematic review and meta-analysis (Goryakin, Suhlrie and Cecchini, 2018[18]). Specifically, prescribing physical activity increases leisure (sports) physical activity by 168.6 extra metabolic equivalent of task (MET) minutes per week, which is approximately equivalent to 56 extra minutes of moderate exercise a week. However, total physical activity is likely to increase by a smaller amount, as people may adjust their behaviour by spending less time doing other types of exercise (Graf and Cecchini, 2019[19]). Specifically, it was estimated that total physical activity will increase by about 96 MET-minutes per week when this adjustment is taken into account.

The eligible population is restricted to persons aged 50-75 years of age with at least one of the following risk factors: overweight; physical inactivity; diabetes; hypertension; smoking. In line with the reviewed evidence, it is expected that 26.4% of the eligible population will be exposed to the intervention, based on the data that: about up to 80% of people visit their general practitioner at least once a year in developed countries (Sanchez et al., 2015[20]); 55% of patients are likely to participate (Goryakin, Suhlrie and Cecchini, 2018[18]); and about 60% of doctors/practices agree to participate (Goryakin, Suhlrie and Cecchini, 2018[18]). In line with the reviewed evidence, maximum effectiveness is achieved after six months and gradually wears off to zero by the end of the first year. Eligible persons can participate again in the future.

The cost consists of two components: programme and individual-level expenses. The programme cost comes from expenses on programme administration and on recruitment and training of doctors; while the individual costs consists of doctor-provided consultations and of maintaining contacts with the participating patients. As giving a prescription for physical activity can be done in the context of a routine primary care visit, it is assumed that only about 10% of the visit time is needed for such a prescription. Total intervention costs vary between USD PPP 1.61 and USD PPP 1.66 annually per capita.

Mobile apps

This intervention entails the implementation of a nation-wide introduction of a smartphone application promoting behaviours leading to weight reduction. These applications can help individuals count the numbers of steps they walk in a day, or estimate calories consumed by providing nutritional information for various foods and beverages. Further, they can take advantage of various technological options, for example by linking calorie information to product barcodes that can be scanned by phones; by generating charts on trends in calorie consumption and physical activity levels; by providing information on the nearby health and wellness events/facilities; by promoting health behaviours through various rewards programmes. It is assumed that the development and release of the application will rely on governmental marketing and promotion.

Based on an existing meta-analysis (Mateo et al., 2015[21]), the intervention is assumed to lead to a drop in BMI by 0.43 kg/m^2 in participating people. In several studies included in the meta-analysis, mobile apps are compared with some control intervention (e.g. counselling or printed materials) rather than with a

complete absence of any intervention, so this effect is likely to be an underestimate of the true effect. It is also assumed that those participating remain active for one year, and that the maximum effect (0.43 kg/m^2 drop) is linearly achieved within one year. After that, people gradually revert to the old BMI within another year, as they decide not to use the app any longer.

The target group for this policy action is made up of individuals aged 15 to 64, broadly in line with the population groups included in the studies underlying the meta-analysis used to model the effectiveness of the intervention (Mateo et al., 2015[21]). In addition, based on findings from a previous study (Goryakin et al., 2017[17]), the population coverage is assumed to be 2.21% of the target group.

Intervention costs include the expenses of developing and updating the application, marketing it nationwide, as well as storing and processing the data generated by the application use. This cost varies between USD PPP 0.56 and USD PPP 0.63 annually per capita across the countries included in the analysis.

6.2.2. Policies widening the number of healthy choice options

School-based programmes

This intervention further scales-up and strengthens policies currently in place in many OECD countries mandating the inclusion of physical activity classes in the school curricula. More specifically, this intervention entails the inclusion of classroom lessons on the benefits of physical activity led by trained teachers and of moderate-to-vigorous physical activity sessions (including playing sports and aerobic exercise) as part of the school curriculum. In addition, the intervention also entails the distribution of nutritional education materials and the provision of healthful foods in school canteens.

A meta-analysis of school-based programmes promoting both a healthier diet and additional physical activity found that these interventions lead to an overall mean reduction in BMI of 0.30 kg/m^2 (Wang et al., 2015[22]). This analysis already takes into account students' compliance, so the average reduction is equally applied to all the schoolchildren. For each affected child, there is a linear reduction in BMI within a year of the programme's implementation until the individual's BMI drops by 0.30 kg/m^2, after which it stays constant on the lower parallel trajectory until the child graduates from school at age 18. It is also assumed that such programmes have a long-term effect as children are expected to acquire a habit of doing physical activity or eating more healthily. Specifically, consistent with the previous OECD analysis (Sassi et al., 2009[23]), it is assumed that after children turn 18, there is a linear decrease of the programme's effectiveness by 50% (i.e. BMI is reduced by 0.15 kg/m^2) over one year parallel to their baseline BMI trajectory, and then it stays at this level for the rest of life.

Since any policy in public schools is likely to be mandatory and apply to almost all students (probably with some exceptions for health-related reasons), it is assumed that about 90% of all public school students in both primary and secondary education can be affected (ages 8-18). If not selected in the first year in which the intervention is implemented, students remain ineligible for participation for the rest of their life.

The cost of the programme includes the programme component and the cost of delivering the intervention in the schools. Half of the total cost is spent on programme organisation costs, while the remaining half is split between training of teachers and food service staff, extra teaching and additional curricular activities, e.g. guest speakers, brochures, books, posters and equipment. The single most expensive item is extra teaching hours. Costs do not include changes in food service contracts, vouchers/coupons from sponsors and school nurse time. The annual cost is estimated to vary between USD PPP 2.78 and USD PPP 3.14 per capita across the countries included in the analysis.

Workplace programmes targeting sedentary behaviour

This intervention is modelled as an employer-sponsored programme to discourage sitting in the workplace by making sit-stand workstations and treadmill desks available to employees.

Based on the reviewed evidence (Chu et al., 2016[24]), this type of environmental intervention is expected to reduce sitting time by 72.78 min per eight-hour workday. For those concerned, it is assumed that this reduction will be achieved gradually within a year, after which the amount of sitting time will be maintained at a lower level until the individuals retire or become unemployed, whichever is sooner.

It is assumed that only full-time employees (aged 18-65 years) who work in service industries and in medium and large enterprises are potentially eligible for the intervention, and that, in line with the OECD analysis (Sassi et al., 2009[23]), 50% of such enterprises will choose to participate, offering their employees the opportunity to benefit from standing desks. The evidence on the participation of potentially eligible employees is not easily available. According to Chu and colleagues (2016[24]), the largest drop-out rate among the initially recruited programme participants was 62% in a study by Pronk and colleagues (2012[25]), which suggests that at least 38% of participants may be potential long-term users. Furthermore, it is assumed that about 10% of eligible employees are not willing to try using the desks even once. Therefore, conservatively, it is assumed that only about one-third of eligible employees (i.e. 34%) are willing to participate in the programme for a sufficiently long period of time. In addition, it is assumed that employees who do not join the intervention at the start will not join it in the future. In subsequent years, new people are added to the eligible pool only if they are employed for the first time and are aged between 18 and 65. In addition, if a person who was initially selected becomes unemployed, the person can only participate again in the case of re-employment.

The main intervention cost is the cost of equipment such as adjustable stand up desks, which can vary widely. Conservatively, a price at the higher range is assumed, at EUR 500 (about USD 570) up-front per desk. A further assumption is made that such desks will last for 10 years and that they will be used individually (i.e. that desks are not shared between employees). In this case, the annual cost varies between USD PPP 43 and USD PPP 144 per target person, or USD PPP 1.08-2.09 per capita across the countries included in the analysis. It is assumed that the governments will buy such desks for their employees, or will provide subsidies to the industry to buy such desks for private-sector workers. No other costs are assumed.

Workplace wellness programmes

Workplace wellness programmes can include a number of components, including health risk assessment for employees, self-help education materials, classes, seminars, group activities and individual counselling about healthy lifestyles. They can also provide various incentives (such as bonuses and reimbursements) to encourage participation in these activities (Baicker, Cutler and Song, 2010[26]). Increasingly, as for example in Japan, these programmes also entail environmental changes in the workplace by putting in place actions to promote a healthier diet (e.g. through changes in the food served by canteens) and to increase physical activity (e.g. by encouraging the use of stairs) (OECD, 2019[27]).

The effectiveness of this intervention is assumed based on a recent meta-analysis (Penalvo et al., 2017[28]), which concluded that a generic worksite wellness programme produces an average reduction in BMI of 0.28 kg/m^2. Based on the same study, it is assumed that 12 months after the beginning of the action, the intervention would reach its maximum effectiveness, producing a 0.64 kg/m^2 drop in BMI relative to baseline. After 24 months the drop in BMI decreases to 0.16 kg/m^2 relative to baseline, while the effect completely disappears after 36 months.

It is assumed that the proportion of people exposed to this intervention will be the same as in the workplace intervention for sedentary behaviour (see below). In line with the reviewed evidence, the exposure is assumed to last for 3 years only (Penalvo et al., 2017[28]). However, everyone (including previously

exposed employees) would have a chance to participate again in the programme. The participation is restricted to white collar, full-time employees working in medium and large service industry enterprises (within an 18-65 year age range). Other persons potentially eligible are those employed for the first time. If persons who initially joined become unemployed, they become eligible to be selected again in case of re-employment in one of the enterprises participating to the scheme.

The intervention cost is likely to vary considerably, depending on programme features and local prices and may include, for example, costs of initial risk assessment, telephonic coaching and various incentives. In line with some available evidence (Hall, 2011[29]), the intervention costs were assumed to vary between USD PPP 118 and USD PPP 133 per target person, or USD PPP 6-8 per capita across the countries included in the study. While it is possible that certain types of workplace wellness programmes, particularly if very comprehensive, may cost more than this, this figure is assumed to cover the costs of implementing the programme in public institutions and incentives that the government could give to enterprises deciding to participate in the programme.

Expanding public transport

This intervention entails the expansion of mass transit options, publicly or privately provided, with the objective to increase people's access to active transport options.

The effectiveness to model the intervention is based on findings from a systematic review and meta-analysis (Xiao, Goryakin and Cecchini, 2019[30]) concluding that each person exposed to a new public transport option increases transport-related physical activity by 105.6 MET-minutes/week, which is roughly equivalent to an extra 35 minutes of walking per week. As described in the section on prescribing physical activity, the change in total physical activity is likely to be smaller as individuals exposed to the intervention may choose to reduce other types of physical activity (e.g. leisure time physical activity). Therefore, this change in transport-related physical activity was converted into a change in total physical activity, using methodology described in Graf and Cecchini (2019[19]). Specifically, total physical activity was estimated to increase by about 60 MET-minutes per week, corresponding to an equivalent of about 20 minutes of walking per week.

This intervention is assumed to affect both children and adults. Children, in particular, may benefit from public transport both when they travel with their parents, and when they travel to school. In a number of countries, a compulsory minimum education age varies between five and six years, so the age of five was chosen as a lower cut-off for this intervention. Since public transport is already well developed in most OECD countries, a modest scenario is modelled of expanding access to public transport to an additional 1% of the eligible population (i.e. persons over five years old), every five years. The maximum effectiveness is assumed to be achieved one year after the start of implementation, after which the physical activity level will remain at the higher level until the end of life for all those affected.

No implementation costs are considered for this intervention. While the cost of building a new public transport network can be very expensive, the main goal of public transport is not to increase physical activity, but to help people move around.

6.2.3. Policies to regulate or restrict actions promoting unhealthy choice options

Food advertising regulations

This intervention entails the implementation of a complete statutory ban of food advertisements on television, targeting children less than 18 years of age, with the intent of limiting their consumption of calorie-dense and/or highly processed food. The intervention is assumed to be initiated by the government, and may include both regulatory and enforcement components to support maintenance of healthier dietary patterns among children.

Based on a systematic review and meta-analysis (Boyland et al., 2016[31]), as well as further analysis described in (Goryakin et al., 2017[17]), this statutory ban would correspond to a 0.31 kg/m^2 lower average BMI among children. This is also consistent with a previous OECD study (Sassi, 2010a), that modelled a reduction of BMI of between 0.13 kg/m^2 to 0.34 kg/m^2 among children in comparable age groups.

This policy is assumed to affect all children aged between 5 and 18. The reduction in BMI is assumed to be age dependent: for those between 5 and 12 years, BMI would be reduced by 0.12 kg/m^2 within one year, and staying on a new parallel trend until the age of 12. For those between the ages of 12 and 18, the reduction is assumed to be larger: a drop in BMI by 0.31 kg/m^2 relative to counterfactual within one year. Finally, those reaching the age of 18 would have a linear decrease of effectiveness until reduction of BMI to 0.155 kg/m^2 relative to the counterfactual, which remains for the rest of life. Based on research showing that exposure to advertising in childhood may affect consumer product evaluation that persists for many years into adulthood (Connell, Brucks and Nielsen, 2014[32]), it is assumed that this effect will persist for the rest of life.

The intervention programme will include expenses on administration and planning at the national and local levels, as well as monitoring and enforcement costs. In addition, minor training may be required for communication authority staff charged with the task of overseeing the implementation of the scheme. This cost varies between USD PPP 0.52 and USD PPP 0.59 per capita annually across the countries included in the analysis.

Table 6.1 provides a brief summary of the key inputs to model the policy scenarios described above.

Table 6.1. Inputs to model: Selected public health interventions targeting overweight

	Food labelling	Menu labelling	Public transport	Workplace sedentary behaviour	Workplace wellness	School-based programmes	Regulation of advertising	Prescription of Physical Activity	Mass media campaigns	Mobile apps
Target age	>5 y.o.	> 5 y.o.	> 5 y.o.	18-65	18-65	8-18 y.o.	Between 5 and 18 y.o.	50-75 y.o., with at least 1 chronic condition/risk factor	>18 y.o.	15-64 y.o.
Exposure	15% of eligible	12% of eligible	1% expansion every 5 years	2.31-6.95%	2.31-6.95%	90%	100%	26.4%	100%	2.21%
Effectiveness	0.40% lower BMI	1.05-1.31% drop in BMI after 1 year of intervention	+105.6 MET-min/week	-72.78 min of SB/ 8 h workday	<12 m: -0.64 kg/m2 12-24 m: -0.16 kg/m2	-0.30 BMI until 18; after 18: -0.15 BMI	-0.12 BMI (between 5 and 12 y.o.)-0.31 BMI (between 12 and 18 y.o) -after 18: -0.155 BMI	168.6 extra MET*minutes per week, lasting 1 year	60% increase in at least moderate activity after 1 month; 30% after 1 year, 0 after 2 years.	0.43% drop in BMI after 1 year
Per capita cost, USD PPP	1.15-1.30	1.15-1.30	n/a	1.08-2.09	6-8	2.78-3.14	0.52-0.59	1.61-1.66	1.93-2.18	0.56-0.63

Source: OECD analyses of the literature; meta-analyses.

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6.3. Policies to tackle overweight and unhealthy lifestyles: what works?

6.3.1. Obesity policies can contribute to significant health gains

All the interventions are predicted to make a positive effect on population health[3]. The largest absolute reductions are expected to occur for cardiovascular diseases (CVDs) and diabetes, with, in from the menu labelling intervention, up to 700 000 cases of CVDs (or 24 000 annually) and 340 000 cases of diabetes (or 11 000 annually) avoided between 2020 and 2050 (Figure 6.1). In general, menu labelling and mass media campaigns are evaluated as the most effective interventions, while food advertising restrictions and school-based programmes produce a smaller impact. However, it should be noted that food advertising restrictions and school-based programmes target children and, therefore, are not particularly effective in the short term. Thus, no child targeted under these two interventions will achieve the age of 50 by the end of the simulation period, which means that most of their health-related benefit is not captured by these numbers. The largest impact on the number of new cases avoided, as a share of total new cases, is predicted for diabetes, with a reduction of up to 0.1% in the case of menu labelling and mass media interventions.

To put this in context, 700 000 new cases avoided as a result of implementing menu labelling represent only about 0.16% of all CVD cases attributable to overweight (see Figure 3.4, Chapter 3). Therefore, there is large scope for potential further action to either upscale existing interventions, or introduce new ones to make a substantial impact on obesity-attributable disease incidence.

When considering the policy effect on the aggregate measures of population, population-wide interventions such us food labelling, menu labelling and mass media campaigns produce the largest health gains, resulting in between 51 000 and 115 000 LYs gained annually in the 36 countries included in the analysis. Menu labelling is also predicted to perform the best in terms of the impact on DALYs (Annex Figure 6.A.1), with a gain of 2.7 million DALYs by 2050 in all countries combined, followed by mass media campaigns, saving up to 2.3 million DALYs cumulatively by 2050, and by food labelling (1.2 million). The largest cumulative effect on DALYs is predicted in Mexico, Germany and in Japan, and the lowest in Malta and Iceland. It is also notable that the effect of menu labelling on DALYs does not fall off over time, even after discounting (Annex Figure 6.A.1), suggesting that it pays off to wait as new cohorts of people are affected in the future.

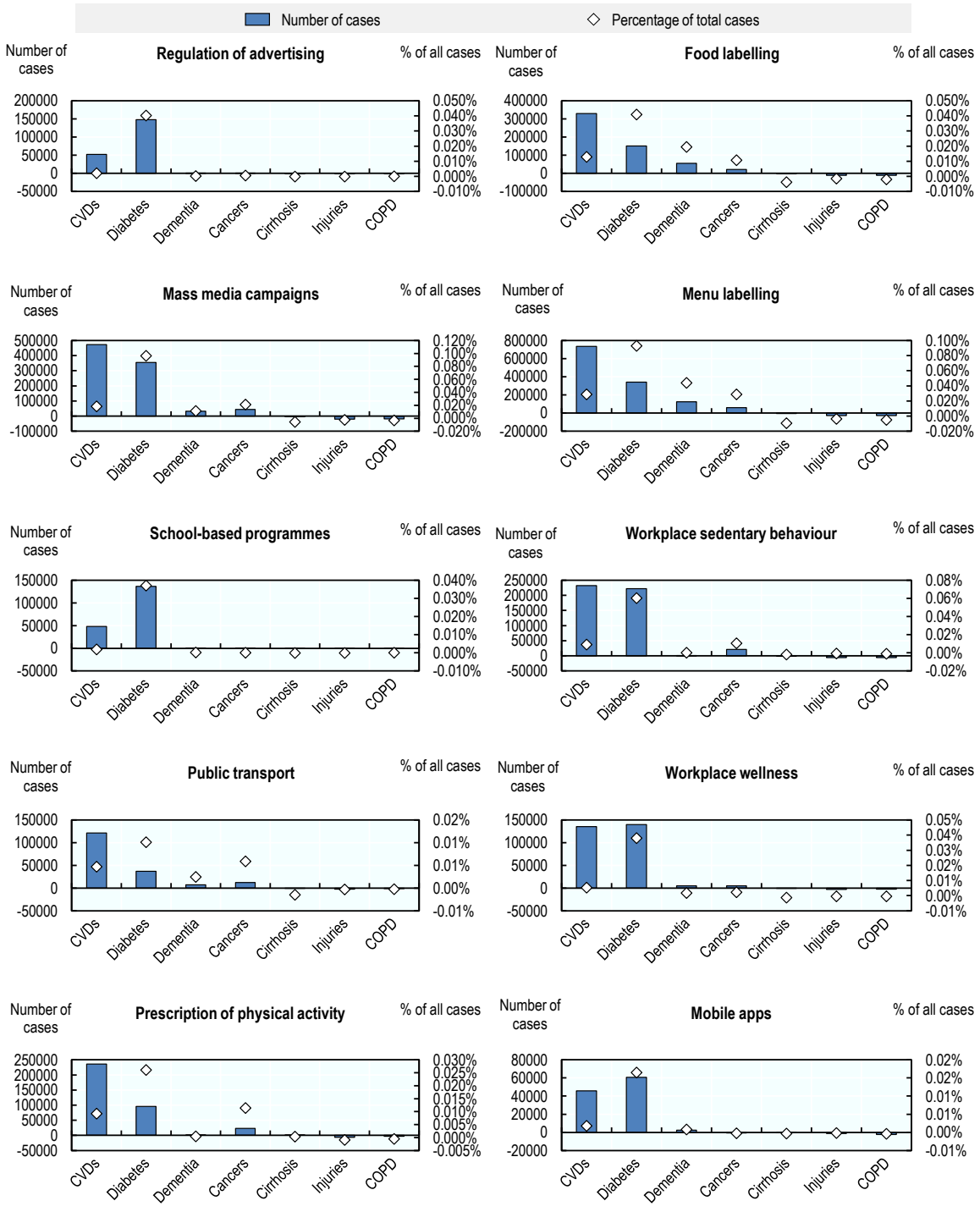
Once results are standardised by the population size, all the interventions are predicted to lead to a gain in LYs and DALYs, with the effect on DALYs (measuring morbidity) being larger than on LYs (measuring life expectancy) (Figure 6.2). This is especially true for the interventions targeting children, who will still be too young in 2050 when the simulation period ends, and therefore mostly unaffected by the impact of the interventions on their mortality risk.

As for regional differences, the interventions will have a larger impact on health outcomes in Central and Eastern European countries, with up to 59 DALYs per 100 000 that can be gained annually in Bulgaria for mass media campaigns (Figure 6.2). This is almost four times greater than in the Netherlands, the Western European country with the highest population-standardised impact on DALYs for this intervention. The stronger effect of policies on DALYs in Central and Eastern European countries is mostly due to the relatively large prevalence of overweight (see Figure 2.1 in Chapter 2), the large burden of premature mortality caused by related chronic diseases (Figure 3.5 in Chapter 3) and the greater prevalence of overweight-related diseases in that region, especially cardiovascular conditions.

Finally, menu labelling is expected to perform particularly well in Western Europe, while mass media campaigns will do so in Central and Eastern European countries. The main reason why mass media campaigns are predicted to perform so well in Central and Eastern Europe is because a relatively large proportion of people in these countries are already at least moderately active.

