Economic impacts of overweight and obesity: current and future estimates for 161 countries – Supplementary materials

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Appendix 1: Methods

Introduction

We assess the economic impacts of overweight and obesity (OAO) for children and adults in 161 countries. This is an expansion of our earlier work that estimated the economic impact of overweight and obesity in eight countries.[1] Overweight is defined as a body mass index (BMI) of 25 kg/m^2 to 29.9 kg/m^2 in adults and obesity as BMI of 30 kg/m^2 and above. For children overweight is defined as weight that is one to two standard deviations above the median and obesity as more than two standard deviations above the median.[2]. We included 28 OAO-related diseases in this study (Table 1). These are the 28 diseases identified in the Global Burden of Disease (GBD) database for which evidence of their high BMI risk linkages were graded as being convincing or probable (based on the World Cancer Research Fund [WCRF] grades of convincing, probable, possible, or insufficient evidence).[3]

Table 1: Obesity (High BMI) attributable diseases in Global Burden of Disease study (GBD)

Cause	Cause Group
1. Esophageal cancer	Neoplasms
2. Liver cancer	Neoplasms
3. Breast cancer	Neoplasms
4. Uterine cancer	Neoplasms
5. Colon and rectum cancer	Neoplasms
6. Gallbladder and biliary tract cancer	Neoplasms
7. Pancreatic cancer	Neoplasms
8. Ovarian cancer	Neoplasms
9. Kidney cancer	Neoplasms
10. Thyroid cancer	Neoplasms
11. Non-Hodgkin lymphoma	Neoplasms
12. Multiple myeloma	Neoplasms
13. Leukemia	Neoplasms
14. Ischemic heart disease	Cardiovascular diseases
15. Ischemic stroke	Cardiovascular diseases
16. Intracerebral hemorrhage	Cardiovascular diseases
17. Subarachnoid hemorrhage	Cardiovascular diseases
18. Hypertensive heart disease	Cardiovascular diseases
19. Atrial fibrillation and flutter	Cardiovascular diseases
20. Asthma	Chronic Respiratory diseases
21. Gallbladder and biliary diseases	Digestive Diseases
22. Alzheimer's disease and other dementias	Neurological disorders
23. Chronic kidney disease	Chronic kidney disease
24. Osteoarthritis	Musculoskeletal disorders
25. Low back pain	Musculoskeletal disorders
26. Gout	Musculoskeletal disorders
27. Cataract	Sense organ diseases
28. Diabetes mellitus type 2	Endocrine diseases

We employed a cost-of-illness approach to estimate the economic impacts of overweight and obesity (both direct and indirect costs) from a societal perspective. This approach translates the adverse effect of overweight and obesity into monetary terms.[4] The estimates are useful for understanding the impact of overweight and obesity for policy prioritization and agenda setting. In addition, they are useful for facilitating cross-national comparisons of overweight and obesity consequence across different contexts[5]. The time horizon of the analysis includes current costs in the index year (2019) as well as projections to 2060 (Table 2). Model parameters and values were sourced from publicly available global databases and peer reviewed literature (see Table 1 in main manuscript). We aggregated the economic costs by country income group using the World Bank's fiscal year 2021 classifications and by WHO regions (see Appendix 3 Table 2). Detailed steps for estimations are explained in the following sections.

Estimating current impact of overweight and obesity

The total economic cost of overweight and obesity is the sum of direct and indirect costs attributable to overweight and obesity.

$$\text{Total Economic Cost} = \text{Direct Costs} + \text{Indirect Costs}$$

Direct costs

These refer to the total healthcare expenditures resulting from treating OAO-related diseases. This includes medical resources used in treating these conditions (direct medical costs) as well as non-medical resources that are expended while seeking treatment (direct non-medical costs). It is noted that many countries with low spending on health provide limited care for many of the OAO-related diseases we are measuring. This leads to an underestimation of the total economic impact of overweight and obesity in those countries.

Direct medical costs (DMC): Cost of medical resources to treat illness

Direct medical costs are the cost of health care goods and services consumed for personal health care due to overweight and obesity and includes curative care, rehabilitative care, preventative care, ancillary services and medical goods.[6] The commonly used methodologies for quantifying these costs are the top-down approach and the bottom-up approach. In principle, the top-down approach estimates DMC by multiplying cost of treating OAO-attributable illnesses – typically derived from aggregate data – with an OAO-attributable fraction or ratio.[7] A commonly used parameter is the population attributable fraction (PAF) or population attributable risk (PAR). This is used to quantify how much a risk factor (in this case overweight and obesity) contributes to a disease or death. It can be defined as the reduction in disease or mortality that would occur at the population level if exposure to a risk factor is reduced to an alternative ideal exposure scenario (e.g. if no one experiences overweight and obesity).[8]

Alternatively, the bottom-up approach estimates the resources used per individual and extrapolates the per-capita costs to the population with overweight and obesity. Included costs are drugs, hospitalization, physician costs, inpatient and outpatient costs, etc.[7] Estimation of resources used per individual can be done through econometric modelling. This approach requires having nationally representative individual-level medical expenditure and anthropometric data. Due to the data constraints in many LMICs, this approach is impractical for the scope of this project.

We estimate DMC in this study by employing a hybrid of a top-down and bottom-up approach; using OAO-attributable fraction (OAF) for costs that were calculated using a bottom-up approach. The OAF is the proportion of total health expenditure that can be attributed to overweight and obesity. This represents the cost of health care goods and services for personal health care and includes curative care, rehabilitative care, preventative care, ancillary services and medical goods.[6] This proportion is then applied to national health expenditure data to calculate OAO-related medical costs.

$$\text{DMC} = \text{OAF} \times \text{Total Healthcare Expenditures}$$

Aggregate data on total health expenditure is available for most countries from the WHO Global Health Expenditure Database. To estimate the direct medical cost or OAO-attributable healthcare expenditures, we identified studies from our literature search that reported the proportion of health expenditure attributable to overweight and obesity or OAO-attributable fractions (OAF) for a country. We found the OAFs from the OECD report (for the 52 countries in the report) to be the most appropriate because they are based on the Global Burden of Disease study and include the same number of OAO-related diseases as this paper (Appendix 1: Table 1)[6]. The reported OAFs from the OECD report are the health expenditure associated with overweight and obesity as a percentage of total health expenditure and were presented as an average between 2020-2050.

Deriving OAO-attributable fraction (OAF)

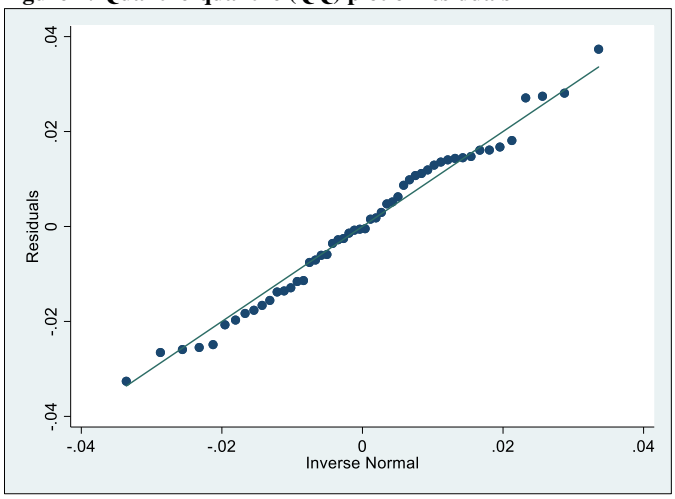
To estimate OAF for countries not included in the OECD report and for projections, we regressed the available OAFs of the 52 countries from the OECD report on each country's average overweight and obesity prevalence between 2020 and 2050. The coefficient β is estimated with a simple linear regression of OAF on overweight and obesity prevalence following the approach used by Goodchild and colleagues for tobacco attributable fractions.[9]

$$\text{OAF}_\text{i} = \beta^*\text{Prev}_\text{I} + \varepsilon$$

The data does not violate assumptions of normality required for simple linear regression as demonstrated by the QQ plot below (Figure 1). The residuals of the regression (except the few outliers) do fall along a straight line at a 45 degree angle for the most part. The results of statistical tests for normality such as the Shapiro-wilk test (W=0.980,

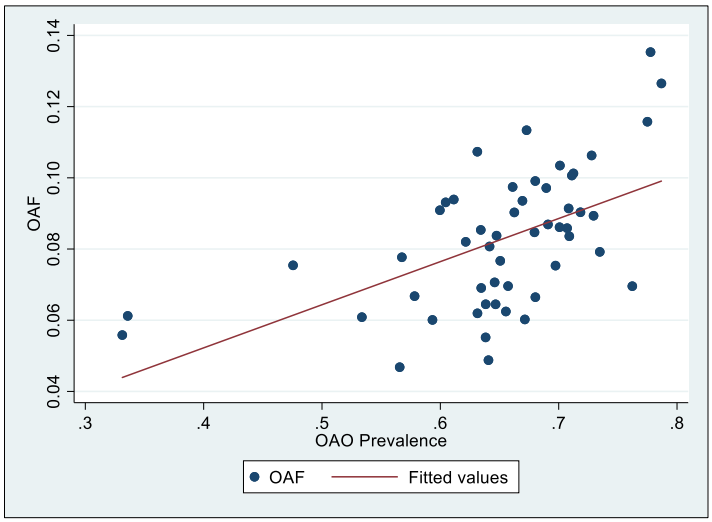
p=0.508), Shapiro-Francia test (W'=0.981, p=0.471) and Skewness/Kurtosis test [(Pr[Skewness] = 0.189, Pr[Kurtosis]=0.7612), p=0.3860] indicate we cannot reject the null hypothesis that OAF is normally distributed.

Figure 1: Quantile-quantile (QQ) plot of residuals



There is a significant positive association between OAF and OAO-prevalence (β=0.121, F=21.74, p<0.001) (Figure 2). We opted to run the regression though the origin as the constant term was statistically insignificant The two models are also not significantly different from each other (p=0.948). The regression coefficient (0.1268395) from the estimated equation and the total overweight and obesity prevalence was used to estimate the OAF for all countries.[6,10] We also apply the regression outputs to projected overweight and obesity prevalence till 2060 to calculate future OAFs. While the OAFs from the OECD study may not be representative for all income groups, these countries account for the majority (about 95%) of global health expenditure based on the 2018 WHO Global Health Expenditure Database. To ensure consistency, we used the estimated OAFs from the regression outputs in computing direct medical costs in 2019 for all countries including the 52 countries in the OECD study.

Figure 2: Plot of OAF and OAO-prevalence



Direct non-medical costs: Cost of non-medical resources to treat illness

Direct non-medical costs measure the additional cost incurred during the process of seeking medical care. This can include travel expenses to health facilities or doctor appointments, cost incurred by caregivers, cost of food and lodging during inpatient care, and cost of home modifications. This study includes an estimation of travel expenses and caregiver costs expected to be incurred by people living with overweight and obesity. The key parameters needed for this sub-component – the average inpatient and outpatient visits by the population with overweight and obesity were sourced from a systematic review of peer-reviewed studies. See Appendix 4 for more details. We found very little data on length of hospitalization and the existing evidence was inconclusive, hence, we excluded informal caregiver time cost that required this parameter for estimation.

Travel costs

This is estimated separately for inpatient (hospitalization) and outpatient care. We calculated this by multiplying the average transport cost per trip by the population with overweight and obesity. The transport cost was assumed to be the cost of gasoline to drive to a health facility in a private vehicle. This was calculated by taking the country-specific data for price per liter of gasoline from the World Bank's World Development Indicators database and fuel economy and assuming a distance of five kilometers to a health facility.[11,12] For outpatient visits and hospitalizations, we use a global estimate due to the paucity of country-specific data.

$$\text{Inpatient Travel Costs} = \text{ATC} \times \text{N}_{\text{in}} \times \text{Population with Obesity}$$

where:

ATC is the average travel cost to and from health facility;

N_{in} is the average number of inpatient consultations by population with overweight and obesity compared to healthy weight population.

$$\text{Outpatient Travel Costs} = \text{ATC} \times \text{N}_{\text{out}} \times \text{Population with Obesity}$$

where:

ATC is the average travel cost to and from health facility;

N_{out} is the average number of outpatient consultations by population with overweight and obesity compared to healthy weight population.

The total travel cost is the sum of outpatient and inpatient travel costs.

Informal Caregiver (ICG) costs

These are estimated for impatient care and includes the travel cost of informal caregivers (assuming one informal caregiver per patient).

$$\text{ICG Travel Costs} = \text{ATC} \times \text{N}_{\text{in}} \times \text{Population with Obesity}$$

where:

ATC is the average travel cost to and from health facility;

N_{in} is the average number of inpatient consultations/visits by population with overweight and obesity compared to healthy weight population.

The data on hospitalization days was very scanty, hence we excluded informal caregiver time cost from our estimations. The time cost for inpatient/outpatient care for population with overweight and obesity is assumed to be included within the indirect cost from absenteeism.

Indirect costs

These represent the economic value of lost time, productive capacity, or quality of life due to living with overweight and obesity. In our study, this includes the economic cost of premature mortality, productivity losses from missed days of work (absenteeism), and reduced productivity while at work (presenteeism). Other relevant cost components such as long-term disability and early retirement costs were not included as it was not feasible to measure these across countries.[13] Also, in some societies there may be costs associated with weight bias (e.g. lower academic

achievement, reduced emotional support, reduced likelihood of promotion) and in others there may be a premium associated with high BMI;[14] however, the magnitude and direction of these impacts have not been studied across countries.[15] For absenteeism and presenteeism costs, we assume the same employment rates by BMI status. While it is plausible that the population with overweight and obesity may have a lower employment rate compared to the general population, the existing evidence is mixed and inconclusive.[16–23] Data on absenteeism days and presenteeism rate were sourced from a systematic review of peer-reviewed studies (See Appendix 4 for details).

Economic cost of premature mortality

This is the economic value of life lost prematurely due to OAO-attributable deaths. This is calculated as the number of years of potential life lost by individuals (by age group and sex) who died from OAO multiplied by the economic value of a life year.[4,24–26] We quantify the economic costs of premature mortality using these three steps (adapted from the FCTC Tobacco Investment Case Economic Model, RTI International).[27]

Step 1: Calculating number of years of potential life lost prematurely due to OAO-attributable deaths

This denotes the number of years that individuals (by age group and sex) would have lived had they not died from OAO based on the number of years of life expectancy remaining at the age of death. To quantify this, we estimated how many people in each cohort would have been alive in future years if they had not died from OAO-related diseases (ORDs). This is because people die from causes other than ORDs and some of the people who died from overweight and obesity may not have made it to their full life expectancy because of dying from other causes. To account for these deaths, our model uses background mortality rates drawn from country-specific life tables, available online from the United Nations Population Division.

For each age and sex cohort of individuals who died from overweight and obesity in their death year, we estimate how many of those people would have been alive in future years if they had not died from overweight and obesity in their death year,

$$\text{People}_{i+1} = \text{People}_{i} \times (1\text{-Deathprob}_{i})$$

where People_i is the number of people alive in model year (i=0 for age of death), People_{i+1} is the number of people alive in each successive years of remaining life expectancy, and DeathProb_i is the probability of death in age cohort. This calculation is performed for each age- and sex-specific cohort until no one is left alive based on life expectancy.

Step 2: Life year valuation

This study uses GDP per capita as a proxy for economic value of a life year. Other alternative proxies used in estimating cost of premature mortality include the use of average annual wages and the use of value of statistical life year[28] (see Box 1).

Box 1: Estimating economic cost of premature mortality

Three parameters used in estimating the economic cost of premature mortality include annual wages, value of statistical life year (VSL) and value of life year (VLY).

Annual wages: Some studies in the obesity literature have used average annual wages as a proxy for productivity loss from premature mortality. Average annual wages are used to estimate the foregone economic value from lost days of work due to premature death. In addition to various labor market imperfections and idiosyncrasies across countries, an obvious weakness to this is that future lost earnings do not fully represent the economic contribution of an individual to society. Also, it does not capture the value of the time spent not working such as vacation or leisure.

Value of Statistical Life: The value of a statistical life (VSL) is the local tradeoff rate between fatality risk and money.[13] It is a measure of the population's willingness to pay for reduction in mortality risk and the marginal cost of safety. It has been adopted by policy analysts as an economically valid measure for benefits that accrue to individuals for enhancements to their health and safety.[13] Typically calculated using contingent valuation methods, VSL calculations are available only for a small number of countries that are mostly high-income. In addition, studies from the same countries have come up with different estimates of VSL. Hence, while this approach is theoretically sound, it is not practical for the scope of this project that seeks to compare costs across countries.

