Estimated Global, Regional, and National Disease Burdens Related to Sugar-Sweetened Beverage Consumption in 2010

Gitanjali M. Singh, PhD; Renata Micha, PhD; Shahab Khatibzadeh, MD; Stephen Lim, PhD; Majid Ezzati, PhD; Dariush Mozaffarian, MD, DrPH; on behalf of the Global Burden of Diseases Nutrition and Chronic Diseases Expert Group (NutriCoDE)*

Background—Sugar-sweetened beverages (SSBs) are consumed globally and contribute to adiposity. However, the worldwide impact of SSBs on burdens of adiposity-related cardiovascular diseases (CVDs), cancers, and diabetes mellitus has not been assessed by nation, age, and sex.

Methods and Results—We modeled global, regional, and national burdens of disease associated with SSB consumption by age/sex in 2010. Data on SSB consumption levels were pooled from national dietary surveys worldwide. The effects of SSB intake on body mass index and diabetes mellitus, and of elevated body mass index on CVD, diabetes mellitus, and cancers were derived from large prospective cohort pooling studies. Disease-specific mortality/morbidity data were obtained from Global Burden of Diseases, Injuries, and Risk Factors 2010 Study. We computed cause-specific population-attributable fractions for SSB consumption, which were multiplied by cause-specific mortality/morbidity to compute estimates of SSB-attributable death/disability. Analyses were done by country/age/sex; uncertainties of all input data were propagated into final estimates. Worldwide, the model estimated 184 000 (95% uncertainty interval, 161 000–208 000) deaths/y attributable to SSB consumption: 133 000 (126 000–139 000) from diabetes mellitus, 45 000 (26 000–61 000) from CVD, and 6450 (4300–8600) from cancers. Five percent of SSB-related deaths occurred in low-income, 70.9% in middle-income, and 24.1% in high-income countries. Proportional mortality attributable to SSBs ranged from <1% in Japanese >65 years if age to 30% in Mexicans <45 years of age. Among the 20 most populous countries, Mexico had largest absolute (405 deaths/million adults) and proportional (12.1%) deaths from SSBs. A total of 8.5 (2.8, 19.2) million disability-adjusted life years were related to SSB intake (4.5% of diabetes mellitus–related disability-adjusted life years).

Conclusions—SSBs are a single, modifiable component of diet that can impact preventable death/disability in adults in high-, middle-, and low-income countries, indicating an urgent need for strong global prevention programs. **(*Circulation*. 2015;132:639-666. DOI: 10.1161/CIRCULATIONAHA.114.010636.)**

Key Words: cardiovascular diseases ■ diabetes mellitus ■ diet ■ obesity

Adiposity-related chronic diseases, including type 2 diabetes mellitus, cardiovascular diseases (CVDs), and cancers, cause >17 million global deaths each year.[1] Consumption of sugar-sweetened beverages (SSBs) increases adiposity and long-term weight gain.[2–4] In addition, SSB intake appears to increase the risk of diabetes mellitus independently of adiposity,[5] likely related to adverse metabolic and glucose-insulin effects. Yet, despite dramatic increases in both global sales of SSBs[6] and the global pandemic of obesity,[7,8] comprehensive quantitative estimates of the impact of SSB intake on obesity-related diseases in nations worldwide by age and sex have not been available. Few published reports of country-level SSB consumption exist,[9–18] and these previous national reports have used disparate data sources and methods that are not easily compared. In addition, previous studies have not systematically assessed how SSB intake impacts major chronic diseases worldwide by region, country, age, and sex. Comprehensive, accurate estimates of the burdens of chronic

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From Friedman School of Nutrition Science & Policy, Tufts University, Boston, MA (G.M.S., R.M., D.M.); Department of Global Health and Population, Harvard School of Public Health, Boston, MA (S.K.); Institute for Health Metrics and Evaluation, University of Washington, Seattle (S.L.); and Departments of Global Environmental Health and Biostatistics and Epidemiology, School of Public Health, Imperial College London, United Kingdom (M.E.).

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Correspondence to Gitanjali M. Singh, PhD, Tufts University, Friedman School of Nutrition, 150 Harrison Ave, Boston, MA 02115. E-mail Gitanjali.Singh@Tufts.edu

obesity-related diseases attributable to SSB consumption, including the uncertainty in such estimates, are essential for informed national, regional, and global policies.

As part of our work in the 2010 Global Burden of Diseases *Nutri*tion and *C*hr*o*nic *D*iseases *E*xpert Group (NutriCoDE), we systematically reviewed, compiled, and extracted national data on SSB consumption worldwide and addressed issues of consistency, comparability, bias, and missingness in the collated data. We also derived and incorporated into our analysis the best available estimates of the effects of SSB intake on obesity and diabetes mellitus, and of obesity on diabetes mellitus, CVD, and cancers, including heterogeneity in these effects by age and sex. Our analysis further included data on age-, sex-, and cause-specific mortality in all nations worldwide. We used a comparative risk assessment analytic framework to quantify global, regional, and national disease burdens related to SSB consumption, assessing both the direct and obesity-mediated effects of SSBs on chronic disease.

Methods

To quantify the number of adult deaths worldwide related to SSB intake, we used a comparative risk assessment framework[19–21] that captures geographical, sex, and age variation in SSB consumption, in the effects of SSB consumption on diabetes mellitus and body mass index (BMI), in the effects of BMI on disease outcomes, and in cause-specific mortality (Table 1, Figure 1). We estimated both the direct effects of SSB consumption on diabetes mellitus burdens and the BMI-mediated effects of SSB consumption on CVD, diabetes mellitus, and cancer burdens.

Global SSB Consumption Data by Country, Age, and Sex

As part of the Global Burden of Diseases, Risk Factors, and Injuries 2010 study, we identified national surveys or, if unavailable, subnational surveys on SSB intake in adults through systematic searches of multiple literature databases and direct contact with experts worldwide, as described elsewhere.[26] SSBs were defined as any sugar-sweetened sodas, fruit drinks, sports/energy drinks, sweetened iced tea, or homemade SSBs such as frescas, which contained at least 50 kcal per 8-oz serving; 100% fruit juice was excluded. In total, we compiled data on SSBs from 62 dietary surveys including 611 971 individuals conducted between 1980 and 2010 across 51 countries (Table I in the online-only Data Supplement).[26] Eighty-eight percent of the surveys were nationally representative, and all but one had data on both men and women. Forty-five surveys (72%) were from low- and middle-income countries, and 18 (28%) were from high-income countries. Together, these surveys provided data on SSB intake in countries representing 63% of the world's adult population (Table 1).[26] We also identified annual country-level data relevant to SSB intake between 1980 and 2010 for 187 countries in our analysis by using food balance sheet data on per capita sugar availability from the United Nations Food and Agriculture Organization.[27]

From each survey, we extracted data on survey location, time period, representativeness, sampling design, dietary assessment method, and the age- and sex-specific distributions (mean, standard deviation) of SSB intake and corresponding strata-specific sample size, using a standardized electronic spreadsheet. We evaluated the quality of population sampling and diet assessment methods and checked data for plausibility. SSB consumption data were adjusted for total energy by using the residual method to reduce measurement error and account for differences in physical activity and metabolic rate.[28]

To combine individual-level intake data with country-level food availability data, to address issues of data incomparability, and to capture the uncertainty in estimates of beverage intake attributable to measurement error, sampling uncertainty, and modeling uncertainty, we used established age-integrating Bayesian hierarchical modeling methods. The primary model inputs were survey-level quantitative data, including country-, time-, age-, and sex-specific consumption levels (mean and standard deviation); data on the numbers of subjects in each strata; survey-level indicator covariates for sampling representativeness, dietary assessment method, and type of dietary metric; country-level year-specific data relevant to sugar availability from the United Nations Food and Agriculture Organization; and country, region (21 regions), and superregion (7 groupings of regions) random effects (Table 1).[19,26] Model outputs were country-, age-, sex-, and year-specific estimates of mean SSB consumption and its uncertainty. In our present analysis, we used data on SSB consumption produced by this model for the year 2010.

Direct and BMI-Mediated Effects of SSB Intake on CVD, Diabetes Mellitus, and Cancers

We incorporated into our analysis the best available estimates for etiologic effects of SSBs on BMI and type 2 diabetes mellitus and of BMI on CVD (ischemic heart disease, stroke), type 2 diabetes mellitus, and cancers (esophageal, colon, pancreatic, breast, uterine, kidney, gall bladder; Tables 1 and 2).[24,29]

Effects of SSB Intake on BMI

Long-term effects of SSB intake on BMI in adults were derived from meta-analysis of 3 large prospective US cohort studies that have evaluated the effects of changes in SSB intake on changes in weight gain, namely, the Nurses' Health Study, the Nurses' Health Study II, and the Health Professionals Follow-up Study, with a combined sample size of 120 877 participants (Table 1). Each serving per day increase in SSB intake was associated with a 0.10 (95% confidence interval [CI], 0.05–0.15) kg/m^2 increase in BMI in individuals with BMI <25 and a 0.23 (95% CI, 0.14–0.32) kg/m^2 increase in BMI in individuals with BMI ≥25 (Table 2).[29] These estimates are consistent with a recent meta-analysis of 7 prospective cohorts (174 252 individuals) that reported an 0.12- to 0.22-kg increase in weight per serving per day of SSBs over a 1-year period, and a meta-analysis of 5 trials (292 participants) that found a 0.85-kg (95% CI, 0.50–1.2 kg) increase in body weight when SSBs were added to the diet.[30] These estimates are also broadly supported by results from 2 recent large randomized trials of the effects of SSB intake on weight gain in children, one of which reported BMI reductions of ~0.57 kg/m^2 for a 1.7 servings/d reduction in SSB intake over a 1-year period, and the other of which reported significant reductions in weight gain, body fat change, and BMI *z* score for each 104-kcal reduction in sugary beverage intake per day over an 18-month period.[2,3]

Effects of SSB Intake on Diabetes Mellitus

Effects of SSB consumption on diabetes mellitus were based on a meta-analysis of 8 prospective cohorts with a total of 310 819 participants and 15 043 cases of type 2 diabetes mellitus (Tables 1 and 2).[31] In this meta-analysis, individuals in the highest category of SSB intake (1–2 servings/d) had a 26% greater risk of developing type 2 diabetes mellitus in comparison with those in the lowest category of SSB intake (none or <1 serving per month; risk ratio, 1.26; 95% CI, 1.12–1.41). The association between SSB intake and risk of type 2 diabetes mellitus in this meta-analysis was consistent across sex and ethnic groups, which included blacks, whites, and Asians. Although there was heterogeneity among studies (I^2=66%), all but one showed positive associations between SSB intake and risk of type 2 diabetes mellitus, with the strength of the association increasing with study size and duration. Three cohorts included adjustment for BMI, most appropriate for our modeling of direct (nonobesity-mediated) effects, but these also adjusted for total energy intake, which could result in underestimation of true effects. Results from this meta-analysis are supported by other large studies, including a subcohort of the European Prospective Investigation into Cancer and Nutrition, which included 15 374 participants and 11 684 cases of type 2 diabetes mellitus, and reported a hazard ratio of 1.18 (95% CI, 1.06–1.32) for the association of SSBs with type 2 diabetes mellitus.[22,32]

Sensitivity Analyses

To determine whether relative risks for individual dietary components derived from prospective cohorts might overestimate the impact on chronic disease attributable to residual confounding by other dietary factors, we performed 3 sensitivity analyses based on studies of overall dietary patterns.[29] In brief, we compared the predicted risk of coronary heart disease (CHD) calculated from the effects of individual dietary components on CHD from cohort data with the observed risk of CHD in dietary pattern studies, including (1) prospective cohort studies on the association of overall dietary patterns with incident CHD, (2) randomized controlled feeding trials quantifying the effects of overall dietary patterns on SBP and low-density lipoprotein cholesterol, and (3) a large randomized clinical trial evaluating the impact of an overall dietary pattern on incident CVD events.

Effects of BMI on CVD, Diabetes Mellitus, and Cancers

Evidence for effects of BMI on CVD, diabetes mellitus, and site-specific cancers was obtained from published analyses of large international pooling studies[24,25] (Tables 1 and 2). The effects of BMI on CVD and diabetes mellitus were obtained from pooled analysis of 163 international cohorts with 2.43 million participants and 70 000 cases. At the reference median age of 60, the relative risk of BMI on CVDs, such as ischemic heart disease, stroke, and hypertensive heart disease ranged from 1.44 (95% CI, 1.40–1.48) to 1.90 (95 % CI, 1.17–3.07) per 5 kg/m^2 increase in BMI, and the corresponding pooled effect for diabetes mellitus was 2.32 (95% CI, 2.04–2.63). The effects of BMI on 7 site-specific cancers (breast, uterine, esophageal, pancreatic, colon, kidney, and gall bladder) were based on pooled analysis of 221 international cohorts with 282 137 cases.[25] The effects of SSB on CVD and cancers were assumed to be mediated only through changes in BMI, whereas the effects of SSB on diabetes mellitus were assumed to be mediated through both BMI- and non-BMI–related pathways.[31,33–35]

A J-shaped relationship between BMI and all-cause mortality has been observed in some population-based studies, and such nonlinearities are primarily attributable to effect modification by smoking or reverse causation attributable to underlying chronic disease (such as chronic respiratory disease or cancer) in which weight loss may precede death by a decade or more. Among the international pooling projects used in estimating the etiologic effects of BMI on CVD and diabetes mellitus for the present analysis, 21 kg/m^2 was the lowest empirically observed minimum beyond which no additional benefits of lowering BMI were found.[24] In our analyses, we therefore restricted benefits of SSB reduction up to a BMI of 21 kg/m^2, beyond which we did not include additional benefits of further weight reduction.