Figure 6.1. The impact of interventions on disease incidence

Cases avoided, total, 2020-2050



Note: Bars represent absolute reduction in the number of new diseases cases; the markers represent percentage reduction in the number of total new cases, as a share of total new cases, between 2020 and 2050.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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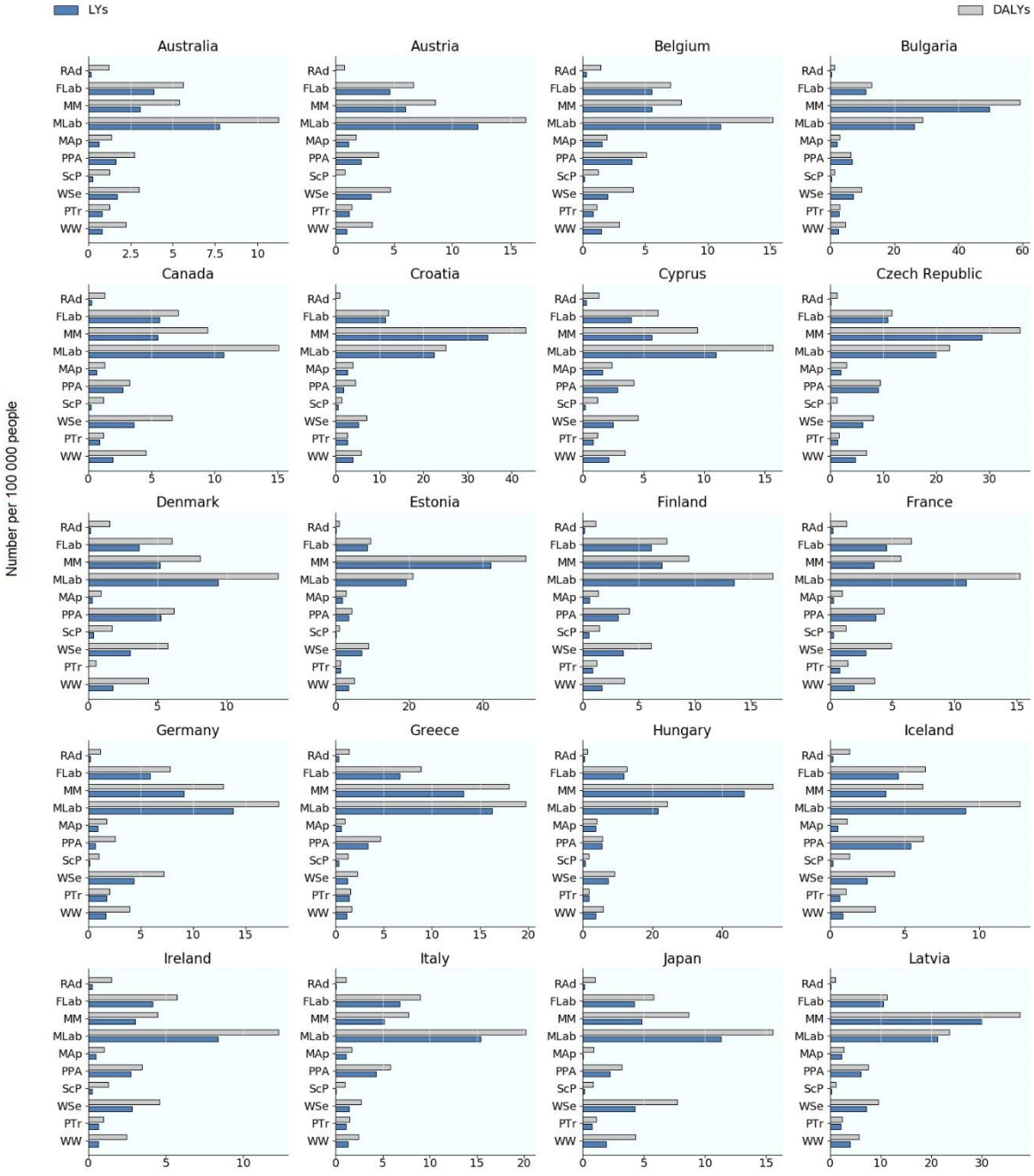
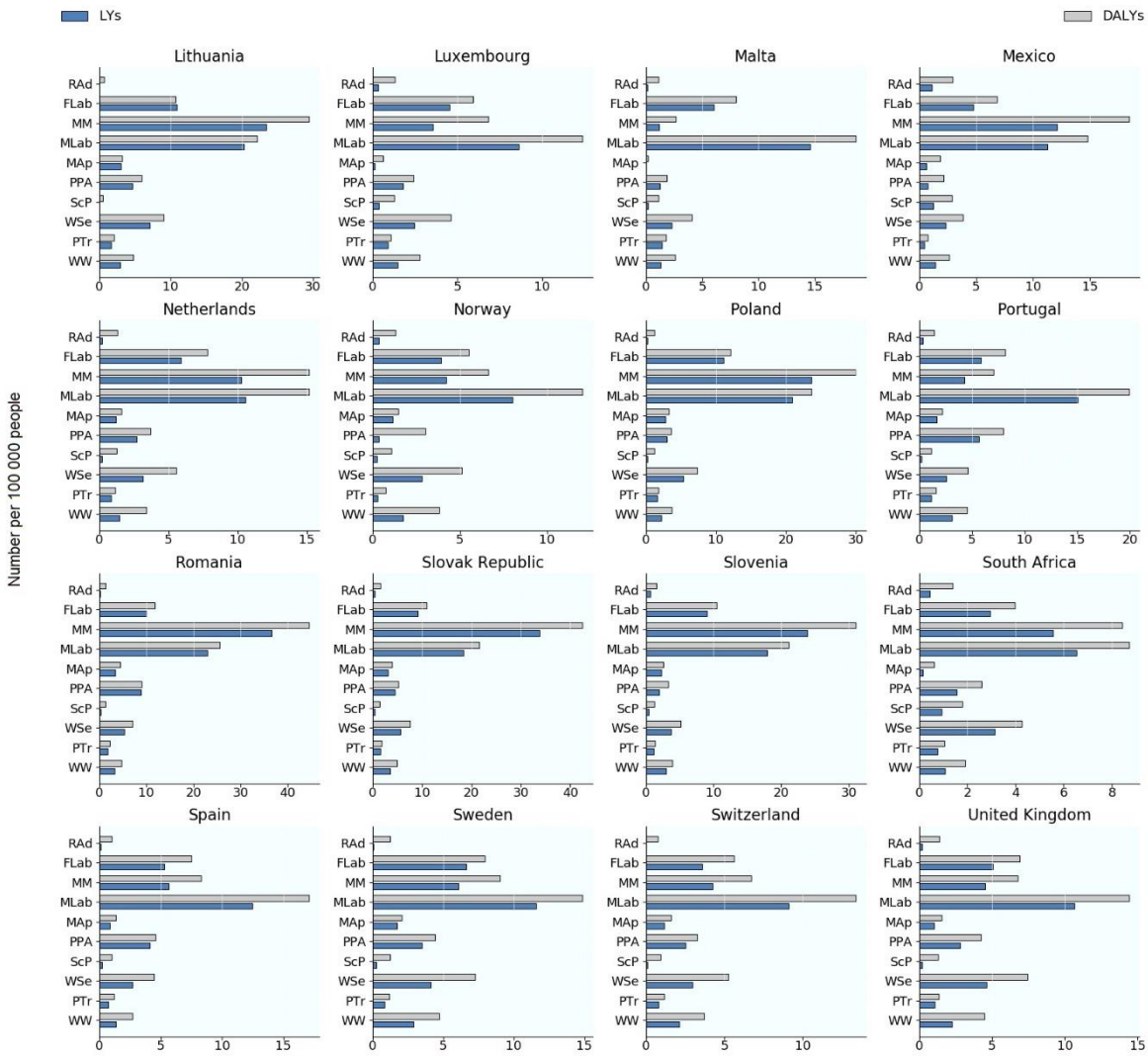
Figure 6.2. Population-standardised effect of interventions on health

Life years (LYs) and disability-adjusted life years (DALYs) gained per 100 000 population annually, 2020-2050





Note: FLab: Food labelling; MAp: Mobile apps; MLab: Menu labelling; MM: Mass media campaigns; PPA: Prescription of physical activity; PTr: Public transport; RAd: Regulation of advertising; ScP: School-based programmes; WSe: Workplace sedentary behaviour; WW: Workplace wellness.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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6.3.2. Obesity policies can reduce health expenditure

Although it might seem intuitive to expect that reducing the obesity burden should lead to health expenditure[4] savings, this is by no means guaranteed, since people who avoid obesity-related conditions as a result of preventative interventions may still suffer from other diseases, and/or accumulate health expenditures as a result of living longer (Van Baal et al., 2008[33]). Nevertheless, findings from the OECD model suggest that this is not the case for the set of assessed public health actions: all the interventions are predicted to contribute to the reduction in health expenditure. The effects of two interventions in particular stand out: menu labelling and mass media campaigns. On average, the menu labelling intervention can save USD PPP 0.99 per capita annually across the 36 countries studied, the largest impact compared to the other interventions. The other interventions will produce average savings in health expenditure ranging from USD PPP 0.04 to USD PPP 0.97 per capita per year. Scaled up to the national level, menu labelling is predicted to save more than USD PPP 13 billion across all countries cumulatively

by 2050 (or USD PPP 922 million in undiscounted costs annually), with the largest cumulative savings predicted in Japan (USD PPP 2.7 billion by 2050) and in Germany (USD PPP 2.3 billion by 2050). The interventions targeting children, such as advertising bans and school-based programmes, are predicted to make a smaller impact on health expenditure, mostly due to the relatively short span of the microsimulation horizon unable to capture their savings later in life. In addition, as discussed in the following section, these interventions make a significantly more pronounced impact on labour force productivity, as well as on the overall economy.

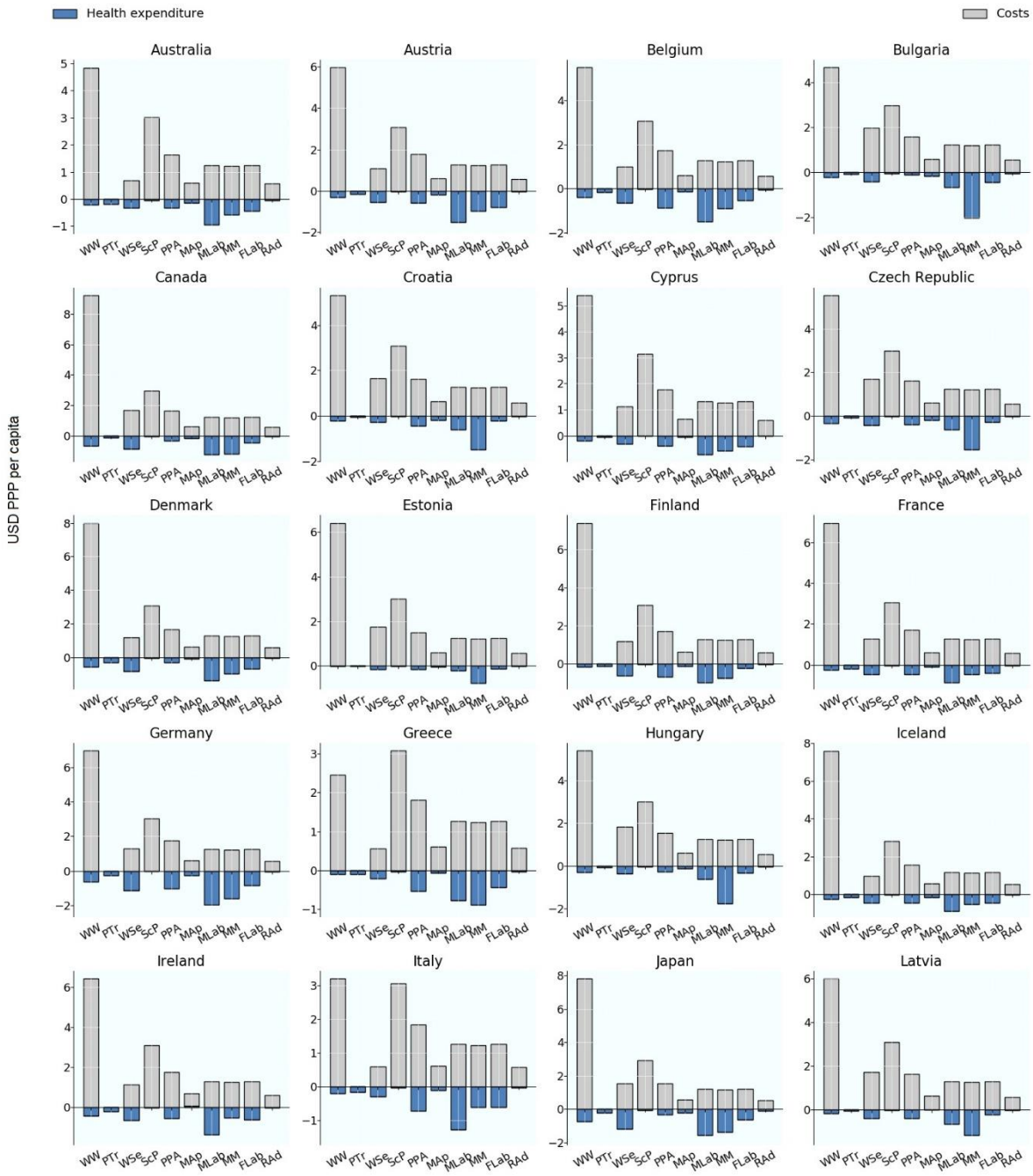
There are important geographical differences in the impact of the interventions. Menu labelling generally performs the best in North and Western Europe, and in Japan. For example, more than USD PPP 37 per capita in medical expenditure can be saved cumulatively by 2050 in Germany (Annex Figure 6.A.2). On the other hand, the lowest savings on a per capita basis for this intervention are predicted in some Central and Eastern European countries, Mexico and South Africa. Two main factors drive this pattern. First, medical treatments in Central and Eastern Europe, Mexico and South Africa are generally less expensive than in other countries and, therefore, a decrease in the number of cases to treat has a lower impact on total savings in health expenditure. Second, the growth in life expectancy caused by preventive interventions, which is particularly pronounced in Central and Eastern Europe, increases the probability that individuals develop other diseases that bring additional expenditure later in life. This pattern is also in contrast to the epidemiological results, where these interventions were found to make the largest impact on DALYs in Central and Eastern European countries (see above).

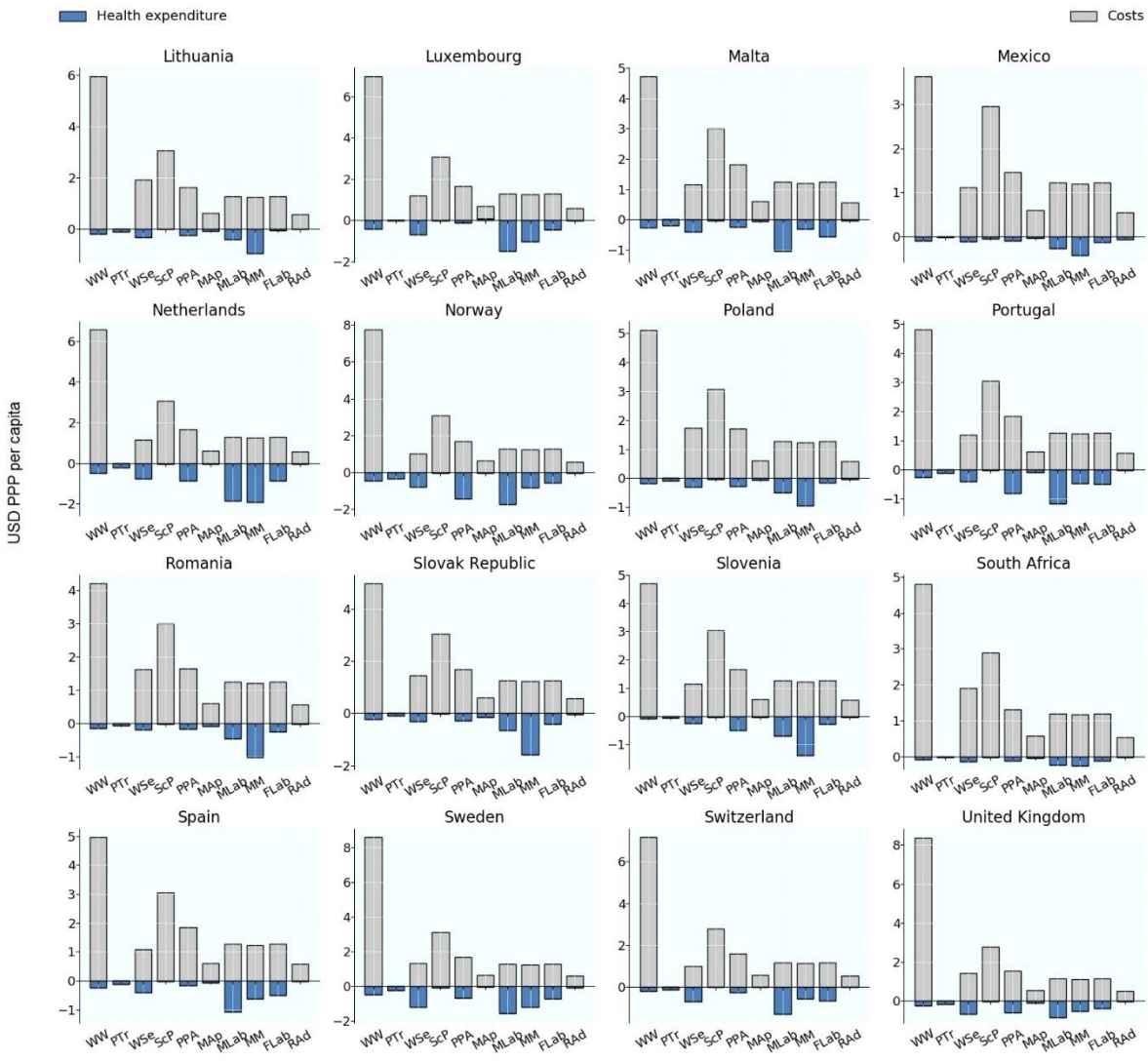
For mass media campaigns, the situation is different: the savings in Western, Central and Eastern European countries are generally equally large. This is mostly due to the fact that mass media campaigns are particularly effective at affecting population health in Central and Eastern Europe (see above), which compensates for the lower cost of treatment in that region.

Finally, Figure 6.3 compares the per capita annual cost of implementing the interventions and the reductions in the associated health expenditures. In the case of expanding public transport, the costs of implementing the intervention were assumed to be zero. In general, the intervention costs significantly outweigh the health expenditure savings resulting from the policy implementation, with the exception of mass media campaigns and menu labelling interventions which are sometimes cost saving. Nevertheless, Figure 6.3 does not necessarily indicate that these interventions represent poor value for money, as shown below.

Figure 6.3. Cost of interventions and their impact on health expenditure

USD PPP per capita, annually, 2020-2050





Note: FLab: Food labelling; MAp: Mobile apps; MLab: Menu labelling; MM: Mass media campaigns; PPA: Prescription of physical activity; PTr: Public transport; RAd: Regulation of advertising; ScP: School-based programmes; WSe: Workplace sedentary behaviour; WW: Workplace wellness.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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6.3.3. The impact of obesity policies on the labour market and related costs

Overweight causes lower employment rate, greater absenteeism and presenteeism, as well as increases in the number of people who retire early. Therefore, implementation of policies designed to reduce the burden of overweight provides an opportunity to reduce economic costs associated with suboptimal utilisation and productivity of the labour force.

Results confirm that the interventions affect such costs in the expected direction. Thus, across all countries, 21 000 more people will be in employment annually as a result of the menu labelling intervention, while mass media campaigns will help add 28 000 people. When considering the effect on total employment, which also takes into account missed days of work due to illness, being less productive at work, as well as missed work due to early retirement, menu labelling will help add up to 49 000 labour market outputs to the workforce each year in all countries, while mass media campaigns about 51 000. This effect is

predicted to be the largest in Germany, where about 4 000 individuals can be added to the workforce annually for each of the four interventions: mass media campaigns, menu labelling, workplace sedentary behaviour and workplace wellness (Annex Figure 6.A.3), while the lowest effect is predicted to be in Malta, where only 20 individuals will be added to the workforce annually in the case of menu labelling.

On a per capita basis, mass media campaigns will make the strongest impact on labour market outputs, followed by menu labelling. On the other hand, this effect will be the lowest for the transport policy, mostly due to the small population coverage which also includes people of non-working age. Mass media campaigns are predicted to make the largest impact on labour market outputs in Estonia, with up to 10 people per 100 000 being in employment annually, followed by Bulgaria (9.8 per 100 000) and Hungary (9.1 per 100 000).

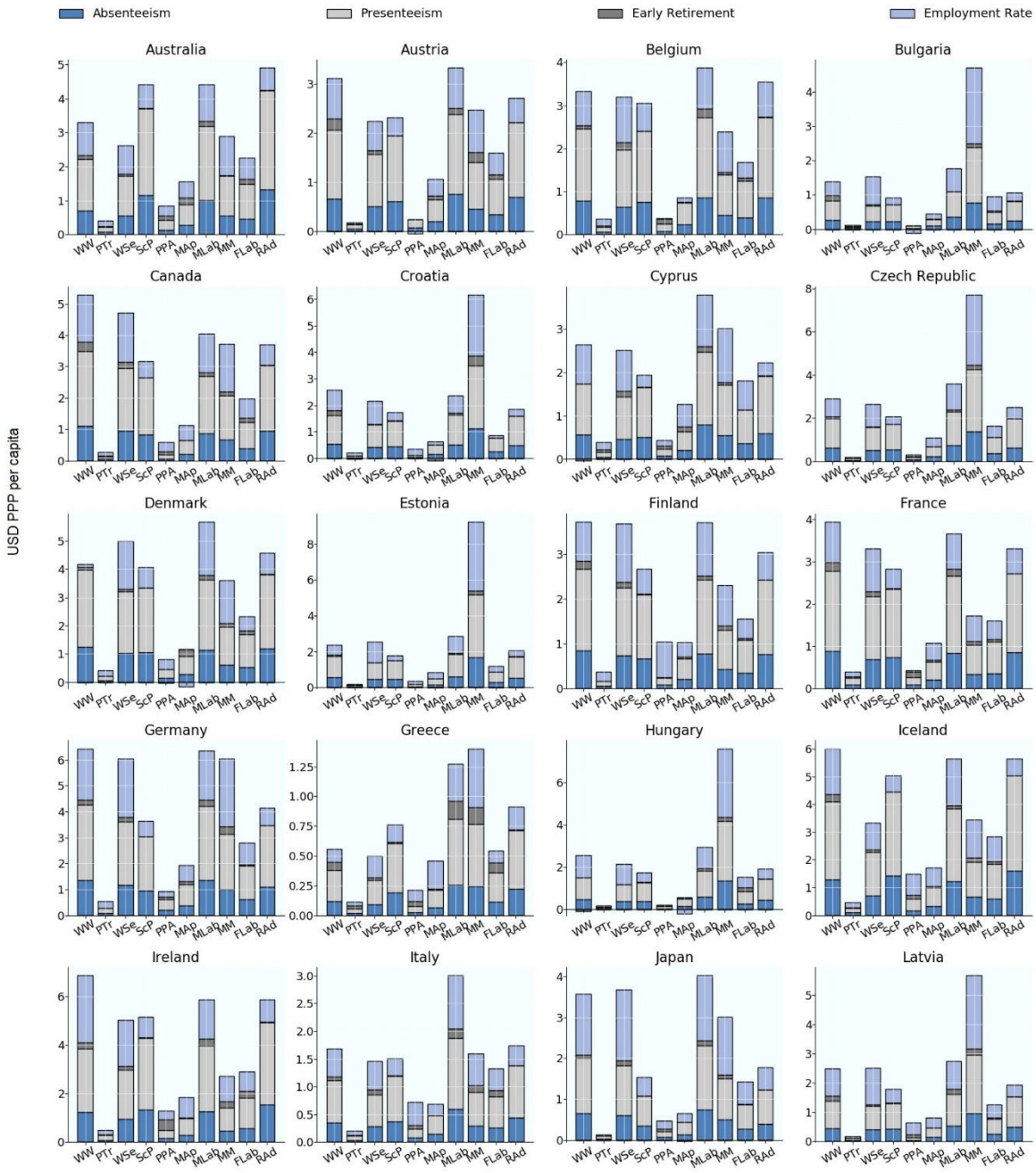
When expressed in monetary terms by converting missed work time into missed wages, in total each year, about USD PPP 12 billion in labour market costs can be saved in all countries combined as a result of implementing the modelled policies. This is due to the following components: increase in employment rate (4.9 billion); reduction in presenteeism (4.8 billion), reduction in absenteeism (2.2 billion) and reduction in early retirement (0.2 billion). Among the policies, the largest effect is due to the implementation of mass media campaigns and menu labelling, with the corresponding expected saving of USD PPP 1.92 billion and USD PPP 2 billion in labour market costs in all the countries combined. When standardised by the population size (Figure 6.4), the combined labour productivity cost avoided for the mass media intervention will be the highest in Central and Eastern European countries, with up to USD PPP 9.2 per capita saved in Estonia.