Value of Life Year: The VLY assigns monetary terms to changes in mortality risk using a full income approach.[12] A country's full income combines changes in national income (e.g. GDP) and the value of change in mortality or life expectancy in a given period. A VLY is defined as the economic value in a country or region of a 1-year increase in life expectancy. Economic loss due to premature mortality from a disease is assessed using GDP, adjusted for gains in health or life expectancy in the absence of the risk factor (obesity) attributable death. On average, one VLY is estimated to be 1.6 (GDP multiplier) times the per-person income globally,[14] but the global figure hides considerable variation across regions and countries.

Our choice of GDP per capita is driven by our desire to value the economic contribution of every individual in society irrespective of employment status. This brings an equity lens to how economic contributions are counted. Also, as part of sensitivity analysis for an upper bound of premature mortality cost, we adjust GDP per capita for the full income value of a life year (VLY) as developed by *The Lancet* Commission on Investing in Health (CIH). This combines changes in national income (GDP per capita) and the value of change in mortality or life expectancy in a given period adjusted for the gains in health or life expectancy that would have occurred in the absence of the overweight and obesity attributable death.[29] This is done by using a multiplier applied to GDP per capita. The global GDP multiplier was calculated by CIH to be 1.6 based on life year valuation estimates from life expectancy changes between 2000 and 2011.[30] There are also estimations of regional GDP multipliers that more closely reflect variations in gains in different regions of the world (Table 3). We use this approach in sensitivity analysis to estimate an upper bound of premature mortality cost. For more information about the GDP multiplier, see Global Health 2035: A World Converging Within a Generation, Supplementary Web Appendix 3.[29] We use the regional and income-level GDP multipliers (Table 2). Though updated GDP multipliers would be ideal, they are not yet available.

Table 2: GDP Multipliers

Country	*GDP Multiplier used for Study**	*Global GDP Multiplier*	*GDP Multipliers based on Income Level groups¥*	*GDP Multipliers for Regions*
Brazil	1.4	1.6	2.3	1.4 (Latin America and the Caribbean)
Australia	1.4	1.6	1.4	2.2 (East Asia and the Pacific)
South Africa	4.2	1.6	2.3	4.2 (Sub-Saharan Africa)
India	2.8	1.6	2.3	2.8 (South Asia)
Mexico	1.4	1.6	2.3	1.4 (Latin America and the Caribbean)
Saudi Arabia	1.4	1.6	1.4	1.4 (Middle East and North Africa)
Thailand	2.2	1.6	2.3	2.2 (East Asia and the Pacific)
Spain	1.4	1.6	1.4	1.9 (Europe and Central Asia)

Source: Appendix 3 of Global Health 2035: A World Converging Within A Generation

*GDP multipliers used are a combination of regional and income level adjusted GDP multipliers
¥Income level groups: High Income (Australia, Saudi Arabia, Spain); Low and Middle Income (Brazil, South Africa, India, Mexico, Thailand)

Step 3: Calculating costs of OAO-attributable mortality

The total cost of premature mortality is calculated by applying the economic value of a life year (proxied by GDP per capita) to the potential years of life lost from age of death to end of life expectancy. All future costs are discounted at a rate of 3% per year to obtain the net present value. All future economic costs associated with current OAO-attributable mortality are assigned to the year in which the death occurred. Therefore, the discounted economic costs of future years are added up and assigned to the death year.

The total economic cost of OAO-attributable mortality for each sex (S) and age (A) cohort included in the model is calculated as the sum of annual costs from the age of death (i=0) to remaining life expectancy *(RLE)* when no persons from the cohort would remain alive if they had not died from OAO, where VLY is the value of a life year proxied by GDP per capita in model year DY (death year) and $People_i$ is the number of people who would have still been alive in year *i* had they not died of OAO.

$$\text{OAO-attributable mortality cost in cohort}_{SA} = \sum_{i=0}^{RLE} \text{VLY} \times (1+r)^{-(i)} \times \text{People}_i$$

In the above formula, the net present value of costs of OAO-attributable mortality for each cohort is added together. The net present value of the economic cost of OAO-attributable mortality for all cohorts are then added up to give the total economic cost of OAO-attributable mortality.

$$\text{Total OAO-attributable mortality cost} = \sum \text{OAO-attributable mortality cost in cohort}_{SA}$$

Productivity losses due to additional absenteeism

Absenteeism denotes when employees miss work due to illness or health conditions. Additional absenteeism refers to the average additional days of work missed because of overweight and obesity in comparison to healthy weight population. The calculation for the cost of lost productivity due to additional absenteeism among the working population with overweight and obesity is:

$$\text{Absenteeism Cost} = \text{Employed Pop. with Obesity} \times \text{Additional Days Absent} \times \text{Average Daily Wages}$$

where:

$$\text{Employed Pop. with Obesity} = \text{Employment rate} \times \text{Working Age Pop} \times \text{Obesity Prevalence}$$

Additional Days Absent = Average number of additional days of absenteeism by working population with overweight and obesity compared to healthy weight working population.

Average Daily Wages = Calculated from Average Wage Data

Productivity losses due to additional presenteeism

Presenteeism refers to lower on-the-job productivity resulting from OAO-related impairment and disability. The calculation for the cost of lost productivity due to additional presenteeism among the working population with overweight and obesity is:

$$\text{Presenteeism Cost} = \text{Employed Pop. with Obesity} \times \text{Additional Presenteeism Rate} \times \text{Average Annual Wages}$$

where:

$$\text{Employed Pop. with Obesity} = \text{Employment rate} \times \text{Working Age Pop.} \times \text{Obesity Prevalence;}$$

Additional Presenteeism Rate = Rate of Reduced Productivity among employees with overweight and obesity.

Average Annual Wages = Calculated from Average Wage Data

Estimating future impacts of overweight and obesity

Our second main research objective is to derive country-level estimates of the projected economic impacts of overweight and obesity from 2020 to 2060.

The projections for future burden are an extension of the modeling approach used for the current burden estimation. That is, we calculated total costs for future years using projected future estimates for the different parameters in the model. The index year for current burden estimation is 2019, the most recent year with available mortality data from the Global Burden of Disease study. Our projections were therefore from 2020 to 2060.

The underlying dynamic of our model comes from the United Nations Population Division (UNPD) population projections.[31] UNPD population projections consider the three key determinants of population size (mortality, fertility and migration). We used the estimates of the UNPD medium projection variant which is based on defined assumptions of medium fertility, normal mortality, and normal international migration (see UNPD 2020 definitions of projection variants).[32] Data on life expectancy and death rates were also drawn from UNPD database. Projections for GDP and GDP Deflator up to 2027 were drawn from the IMF World Economic Outlook.[33] Historic wage data was drawn from the ILOStat Database.[34] Total health expenditure projections up to 2050 were drawn from Chang et al (2019).[35] We updated data for the projections to 2019 values for GDP, employment rates, and total health expenditures for the sources listed in Table 1 of the main manuscript and applied the annual percentage change calculated from the projection sources to align the existing long-term projections with baseline in 2019.

Some parameters such as number of inpatient and outpatient consultations, hospitalization days, absenteeism days, and presenteeism rate were assumed to stay constant over the projection period. For financial parameters such as travel cost, we adjusted for inflation in future years using GDP Deflator projections.

Table 3: Summary of parameter projection sources

Projection Type	Future Parameter Values	Source
Projection from secondary sources	Population	United Nations Population Division (UNPD) (projections to 2060)[31]
	Total health expenditure per capita	Chang et al, 2019 (Global Burden of Disease Health Financing Collaborator Network)[35] (projections to 2050)
	All-cause mortality for Obesity related diseases	Foreman et. al, 2019. (projections to 2040)[36]
	Life expectancy	United Nations Population Division (projections to 2060)[31]
	Background death rates	United Nations Population Division (projections to 2060)[31]
Projection by authors	Overweight and Obesity prevalence for ages under and above 20 years and by sex.	NCD-Risk Factor Collaboration (1975-2016)[37]
	Obesity Attributable Fraction (OAF) of Health Expenditures.	Current OAF estimations from OECD study[6] and projected prevalence.
	Annual GDP	IMF World Economic Outlook[33]
	Employment rates	International Labour Organization (ILO)[38]
	Wages	ILO Global Wage Report[39], ILO[38]
Assumed to stay constant (financial parameters adjusted for inflation)	Average travel cost to and from health facility; Average number of hospitalization days of population with overweight and obesity; Average number of outpatient consultations by population with overweight and obesity; Absenteeism days; Presenteeism rate.	Peer-reviewed studies.

We estimated future values for parameters for which we found no existing long-term projections as described below. These are overweight and obesity prevalence, employment, GDP, wages, OAO-attributable fraction of health expenditures, and OAO-attributable mortality.

Projected employment rates, annual wages, and GDP

Future employment rate, GDP and wages were projected using growth rates from historical data.

Employment Rates: We projected employment rates by calculating an average growth rate from country and sex-specific historical employment rate data drawn from the ILO (Table 3). We assumed a ceiling of 99% for maximum

employment rate. The sex-specific average growth rate was applied to the year with most recent data for the country and projected till 2060. For countries with no sex-specific data, we used the national employment rate.

GDP: Drawing on historical (from 1980) and projected (till 2027) GDP data from the IMF World Economic Outlook[40] (Table 3), we calculated annual growth rates in GDP. We excluded annual growth rates that were extreme outliers by computing the interquartile range of the annual growth rates for all countries in the same World Bank region. Country-specific annual growth rates below the lower outer fence (calculated as the 25th percentile minus [3*interquartile range]) and above the upper outer fence (calculated as the 75th percentile plus [3*interquartile range]) were excluded. Average annual growth rates were then calculated from the country-specific annual growth rates after exclusion of extreme outliers. The average annual growth rates were used to project future GDP till 2050. We applied a dampening effect to the average annual growth rates to account for the expected slowing in GDP growth as countries grow their economies. The dampening factor was calculated based on the difference in projected mean GDP growth rates for high-, middle-, and low-income country groups between 2010-2050 and 2050-2100 from expert forecasts[41]. This reduction was applied to annual GDP growth rates of all countries in these income groups from 2051 to 2060.

Wages: Historical data on wages (between 1980 and 2020) was drawn from the ILO Stat database and the ILO Global Wage Report (Table 3). This is the most complete global wage database. We calculated annual rate of change (AROC) of wages for countries with at least 2 data points. We excluded AROC values that are extreme outliers by computing the interquartile range of all AROC for all countries in the same World Bank region. AROC values below the lower outer fence (calculated as the 25th percentile minus [3*interquartile range]) and above the upper outer fence (calculated as the 75th percentile plus [3*interquartile range]) were excluded. We then re-calculated regional average AROC from the annual rate of change values of all countries in the same World Bank region. We projected most recent male and female wage data to 2060 by applying the average regional AROC to countries in the same region.

Future Obesity prevalence

Obesity is a complex chronic disease process resulting from the interaction of various environmental factors such as high energy dense nutrition, decline in physical activity, and stress along with genetic susceptibility.[42] The upward trend in overweight and obesity prevalence globally has been attributed to increased intake of energy-dense foods which are high in fats and sugars as well as decreases in physical activity. Decline in physical activity has been attributed to the increasingly sedentary nature of many forms of work, changing modes of transportation and increasing urbanization.[43] Similar patterns have been implicated in LMICs where the rapid upward trend in overweight and obesity has been associated with ongoing economic, demographic, and nutrition transitions.[44,45]

We employed a regression-based approach for projecting future overweight and obesity prevalence. We used the historical trend of country-level annual overweight and obesity prevalence estimates from 1975 to 2016 sourced from the NCD Risk Collaboration group.[37] The data set provides estimates separately for males above 20 years old (referred to as men), females above 20 years of age (women), males below 20 years of age (boys) and females below 20 years of age (girls). Hence our projections are done for these four groups separately. Then, male, female, and total prevalence are calculated using the population estimates for each group.

Following the approach of Ward et al (2020),[46] we used multinomial regressions to predict the prevalence of BMI categories for each group. For adults the BMI categories modelled were healthy weight, overweight, moderate obesity, and severe obesity. For those below age 20, modeled BMI categories were underweight, healthy weight, overweight and obesity. This ensures that the sum of the prevalence of all categories does not exceed 100%, allows for estimation on nonlinear trends and movements of individuals between categories. We assume that trends in other variables such as urbanization and population changes (that change with time) are implicitly controlled for by having time as the predictor variable.

Forecasts for male, female, and total (national) overweight and obesity prevalence was generated using a bottom-up approach.[47] That is, forecasts for each series of prevalence for men, women, boys and girls together with their population sizes was used to calculate male (combining under and above 20 years male prevalence); female

(combining under and above 20 years female prevalence); and total (combining prevalence for male and female under and above 20 years population) overweight and obesity prevalence.

Appendix 3 Table 3 shows the overweight and obesity prevalence estimates for 2019 and 2060. Our overweight and obesity prevalence estimates are in a similar range to other studies that have projected overweight and obesity prevalence. (See Box 2 for a summary of relevant studies). Kilpi and colleagues[48] adapted the Foresight modelling framework (a two-part modeling process made up of a cross-sectional regression analysis and a microsimulation program [McPherson and colleagues[49]; Wang and colleagues[50]]) to estimate that overweight and obesity prevalence will rise to 92% in men and 75% in women by 2050 in Saudi Arabia. In another study of 10 countries in Latin America, overweight and obesity levels in 2050 are estimated to exceed 90 percent for males in two countries (Cuba and Panama) and above 85 percent for females in six countries (Chile, Cuba, Nicaragua, Panama, Peru, and Uruguay).[51]

Box 2: Bibliography of selected studies that forecasted overweight and obesity prevalence

- Wang, Y., Beydoun, M. A., Liang, L., Caballero, B., & Kumanyika, S. K. (2008). Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic. *Obesity (Silver Spring, Md.)*, *16*(10), 2323–2330. https://doi.org/10.1038/oby.2008.351
  - ✓ Authors fitted linear regression models with the prevalence as the dependent variable and the survey time as the predictors for different sociodemographic groups in the US.
  - ✓ By 2048, all American adults would become overweight or obese, while black women will reach that state by 2034.
- Relevant studies that used/adapted the two-part modelling process developed by the UK Foresight Working Group. The first module employs a regression analysis based on series of cross-sectional data; while the second module uses a microsimulation program to produce longitudinal projections
  - ✓ McPherson K, Marsh T, Brown M. Foresight. Tackling obesities: future choices—modelling future trends in obesity & their impact on health. London: Government Office for Science, 2007.
    - The extrapolation of current trends, which underpins the microsimulation, indicates that, by 2015, 36% of males and 28% of females will be obese.
    - By 2050, 60% of males and 50% of females could be obese. The proportion of men having a healthy BMI (18.5–25kg/m2) declines from about 30% at present to less than 10% by 2050.
  - ✓ Webber, L., Kilpi, F., Marsh, T., Rtveladze, K., Brown, M. and McPherson, K., 2012. High rates of obesity and non-communicable diseases predicted across Latin America. *PloS one*, *7*(8), p.e39589.
    - Projections for 10 Latin America countries-Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, Nicaragua, Panama, Peru, Uruguay for males and females aged 20+ years.
    - Projections in 2050 exceed 90 percent for males in 2 countries and above 85 percent for females in 6 countries.
  - ✓ Pineda, E., Sanchez-Romero, L.M., Brown, M., Jaccard, A., Jewell, J., Galea, G., Webber, L. and Breda, J., 2018. Forecasting future trends in obesity across Europe: the value of improving surveillance. *Obesity facts*, *11*(5), pp.360-371.
    - The four countries that are estimated to have the highest obesity prevalence were: Georgia (77%; 95% CI 58–97%); Romania (50%; 95% CI 43–57%); and Serbia (47%; 95% CI 0–175%) and Croatia (47%; 95% CI 26–68%).
    - From the 15 countries that had the best quality data (score ≥ 25 points), obesity prevalence was projected to reach between 13 and 43% by 2025. Ireland was predicted to have the highest prevalence, with 43% (95% CI 28–58%) of the population was predicted to be obese by 2025, followed by Scotland, with 37% (95% CI 29–45%).
  - ✓ Keaver, L., Webber, L., Dee, A., Shiely, F., Marsh, T., Balanda, K. and Perry, I., 2013. Application of the UK foresight obesity model in Ireland: the health and economic consequences of projected obesity trends in Ireland. *PLoS One*, *8*(11), p.e79827.
    - Overweight and obesity are projected to reach levels of 83% and 74% in males and females respectively by 2020. Overweight and obesity are projected to reach levels of 89% and 85% in males and females respectively by 2030.
  - ✓ Kilpi, F., Webber, L., Musaigner, A., Aitsi-Selmi, A., Marsh, T., Rtveladze, K., . . . Brown, M. (2014). Alarming predictions for obesity and non-communicable diseases in the Middle East. *Public Health Nutrition, 17*(5), 1078-1086. doi:10.1017/S1368980013000840
    - Statistical modelling of overweight/obesity trends was carried out in nine Middle East countries (Bahrain, Egypt, Iran, Jordan, Kuwait, Lebanon, Oman, Saudi Arabia and Turkey).
    - Overweight and obesity are projected to reach levels of 92% and 75% in males and females respectively by 2050.