We used the same risk estimates in men and women and across different races based on evidence that proportional effects of BMI are generally similar by sex and race,[24,36] with the exception of specific cancers for which we used separate risk estimates in men versus women based on evidence for differing effects of BMI by sex[25] (Table 2). In our analysis, we included age-specific relative risks for the effects of BMI on CVD and diabetes mellitus, based on previous work demonstrating decreasing proportional effects at older ages.[24]

Cause-Specific Mortality by Country, Age, and Sex

Data on mortality from 235 causes were compiled as part of the 2010 GBD study (Table 1).[1] In brief, data were obtained on causes of death for 187 countries from 1980 to 2010 based on vital registration, verbal autopsy, mortality surveillance, censuses, surveys, hospitals, police records, and mortuaries; and assessed for completeness, diagnostic accuracy, missing data, stochastic variations, and probable causes of death. As described elsewhere, statistical modeling strategies estimated cause-specific mortality, including different permutations of covariates and assessment of model performance with specific models selected based on data quality and out-of-sample testing of prediction error and the validity of 95% uncertainty intervals (UIs).[1] Cause-specific mortality fractions within each age-sex group were constrained to sum to total mortality based on draws from the uncertainty distributions. The final mortality data set included cause-, age-, and sex-specific mortality for 187 countries between 1990 and 2010. In this analysis we used age-, sex-, and country-specific data for 2010 on deaths attributable to diabetes mellitus (E10–E14), ischemic heart disease (*International Classification of Diseases, Tenth Revision* codes I20–I25), ischemic stroke (I63, I65–I67, I69.3), hypertensive heart disease (I11), and breast (C50), uterine (C54–C55), esophageal (C15), pancreatic (C25), colon (C18–C21), kidney (C64), and gall bladder (C23) cancer.

Statistical Analysis

Estimation of Deaths Attributable to SSB Consumption

We quantified disease burdens attributable to SSB consumption in 2010 in 187 countries by age and sex by incorporating the data described above into a comparative risk assessment analytic framework (Figure 1). We included in our analysis the direct effects of SSB on diabetes mellitus and BMI, and the BMI-mediated effects of SSBs on diabetes mellitus, CVD (CHD, stroke), and cancers (breast, uterine, esophageal, colon, pancreatic, kidney, and gall bladder), as well. All analyses evaluated SSB consumption, effects of SSBs on diabetes mellitus and BMI, effects of BMI on diseases, and cause-specific mortality across 16 age- and sex-specific strata within each country (men and women ages 20–24, 25–34, 35–44, 45–54, 55–64, 65–74, 75–84, and 85+ years). We also accounted for stronger effects of SSB intake on BMI in overweight versus normal adults[29] by partitioning effects in each age-, sex-, and country-specific strata according to the proportion of the population who were normal weight or overweight.[7,8] Our analyses did not involve ecological correlations (ie, simple comparisons of SSB intakes and disease rates) because these would be limited by substantial confounding. We have instead quantitatively assessed and incorporated into our analysis age- and sex-specific data on SSB consumption, external evidence on causal effects of SSBs on disease risk, and validated data on country-, age-, sex-, and cause-specific mortality.

For diabetes mellitus and each BMI-related disease end point, we calculated the disease-specific population-attributable fraction attributable to SSB consumption:

$$\frac{\int_{x=0}^{m} RR(x)P(x)dx - \int_{x=0}^{m} RR(x)P'(x)dx}{\int_{x=0}^{m} RR(x)P(x)dx} \qquad (1)$$

where x=SSB consumption level; $P(x)$=current distribution in the age and sex stratum; $P'(x)$=alternative distribution (zero consumption); $RR(x)$=relative risk of mortality at SSB consumption level x; and m=maximum exposure level. Mortality attributable to SSB consumption was calculated by multiplying the calculated population-attributable fraction by the observed number of cause-specific deaths (Figure 1). Analyses were done separately for each country, age, and sex group, and assessed as both absolute and proportional mortality.

Estimation of DALYs Attributable to SSB Consumption

Disability-adjusted life-years (DALYs) are summary metrics of population health that measure how many years of healthy life are lost because of death and disability.[37] DALYs are the sum of 2 components: the years of life lost attributable to premature mortality and the years lived with disability. Years of life lost are computed by multiplying the number of deaths at each age by a standard life expectancy at that age in the given population. Years lived with disability are estimated as the prevalence of different disease sequelae multiplied by the disability weight for each sequela.[38] Disability weights are selected on the basis of surveys of the general population about the loss of health associated with the health state related to the disease sequelae.[39] The estimation of cause-specific DALYs by country, age, and sex has been described elsewhere.[37–39] DALYs attributable to SSB consumption were calculated by multiplying the total DALYs attributable to CVD, diabetes mellitus, and cancers by the country-,

Table 1. Description of Data Sources and Modeling Methods Used to Estimate Adult SSB Consumption Levels, the Effects of SSB Intakes on BMI and Diabetes Mellitus, and Total Cause-Specific Mortality by Country, Age, and Sex

Data Source and Description	Data Coverage	
SSB consumption by country, age, and sex	Individual-level survey data	National food availability data
Total consumption of sugar-sweetened beverages containing >50 kcal/8-oz serving, including sodas, fruit drinks, sports/energy drinks, and sweetened iced tea	A total of 780 age- and sex-specific data points, 88% nationally representative, were collected from 51 countries and represented 63% of the world's adult population. 16% of all data were from multiple dietary recall surveys, 20% of all data were from food-frequency questionnaires, 17% of data were from single dietary recall surveys, and 47% of data were from household availability surveys.	Total annual per capita sugar availability in each of 187 countries worldwide based on availability of sugar, sugar beet, sugar cane, noncentrifugal sugar, and sugar crops. These data are based on U.N. Food and Agriculture Organization (FAO) food balance sheets which capture a country's net annual food availability, accounting for imports and exports.
Relative risks by age and sex		
Effects of SSB on diabetes mellitus		
Published meta-analyses of 8 prospective cohort studies	Data were from US, European, and Asian cohorts including 310 819 participants and 15 043 cases of type 2 diabetes mellitus.*	
Linear effects of SSB on BMI		
Original meta-analysis of 3 prospective cohort studies (NHS I, NHS II, HPFS)	Data were from US cohorts including 120 877 participants.	
Effects of BMI on CVD and diabetes mellitus		
Published pooled analysis of 3 international pooling projects (APCSC, PSC, ERFC)	Data were from East Asian, North American, and European pooling projects comprising a total of 163 cohorts, 2.43 million participants, and 70 000 CVD events.[24]	
Effects of BMI on site-specific cancers		
Published meta-analysis of 221 cohort studies.	Data were from North American, East Asian, European, and Australian cohorts with a total of 282 137 incident cases of cancer >133 000 000 person-years of follow-up.[25]	
Cause-specific total mortality by country, age, and sex[1]		
Vital registration with medical certification of cause of death	Data represented 2798 site-years from 130 countries	
Verbal autopsy (sample registration, demographic surveillance systems)	Data represented 486 site-years from 66 countries, 10% nationally representative	
Cancer registries	Data represented 2715 site-years from 93 countries	
Survey/census data	Data were from 56 national surveys	
Sibling history	Data represented 1557 survey-years from 61 countries	
Burial/mortuary data	Data represented 32 site-years from 11 countries	
Hospital records	Data represented 21 site-years	
Police records	Data represented 1129 site-years from 122 countries	

These represent the primary data used in analyses to compute mortality attributable to SSB consumption by age, sex, and country in 2010. BMI indicates body mass index; CVD, cardiovascular disease; MCMC, Markov chain Monte Carlo; and SSB, sugar-sweetened beverages.

*Malik et al (2010).[5] A meta-analysis of 8 prospective cohorts (310 819 participants, 15 043 incident cases of diabetes mellitus), comparing the highest (1–2 servings/d) vs lowest (<1 serving/mo) category of intake. Three cohorts included adjustment for BMI, most appropriate for our modeling of direct (non–obesity-mediated) effects; but these also adjusted for total energy intake, which could result in underestimation of true effects. A more recent meta-analysis of 6 cohorts, published after finalization of our dietary RRs, reported a similar pooled dose-response association per daily SSB serving of 1.20 (95% CI, 1.12–1.29).[22]

Statistical Methods Used for Pooling and Modeling Data From Diverse Global Sources		
Modeling Approach	Covariates	Validity
DisMod3,[19] a Bayesian hierarchical method was used to pool data from multiple sources and model missing data using informative time-varying covariates, borrowing information across geographical regions and time periods while also incorporating uncertainty attributable to measurement error and model specification. Models were fit by using a randomized MCMC algorithm based on the Adaptive Metropolis step function.	Both study-specific and national-level covariates were incorporated in the model. Study-level covariates included information on national representativeness of data points, method/metric of data collection, and sex. Country-level information included country, region, and superregion random effects. Other country-level covariates such as gross domestic product were tested but did not improve prediction.	Models were assessed for convergence of MCMC iterations and were validated by using goodness-of-fit tests. Final model results were assessed for plausibility by subject-matter experts.
Systematic review and meta-analysis were used to identify and pool relevant data from cohort studies. Given that the effects of SSB on incidence of diabetes mellitus are attenuated with age, we extrapolated the effect estimate into 10-y age groups from age 20 to 100 using an age pattern derived from the average percent change in relative risk for CVD and diabetes mellitus across 4 metabolic risk factors.	Included studies considered adjustment for potential confounding by age, sex, and various lifestyle factors, such as smoking, alcohol use, and physical activity, and various dietary habits. For most, a positive association persisted, suggesting an independent effect of SSBs on incident diabetes mellitus.	Standard methods of assessing publication bias, such as Begg and Eggers tests and visual inspection of funnel plots indicated no evidence of such bias in this analysis. Cochrane Q test and the I^2 statistic revealed statistically significant heterogeneity, which was reduced in sensitivity analyses excluding smaller studies of shorter duration.
The association of change in BMI with change in SSB consumption was assessed by using multivariate linear regression accounting for within-person repeated measures. Results across the 3 cohorts were pooled by an inverse-variance weighted meta-regression as described in earlier work.[23] Separate linear effects were estimated for BMI < 25 and BMI ≥ 25 because the rate of increase in BMI attributable to SSB intake varies based on an individual's baseline BMI.	Analyses were adjusted for age, baseline BMI, and changes in other lifestyle behaviors such as diet, smoking, physical activity, alcohol consumption, sleep duration, and TV watching.	Change in SSB consumption resulted in a statistically significant change in BMI across all 3 cohorts, and the magnitude of change in BMI was consistent across all cohorts. This is the only analysis thus far to examine effects of change in SSB consumption on change in adiposity.
Relative risks from the pooling projects were interpolated and extrapolated into standard age groups by using log-linear models. Age-specific relative risks were pooled using random-effects models. Trends in age-specific relative risks from pooled analyses were compared with trends in original cohort data to ensure validity of pooled results.	Effect modification by race/ethnicity and sex were assessed but were not found to be statistically significant.	Trends in age-specific relative risks from pooled analyses were compared with trends in original cohort data to ensure validity of pooled results. The I^2 test did not reveal significant heterogeneity between studies for any age group.
Systematic review and random-effects meta-analysis	Effect modification by race/ethnicity, sex, and age were assessed for cancers other than breast and ovarian, but were not found to be statistically significant.	Between-study heterogeneity varied by cancer, from low to moderate (0%–55%), and there was no evidence of publication bias in inspection of funnel plots.
Cause of Death Ensemble Modeling (CODEm), a modeling strategy encompassing 4 families of statistical models, was used to pool mortality data from diverse sources, aggregate deaths hierarchically, and capture uncertainty attributable to model parameter estimation, model specification, and fundamental sources of error.	Covariates were selected from a database of mortality predictors based on the cause of death being modeled. Covariates were tested for predictive ability before inclusion in a given model.	Models were validated by using out-of-sample predictive validity tests in which 30% of data were withheld from initial model fits. Predicted trends were then compared with trends in the existing held-out data.