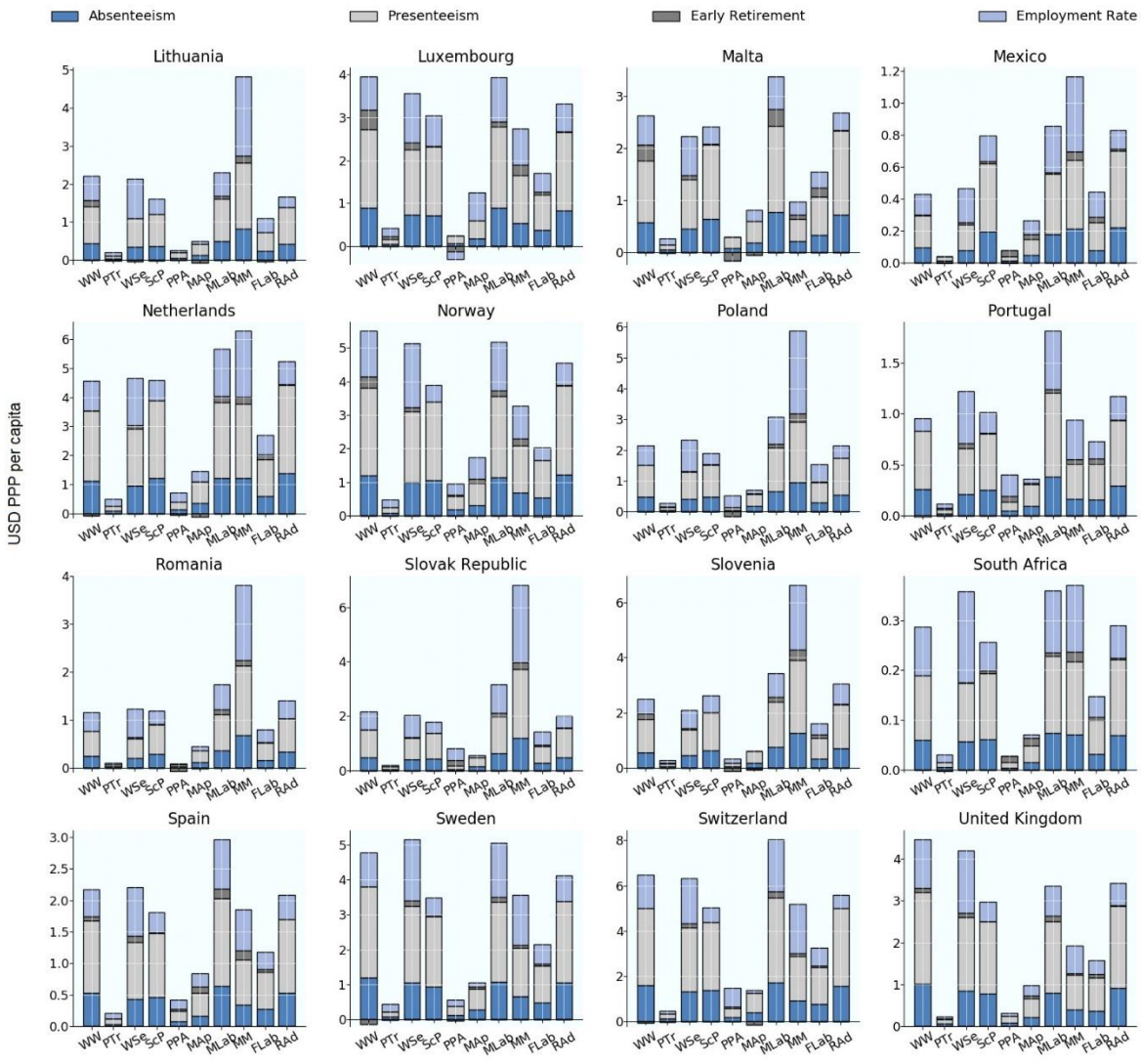
As shown above, medical expenditure-related savings are considerably larger in Western than in Central and Eastern Europe, due mainly to the higher cost of medical treatment in the former region. The fact that the reverse is true for labour market-related costs is largely due to the fact that people living in Central and Eastern Europe tend to develop complications at a younger age, compared to individuals living in Western Europe. This means that labour market losses are larger in Central and Eastern Europe.

Finally, the figures in this section indicate that interventions targeting children, as well as workplace-based interventions, perform well on the labour market cost measures. This is in notable contrast to the population health and health expenditure outcomes, and is attributable to the fact that these interventions, although not having much effect on these outcomes within the horizon taken into account, can still improve productivity during a person's working life, reducing the prevalence of overweight, and/or by delaying the development of chronic diseases towards later life.

Figure 6.4. Labour market economic costs avoided

USD PPP per capita, annually, 2020-2050





Note: FLab: Food labelling; MAp: Mobile apps; MLab: Menu labelling; MM: Mass media campaigns; PPA: Prescription of physical activity; PTr: Public transport; RAd: Regulation of advertising; ScP: School-based programmes; WSe: Workplace sedentary behaviour; WW: Workplace wellness.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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6.3.4. Impact on the broader economy

Although intervention costs are generally predicted to outweigh health expenditure savings, they may still offer a good return on investment, especially after a number of years. In fact, interventions usually require up-front investment that, in many cases, may be very large relative to the health improvements they produce and to the gains in terms of health expenditure, especially in early years. However, over time, implemented policies may represent increasingly good value for money invested, especially if their effect on labour market productivity and utilisation is also taken into account.

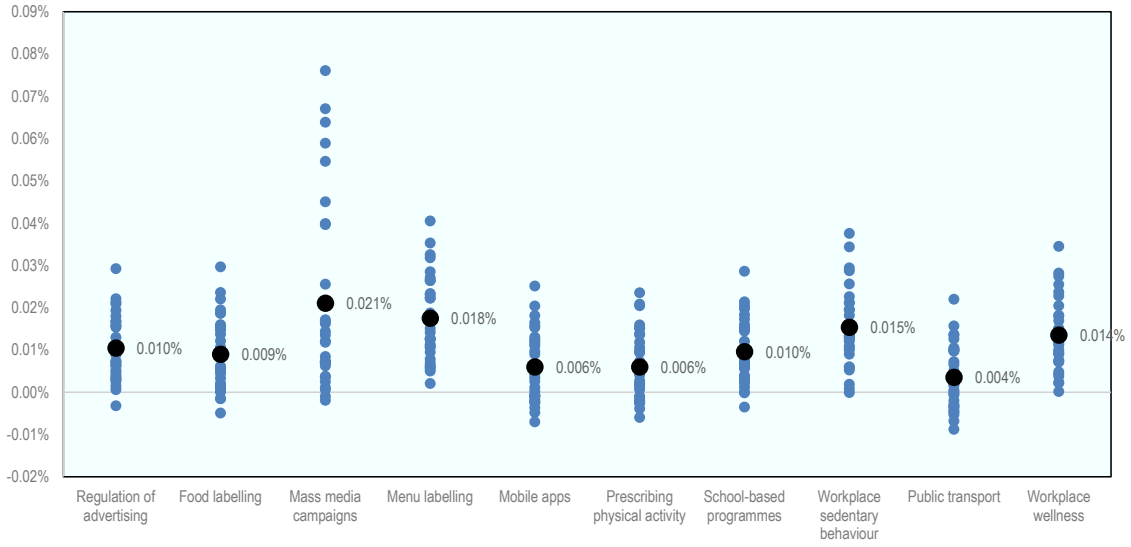
Analysis in this chapter shows that economic gains from increased labour productivity and utilisation will in general considerably exceed the savings from reduced health expenditure. This also parallels findings in Chapter 3 (compare Figure 3.8 with Figure 3.11). If such labour market costs are taken into account, the return on investment for some interventions will improve even further, in many cases implying cost-saving.

The simulated effect on GDP supports this expectation. In most countries, policies are expected to contribute to an increase of GDP in the range of 0.005%-0.021% annually (Figure 6.5). Taking 0.005% as a conservative assumption, this corresponds to an increase of USD PPP 1.7 billion in GDP for the 36 countries analysed. The range of GDP benefit also corresponds to approximately USD PPP 1.3 to 7.7 per capita per year.

Comparing the increase in GDP to the cost of implementing the policies in all 36 countries, the policies appear to provide good value for money. For more expensive policies, such as workplace wellness, prescribing physical activity and school-based programmes, the total return in GDP across the 36 countries is roughly equal to the total cost of implementing the policy in all countries. The cost of implementing food labelling or mobile apps is about 40% of the benefit in terms of GDP. Four remaining policies (regulation of advertising, mass media campaigns, menu labelling and workplace sedentary behaviour) cost around 20% or the conservatively predicted benefit to the economy. In other words, for each USD PPP 1 invested, around USD PPP 4-5 will be returned in the form of the economic benefit on average each year over the next 30 years for these interventions.

Figure 6.5. The impact of interventions on GDP

Percentage change in GDP due to intervention, average 2020-2050



Note: Blue dots are countries analysed, black dot is the average across countries.
Source: OECD analyses based on the OECD SPHeP-NCDs model & OECD long-term economic model, 2019.

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6.4. Combining policies into coherent prevention strategies has greater impact

Combining public health actions into prevention packages provides multiple advantages. Causes of unhealthy lifestyles and ultimately of obesity are multifaceted. A first substantial advantage of combining single actions into prevention strategies is that packages of interventions can address multiple causes at the same time. In addition, packages can target different population groups simultaneously producing greater results at the population level. Finally, policies within a package can interact with each other

sustaining positive behavioural changes in a more than additive fashion. For example, there is some evidence that the combination of mass media campaigns and food labelling schemes may have a greater impact on sales of healthy products (Surkan et al., 2015[34]). Analyses carried out with the OECD model take into account these first two components but adopt a conservative assumption on the potential super-additivity of combining policies in packages and no additional effect is considered. The following three policy packages were evaluated:

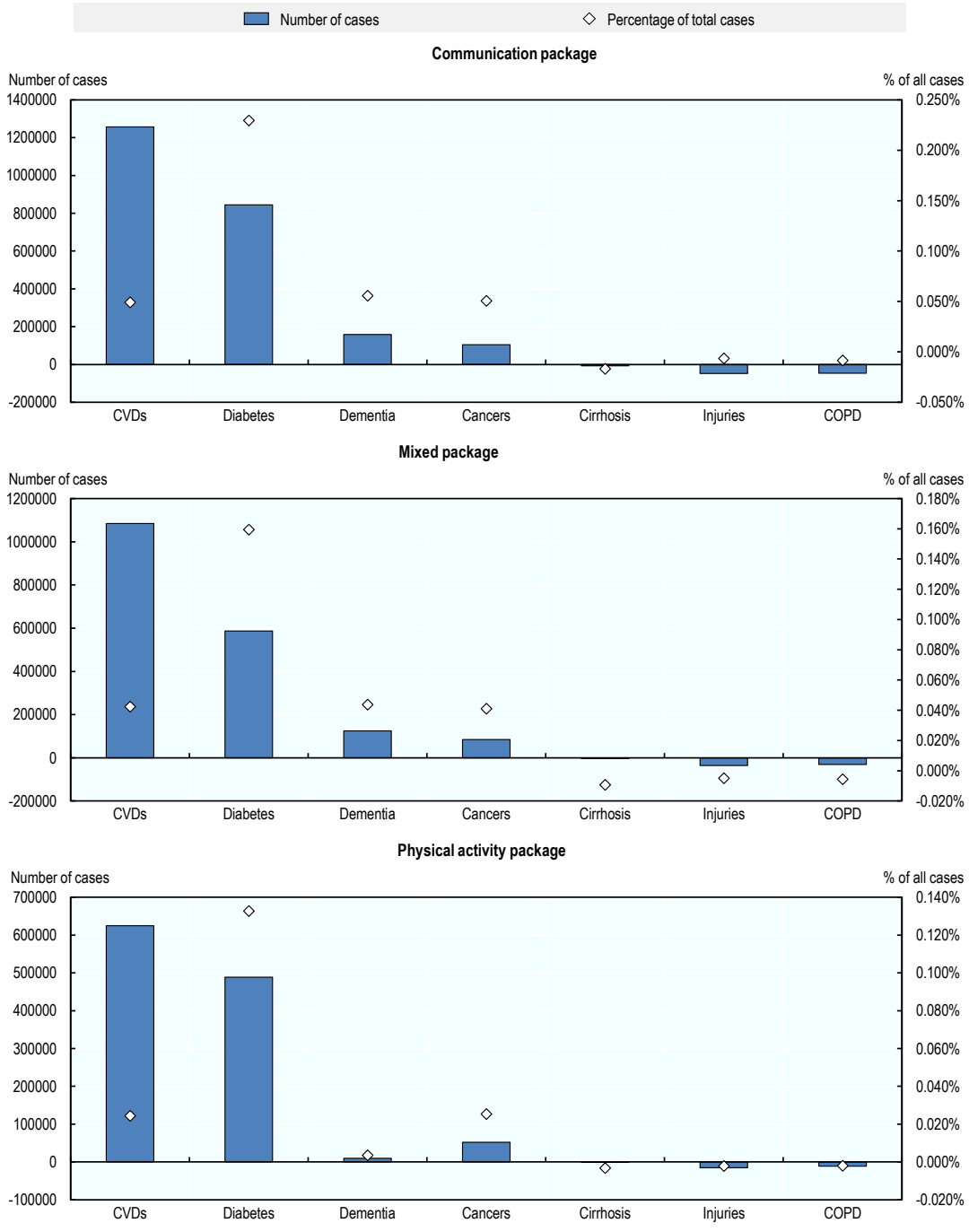
- Communication package: focusing primarily on actions to increase public awareness. Actions include food labelling, advertising restrictions and mass media campaigns and are already implemented in many, but not all, OECD countries, with much variability in terms of implementation and design. The package entails the implementation of the most effective version of these actions, scaling up policies already in place.
- Mixed package: containing policies which are less often implemented by OECD countries, but which show promise. The package encompasses menu labelling, prescribing physical activity and workplace wellness programmes.
- Physical activity package: primarily encompasses environmental changes to promote an active lifestyle and includes prescribing physical activity, public transport interventions, physical education in schools and actions to counteract workplace sedentary behaviour. These interventions are less often implemented by OECD countries.

Upscaling the communication package is predicted to have the largest effect on health outcomes, followed by the mixed package and then by the physical activity package Specifically, by 2050, the communications package is expected to prevent almost 1.3 million cases of CVDs (or 40 000 cases annually, 6 300 of which in Mexico); 0.844 million cases of diabetes (or 27 000 cases annually), 0.158 million cases of dementia (or 5 100 cases annually) and 0.104 million cases of cancers (or 3 360 annually, about 500 of which will be in Japan) (Figure 6.6). This is also more than the sum of the component interventions belonging to the communications package: for example, three separate interventions, if implemented separately, are only predicted to avoid 0.854 million cases of CVDs and 0.653 million cases of diabetes. The share of diseases as a proportion of total diseases avoided is quite similar across packages: about 55-60% for CVDs, and about 37-42% for diabetes (Figure 6.6).

The communications package will also make the strongest impact on DALYs and LYs gained, compared to the other two packages. For example, investing in a communication package to upscale policies already in place in many OECD countries can result in a gain of 205 000 LYs per year across all the 36 countries included in the analysis. The impact of the communications package will be greater in Central and Eastern European countries, with up to 76 LYs gained annually per 100 000 people in Bulgaria (Figure 6.7). Again, this finding is consistent with the large obesity-related disease burden observed in Central and Eastern Europe, and the potential of these interventions to make a difference there. The communication package is also predicted to make the largest impact on health expenditure (Annex Figure 6.A.4), although as a rule, the cost of implementing the interventions will be higher than the savings in health expenditure. Cumulatively, the communications package is predicted to save about USD PPP 26 billion by 2050. The largest annual effect of this package will be observed in Netherlands (USD PPP 3.9 per capita), while the smallest in South Africa (USD PPP 0.53). The health expenditure savings will generally be greater in Western and Northern Europe as well as in Japan.

Figure 6.6. New cases avoided due to implementation of packages

Total number of cases, 2020-2050



Note: Bars represent absolute reduction in the number of new disease cases; the markers represent percentage reduction in the number of total new cases as a share of total new cases, between 2020 and 2050
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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The communication package is predicted to make the largest impact on the productivity-related costs, saving up to USD PPP 5.3 billion per year in all the countries combined. This is due to the following components: USD PPP 1 billion in absenteeism-related costs; USD PPP 2.1 billion in presenteeism; USD PPP 2.15 billion due to the employment rate and USD PPP 0.1 billion in early retirement costs. When standardised by the population size, the largest reduction will be in Switzerland with savings of USD PPP 19 per capita annually. In addition, each year, 57 000 more people will be in employment as a result of the communications package; 40 000 as a result of mixed package, and 35 000 as a result of physical activity package. On a per capita basis, the largest increase in employment will be in Bulgaria (14 per 100 000 annually).

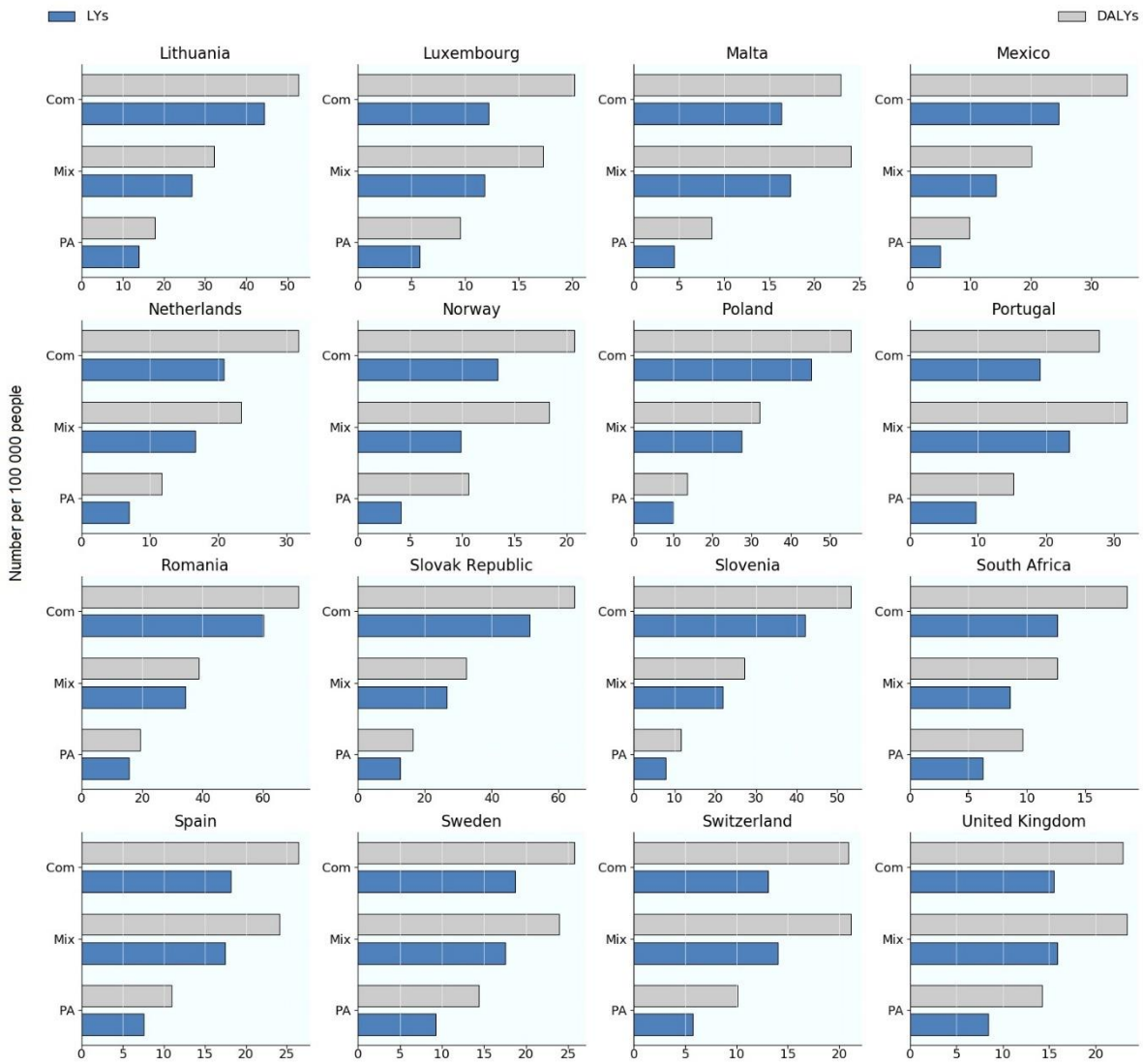
A mixed package also shows significant promise. Although it contains policies which are still rarely implemented, their upscaling can produce similar results, leading to almost 160 000 LYs gained annually and savings for USD PPP 23 billion cumulatively by 2050. A package to promote physical activity is predicted to produce smaller, but still significant effects, by leading to a gain of 70 000 LYs and by saving USD PPP 17 billion in health expenditures. The three packages would also avoid between 5.2 DALYs and 2 million DALYs in all modelled countries by 2050.

The impact on GDP will be also substantial, with the communication package expected to produce an impact on GDP varying between 0.02% and 0.11% across the countries included in the study. The other two packages –the mixed package and the physical activity package- will produce a smaller effect, generally in the order of magnitude of 0.01% and 0.06%, respectively, compared to the communication package. Overall, for each USD invested in one of the policy packages, between USD 1.3 and USD 4.6 will be returned in the form of economic benefits each year.

To sum up, the communication package is predicted to perform better than the other packages, while also having a stronger effect compared to implementing the three component interventions separately. The relatively strong performance of communication package is not surprising, as it includes such policies as mass media campaigns and food labelling, which were among the top three performing interventions in almost all countries. These policies are already implemented in many countries, although in many cases not in their most effective version. Therefore, ensuring a further roll-out of communication policies that already have good evidence base on their effectiveness is a promising avenue for the countries to consider.

Figure 6.7. Population-standardised effect of packages on health

Life years (LYs) and disability-adjusted life years (DALYs) gained per 100 000 population annually, 2020-2050



Note: PA: physical activity package; Mix: mixed package; Com: communications package
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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6.5. Conclusions

This section shows that population-wide interventions such us food labelling, menu labelling and mass media campaigns will produce the largest health gains and largest savings in health expenditure. Although the costs of running the interventions are usually higher than the resulting health savings, the labour market gains are usually several times larger than the reductions in medical expenditures. When this effect on labour market inputs is taken into account, the policies appear to provide very good value for money: for every USD 1 invested in all the interventions, the total GDP return is generally at least equal to their cost, and for the best performing interventions, it can be 4-5 times bigger. Finally, the communication package is predicted to perform better than the other packages, while also demonstrating that it has a stronger combined effect compared to implementing the three component interventions independently.