Overweight & Obesity-attributable fraction (OAF) of health expenditure

We estimated future Overweight & Obesity-Attributable Fraction (OAF) of health expenditure with the following approach as explained previously: We used the average OAFs between 2020 and 2050 estimated for 52 countries from the OECD cross-country economics of obesity report. We estimated a simple linear regression of these OAFs on average overweight and obesity prevalence in the same time period.

$$OAF_i = \beta . P_i + \varepsilon_i$$

where OAF_i= OAF for country i; P_i=prevalence of overweight and obesity (point prevalence). We then use the estimated prevalence for future years to generate future OAFs based on the estimated regression coefficient using a regression through the origin (constant term was insignificant).

$$\widehat{OAF_t} = \beta . \widehat{P_t}$$

Risk factor (overweight and obesity) attributable mortality

All-cause mortality estimates for OAO-related diseases (ORDs) were obtained from projections by Foreman and colleagues .[36] We follow the approach below to estimate future OAO-attributable mortality.

Deriving OAO-attributable deaths for future years

The following parameters are sourced from GBD 2019: All-cause mortality by sex and age group for ORDs, Obesity Attributable Mortality, and relative risks [52] (RR) of overweight and obesity by age and sex for ORDs.

Steps:

1. We calculated all-cause mortality (total deaths) for the included OAO-related diseases (ORDs) from 2020 to 2060 using projections for 2016 and 2040 presented in Foreman and colleagues.[36]
    a. We calculated annualized rate of change by ORDs (AROC).

$$\text{AROC} = \left(\frac{\text{Value in Year (t+h)}}{\text{Value in Year t}}\right)^{\frac{1}{h}} - 1$$

Applying the AROC h times to the starting value will result in the value for the ending year.

$$M_{t+h} = M_t * (\text{AROC} + 1)^h$$

    b. We used the AROC to calculate total deaths by cause, sex and age-group for each projected year, assuming a constant rate of change till 2060.
2. We calculated Population Attributable Fraction (PAF) with the formulae below [53].

$$\text{Population Attributable Fraction (PAF)} = \frac{\text{Prev (RR}-1)}{1+\text{Prev (RR}-1)}$$

We calculated PAF for each ORD by sex, age group and year using projected overweight and obesity prevalence and RR, making the assumption that RR is constant over time.

$$\text{Population Attributable Fraction } (\text{PAF}_{t+h}) = \frac{\text{Prev}_{t+h}\,(\text{RR}-1)}{1+\text{Prev}_{t+h}\,(\text{RR}-1)}$$

3. We then calculated risk factor or OAO-attributable deaths (OADs) for projected years (t) by sex, age group and cause.

$$\sum_{s,a,c,t} \text{RFA deaths} = \sum_{s,a,c,t} \text{PAF} * \sum_{s,a,c,t} \text{Total deaths}$$

We adjusted the RFA deaths by calculating their rate of change from year to year which were then applied to the baseline RFA deaths from GBD 2019.

Currency conversions

All costs were computed in 2019 constant US dollars. Data was collected in local currency units (LCU) where possible and then adjusted to 2019 values. To adjust to 2019 values, GDP deflator data from the IMF World Economic Outlook database was used to account for inflation.[33] Next, the 2019 LCU values were converted to USD using the average annual exchange rate from the World Bank.[11] The formula for obtaining the final amount in 2019 USD is expressed as:

$$\begin{aligned}\text{2019 USD amount} &= \text{2019 LCU to USD exchange rate} \\ &\times \left[\left(\frac{\text{GDP deflator for LCU in 2019}}{\text{GDD deflator for LCU in data year}}\right) \times \text{LCU in data year}\right]\end{aligned}$$

Estimates were also produced to account for purchasing power parity (PPP). The methods for adjusting for inflation using GDP deflator remain the same, however, instead of using an LCU to USD exchange rate, an LCU PPP conversion factor was used. PPP conversion factors were drawn from the World Bank World Development

Indicators Database, which contains PPP conversion factors for GDP and for private consumption.[11] The PPP conversion factor for GDP was used for GDP and healthcare expenditures, while the PPP conversion factor for private expenditure was used for wages and travel costs. Where only USD costs were available, costs were converted into LCU, then adjusted for inflation, and then converted to 2019 USD or PPP. By first adjusting for inflation in the local currency and then converting to USD, the final amount will more accurately reflect the price changes for local non-tradable resources, especially labor, than by first converting to USD and then adjusting for inflation using US inflation rates.[54]

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Appendix 2: Additional Tables

Table 1: List of included countries by income group

Income group	Countries
Low (21)	Afghanistan, Burkina Faso, Burundi, Central African Republic, Chad, Democratic Republic of Congo, Ethiopia, The Gambia, Guinea, Guinea-Bissau, Haiti, Madagascar, Malawi, Mali, Mozambique, Niger, Rwanda, Sierra Leone, Tajikistan, Togo, Uganda
Lower middle (44)	Algeria, Angola, Bangladesh, Benin, Bhutan, Bolivia, Cabo Verde, Cambodia, Cameroon, Comoros, Rep. of Congo, Côte d'Ivoire, Egypt, El Salvador, Eswatini, Ghana, Honduras, India, Kenya, Kyrgyz Republic, Lao PDR, Lesotho, Mauritania, Moldova, Mongolia, Morocco, Myanmar, Nepal, Nicaragua, Nigeria, Pakistan, Philippines, Senegal, Sri Lanka, Tanzania, Timor-Leste, Tunisia, Ukraine, Uzbekistan, Vanuatu, Vietnam, West Bank and Gaza, Zambia, Zimbabwe
Upper middle (44)	Albania, Argentina, Armenia, Azerbaijan, Belarus, Belize, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, China, Colombia, Costa Rica, Dominican Republic, Ecuador, Equatorial Guinea, Fiji, Gabon, Georgia, Guatemala, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Lebanon, Libya, Malaysia, Maldives, Mexico, Montenegro, Namibia, North Macedonia, Paraguay, Peru, Russian Federation, Samoa, Serbia, South Africa, Thailand, Tonga, Turkey, Turkmenistan
High (52)	Australia, Austria, The Bahamas, Bahrain, Barbados, Belgium, Brunei Darussalam, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Mauritius, Netherlands, New Zealand, Norway, Oman, Panama, Poland, Portugal, Qatar, Romania, Saudi Arabia, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States, Uruguay

Table 2: List of included countries by WHO region

WHO region	Countries
AFR (42)	Algeria, Angola, Benin, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Comor
EMR (17)	Afghanistan, Bahrain, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Tunisia, United Arab Emirates, West Bank and Gaza
EUR (50)	Albania, Armenia, Austria, Azerbaijan, Belarus, Belgium,Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Repub Turkey, Turkmenistan, Ukraine, United Kingdom, Uzbekistan
AMR (25)	Argentina, The Bahamas, Barbados, Belize, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad and Tobago, United States, Uruguay
SEAR (10)	Bangladesh, Bhutan, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand, Timor-Leste
WPR (17)	Australia, Brunei Darussalam, Cambodia, China, Fiji, Japan, Rep. of Korea, Lao PDR, Malaysia, Mongolia, New Zealand, Philippines, Samoa, Singapore, Tonga, Vanuatu, Vietnam

Table 3: Adult, childhood/adolescent, and overall overweight and obesity prevalence, by sex, 2019 and 2060

Country	Year	Overall overweight and obesity prevalence	Adult male prevalence	Adult female prevalence	Childhood and adolescent male prevalence	Childhood and adolescent female prevalence
Afghanistan	2019	18.5%	22.6%	30.1%	11.5%	12.3%
Afghanistan	2060	73.8%	63.8%	76.5%	80.3%	84.0%
Albania	2019	53.2%	67.6%	53.9%	35.0%	24.6%
Albania	2060	86.3%	92.7%	77.8%	93.5%	86.7%
Algeria	2019	56.5%	63.3%	71.8%	38.8%	36.8%
Algeria	2060	93.3%	95.0%	94.1%	92.1%	87.6%
Angola	2019	21.2%	22.0%	40.0%	8.8%	18.5%
Angola	2060	77.3%	64.0%	86.1%	75.6%	83.7%
Antigua and Barbuda	2019	46.4%	44.9%	60.3%	29.7%	31.3%
Antigua and Barbuda	2060	82.9%	80.2%	86.3%	82.0%	80.6%
Argentina	2019	57.7%	70.8%	63.1%	43.8%	33.9%
Argentina	2060	82.1%	92.5%	82.4%	75.9%	55.2%
Armenia	2019	48.1%	58.4%	57.7%	19.8%	21.6%
Armenia	2060	72.3%	84.0%	77.6%	43.9%	39.4%
Australia	2019	61.1%	75.8%	62.5%	39.2%	35.9%
Australia	2060	83.9%	95.0%	85.9%	66.6%	56.2%
Austria	2019	52.9%	67.1%	50.2%	33.7%	25.7%
Austria	2060	76.1%	90.9%	71.1%	63.0%	47.2%
Azerbaijan	2019	45.8%	56.2%	57.1%	20.1%	20.6%
Azerbaijan	2060	76.1%	84.2%	80.9%	55.3%	49.3%
Bahamas	2019	60.8%	66.3%	72.9%	41.1%	39.5%
Bahamas	2060	87.9%	93.3%	89.9%	79.0%	70.1%
Bahrain	2019	61.5%	67.9%	71.5%	39.0%	36.0%
Bahrain	2060	84.3%	90.0%	84.8%	71.9%	58.1%

Bangladesh	2019	18.9%	20.8%	25.5%	12.2%	11.1%
Bangladesh	2060	70.3%	66.4%	69.0%	82.3%	78.4%
Barbados	2019	50.5%	48.8%	63.7%	30.5%	31.2%
Barbados	2060	85.4%	84.4%	88.0%	83.2%	80.7%
Belarus	2019	55.8%	67.6%	60.8%	31.0%	21.8%
Belarus	2060	80.4%	92.0%	76.5%	78.8%	57.0%
Belgium	2019	55.0%	72.5%	54.5%	27.0%	26.3%
Belgium	2060	69.7%	91.6%	67.2%	35.4%	30.0%
Belize	2019	47.9%	52.7%	65.1%	31.2%	31.4%
Belize	2060	83.8%	86.2%	86.9%	77.7%	72.5%
Benin	2019	23.5%	24.7%	43.1%	8.8%	19.4%
Benin	2060	73.4%	65.0%	86.2%	62.3%	78.2%
Bhutan	2019	25.7%	29.6%	35.1%	15.0%	12.5%
Bhutan	2060	83.5%	80.9%	84.9%	90.2%	83.9%
Bolivia	2019	50.4%	58.2%	65.4%	31.7%	35.4%
Bolivia	2060	88.3%	91.4%	90.6%	81.9%	79.6%
Bosnia and Herzegovina	2019	50.8%	64.0%	50.6%	30.2%	21.0%
Bosnia and Herzegovina	2060	79.9%	87.9%	71.0%	86.7%	78.9%
Botswana	2019	40.7%	37.7%	67.2%	14.8%	33.6%
Botswana	2060	92.3%	88.3%	95.5%	89.8%	96.4%
Brazil	2019	53.8%	63.6%	61.0%	35.1%	30.5%
Brazil	2060	88.1%	93.7%	87.8%	84.1%	70.0%
Brunei Darussalam	2019	41.1%	45.7%	45.4%	36.4%	25.2%
Brunei Darussalam	2060	86.0%	92.0%	81.3%	87.4%	78.3%
Bulgaria	2019	58.6%	72.9%	57.6%	37.9%	26.0%
Bulgaria	2060	81.2%	92.3%	72.7%	84.3%	68.9%
Burkina Faso	2019	16.5%	17.9%	33.3%	6.2%	12.1%
Burkina Faso	2060	67.8%	53.4%	84.2%	65.8%	66.7%
Burundi	2019	18.2%	15.7%	34.1%	7.7%	17.8%
Burundi	2060	66.9%	40.8%	81.3%	66.0%	83.2%
Cabo Verde	2019	32.2%	33.3%	49.4%	11.9%	22.0%
Cabo Verde	2060	85.8%	83.4%	91.8%	76.6%	82.1%
Cambodia	2019	20.8%	21.5%	28.1%	18.1%	10.9%
Cambodia	2060	72.5%	67.4%	71.4%	92.8%	68.4%
Cameroon	2019	26.7%	29.4%	47.8%	10.1%	22.2%
Cameroon	2060	77.3%	74.8%	88.4%	64.6%	76.7%
Canada	2019	62.2%	75.0%	63.2%	39.3%	34.0%
Canada	2060	86.6%	95.1%	87.8%	73.6%	59.9%
Central African Republic	2019	19.7%	20.6%	37.0%	7.9%	17.2%
Central African Republic	2060	64.1%	50.6%	74.3%	60.9%	71.9%
Chad	2019	17.0%	18.2%	33.9%	6.5%	14.5%
Chad	2060	62.0%	47.2%	77.0%	54.7%	68.5%
Chile	2019	59.4%	69.1%	65.2%	40.1%	35.4%
Chile	2060	84.0%	91.8%	84.1%	74.5%	59.3%
China	2019	36.3%	38.8%	34.0%	43.8%	26.5%
China	2060	83.2%	86.6%	72.8%	98.7%	96.1%
China (Hong Kong SAR)	2019	42.2%	51.0%	39.6%	36.7%	20.7%
China (Hong Kong SAR)	2060	64.0%	83.4%	51.9%	70.1%	37.3%
Colombia	2019	53.0%	62.5%	66.1%	26.1%	29.7%
Colombia	2060	85.6%	91.8%	88.1%	67.0%	67.4%
Comoros	2019	22.7%	21.0%	40.0%	9.2%	20.7%
Comoros	2060	66.4%	47.7%	79.5%	62.0%	80.4%
Congo	2019	23.4%	27.6%	42.1%	9.3%	16.2%
Congo	2060	70.3%	68.8%	79.1%	68.5%	61.2%
Costa Rica	2019	58.9%	65.6%	68.7%	36.7%	39.5%
Costa Rica	2060	94.3%	96.7%	94.4%	89.2%	88.3%
Cote d'Ivoire	2019	25.2%	27.6%	44.2%	11.1%	20.5%
Cote d'Ivoire	2060	75.2%	70.9%	84.1%	70.3%	73.4%
Croatia	2019	57.1%	70.4%	56.4%	38.2%	26.1%
Croatia	2060	82.9%	91.6%	74.7%	87.9%	76.4%
Cuba	2019	57.5%	60.4%	67.4%	35.6%	33.0%
Cuba	2060	86.7%	92.1%	87.8%	76.5%	64.6%
Cyprus	2019	59.6%	72.1%	58.9%	44.3%	35.4%
Cyprus	2060	85.9%	94.5%	81.8%	79.6%	69.9%
Czech Republic	2019	57.8%	73.3%	57.4%	34.4%	23.2%
Czech Republic	2060	74.7%	89.8%	65.9%	73.3%	51.7%
Denmark	2019	52.8%	69.1%	50.6%	31.%	25.8%
Denmark	2060	71.9%	91.9%	67.3%	51.7%	34.8%
Djibouti	2019	33.5%	36.9%	48.5%	15.2%	24.0%
Djibouti	2060	65.5%	70.8%	72.0%	46.9%	49.8%
Dominican Republic	2019	56.0%	61.9%	70.2%	38.9%	38.0%