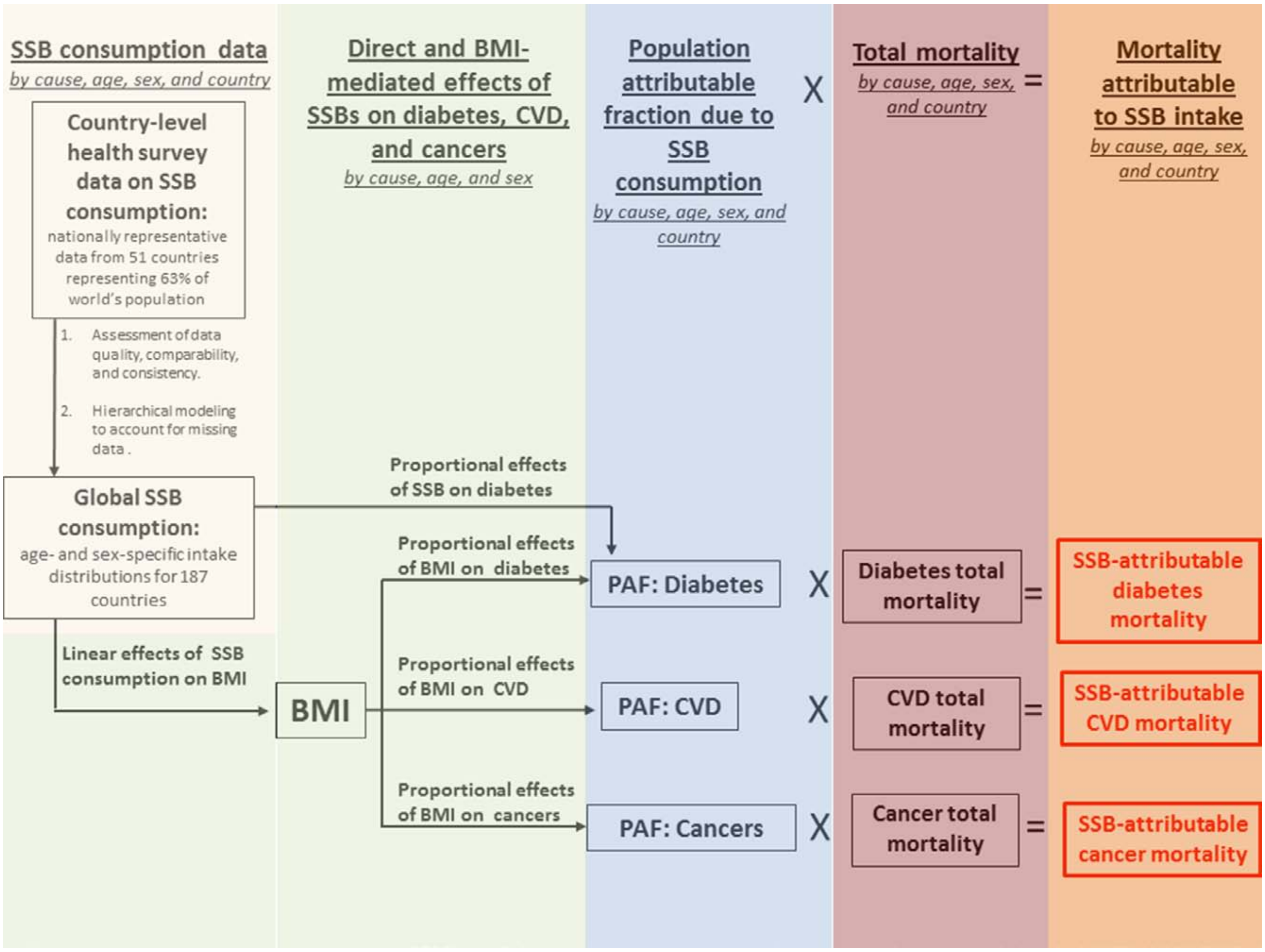

Figure 1. Schematic diagram of the relationships between the data sources used in the comparative risk assessment modeling framework on which this analysis is based. BMI indicates body mass index; CVD, cardiovascular disease; PAF, population-attributable fraction; and SSB, sugar-sweetened beverages.

age-, and sex-specific population-attributable fractions, which were calculated as described above.[37,38]

Estimation of Uncertainty

We used Monte Carlo simulation to quantify the uncertainty in the attributable deaths and DALYs, propagating the uncertainty from SSB intake data (which includes both measurement and sampling error and modeling uncertainty), and uncertainty from the relative risks into our final estimates. We drew 1000 times from the distribution of SSB consumption for each country-age-sex group as characterized by its mean and standard error. For each mean exposure, population-representative standard deviations were predicted by using coefficients from regressions performed on all available dietary survey data in our collection, in which standard deviation was the dependent variable and mean was the independent variable.[40,41] Independent of exposure, we generated 1000 draws of the etiologic relative risks of SSB intake on diabetes mellitus and BMI, and of BMI on adiposity-related diseases. These simultaneous draws were entered into the analysis to generate 1000 mortality estimates for each country-age-sex group, of which we report the mean and 95% UIs. All analyses were performed by using R software, version 2.15.0.

Results

In 2010, the mean global consumption of SSBs among adults was 0.58 servings/d (95% UI, 0.37–0.89). The mean intake varied substantially in men and women across different ages and world regions, highest in countries in Latin America and the Caribbean and lowest in parts of East Asia. Detailed findings on SSB consumption patterns across the world have been reported.[26]

Mortality Related to SSB Consumption

Global Mortality Related to SSB Consumption

In 2010, the model attributed a total of 184 000 (95% UI, 161 000–208 000) deaths globally to SSB intake (Table 3), representing 5.3% (95% UI, 5.0%–5.5%) of all diabetes mellitus deaths, 0.4% (95%UI, 0.3%–0.6%) of BMI-related CVD deaths, and 0.3% (95% UI, 0.2%–0.3%) of all BMI-related cancer deaths. Most of these deaths (72.3% or 133 000; 95% UI, 126 000–139 000) were attributable to diabetes mellitus, 24.2% (45 000; 95% UI, 29 000–61 000) were attributable to CVD, and 3.5% (6450; 95% UI, 4300–8600) were attributable to BMI-related cancers. Half of all SSB-attributable deaths were in women. Three in 4 (75.9%) of all deaths attributable to SSB consumption occurred in low- and middle-income countries. Globally, absolute mortality from SSBs was greatest in adults >65 years of age, at 167 (95% UI, 141–195) deaths per million adults. Conversely, proportional mortality was highest among adults aged 20 to 44 years, in whom 14.0% (95% UI, 12.9%–15.0%) of all diabetes mellitus– and adiposity-related deaths were attributable to SSB consumption.

Regional Mortality Related to SSB Consumption

Across 9 major world regions, Latin America and the Caribbean had the highest absolute mortality related to SSB consumption (48 000 per million adults; 95% UI, 41 000–54 000), whereas Australia and New Zealand had the lowest (560; 95% UI, 440–700; Table 3). Among age and sex groups in these regions, men >65 years in Latin America and the Caribbean had the highest SSB-related absolute mortality (582 deaths per million men; 95% UI, 485–681); women >65 years of age in this region were close behind (552 deaths per million women; 95% UI, 460–644). Adults 65+ years in the United States and Canada had the next highest SSB-attributable mortality: 379 (95% UI, 285–478) per million men and 300 (95% UI, 227–386) per million women. Women aged 20 to 44 years in Western Europe and Australia/New Zealand had the lowest mortality: 2 (95% UI, 1–3) deaths per million.

Although older adults had the highest absolute mortality attributable to SSBs, younger adults had the highest proportional mortality (Table 3). Among adults aged 20 to 44 years in Latin America/Caribbean, 1 in 7 (13.9%; 95% UI, 11.7%–16.1%) of all diabetes mellitus– and adiposity-related deaths in men and 1 in 9 (10.9%; 95% UI, 9.3%–12.4%) of all such deaths in women were attributable to SSBs. Considering only deaths attributable to diabetes mellitus, 1 in 3 such deaths in men aged 20 to 44 years in both Latin America/Caribbean and United States/Canada were attributable to SSBs. Among all diabetes mellitus deaths, the percentage related to SSB consumption exceeded 10% among adults aged 20 to 44 years in every world region except South Asia.

National Mortality Related to SSB Consumption

Across all countries worldwide, proportional mortality related to SSB intake varied substantially (Figure 2, Table II in the online-only Data Supplement). Proportional deaths were highest in Mexican men aged 20 to 44 years, in whom 1 in 3 (33.6; 95% UI, 26.4–39.5%) diabetes mellitus– and BMI-related deaths were linked to SSB consumption. Proportional mortality also exceeded 20% in adults aged 20 to 44 years in Kiribati, Gabon, Marshall Islands, Belize, Barbados, and Tonga. Proportional mortality attributable to SSBs was lowest in adults aged >65 years in several East Asian countries, approaching zero in some cases.

Among larger nations (population >1 million), the SSB-related mortality rate was highest in Mexico (405 deaths per million adults; 95% UI, 345–462) and lowest in Bangladesh (1; 95% UI, 0–2 deaths per million adults; Table II in the online-only Data Supplement). In total, Mexico had an estimated 24 000 (95% UI, 21 000–28 000) SSB-related deaths in 2010, whereas Bangladesh had 72 (95% UI, 40–104) such deaths. Among the 20 countries with highest SSB-related deaths, at least 8 of these countries were in Latin America and the Caribbean across all age and sex subgroups (Figure 3).

Of the 20 most populous countries in the world, the death rate related to SSB intake was highest in Mexico in all age-sex groups, followed by the United States, Indonesia, and Brazil (Figure I in the online-only Data Supplement). In these 20 countries, most SSB-related deaths were attributable to diabetes mellitus, except in Russia and Egypt in which most SSB-related deaths were attributable to CVD. Overall, the United States ranked second in SSB-related deaths among the 20 most populous countries, with an absolute death rate of 125 (95% UI, 101–149) per million adults, or 25 000 total deaths (95% UI, 20 000–30 000) related to SSB consumption in 2010 (Table II in the online-only Data Supplement).

Morbidity Related to SSB Consumption

Global DALYS Related to SSB Consumption

In 2010, a total of 8 526 456 (95% UI, 2 769 953–19 244 657) DALYs were attributable to SSBs, of which 49.5% were attributable to CVD, 41.4% were attributable to diabetes mellitus, 4.5% were attributable to BMI-related cancers, and 4.9% were attributable to musculoskeletal disorders (Table 4 and Table III in the online-only Data Supplement.). Globally, 0.7% (95% UI, 0.3%–1.5%) of total DALYs were related to SSB consumption; 1.6% (95% UI, 0.5%–4.5%) of CVD DALYs, 4.5% (95% UI, 1.7%–8.9%) of diabetes mellitus DALYs, 0.2% (95% UI, 0.1%–0.7%) of obesity-related cancer DALYs, and 0.4% (95% UI, 0.1%–1.3%) of musculoskeletal DALYs were attributable to intake of SSBs. Lower- and middle-income countries had the largest absolute number of SSB-related DALYs, a total of 4 243 602 (95% UI, 998 925–9 058 923) DALYs, or 2931 (95% UI, 690–6258) per million adults. Upper- and middle-income countries had the highest percentage of diabetes mellitus–related DALYS that were related to SSB consumption (6.1%; 95% UI, 2.5–11.7; Table 4).

As with SSB-related mortality, the absolute number of DALYs attributable to SSBs was highest in men >65 years of age, at 6230 (95% UI, 2300–16 095) DALYs per million. Men <45 years of age had the highest percentage of CVD-related DALYs caused by SSBs (2.9%; 95% UI, 1.0%–6.9%), and the highest percentage of diabetes mellitus–related DALYS caused by SSBs (6.1%; 95% UI, 2.3%–12.1%).

Regional DALYs Related to SSB Consumption

Among 9 world regions, the greatest absolute SSB-related burdens were in South Asia, with 3528 (95% UI, 686–7070) DALYs per million adults and United States/Canada (3265; 95 % UI, 1934–4982), whereas Australia/New Zealand had the least (609; 95% UI, 364–1028). In Latin America/Caribbean, almost 1 in 10 diabetes mellitus–related DALYs were related to SSB consumption (9.7%; 95% UI, 4%–18.3%), which also accounted for ~1 in 12 diabetes mellitus–related DALYs in United States/Canada (8.5%; 95% UI, 3.9%–14.3%). The percentage of all diabetes mellitus–related DALYs caused by SSB consumption was highest in men <45 years of age in United States/Canada (12.9%; 95% UI, 5.8%–21.8%) and Latin America/Caribbean (12.4%; 95% UI, 5.0%–23.2%).

National DALYs Related to SSB Consumption

Of the world's 20 most populous countries, Mexico had the greatest number of SSB-attributable DALYs per million adults (3960; 95% UI, 1516–13 990), whereas China had the lowest (584; 95% UI, 42–2462). In Mexico, almost 1 of every 6 diabetes mellitus–related DALYs was attributable to SSB intake (15.8%; 95% UI, 7.0%–27.5%). In the United States, a total of 32 997 (95% UI, 2279–73 697) DALYs were related to SSB consumption in 2010, or 2087 (95% UI, 2050–5180) per

Table 2. Sources and Magnitudes of the Effects of SSBs on Diabetes Mellitus, SSB on BMI, and BMI on Chronic Disease Outcomes

Risk Factor	Type of Effect Estimate	Source of Effect Estimate	Unit of Effect Estimate	Sex
SSB-diabetes mellitus	Relative risk	Published meta-analysis of 8 prospective cohort studies*	Per SSB serving/d	Both
SSB-BMI (for baseline BMI < 25)	Linear effect	Original meta-analysis of 3 prospective cohort studies[29]	kg/m^2 increase in BMI per SSB serving/d	Both
SSB-BMI (for baseline BMI ≥ 25)	Linear effect	Original meta-analysis of 3 prospective cohort studies[29]	kg/m^2 increase in BMI per 8-oz SSB serving/d	Both
BMI-ischemic stroke	Relative risk	Pooled analysis of APCSC, PSC, and ERFC international pooling projects[24]	Per kg/m^2 increase in BMI	Both
BMI-ischemic heart disease	Relative risk	Pooled analysis of APCSC, PSC, and ERFC international pooling projects[24]	Per 5 kg/m^2 increase in BMI	Both
BMI-hypertensive heart disease	Relative risk	Pooled analysis of APCSC, PSC, and ERFC international pooling projects[24]	Per 5 kg/m^2 increase in BMI	Both
BMI-diabetes mellitus	Relative risk	Pooled analysis of APCSC, PSC, and ERFC international pooling projects[24]	Per 5 kg/m^2 increase in BMI	Both
BMI-breast cancer	Relative risk	Meta-analysis of 221 cohort studies[25]	Per 5 kg/m^2 increase in BMI	Female
BMI-colon cancer	Relative risk	Meta-analysis of 221 cohort studies[25]	Per 5 kg/m^2 increase in BMI	Female
				Male
BMI-pancreatic cancer	Relative risk	Meta-analysis of 221 cohort studies[25]	Per 5 kg/m^2 increase in BMI	Female
				Male
BMI-esophageal cancer	Relative risk	Meta-analysis of 221 cohort studies[25]	Per 5 kg/m^2 increase in BMI	Female
				Male
BMI-uterine cancer	Relative risk	Meta-analysis of 221 cohort studies[25]	Per 5 kg/m^2 increase in BMI	Female
BMI-kidney cancer	Relative risk	Meta-analysis of 221 cohort studies[25]	Per 5 kg/m^2 increase in BMI	Female
				Male
BMI-gall bladder cancer	Relative risk	Meta-analysis of 221 cohort studies[25]	Per 5 kg/m^2 increase in BMI	Female
				Male

BMI indicates body mass index; CI, confidence interval; CVD, cardiovascular disease; and SSB, sugar-sweetened beverages.