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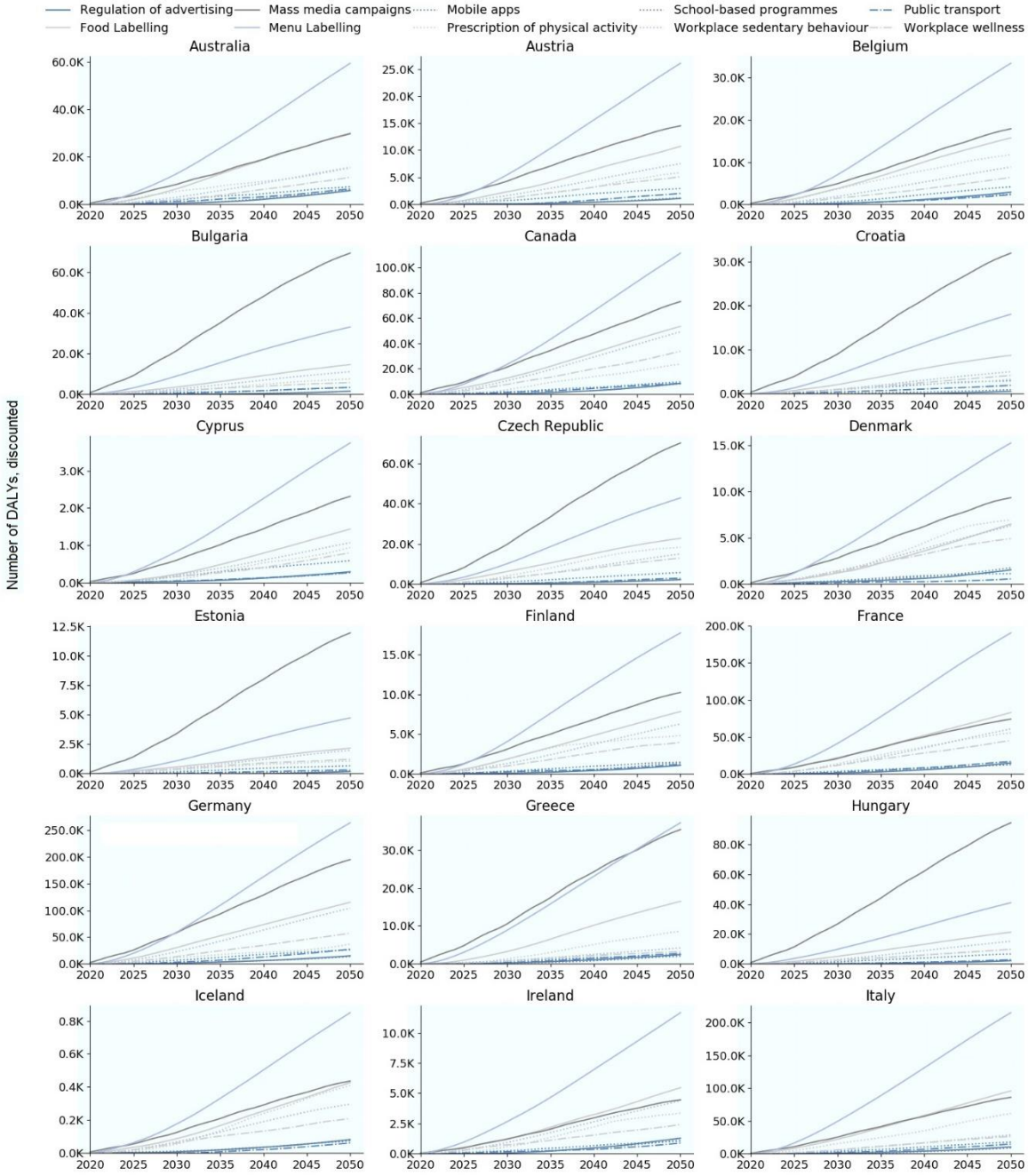
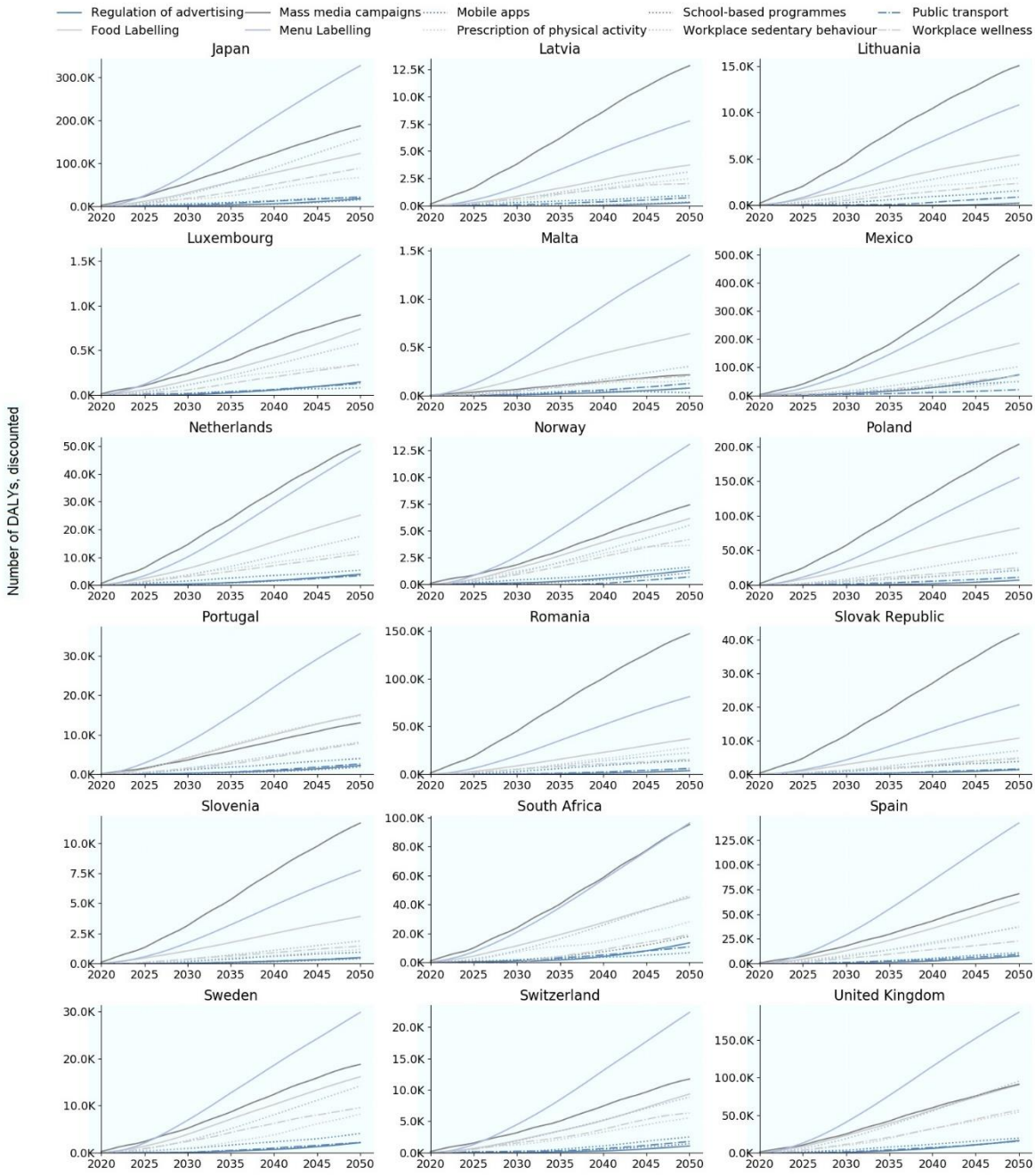
Annex 6.A. Additional analyses

In this section, some additional results are shown demonstrating a potential impact of interventions (and of their packages), on health and economic outcomes, separately for each country. First, Annex Figure 6.A.1 shows the progression of cumulative DALYs gained over time resulting from the implementation of ten modelled interventions. Next, Annex Figure 6.A.2 demonstrates the predicted cumulative savings in medical expenditures, and how they change over time. Annex Figure 6.A.3 shows how the interventions can contribute to increases in the labour force. Finally, Annex Figure 6.A.4 compares the costs of implementing the packages with the potential savings in health expenditure resulting from their implementation.

Annex Figure 6.A.1. Cumulative disability-adjusted life years (DALYs) gained

Cumulative number of DALYs gained, discounted, 2020-2050





Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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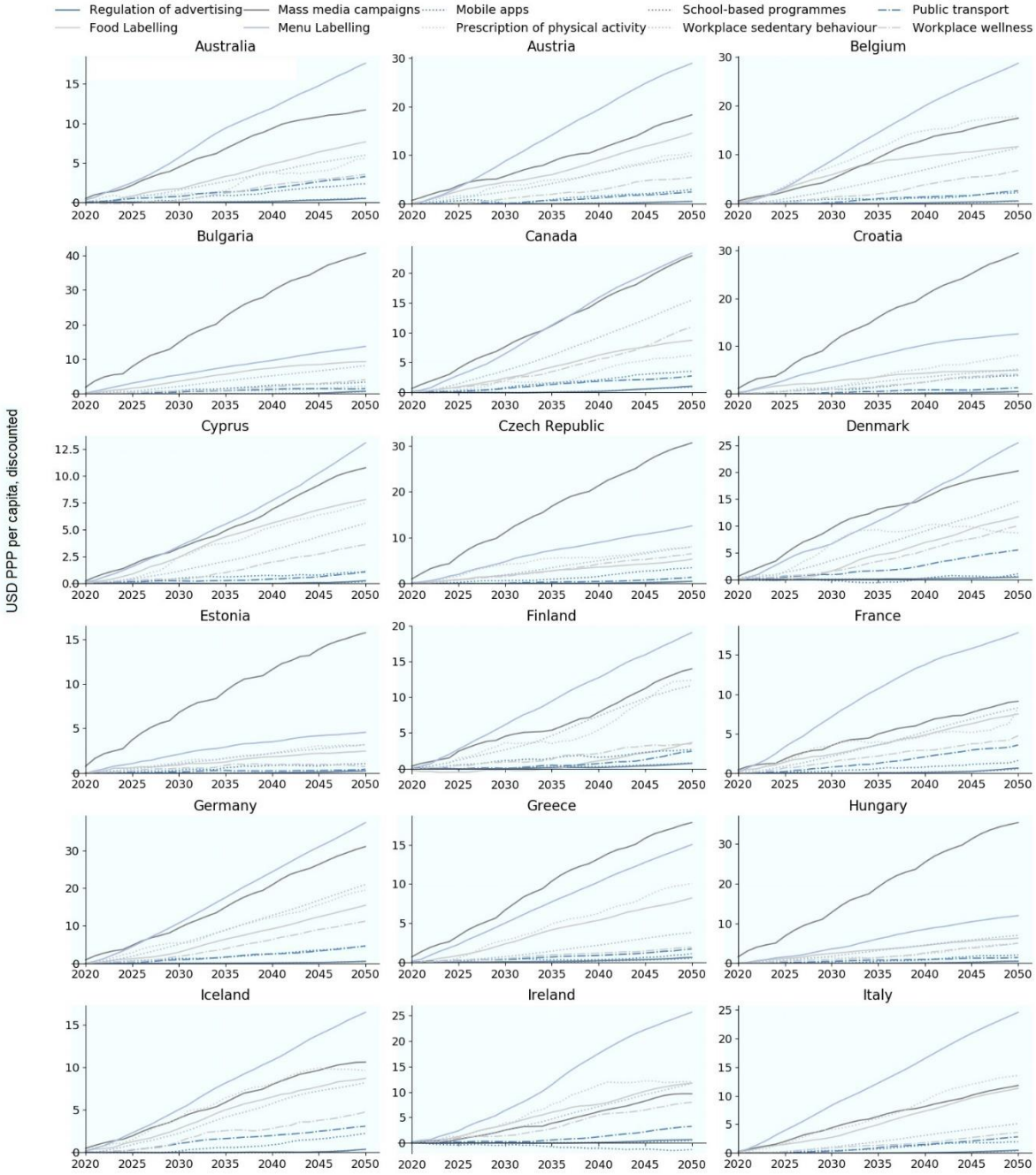
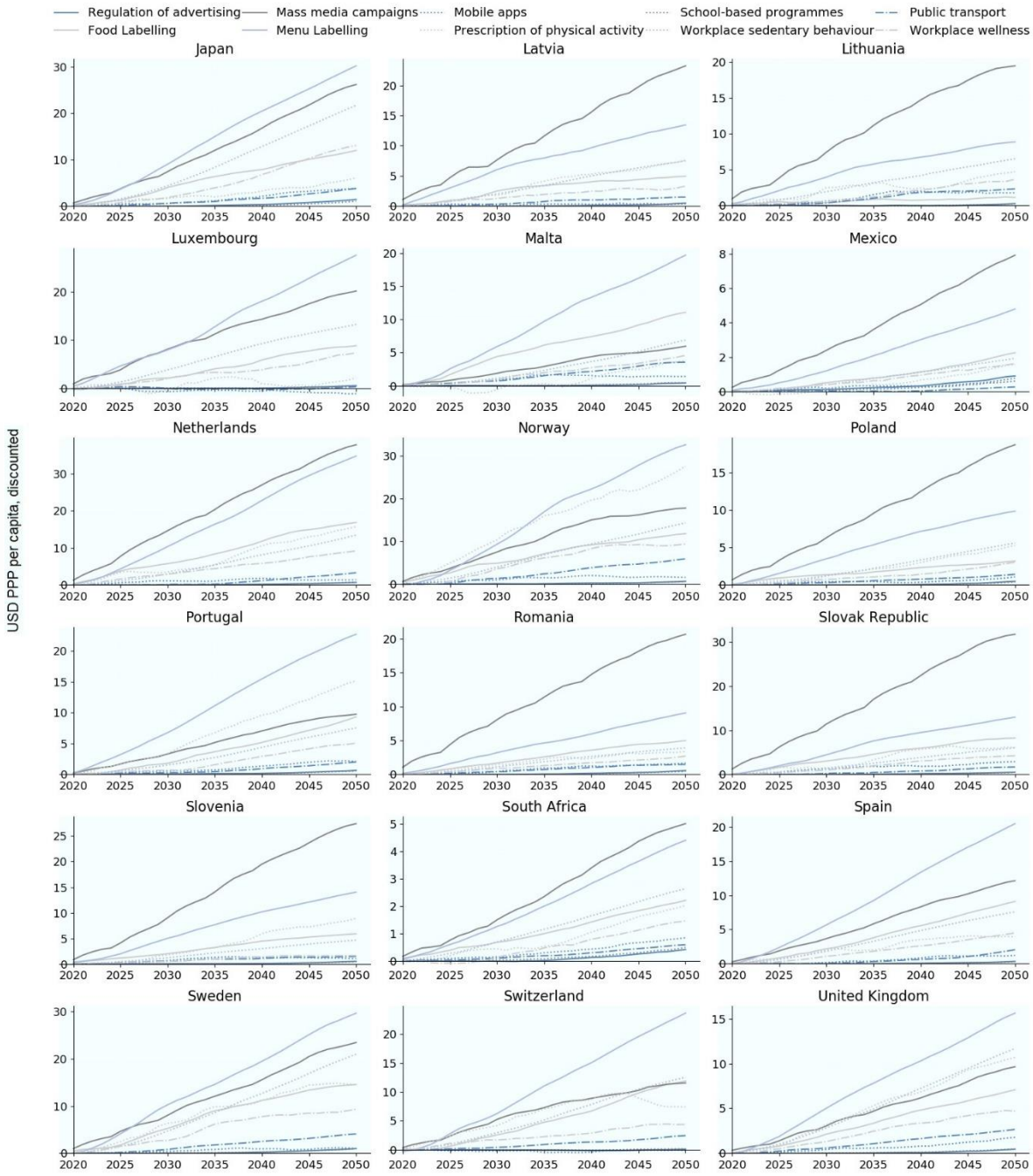
Annex Figure 6.A.2. Cumulative savings in health expenditure

USD PPP per capita, discounted, 2020-2050





Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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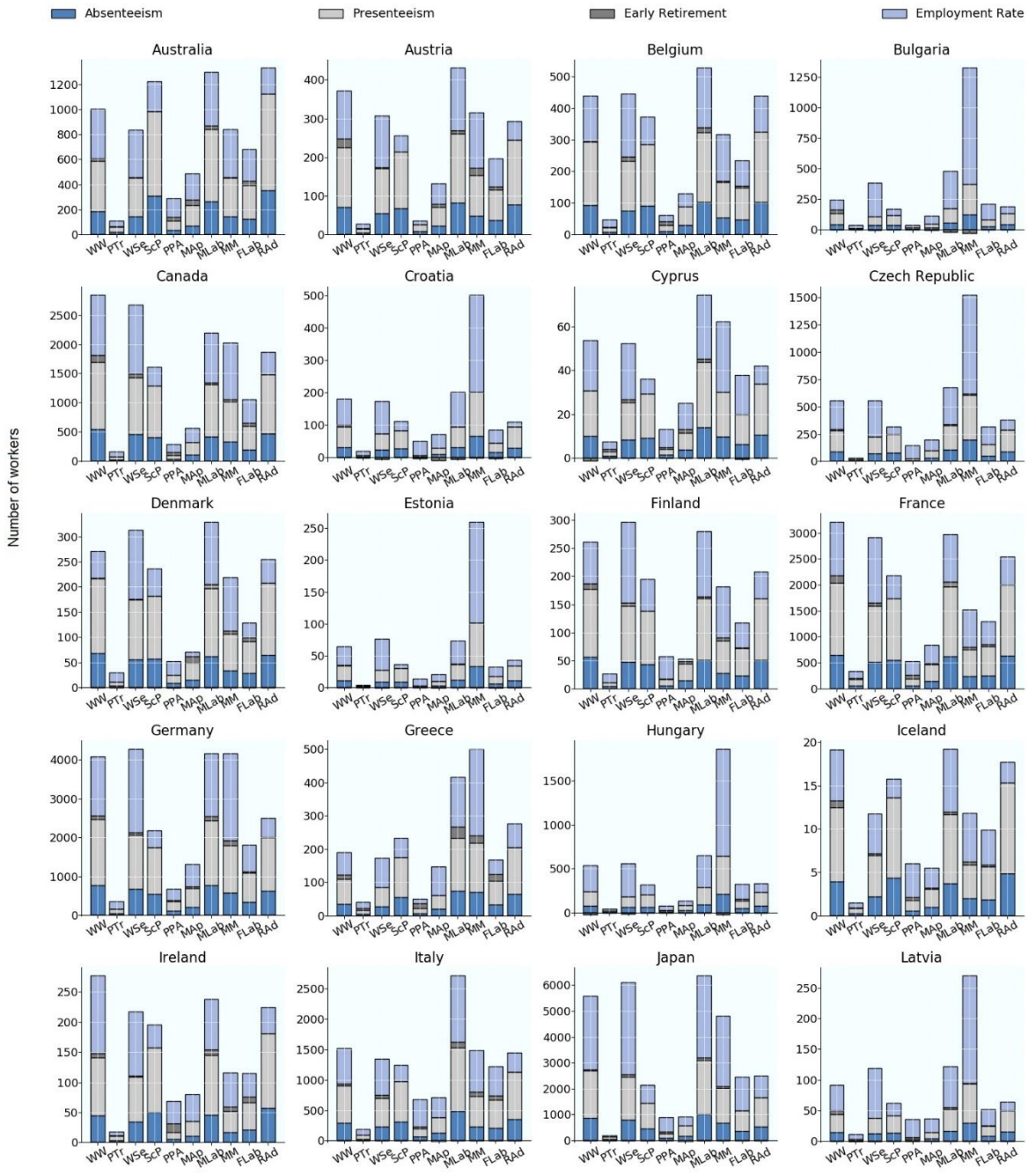
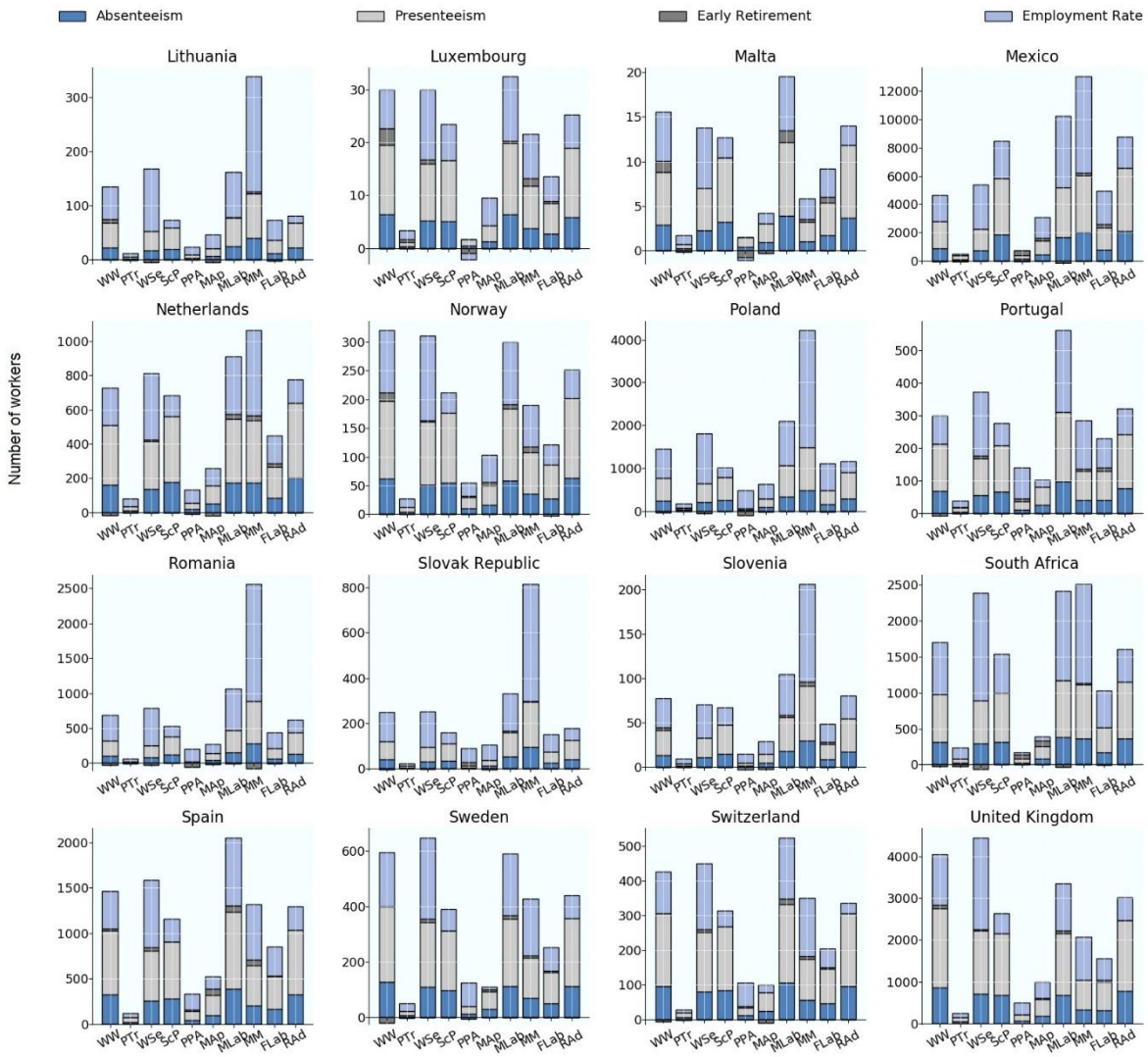
Annex Figure 6.A.3. Increases in workforce

Number of workers added annually, 2020-2050





Note: FLab: Food labelling; MAp: Mobile apps; MLab: Menu labelling; MM: Mass media campaigns; PPA: Prescription of physical activity; PTr: Public transport; RAd: Regulation of advertising; ScP: School-based programmes; WSe: Workplace sedentary behaviour; WW: Workplace wellness.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