Dominican Republic	2060	93.2%	96.1%	93.9%	89.9%	85.0%
DR Congo	2019	19.1%	20.1%	36.0%	7.4%	17.0%
DR Congo	2060	68.8%	55.1%	78.8%	63.5%	79.1%
Ecuador	2019	51.2%	58.5%	64.5%	32.6%	33.9%
Ecuador	2060	87.3%	90.7%	89.0%	81.0%	77.2%
Egypt	2019	56.5%	61.3%	73.2%	41.3%	42.6%
Egypt	2060	89.4%	89.5%	91.7%	87.7%	86.5%
El Salvador	2019	55.3%	63.2%	67.9%	34.0%	39.9%
El Salvador	2060	92.0%	94.7%	92.7%	85.5%	86.8%
Equatorial Guinea	2019	21.8%	21.7%	40.5%	8.2%	17.9%
Equatorial Guinea	2060	68.7%	56.2%	81.1%	65.1%	76.6%
Eritrea	2019	18.4%	16.4%	31.5%	7.6%	18.8%
Eritrea	2060	62.4%	40.7%	74.1%	60.0%	82.8%
Estonia	2019	50.5%	63.1%	53.9%	24.0%	18.8%
Estonia	2060	66.0%	83.6%	59.1%	53.7%	36.0%
Ethiopia	2019	16.7%	15.2%	31.4%	5.7%	15.2%
Ethiopia	2060	57.9%	39.4%	74.4%	48.4%	70.9%
Fiji	2019	57.8%	65.2%	72.6%	34.2%	45.0%
Fiji	2060	90.1%	93.3%	92.3%	82.9%	84.0%
Finland	2019	56.7%	72.2%	55.2%	35.3%	27.9%
Finland	2060	80.7%	94.2%	77.1%	66.4%	51.0%
France	2019	55.7%	71.2%	55.3%	34.1%	30.7%
France	2060	76.0%	92.0%	72.5%	56.6%	50.4%
French Polynesia	2019	78.5%	84.1%	86.2%	60.4%	66.3%
French Polynesia	2060	95.1%	96.0%	94.8%	94.3%	93.3%
Gabon	2019	35.1%	41.0%	54.7%	15.5%	25.1%
Gabon	2060	83.6%	88.2%	89.2%	75.4%	73.4%
Gambia	2019	25.2%	28.7%	45.4%	10.8%	19.7%
Gambia	2060	80.5%	77.0%	89.6%	74.2%	77.8%
Georgia	2019	48.6%	58.5%	57.1%	22.5%	20.8%
Georgia	2060	77.6%	87.0%	81.6%	61.4%	50.1%
Germany	2019	55.0%	70.3%	52.0%	31.8%	26.6%
Germany	2060	75.3%	92.1%	70.4%	56.4%	43.3%
Ghana	2019	25.2%	25.3%	46.6%	8.1%	18.8%
Ghana	2060	72.3%	66.6%	87.6%	55.0%	73.2%
Greece	2019	61.5%	73.0%	60.1%	45.3%	35.5%
Greece	2060	82.8%	93.6%	77.8%	73.9%	61.5%
Grenada	2019	48.5%	48.7%	63.8%	30.6%	31.4%
Grenada	2060	88.2%	87.4%	90.6%	86.7%	84.2%
Guatemala	2019	48.5%	56.7%	64.7%	31.0%	35.7%
Guatemala	2060	89.0%	90.7%	90.9%	83.7%	84.8%
Guinea	2019	20.3%	21.4%	39.0%	6.8%	16.5%
Guinea	2060	66.8%	56.6%	82.4%	52.6%	72.3%
Guinea Bissau	2019	24.1%	25.9%	43.5%	9.4%	18.8%
Guinea Bissau	2060	79.8%	73.6%	89.6%	71.9%	81.4%
Haiti	2019	49.2%	56.4%	64.3%	38.0%	30.6%
Haiti	2060	95.6%	97.2%	95.4%	95.9%	91.4%
Honduras	2019	49.4%	57.5%	65.0%	30.3%	35.6%
Honduras	2060	91.2%	92.7%	92.6%	85.7%	87.3%
Hungary	2019	57.2%	72.7%	55.7%	35.2%	25.6%
Hungary	2060	77.9%	91.1%	68.0%	79.8%	64.4%
Iceland	2019	55.1%	72.7%	54.2%	34.3%	28.2%
Iceland	2060	74.8%	93.3%	70.4%	52.5%	37.6%
India	2019	17.4%	20.4%	24.7%	9.3%	7.3%
India	2060	64.5%	60.5%	64.6%	78.9%	62.3%
Indonesia	2019	28.8%	29.1%	36.6%	22.7%	19.3%
Indonesia	2060	87.1%	83.9%	86.4%	94.6%	91.6%
Iran	2019	56.2%	63.0%	70.8%	33.9%	31.4%
Iran	2060	91.5%	94.0%	92.6%	89.3%	81.7%
Iraq	2019	52.9%	65.8%	72.0%	36.2%	35.6%
Iraq	2060	85.1%	90.7%	88.9%	79.3%	72.9%
Ireland	2019	57.7%	71.7%	60.4%	36.7%	35.0%
Ireland	2060	89.3%	95.4%	89.7%	79.4%	73.2%
Israel	2019	57.2%	75.4%	61.2%	40.6%	33.7%
Israel	2060	74.3%	92.9%	74.1%	57.2%	45.5%
Italy	2019	57.9%	69.8%	54.5%	43.0%	36.4%
Italy	2060	77.8%	89.9%	71.6%	66.5%	59.3%
Jamaica	2019	52.2%	52.3%	68.2%	33.8%	35.5%
Jamaica	2060	89.6%	90.8%	91.6%	85.7%	82.3%
Japan	2019	26.6%	34.9%	22.9%	19.8%	13.3%
Japan	2060	45.8%	66.0%	33.9%	32.3%	20.9%

Jordan	2019	59.0%	73.2%	77.9%	38.4%	37.2%
Jordan	2060	92.0%	96.0%	94.2%	86.5%	79.4%
Kazakhstan	2019	45.0%	58.5%	56.5%	21.8%	21.0%
Kazakhstan	2060	74.6%	85.7%	80.1%	57.9%	49.6%
Kenya	2019	21.2%	18.2%	38.5%	7.9%	20.2%
Kenya	2060	67.8%	47.5%	83.1%	60.1%	84.3%
Kiribati	2019	75.0%	82.2%	86.0%	59.5%	67.7%
Kiribati	2060	97.7%	97.6%	97.6%	98.1%	97.8%
Kuwait	2019	69.2%	76.7%	78.6%	49.0%	43.6%
Kuwait	2060	87.5%	94.0%	89.6%	78.8%	63.9%
Kyrgyzstan	2019	37.8%	50.7%	51.9%	17.6%	17.8%
Kyrgyzstan	2060	73.2%	81.0%	79.5%	59.9%	54.3%
Lao PDR	2019	24.1%	25.1%	31.9%	20.9%	15.0%
Lao PDR	2060	82.4%	78.9%	79.0%	95.7%	88.9%
Latvia	2019	52.8%	64.6%	57.4%	26.1%	19.4%
Latvia	2060	69.5%	85.9%	64.8%	60.3%	39.7%
Lebanon	2019	62.0%	72.7%	74.4%	43.1%	36.0%
Lebanon	2060	89.4%	94.6%	91.0%	83.7%	69.5%
Lesotho	2019	32.5%	23.9%	59.6%	7.6%	31.6%
Lesotho	2060	80.6%	64.9%	91.3%	72.9%	98.0%
Liberia	2019	23.4%	27.0%	43.6%	7.4%	17.2%
Liberia	2060	64.8%	64.8%	81.2%	43.5%	59.8%
Libya	2019	59.5%	68.9%	74.9%	39.0%	36.3%
Libya	2060	88.5%	92.9%	91.3%	81.6%	72.2%
Lithuania	2019	55.5%	67.3%	60.3%	26.5%	19.9%
Lithuania	2060	74.9%	89.0%	71.2%	67.2%	46.5%
Luxembourg	2019	56.0%	71.9%	54.3%	32.1%	26.9%
Luxembourg	2060	77.0%	93.8%	73.8%	56.1%	41.9%
Macedonia (TFYR)	2019	54.6%	69.3%	54.4%	34.9%	23.6%
Macedonia (TFYR)	2060	79.2%	89.8%	69.8%	83.5%	69.8%
Madagascar	2019	19.8%	19.9%	33.3%	10.1%	16.6%
Madagascar	2060	67.4%	52.3%	76.6%	71.2%	72.3%
Malawi	2019	19.4%	17.0%	35.8%	7.8%	18.8%
Malawi	2060	66.7%	43.6%	81.3%	62.4%	83.3%
Malaysia	2019	44.3%	48.3%	49.7%	38.6%	30.1%
Malaysia	2060	93.9%	95.4%	92.5%	95.0%	92.2%
Maldives	2019	30.0%	29.7%	38.8%	25.1%	18.4%
Maldives	2060	86.2%	81.4%	88.5%	95.5%	93.3%
Mali	2019	21.1%	23.0%	40.2%	8.4%	18.6%
Mali	2060	75.3%	65.2%	86.9%	66.6%	82.3%
Malta	2019	63.9%	77.0%	62.5%	42.8%	35.4%
Malta	2060	78.7%	93.8%	74.5%	58.9%	46.6%
Mauritania	2019	29.1%	31.1%	50.2%	12.2%	23.1%
Mauritania	2060	83.3%	79.4%	91.7%	76.9%	82.8%
Mauritius	2019	31.1%	27.7%	43.5%	13.2%	21.1%
Mauritius	2060	64.6%	55.3%	73.1%	63.2%	66.3%
Mexico	2019	59.8%	69.4%	70.6%	41.4%	39.8%
Mexico	2060	88.9%	93.8%	90.3%	80.0%	76.0%
Micronesia (Federated States of)	2019	70.8%	76.7%	83.7%	53.0%	62.5%
Micronesia (Federated States of)	2060	95.9%	94.9%	95.9%	96.9%	97.0%
Moldova	2019	48.3%	58.0%	53.9%	22.5%	17.6%
Moldova	2060	74.8%	84.9%	70.2%	71.7%	56.7%
Mongolia	2019	44.4%	58.9%	59.1%	18.6%	21.3%
Mongolia	2060	78.8%	90.7%	85.5%	59.6%	54.2%
Montenegro	2019	57.1%	72.5%	58.5%	37.8%	25.2%
Montenegro	2060	89.5%	95.5%	83.9%	92.8%	84.3%
Morocco	2019	54.3%	61.8%	69.5%	33.4%	33.0%
Morocco	2060	91.7%	93.3%	93.0%	88.8%	85.5%
Mozambique	2019	23.0%	21.5%	39.5%	10.6%	22.5%
Mozambique	2060	72.5%	57.6%	84.2%	66.7%	81.8%
Myanmar	2019	23.0%	23.5%	31.1%	17.0%	12.2%
Myanmar	2060	75.7%	68.1%	77.9%	89.7%	77.1%
Namibia	2019	32.5%	30.1%	56.9%	12.1%	26.0%
Namibia	2060	86.6%	78.4%	88.7%	88.2%	96.2%
Nepal	2019	18.5%	22.2%	26.5%	9.4%	9.7%
Nepal	2060	69.4%	64.6%	71.2%	74.7%	74.9%
Netherlands	2019	55.5%	70.9%	55.1%	30.7%	27.7%
Netherlands	2060	83.4%	95.5%	80.7%	69.4%	57.2%
New Zealand	2019	63.1%	75.8%	65.0%	43.8%	41.5%
New Zealand	2060	87.0%	95.4%	87.7%	74.1%	66.0%
Nicaragua	2019	51.4%	59.9%	65.9%	30.4%	36.4%

Nicaragua	2060	87.2%	91.0%	89.3%	76.0%	79.3%
Niger	2019	15.8%	16.5%	33.6%	6.0%	13.7%
Niger	2060	62.4%	43.0%	79.0%	55.9%	72.4%
Nigeria	2019	20.9%	24.9%	41.5%	8.1%	13.1%
Nigeria	2060	74.7%	69.9%	87.9%	68.1%	70.2%
North Korea	2019	32.6%	37.6%	33.0%	31.9%	19.2%
North Korea	2060	64.3%	71.2%	53.0%	82.5%	63.5%
Norway	2019	55.8%	70.6%	55.4%	34.2%	29.6%
Norway	2060	80.6%	94.1%	77.3%	66.0%	53.4%
Occupied Palestinian Territory	2019	54.9%	69.4%	74.3%	37.4%	36.9%
Occupied Palestinian Territory	2060	88.8%	93.6%	91.6%	84.0%	77.2%
Oman	2019	62.1%	68.3%	73.3%	43.7%	38.8%
Oman	2060	94.9%	96.7%	95.4%	92.6%	87.3%
Pakistan	2019	23.2%	29.3%	35.5%	12.8%	11.1%
Pakistan	2060	75.8%	72.2%	79.1%	75.3%	77.2%
Panama	2019	53.9%	62.3%	66.6%	31.8%	37.0%
Panama	2060	89.2%	93.4%	90.8%	79.3%	81.1%
Papua New Guinea	2019	47.8%	51.9%	63.2%	30.2%	42.8%
Papua New Guinea	2060	87.4%	85.5%	89.7%	85.3%	89.3%
Paraguay	2019	49.4%	59.7%	59.1%	34.8%	31.9%
Paraguay	2060	89.7%	92.9%	89.6%	88.6%	82.0%
Peru	2019	51.4%	59.7%	64.1%	29.5%	30.9%
Peru	2060	81.7%	88.6%	85.0%	66.9%	61.3%
Philippines	2019	25.7%	30.5%	33.6%	18.6%	13.8%
Philippines	2060	74.2%	72.9%	73.8%	80.3%	72.6%
Poland	2019	54.8%	69.5%	53.8%	34.6%	22.1%
Poland	2060	76.9%	89.5%	66.7%	83.0%	62.9%
Portugal	2019	58.3%	68.7%	57.1%	41.2%	38.3%
Portugal	2060	87.5%	94.8%	83.4%	81.4%	78.9%
Puerto Rico	2019	68.7%	73.1%	77.3%	47.8%	43.7%
Puerto Rico	2060	93.7%	96.7%	94.2%	86.5%	78.1%
Qatar	2019	69.5%	75.1%	76.6%	45.1%	38.1%
Qatar	2060	89.3%	94.2%	89.2%	76.6%	59.3%
Romania	2019	54.5%	68.8%	54.6%	33.3%	22.8%
Romania	2060	81.5%	91.3%	72.8%	87.5%	72.9%
Russian Federation	2019	51.2%	61.5%	58.5%	25.6%	18.7%
Russian Federation	2060	68.5%	84.5%	65.6%	60.7%	37.3%
Rwanda	2019	21.2%	17.5%	38.1%	7.0%	21.6%
Rwanda	2060	72.1%	53.1%	86.3%	64.0%	88.0%
Saint Lucia	2019	46.7%	44.5%	61.7%	26.6%	28.8%
Saint Lucia	2060	85.9%	83.2%	89.4%	83.1%	83.1%
Saint Vincent and the Grenadines	2019	52.8%	54.7%	67.0%	34.8%	34.7%
Saint Vincent and the Grenadines	2060	91.9%	92.8%	92.9%	89.8%	86.4%
Samoa	2019	71.6%	78.7%	85.9%	55.3%	64.7%
Samoa	2060	96.9%	95.8%	96.8%	98.0%	98.3%
Sao Tome and Principe	2019	28.0%	33.1%	48.2%	12.7%	21.2%
Sao Tome and Principe	2060	83.1%	83.4%	89.8%	78.2%	76.7%
Saudi Arabia	2019	65.2%	74.7%	77.6%	45.1%	38.4%
Saudi Arabia	2060	93.1%	96.4%	94.1%	89.6%	79.4%
Senegal	2019	20.8%	22.1%	40.1%	6.8%	15.8%
Senegal	2060	60.7%	53.3%	78.5%	43.7%	61.2%
Serbia	2019	54.8%	68.3%	54.1%	38.1%	25.6%
Serbia	2060	82.1%	90.5%	72.9%	89.0%	79.5%
Seychelles	2019	36.2%	31.9%	49.0%	25.4%	28.6%
Seychelles	2060	74.9%	67.4%	79.6%	80.9%	76.8%
Sierra Leone	2019	21.8%	21.8%	40.6%	7.7%	18.4%
Sierra Leone	2060	67.2%	57.1%	81.8%	52.9%	73.0%
Singapore	2019	32.1%	39.1%	28.4%	27.8%	18.0%
Singapore	2060	44.8%	62.7%	31.9%	33.5%	18.9%
Slovakia	2019	53.3%	68.4%	52.4%	31.7%	21.3%
Slovakia	2060	78.6%	89.1%	68.5%	85.5%	71.6%
Slovenia	2019	54.2%	66.6%	53.3%	35.1%	26.2%
Slovenia	2060	79.6%	88.2%	70.3%	85.8%	76.7%
Solomon Islands	2019	43.6%	54.3%	65.7%	20.2%	35.2%
Solomon Islands	2060	87.9%	90.0%	91.8%	80.3%	86.6%
Somalia	2019	22.5%	22.8%	40.1%	10.6%	21.1%
Somalia	2060	71.3%	54.9%	80.1%	71.1%	80.1%
South Africa	2019	47.2%	45.3%	70.0%	24.6%	33.4%
South Africa	2060	91.5%	87.7%	90.1%	98.8%	97.8%
South Korea	2019	35.0%	39.7%	31.0%	40.5%	25.4%
South Korea	2060	67.9%	76.9%	57.0%	83.1%	66.3%