*Malik et al (2010).[5] A meta-analysis of 8 prospective cohorts (310 819 participants, 15 043 incident cases of diabetes mellitus), comparing the highest (1–2 servings/d) vs lowest (<1 serving/mo) category of intake. Three cohorts included adjustment for BMI, most appropriate for our modeling of direct (nonobesity-mediated) effects; but these also adjusted for total energy intake, which could result in underestimation of true effects. A more recent meta-analysis of 6 cohorts, published after finalization of our dietary RRs, reported a similar pooled dose-response association per daily SSB serving of 1.20 (95% CI, 1.121.29).[22]

million adults, and 1.1% (95% UI, 0.6%–1.6%) of all DALYs in the United States were attributable to SSBs.

Discussion

These findings, based on a model that incorporated individual-level national surveys of SSB consumption, country-level food availability data, the adiposity-mediated and direct effects of SSBs on chronic diseases, and cause-specific deaths and disability by age, sex, and country, provide current estimates of the worldwide annual mortality and morbidity related to SSB consumption. In total, our model attributed >180 000 global deaths in 2010 to SSB consumption, with 72.3% from diabetes mellitus, 24.2% from CVD, and 3.5% from cancers. In addition, >8.5 million DALYs were linked to SSB consumption globally. To our knowledge, this investigation represents the first comprehensive, systematic assessment of the worldwide burdens of diabetes mellitus, CVD, and cancers attributable to SSBs.

Our findings demonstrate remarkable geographic heterogeneity in SSB-related mortality and morbidity, with substantial absolute and proportional burdens in Latin America and the Caribbean, and nearly none in East Asia. In Caribbean and Latin American countries, such as Mexico, homemade sugary beverages (eg, “frescas”) are often made and consumed in addition to commercially produced SSBs; these high intakes are compounded by some of the highest rates of both obesity and diabetes mellitus in the world.[7,8,42] The low cost of SSBs, lax regulation of advertising, and poor access to clean drinking water in some Latin American and Caribbean countries could contribute to the high SSB intakes in these regions and are natural targets for policy-driven interventions.[43,44] Although the global proportion of deaths related to SSB consumption may seem low at first glance at ~.2% of all diabetes mellitus, CVD, and cancer deaths, we found great variability in national and regional burdens, with SSB-attributable proportional mortality in Mexican men aged 20 to 44 years as high as 33%. Importantly, our findings demonstrate that 75% of deaths and 85% of DALYs related to sugary beverages occur in low- and middle-income countries, highlighting the need for effective

Effect Size by Age Group						
25–34	35–44	45–54	55–64	65–74	75–84	85+
1.41 (1.19–1.66)	1.39 (1.18–1.63)	1.32 (1.15–1.51)	1.26 (1.12–1.41)	1.21 (1.10–1.33)	1.16 (1.08–1.24)	1.08 (1.04–1.12)
0.10 (0.05–0.15)	0.10 (0.05–0.15)	0.10 (0.05–0.15)	0.10 (0.05–0.15)	0.10 (0.05–0.15)	0.10 (0.05–0.15)	0.10 (0.05–0.15)
0.23 (0.14–0.32)	0.23 (0.14–0.32)	0.23 (0.14–0.32)	0.23 (0.14–0.32)	0.23 (0.14–0.32)	0.23 (0.14–0.32)	0.23 (0.14–0.32)
2.09 (1.81–2.40)	1.86 (1.67–2.08)	1.67 (1.53–1.81)	1.50 (1.40–1.60)	1.35 (1.28–1.41)	1.21 (1.16–1.26)	1.04 (0.96–1.12)
1.79 (1.56–2.06)	1.66 (1.51–1.84)	1.55 (1.46–1.64)	1.44 (1.40–1.48)	1.35 (1.32–1.38)	1.26 (1.20–1.32)	1.14 (1.04–1.26)
2.30 (0.66–7.95)	2.15 (0.80–5.78)	2.02 (0.97–4.21)	1.90 (1.17–3.07)	1.81 (1.45–2.26)	1.63 (1.53–1.74)	1.45 (1.05–2.01)
3.55 (2.41–5.23)	3.07 (2.28–4.15)	2.66 (2.15–3.30)	2.32 (2.04–2.63)	2.03 (1.95–2.11)	1.70 (1.61–1.79)	1.38 (1.23–1.56)
1.12 (1.08–1.16)	1.12 (1.08–1.16)	1.12 (1.08–1.16)	1.12 (1.08–1.16)	1.12 (1.08–1.16)	1.12 (1.08–1.16)	1.12 (1.08–1.16)
1.07 (1.03–1.12)	1.07 (1.03–1.12)	1.07 (1.03–1.12)	1.07 (1.03–1.12)	1.07 (1.03–1.12)	1.07 (1.03–1.12)	1.07 (1.03–1.12)
1.20 (1.17–1.24)	1.20 (1.17–1.24)	1.20 (1.17–1.24)	1.20 (1.17–1.24)	1.20 (1.17–1.24)	1.20 (1.17–1.24)	1.20 (1.17–1.24)
1.12 (1.03–1.23)	1.12 (1.03–1.23)	1.12 (1.03–1.23)	1.12 (1.03–1.23)	1.12 (1.03–1.23)	1.12 (1.03–1.23)	1.12 (1.03–1.23)
1.07 (0.93–1.23)	1.07 (0.93–1.23)	1.07 (0.93–1.23)	1.07 (0.93–1.23)	1.07 (0.93–1.23)	1.07 (0.93–1.23)	1.07 (0.93–1.23)
1.51 (1.31–1.74)	1.51 (1.31–1.74)	1.51 (1.31–1.74)	1.51 (1.31–1.74)	1.51 (1.31–1.74)	1.51 (1.31–1.74)	1.51 (1.31–1.74)
1.52 (1.33–1.74)	1.52 (1.33–1.74)	1.52 (1.33–1.74)	1.52 (1.33–1.74)	1.52 (1.33–1.74)	1.52 (1.33–1.74)	1.52 (1.33–1.74)
1.59 (1.5–1.68)	1.59 (1.5–1.68)	1.59 (1.5–1.68)	1.59 (1.5–1.68)	1.59 (1.5–1.68)	1.59 (1.5–1.68)	1.59 (1.5–1.68)
1.34 (1.25–1.43)	1.34 (1.25–1.43)	1.34 (1.25–1.43)	1.34 (1.25–1.43)	1.34 (1.25–1.43)	1.34 (1.25–1.43)	1.34 (1.25–1.43)
1.24 (1.15–1.34)	1.24 (1.15–1.34)	1.24 (1.15–1.34)	1.24 (1.15–1.34)	1.24 (1.15–1.34)	1.24 (1.15–1.34)	1.24 (1.15–1.34)
1.59 (1.02–2.47)	1.59 (1.02–2.47)	1.59 (1.02–2.47)	1.59 (1.02–2.47)	1.59 (1.02–2.47)	1.59 (1.02–2.47)	1.59 (1.02–2.47)
1.09 (0.98–1.2)	1.09 (0.98–1.2)	1.09 (0.98–1.2)	1.09 (0.98–1.2)	1.09 (0.98–1.2)	1.09 (0.98–1.2)	1.09 (0.98–1.2)

interventions to reduce SSB consumption in not only richer, but also lower-income countries. Furthermore, our model estimates the effect of removing all SSBs independent of any collateral effects that such a change might have. However, it is possible that reduction in SSB intake could additionally influence other dietary behaviors, such as switching to healthier beverages and otherwise improving diet quality. Therefore, the number of deaths and DALYs that could be prevented by reducing SSB consumption globally may be greater than what is estimated by our current model.

The absolute burdens of deaths attributable to SSB consumption are lower than for some risk factors for chronic diseases, including metabolic risk factors, such as BMI,[40] and other dietary factors, such as excess dietary sodium[41] and insufficient consumption of fruits and vegetables.[45] In 2010, ~2.4 million chronic disease deaths were attributable to elevated BMI,[40] with the BMI-mediated chronic disease mortality attributable to SSB consumption accounting for ~1 in 12 of those deaths. However, SSBs are but 1 contributor to the obesity epidemic, which is also related to multiple additional factors such as consumption of refined carbohydrates, other dietary sugars, inadequate physical activity, genetics/epigenetics, and psychosocial/environmental factors. In light of this, the number of SSB-related deaths is considerable given that it is only a single component of diet. In 2010, ~2.7 million deaths were attributable to elevated intake of dietary sodium[41] and 4.7 million were attributable to inadequate fruit and vegetable consumption[45]; yet, in comparison with sodium, which is nearly ubiquitous across the food supply, or fruits and vegetables, which represent large and diverse classes of foods, SSBs represent only a single class of beverage. Although substantial increases in global consumption of fruits and vegetables would require major long-term changes to agricultural systems, policies, transport and storage infrastructures, food manufacturing, and sociocultural priorities and norms, SSBs could be decreased without any new investments or technological advances in agriculture, transport, storage, manufacturing, or marketing.

Table 3. Global And Regional Deaths Related to SSB Consumption in 2010

	Population Characteristics			Number of Deaths Attributable to SSBs (95% UI)			
	Population (millions)	Mean SSB Intake (Servings/d)	Mean BMI (kg/m²)	CVD*	Diabetes Mellitus†	Cancers‡	Total§
Globe							
Women							
Ages 20–44	987	0.8 (0.3–1.3)	25 (23–26)	1299 (891–1725)	7760 (7152–8337)	268 (186–351)	9327 (8392–10 254)
Ages 45–64	654	0.4 (0.2–0.6)	27 (25–29)	4764 (3229–6342)	27 473 (25 067–29 900)	1154 (778–1555)	33 391 (29 786–37 045)
Ages ≥65	293	0.3 (0.1–0.5)	26 (23–29)	13 739 (8905–19 263)	33 385 (30 527–36 169)	1854 (1204–2537)	48 978 (41 292–56 966)
Women overall	1930	0.5 (0.2–0.8)	26 (24–28)	19 802 (13 133–27 332)	68 618 (64 410–72 881)	3276 (2160–4427)	91695 (80923–103015)
Men							
Ages 20–44	1020	0.9 (0.4–1.4)	24 (23–26)	3045 (2071–4043)	10 291 (9426–11 115)	189 (131–251)	13 525 (11 887–15 214)
Ages 45–64	645	0.4 (0.2–0.7)	26 (24–27)	9846 (6499–13 274)	28 713 (26 343–31 181)	1221 (839–1626)	39 780 (34 247–45 183)
Ages ≥65	231	0.3 (0.1–0.5)	25 (23–27)	12 027 (7851–16 371)	25 159 (23 081–27 343)	1749 (1191–2318)	389 35 (32 988–45 331)
Men overall	1890	0.6 (0.2–0.9)	25 (23–27)	24 918 (16 357–33 582)	64 163 (60 411–67 903)	3159 (2170–4198)	92 240 (80 161–105 248
Both sexes overall	3830	0.5 (0.2–0.9)	25 (23–27)	44 680 (29 087–60 715)	132 652 (125 924–139 384)	6449 (4333–8637)	183 781 (160 625–208 002
Country income level							
High income	763	0.5 (0.3–0.6)	27 (25–28)	14 034 (8571–20 249)	27 812 (24 197–31 548)	3056 (1897–4279)	44 901 (34 663–56 077)
Upper-middle income	1530	0.7 (0.3–1.1)	26 (24–28)	20 727 (13 597–28 337)	60 118 (54 138–66 061)	2606 (1734–3516)	83 451 (69 469–97 914)
Lower-middle income	1210	0.6 (0.2–1.0)	25 (23–27)	8939 (576–1490)	36 886 (33 412–40 536)	650 (424–896)	46 475 (34 412–42 921)
Low income	323	0.3 (0.1–0.5)	22 (20–24)	1021 (576–1490)	7965 (7395–8532)	124 (67–183)	9109 (8039–10 205)
Australia and New Zealand							
Women							
Ages 20–44	3.6	0.4 (0.2–0.6)	26 (25–27)	1 (1–2)	6 (5–8)	1 (1–2)	9 (7–11)
Ages 45–64	3.35	0.2 (0.1–0.3)	29 (28–30)	7 (4–10)	26 (19–34)	7 (4–10)	40 (30–51)
Ages ≥65	1.94	0.1 (0.1–0.2)	28 (27–29)	70 (38–110)	107 (81–132	18 (11–25)	195 (146–253)
Overall	8.89	0.2 (0.1–0.4)	27 (26–28)	79 (45–122)	139 (111–168)	26 (15–36)	244 (189–310)
Men							
Ages 20–44	3.57	0.4 (0.2–0.6)	27 (26–28)	5 (3–7)	10 (7–13)	1 (0–1)	16 (12–20)
Ages 45–64	3.28	0.2 (0.1–0.3)	29 (28–30)	26 (16–37)	52 (38–66)	8 (5–11)	86 (65–107)
Ages ≥65	1.64	0.1 (0.1–0.2)	28 (27–29)	70 (39–103)	126 (98–155)	20 (12–28)	215 (163–272)
Overall	8.48	0.2 (0.1–0.4)	28 (27–28)	101 (61–146)	188 (155–222)	29 (17–40)	317 (249–389)
Both sexes overall	17.4	0.2 (0.1–0.4)	28 (27–28)	180 (107–263)	327 (280–371)	54 (33–75)	561 (444–694)
Canada and United States							
Women							
Ages 20–44	45	1.6 (1.2–2.0)	26 (26–27)	133 (77–199)	690 (500–850)	40 (23–58)	863 (660–1057)
Ages 45–64	46.1	0.8 (0.6–1.0)	29 (28–30)	645 (388–936)	2621 (1921–3363)	222 (132–321)	3488 (2605–4342)
Ages ≥65	25.6	0.6 (0.4–0.7)	28 (27–29)	2531 (1365–4106)	4729 (3583–5888)	437 (261–630)	7698 (5816–9888)
Overall	117	1.0 (0.8–1.2)	28 (27–28)	3310 (1903–5176)	8040 (6670–9441)	699 (421–992)	12 049 (9467–14 760)
Men							
Ages 20–44	46.3	1.8 (1.3–2.2)	27 (27–28)	378 (216–558)	1116 (850–1368)	33 (20–48)	1527 (1170–1853)
Ages 45–64	44.2	0.9 (0.7–1.1)	29 (29–30)	1714 (1035–2445)	4040 (2899–5119)	277 (167–399)	6031 (4617–7501)
Ages ≥65	19.4	0.6 (0.5–0.8)	28 (27–28)	2365 (1334–3569)	4541 (3380–5693)	433 (257–618)	7339 (5521–9245)
Overall	110	1.1 (0.8–1.4)	28 (27–29)	4457 (2613–6373)	9697 (8072–11 325)	743 (447–1041)	14 897 (11 858–18 080)
Both sexes overall	226	1.1 (0.8–1.3)	28 (27–28)	7767 (4667–11 383)	17 736 (15 540–20 035)	1443 (870–2035)	26 946 (21 785–32 008)
East/Central Eurasia							
Women							
Ages 20 to 44	60.4	0.4 (0.2–0.6)	24 (22–26)	109 (68–152)	212 (184–240)	17 (11–24)	338 (279–405)
Ages 45 to 64	55.5	0.2 (0.1–0.3)	28 (26–30)	858 (524–1204)	749 (639–855)	136 (81–193)	1743 (1304–2192)
Ages 65 and older	32.5	0.1 (0.1–0.2)	28 (24–31)	4093 (2397–5798)	1301 (1154–1451	252 (152–358)	5647 (3802–7521)
Overall	148	0.2 (0.1–0.4)	26 (24–29)	5061 (2994–7115)	2262 (2066–2472)	405 (244–574)	7728 (5397–10 114)
Men							
Ages 20 to 44	59.7	0.4 (0.2–0.6)	25 (24–27)	496 (305–697)	340 (299–381)	15 (9–20)	850 (642–1081)