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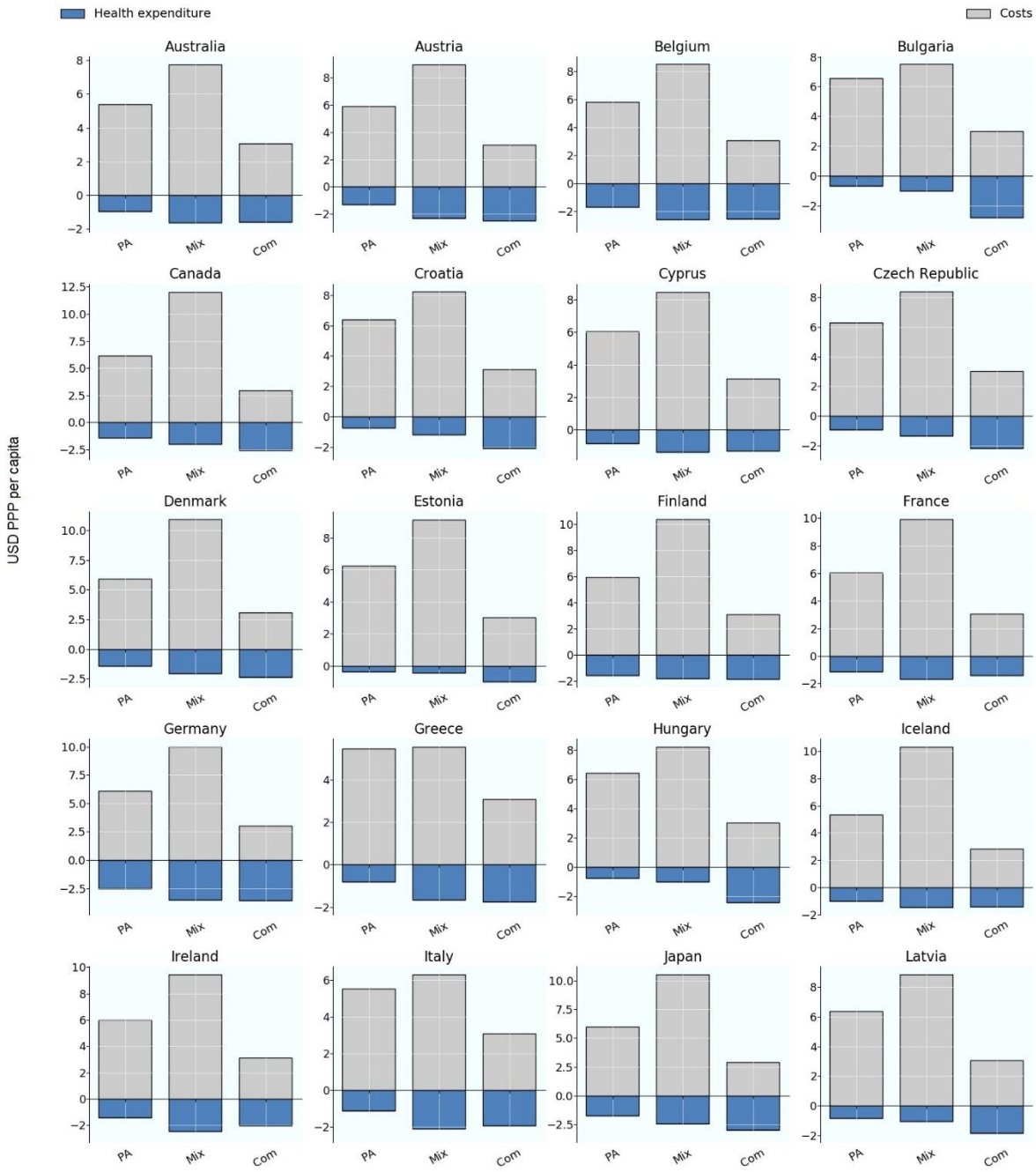
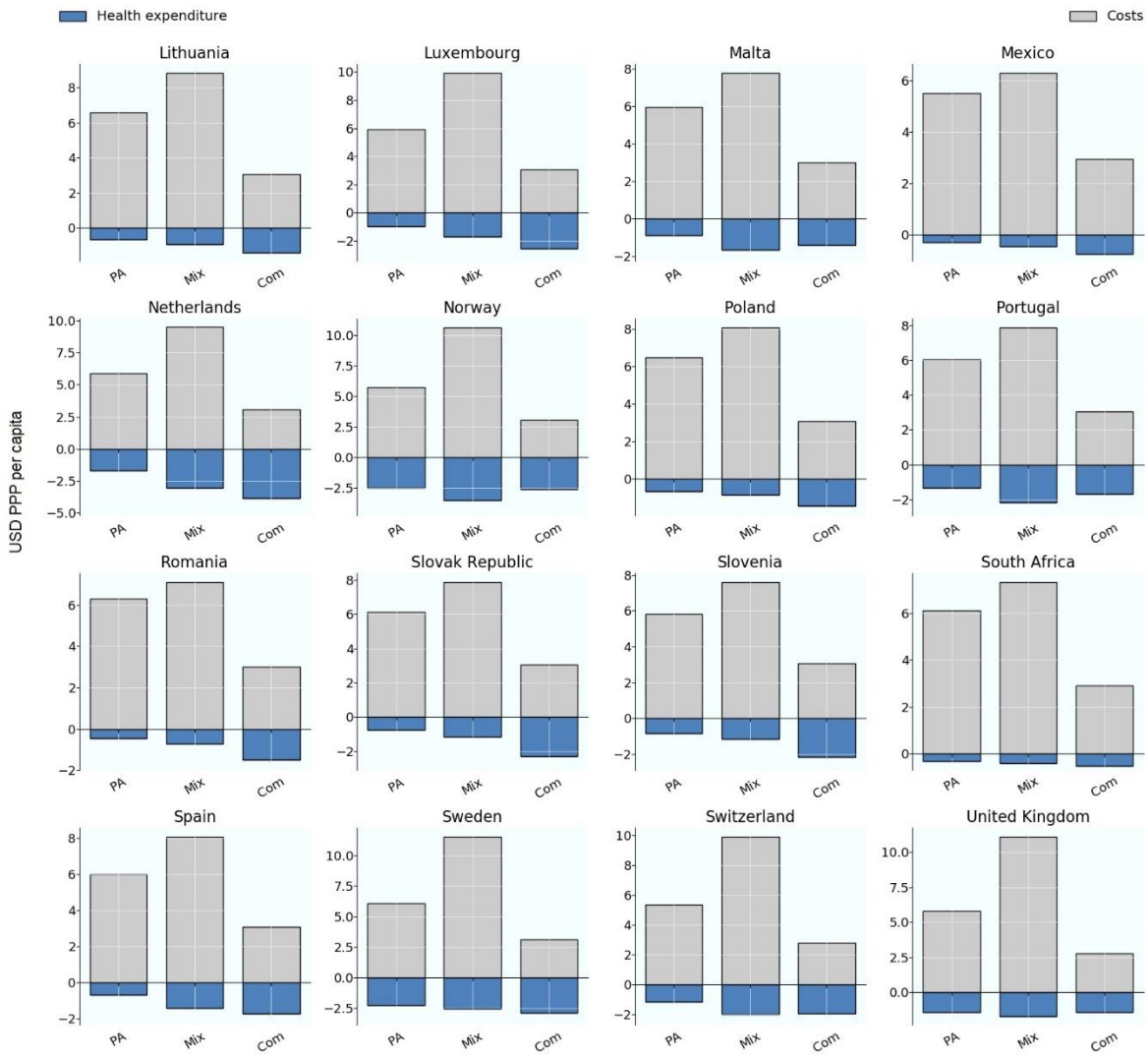
Annex Figure 6.A.4. Cost of packages and their impact on health expenditure

USD PPP per capita, annually, 2020-2050





Note: PA: physical activity package; Mix: mixed package; Com: communications package
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

StatLink https://doi.org/10.1787/888934007829

Notes

[1] Throughout this chapter, the nutritional status of individuals is defined according to WHO guidelines and thresholds and uses body-mass index (BMI). Overweight is defined as a BMI higher than 25 kg/m2; pre-obesity is defined as a BMI of 25-30 kg/m2; and obesity is defined as a BMI higher than 30 kg/m2. Obesity can be further divided into class I, class II and class III obesity. Class I obesity is the milder form of obesity and is defined as a BMI of 30-35 kg/m2; class II obesity is defined as a BMI of 35-40 kg/m2; while class III obesity is defined as a BMI over 40 kg/m2. Morbid obesity includes class II and class III obesity and is defined as a BMI higher than 35 kg/m2. Further information can be found in Chapter 2 – Box 2.1. Using body mass index (BMI) to define levels of adiposity.

[2] The full list of countries analysed in this chapter includes: Australia, Austria, Belgium, Bulgaria, Canada, Cyprus, Czech Republic, Germany, Denmark, Estonia, Finland, France, Greece, Croatia, Hungary, Ireland, Iceland, Italy, Japan, Lithuania, Latvia, Luxembourg, Mexico, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, South Africa, United Kingdom.

[3] Unless otherwise specified, all presented results are undiscounted.

[4] Health expenditure measures the final consumption of health care goods and services for personal health care including curative care, rehabilitative care, preventative care, ancillary services and medical goods but not long-term care.

7 Special focus: The health and economic impact of food reformulation

Yevgeniy Goryakin, Alexandra Aldea, Aliénor Lerouge and Yvan Guillemette

Properly implemented, a reformulation policy can help achieve a win-win-win outcome for public health, the food industry and for consumers. This section briefly discusses the opportunities and challenges presented by the implementation of the set of actions needed to achieve food and beverage reformulation, while also presenting the health and economic outcomes based on a scenario of a 20% calorie reduction in foods high in sugar, salt, calories and saturated fats.

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

Key findings

- Achieving a 20% calorie reduction for foods high in sugar, salt, calories and saturated fats can result in significant health gains, with up to 1.1 million cases per year of cardiovascular diseases, diabetes and cancer avoided annually in the 42 countries included in the analysis.
- About USD PPP 13.2 billion can be saved each year across the countries considered in this study, which corresponds to about 0.21% reduction in total health expenditure.
- Reformulation can increase the gross domestic product (GDP) of 42 countries by 0.51% on average each year relative to the trend, generating additional economic growth similar to the whole economy of Chile (i.e. about USD PPP 456 billion).
- Food reformations, if properly implemented, can be a win-win-win for public health, for the food industry and for consumers. It is important to ensure that such initiatives are implemented to achieve the original purpose, and do not serve to defer other, more rigorous, policy actions or to make unjustified health claims.

7.1. Food reformulations present opportunities for effective public-private cooperation in overweight control

Food reformulation delivers a different end product through a deliberate change in the production process or in the content of ingredients. Most producers reformulate their products every few years as part of their normal business process, for example to improve quality, save costs, respond to changes in consumer preferences or as an adjustment to food-related governmental policies (Webster and Hawkes, 2009[1]).

Product reformulation can be challenging to implement, especially if it results in a large change in taste over the short term. On the other hand, gradually implemented product reformulations may be one of the least intrusive ways to help the public improve their diet, as it reduces the need for counting calories and checking for other potentially unhealthy ingredients without affecting their dietary habits. Gradual reformulations may also help businesses preserve their sales, as the public are more likely to adjust to a new taste over time, as has been the case, for example, with salt reduction targets (Tedstone et al., 2018[2]). Reformulations may also help businesses open new market niches, for example by attracting people from the health-conscious segment of the market.

In recent years, many OECD countries have been showing a growing interest for policies promoting food reformulation. Much of this interest was fostered by successful attempts to promote reductions in the content of salt in pre-packaged food and the pressing need for countries to implement ambitious programmes to halt the raise in obesity[1] and childhood obesity. Since the early 2000s, a number of OECD countries have been in discussions with industry on suitable actions to promote reductions in calorie content or in specific nutrients such as sugar or fat, mainly saturated fat.

In some countries, reformulation initiatives are mandatory. For example, following a United States Department of Agriculture ruling in 2015, the United States food manufacturers and restaurants can no longer produce foods containing partially hydrogenated oils, a primary source of trans fats. Some countries have strict controls, sometimes even bans, on the amount of trans fat in foods (or their major sources, such as partially hydrogenated oils), including Austria, Canada, Chile, Denmark, Hungary and Latvia. Mandatory limits on the amount of salt have also been set, for example, in Argentina, Belgium, Bulgaria, Greece, Hungary, Netherlands, Portugal and South Africa (WCRFI, 2016[3]). There are also examples of voluntary reformulation initiatives, which are most often undertaken in collaboration between private companies and

governmental entities as highlighted in Box 7.1. They often focus on the reduction and replacement of trans fats and saturated fat content, salt, and sometimes on reducing the amount of sugar. In addition, they can aim to increase the content of certain healthy foods such as whole grains or nutrients, such as dietary fibre.

Box 7.1. Examples of public-private cooperation through voluntary reformulation programmes

Austria

- In 2010, the Ministry of Health in Austria, the Agency for Health and Food Safety and the Industrial Bakers of Austria agreed on a voluntary target to reduce the salt content in bakery products by 15% by 2015. This initiative is part of an overall nutrition action plan which also includes the promotion of healthy eating (WHO, 2013[4]).

Australia

- In 2015, the Government of Australia launched the Healthy Food Partnership. Its stated aim is to improve the dietary habits of Australians by making healthier food choices easier and more accessible and by raising awareness of better food choices and portion sizes. The Partnership is a collaboration between the government, food industry bodies and public health groups. Its focus is on making progress in the following areas:
  - continuing to support industry with food reformulation
  - supporting consumers with eating appropriate levels of core foods such as fruit, vegetables, whole grains, meat, fish and dairy, and appropriate levels of energy intake
  - educating consumers on appropriate portion and serve sizes
  - improving consumer knowledge and awareness of healthier food choices, including through developing and publicising tools and resources for consumers and health professionals.
- The Healthy Food Partnership follows a previous initiative, the Food and Health Dialogue, which was launched in 2009 to provide a collaborative forum where the government could work together with the health sector and food industry to improve the availability of healthy food options and increase consumer awareness and understanding of the link between food choices and health outcomes. During the time the Food and Health Dialogue was active, a number of priority food categories were targeted for reformulation to reduce sodium content. A subsequent evaluation of the Dialogue found a significant reduction in the average sodium content of products in most of the targeted categories (Heart Foundation, 2016[5]).

Belgium

- Although there is already a mandatory 2% limit on the amount of salt allowed in bread in Belgium, the Belgian food and drink industry also agreed to reduce voluntarily the salt content of foods over the period 2009-2012 by 10%, using a self-reporting framework (WCRFI, 2016[3]). This reduction was implemented gradually so that consumers would not notice any significant taste differences. The plan also included a public awareness campaign supported by the authorities to educate consumers. The actual reduction varied by product. For example, according to estimates provided by the Belgian Food Industry Federation (Fédération de l'industrie alimentaire Belge), by 2013, there was a reduction in salt content from 16% to 36% in meat products, 22% in bread, 17% in powdered soup, 15% to 29% in ready meals and 7.5% to 20% in cheese (FoodDrink Europe, 2015[6]).

Denmark

- The "Whole Grain Partnership" was established in 2008 with the aim of increasing the intake of whole grains. The partnership sets standards that companies need to meet on the minimum amount of whole grains contained in products before they can put a certification logo on their package. In addition, such products should not contain amounts of added sugar and salt above a certain threshold. The programme places greater emphasis on foods consumed at breakfast and dinner (Fagt et al., 2018[7]). This partnership includes the Danish government, non-governmental organisations focusing on health (such as the Danish Cancer Society and the Danish Diabetes Association), the food and drink industry, and retailers. One evaluation attributed the change in the intake of whole grains in the Danish population from 36 g/day in 2007 to 63 g/day in 2014 to the effect of the partnership (Greve, Carsten, 2014[8]).

France

- The Programme National Nutrition Santé (PNNS) has been in force since 2001. It is a government-led, multi-stakeholder programme that promotes health across the population with nine objectives including reductions in saturated fats, salt and sugar intake (Haut Conseil de la santé publique, 2017[9]). The food and non-alcoholic beverage industry committed to voluntarily reformulating their products through charters, which resulted, for example, in a 3-14% reduction in the amount of salt in 2012 (Haut Conseil de la santé publique, 2017[9]).
- The French Syndicat National des Boissons Rafraîchissantes (SNBR) representing 80% of the French beverage market signed an agreement in 2014 with the French government within the framework of the Programme National pour l'Alimentation and pledged to reduce by 5% the calorie and sugar content per litre in soft drinks by 2015 compared to 2010 (Challenges.fr, 2014[10]).

Italy

- A voluntary agreement was reached in 2009 between four main baker associations, and the Italian government, to reduce the amount of salt in some products by 10-15% within two years (WCRFI, 2016[3]).

Singapore

- In 2017, seven beverage manufacturers representing 70% of the sugar-sweetened beverage (SSB) market in Singapore voluntarily agreed to reduce the content of sugar in their drinks to a maximum level of 12% by the year 2020. This pledge was made in the context of collaboration between the industry and The Diabetes Prevention and Care Taskforce at the Singapore Ministry of Health (WCRFI, 2016[3]).

Spain

In Spain, a reformulation initiative called "The collaboration plan for the improvement of food and beverage composition and other measures, 2020" was recently agreed between the Spanish Food Safety and Nutrition Agency and a number of food sector associations involving almost 400 companies. This initiative aims to reduce the amount of added sugar, salt and saturated fat reduction in the manufacturing and retail sectors, and to increase healthier options in a number of different settings. The initiative is expected to give the companies sufficient time (until the end of 2020) to implement the reformulation of their foods, and has already resulted in the signing of 20 relevant agreements (Aecosan, 2018[11]).

United States

- The US Healthy Weight Commitment Foundation is a multi-stakeholder, industry-led initiative, aiming to significantly reduce the amount of calories in the participating businesses' products between 2010 and 2015. Lower-calorie products drove more than 80% of the sales growth among the participating companies, four times more than higher-calorie products (Samuel Mary, 2017[12]). The foundation claims that its member companies (including major actors in the soft drink business) sold 6.4 trillion fewer calories in the United States in 2012 than in 2007, which was 400% above their original goal (Samuel Mary, 2017[12]).

Europe

- In the European Union, a number of reformulation initiatives have been launched. For example, in 2008, a framework was agreed to reduce salt in food by 16% within 4 years. Furthermore, a target benchmark was agreed to reduce saturated fat by 5% until 2016 and by an additional 5% by 2020. In 2015, the Added Sugars Annex was agreed promoting a voluntary 10% reduction by 2020 of added sugars in processed food (European Commission, 2019[13])
- The Union of European Beverages Associations (UNESDA), representing the European soft drink industry, has committed to voluntarily reducing added sugar in beverages by 10% by 2020, compared to 2015 baseline. A mid-term evaluation carried out by auditors concluded that there was a 11.9% reduction in added sugar achieved by the end of 2017 (UNESDA, 2019[14]).

Another voluntary reformulation example is the UK initiative challenging UK food manufacturers to reduce the amount of calories in relevant foods by 20% by 2024; especially those consumed by children (see Box 7.2). In 2018, the OECD put forward a proposal to the G20 for a global deal between national governments and industry to scale up the UK efforts worldwide.

Box 7.2. Calorie reformulation initiative in the United Kingdom

The obesity burden facing the younger generation is a problem with serious long-term consequences. Recognising this, the United Kingdom unveiled a policy action plan in 2016 to deal with childhood obesity (Department of Health & Social Care, 2016[15]). The government also announced a sugar reduction programme the same year, challenging the food and beverage industry to reduce the amount of sugar by 20% by 2020.

However, it soon became clear that a more ambitious programme was needed in order to make a significant impact on childhood obesity in the United Kingdom. In 2018, the government set out details for the reformulation programme challenging the industry to reduce calories from relevant foods (i.e. those high in sugar, salt, calories and saturated fat, such as ready meals, pizzas, snacks sauces and dressings) by 20% by 2024 (Tedstone et al., 2018[2]). Together with the sugar reduction programme and the soft drink levy introduced in 2018, it is hoped that about 50% of all calories consumed by children in the United Kingdom will be covered. Such a target requires commitment not only from the food and beverage manufacturers, but also from retailers, restaurants and other food outlets, takeaway and delivery services. Since this programme is not mandatory, achieving the targets may be challenging. One approach is for the government to monitor and publish the progress, highlighting the participants that are doing well, or those lagging behind.

Although the focus of the programme is explicitly on food and drink sold to children under the age of 18, it is likely that other age groups will benefit as well, since adults eat similar food. Indeed, it was estimated that on a per capita basis, such an initiative can result in an average reduction of 68 calories per day for the whole population (Tedstone et al., 2018[2]).

Food reformulation can also occur as a reaction to some other governmental measures, which at first sight may appear unrelated. For example, food manufacturers can respond to the labelling requirements by voluntary reformulation to make the product more attractive to consumers (for example, by reducing calorie, salt or sugar content) (Hawley et al., 2013[16]). Likewise, restaurants may have an incentive to voluntarily reduce portion sizes when they face the menu labelling requirements (Littlewood et al., 2016[17]). Taxation of sugary beverages and other calorie-dense products can also induce product reformulation and other supply-side responses that can increase their positive impact on health (Chaloupka, Powell and Warner, 2019[18]). Such reformulations are more likely to happen when the tax targets specific ingredient(s) within the products, rather than total weight or volume of a product (Ecorys, 2014[19]).

Whatever the motivation for reformulation, it is important to ensure that such initiatives are implemented effectively to achieve the original purpose, and that they do not prevent governments from implementing other evidence-based policies. It is also important to ensure reformulations are not used to make unjustified health claims.

7.2. What would be the effect of a global deal to scale up food reformulation worldwide?

The reduction in calories consistent with the voluntary reformulation policy proposed in the United Kingdom is modelled from 2020 until 2050. Specifically, Public Health England proposes a 20% calorie reduction for the foods in the relevant categories, i.e. high in sugar, salt, calories and saturated fats. Furthermore, they calculated that this would translate into 68 fewer calories per day for the whole population (Tedstone et al., 2018[2]).

This target reduction is implemented as a scenario rather than an actual policy. In practice, achieving such a large reduction will require the implementation of many different policies and actions, including the establishment of partnerships among all the various stakeholders to effectively address the technical, social and policy issues arising throughout this effort. Some of the policies that countries have put in place to promote food reformulation include food labelling and menu labelling, mass media campaigns, changes in portion sizes, price policies targeting nutrient content above a certain threshold (e.g. sugar content), incentives for research and development.

The major assumption behind modelling this scenario is that consumers will not compensate for this reduction in calories per item by buying a larger number of items, or switching to higher calorie alternatives not covered by reformulation. The population coverage is assumed to be 100%. The analysis covered 42 countries[2].

While a global deal to reduce calorie content in relevant foods by 20% would not address all the causes underpinning the obesity epidemic, including for example low levels of physical activity, the OECD model calculates that, if such plan was to be implemented in 42 countries worldwide, it would have a significant impact on the health and economy of countries.

7.2.1. Impact on the population

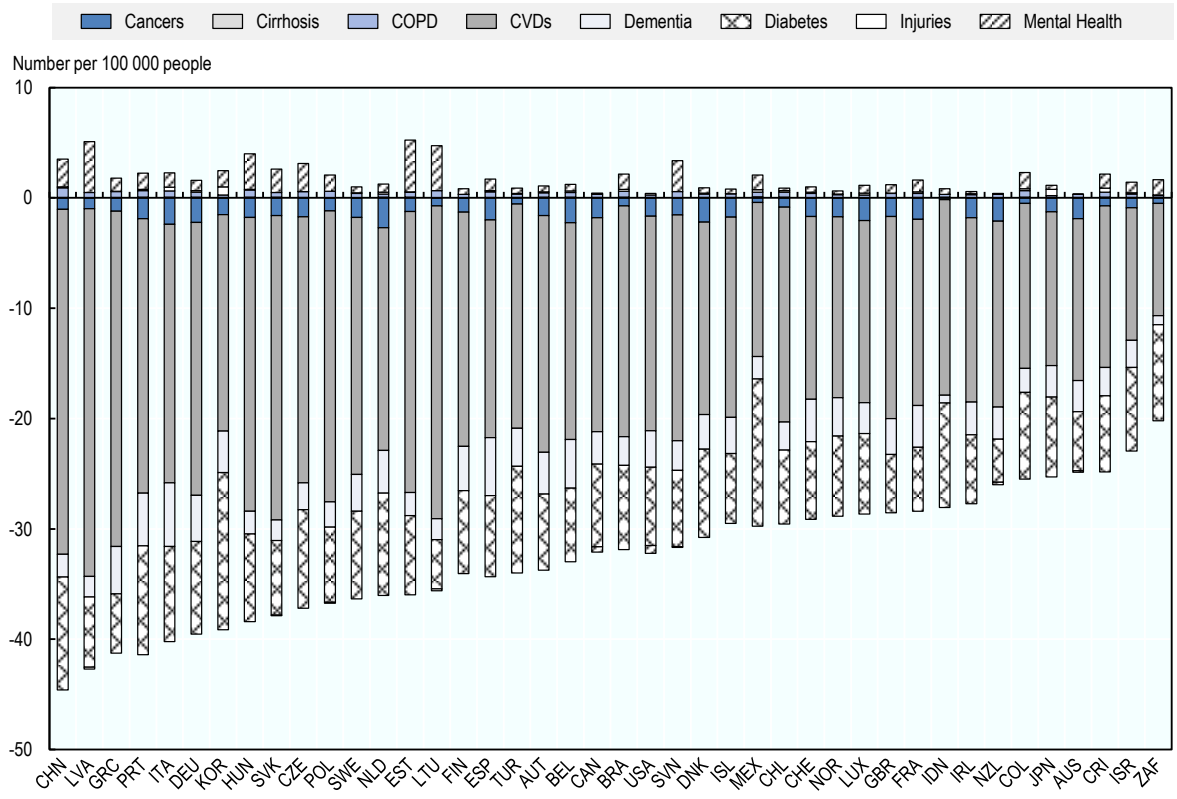
Achieving a reduction of 20% in calories from relevant food groups across 42 countries will prevent the development of up to 1.1 million cases per year of non-communicable diseases in the 42 countries included in the analysis. Most of the gains in health will be achieved through a reduction in cardiovascular diseases (CVDs) (about 771 000 cases per year would be prevented) with additional reductions in diabetes, dementia and cancers.