Spain	2019	60.3%	73.9%	58.3%	41.4%	33.0%
Spain	2060	80.2%	93.3%	75.0%	67.7%	56.2%
Sri Lanka	2019	22.8%	20.6%	30.5%	17.4%	14.8%
Sri Lanka	2060	72.2%	58.4%	74.4%	89.9%	90.1%
Sudan	2019	24.0%	23.3%	41.6%	10.5%	21.3%
Sudan	2060	72.4%	56.8%	82.2%	71.2%	82.6%
Suriname	2019	54.3%	59.6%	69.5%	37.0%	34.4%
Suriname	2060	86.7%	91.0%	89.7%	80.6%	71.1%
Swaziland	2019	32.0%	25.7%	58.6%	10.3%	30.9%
Swaziland	2060	81.3%	64.5%	88.4%	84.0%	96.8%
Sweden	2019	52.3%	69.1%	51.3%	28.1%	23.3%
Sweden	2060	71.4%	91.6%	68.1%	47.7%	32.5%
Switzerland	2019	54.0%	69.9%	51.7%	29.3%	25.2%
Switzerland	2060	80.7%	94.5%	77.7%	64.2%	52.5%
Syrian Arab Republic	2019	52.7%	61.9%	69.8%	33.8%	32.4%
Syrian Arab Republic	2060	89.5%	91.7%	91.1%	86.8%	81.5%
Taiwan	2019	40.6%	45.7%	38.7%	41.8%	25.2%
Taiwan	2060	79.2%	85.2%	70.5%	93.1%	81.9%
Tajikistan	2019	33.0%	46.5%	48.5%	15.1%	16.5%
Tajikistan	2060	67.5%	74.8%	75.6%	54.5%	53.1%
Tanzania	2019	22.3%	22.1%	40.2%	9.6%	20.3%
Tanzania	2060	74.5%	58.3%	85.6%	70.9%	84.8%
Thailand	2019	34.4%	31.9%	40.1%	31.8%	25.0%
Thailand	2060	87.4%	82.6%	89.3%	94.9%	93.1%
Timor-Leste	2019	20.4%	21.3%	27.7%	18.5%	13.6%
Timor-Leste	2060	75.5%	67.9%	70.8%	92.1%	84.6%
Togo	2019	21.7%	22.3%	40.4%	8.1%	17.2%
Togo	2060	69.3%	57.3%	83.6%	60.9%	73.8%
Tonga	2019	75.0%	79.7%	86.1%	61.0%	70.3%
Tonga	2060	97.2%	96.3%	96.9%	98.2%	98.3%
Trinidad and Tobago	2019	45.4%	41.6%	59.9%	29.7%	30.5%
Trinidad and Tobago	2060	88.9%	83.8%	91.9%	92.5%	92.7%
Tunisia	2019	55.8%	62.9%	71.4%	29.2%	31.2%
Tunisia	2060	90.8%	93.2%	92.4%	86.5%	82.0%
Turkey	2019	61.4%	70.4%	75.7%	38.1%	35.7%
Turkey	2060	94.2%	96.2%	95.1%	91.4%	86.0%
Turkmenistan	2019	40.9%	54.8%	54.2%	19.3%	19.6%
Turkmenistan	2060	74.2%	84.1%	80.3%	58.7%	50.9%
Uganda	2019	18.1%	15.5%	34.8%	5.6%	19.9%
Uganda	2060	62.6%	39.6%	79.3%	50.0%	84.9%
Ukraine	2019	53.9%	65.4%	58.6%	27.0%	19.9%
Ukraine	2060	74.0%	88.2%	69.3%	67.6%	46.2%
United Arab Emirates	2019	64.5%	69.6%	73.7%	39.6%	35.1%
United Arab Emirates	2060	85.2%	91.2%	87.4%	74.5%	60.6%
United Kingdom	2019	60.7%	73.4%	63.1%	35.7%	35.9%
United Kingdom	2060	84.8%	94.7%	87.1%	65.4%	57.7%
United States of America	2019	66.7%	78.1%	68.4%	50.1%	45.0%
United States of America	2060	90.7%	96.7%	91.7%	82.3%	73.9%
Uruguay	2019	58.2%	69.3%	64.5%	38.5%	32.9%
Uruguay	2060	82.0%	92.2%	83.0%	70.3%	52.4%
Uzbekistan	2019	39.3%	50.7%	52.0%	18.0%	18.5%
Uzbekistan	2060	74.3%	80.7%	79.3%	60.4%	55.2%
Vanuatu	2019	49.7%	57.5%	67.6%	29.4%	42.8%
Vanuatu	2060	90.5%	91.3%	92.7%	86.7%	89.5%
Venezuela	2019	57.6%	68.9%	68.5%	37.2%	38.7%
Venezuela	2060	83.8%	92.5%	85.9%	68.6%	65.3%
Viet Nam	2019	17.5%	17.3%	22.6%	14.5%	8.8%
Viet Nam	2060	65.4%	62.7%	59.5%	94.5%	65.2%
Yemen	2019	39.8%	48.7%	59.0%	25.0%	26.5%
Yemen	2060	91.4%	90.0%	92.0%	92.3%	92.1%
Zambia	2019	21.4%	20.7%	39.1%	9.8%	19.1%
Zambia	2060	60.0%	43.5%	72.2%	58.6%	66.3%
Zimbabwe	2019	30.6%	26.4%	59.6%	8.2%	28.2%
Zimbabwe	2060	77.6%	63.5%	88.4%	65.4%	94.6%

Table 4: Economic impacts of overweight and obesity, baseline projections for 2020, 2030 and 2060 (in 2019 PPP), by country income group

	Direct medical costs (PPP billions)	Direct non-medical costs (PPP billions)	Total direct costs (PPP billions)	Absent-eeism costs (PPP billions)	Present-eeism costs (PPP billions)	Premature mortality costs (PPP billions)	Total indirect costs (PPP billions)	Total costs (PPP billions)	Total costs per capita (PPP)	Total costs as a percent of GDP
Low-income	..	..	..	..	..	..	..	..	..	..
2020	1.44	0.05	1.49	1.64	2.54	3.81	7.99	9.48	17.77	0.94%
2030	3.08	0.10	3.18	2.91	4.62	8.10	15.64	18.81	27.26	1.09%
2060	21.46	0.41	21.87	12.30	20.97	61.37	94.64	116.51	94.57	1.47%
Lower middle income	..	..	..	..	..	..	..	..	..	..
2020	30.58	0.25	30.83	15.32	42.78	190.34	248.44	279.28	94.89	1.44%
2030	57.89	0.40	58.28	26.56	75.08	443.76	545.40	603.68	180.92	1.77%
2060	313.14	1.08	314.22	110.11	314.91	4,103.73	4,528.75	4,842.97	1,135.62	2.69%
Upper-middle income	..	..	..	..	..	..	..	..	..	..
2020	161.91	0.53	162.44	54.99	144.44	616.76	816.19	978.63	340.82	2.02%
2030	284.95	0.70	285.65	86.57	236.27	1,524.85	1,847.69	2,133.33	711.48	2.75%
2060	1,159.95	1.07	1,161.02	271.37	766.38	18,777.23	19,814.98	20,976.00	6,965.53	3.27%
High-income	..	..	..	..	..	..	..	..	..	..
2020	566.72	0.20	566.92	111.38	214.40	650.21	976.00	1,542.92	1,284.39	2.61%
2030	734.52	0.22	734.74	138.05	263.79	1,028.71	1,430.54	2,165.28	1,758.67	2.85%
2060	1,424.45	0.28	1,424.73	268.37	489.36	4,327.88	5,085.61	6,510.34	5,230.91	3.85%

Table 5: Economic impacts of overweight and obesity, baseline projections for 2020, 2030 and 2060 (in 2019 PPP), by WHO region

	Direct medical costs (PPP billions)	Direct non-medical costs (PPP billions)	Total direct costs (PPP billions)	Absent-eeism costs (PPP billions)	Present-eeism costs (PPP billions)	Premature mortality costs (PPP billions)	Total indirect costs (PPP billions)	Total costs (PPP billions)	Total costs per capita (PPP)	Total costs as a percent of GDP
AFR	..	..	..	..	..	..	..	..	..	..
2020	10.71	0.11	10.82	7.16	12.10	25.27	44.53	55.35	50.31	1.19%
2030	19.37	0.20	19.57	11.07	18.90	47.67	77.64	97.22	69.35	1.42%
2060	87.82	0.75	88.57	30.40	53.09	308.71	392.20	480.76	194.31	2.07%
EMR	..	..	..	..	..	..	..	..	..	..
2020	32.00	0.07	32.07	9.09	30.61	101.66	141.36	173.43	278.49	2.22%
2030	46.94	0.10	47.05	12.46	42.25	201.58	256.30	303.34	418.29	2.64%
2060	116.96	0.23	117.19	27.71	95.83	1,473.17	1,596.70	1,713.89	1,755.37	4.76%
EUR	..	..	..	..	..	..	..	..	..	..
2020	209.78	0.21	209.98	88.63	93.57	387.43	569.63	779.62	835.84	2.40%
2030	263.40	0.23	263.63	111.93	121.42	575.02	808.37	1,072.00	1,137.32	2.60%
2060	479.05	0.28	479.33	254.25	296.82	1,921.98	2,473.04	2,952.37	3,194.48	3.33%
AMR	..	..	..	..	..	..	..	..	..	..
2020	385.67	0.19	385.86	35.20	130.25	416.93	582.37	968.23	991.67	3.06%
2030	513.16	0.23	513.39	43.71	155.10	669.18	867.99	1,381.39	1,321.75	3.35%
2060	1,049.08	0.34	1,049.42	70.69	236.21	2,658.06	2,964.95	4,014.36	3,479.98	4.43%
SEAR	..	..	..	..	..	..	..	..	..	..
2020	15.82	0.15	15.97	6.15	22.57	154.99	183.71	199.68	100.06	1.34%
2030	34.86	0.24	35.10	11.92	43.55	411.68	467.15	502.25	231.56	1.86%
2060	218.11	0.59	218.70	56.52	205.56	4,303.91	4,565.98	4,784.68	2,025.55	3.03%
WPR	..	..	..	..	..	..	..	..	..	..
2020	106.68	0.30	106.98	37.11	115.06	374.85	527.02	634.00	329.91	1.73%
2030	202.69	0.42	203.11	63.00	198.52	1,100.29	1,361.81	1,564.92	793.29	2.54%
2060	967.98	0.66	968.64	222.59	704.13	16,604.39	17,531.11	18,499.75	9,935.13	3.07%

Table 6: Upper and lower bound estimates of economic impacts of overweight and obesity projections, by country income group

	Cost per capita	Cost as percent of GDP	Cost per capita (lower bound)	Cost as percent of GDP (lower bound)	Cost per capita (upper bound)	Cost as percent of GDP (upper bound)
Low	..	..	..	..	..	..
2019	6.15	0.9%	4.38	0.6%	7.97	1.1%
2020	6.38	0.9%	4.55	0.7%	8.26	1.2%
2030	9.63	1.0%	7.12	0.8%	12.20	1.3%
2060	32.05	1.4%	26.28	1.1%	38.05	1.6%
Lower middle	..	..	..	..	..	..
2019	27.94	1.3%	24.24	1.1%	31.70	1.4%
2020	29.50	1.4%	25.65	1.2%	33.40	1.6%
2030	56.13	1.7%	50.24	1.6%	62.11	1.9%
2060	350.32	2.7%	331.52	2.5%	369.50	2.8%
Upper middle	..	..	..	..	..	..
2019	163.38	1.9%	143.04	1.60%	186.36	2.1%
2020	173.67	2.0%	152.47	1.80%	197.57	2.3%
2030	376.40	2.8%	343.19	2.50%	412.83	3.0%
2060	3,936.29	3.2%	3,830.62	3.10%	4,046.75	3.3%
High	..	..	..	..	..	..
2019	1,109.90	2.5%	971.58	2.1%	1,263.38	2.8%
2020	1,137.67	2.6%	997.33	2.3%	1,293.53	3.0%
2030	1,545.45	2.9%	1,378.64	2.6%	1,734.02	3.2%
2060	4,404.59	3.8%	4,105.85	3.5%	4,774.24	4.1%

Table 7: Upper and lower bound estimates of economic impacts of overweight and obesity projections, by WHO region

Row Labels	Cost per capita	Cost as percent of GDP	Cost per capita (lower bound)	Cost as percent of GDP (lower bound)	Cost per capita (upper bound)	Cost as percent of GDP (upper bound)
AFR	..	..	..	..	..	..
2019	20.15	1.1%	15.83	0.9%	24.55	1.4%
2020	20.66	1.2%	16.26	0.9%	25.14	1.5%
2030	28.41	1.4%	23.04	1.2%	33.87	1.7%
2060	79.04	2.1%	70.61	1.9%	87.62	2.3%
EMR	..	..	..	..	..	..
2019	108.86	2.1%	92.78	1.8%	125.20	2.4%
2020	112.43	2.3%	96.11	2.0%	129.03	2.7%
2030	168.31	2.8%	149.56	2.5%	187.43	3.1%
2060	738.67	5.4%	711.72	5.2%	766.47	5.6%
EUR						
2019	541.52	2.2%	457.31	1.8%	616.33	2.5%
2020	553.19	2.3%	467.37	2.0%	629.47	2.7%
2030	733.38	2.5%	629.80	2.1%	826.30	2.8%
2060	1,877.52	3.1%	1,670.07	2.7%	2,069.93	3.4%
AMR	..	..	..	..	..	..
2019	872.33	3.0%	787.42	2.7%	985.24	3.4%
2020	891.26	3.2%	805.93	2.9%	1,004.76	3.6%
2030	1,172.77	3.5%	1,078.32	3.2%	1,298.64	3.9%
2060	2,956.66	4.5%	2,826.57	4.3%	3,128.65	4.7%
SEA	..	..	..	..	..	..
2019	30.15	1.2%	27.47	1.1%	32.87	1.3%
2020	32.44	1.4%	29.63	1.2%	35.28	1.5%
2030	74.83	1.9%	69.85	1.8%	79.90	2.0%
2060	648.65	3.1%	627.20	3.0%	670.73	3.20%
WPR	..	..	..	..	..	..
2019	200.13	1.6%	171.41	1.4%	232.61	1.80%
2020	214.35	1.7%	184.28	1.5%	248.39	2.00%
2030	498.89	2.5%	449.18	2.2%	555.41	2.80%
2060	6,054.71	3.1%	5,873.37	3.0%	6,272.29	3.20%

Table 8: Economic impacts of overweight and obesity in 2019 and 2060 (in 2019 USD), by country