Deaths per Million Adults Attributable to SSBs (95% UI)				Proportion of Deaths Attributable To SSBs (95% UI)			
CVD*	Diabetes Mellitus†	Cancers‡	Total§	CVD*	Diabetes Mellitus†	Cancers‡	Total§
1 (0–2)	8 (7–8)	0 (0–0)	9 (9–10)	1.3 (0.9–1.7)	14.2 (13.1–15.3)	0.3 (0.2–0.4)	4.0 (3.6–4.4)
7 (5–10)	42 (38–46)	2 (1–3)	51 (46–57)	0.8 (0.5–1.0)	8.5 (7.7–9.2)	0.3 (0.2–0.4)	2.6 (2.3–2.9)
47 (30–66)	114 (104–124)	6 (4–9)	167 (141–195)	0.3 (0.2–0.4)	3.4 (3.1–3.7)	0.2 (0.2–0.3)	0.8 (0.6–0.9)
10 (7–14)	35 (33–38)	2 (1–3)	47 (42–53)	0.4 (0.2–0.5)	5.1 (4.7–5.4)	0.3 (0.2–0.4)	1.2 (1.0–1.3)
3 (2–4)	10 (9–11)	0 (0–0)	13 (12–15)	1.3 (0.9–1.7)	13.5 (12.4–14.6)	0.3 (0.2–0.4)	3.8 (3.4–4.3)
15 (10–21)	45 (41–48)	2 (1–3)	62 (53–70)	0.7 (0.5–1.0)	7.9 (7.2–8.6)	0.3 (0.2–0.4)	2.0 (1.7–2.2)
52 (34–71)	109 (100–118)	8 (5–10)	168 (143–196)	0.3 (0.2–0.4)	3.5 (3.2–3.8)	0.2 (0.1–0.3)	0.8 (0.6–0.9)
13 (9–18)	34 (32–36)	2 (1–3)	49 (42–56)	0.5 (0.3–0.6)	5.5 (5.2–5.8)	0.2 (0.2–0.3)	1.2 (1.1–1.4)
12 (8–16)	35 (33–36)	2 (1–3)	48 (42–54)	0.4 (0.3–0.6)	5.3 (5.0–5.5)	0.3 (0.2–0.3)	1.2 (1.0–1.3)
18 (11–27)	36 (32–41)	4 (2–6)	59 (45–73)	0.5 (0.3–0.8)	5.8 (5.3–6.3)	0.3 (0.2–0.4)	1.1 (0.9–1.3)
14 (9–19)	39 (35–43)	2 (1–3)	55 (45–65)	0.5 (0.3–0.6)	7.2 (6.6–7.7)	0.3 (0.2–0.3)	1.3 (1.2–1.5)
1 (0–2)	30 (28–34)	1 (0–2)	38 (28–35)	0.3 (0.2–0.4)	3.8 (3.5–4.1)	0.2 (0.1–0.2)	1.1 (1.0–1.2)
3 (2–5)	25 (23–26)	0 (0–0)	28 (25–32)	0.2 (0.1–0.3)	3.5 (3.3–3.7)	0.1 (0.1–0.2)	1.2 (1.1–1.3)
0 (0–1)	2 (1–2)	0 (0–0)	2 (1–3)	1.5 (0.9–2.1)	12.1 (9.0–15.2)	0.3 (0.2–0.4)	1.6 (1.2–2.0)
2 (1–3)	8 (6–10)	2 (1–3)	12 (9–15)	0.8 (0.5–1.2)	6.7 (4.9–8.8)	0.2 (0.1–0.4)	1.0 (0.7–1.2)
36 (19–57)	55 (42–68)	9 (5–13)	100 (75–130)	0.3 (0.1–0.4)	2.6 (2.0–3.3)	0.2 (0.1–0.3)	0.5 (0.4–0.7)
9 (5–14)	16 (13–19)	3 (2–4)	27 (21–35)	0.3 (0.2–0.5)	3.1 (2.5–3.8)	0.2 (0.1–0.3)	0.6 (0.4–0.7)
1 (0–2)	3 (2–4)	0 (0–0)	5 (3–6)	1.5 (0.9–2.1)	12.1 (8.5–15.6)	0.3 (0.2–0.4)	2.7 (2.0–3.4)
8 (5–11)	16 (12–20)	2 (1–3)	26 (20–33)	0.9 (0.5–1.2)	6.9 (5.1–8.7)	0.2 (0.1–0.3)	1.4 (1.1–1.8)
43 (24–63)	77 (60–95)	12 (7–17)	132 (100–166)	0.3 (0.2–0.5)	3.1 (2.4–3.8)	0.2 (0.1–0.3)	0.7 (0.5–0.9)
12 (7–17)	22 (18–26)	3 (2–5)	37 (29–46)	0.4 (0.2–0.6)	3.8 (3.2–4.5)	0.2 (0.1–0.3)	0.8 (0.7–1.0)
10 (6–15)	19 (16–21)	3 (2–4)	32 (26–40)	0.3 (0.2–0.5)	3.5 (3.0–4.0)	0.2 (0.1–0.3)	0.7 (0.5–0.9)
3 (2–4)	15 (11–19)	1 (0–2)	19 (15–23)	4.6 (2.7–6.9)	30.8 (22.4–38.0)	0.9 (0.5–1.3)	9.2 (7.1–11.3)
14 (8–20)	57 (42–73)	5 (3–7)	76 (57–94)	2.1 (1.3–3.1)	15.6 (11.4–20.0)	0.6 (0.4–0.9)	4.2 (3.2–5.3)
99 (53–160)	184 (140–230)	17 (10–25)	300 (227–386)	0.6 (0.3–1.0)	6.0 (4.5–7.4)	0.5 (0.3–0.7)	1.3 (1.0–1.7)
28 (16–44)	69 (57–81)	6 (4–8)	103 (81–126)	0.8 (0.4–1.2)	8.2 (6.8–9.6)	0.5 (0.3–0.7)	1.8 (1.4–2.2)
8 (5–12)	24 (18–30)	1 (0–2)	33 (25–40)	5.0 (2.9–7.4)	33.1 (25.2–40.5)	0.9 (0.5–1.3)	12.3 (9.4–14.9)
39 (23–55)	91 (66–116)	6 (4–9)	136 (105–170)	2.3 (1.4–3.3)	16.9 (12.1–21.4)	0.7 (0.4–1.1)	4.9 (3.7–6.1)
122 (69–184)	235 (175–294)	22 (13–32)	379 (285–478)	0.8 (0.5–1.2)	7.1 (5.3–8.9)	0.5 (0.3–0.7)	1.7 (1.3–2.2)
41 (24–58)	88 (74–103)	7 (4–9)	136 (108–165)	1.2 (0.7–1.7)	10.6 (8.8–12.4)	0.6 (0.3–0.8)	2.7 (2.1–3.2)
34 (21–50)	78 (69–88)	6 (4–9)	119 (96–141)	1.0 (0.6–1.4)	9.4 (8.2–10.6)	0.5 (0.3–0.8)	2.2 (1.8–2.6)
2 (1–3)	4 (3–4)	0 (0–0)	6 (5–7)	1.3 (0.8–1.8)	11.0 (9.6–12.4)	0.3 (0.2–0.4)	2.0 (1.7–2.4)
15 (9–22)	14 (12–15)	2 (1–3)	31 (24–40)	0.9 (0.5–1.2)	6.3 (5.3–7.2)	0.3 (0.2–0.4)	1.0 (0.7–1.3)
126 (74–178)	40 (36–45)	8 (5–11)	174 (117–231)	0.3 (0.2–0.5)	3.4 (3.0–3.7)	0.2 (0.1–0.3)	0.4 (0.3–0.5)
34 (20–48)	15 (14–17)	3 (2–4)	52 (36–68)	0.4 (0.2–0.5)	4.3 (3.9–4.7)	0.2 (0.1–0.3)	0.5 (0.3–0.6)
8 (5–12)	6 (5–6)	0 (0–0)	14 (11–18)	1.5 (0.9–2.1)	11.5 (10.1–12.9)	0.3 (0.2–0.4)	2.0 (1.5–2.6)

(*Continued*)