On a population-standardised basis, reformulations will contribute the most to avoiding CVDs in China and Eastern Europe; while its effect on avoiding cancers and dementia will be higher in Western Europe

(Figure 7.1). The reduction in the diabetes rate appears similar across regions. As a side effect of extended life expectancy in the population, due to the implementation of the intervention, people will also slightly increase their lifetime risk of developing other chronic conditions, mainly mental illnesses. Nonetheless, as testified by the significant gains in life years (LYs) and disability-adjusted life years (DALYs) discussed below, the effect of food reformulation on population health will be overwhelmingly positive.

Figure 7.1. Population-standardised effect of reformulation on disease incidence

Impact on new disease cases, number per 100 000 population annually, 2020-2050



Note: COPD: Chronic obstructive pulmonary disease; CVDs: cardiovascular diseases.
Source: OECD SPHEP-NCDS MODEL, 2019.

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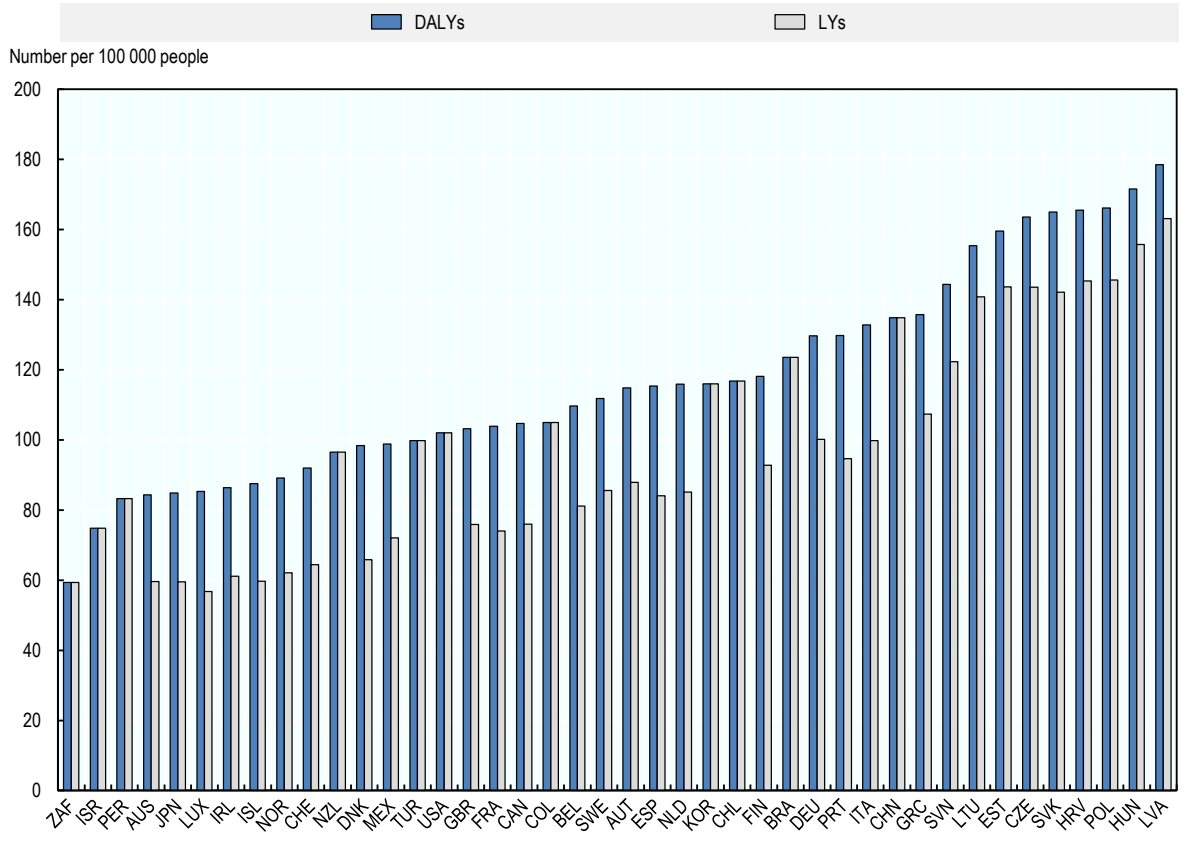
Overall, 4 million DALYs and 3.1 million LYs are predicted to be gained each year from 2020 to 2050 as a result of implementing the reformulation scenario in all 42 countries. This will translate into an increase in life expectancy of about 2.9 months above trend, similar to the average gain in life expectancy experience in OECD countries in the last 2.5 years.

The largest per capita effect is expected to occur in Central and Eastern European countries, due to the larger burden of obesity-related diseases, with up to 180 DALYs that can potentially be gained annually per 100 000 population in Latvia (Figure 7.2). The smallest change is expected in South Africa with 59 DALYs expected to be gained per 100 000 population. In almost all cases, the gain in DALYs is predicted to be significantly larger than in LYs.

Figure 7.2. Population-standardised effect of reformulation on disability-adjusted life years (DALYs) and life years (LYs) gained

Number of DALYs and LYs gained per 100 000 population annually, 2020-2050



Source: OECD SPHEP-NCDs MODEL, 2019.

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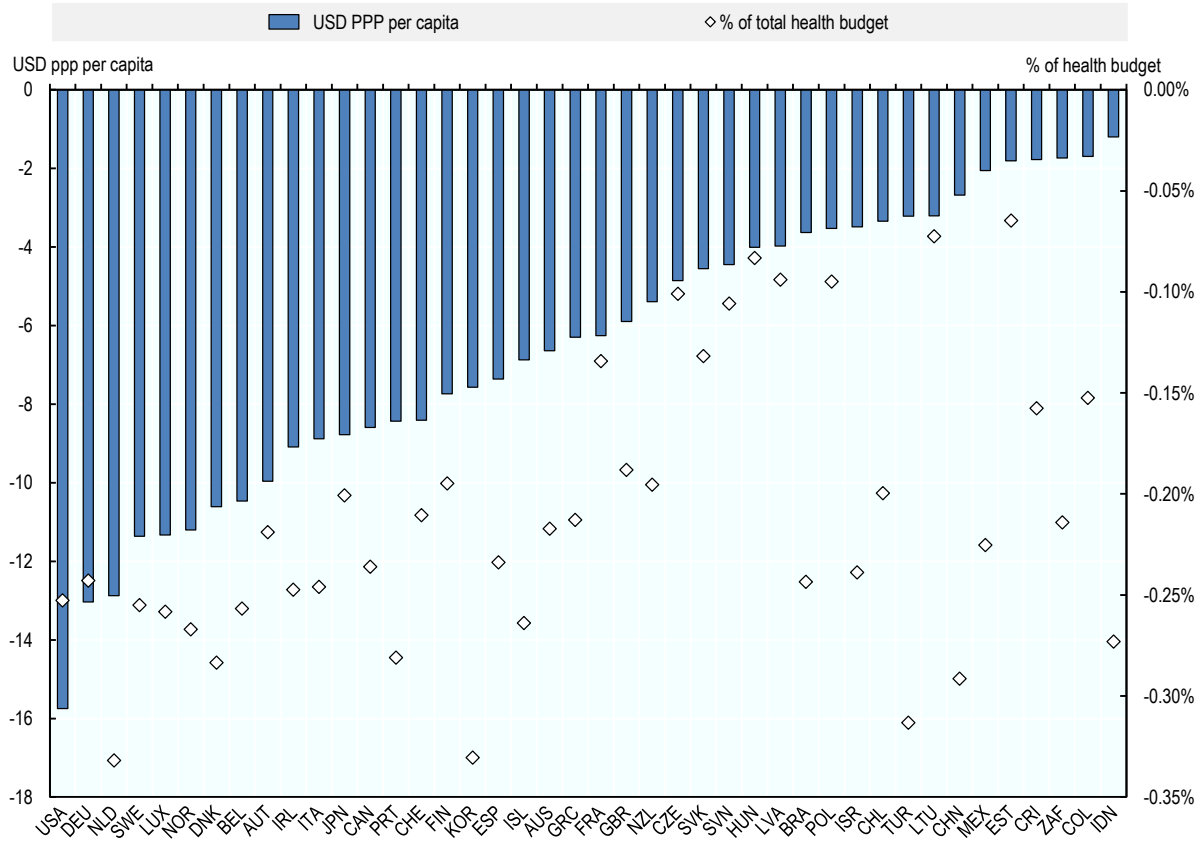
7.2.2. Impact on health expenditure

Overall, about USD PPP 13.2 billion can be saved each year across the countries considered in this study, which corresponds to about 0.21% reduction in total health spending. The strongest reduction in annual health expenditure[3] per capita will be in the United States, up to almost USD PPP 16 saved each year (Figure 7.3). The largest reductions in health expenditure in relation to the total health budget are expected to occur in Turkey, Korea and the Netherlands (about 0.31% to 0.33% of the total health budget).

Finding that food reformulation contributes to lower medical spending in all countries suggests that it is an economically prudent strategy. Indeed, although reformulation can lead to people living longer and therefore needing more access to health care, in all cases cumulative health expenditure gains will remain positive, including in countries where life expectancy gains are potentially the largest. This is mostly due to the fact that reformulation not only helps increase life expectancy, but also leads to people living longer in a healthy state.

Figure 7.3. Population-standardised effect of reformulation on health expenditure

Impact on health expenditure, in USD PPP per capita and as a percentage of total health budget, annual average over 2020-2050



Source: OECD SPHEP-NCDS MODEL, 2019.

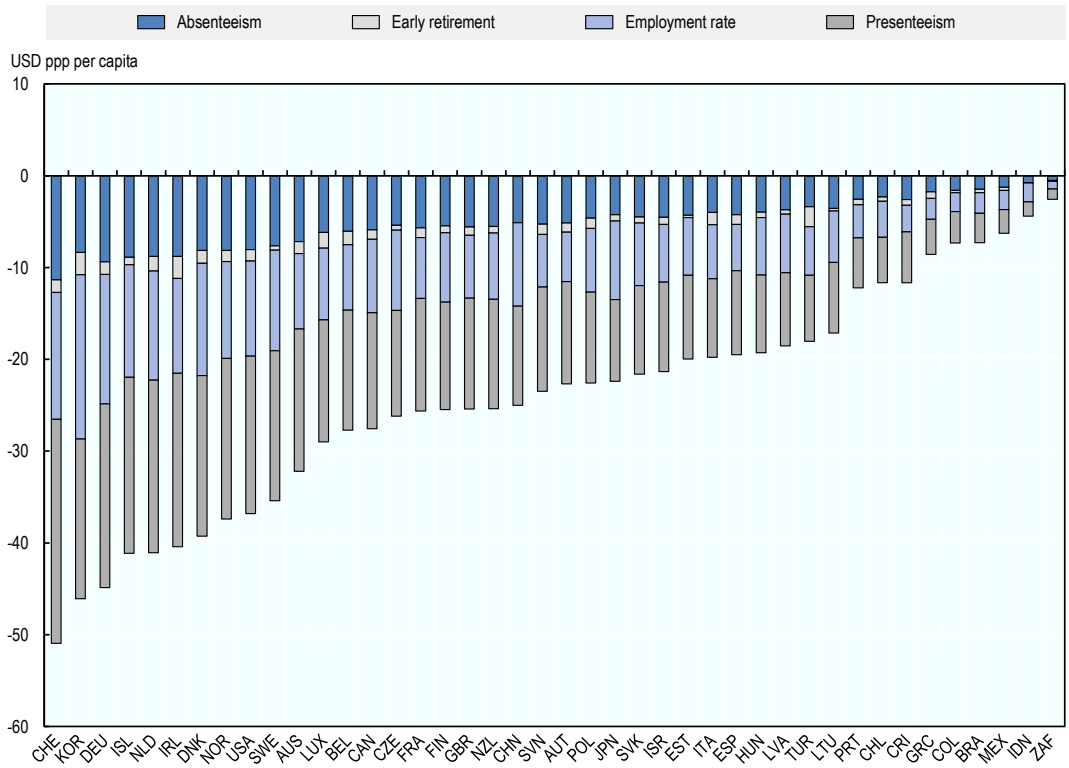
StatLink https://doi.org/10.1787/888934007905

7.2.3. Impact on labour market outputs and the broader economy

The reformulation policy is also predicted to make a significant impact on labour market outputs, as shown in Figure 7.4. The biggest impact is predicted in Western and Northern European countries, Korea and the United States, with up to USD PPP 50 that can be saved annually in Switzerland. Most of these savings will come from reductions in work-related presenteeism and increases in the employment rate, while the effect on early retirement is predicted to be negligible. In addition, savings from changes in labour market outputs are expected to be two to three times larger than savings in health expenditure (compare Figure 7.4 and Figure 7.3).

Figure 7.4. Population-standardised effect of reformulation on labour market costs

Impact on labour market costs, in USD PPP per capita and by component, annual average over 2020-2050



Source: OECD SPHEP-NCDS MODEL, 2019.

StatLink https://doi.org/10.1787/888934007924

Finally, it was estimated that the GDP of countries is expected to be above trend by 0.51% on average each year, generating an additional economic growth similar to the whole economy of Chile (i.e. about USD 456 billion).

7.3. Conclusion

In recent years, many OECD countries have been showing a growing interest in policies promoting food reformulation. Much of this interest was fostered by successful attempts to promote reductions in the content of salt in pre-packaged foods and the pressing need for countries to implement ambitious programmes to halt the rise in obesity and childhood obesity.

More recently, in 2018, the OECD put forward to the G20 a proposal for a global deal between national governments and industry to scale up the UK initiative globally. While a global deal to reduce calorie content in relevant food by 20% will not address all the causes underpinning the obesity epidemic, including for example low levels of physical activity, the OECD model calculates that, if such plan was to be implemented in 42 countries worldwide, it would have a significant impact on the health and the economy of countries.

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Notes

[1] Throughout this chapter, the nutritional status of individuals is defined according to WHO guidelines and thresholds and uses body-mass index (BMI). Overweight is defined as a BMI higher than 25 kg/m^2; pre-obesity is defined as a BMI of 25-30 kg/m^2; and obesity is defined as a BMI higher than 30 kg/m^2. Obesity can be further divided into class I, class II and class III obesity. Class I obesity is the milder form of obesity and is defined as a BMI of 30-35 kg/m^2; class II obesity is defined as a BMI of 35-40 kg/m^2; while class III obesity is defined as a BMI over 40 kg/m2. Morbid obesity includes class II and class III obesity and is defined as a BMI higher than 35 kg/m^2. Further information can be found in Chapter 2 - Box 2.1. Using body mass index (BMI) to define levels of adiposity.

[2] The countries covered by the analysis include: Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, Costa Rica, Czech Republic, Germany, Denmark, Estonia, Finland, France, Greece, Hungary, Ireland, Iceland, Indonesia, Israel, Italy, Japan, Latvia, Lithuania, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, South Africa, Turkey, United Kingdom, United States.

[3] Health expenditure measures the final consumption of health care goods and services for personal health care including curative care, rehabilitative care, preventative care, ancillary services and medical goods but not long-term care.

8 The impact of obesity policies on the food and drink industry

Sabine Vuik and Michele Cecchini

This chapter explores the impact that obesity policies can have on the food and drink industry. It presents the results of a literature review on six public health policies that directly affect the food industry: reformulation, portion size changes, food labelling, food taxes, advertising restrictions and healthy food subsidies. It considers both one-off implementation costs, as well as on-going changes in operations or sales.

Key findings

- Policies aimed at improving diets and reducing obesity can result in costs to the food and drink industry, in terms of implementation costs as well as changes in sales.
- Reformulation requires an investment in research and development (R&D) and can change the ingredient or production cost. In addition, companies may decide to invest in marketing to promote the new, healthier product.
- Portion size changes may require some R&D, as well as an investment in machinery and other production processes. Different marketing approaches have been used to avoid public upset over the smaller quantity – though it is important not to mislead consumers.
- Labelling policies, both for food products and menus, require an investment in redesign and printing. If the labels focus on healthier products, they can be used to promote sales.
- The impact of food taxes on the industry depends on the pass-through rate and the degree and type of substitution.
- Advertising restrictions can result in costs if a new marketing strategy is needed, but partial bans have generally resulted in a shift of marketing spend and sales rather than a reduction.
- A range of healthy lifestyle subsidies exist that are beneficial for the industry as they generate sales.

8.1. Introduction

8.1.1. Obesity policies can have an economic impact on the food industry

To halt the rising rates of obesity, many countries have implemented policies that aim to improve diets (OECD, 2010[1]; OECD, 2017[2]). A number of these policies, such as advertising restrictions, labelling and reformulation, carry direct implications for the food and drink industry. The food and drink industry, consisting of food manufacturers, restaurants and supermarkets and others, can be required to change their product, pricing, packaging, or marketing and advertising approach. This can result in implementation and compliance costs, or a change in the volume of sales.

Public health policies can be associated with a one-off cost for implementation, or ongoing costs as production or ingredient costs change (OECD, 2014[3]). For example, a new public health policy can result in R&D costs; redesign costs; retraining, recruitment or upskilling; downtime costs due to an interruption of operations; investment in machinery; consumer testing; changes in ingredient costs; marketing and/or distribution costs. Obesity policies may also affect sales. In particular, policies aimed at reducing the consumption of specific food products, such as taxes or advertising restrictions, may have an impact on the industry's profitability.

On the other hand, certain policies can also have a positive impact on the industry, by bringing in new customers, opening new markets or increasing margins.

This chapter explores the impact of obesity policies on the industry. The focus is primarily on the food and drink industry, and within that, food manufacturers and vendors (see Box 8.1). It considers the impact of policies on the economy as a whole, rather than the impact on specific businesses, or parts of the industry.

Box 8.1. The food and drink industry

The food and drink industry (or food industry for short) includes farmers and other agricultural businesses, food producers, food processors, marketers, wholesale and distributors, catering (including restaurants and canteens) and retailers (WHO, 2017[4]). Within the industry, producers of processed food and drinks, and vendors of energy-dense or fast-food products, are most directly affected by obesity policies. While for any change in their operations a knock-on effect can be expected throughout the supply-chain, this is outside the scope of this paper.

Food producers

Global food supply is dominated by multinational food and beverage companies that have a large and concentrated market power (Stuckler et al., 2012[5]). These companies produce more than half of the world's soft drinks and a third of the global market for processed foods. Processed foods are generally highly profitable, due to their low production cost, long shelf-life and high retail value (Stuckler et al., 2012[6]). While large multinationals play an important role in the global processed food supply, small and medium enterprises can have a strong impact, particularly on local markets.

Food vendors

The food vendors industry consists of a wide range of players, including supermarkets and other retailers, restaurants and bars, fast-food chains, take-away shops, and canteens at schools and workplaces. At a high level vendors can be split into food services or catering (on-trade) and retailers (off-trade).

One of the food services most often discussed in relation to the obesity problem is the fast food industry. The global fast food industry is highly concentrated, and subject to strong competition (MarketLine, 2012[7]). Price competition is common, using value meals to attract cost-conscious consumers. However, brand power is still one of the greatest forms of competition, and companies spend large amounts of money on advertising (MarketLine, 2012[7]).

In the off-trade, supermarkets account for 55% of retail food sales, with independent and specialist retailers accounting for 32% (MarketLine, 2015[8]). The supermarket industry has seen global consolidation in recent years, with supermarket chains now operating in a wide range of countries (OECD, 2013[9]). Competition in the food retail industry is strong, and pricing policies are one of the main competitive tools (MarketLine, 2015[8]).

8.2. Product reformulation and its impact on the food industry

8.2.1. Food producers can reformulate their products to improve the nutritional profile

Product reformulation is a deliberate change in the production process or ingredients that results in a different end product. Most producers reformulate their products every few years as part of their normal business, to improve quality, save on costs or respond to changes in consumer preferences (Webster and Hawkes, 2009[10]). Reformulation can also be done as a public health measure, to improve the nutritional value of the product or reduce harmful substances.

In 2018, 98% of 75 surveyed food companies reported having programmes to offer consumers healthier products, and in total they reported having reformulated 320 000 products since 2015 to support a healthier lifestyle (The Consumer Goods Forum, 2019[11]). In 2016, the most common targets for which reformulation was reported were salt or sodium (67%), sugar (61%), saturated fat (50%) and trans fat (47%) (The

Consumer Goods Forum, 2017[12]). Other targets focused on healthy additions, including whole grains (25%) and vitamins (20%). As the topic of this report is obesity, this chapter focuses on reformulation policies that reduce the overall energy content of a product, primarily by reducing fat or sugar.

Reformulation for public health involves a change in composition of the foodstuff. However, changing the nutritional profile of a product is complex. Reformulation can be done in a number of ways (Webster and Hawkes, 2009[10]):

- reducing the amount of the target ingredient (e.g. fat, sugar) without replacing it
- replacing the target ingredient with a substitute (e.g. artificial sweeteners)
- reducing the density of the target ingredient by adding a bulking agent such as water, air or fibre
- technological approaches to mimic the lost ingredient (e.g. microparticulation[1] or enzyme inhibitors[2]).

Reformulation can be either voluntary or mandated (van de Velde, van Gunst and Roodenburg, 2016[13]). For example, in Australia the government has set up the Healthy Food Partnership, which provides a mechanism for government, the public health sector and the food industry to cooperatively tackle obesity, encourage healthy eating and empower food manufacturers to make positive changes (Department of Health, 2019[14]). This partnership is working on developing voluntary food reformulation targets. While some countries have introduced mandatory reformulation targets on trans fat (WHO, 2018[15]) and salt (Trieu et al., 2015[16]), so far few examples exist of mandatory fat or sugar reduction policies.

8.2.2. Reformulation carries R&D and implementation costs, and can have an impact on sales

The reformulation of a product can affect the profits of producers in a number of ways (see Figure 8.2). There may be fixed, one-off costs associated with the development of the new product and its implementation, or changes in on-going profit due to potential lower sales or higher production costs.

To develop and launch a reformulated product, producers may need to invest in R&D, new production processes and marketing

To comply with nutrient targets, food companies may need to invest in research to develop the healthier product that is acceptable to consumers. This process is complicated by the many functions that any one ingredient can have. R&D for reformulation needs to go through a number of steps: idea generation; product development; product evaluation; consumer testing; and shelf-life studies (White et al., 2002[17]). Trial and error may increase the number of R&D cycles needed.

Once the reformulated product has been developed, the changes need to be implemented. Food producers may face a number of one-off costs associated with the implementation of the new product, which could include downtime costs due to an interruption of processes while production is switched to the new approach; retraining staff; procurement of different materials or ingredients; capital investment in new machinery and other production tools; and marketing of the new product.

The UK Food Standards Agency estimates that the R&D cost for reformulation, which includes kitchen samples, a factory run, consumer panels, nutritional analysis, relabelling, shelf-life evaluation and repackaging design, can vary from GBP 5 000 to GBP 450 000 per product (ca. USD 6 500 to USD 590 0000) (Food Standards Agency, 2010[18]). They estimated the cost of factory and transport re-tooling in response to a reformulated product to range from GPB 8 000 (USD 10 500) to well over GBP 100 000 (USD 130 000) (Food Standards Agency, 2010[18]).