Country	Year	Direct	Direct	Total	Absent-	Present-	Premature	Total	Total costs	Total	Total

		medical costs (billions)	non-medical costs (billions)	direct costs (PPP billions)	eeism costs (billions)	eeism costs (billions)	mortality costs (billions)	indirect costs (billions)	(billions)	costs per capita	costs as percent of GDP
Afghanistan	2019	44.1	2.3	46.5	21.3	66.8	162.4	250.5	296.9	7.81	1.58%
Afghanistan	2060	738.9	17.5	756.3	489.5	1,422.2	3,124.5	5,036.2	5,792.6	81.76	4.05%
Albania	2019	54.8	0.9	55.7	35.3	48.2	201.3	284.8	340.5	118.19	2.21%
Albania	2060	154.1	1.1	155.2	215.3	293.9	2,468.2	2,977.5	3,132.7	1,429.85	5.15%
Algeria	2019	770.4	3.2	773.7	124.9	462.7	1,708.7	2,296.3	3,070.0	71.31	1.79%
Algeria	2060	3,871.7	8.1	3,879.8	351.7	1,283.2	15,366.3	17,001.2	20,881.1	321.35	4.79%
Angola	2019	63.5	2.6	66.1	116.4	231.8	188.3	536.4	602.5	18.93	0.71%
Angola	2060	1,264.7	28.8	1,293.5	981.2	1,976.3	2,509.6	5,467.1	6,760.6	69.45	1.45%
Argentina	2019	3,301.0	11.5	3,312.5	887.2	912.9	3,637.6	5,437.8	8,750.3	195.40	1.94%
Argentina	2060	10,995.2	20.8	11,016.0	1,885.6	1,920.7	18,717.6	22,523.9	33,539.8	591.44	2.91%
Armenia	2019	78.8	0.4	79.2	17.6	15.6	234.8	268.1	347.3	117.42	2.55%
Armenia	2060	418.3	0.6	418.9	104.6	93.9	3,897.6	4,096.0	4,514.9	1,679.17	3.84%
Australia	2019	10,591.9	4.6	10,596.6	744.7	5,019.2	10,605.8	16,369.8	26,966.3	1,069.96	1.89%
Australia	2060	36,806.4	8.9	36,815.3	6,719.8	44,210.5	70,273.4	121,203.8	158,019.1	4,521.27	3.49%
Austria	2019	3,096.8	1.2	3,098.0	1,353.2	696.3	3,496.1	5,545.6	8,643.6	965.21	1.94%
Austria	2060	7,091.8	1.7	7,093.4	2,218.7	1,114.4	17,358.8	20,691.9	27,785.4	3,095.35	2.89%
Azerbaijan	2019	100.9	1.1	102.0	115.6	139.6	843.5	1,098.7	1,200.7	119.50	2.49%
Azerbaijan	2060	465.9	2.0	467.9	1,024.3	1,238.7	12,161.6	14,424.5	14,892.4	1,374.84	6.66%
Bahamas, The	2019	62.1	0.1	62.2	3.4	4.2	171.1	178.7	240.9	618.59	1.83%
Bahamas, The	2060	135.3	0.1	135.4	7.5	9.3	1,272.6	1,289.4	1,424.8	3,042.64	5.16%
Bahrain	2019	129.1	0.1	129.2	87.3	326.9	347.8	762.0	891.2	543.02	2.31%
Bahrain	2060	515.6	0.3	515.9	193.6	701.5	9,670.6	10,565.7	11,081.6	4,644.25	7.40%
Bangladesh	2019	176.5	16.4	192.9	119.4	469.9	1,799.6	2,388.9	2,581.7	15.83	0.85%
Bangladesh	2060	3,220.1	71.6	3,291.6	1,392.6	5,305.2	48,079.5	54,777.3	58,068.9	303.32	2.06%
Barbados	2019	22.8	0.1	22.9	15.1	12.3	102.6	130.1	153.0	532.93	2.89%
Barbados	2060	59.2	0.1	59.3	30.7	25.0	749.0	804.7	864.0	3,265.46	9.62%
Belarus	2019	258.9	1.4	260.4	101.5	309.4	1,133.1	1,544.1	1,804.4	190.90	2.80%
Belarus	2060	853.4	1.8	855.2	814.9	2,483.1	5,230.3	8,528.3	9,383.4	1,126.11	4.46%
Belgium	2019	3,822.0	1.8	3,823.9	1,135.3	1,354.2	3,327.4	5,817.0	9,640.9	835.48	1.80%
Belgium	2060	7,292.8	2.5	7,295.3	2,106.6	2,460.5	11,956.2	16,523.3	23,818.5	1,947.61	2.30%
Belize	2019	7.0	0.1	7.1	5.5	6.8	19.8	32.0	39.1	100.15	2.01%
Belize	2060	40.9	0.3	41.2	23.3	28.6	388.9	440.9	482.1	798.97	5.52%
Benin	2019	10.3	0.9	11.3	13.8	28.7	71.3	113.8	125.1	10.60	0.87%
Benin	2060	157.6	7.1	164.7	89.0	183.8	876.7	1,149.5	1,314.3	45.23	1.54%
Bhutan	2019	2.6	0.1	2.7	1.5	5.3	17.7	24.5	27.2	35.63	1.11%
Bhutan	2060	35.6	0.3	35.9	11.7	41.8	767.8	821.3	857.2	951.46	3.46%
Bolivia	2019	166.1	2.2	168.4	342.4	452.4	425.1	1,219.8	1,388.2	120.58	3.39%
Bolivia	2060	874.9	5.7	880.7	1,122.6	1,475.1	3,316.7	5,914.4	6,795.1	405.54	4.54%
Bosnia and Herzegovina	2019	114.1	0.7	114.8	45.0	58.5	382.8	486.4	601.2	182.13	2.98%
Bosnia and Herzegovina	2060	325.3	0.8	326.1	100.5	130.5	3,278.4	3,509.4	3,835.5	1,572.82	5.53%
Botswana	2019	56.0	0.3	56.3	15.2	35.2	207.3	257.7	314.0	136.29	1.88%
Botswana	2060	501.3	1.1	502.4	59.9	139.0	5,076.9	5,275.8	5,778.2	1,531.67	4.91%
Brazil	2019	11,956.9	54.6	12,011.5	2,684.3	2,960.6	19,492.9	25,137.9	37,149.3	176.02	1.98%
Brazil	2060	30,255.7	95.1	30,350.8	4,900.8	5,305.2	177,654.3	187,860.4	218,211.2	972.37	4.66%
Brunei Darussalam	2019	16.5	0.0	16.5	10.1	23.7	81.8	115.7	132.2	305.14	0.98%
Brunei Darussalam	2060	35.3	0.0	35.3	83.5	194.8	1,537.7	1,816.1	1,851.4	3,844.18	7.82%
Bulgaria	2019	368.1	1.9	370.0	142.8	185.6	2,229.0	2,557.4	2,927.4	418.20	4.25%
Bulgaria	2060	1,011.7	1.9	1,013.6	998.7	1,298.9	6,864.1	9,161.6	10,175.2	2,066.67	7.08%
Burkina Faso	2019	16.5	1.6	18.0	29.3	42.8	57.3	129.4	147.4	7.25	0.92%
Burkina Faso	2060	504.6	16.5	521.2	171.7	253.7	1,144.1	1,569.5	2,090.6	40.09	1.77%
Burundi	2019	5.5	1.1	6.5	1.7	12.5	4.9	19.0	25.5	2.22	0.97%
Burundi	2060	89.5	10.6	100.1	11.0	81.0	48.3	140.3	240.4	7.83	2.97%
Cabo Verde	2019	4.3	0.1	4.4	2.4	4.7	14.4	21.5	25.9	47.03	1.31%
Cabo Verde	2060	35.0	0.3	35.3	6.1	12.1	334.2	352.4	387.7	563.35	2.94%
Cambodia	2019	41.6	1.5	43.1	30.7	115.1	141.7	287.5	330.6	20.05	1.22%
Cambodia	2060	653.1	7.3	660.4	602.8	2,271.6	5,551.0	8,425.5	9,085.9	401.33	2.88%
Cameroon	2019	45.9	3.4	49.3	72.9	148.0	232.2	453.1	502.4	19.42	1.27%
Cameroon	2060	567.1	22.9	590.0	412.3	849.2	1,666.7	2,928.2	3,518.2	59.20	2.12%
Canada	2019	14,767.5	6.0	14,773.6	5,732.7	5,879.2	13,952.3	25,564.2	40,337.8	1,078.23	2.32%
Canada	2060	41,183.2	10.7	41,194.0	11,451.4	11,598.7	98,103.7	121,153.8	162,347.7	3,397.86	3.74%
Central African	2019	6.2	0.7	6.9	4.9	35.4	7.0	47.3	54.2	11.42	2.38%

Republic											
Central African Republic	2060	94.5	4.4	98.9	26.7	194.0	41.8	262.6	361.5	38.07	5.24%
Chad	2019	9.7	1.0	10.7	24.5	48.9	20.0	93.3	104.0	6.52	0.95%
Chad	2060	107.4	9.4	116.8	179.1	358.8	261.0	798.9	915.7	22.58	1.97%
Chile	2019	1,975.1	3.3	1,978.5	605.3	1,071.6	2,559.2	4,236.2	6,214.6	327.91	2.23%
Chile	2060	5,761.6	5.0	5,766.6	1,206.4	2,070.1	32,910.3	36,186.9	41,953.5	2,089.81	3.32%
China	2019	33,810.6	248.9	34,059.5	12,631.0	50,027.4	162,790.1	225,448.5	259,508.0	181.00	1.81%
China	2060	482,132.4	530.3	482,662.7	75,120.4	297,989.9	9,252,564.8	9,625,675.2	10,108,337.9	7,582.97	3.06%
Colombia	2019	1,651.4	9.7	1,661.2	336.1	1,106.8	2,217.3	3,660.2	5,321.4	105.71	1.65%
Colombia	2060	5,406.0	17.3	5,423.3	661.3	2,170.1	47,512.1	50,343.5	55,766.7	1,006.48	4.39%
Comoros	2019	1.6	0.1	1.7	1.0	2.1	4.6	7.7	9.4	11.02	0.79%
Comoros	2060	14.1	0.5	14.6	4.9	10.5	62.0	77.3	92.0	55.20	2.41%
Congo, Dem. Rep.	2019	40.2	13.5	53.6	74.6	133.0	159.9	367.5	421.1	4.85	0.84%
Congo, Dem. Rep.	2060	835.8	130.7	966.5	514.7	922.2	2,192.2	3,629.2	4,595.6	19.63	1.70%
Congo, Rep.	2019	7.2	0.8	8.0	27.3	23.5	69.8	120.5	128.5	23.88	1.00%
Congo, Rep.	2060	72.9	5.5	78.5	189.3	163.8	314.1	667.2	745.6	58.54	2.84%
Costa Rica	2019	353.2	1.5	354.7	197.5	158.5	498.3	854.3	1,209.0	239.51	1.88%
Costa Rica	2060	1,300.6	2.7	1,303.2	441.5	344.0	9,233.1	10,018.7	11,321.9	1,977.95	4.25%
Côte d'Ivoire	2019	56.9	2.8	59.7	36.8	81.8	237.3	355.9	415.6	16.16	0.71%
Côte d'Ivoire	2060	780.1	19.6	799.7	176.6	392.6	1,869.0	2,438.2	3,237.8	53.15	1.25%
Croatia	2019	293.3	0.6	293.9	176.4	148.4	1,063.1	1,388.0	1,681.9	407.20	2.70%
Croatia	2060	595.9	0.6	596.6	375.5	315.5	6,410.7	7,101.7	7,698.3	2,487.15	3.50%
Cyprus	2019	125.1	0.2	125.3	89.6	112.0	173.6	375.2	500.5	417.60	1.94%
Cyprus	2060	310.7	0.3	311.0	156.5	194.0	1,569.2	1,919.7	2,230.7	1,637.64	2.16%
Czech Republic	2019	1,375.5	1.7	1,377.2	647.2	543.3	3,687.9	4,878.5	6,255.6	585.23	2.48%
Czech Republic	2060	3,620.6	2.1	3,622.7	4,807.3	4,035.7	18,067.4	26,910.4	30,533.2	2,927.43	4.61%
Denmark	2019	2,320.9	0.9	2,321.8	1,378.3	699.4	2,272.9	4,350.6	6,672.4	1,156.02	1.92%
Denmark	2060	5,468.0	1.3	5,469.3	2,368.9	1,199.4	9,733.4	13,301.7	18,771.0	2,953.83	2.61%
Dominican Republic	2019	356.2	3.2	359.4	112.0	83.3	1,454.4	1,649.8	2,009.2	187.09	2.26%
Dominican Republic	2060	2,616.9	6.5	2,623.3	340.1	246.8	18,652.2	19,239.2	21,862.5	1,696.68	3.98%
Ecuador	2019	594.4	2.8	597.2	139.4	445.1	1,064.7	1,649.3	2,246.5	129.30	2.08%
Ecuador	2060	2,930.3	6.8	2,937.1	430.1	1,365.6	10,940.2	12,735.8	15,672.9	641.92	5.42%
Egypt, Arab Rep.	2019	1,057.9	8.9	1,066.8	260.1	1,023.4	5,581.1	6,864.6	7,931.4	79.01	2.62%
Egypt, Arab Rep.	2060	6,087.8	24.9	6,112.7	735.6	2,910.9	60,388.4	64,034.9	70,147.6	395.11	3.44%
El Salvador	2019	133.9	1.5	135.4	44.3	96.3	259.8	400.4	535.8	83.03	1.99%
El Salvador	2060	486.8	2.7	489.5	95.6	207.5	1,734.4	2,037.5	2,527.0	372.40	4.34%
Equatorial Guinea	2019	11.2	0.2	11.3	2.4	4.8	29.5	36.8	48.1	35.47	0.42%
Equatorial Guinea	2060	262.8	1.2	264.0	15.6	31.2	155.5	202.2	466.3	142.31	2.66%
Estonia	2019	130.3	0.2	130.5	74.6	61.3	643.9	779.8	910.2	686.64	2.93%
Estonia	2060	355.6	0.2	355.8	472.9	389.2	4,244.4	5,106.5	5,462.3	5,004.31	3.63%
Eswatini	2019	12.0	0.1	12.2	2.1	7.6	46.4	56.1	68.3	59.46	1.52%
Eswatini	2060	110.2	0.6	110.8	7.6	27.7	590.0	625.3	736.0	394.75	4.42%
Ethiopia	2019	64.3	6.4	70.7	109.0	157.3	215.3	481.6	552.3	4.93	0.58%
Ethiopia	2060	1,191.5	46.4	1,237.8	714.7	1,023.3	4,275.0	6,013.0	7,250.8	31.12	0.63%
Fiji	2019	14.1	0.2	14.3	12.1	23.8	157.3	193.3	207.5	233.18	3.78%
Fiji	2060	58.8	0.4	59.2	90.5	178.3	713.4	982.2	1,041.4	947.33	6.98%
Finland	2019	1,748.1	0.9	1,749.1	850.5	450.4	2,350.6	3,651.5	5,400.6	976.22	2.01%
Finland	2060	4,339.5	1.3	4,340.8	1,239.5	654.5	13,312.1	15,206.1	19,546.9	3,605.30	3.26%
France	2019	21,609.9	21.0	21,630.9	5,282.5	7,168.6	16,421.5	28,872.6	50,503.5	775.43	1.85%
France	2060	47,441.3	29.5	47,470.8	8,630.7	11,592.1	64,875.2	85,098.0	132,568.8	1,976.19	2.39%
Gabon	2019	20.4	0.4	20.7	7.5	9.9	103.5	121.0	141.7	65.22	0.84%
Gabon	2060	135.0	1.7	136.7	35.0	46.6	559.8	641.3	778.0	179.95	1.61%
Gambia, The	2019	1.7	0.3	2.0	1.5	3.6	7.6	12.8	14.8	6.30	0.82%
Gambia, The	2060	27.2	2.6	29.8	11.2	26.6	109.2	146.9	176.7	30.80	2.38%
Georgia	2019	74.4	0.5	74.9	39.5	53.0	408.3	500.8	575.7	144.05	3.29%
Georgia	2060	259.5	0.7	260.2	270.2	364.1	3,914.2	4,548.5	4,808.7	1,447.97	3.78%
Germany	2019	30,994.6	22.7	31,017.2	17,198.5	13,027.2	40,261.6	70,487.4	101,504.6	1,215.38	2.61%
Germany	2060	62,128.5	29.0	62,157.5	26,069.8	19,310.7	143,205.6	188,586.1	250,743.6	3,216.24	3.52%
Ghana	2019	74.0	3.2	77.2	146.2	127.6	520.8	794.6	871.9	28.66	1.28%
Ghana	2060	1,371.8	17.9	1,389.8	601.6	528.8	9,099.3	10,229.8	11,619.5	197.34	2.24%