Table 3. Continued

	Population Characteristics			Number of Deaths Attributable to SSBs (95% UI)			
	Population (millions)	Mean SSB Intake (Servings/d)	Mean BMI (kg/m^2)	CVD*	Diabetes Mellitus†	Cancers‡	Total§
Ages 45 to 64	47.3	0.2 (0.1–0.3)	27 (25–29)	2410 (1459–3389)	846 (752–942)	161 (98–228)	3417 (2352–4535)
Ages 65 and older	17.6	0.1 (0.1–0.2)	26 (24–29)	3009 (1842–4216)	759 (686–834)	200 (122–278)	3969 (2676–5319)
Overall	125	0.3 (0.1–0.4)	26 (24–28)	5915 (3625–8342)	1945 (1798–2093)	376 (231–527)	8236 (5675–10 849)
Both sexes overall	273	0.2 (0.1–0.4)	26 (24–29)	10 976 (6591–15 346)	4206 (3913–4508)	781 (475–1098)	15 964 (11 097–20 903)
East and Southeast Asia							
Women							
Ages 20–44	341	0.9 (0.4–1.3)	25 (23–26)	162 (96–234)	1849 (1549–2151)	44 (27–62)	2055 (1735–2378)
Ages 45–64	238	0.4 (0.2–0.7)	27 (25–28)	679 (436–931)	7484 (6267–8654)	194 (116–278)	8356 (7044–9610)
Ages ≥65	101	0.3 (0.1–0.5)	25 (22–27)	1565 (833–2348)	8651 (7223–10 117)	275 (143–414)	10 491 (8745–12 412)
Overall	680	0.5 (0.2–0.9)	25 (23–27)	2406 (1380–3492)	17 983 (16 005–19 920)	513 (285–752)	20 902 (18 392–23 602)
Men							
Ages 20–44	352	0.9 (0.4–1.4)	24 (23–25)	424 (244–613)	2337 (1966–2717)	38 (20–56)	2799 (2344–3253)
Ages 45–64	243	0.5 (0.2–0.7)	25 (24–27)	1448 (890–2028)	7275 (6250–8331)	296 (161–449)	9019 (7723–10 305)
Ages ≥65	84.6	0.3 (0.2–0.5)	24 (22–26)	1528 (793–2315)	4982 (4132–5857)	385 (194–579)	6895 (5496–8280)
Overall	680	0.6 (0.3–0.9)	24 (23–26)	3400 (1920–4949)	14 594 (13 237–15 992)	719 (384–1073)	18 713 (16 178–21 266)
Both sexes overall	1360	0.6 (0.3–0.9)	25 (23–27)	5807 (3314–8421)	32 577 (30 041–35 102)	1232 (670–1807)	39 615 (35 154–44 109)
Latin America and Caribbean							
Women							
Ages 20–44	88.1	1.7 (0.7–2.7)	26 (25–28)	290 (182–402)	1760 (1513–1958)	71 (43–100)	2121 (1810–2419)
Ages 45–64	54.2	0.8 (0.3–1.4)	29 (27–31)	947 (572–1313)	7409 (6092–8614)	249 (147–354)	8605 (7111–10 031)
Ages ≥65	22.7	0.6 (0.3–1.0)	27 (24–30)	2214 (1379–3141)	9992 (8510–11 441)	336 (205–468)	12 541 (10 455–14 628)
Overall	165	1.1 (0.4–1.7)	27 (25–30)	3452 (2120–4845)	19 161 (16 982–21 159)	655 (403–919)	23 268 (19 980–26 370)
Men							
Ages 20–44	85.6	1.8 (0.7–2.9)	25 (24–27)	648 (408–905)	2650 (2255–2957)	42 (25–59)	3340 (2813–3868)
Ages 45–64	50.3	0.9 (0.3–1.5)	27 (25–28)	1798 (1088–2552)	8569 (6955–9929)	181 (111–254)	10 549 (8476–12 410)
Ages ≥65	17.9	0.7 (0.3–1.1)	25 (23–27)	2116 (1349–2919)	8092 (6758–9376)	221 (145–305)	10 429 (8687–12 186)
Overall	154	1.2 (0.4–1.9)	26 (24–27)	4562 (2872–6297)	19 311 (17 115–21 458)	445 (279–613)	24 318 (20 736–27 976)
Both sexes overall	319	1.1 (0.4–1.8)	26 (24–29)	8013 (4992–11 191)	38 472 (35 106–41 892)	1100 (682–1524)	47 585 (41 061–53 845)
North Africa and Middle East							
Women							
Ages 20–44	66.1	0.6 (0.2–1.1)	27 (26–28)	234 (142–330)	515 (456–570)	27 (16–38)	776 (651–926)
Ages 45–64	32.8	0.3 (0.1–0.6)	30 (29–32)	563 (341–801)	1363 (1202–1528)	52 (32–74)	1979 (1627–2321)
Ages ≥65	11.2	0.3 (0.1–0.4)	28 (26–31)	995 (600–1400)	2067 (1811–2317)	43 (26–61)	3106 (2518–3694)
Overall	110	0.4 (0.1–0.7)	28 (27–30)	1793 (1087–2564)	3945 (3585–4285)	123 (75–172)	5861 (4840–6860)
Men							
Ages 20–44	71.6	0.7 (0.2–1.1)	26 (25–27)	496 (308–693)	636 (567–701)	14 (9–19)	1146 (920–1377)
Ages 45–64	33.5	0.3 (0.1–0.6)	28 (26–29)	1006 (606–1409)	1485 (1292–1672)	32 (19–45)	2523 (1984–3053)
Ages ≥65	9.67	0.3 (0.1–0.4)	26 (25–28)	1005 (626–1400)	1668 (1476–1854)	34 (22–46)	2707 (2204–3249)
Overall	115	0.4 (0.2–0.7)	27 (25–28)	2507 (1551–3490)	3789 (3482–4110)	79 (50–110)	6376 (5165–7616)
Both sexes overall	225	0.4 (0.2–0.7)	28 (26–29)	4300 (2640–5986)	7734 (7190–8293)	202 (125–283)	12 236 (10 059–14 421)
South Asia							
Women							
Ages 20–44	224	0.3 (0.1–0.5)	22 (20–23)	216 (112–333)	1260 (942–1574)	36 (18–55)	1512 (1145–1851)
Ages 45–64	122	0.2 (0.0–0.3)	22 (20–24)	621 (317–945)	4639 (3378–5965)	118 (61–184)	5378 (4016–6767)
Ages ≥65	40.1	0.1 (0.0–0.2)	21 (18–23)	126 (64–193)	887 (634–1160)	12 (6–19)	1026 (763–1319)
Overall	385	0.2 (0.1–0.3)	21 (19–23)	963 (498–1467)	6787 (5461–8192)	167 (85–253)	7916 (6458–9589)
Men							
Ages 20–44	238	0.4 (0.1–0.6)	21 (20–23)	355 (177–554)	1570 (1033–2111)	20 (10–31)	1945 (1361–2541)
Ages 45–64	126	0.2 (0.0–0.3)	22 (20–23)	608 (308–921)	2858 (1791–3897)	56 (28–91)	3522 (2410–4585)

Deaths per Million Adults Attributable to SSBs (95% UI)				Proportion of Deaths Attributable To SSBs (95% UI)			
CVD*	Diabetes Mellitus†	Cancers‡	Total§	CVD*	Diabetes Mellitus†	Cancers‡	Total§
51 (31–72)	18 (16–20)	3 (2–5)	72 (50–96)	0.9 (0.5–1.2)	6.4 (5.7–7.1)	0.3 (0.2–0.4)	1.0 (0.7–1.3)
171 (105–240)	43 (39–47)	11 (7–16)	226 (152–302)	0.4 (0.2–0.6)	3.6 (3.3–4.0)	0.2 (0.1–0.2)	0.5 (0.3–0.6)
47 (29–67)	16 (14–17)	3 (2–4)	66 (46–87)	0.6 (0.3–0.8)	5.2 (4.8–5.6)	0.2 (0.1–0.3)	0.6 (0.4–0.9)
40 (24–56)	15 (14–17)	3 (2–4)	58 (41–77)	0.5 (0.3–0.6)	4.7 (4.4–5.0)	0.2 (0.1–0.3)	0.5 (0.4–0.7)
0 (0–0)	5 (4–6)	0 (0–0)	6 (5–7)	0.8 (0.5–1.1)	11.8 (9.8–13.7)	0.2 (0.1–0.2)	3.2 (2.7–3.7)
3 (2–4)	31 (26–36)	1 (0–2)	35 (30–40)	0.5 (0.3–0.6)	6.7 (5.6–7.8)	0.1 (0.1–0.2)	2.3 (1.9–2.6)
16 (8–23)	86 (72–100)	3 (1–4)	104 (87–123)	0.1 (0.1–0.2)	2.9 (2.4–3.4)	0.1 (0.1–0.2)	0.6 (0.5–0.7)
4 (2–5)	26 (24–29)	1 (0–2)	31 (27–35)	0.2 (0.1–0.3)	4.2 (3.7–4.7)	0.1 (0.1–0.2)	1.0 (0.9–1.1)
1 (0–2)	7 (6–8)	0 (0–0)	8 (7–9)	0.7 (0.4–1.1)	11.1 (9.4–13.0)	0.1 (0.1–0.2)	2.9 (2.4–3.4)
6 (4–8)	30 (26–34)	1 (0–2)	37 (32–42)	0.4 (0.3–0.6)	6.8 (5.9–7.8)	0.2 (0.1–0.3)	1.6 (1.3–1.8)
18 (9–27)	59 (49–69)	5 (2–7)	82 (65–98)	0.1 (0.1–0.2)	2.5 (2.0–2.9)	0.1 (0.1–0.2)	0.4 (0.4–0.5)
5 (3–7)	21 (19–24)	1 (0–2)	28 (24–31)	0.2 (0.1–0.3)	4.4 (4.0–4.9)	0.1 (0.1–0.2)	0.8 (0.7–0.9)
4 (2–6)	24 (22–26)	1 (0–2)	29 (26–32)	0.2 (0.1–0.3)	4.3 (4.0–4.6)	0.1 (0.1–0.2)	0.9 (0.8–1.0)
3 (2–5)	20 (17–22)	1 (0–2)	24 (21–27)	3.9 (2.4–5.4)	30.4 (26.2–33.9)	1.0 (0.6–1.4)	10.9 (9.3–12.4)
17 (11–24)	137 (112–159)	5 (3–7)	159 (131–185)	2.0 (1.2–2.8)	17.1 (14.1–19.9)	0.8 (0.5–1.1)	7.7 (6.4–9.0)
98 (61–138)	440 (375–504)	15 (9–21)	552 (460–644)	0.8 (0.5–1.1)	7.3 (6.2–8.4)	0.6 (0.4–0.8)	2.7 (2.3–3.2)
21 (13–29)	116 (103–128)	4 (2–6)	141 (121–160)	1.0 (0.6–1.4)	10.3 (9.2–11.4)	0.7 (0.4–1.0)	3.9 (3.4–4.5)
8 (5–11)	31 (26–35)	0 (0–2)	39 (33–45)	4.4 (2.8–6.1)	33.4 (28.4–37.2)	0.7 (0.4–1.0)	13.9 (11.7–16.1)
36 (22–51)	170 (138–197)	4 (2–5)	210 (169–247)	2.1 (1.3–3.0)	18.5 (15.0–21.4)	0.7 (0.4–1.0)	7.5 (6.0–8.8)
118 (75–163)	452 (377–524)	12 (8–17)	582 (485–681)	0.8 (0.5–1.1)	8.5 (7.1–9.9)	0.4 (0.3–0.6)	2.7 (2.3–3.2)
30 (19–41)	126 (111–140)	3 (2–4)	158 (135–182)	1.2 (0.8–1.7)	12.9 (11.5–14.4)	0.5 (0.3–0.7)	4.4 (3.8–5.1)
25 (16–35)	121 (110–131)	3 (2–5)	149 (129–169)	1.1 (0.7–1.6)	11.5 (10.5–12.5)	0.6 (0.4–0.9)	4.2 (3.6–4.7)
4 (2–5)	8 (7–9)	0 (0–1)	12 (10–14)	2.0 (1.2–2.8)	14.4 (12.8–16.0)	0.4 (0.3–0.6)	3.5 (2.9–4.1)
17 (10–24)	42 (37–47)	2 (1–3)	60 (50–71)	1.1 (0.7–1.6)	7.9 (7.0–8.9)	0.4 (0.2–0.5)	2.4 (2.0–2.8)
89 (54–125)	185 (162–208)	4 (2–6)	278 (226–331)	0.5 (0.3–0.7)	4.0 (3.5–4.5)	0.3 (0.2–0.5)	1.2 (1.0–1.4)
16 (10–23)	36 (33–39)	1 (0–2)	53 (44–62)	0.7 (0.4–1.0)	5.4 (4.9–5.9)	0.4 (0.2–0.5)	1.6 (1.3–1.9)
7 (4–10)	9 (8–10)	0 (0–0)	16 (13–19)	1.9 (1.2–2.7)	15.0 (13.4–16.6)	0.3 (0.2–0.4)	3.4 (2.8–4.1)
30 (18–42)	44 (39–50)	1 (1–1)	75 (59–91)	1.1 (0.6–1.5)	8.2 (7.1–9.2)	0.3 (0.2–0.4)	2.1 (1.6–2.5)
104 (65–145)	172 (153–192)	3 (2–5)	280 (228–336)	0.5 (0.3–0.7)	4.2 (3.7–4.7)	0.2 (0.1–0.3)	1.0 (0.8–1.2)
22 (14–30)	33 (30–36)	1 (0–2)	56 (45–66)	0.8 (0.5–1.0)	6.1 (5.6–6.6)	0.2 (0.1–0.3)	1.5 (1.2–1.8)
19 (12–27)	34 (32–37)	1 (0–2)	54 (45–64)	0.7 (0.4–1.0)	5.7 (5.3–6.2)	0.3 (0.2–0.4)	1.6 (1.3–1.8)
1 (0–2)	6 (4–7)	0 (0–0)	7 (5–8)	0.6 (0.3–0.9)	9.0 (6.7–11.2)	0.2 (0.1–0.3)	2.2 (1.7–2.7)
5 (3–8)	38 (28–49)	1 (0–2)	44 (33–56)	0.4 (0.2–0.6)	5.8 (4.2–7.5)	0.2 (0.1–0.3)	1.8 (1.3–2.3)
3 (2–5)	22 (16–29)	0 (0–0)	26 (19–33)	0.0 (0.0–0.0)	0.5 (0.4–0.6)	0.0 (0.0–0.0)	0.1 (0.1–0.2)
2 (1–4)	18 (14–21)	0 (0–1)	21 (17–25)	0.1 (0.1–0.2)	2.5 (2.0–3.0)	0.1 (0.1–0.2)	0.7 (0.6–0.9)
1 (1–3)	7 (4–9)	0 (0–0)	8 (6–11)	0.5 (0.2–0.7)	6.7 (4.4–9.0)	0.2 (0.1–0.3)	1.8 (1.3–2.4)
5 (2–7)	23 (14–31)	0 (0–1)	28 (19–36)	0.2 (0.1–0.3)	2.7 (1.7–3.7)	0.1 (0.1–0.2)	0.7 (0.5–0.9)

(*Continued*)