The cost of each step in R&D is influenced by the degree of change. Some nutrients may have replacements that are widely used and will need little additional research; some products may not taste

any different and will need less consumer testing; and there may be no need for a change in the production process. One study estimates that for minor, non-critical ingredients the R&D costs are between USD 9 000 and USD 82 000; while for major ingredients costs are between USD 89 000 and USD 660 000 (White et al., 2002[17]).

It is important to note that these costs refer to the reformulation of existing products. Policies to improve the nutritional composition of food products would also apply to new products, which require an investment in R&D either way.

Reformulation can result in a reduction or an increase in sales

Reformulation can affect sales negatively or positively. Reformulation could lead to a reduction in sales if the product is of a lower quality, or if the reformulation has a negative image.

A reformulation resulting in a reduced fat or sugar level may negatively affect the taste of a product. This can be due to a genuine dislike of the reformulated product, or because consumers have become accustomed to high salt or sugar levels. In addition, these nutrients can also contribute to the product's texture and mouthfeel, colour and size, firmness or softness (Buttriss, 2013[19]).

Reformulation can also change consumers' perception of a product. Reformulation to make a product healthier could improve the image of the product and make it more attractive to customers (see Box 8.2). However, the ingredients used in the reformulated product could also negatively affect its image, for example if their safety is questioned or if they are perceived as "unnatural" (WHO, 2017[4]). A global consumer survey found that 42% of respondents found "no artificial colours" a very important attribute when making purchasing decisions, and 41% artificial sweeteners (Nielsen, 2015[20]).

Box 8.2. Increasing sales through reformulation

There is a growing market for healthier food products. A global consumer survey found that half of all respondents were trying to lose weight, and three-quarters of them attempted to do so by changing their diet (Nielsen, 2015[20]). A survey in the United States found that more than a third of respondents followed a specific diet (IFIC, 2018[21]). Nearly half did so in order to lose weight; other common goals were feeling better and protecting long-term health.

To achieve this, consumers are looking for healthier food products: 32% of global consumers said that "low in sugar" was a very important attribute when making purchasing decisions, 30% said the same for "low in fat", and 27% for "low in calories" (Nielsen, 2015[20]).

This presents an opportunity for the food industry. Many large food companies have already started to capitalise on this, by expanding their portfolio with products that are lower in sugar or fat, fruit and vegetable based products, and products higher in fibre (PepsiCo[22]) (Nestlé[23]) (Mars Inc.[24]). Similarly, fast-food restaurants are changing their menus to offer lower-calorie options and salads (Business Insider, 2017[25]).

Producers may decide not to communicate the change explicitly to the public, taking a "stealth" approach (Webster and Hawkes, 2009[10]). This approach can be used in cases where there are prejudices about the taste or quality of "low in" products. The stealth approach can be used to avoid reductions in sales. A study of a Danish supermarket chain showed that stealth reformulations across a range of products reduced the total calories sold, while having either positive, zero or very moderate negative effects on sales (Jensen and Sommer, 2017[26]). On the other hand, if the change is perceived as positive by the public because of the health benefits, marketing can be used to emphasise the new, healthier product.

Reformulation may result in higher or lower production cost for producers

Depending on the change in product, food producers may face higher (or lower) ingredient costs (Buttriss, 2013[19]). For example, engineered salt-replacement products can carry higher cost than traditional salt (Wilson, Komitopoulou and Incles, 2012[27]). However, artificial sweeteners may be cheaper to use than sugar because of the low volume needed to reach the same level of sweetness (Tandel, 2011[28]; Piisola, 2014[29]). In 2012, aspartame, saccharin and cyclamates cost USD 14.8, USD 5.3 and USD 1.9 per kilogramme, compared to sugar which traded at USD 0.58 per kilogramme (LMC International, 2012[30]). However, on a sweetness-equivalent basis, the price for the artificial sweeteners was only ca. 12%, 3% and 10% of the white sugar price, respectively.

In addition to ingredient cost, the different characteristics of the reformulated product may carry higher, or lower, transport, storage or packaging costs (Buttriss, 2013[19]). Sugar and fat can both affect the shelf-life of a product. Shelf-life can be defined as the time between production or distribution, and the moment when the product becomes unacceptable for sale or consumption (Man and Jones, 2000[31]). A reduced shelf-life will impact the profitability and efficiency of the company. Products with a shorter shelf-life are more difficult to transport long distances, carry more re-stocking costs, are subject to more wastage, and may be less attractive to consumers.

While this chapter focuses on food producers and vendors, a reduction in certain ingredients will also have an impact on the suppliers of these ingredients. Box 8.3 presents the results of an OECD study of the impact of reduced sugar consumption on the world sugar market.

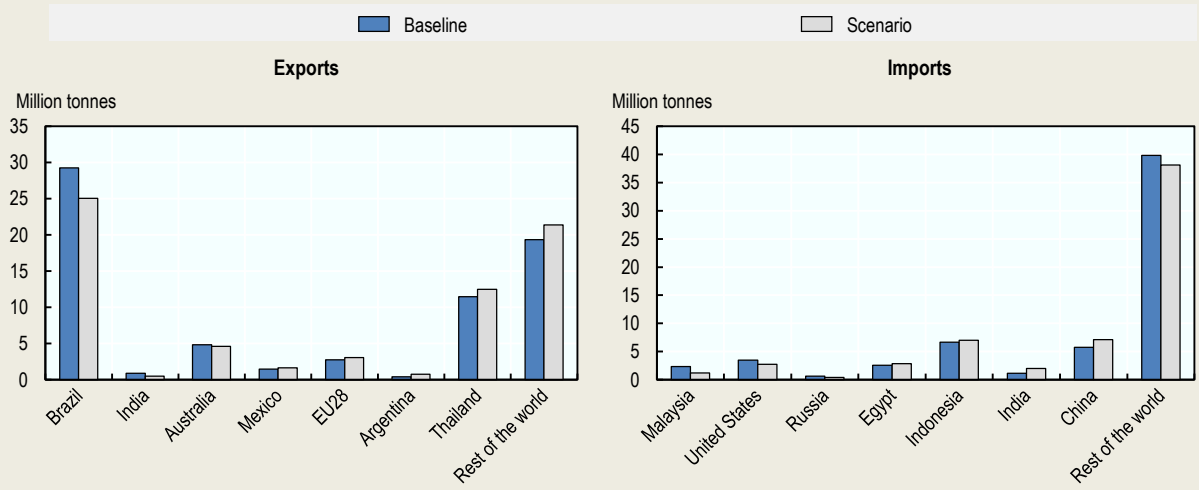
Box 8.3. The impact of reduced sugar intake on the world sugar market

The World Health Organization (WHO) recommends that the intake of free sugars (monosaccharides and disaccharides added to foods and beverages, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates) be reduced to less than 10% of total energy intake, and suggests that a further reduction to 5% would provide additional health benefits (WHO, 2015[32]). The OECD analysed the impact of adhering to these guidelines on agricultural markets, using the Aglink-Cosimo modelling framework, developed by the OECD and the FAO (OECD/FAO, 2016[33]).

The scenario assessed the effect of limiting calorie intake from sugars to 10% of total calorie intake, by reducing per capita demand over a five-year period. By 2025, sugar consumption would be at 74 g per capita per day on average across countries in the baseline, compared to 66 g per capita per day in the 10% scenario. However, the degree of reduction varies by region. Developed countries, where baseline consumption is above the 10% target in most countries, would experience the largest reduction in daily sugar calorie intake. Countries that are already below the 10% threshold were mostly in Asia (India, Indonesia, China) and Sub-Saharan Africa.

Meeting the 10% target would reduce the worldwide demand for sugar, thus reducing the world sugar price. The country-specific impact of these effects vary considerably – depending on whether the country is a net exporter or importer, production efficiency, and the level of sugar currently consumed (see Figure 8.1).

Figure 8.1. Trade implications of the implementation of the WHO recommendations regarding sugar intake in 2025



Source: OECD/FAO (2016[33]), *OECD-FAO Agricultural Outlook 2016-2025*, https://doi.org/10.1787/agr_outlook-2016-en.

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On the export side, countries like Brazil and Australia, where high prices are needed to sustain production, will lose export market share. On the other hand, countries like Thailand and Argentina, where production is efficient, would benefit from lower prices and see an increase in exports. On the import side, countries where sugar consumption currently exceeds the 10% target would see a reduction in imports. Other countries, such as China and Indonesia, will see a slight increase in sugar imports as a result of the decrease in sugar prices.

8.2.3. The impact of reformulation on the industry is modulated by a number of factors

The impact of reformulation on the industry is dependent on a large range of factors. Some of these factors can be influenced by policy makers, to facilitate reformulation and disburden producers.

- **Type of ingredient**: Almost all costs for industry are in some way dependent on which ingredient and products are the target of a reformulation policy. In terms of R&D and implementation, there is great variation in the complexity of replacing or reducing ingredients. While in some cases only taste is affected, in other food products the same ingredients may have more complex functions. Baked goods such as bread, cakes and cookies rely on sugar and fat for their structure, volume, mouthfeel and texture. In addition, many substitutes or additives bring their own issues.
- **Type of product**: The target product also determines how easily changes can be made. In different products, the same nutrient can be a non-critical minor ingredient, a critical minor ingredient with functional effects, a critical minor ingredient with safety effects, or a major ingredient (White et al., 2002[17]).
- **Voluntary vs. mandatory policies**: The impact of a reformulation policy on the industry depends on whether participation is voluntary or mandatory. Mandatory reformulation schemes have the benefit of creating a level playing field for food producers (WHO, 2017[4]). In addition, it has been

argued that a legislated approach is more cost-effective than a voluntary approach, and to have a larger impact on public health (National Heart Foundation of Australia, 2012[34]). However, voluntary programmes are beneficial to producers as they allow the creation of line extensions rather than replacing the product completely. Many of the existing voluntary programmes are public-private partnerships. Benefits of public-private partnerships include increased commitment of producers, expertise on reformulation, and greater financial resources (Hernandez-Aguado and Zaragoza, 2016[35]). However, disadvantages include the inherent conflicts of interests, and the risk of conferring the legitimacy of the government on the industry and their actions.

- **The length of the transition period:** The timing of a new policy, and any leniency or grace period, can have an influence on the cost of implementation for producers. If new standards are introduced in the short term, producers may see increased transition cost due to long-term contracts with suppliers, left-over stock and greater interruption to production (White et al., 2002[17]). A longer time scale may allow producers to plan their switch to the new production process more carefully to minimise transition costs. In addition, it could increase the chances of the public health reformulation being included in a standard planned reformulation cycle, further reducing cost (Food Standards Agency, 2010[18]). It has been estimated that a 12-month lead time would allow 5% of producers to coordinate reformulation with the usual cycle, at 24 months this would be 20%, at 36 months 30% and at 48 months 40% (White et al., 2002[17]). A longer transition period may also allow producers to make incremental changes to a product, to make the change in flavour more acceptable to consumers. For example, when done gradually, it is possible to reduce salt levels by 5-15% without the change being noticeable (Cappuccio et al., 2011[36]). However, a longer transition period needs to be justified against the delay in public health benefits.
- **Public health campaigns:** When reformulating a specific product or nutrient, a corresponding public health campaign focused on increasing consumer awareness of this nutrient can positively impact public health as well as the cost to industry. A consumer awareness campaign can encourage consumers to buy the reformulated products, thus increasing the consumption of healthier products, and reducing the impact of reformulation on sales (National Heart Foundation of Australia, 2012[34]). For the UK Salt Reduction Campaign, the government committed to running a high profile campaign on salt and its impact on health, in return for voluntary commitments from industry to reducing salt levels (Charlton, Webster and Kowal, 2014[37]). While initially manufacturers took a silent approach to their salt reduction efforts, once the campaign started to change public perception they started actively marketing their reduced salt levels.

Figure 8.2. Overview of the impact of product reformulation on the industry

	Potential impact on industry		Influencing factors
R&D	Negative	Producers may need to invest in research and development to reformulate their products	These costs depend on the type of product and reformulation; with minor, non-critical ingredients being easier to replace than major ingredients
	Neutral	If reformulation can be incorporated into planned reformulation cycles, additional costs can be reduced or eliminated	A longer transition period (e.g. 48+ months) increases the chance that the reformulation can be done as part of normal business activity
Marketing	Negative	There may be marketing costs associated with the promotion of the new reformulated product	Whether or not the change in formula is marketed will depend on consumer perception (e.g. are reformulated products perceived to be less tasty, or are they considered healthier)
	Neutral	If a stealth approach is taken, there will be no marketing costs for the new product	
Sales	+/− Variable	If the reformulated product is (or is perceived to be) of lower quality, sales may be reduced. However, sales could also be increased if the new product is considered healthier.	Changes in sales will depend on: • Changes in product quality and price • Consumer perception and priorities • Marketing or stealth approach • Whether the reformulation is voluntary or mandated, the latter creating a level playing field between producers • The length of the transition period and whether it allows incremental changes • Awareness of consumers, aided by public health campaigns
Production cost	+/− Variable	The reformulated product may carry higher or lower ingredient costs, or different production costs	Changes in production costs depend on the type of reformulation

Source: OECD analyses on cited literature.

8.3. Portion size changes and their impact on the food industry

8.3.1. Portion size restrictions aim to reduce the volume of energy-dense products consumed

Many portion sizes have increased in recent years (Benton, 2015[38]). Studies from the Netherlands, Denmark and the United Kingdom show that individual portion sizes have increased, as well as the availability of multipacks and larger portion options (see Box 8.4) (Matthiessen et al., 2003[39]) (Steenhuis, Leeuwis and Vermeer, 2010[40]) (Wrieden, Gregor and Barton, 2008[41]). The same applies for sugar-sweetened beverages, with bottles intended for individual consumption now three times the size compared to when they were first produced (Pomeranz and Brownell, 2014[42]).

Larger portions are associated with an increased consumption: when presented with larger portions, people have a tendency to consume more (Benton, 2015[38]) (Marteau et al., 2015[43]). One reason for this is “unit bias”, which means that the portion or quantity provided is automatically perceived to be the appropriate amount to eat (Benton, 2015[38]). For example, a study showed that when snacks were offered as halves, in smaller packaging or with smaller serving spoons, significantly less was consumed (Geier, Rozin and Doros, 2006[44]). For the United Kingdom, larger portion sizes have been estimated to contribute

to a 12-16% increase in consumption (Hollands et al., 2015[45]). A meta-analysis found that for a doubling of portion size, consumption increases by 35% on average (Zlatevska, Dubelaar and Holden, 2014[46]).

Smaller portion sizes can be used as a public health tool to reduce consumption of energy-dense foods. This can be done by providing food in single servings, banning large servings, marketing of the desired portion size or designing products to clearly delineate a portion (Marteau et al., 2015[43]). A number of countries have implemented or are considering policies that reduce portion sizes, which can have an impact on the industry (see Figure 8.3).

Box 8.4. The origins of super-sizing

"Super-sizing" – where larger portions of food or drinks can be chosen at a small incremental cost – is thought to have started in 1967, by a movie theatre manager looking to increase popcorn sales (The Independent, 2012[47]; The New York Times, 2007[48]). While consumers were unlikely to buy multiple cartons of popcorn, they could be tempted to by a larger carton – for which a higher price could be charged.

Super-sizing is highly profitable (Dobson and Gerstner, 2010[49]). In the catering industry, fixed costs dominate variable costs, making the incremental costs of upsizing relatively small. This creates the perception of value for money for consumers. By offering two sizes, the vendor is able to meet the demand from both the "disciplined" consumer, who sticks to the normal size, and the "tempted" consumer willing to increase consumption.

Super-sizing can have a negative impact on overweight. In addition to increasing overall consumption, super-sizing is thought to encourage overeating specifically, as it makes consumption incrementally more affordable (Dobson and Gerstner, 2010[49]). It has been estimated that, on average, super-sizing increases the energy content of already calorific meals by 73%, for only a 17% price increase (Close and Schoeller, 2006[50]).

8.3.2. Creating smaller portion sizes carries implementation costs, but the right marketing approach can benefit sales

Some R&D and implementation costs may be associated with portion size changes

For both food producers and vendors, a change in portion size can carry implementation costs if the smaller size is new to the product line. For food producers, the new product size may require changes to machinery and other production processes, which requires a one-off investment in capital, as well as the cost associated with downtime and implementation. While the R&D required is likely more limited than for nutritional reformulation, some investment may be needed for redesigning packaging and consumer testing. Food vendors will face similar costs if they introduce a new, smaller portion size, mainly around designing and implementing new food containers, signage and menus. In addition, in places where food is portioned by staff, training may be required.

The impact on sales for producers partially depends on the perception of value for money

Portion size changes may have an impact on sales. Producers who charge the same price for the smaller product risk angering the public who receive less worth for their money, which in turn may reduce sales. In a survey, 35% of UK consumers said they would stop buying a product if the size was reduced by just 10% (YouGov, 2017[51]). Nevertheless, this intention may not translate into actual reductions in sales.

Producers can decide to reduce their price in accordance with the smaller volume. However, the scope for price reductions may be minimal. The "cost of goods sold" does not decrease in a linear manner in relation to the size of the product, as labour, production and distribution costs will be little affected (Riis, 2014[52]). In addition, some other costs such as marketing, selling and administrative costs will not be affected by the smaller portion size at all.

As with product reformulation, producers have the option to market the new, resized product as a healthier choice, or to take a stealth approach. However, contrary to changes in ingredients, changes to portion size are visible to consumers. To counter this, there are methods that have been used to create the perception of a "sufficient" portion.

Changing the shape of the packaging can make portion size changes less noticeable for consumers. If a package is reduced in only one dimension, consumers are more likely to notice the change in volume than when it is changed in multiple dimensions (Chandon and Ordabayeva, 2009[53]). Serving products in elongated packages has therefore been used to give the perception of a large portion (Riis, 2014[52]) (Chandon and Ordabayeva, 2009[53]).

It is important to note that these practices should focus on creating the perception of large portions to increase satiety for the benefit of consumers, rather than deceiving them. So called "shrinkflation", where products are made slightly smaller but sold at the same price to save cost, can be negatively received by consumers (Business Insider, 2016[54]; Office for National Statistics, 2017[55]).

The alternative to the stealth approach is to market the new smaller portions as the healthier choice, based on their calorie content or as a tool for portion control. A global consumer survey showed that 41% of respondents try to lose weight by reducing portion size, while 27% said portion control is very important to their purchasing decisions (Nielsen, 2015[20]). In the recent years, some leading soft-drink producers have introduced "slimline" cans, which contain less volume than regular cans (250 ml versus 330 ml), to respond to a demand for lower calorie portions (Coca-Cola, 2013[56]).

However, when promoting the smaller portion, producers need to ensure claims are not potentially misleading, and adhere to regulation. For example, in the EU28, comparative health claims are only allowed when based on similar quantities of product (EUR-Lex[57]).

Marketing based on behavioural economics can help avoid a loss in sales for food vendors

Restrictions on portion sizes may negatively impact sales for food vendors. Especially for restaurants and other catering businesses that rely on a value-for-money offering, portion size restrictions may make it more difficult to compete with home-cooked meals (Riis, 2014[52]).

There are different ways in which food vendors can encourage the sales of smaller portions to reduce the loss in turnover. Principles from behavioural economics can be applied to nudge consumers to choose the smaller portions (OECD, 2017[58]):

- **Change the default to a smaller portion**: Making the default option smaller can be a strong nudge, as people often accept whatever the default setting is, even if it has significant consequences (Cabinet Office and Institute for Government, 2010[59]). This theory led to the serving of apples instead of French fries as the default in all children's meals in a restaurant chain (Riis, 2014[52]; Peters et al., 2016[60]). It was reported that 48% of families accepted the default option rather than requesting the alternative (Peters et al., 2016[60]).
- **Change the names of portion sizes**: The labelling of different portion sizes can create a normative effect, where a consumer perceives the label "regular" as informative of a hypothetical normal amount (Aydinoğlu and Krishna, 2011[61]). Moreover, it can make a "double" seem like double the value (at a fraction of the price). Instead, smaller portions could be labelled "right-sized" (Riis, 2014[52]; The New York Times, 2007[48]).

- **Prompt consumers to downsize rather than supersize**: Many behavioural interventions provide people with a prompt to make choices that are in line with their underlying motivations (Behavioural Insights Team, 2010[62]). Since many consumers will be aware of the impact of energy-dense food and their tendency to overeat, asking them at the point of sale whether they want to downsize can help activate self-control and facilitate healthy behaviour. In an experiment, 33% of consumers accepted the smaller portion, whether the price of the meal was reduced or not (Schwartz et al., 2012[63]).

Figure 8.3. Overview of the impact of portion size changes on the industry

	Potential impact on industry		Influencing factors
Implementation cost	Negative	If new, smaller portion sizes need to be created, this can carry design costs, changes to machinery, and down-time costs	If smaller portion sizes already exist within the product line, the implementation costs will be lower
Profit margin	Positive	Smaller products can carry lower ingredient, packaging and transport costs	This depends on the degree that the savings on ingredient costs are reflected in a price decrease
	Neutral	If the price is decreased in accordance with the smaller size, there will be no savings on production costs and no change in profit margin	
Sales	Negative	If a smaller size product is sold for the same price, consumers may reduce their consumption	
	Neutral	Behavioural economics can be used to create the perception of a sufficient-sized portion that provides value for money	
	Positive	Smaller products can be marketed as a healthier choice that supports portion control, to increase sales	

Source: OECD analyses on cited literature.

8.4. Food labelling and its impact on the food industry

8.4.1. Food labels inform consumers about the nutritional value of products and encourage reformulation

The vast majority of OECD countries require ingredient and nutritional labels on processed or packaged food (OECD, 2017[2]). The aim of these labels is to give comprehensive information, and they are often long and detailed (European Commission, 2017[64]; US Food and Drug Administration, 2013[65]).

Evidence shows that easy-to-understand interpretative labels, printed clearly on the front of the package, prompt a greater response rate from consumers in terms of food and diet choices (Cecchini and Warin, 2016[66]). In addition to informing consumers, labelling schemes have also been shown to encourage producers to reformulate their products (Thomson et al., 2016[67]; Vyth et al., 2010[68]).

In addition to labels on retail products, some countries are introducing menu labelling schemes, such as the United States, as well as local schemes in Australia and Canada (OECD, 2017[2]). While many chain restaurants provide nutrient information on their website or upon request, these schemes promote the use

of at-a-glance information available on the menu that is used to order food (Pulos and Leng, 2010[69]). These programmes can be voluntary (Pulos and Leng, 2010[69]) or mandated (City of New York, 2017[70]). For the industry, implementing labelling schemes can have consequences for costs and sales (see Figure 8.4).

8.4.2. For producers, the introduction of front-of-pack food labels carries implementation costs, but may lead to an increase in sales

There are direct costs associated with the design and printing of new labels

To implement new front-of-pack labels, food producers will incur some implementation costs. Since almost all OECD countries already require food producers to supply nutritional information, the need for nutritional analyses will be very limited. However, food producers may need to invest in label redesign and implementation.

The cost of redesigning and implementing the new front-of-pack label will depend on the size and colour of the logo. If the existing product label has to be redesigned to make space for the new logo, and if the colour of the logo is not already being used in the printing of the existing label, adding the logo will constitute a major change to production (RTI International, 2012[71]). Another significant change would be if the package surface area needs to be increased to allow for the additional label.

A one-off major change to a single product's label would result in labour costs (estimated at USD 5 800 per product), printing material costs (USD 1 100 to USD 6 150, depending on the printing method), graphic design and prepress costs (USD 4 000) (RTI International, 2012[71]). However, the costs depend on the implementation period of the policy. If the introduction of the new front-of-pack label can be coordinated with planned, regular changes in labelling, the cost would be substantially lower (Food and Drug Administration, 2014[72]). In this case, labour costs would be only around USD 550, and there would be no additional cost for the new printing material (RTI International, 2012[71]).

For branded food products, a 24 month compliance period would ensure nearly all products can be relabelled during a planned change, while private label foods, which are typically updated less frequently, would need to up 42 months to cover all products (RTI International, 2012[71]). However, a compliance period of 24 months would still include a planned relabelling for around 74% of private label products (RTI International, 2012[71]).