Greece	2019	1,245.9	1.7	1,247.7	176.5	364.5	2,475.1	3,016.0	4,263.7	407.10	2.08%
Greece	2060	1,575.0	1.9	1,576.8	186.0	378.5	8,345.0	8,909.5	10,486.3	1,248.34	2.68%
Guatemala	2019	289.5	3.6	293.0	78.1	287.9	541.7	907.7	1,200.7	68.30	1.56%
Guatemala	2060	1,656.0	10.8	1,666.8	302.4	1,117.9	5,118.6	6,538.9	8,205.7	282.05	3.07%
Guinea	2019	13.7	1.4	15.1	2.4	3.0	52.5	57.9	72.9	5.71	0.54%
Guinea	2060	254.7	10.7	265.4	14.7	18.8	652.3	685.7	951.2	31.04	1.17%
Guinea-Bissau	2019	2.9	0.2	3.1	3.1	6.2	5.8	15.0	18.1	9.42	1.26%
Guinea-Bissau	2060	40.4	1.5	41.9	18.3	37.1	49.1	104.5	146.4	35.68	2.16%
Haiti	2019	43.2	2.3	45.5	56.6	74.6	86.5	217.7	263.2	23.37	1.78%
Haiti	2060	224.0	6.2	230.3	168.5	222.4	324.2	715.2	945.4	61.03	4.33%
Honduras	2019	111.0	2.5	113.5	44.1	151.1	205.6	400.9	514.3	52.77	2.06%
Honduras	2060	624.4	6.8	631.2	153.4	524.0	2,027.6	2,705.0	3,336.2	228.90	3.44%
Hungary	2019	757.7	1.5	759.2	262.9	510.7	3,289.3	4,062.8	4,822.0	497.90	2.95%
Hungary	2060	1,865.5	1.7	1,867.2	2,135.3	4,152.6	11,418.2	17,706.1	19,573.3	2,425.13	4.77%
Iceland	2019	145.2	0.1	145.2	115.9	64.9	141.5	322.3	467.5	1,379.03	1.88%
Iceland	2060	428.7	0.1	428.8	193.8	108.1	1,157.8	1,459.8	1,888.6	5,017.01	2.44%
India	2019	2,251.0	83.9	2,334.9	860.4	3,479.8	22,273.3	26,613.6	28,948.5	21.19	1.02%
India	2060	42,656.9	375.6	43,032.4	6,995.0	28,944.2	759,629.0	795,568.2	838,600.6	507.93	2.47%
Indonesia	2019	1,162.7	24.9	1,187.5	442.7	1,410.2	14,431.3	16,284.2	17,471.8	64.56	1.56%
Indonesia	2060	13,811.2	93.7	13,904.9	6,515.4	20,795.7	353,179.9	380,490.9	394,395.9	1,172.25	4.70%
Iran, Islamic Rep.	2019	1,624.7	5.9	1,630.6	141.7	527.9	2,459.5	3,129.1	4,759.7	57.41	1.63%
Iran, Islamic Rep.	2060	5,541.6	12.3	5,553.8	325.8	1,118.1	35,675.9	37,119.9	42,673.7	405.59	5.52%
Iraq	2019	633.5	8.2	641.7	115.4	401.2	2,259.3	2,775.9	3,417.7	86.94	1.46%
Iraq	2060	3,837.9	27.2	3,865.1	397.9	1,369.2	18,174.9	19,941.9	23,807.0	294.96	2.59%
Ireland	2019	1,998.0	0.7	1,998.8	915.4	485.9	3,207.3	4,608.6	6,607.4	1,353.27	1.66%
Ireland	2060	7,896.1	1.3	7,897.5	2,625.0	1,348.0	38,473.2	42,446.2	50,343.7	8,772.61	2.07%
Israel	2019	2,132.5	1.7	2,134.1	1,068.1	857.8	2,510.2	4,436.2	6,570.3	771.22	1.65%
Israel	2060	7,834.4	3.6	7,837.9	3,218.0	2,513.9	23,923.8	29,655.7	37,493.6	2,671.57	1.87%
Italy	2019	12,770.2	23.0	12,793.2	3,960.1	4,209.0	16,246.8	24,416.0	37,209.2	614.52	1.85%
Italy	2060	17,898.3	25.8	17,924.1	5,057.5	4,956.1	52,097.5	62,111.1	80,035.2	1,583.07	2.52%
Jamaica	2019	63.3	0.9	64.2	79.0	87.9	194.2	361.1	425.3	144.25	2.69%
Jamaica	2060	159.9	1.5	161.4	150.4	166.1	1,048.7	1,365.2	1,526.6	543.68	5.85%
Japan	2019	18,834.0	7.6	18,841.6	7,254.5	6,036.9	18,672.6	31,964.0	50,805.7	400.49	0.99%
Japan	2060	43,627.5	10.1	43,637.6	36,508.0	30,459.9	86,941.9	153,909.8	197,547.4	2,009.11	2.18%
Jordan	2019	256.4	3.4	259.8	35.6	144.0	411.0	590.6	850.5	84.19	1.91%
Jordan	2060	885.3	7.2	892.5	84.4	336.0	7,655.6	8,076.0	8,968.5	658.73	4.50%
Kazakhstan	2019	289.4	1.5	290.9	151.6	491.8	2,557.8	3,201.1	3,492.1	188.24	1.92%
Kazakhstan	2060	1,711.9	3.3	1,715.2	355.8	1,157.0	25,470.8	26,983.7	28,698.9	1,136.88	2.86%
Kenya	2019	131.2	5.7	136.9	65.7	146.6	393.4	605.7	742.6	14.12	0.74%
Kenya	2060	1,852.0	35.4	1,887.4	349.2	783.9	7,916.0	9,049.1	10,936.5	106.80	2.07%
Korea, Rep.	2019	5,567.6	4.8	5,572.3	1,597.9	5,412.7	8,905.6	15,916.3	21,488.6	419.49	1.30%
Korea, Rep.	2060	23,818.4	7.7	23,826.1	8,031.3	27,077.3	351,587.6	386,696.3	410,522.3	9,613.75	3.41%
Kuwait	2019	637.5	0.4	637.9	150.3	549.0	957.8	1,657.1	2,295.0	545.50	1.69%
Kuwait	2060	1,625.3	0.6	1,625.9	279.2	998.1	30,425.4	31,702.7	33,328.6	6,093.03	9.42%
Kyrgyz Republic	2019	27.7	0.6	28.3	28.4	55.2	61.5	145.0	173.3	27.02	1.95%
Kyrgyz Republic	2060	185.1	1.7	186.8	499.5	975.6	784.7	2,259.8	2,446.5	250.28	7.00%
Lao PDR	2019	12.9	0.7	13.6	17.9	63.1	149.4	230.4	244.0	34.03	1.30%
Lao PDR	2060	253.4	3.3	256.7	319.4	1,129.0	3,810.5	5,258.9	5,515.6	568.25	3.48%
Latvia	2019	139.0	0.3	139.3	76.2	64.0	754.7	894.9	1,034.2	542.40	3.01%
Latvia	2060	307.8	0.3	308.0	454.0	382.1	3,312.2	4,148.3	4,456.4	3,218.99	3.08%
Lebanon	2019	380.2	1.7	382.0	87.2	204.8	539.7	831.7	1,213.6	177.03	2.34%
Lebanon	2060	708.5	2.4	710.9	124.2	290.9	7,235.8	7,651.0	8,361.9	1,274.07	4.85%
Lesotho	2019	10.7	0.3	11.0	5.7	9.3	22.1	37.1	48.1	22.65	2.05%
Lesotho	2060	96.5	0.8	97.3	17.9	29.2	142.9	190.1	287.3	103.53	4.46%
Libya	2019	102.3	0.2	102.5	12.8	98.2	483.9	594.9	697.4	102.90	1.78%
Libya	2060	519.4	0.4	519.8	30.6	230.6	9,190.3	9,451.6	9,971.4	1,154.51	6.24%
Lithuania	2019	243.4	0.4	243.8	148.0	124.7	1,179.0	1,451.7	1,695.5	614.39	3.10%
Lithuania	2060	598.2	0.4	598.6	799.4	674.2	8,142.0	9,615.5	10,214.1	5,187.10	3.57%
Luxembourg	2019	261.8	0.1	261.9	112.1	138.9	383.0	634.0	895.8	1,454.90	1.28%
Luxembourg	2060	642.9	0.2	643.1	268.1	323.7	3,301.8	3,893.6	4,536.7	5,477.38	1.61%
Madagascar	2019	14.9	2.9	17.8	36.0	38.8	56.7	131.6	149.4	5.54	1.06%
Madagascar	2060	223.5	23.4	246.9	246.0	266.2	520.6	1,032.8	1,279.7	19.98	3.00%
Malawi	2019	17.3	2.4	19.6	22.2	14.4	29.3	65.8	85.5	4.59	0.78%
Malawi	2060	255.0	19.8	274.7	148.9	97.7	376.0	622.5	897.3	19.91	1.73%
Malaysia	2019	772.5	2.9	775.4	279.6	1,082.1	3,538.9	4,900.6	5,676.0	177.65	1.55%
Malaysia	2060	6,227.6	8.1	6,235.7	3,132.7	12,102.9	83,082.2	98,317.7	104,553.5	2,505.36	3.98%

Maldives	2019	20.0	0.1	20.1	3.3	13.6	29.0	45.8	65.9	124.11	1.18%
Maldives	2060	149.1	0.4	149.5	30.7	117.7	1,711.9	1,860.2	2,009.7	3,387.24	3.10%
Mali	2019	17.8	2.3	20.1	16.8	36.5	52.9	106.2	126.2	6.42	0.73%
Mali	2060	366.5	21.7	388.2	138.8	307.4	651.3	1,097.6	1,485.7	28.34	1.61%
Malta	2019	105.4	0.1	105.5	34.2	43.1	145.5	222.8	328.3	745.46	2.09%
Malta	2060	329.4	0.1	329.5	47.4	58.3	1,301.8	1,407.5	1,737.0	4,187.16	2.57%
Mauritania	2019	9.3	0.7	10.1	2.9	5.7	31.4	40.0	50.0	11.06	0.63%
Mauritania	2060	111.5	4.8	116.3	14.3	28.2	388.6	431.2	547.5	51.24	1.57%
Mauritius	2019	32.5	0.1	32.6	12.0	14.4	331.7	358.1	390.7	307.71	2.78%
Mauritius	2060	201.5	0.2	201.7	17.4	20.7	6,222.1	6,260.2	6,461.9	5,789.05	8.89%
Mexico	2019	5,305.5	29.7	5,335.1	1,493.5	1,902.5	14,436.7	17,832.6	23,167.8	181.60	1.83%
Mexico	2060	16,340.5	54.4	16,394.8	3,615.4	4,510.4	114,367.3	122,493.0	138,887.9	883.76	5.01%
Moldova	2019	47.4	0.7	48.1	43.6	34.3	188.6	266.5	314.7	77.82	2.63%
Moldova	2060	99.7	0.9	100.5	215.9	171.5	1,402.8	1,790.2	1,890.7	618.07	4.51%
Mongolia	2019	29.5	0.5	30.0	24.7	59.0	223.2	306.9	337.0	104.48	2.37%
Mongolia	2060	242.6	1.3	243.9	275.4	660.7	3,145.7	4,081.7	4,325.6	913.04	5.14%
Montenegro	2019	32.9	0.2	33.1	17.7	14.6	107.7	140.0	173.0	275.56	3.12%
Montenegro	2060	107.1	0.2	107.3	82.9	67.8	882.7	1,033.5	1,140.8	2,014.62	5.65%
Morocco	2019	445.0	10.2	455.2	368.4	532.9	1,804.0	2,705.3	3,160.5	86.66	2.64%
Morocco	2060	2,215.0	22.5	2,237.5	705.4	1,034.5	21,384.6	23,124.5	25,362.0	534.61	5.45%
Mozambique	2019	36.1	2.4	38.5	72.2	64.1	51.4	187.8	226.3	7.45	1.47%
Mozambique	2060	577.2	19.9	597.1	447.4	408.9	929.6	1,785.9	2,383.0	30.41	1.52%
Myanmar	2019	97.9	2.8	100.6	22.2	187.0	553.7	762.8	863.5	15.98	1.26%
Myanmar	2060	1,831.1	10.5	1,841.6	236.6	2,002.4	21,616.9	23,855.9	25,697.5	413.43	3.47%
Namibia	2019	45.2	0.3	45.5	20.7	19.4	63.5	103.6	149.1	59.76	1.19%
Namibia	2060	429.4	1.6	430.9	88.2	83.0	729.6	900.9	1,331.8	301.98	3.66%
Nepal	2019	40.2	2.3	42.5	71.8	91.4	154.2	317.4	359.9	12.58	1.05%
Nepal	2060	479.5	10.6	490.1	715.6	920.7	3,501.5	5,137.8	5,627.9	162.01	2.74%
Netherlands	2019	6,373.2	3.2	6,376.4	3,444.8	1,624.2	5,860.1	10,929.1	17,305.5	1,012.19	1.90%
Netherlands	2060	17,271.9	4.7	17,276.6	7,326.1	3,309.3	41,707.6	52,343.0	69,619.6	4,147.23	3.47%
New Zealand	2019	1,531.0	1.1	1,532.1	863.1	639.4	1,692.5	3,195.0	4,727.1	988.30	2.24%
New Zealand	2060	4,334.9	1.8	4,336.7	7,237.5	5,279.9	10,158.2	22,675.6	27,012.3	4,716.43	4.68%
Nicaragua	2019	76.1	1.5	77.6	71.8	83.4	108.1	263.2	340.9	52.08	2.70%
Nicaragua	2060	401.0	3.4	404.4	241.4	275.0	2,021.3	2,537.6	2,942.0	334.04	6.64%
Niger	2019	13.6	1.6	15.1	26.0	47.8	26.9	100.8	115.9	4.97	0.90%
Niger	2060	320.6	22.4	343.0	251.6	467.5	397.5	1,116.7	1,459.7	17.23	1.66%
Nigeria	2019	468.5	9.4	477.8	274.4	600.7	1,013.1	1,888.2	2,366.1	11.77	0.53%
Nigeria	2060	6,403.1	79.3	6,482.5	1,512.7	3,324.6	24,060.1	28,897.3	35,379.8	74.31	1.65%
North Macedonia	2019	55.8	0.5	56.3	27.0	32.5	286.1	345.6	401.9	192.92	3.19%
North Macedonia	2060	104.5	0.6	105.1	98.9	119.0	1,572.3	1,790.2	1,895.3	1,093.06	5.24%
Norway	2019	2,870.0	1.0	2,870.9	1,522.4	761.2	1,852.6	4,136.3	7,007.2	1,302.73	1.73%
Norway	2060	7,411.0	1.8	7,412.9	3,458.7	1,717.7	10,076.7	15,253.1	22,665.9	3,288.63	2.24%
Oman	2019	256.9	0.4	257.3	262.0	582.4	570.3	1,414.7	1,672.0	336.09	2.19%
Oman	2060	588.7	1.0	589.6	668.0	1,408.3	14,549.2	16,625.5	17,215.1	2,358.87	4.36%
Pakistan	2019	268.7	17.6	286.3	156.9	629.6	2,334.6	3,121.1	3,407.4	15.73	1.06%
Pakistan	2060	3,277.9	97.5	3,375.5	2,370.4	9,115.5	36,461.3	47,947.2	51,322.7	139.92	2.57%
Panama	2019	336.3	0.5	336.8	160.7	164.3	546.6	871.6	1,208.5	284.58	1.80%
Panama	2060	1,791.4	1.1	1,792.6	553.0	560.9	10,756.4	11,870.2	13,662.8	2,221.14	2.68%
Paraguay	2019	169.8	1.8	171.6	94.0	110.4	337.7	542.0	713.6	101.29	1.88%
Paraguay	2060	959.0	4.3	963.3	300.7	350.2	3,520.8	4,171.7	5,135.0	546.28	3.93%
Peru	2019	801.4	9.1	810.5	508.8	844.2	1,350.4	2,703.4	3,514.0	108.09	1.52%
Peru	2060	4,170.8	18.4	4,189.2	1,500.9	2,482.3	24,165.2	28,148.4	32,337.6	780.90	2.92%
Philippines	2019	509.8	12.2	522.0	254.0	777.1	3,509.4	4,540.6	5,062.6	46.83	1.34%
Philippines	2060	6,905.3	49.0	6,954.3	3,629.9	11,101.8	62,894.2	77,625.9	84,580.1	563.04	4.45%
Poland	2019	2,547.8	5.0	2,552.8	1,350.5	1,742.6	9,763.0	12,856.1	15,408.9	406.70	2.58%
Poland	2060	7,252.1	5.7	7,257.8	8,957.1	11,573.5	63,668.6	84,199.2	91,457.1	2,934.33	4.86%
Portugal	2019	1,635.2	1.6	1,636.8	370.8	306.4	2,104.8	2,782.0	4,418.8	432.11	1.84%
Portugal	2060	2,666.2	2.0	2,668.3	448.3	368.7	9,615.0	10,432.0	13,100.3	1,538.65	2.39%
Qatar	2019	419.8	0.2	420.1	366.1	893.1	1,020.9	2,280.1	2,700.2	953.43	1.53%
Qatar	2060	1,595.0	0.5	1,595.4	620.9	1,514.6	65,465.5	67,601.1	69,196.5	17,267.69	7.97%
Romania	2019	942.9	2.7	945.6	448.1	882.8	5,322.2	6,653.0	7,598.6	392.40	3.04%
Romania	2060	3,497.8	3.1	3,501.0	2,436.9	4,810.8	18,227.4	25,475.1	28,976.1	1,909.49	4.47%
Russian Federation	2019	5,855.2	27.8	5,883.0	3,159.9	3,777.6	27,599.8	34,537.3	40,420.3	277.09	2.39%
Russian Federation	2060	12,807.1	33.8	12,841.0	22,426.9	26,953.4	65,954.5	115,334.8	128,175.7	965.97	4.57%
Rwanda	2019	19.5	1.4	20.9	14.3	14.5	37.8	66.6	87.5	6.93	0.84%
Rwanda	2060	406.3	9.8	416.0	76.5	78.5	1,137.2	1,292.3	1,708.3	65.22	1.66%
Samoa	2019	4.1	0.1	4.2	1.6	3.6	14.4	19.6	23.8	120.58	2.79%
Samoa	2060	17.6	0.1	17.7	12.1	27.1	46.2	85.4	103.2	361.45	5.94%