Table 3. Continued

	Population Characteristics			Number of Deaths Attributable to SSBs (95% UI)			
	Population (millions)	Mean SSB Intake (Servings/d)	Mean BMI (kg/m²)	CVD*	Diabetes Mellitus†	Cancers‡	Total§
Ages ≥65	36.5	0.1 (0.0–0.2)	21 (19–23)	89 (47–136)	590 (379–806)	6 (3–10)	685 (463–914)
Overall	401	0.2 (0.1–0.4)	21 (19–23)	1053 (543–1601)	5017 (3900–6227)	83 (43–128)	6152 (4806–7478)
Both sexes overall	786	0.2 (0.1–0.4)	21 (19–23)	2015 (1042–3051)	11 803 (10 025–13 663)	250 (130–376)	14 068 (11 790–16 456)
Sub-Saharan Africa							
Women							
Ages 20–44	102	0.7 (0.2–1.2)	23 (22–25)	133 (89–181)	1399 (1277–1516)	17 (12–23)	1549 (1399–1700)
Ages 45–64	46	0.3 (0.1–0.6)	25 (23–26)	294 (200–396)	2818 (2516–3113)	51 (34–68)	3163 (2814–3509)
Ages ≥65	15.1	0.2 (0.1–0.4)	23 (20–26)	420 (285–565)	3060 (2697–3398)	42 (29–56)	3522 (3085–3938)
Overall	163	0.4 (0.1–0.8)	24 (21–26)	847 (573–1136)	7277 (6761–7739)	110 (74–148)	8234 (7514–8915)
Men							
Ages 20–44	103	0.8 (0.2–1.3)	22 (20–24)	148 (90–211)	1453 (1335–1574)	13 (8–18)	1613 (1463–1777)
Ages 45– 64	42.5	0.4 (0.1–0.6)	23 (21–25)	288 (187–393)	2765 (2486–3059)	48 (32–65)	3101 (2767–3452)
Ages ≥65	12.3	0.3 (0.1–0.5)	22 (20–25)	266 (170–366)	2215 (2001–2433)	39 (26–52)	2519 (2252–2790)
Overall	158	0.5 (0.1–0.8)	22 (20–24)	702 (455–970)	6432 (6035–6837)	100 (67–135)	7234 (6625–7840)
Both sexes overall	320	0.5 (0.1–0.8)	23 (21–25)	1549 (1043–2096)	13 709 (12 984–14 396)	210 (141–281)	15 468 (14 295–16 610)
Western Europe							
Women							
Ages 20–44	57.2	0.6 (0.4–0.7)	24 (23–26)	19 (13–26)	71 (63–78)	15 (9–20)	104 (88–120)
Ages 45–64	55.9	0.2 (0.2–0.3)	28 (26–30)	149 (90–209)	363 (317–408)	125 (76–176)	638 (502–778)
Ages ≥65	42.9	0.2 (0.1–0.2)	28 (25–30)	1724 (1014–2488)	2591 (2325–2877)	438 (260–623)	4752 (3769–5788)
Overall	156	0.4 (0.3–0.5)	26 (24–28)	1892 (1115–2722)	3025 (2753–3317)	578 (348–823)	5494 (4364–6646)
Men							
Ages 20–44	58.4	0.7 (0.5–0.9)	26 (25–27)	96 (59–134)	180 (156–202)	14 (8–19)	289 (232–345)
Ages 45–64	54.8	0.3 (0.2–0.3)	28 (27–30)	547 (332–768)	824 (721–934)	161 (97–226)	1532 (1191–1881)
Ages ≥65	31.9	0.2 (0.1–0.3)	28 (26–29)	1579 (941–2204)	2187 (1939–2429)	411 (249–579)	4177 (3222–5139)
Overall	145	0.4 (0.3–0.5)	27 (26–28)	2222 (1337–3116)	3191 (2871–3483)	586 (354–823)	5998 (4645–7365)
Both sexes overall	301	0.4 (0.3–0.5)	27 (25–28)	4114 (2460–5750)	6215 (5768–6701)	1163 (703–1643)	11 493 (9044–13 926)

Countries are grouped into regions as follows: Australia/New Zealand – Australia, New Zealand; East/Central Eurasia – Albania, Armenia, Azerbaijan, Bulgaria, Bosnia and Herzegovina, Belarus, Czech Republic, Estonia, Georgia, Croatia, Hungary, Kazakhstan, Kyrgyzstan, Lithuania, Latvia, Moldova, Macedonia, Montenegro, Mongolia, Poland, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan; East/Southeast Asia – Brunei Darussalam, China, Fiji, Micronesia, Indonesia, Japan, Cambodia, Kiribati, Republic of Korea, Lao People's Democratic Republic, Sri Lanka, Maldives, Marshall Islands, Myanmar, Malaysia, Philippines, Papua New Guinea, Democratic People's Republic of Korea, Singapore, Solomon Islands, Thailand, Timor-Leste, Tonga, Taiwan, Viet Nam, Vanuatu, Samoa; Latin America/Caribbean – Argentina, Antigua and Barbuda, Bahamas, Belize, Bolivia, Brazil, Barbados, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Grenada, Guatemala, Guyana, Honduras, Haiti, Jamaica, Saint Lucia, Mexico, Nicaragua, Panama, Peru, Paraguay, El Salvador, Suriname, Trinidad and Tobago, Uruguay, Saint Vincent and the Grenadines, Venezuela; North Africa/Middle East – United Arab Emirates, Bahrain, Algeria, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman, Occupied Palestinian Territory, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, Turkey, Yemen; South Asia – Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan; Sub-Saharan Africa – Angola, Burundi, Benin, Burkina Faso, Botswana, Central African Republic, Côte d'Ivoire, Cameroon, Democratic Republic of the Congo, Congo, Comoros, Cape Verde, Djibouti, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Gambia, Guinea-Bissau, Equatorial Guinea, Kenya, Liberia, Lesotho, Madagascar, Mali, Mozambique, Mauritania, Mauritius, Malawi, Namibia, Niger, Nigeria, Rwanda, Sudan, Senegal, Sierra Leone, Somalia, São Tomé and Príncipe, Swaziland, Seychelles, Chad, Togo, United Republic of Tanzania, Uganda, South Africa, Zambia, Zimbabwe; Western Europe – Andorra, Austria, Belgium, Switzerland, Cyprus, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Ireland, Iceland, Israel, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Sweden. BMI indicates body mass index; CVD, cardiovascular disease; SSB, sugar-sweetened beverages; and UI, uncertainty intervals.

The burdens attributable to SSB are also relatively unique because of their predominant proportional impact on the young. Throughout much of the world, intakes at younger ages are far higher than later in life. Consequently, the proportional mortality attributable to SSBs is remarkably high among younger adults, exceeding 1 in 10 of all diabetes mellitus– and obesity-related deaths in nearly every region of the world. Younger adults also constitute the largest proportion of the workforce in most countries, producing tremendous economic losses related to SSB intakes in these age groups.[47] Our findings suggest that ~1 in 20 diabetes mellitus–related DALYs in adults <44 years of age are attributable to SSB intake, highlighting the considerable social and financial impacts of SSB consumption from not only healthcare costs of managing diabetes mellitus, but also losses of wages and productivity.

Although we demonstrated an inverse age effect in proportional disease burdens attributable to SSBs, it remains to be seen whether this pattern represents an effect of aging (ie, owing to people decreasing their intakes as they get older) or a birth cohort or generational effect (ie, owing to more recent

Deaths per Million Adults Attributable to SSBs (95% UI)				Proportion of Deaths Attributable To SSBs (95% UI)			
CVD*	Diabetes Mellitus†	Cancers‡	Total§	CVD*	Diabetes Mellitus†	Cancers‡	Total§
2 (1–4)	16 (10–22)	0 (0–0)	19 (13–25)	0.0 (0.0–0.0)	0.3 (0.2–0.5)	0.0 (0.0–0.0)	0.1 (0.1–0.1)
3 (1–4)	13 (10–16)	0 (0–0)	15 (12–19)	0.1 (0.1–0.2)	1.7 (1.3–2.1)	0.1 (0.0–0.1)	0.4 (0.3–0.5)
3 (1–4)	15 (13–17)	0 (0–0)	18 (15–21)	0.1 (0.1–0.2)	2.0 (1.7–2.4)	0.1 (0.1–0.2)	0.6 (0.5–0.6)
1 (1–2)	14 (13–15)	0 (0–0)	15 (14–17)	1.2 (0.8–1.6)	13.2 (12.1–14.3)	0.3 (0.2–0.4)	6.1 (5.5–6.6)
6 (4–9)	61 (55–68)	1 (0–2)	69 (61–76)	0.6 (0.4–0.8)	7.3 (6.5–8.1)	0.3 (0.2–0.3)	3.3 (2.9–3.6)
28 (19–37)	203 (179–225)	3 (2–4)	233 (204–261)	0.3 (0.2–0.4)	3.8 (3.3–4.2)	0.2 (0.2–0.3)	1.5 (1.3–1.7)
5 (4–7)	45 (42–48)	1 (0–2)	51 (46–55)	0.4 (0.3–0.5)	5.6 (5.2–5.9)	0.2 (0.2–0.3)	2.3 (2.1–2.5)
1 (0–2)	14 (13–15)	0 (0–0)	16 (14–17)	1.0 (0.6–1.4)	12.6 (11.6–13.7)	0.3 (0.2–0.5)	6.1 (5.5–6.7)
7 (4–9)	65 (59–72)	1 (1–2)	73 (65–81)	0.5 (0.3–0.7)	7.1 (6.3–7.8)	0.4 (0.2–0.5)	3.2 (2.8–3.5)
22 (14–30)	180 (163–198)	3 (2–4)	205 (183–227)	0.2 (0.2–0.3)	4.0 (3.6–4.4)	0.3 (0.2–0.4)	1.5 (1.4–1.7)
4 (3–6)	41 (38–43)	1 (0–1)	46 (42–50)	0.4 (0.2–0.5)	6.0 (5.7–6.4)	0.3 (0.2–0.4)	2.5 (2.3–2.7)
5 (3–7)	43 (41–45)	1 (0–2)	48 (45–52)	0.4 (0.3–0.5)	5.8 (5.5–6.1)	0.3 (0.2–0.4)	2.4 (2.2–2.6)
0 (0–0)	1 (0–2)	0 (0–0)	2 (1–3)	1.2 (0.8–1.6)	12.2 (10.8–13.5)	0.3 (0.2–0.3)	1.2 (1.0–1.4)
3 (2–4)	6 (6–7)	2 (1–3)	11 (9–14)	0.9 (0.5–1.2)	6.6 (5.8–7.4)	0.3 (0.2–0.4)	0.9 (0.7–1.1)
40 (24–58)	60 (54–67)	10 (6–15)	111 (88–135)	0.3 (0.2–0.4)	2.5 (2.2–2.8)	0.2 (0.1–0.3)	0.5 (0.4–0.7)
12 (7–17)	19 (18–21)	4 (2–5)	35 (28–43)	0.3 (0.2–0.5)	2.7 (2.5–3.0)	0.2 (0.1–0.3)	0.6 (0.5–0.7)
2 (1–2)	3 (3–3)	0 (0–0)	5 (4–6)	1.6 (1.0–2.2)	13.5 (11.8–15.2)	0.3 (0.2–0.5)	2.8 (2.3–3.4)
10 (6–14)	15 (13–17)	3 (2–4)	28 (22–34)	0.9 (0.5–1.3)	6.9 (6.1–7.8)	0.3 (0.2–0.4)	1.3 (1.0–1.6)
49 (29–69)	68 (61–76)	13 (8–18)	131 (101–161)	0.4 (0.2–0.5)	3.1 (2.7–3.4)	0.2 (0.1–0.3)	0.7 (0.5–0.8)
15 (9–21)	22 (20–24)	4 (2–6)	41 (32–51)	0.4 (0.3–0.6)	3.8 (3.4–4.1)	0.2 (0.1–0.3)	0.8 (0.6–1.0)
14 (8–19)	21 (19–22)	4 (2–5)	38 (30–46)	0.4 (0.2–0.5)	3.2 (3.0–3.4)	0.2 (0.1–0.3)	0.7 (0.5–0.8)

(Continued)

*CVD deaths include those from ischemic heart disease, ischemic stroke, and hypertensive heart disease.

†Diabetes mellitus deaths include deaths from the direct effects of SSBs on diabetes mellitus and the effects of SSBs on diabetes mellitus that are mediated through BMI.

‡Cancer deaths include those from breast cancer, uterine cancer, esophageal cancer, colon and rectum cancers, pancreatic cancers, kidney cancers, and gall bladder cancer.

§Total deaths include those from CVD, diabetes mellitus, and cancers as described above.

generations consuming higher intakes than older generations). If the latter is even partly contributing, then global mortality and morbidity attributable to SSBs may steeply rise as current generations age into higher risk of chronic diseases while continuing their higher intakes of SSBs.