The cost of changing labels may have more impact on smaller businesses, who have limited in-house capacity. An Australian study of the Health Star Rating estimated that small businesses would need to spend AUD 500 to AUD 900 (USD 360 to USD 640) per product to calculate the rating, AUD 2 000 to AUD 3 000 (USD 1 400 to USD 2 100) to redesign the label, and AUD 350 to AUD 5 000 (USD 250 to USD 3 600) to create new printing plates (Centre for International Economics, 2014[73]). In addition, smaller companies may have a larger stock of existing labels or packaging, as they need to order for longer periods to get bulk discounts. The compliance period would then affect the cost of writing-off existing stock (Centre for International Economics, 2014[73]).

Labels can be used in marketing campaigns to increase the sales of healthy products

The impact of front-of-pack labels on product sales will depend on the type of label. Labels indicating healthier choices are generally expected to make products more appealing to consumers, while warning labels on energy-dense products would work as a deterrent. A meta-analysis found that front-of-pack labels increased the number of people selecting a healthier option by around 18% (Cecchini and Warin, 2016[66]). Traffic light systems were found to be most effective, increasing the number of people choosing healthier options by 29% (Cecchini and Warin, 2016[66]).

A label indicating that a product is healthy could be used to increase sales when combined with a strong marketing approach. The Eat Right-Live Well! supermarket intervention in the United States combined food labelling of healthy choices with an awareness campaign, increasing the sales of labelled and promoted healthy items by 28% (Surkan et al., 2015[74]). A study of a campaign aimed to increase the awareness and use of the Keyhole logo among Danish men over 45 years old showed a 9.6% increase in the sale of foods with the logo (Mørk, Tsalis and Grunert, 2015[75]).

8.4.3. For food vendors, there are also implementation costs associated with menu labels, but the labels can be used to promote the sale of healthy products

Implementation of menu labels may be associated with design, printing and nutritional analysis costs

Food vendors will incur some costs to implement menu labels, including the cost of nutritional analyses and menu replacement.

Nutritional analyses will be required for food products where this information is not already available. The Food and Drink Administration (FDA) estimates the average analysis cost per food item to be around USD 660, and calculated that the 600 largest restaurant chains (by sales) in the United States have an average of 117 unique menu items (FDA, 2014[76]). Based on this information, the cost of the initial nutritional analysis for an individual restaurant chain would be around USD 70 000. Additional costs may be incurred when new food items are introduced on the menu.

However, this amount assumes that no prior information exists and that all items need to be analysed. The FDA estimates that 54% of fast-food restaurants in the United States already have or report nutritional information, and will not need to reinvest in nutritional analysis (FDA, 2014[76]). In addition, for food items manufactured elsewhere, such as sodas, nutritional information will be readily available.

The cost associated with changing menus largely depend on the format of the menus used, and the time frame of the implementation (FDA, 2014[76]). Paper, individual menus are often reprinted, and changes to their design can be incorporated with minimal additional cost if the implementation period is long enough to encompass a regular redesign and print cycle.

Menus displayed on boards would normally last longer and are more expensive to replace. The FDA estimates the cost of a new board to be on average USD 550 (FDA, 2014[76]). In addition, it is estimated that the labour cost to replace the boards would amount to between USD 1 500 and USD 2 500 per establishment.

In restaurants where food is not prepared according to strictly portioned ingredients, the nutritional content of each meal varies. In this case, an investment in training would be required to ensure a standard recipe is consistently followed in accordance with the listed nutritional profile (Thomas, 2015[77]).

Figure 8.4. Overview of the impact of food labelling on the industry

	Potential impact on industry		Influencing factors
Printing and design	Negative	Producers will need to get a new label, packaging and menu design and potentially invest in new printing methods	These costs depend on the current packaging or menus, and the extent to which the new label changes this in terms of colour and space
	Neutral	If reformulation can be incorporated into planned rebranding cycles, additional costs can be reduced or eliminated	A transition period of 24 months would cover the planned relabelling of 74% of private label products, and nearly all branded food products; restaurants using paper menus need less time to comply than those that use display boards
Nutritional analysis	Negative	To inform the labelling, products may need to be analysed to determine their nutritional profile	Whether nutritional analysis is required depends on the type of food product: • Packaged, processed food and drinks already require nutritional labelling • 54% of fast-food restaurants in the United States already have or report nutritional information
	Neutral	For some food groups this information is already available	
Training cost	Negative	Where recipes are not currently standardised, personnel may need to be trained to produce food in accordance with its label	
Stock write-off	Negative	Existing labels or packaging stock may need to be written off	Smaller companies, ordering longer-lasting supplies to achieve bulk discounts, are more likely to be affected by this; a longer compliance period may mitigate this impact
Sales	+/− Variable	Negative labels may decrease sales; while positive labels can increase sales	Corresponding marketing or public health campaigns can increase the impact of positive labels on sales

Source: OECD analyses on cited literature.

8.5. Food taxes and their impact on the food industry

8.5.1. An increasing number of countries are implementing taxes which aim to reduce the consumption of energy-dense food and drinks

Several OECD countries are introducing taxes on energy-dense food and drinks

While public health taxes on products such as tobacco and alcohol are widespread, until recently there were few examples of governments taxing energy-dense foods or non-alcoholic beverages. However, an increasing number of countries are now looking to introduce similar taxes on food and drinks. OECD countries, including Belgium, Chile, Denmark, Finland, France, Hungary, Ireland, Latvia, Mexico, Norway, Portugal and the United Kingdom, have or had in place health-related food or drinks taxes.

While taxes on energy-dense food and drinks are primarily meant to increase the price of the product to reduce their consumption, they may also have other impacts: they raise additional revenue for the government, and they may incentivise reformulation (WHO, 2015[78]). For example, the food tax in Hungary reduced sales of taxable products by 27%, raised HUF 61.3 billion (USD 220 million) for public health spending over the first four years, and encouraged 40% of affected food product manufacturers to reduce or eliminate certain ingredients (WHO, 2015[79]).

Food and drink taxes can apply to specific products, such as sugar-sweetened beverages (SSBs), or to specific nutrients, such as saturated fat. The former is most common across OECD countries, with a

number of countries taxing soft drinks. The public health product tax in Hungary applies to a range of food products (e.g. sweets, biscuits, soft drinks, alcoholic drinks and salty snacks) that contain fat or sugar above a threshold level (WHO, 2015[79]). Similarly, Denmark had experimented with nutrient taxes, but this was later repealed.

Some countries have set a minimum threshold for their tax: Chile taxes SSBs that have more than 15 g of sugar per 240 ml (Guerrero-López, Unar-Munguía and Colchero, 2017[80]). Mexico on the other hand taxes all drinks with any added sugar, regardless of the amount (Colchero et al., 2016[81]). The United Kingdom has set different tax rates based on the amount of sugar per 100 ml (Government of the United Kingdom, 2018[82]).

8.5.2. The impact of food taxes on the food industry depends on the pass-through rate and the sale of substitution products

The direct cost related to tax depends on the pass-through rate

The tax itself is the main cost to the industry. This charge can be either absorbed, reducing profit margins on the product, or passed on to the customer in the form of a price increase (see Figure 8.5). The proportion of taxes passed on to the customer is the pass-through rate. For taxes to have the desired impact on consumption, manufacturers and retailers need to pass on the entire tax to the consumer (WHO, 2015[78]). However, there are cases where only part of the tax is passed on, as well as cases where prices increase more than the tax amount.

Pass-through rates are not homogenous across the industry. A study of the Danish fat tax found that the price of butter and margarine increased more in discount stores than in supermarkets, despite being subject to the same amount of tax (Jensen and Smed, 2013[83]). Another study, looking at the soda tax in France, found that the pass-through rate varied by product, brand and retailer (Berardia et al., 2016[84]). While flavoured waters and fruit-flavoured drinks were under-shifted (i.e. the tax was only partially passed on to the customer), taxes on sodas were, on average, fully passed on. However, this complete pass-through was the result of under-shifting of large producers' brands and over-shifting for private labels. In Berkeley, California, taxes were fully passed on in supermarkets and chain gas stations and partially in pharmacies (Silver et al., 2017[85]). Independent corner stores and gas stations however showed a negative pass-through rate (i.e. overall price decreased).

Other costs including, for example, implementation and production costs would be more limited. If nutrients rather than products are taxed, manufacturers may have to invest in nutritional analysis (WHO, 2015[78]). However, at least in the case of OECD countries, current labelling regulation usually already requires producers to have this information.

Changes in sales due to taxes may be offset by sales of substitute products

The aim of these types of taxes is to reduce the consumption of energy-dense food and drinks by increasing their price. In general, the evidence shows that price increases through taxation reduce consumption (WHO, 2015[78]; Cabrera Escobar et al., 2013[86]; WHO, 2016[87]; Thow, Downs and Jan, 2014[88]) (Teng et al., 2019[89]). A reduction in consumption of energy-dense products is often accompanied by an increase in consumption of other products, called substitution. Substitution with healthier products is positive for public health, but may also provide opportunities for the industry.

The choice of substitution product is important in determining the impact of the tax on the industry. If an SSB tax makes consumers switch from regular to diet sodas, which has been shown in the case of Chile's SSB tax (Caro et al., 2018[90]), the impact on the soft drink industry could be limited. If consumers switch to other beverages, such as bottled water as observed in Mexico (Colchero et al., 2016[81]), this may reduce income for soft drink companies, but increase sales for other drinks producers. Producers with a wider

product portfolio may be able to increase sales of their non-taxed products. On the other hand, for producers with a smaller product portfolio, it may be more difficult to mitigate the impact of taxes this way (Ecorys, 2014[91]).

This impact on the overall industry is showcased in an example from the United States. In Berkeley, California, the introduction of an SSB tax resulted in a 9.6% decline in soda sales per transaction (Silver et al., 2017[85]). However, the sales of untaxed beverages increased: customers bought more water (+15.6%), more untaxed fruit, vegetable and tea drinks (+4.4%) and more plain milk (+0.6%).

Substitution rates, which can be measured as cross-product price elasticity, differ per product and by country. A modelling study estimated that a 20% price increase of SSBs in the United Kingdom would decrease their consumption by 15-16%, while increasing consumption of milk, water, fruit juice and concentrated and non-concentrated diet sodas by 3.7%, 2.4%, 3.1%, 7.5% and 3.9%, respectively (Briggs et al., 2013[92]). In Australia, it was estimated that a 20% tax would result in a 3.2% increase in diet soft drink consumption, 1.6% increase in bottled water and 1.1% in low-fat milk (Sharma et al., 2014[93]).

National taxes may reduce the competitive position of the industry as compared to other countries. However, while evidence is limited, potential cross-border trade following the implementation of a tax seems to have limited effect on sales. For example, a study carried out by the Ministry of Taxation in the aftermath of the implementation of the fat tax in Denmark in 2011 concluded that the impact of the fat tax on overall cross-border trade with Germany was relatively limited, due to the short shelf-life of food products compared to other products bought cross-border, like alcohol and tobacco (Skatteministeriet, 2012[94]). Moreover, if neighbouring countries take a coordinated approach, the impact on cross-border trade and competition can be mitigated.

The impact of taxes on employment in the food and drink industry are likely to be offset by new employment in other industries

Available evidence indicates that the impact of taxation of food products on employment rates would be relatively contained. A modelling study found that a 20% SSB tax would in fact very slightly increase the number of jobs in two US states, due to increased consumption of non-SSBs, increased spending on non-beverage goods and services, and the increased economic activity resulting from the tax revenue (Powell et al., 2014[95]). Similarly, a recent study of the Mexican SSB tax and the tax on nonessential energy-dense foods showed no impact on employment in either the manufacturing industry or stores selling foods and drinks (Guerrero-López, Molina and Colchero, 2017[96]).

Figure 8.5. Overview of the impact of food taxes on the industry

	Potential impact on industry		Influencing factors
Production cost	−/○ Variable	If not all tax is passed through to the consumer in the form of price increases, the industry would need to cover these costs	Taxes will either impact production costs or prices, depending on the pass-through rate. The pass-through rate depends on: • The product • The brand • The retail setting • The country
OR	OR		
Sales	−/○ Variable	If part or all of the tax is passed through to the consumer in the form of price increases, sales may decrease	
Sales of substitute products	+ Positive	When consumption of taxed products decreases, sales of substitute products may increase	The type and volume of substitution will depend on the cross price elasticity of the taxed product and the substitute product
International competition	−/○ Negative / minimal	If other countries do not have food taxes, the food industry may see reduced sales due to cross-border trade and reduced exports	These costs depend on a company's reliance on exports, the actions of neighbouring countries with regards to taxes, and the ease of cross-border trade
Employment	○ Neutral	If sales decrease this may affect employment in the associated industry; however substitution sales and the reinvestment of tax revenue can increase employment in other industries	This impact depends on the changes in sales for tax-affected companies, the effect on substitution sales and how the tax revenue is used

Source: OECD analyses on cited literature.

8.6. Advertising restrictions and their impact on the food industry

8.6.1. Many governments and companies have restricted the advertising of energy-dense products to children

Advertising restrictions help to reduce the impact of marketing of energy-dense food and non-alcoholic beverages on children (WHO, 2010[97]). The use of different marketing approaches targeted at children has been shown to influence food preferences, purchase requests and consumption patterns. In addition to regulating advertising in mass media, policy makers can make the settings where children gather (e.g. nurseries, schools, playgrounds) free from all forms of marketing of energy-dense foods. Regulation generally concerns advertising to children, as they do not recognise the persuasive intent of advertising, nor do they have the capacity to critically evaluate commercial messages (Graff, Kunkel and Mermin, 2012[98]).

Mandatory restrictions on the advertising of energy-dense foods to children exist in a number of OECD countries, including Chile, Finland, Ireland, Mexico, Norway, Korea, Sweden, and the United Kingdom (World Cancer Research Fund International, 2017[99]). These bans vary in scope: for example, Norway has a general ban on advertising to children under 18, while Mexico restricts the advertising of food and beverages based on a nutrition profiling model. Ireland bans advertising to children on television and radio, while Chile includes websites and promotional toys with meals. Chile, Hungary, Lithuania, Poland, Spain and the United States have regulations on the marketing of foods in schools.

In addition to mandatory regulations, there exist a large number of voluntary initiatives organised by the industry. For example, the EU Pledge is a voluntary initiative by leading European food and beverage

companies, under which signatories commit to banning advertising of energy-dense foods to children under 12 years of age and marketing communications to children in primary school (EU Pledge, 2016[100]). In the United States, 17 of the nation's largest food companies promised that advertisements targeted at children would feature only healthier foods that meet nutritional standards specified by each company, under the Children's Food and Beverage Advertising Initiative (CFBAI) (Kunkel, Castonguay and Filer, 2015[101]). Similarly, the 16 participating companies in the Canadian Children's Food and Beverage Advertising Initiative (CAI) have committed to only advertising products that meet the CAI's Uniform Nutrient Criteria to children under 12 years of age (CAI, 2018[102]).

Voluntary initiatives can also be developed through cooperation between the government and industry. In Ireland, the "Non-Broadcast Media Advertising and Marketing of Food and Non-Alcoholic Beverages, including Sponsorship and Retail Product Placement: Voluntary Codes of Practice" were developed after 15 months of cooperation and collaboration between government departments, advertising and broadcast authorities and various industry associations (Department of Health, 2018[103]).

However, the effectiveness of the self-regulation of food marketing to children has been questioned by public health experts. For example, a systematic review of the literature concluded that high levels of advertising of energy-dense foods continue to be found in several countries worldwide despite self-reported high levels of adherence to codes (Galbraith-Emami and Lobstein, 2013[104]). A review of the effectiveness of the CFBAI noted that while all companies met their respective pledges, 80.5% of food advertisements aired during children's programming still promoted nutritionally deficient products (Kunkel, Castonguay and Filer, 2015[101]).

8.6.2. The impact of advertising restrictions on the industry depends on the type and extent of the ban

There may be costs associated with the development of new advertising strategies

When new regulations are introduced, companies will need to review their current advertising practices, and potentially change strategy – which may carry costs (see Figure 8.6). Changing the marketing strategy may be associated with expenditure for an advertising agency. However, for some companies this activity will be done in-house. The new advertising strategy may carry higher or lower costs, as different channels are used.

In addition, new marketing campaigns need to be tested against regulations, which can involve a process called preclearance (Advertising Association, 2014[105]). However, the cost associated with this may be carried by the channels on which the advertisement is transmitted (Clearcast, 2017[106]), and even for an express, same-day clearance the fees may be small. For example, in the United Kingdom the clearing process for a new advertisement was set at GBP 250 (USD 320) (Clearcast, 2017[107]).

The impact of advertising restrictions on overall sales is unclear when other advertising possibilities remain

Studies have shown that advertising has an impact on children in an experimental setting, where children are presented with food options directly or shortly after watching television (Halford et al., 2004[108]) (Boyland et al., 2016[109]; Sadeghirad et al., 2016[110]). In addition, experimental studies have found that children are more likely to prefer or ask their parents to buy foods they have seen on advertisements (Aznar et al., 2016[111]; Sadeghirad et al., 2016[110]).

However, the impact of advertising restrictions in practice depends on the extent or scope of the ban, and compliance with the ban. For example, restrictions implemented in the United Kingdom in 2007 prohibited the advertising of foods high in fat, salt and sugar during or around programmes "of particular appeal to" 4 to 15 year olds. While there was almost universal adherence, an increase in the advertising of these

products at other times meant that there was no change in children's exposure, as children watch a wider range of television than just those programmes particularly targeted at them (Adams et al., 2012[112]).

Similarly, restricting advertising through one medium may increase the use of other channels. While television is an important medium, marketing can also be done using sponsorship, product placements, websites, and social media (WHO, 2010[97]). One study in the United States found that of the more than three billion food advertisements seen on children's websites, 84% promoted products high in fat, sugar or sodium – despite industry self-regulation initiatives (Ustjanauskas, Harris and Schwartz, 2014[113]).

8.6.3. The impact of advertising regulations on the advertising and media industries is thought to be limited

In addition to the food and drinks industry, the media industry could be affected by these regulations as income from advertising may change. However, as the large majority of food and drink advertisers have a broad portfolio of products, there is considerable potential to adapt to regulation by advertising other healthier products, advertising to other audiences, or focusing on brand rather than product advertising (Committee of Advertising Practice, 2016[114]). Overall, the loss of advertising revenues to media owners is thought to be marginal (Committee of Advertising Practice, 2016[114]).

For example, in 2010, South Korea implemented regulations that prohibited television advertising of energy-dense, nutrient-poor (EDNP) foods between 5:00 pm and 7:00 pm, and during the commercial breaks of children's programmes at other times (Kim et al., 2013[115]). As a result, the total budget for television advertising of EDNP foods decreased by 31%, from USD 9.6 million to USD 6.6 million for the two four-month periods studied. However, the total budget for non-EDNP foods advertising increased by 17%, from USD 103 million to USD 121 million. As a result, the total spend on food advertising increased by 13%.

Figure 8.6. Overview of the impact of food advertising restrictions on the industry

	Potential impact on industry		Influencing factors
Marketing spend	− Negative	The industry may have to revise their marketing strategy to comply with the restrictions, and have the new campaign tested against regulations	These costs depend on the type of restrictions, and the relative cost and effectiveness of alternative advertising approaches
	+/− Variable	In some cases current marketing spend will be redirected to new marketing activities that comply with restrictions, which may carry a different cost	
Marketing-related industries	○ Neutral	In many cases advertising spend will be redirected to other channels, products or audiences	
Sales	−/○ Variable	The aim of advertising restrictions is to reduce consumption, which may negatively impact sales	The impact of advertising restrictions on overall sales in the industry depends on the extent of the restrictions and the effect of reallocating advertising to other products or audiences

Source: OECD analyses on cited literature.

8.7. Healthy food subsidies and their impact on the food industry

A healthy lifestyle can be encouraged by subsidising foods such as fruit and vegetables (WHO, 2016[87]; WHO, 2015[78]). While the general evidence on this type of policy is limited due to the wide variety of formats, there exist examples of successful subsidy programmes around the world. In general, the limited amount of available evidence suggests that these schemes may have a positive impact on the industry by providing additional revenue and generating public interest.

8.7.1. The US Healthy Incentives Pilot programme increased fruit and vegetable sales with limited burden on retailers

The US Healthy Incentives Pilot (HIP), which ran over 2011 and 2012, aimed to increase the consumption of fruits, vegetables, and other healthy food by providing financial incentives to Supplemental Nutrition Assistance Program (SNAP) participants (US Department of Agriculture, 2014[116]). SNAP is the largest nutrition assistance programme in the United States, and provides eligible families with an electronic benefit card (EBT) that can be used to purchase foods and non-alcoholic beverages at authorised retailers.

Through the HIP, SNAP participants received 30 cents back for every dollar they spent on targeted fruits and vegetables, including fresh, frozen, canned, and dried fruits and vegetables without added sugars, fats, oils or salt (with some exceptions). The 30 cents were deposited back onto the EBT card and could be spent on any SNAP eligible purchases. An evaluation of the programme showed that HIP participants consumed 26% (0.24 cups) more fruit and vegetables than non-participants (US Department of Agriculture, 2014[116]).

The main impact on the industry was the increased sales of fruit and vegetables: 45% of participating stores noted an increase in sales and 16% an increase in profits (US Department of Agriculture, 2014[116]). Since only a small portion of SNAP households participated in the HIP, a greater impact could be expected for a full implementation of the scheme. The SNAP participants who were part of the HIP spent USD 12.05 per month on fruit and vegetables in stores participating in the pilot, compared to USD 10.86 for other SNAP participants, an increase of 11% (US Department of Agriculture, 2014[116]). Overall spend on fruit and vegetables in any store was USD 78.17 in the HIP group, compared to USD 72.02 for other SNAP participants.

The existence of the EBT system facilitated the implementation of the reimbursement to retailers. Nevertheless, at the start of the pilot some retailers had doubts about the increased time and effort required to operate the scheme. However, the evaluation showed that 91.1% of stores reported no change in average checkout time, and only 17% of stores said that the training of staff had been a burden (US Department of Agriculture, 2014[116]). Due to the increased volume of sales, retailers did report some increase in store running activities, such as supplier shipments and floor restocking.

8.7.2. The European Union School Fruit Scheme has created a new, stable market for the agriculture industry

In 2008, the European Union (EU) Council of Agriculture introduced the School Fruit Scheme, which provides free fruits and vegetables to school children, which was combined with the School Milk Scheme in 2017. In the 2017/18 school year, 25 member states participated in the scheme, serving over 20 million children in 160 thousand schools (European Commission, 2019[117]). In total, the scheme provided over 250 million kilogrammes of fruit and vegetables to school children. The scheme also includes educational measures on healthy diets.

The School Fruit Scheme provides the agriculture sector with a sizable additional revenue stream: the 2017/18 allocated EU budget for the supply of fruit and vegetables under the scheme was EUR 105 million (USD 118 million) (European Commission, 2019[117]). Moreover, schools offer an additional stable and potentially expanding market, especially if the scheme has a long-term effect on fruit and vegetable consumption, and a spill over effect on parents (European Commission, 2015[118]).

8.8. Conclusion

Many of the policy options assessed in the OECD analysis carry direct implications for industry and business, particularly in the case of the food and drink industry. The food and drink industry, consisting of food manufacturers, restaurants, supermarkets and other related enterprises, may be required to change their product, pricing, packaging, or marketing and advertising approach. This can result in implementation and compliance costs, or a change in the volume of sales. Certain cost, such as R&D, reformulation, label or menu redesign and printing, can be minimised when aligned with the standard business cycle of planned, regular changes. Some policies, such as subsidies and labelling, can also have a positive impact on the industry by providing additional revenue and generating public interest.

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Notes

[1] Microparticulation is a production technique which creates a more appealing texture in low-fat dairy-based products by creating protein particles similar in size to fat globules.

[2] Enzyme inhibitors reduce or slow down the breakdown of starch.

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