Saudi Arabia	2019	4,173.3	1.8	4,175.1	988.5	3,835.6	10,588.2	15,412.3	19,587.4	571.58	2.44%
Saudi Arabia	2060	10,213.8	3.4	10,217.1	1,726.5	6,678.4	131,841.3	140,246.1	150,463.3	3,317.91	5.62%
Senegal	2019	24.7	1.8	26.6	22.1	47.9	95.9	165.9	192.4	11.81	0.82%
Senegal	2060	335.5	13.0	348.4	116.8	250.1	1,040.9	1,407.8	1,756.2	44.41	1.34%
Serbia	2019	295.7	2.3	298.0	117.3	228.2	1,162.2	1,507.7	1,805.7	205.84	3.51%
Serbia	2060	759.1	2.5	761.6	266.4	516.8	8,499.1	9,282.4	10,043.9	1,549.43	4.40%
Sierra Leone	2019	17.7	0.8	18.5	3.6	7.6	11.7	22.9	41.4	5.30	1.02%
Sierra Leone	2060	222.1	4.5	226.6	15.0	31.8	141.3	188.1	414.6	28.90	3.13%
Singapore	2019	678.2	0.6	678.8	493.4	462.0	1,966.1	2,921.5	3,600.3	620.28	0.96%
Singapore	2060	2,644.3	0.9	2,645.3	2,699.0	2,527.5	50,359.9	55,586.3	58,231.6	9,294.64	2.09%
Slovak Republic	2019	473.1	0.8	473.9	283.1	240.1	1,702.1	2,225.3	2,699.2	494.64	2.56%
Slovak Republic	2060	1,230.0	1.1	1,231.1	1,897.9	1,611.9	14,784.8	18,294.6	19,525.7	4,123.31	4.66%
Slovenia	2019	303.7	0.3	304.0	113.8	146.5	627.6	887.8	1,191.8	573.34	2.20%
Slovenia	2060	801.0	0.4	801.4	317.8	408.7	4,720.4	5,447.0	6,248.4	3,360.52	3.32%
South Africa	2019	1,789.0	13.6	1,802.6	1,217.6	1,566.2	3,033.5	5,817.2	7,619.8	130.12	1.96%
South Africa	2060	8,552.3	35.3	8,587.6	2,923.7	3,739.0	26,742.6	33,405.3	41,992.9	537.19	4.83%
Spain	2019	9,508.1	3.0	9,511.1	5,238.7	3,707.7	10,677.7	19,624.1	29,135.2	623.39	2.09%
Spain	2060	15,675.8	3.5	15,679.3	8,373.8	5,770.8	50,598.8	64,743.3	80,422.6	1,959.33	2.36%
Sri Lanka	2019	92.9	1.7	94.6	26.4	55.3	797.7	879.4	974.1	45.68	1.16%
Sri Lanka	2060	918.5	5.4	923.8	197.8	417.8	24,217.7	24,833.3	25,757.1	1,228.15	5.90%
Sweden	2019	3,838.0	1.5	3,839.4	1,707.8	879.3	3,916.7	6,503.7	10,343.2	1,030.57	1.94%
Sweden	2060	9,908.6	2.3	9,910.9	2,916.8	1,500.6	17,259.7	21,677.1	31,588.0	2,690.79	2.41%
Switzerland	2019	5,731.3	1.5	5,732.8	2,864.7	2,261.7	4,007.6	9,134.0	14,866.8	1,730.44	2.03%
Switzerland	2060	15,167.0	2.5	15,169.6	5,106.3	3,921.5	20,764.8	29,792.6	44,962.2	4,491.05	3.13%
Tajikistan	2019	23.7	0.8	24.4	17.1	21.1	57.8	95.9	120.4	12.91	1.45%
Tajikistan	2060	233.0	3.0	236.1	336.3	412.3	1,588.7	2,337.3	2,573.4	139.58	3.15%
Tanzania	2019	61.2	5.2	66.4	115.0	214.1	234.2	563.4	629.7	10.86	1.03%
Tanzania	2060	1,264.1	47.6	1,311.7	806.2	1,516.0	2,989.3	5,311.5	6,623.2	41.69	1.38%
Thailand	2019	905.7	9.4	915.1	347.7	1,202.1	5,803.9	7,353.7	8,268.8	118.76	1.52%
Thailand	2060	5,583.6	21.2	5,604.7	2,315.3	8,006.4	164,852.3	175,174.0	180,778.7	2,930.36	6.36%
Timor-Leste	2019	3.3	0.1	3.5	3.8	9.6	3.7	17.1	20.6	15.93	1.21%
Timor-Leste	2060	50.8	0.8	51.7	89.6	228.1	47.0	364.6	416.3	188.99	8.56%
Togo	2019	9.1	0.6	9.7	17.8	15.3	30.4	63.4	73.1	9.04	1.01%
Togo	2060	113.6	4.2	117.8	106.1	91.2	314.4	511.8	629.6	34.92	1.97%
Tonga	2019	2.5	0.0	2.6	1.8	3.1	6.3	11.3	13.8	132.39	2.70%
Tonga	2060	10.2	0.1	10.3	10.9	19.0	22.2	52.0	62.3	444.02	5.28%
Trinidad and Tobago	2019	91.6	0.1	91.8	25.2	47.8	507.1	580.2	672.0	481.71	2.81%
Trinidad and Tobago	2060	259.8	0.2	260.0	54.7	103.0	4,491.3	4,649.0	4,908.9	3,856.03	10.20%
Tunisia	2019	203.4	2.1	205.5	111.3	238.8	454.3	804.4	1,009.9	86.35	2.42%
Tunisia	2060	718.0	4.1	722.1	186.0	400.6	6,033.1	6,619.7	7,341.8	525.76	5.33%
Turkey	2019	2,526.4	19.1	2,545.5	546.9	2,007.0	9,536.6	12,090.5	14,636.0	175.43	1.92%
Turkey	2060	11,841.1	34.4	11,875.5	874.8	3,206.4	116,570.9	120,652.1	132,527.6	1,353.14	3.18%
Turkmenistan	2019	167.5	0.3	167.8	102.3	125.7	776.7	1,004.7	1,172.5	197.32	2.21%
Turkmenistan	2060	1,950.4	0.8	1,951.2	1,570.7	1,933.8	16,679.5	20,184.0	22,135.2	2,674.34	5.17%
Uganda	2019	45.0	3.5	48.5	19.5	37.0	91.6	148.1	196.6	4.44	0.52%
Uganda	2060	683.4	28.4	711.8	143.1	271.4	2,056.9	2,471.4	3,183.2	30.75	0.93%
Ukraine	2019	789.1	12.5	801.6	236.7	797.7	3,788.5	4,822.9	5,624.6	127.85	3.66%
Ukraine	2060	1,261.5	12.7	1,274.2	1,251.5	4,234.5	14,080.0	19,565.9	20,840.1	642.75	5.69%
United Arab Emirates	2019	1,404.0	0.9	1,404.9	605.4	2,287.3	7,370.3	10,263.0	11,667.9	1,194.19	2.80%
United Arab Emirates	2060	2,227.6	1.3	2,228.9	932.6	3,347.6	172,781.7	177,061.9	179,290.8	16,873.63	11.04%
United Kingdom	2019	21,857.8	26.0	21,883.8	6,637.2	9,062.6	22,546.5	38,246.4	60,130.2	890.42	2.09%
United Kingdom	2060	53,230.8	40.4	53,271.2	12,843.8	17,273.2	78,628.1	108,745.1	162,016.3	2,158.48	2.41%
United States	2019	304,210.5	33.3	304,243.8	12,523.3	99,954.4	288,994.6	401,472.4	705,716.2	2,144.61	3.30%
United States	2060	831,947.9	53.8	832,001.7	21,697.2	172,118.7	1,596,651.3	1,790,467.1	2,622,468.9	6,698.60	4.62%
Uruguay	2019	389.5	0.9	390.4	143.2	89.4	552.8	785.4	1,175.8	339.65	1.92%
Uruguay	2060	1,042.7	1.3	1,043.9	273.9	169.1	2,070.0	2,513.0	3,557.0	984.60	2.41%
Uzbekistan	2019	149.7	2.9	152.6	223.8	277.9	1,120.7	1,622.5	1,775.1	53.82	2.96%
Uzbekistan	2060	924.6	7.2	931.9	3,225.2	4,018.1	13,428.2	20,671.5	21,603.4	490.06	4.71%
Vanuatu	2019	2.0	0.1	2.1	5.3	8.2	12.7	26.3	28.4	94.55	3.03%
Vanuatu	2060	16.7	0.4	17.1	93.0	144.5	52.6	290.0	307.1	474.53	12.06%
Vietnam	2019	339.0	6.4	345.4	249.4	521.8	2,570.2	3,341.4	3,686.8	38.22	1.12%
Vietnam	2060	5,562.9	26.9	5,589.8	3,319.2	6,978.4	87,209.4	97,507.1	103,096.9	942.70	2.81%
West Bank and Gaza	2019	122.8	2.1	124.9	74.7	474.7	364.2	913.6	1,038.5	208.47	1.70%

West Bank and Gaza	2060	816.0	6.7	822.6	233.5	1,479.3	4,351.5	6,064.3	6,886.9	694.70	2.77%
Zambia	2019	32.2	2.5	34.7	36.5	72.9	91.2	200.7	235.4	13.18	1.01%
Zambia	2060	450.3	18.7	468.9	232.4	464.2	730.1	1,426.7	1,895.6	39.92	1.53%
Zimbabwe	2019	44.6	2.5	47.1	52.9	157.6	84.1	294.7	341.8	23.34	1.77%
Zimbabwe	2060	346.4	11.5	357.9	213.6	652.9	653.6	1,520.1	1,878.0	70.93	5.23%

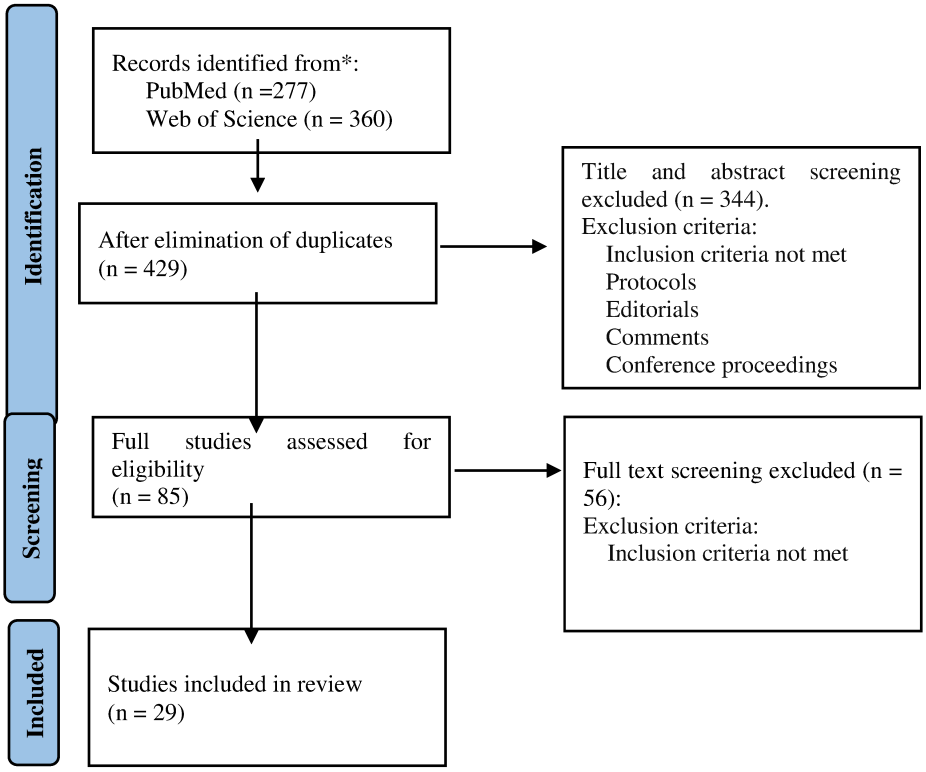
Appendix 3: Systematic literature review for absenteeism, presenteeism, hospitalization, and outpatient visits

A systematic literature review was conducted for absenteeism, presenteeism, and hospitalizations to identify studies that assessed the additional number of each measure experienced by people with overweight and obesity. Only articles that were published in the last 10 years (Dec 2011 – Dec 2021) in English were included in this review. Databases included in the search were PubMed and Web of Science. Duplicates were reconciled using the systematic review tool, Rayyan, leaving 4,680 hospitalization/outpatient articles and 429 absenteeism/presenteeism articles for full abstract screening to assess inclusion/exclusion criteria. Two independent reviewers screened all articles and identified 37 hospitalization/outpatient articles and 85 absenteeism/presenteeism articles for full-text screening. Articles were excluded if they were comments, editorials, conference proceedings, or protocols. They were also excluded if they focused on specific sub-populations rather than the general population. Full-text scanning resulted in 18 hospitalization and 29 absenteeism/presenteeism articles.

Absenteeism and presenteeism

Absenteeism was measured by additional days missed at work and presenteeism was measured by additional percent presenteeism at work experienced by people with overweight and obesity. In the literature review, 10 articles for absenteeism and 5 articles for presenteeism were identified with comparable measurements. For the seven countries for which estimates were available, the point estimate for those countries was applied. When a country had multiple estimates, the average of the point estimates was applied. For all remaining countries, the point estimates from all studies were used to calculate the interquartile range (IQ). The International Trade Union Confederation (ITUC) Global Rights Index was used to identify labor laws on a scale of 1-6 with 1 representing the best labor laws or sporadic violations of rights and 6 representing the worst labor laws or no guarantee of rights due to the breakdown of the rule of law. It was assumed that countries with the best labor laws (1) would have the most absenteeism and least presenteeism while countries with the worst labor laws (6) would have the least absenteeism and most presenteeism. Therefore, we divided the absenteeism and presenteeism IQs by 5 to create 6 categories. Countries with a ITUC ranking of 1 were assigned the highest absenteeism category, Q3, and the lowest presenteeism category, Q1. This application was continued until the countries with an ITUC ranking of 6 were assigned the lowest absenteeism category, Q1, and the highest presenteeism category, Q3.

Prisma Flowchart for Absenteeism and Presenteeism



Hospitalization, length of stay, and outpatient visits

Additional number of primary care/general practitioner/outpatient visits and additional number of hospitalizations experienced by people with overweight and obesity per year each had 12 and 7 articles respectively with comparable measurements for each measure, of which 10 and 7 were statistically significant. Therefore, country-specific data were used where available. For countries with multiple estimates available, the average of the point estimates was used. The one study from a LMIC, Brazil, was used to represent all LMICs in the model. For all HICs without country-specific evidence, the average of the point estimates from all HIC studies were applied. Additional length of stay (days) experienced by people with overweight and obesity had five articles. From these five articles four were not statistically significant and ranged from -2.39 to 1.37. The one article that was statistically significant had a point estimate near the null, 0.16 additional days. Considering the lack of available data, additional length of stay was not included in the model.

Prisma Flowchart for Hospitalization and Length of Stay