This investigation had several strengths. We used global dietary data based on individual-level, largely nationally representative surveys, and assessed and adjusted for comparability, consistency, bias, and missing data across surveys. We evaluated and incorporated the best available evidence for effects of SSBs on BMI and diabetes mellitus and of BMI on adiposity-related diseases. We performed sensitivity analyses to assess the potential for overestimation of effects of individual diet components on chronic disease through comparison with dietary pattern studies based on both observational data and randomized trials. These sensitivity analyses indicated that the effects of dietary patterns on CHD predicted from the effects of individual dietary components on CHD were very similar to those observed both in prospective cohort studies evaluating associations of overall dietary patterns on CHD

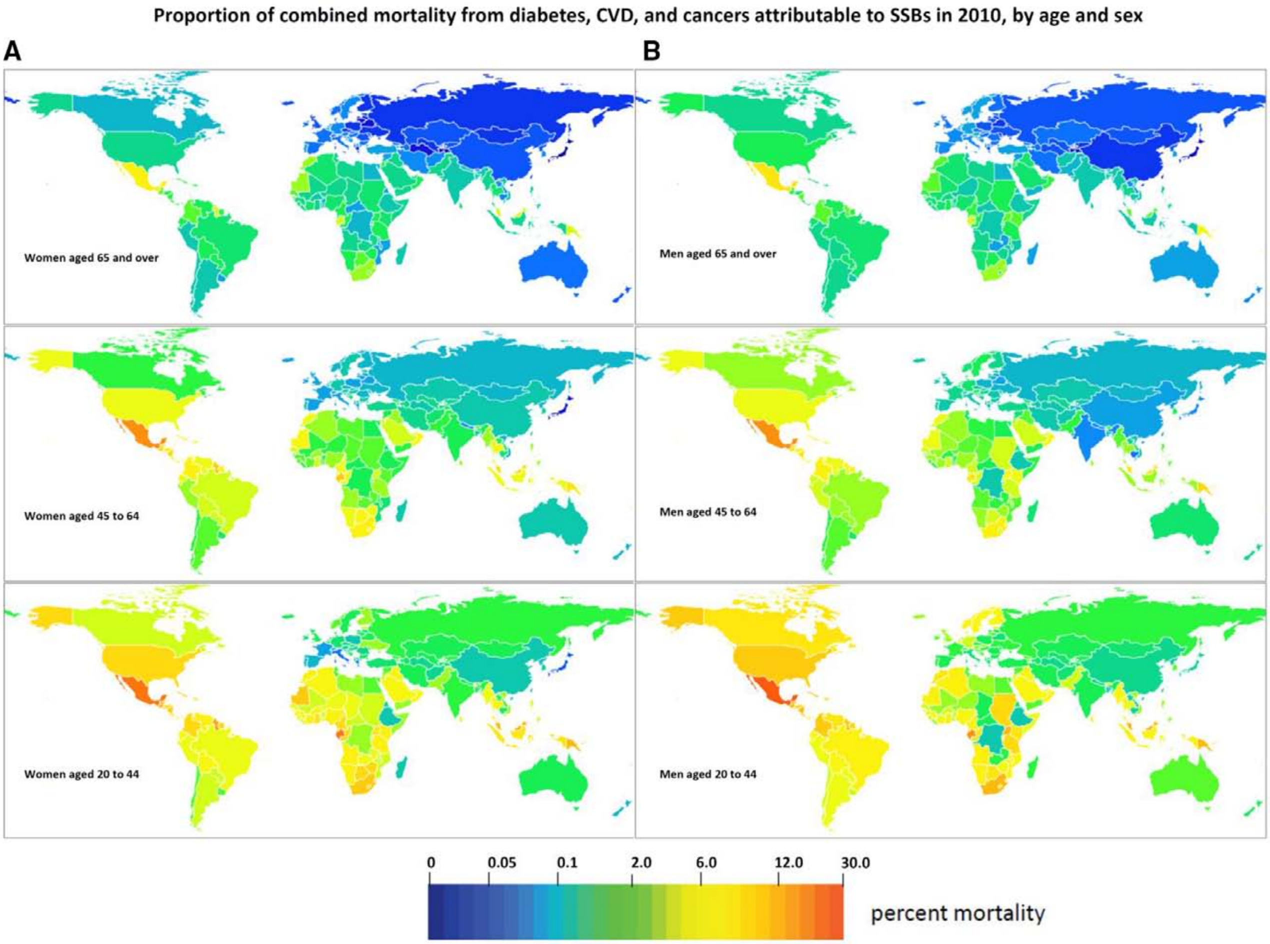

Figure 2. Proportion* of combined mortality from diabetes mellitus, CVD, and cancers that is attributable to SSBs in 2010 in 3 age strata for women (**A**) and men (**B**). The color scale of each map indicates the proportional mortality for the given age-sex stratum in each country of the world, highlighting the inverse age gradient. *Proportional mortality was determined by summing SSB-attributable mortality across the outcomes of interest (diabetes mellitus, CVD, and cancers), and then dividing by the total number of deaths caused by these outcomes within the population of interest. CVD indicates cardiovascular disease; and SSB, sugar-sweetened beverages.

and randomized controlled studies of the impact of dietary patterns on CVD risk factors and CHD. Therefore, in combination, these sensitivity analyses confirm that the effects of single dietary factors on chronic diseases, such as those used in this study, are unlikely to overestimate the effects of diet on noncommunicable diseases attributable to residual confounding from other dietary components. Our analytic framework incorporated variation by age, sex, and country in SSB intakes, etiologic effects of SSBs on disease, and cause-specific mortality and morbidity, and also propagated uncertainty from each of these inputs into the final mortality estimates. Notably, our analyses did not simply involve comparisons of SSB intakes and disease rates, which would be limited by substantial confounding and ecological fallacy, but quantitatively assessed and incorporated age- and sex-specific data on SSB consumption and external evidence on the causal effects of SSBs on disease risk, and validated data on country, age, sex, and cause-specific mortality.

Limitations should be considered. We did not identify national surveys on SSB consumption in some countries, especially those in South Asia and Sub-Saharan Africa, which limits the statistical certainty of estimates in these regions. Yet, no previous global data on individual-level SSB intakes have been compiled,[19] and the dietary survey data we collected covered 62% of the world's population. We implemented hierarchical modeling methods with multiple informative time-varying covariates to account for missing data and to quantify its effects on uncertainty. Given our focus on chronic disease mortality, we did not collect SSB intakes in children and adolescents, among whom SSB consumption is likely higher than in young adults. Conversely, although current morbidity and future mortality attributable to SSBs may be appreciable even in youth, current mortality levels would be very low, producing little impact on our estimated burdens of deaths. Whereas effects of SSB intake on weight gain have been confirmed by randomized controlled trials and gene-diet interactions,[2–4] the impact of BMI on chronic diseases was based on prospective observational studies, which might be overestimated because of residual confounding or underestimated owing to measurement error. Yet, these data represent the best available evidence for the effects of adiposity on chronic diseases, and the magnitude and causality of these

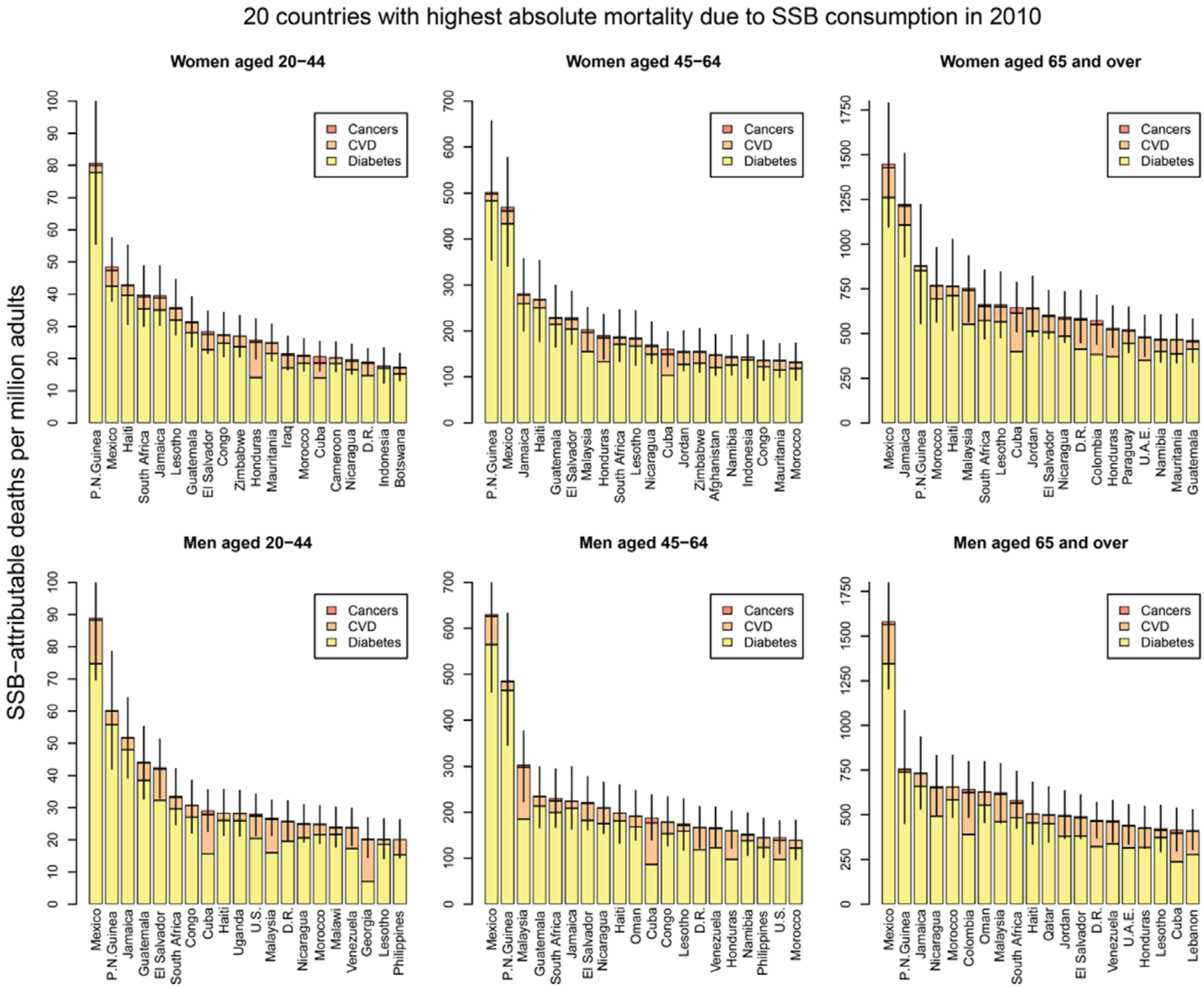

Figure 3. The 20 countries* with highest absolute SSB-attributable mortality in 2010. Mortality is standardized per million adults.** The 20 countries selected in each age–sex group are those with highest SSB-attributable mortality AND with populations of at least 1 million. Note that *y* axis scales differ in each panel. *The 47 smaller countries that were excluded because their populations were <1 million were Andorra, Antigua and Barbuda, Bahamas, Bahrain, Barbados, Belize, Bhutan, Brunei Darussalam, Cape Verde, China (Macao SAR), Comoros, Cyprus, Djibouti, Dominica, Equatorial Guinea, Fiji, French Polynesia, Gabon, Gambia, Grenada, Guadeloupe, Guinea-Bissau, Guyana, Iceland, Kiribati, Luxembourg, Maldives, Malta, Marshall Islands, Martinique, Mauritius, Micronesia, Montenegro, Netherlands Antilles, Réunion, Saint Lucia, Saint Vincent and the Grenadines, Samoa, São Tomé and Príncipe, Seychelles, Solomon Islands, Suriname, Swaziland, Timor-Leste, Tonga, Trinidad and Tobago, and Vanuatu. **Population-standardized absolute mortality was calculated by dividing attributable deaths by the adult population of the entity of interest (ie, country, region, or age–sex groups within a country or region) and then multiplying by 1 million. CVD indicates cardiovascular disease; D.R., Dominican Republic; P.N. Guinea, Papua New Guinea: SSB, sugar-sweetened beverages; and U.A.E., United Arab Emirates.

effects are supported by extensive experimental and shorter-term clinical interventions.[24] In this analysis, we included only the BMI-mediated effects of SSB intake on CVD and cancers, because these effects have been well-established.[24,30] However, SSB intake has been associated, independent of weight gain, with increases in inflammatory biomarkers and triglycerides, and the development of hypertension and hyperuricemia, as well, which may indicate direct effects on outcomes related to these pathways, such as CVD and cancers.[33,47–50] Therefore, the death and DALY burdens presented here could be an underestimate of the true burden of SSB-related disease. Our analyses included diabetes mellitus mortality, but because diabetes mellitus is not often listed as the proximal cause of death, the total number of diabetes mellitus deaths reported here could be an underestimate. However, because many who have diabetes mellitus in life ultimately die of CVD causes, we include CVD mortality in our analyses, thereby mitigating possible underestimation of total SSB-related mortality.

Using a comparative risk assessment model, we found that in 2010, 184 000 deaths and 8.5 million DALYs worldwide were attributable to consumption of sugary beverages, with three-quarters of these burdens occurring in low- and middle-income countries and the highest proportional burdens among adults 20 to 44 years of age. These results indicate the need for population-based efforts to reduce SSB consumption throughout the world through effective health policies and targeted interventions directed at stemming obesity-related disease.

Table 4. Global and Regional DALYs Related to SSB Consumption in 2010

	Population Characteristics			Number of DALYs Attributable to SSBs (95% UI)			
	Population	Mean SSB Intake (Servings/d)	Mean BMI (kg/m^2)	CVD‡	Diabetes Mellitus§	Cancersβ	Musculoskeletal¶
Globe							
Women							
Ages 20–44	987	0.8 (0.3–1.3)	24.7 (23.1–26.3)	294 808 (53 872–894 390)	372 240 (140 880–769 120)	34 343 (6024–132 271)	33 489 (5007–143 503)
Ages 45–64	654	0.4 (0.2–0.6)	27.2 (25.2–29.1)	519 525 (77 623–1 416 485)	712 098 (280 473–1 406 840)	87 985 (15 112–264 554)	132 295 (18 392–411 280)
Ages ≥65	293	0.3 (0.1–0.5)	25.8 (22.8–28.7)	742 527 (121 255–2 136 253)	595 440 (239 959–1 174 648)	68 755 (11 181–236 558)	88 073 (10 524–327 831)
Women overall	1930	0.5 (0.2–0.8)	25.7 (23.5–27.9)	1 556 860 (252 750–4 447 127)	1 679 778 (661 311–3 350 608)	191 083 (32 317–633 384)	253 857 (33 923–882 614)
Men							
Ages 20–44	1020	0.9 (0.4–1.4)	24.3 (22.9–25.8)	619 039 (118 456–1 602 534)	465 992 (179 272–941 049)	24 712 (4043–76 731)	21 364 (3397–62 462)
Ages 45–64	645	0.4 (0.2–0.7)	25.8 (24.1–27.5)	1 230 704 (180 660–2 779 689)	843 033 (335 415–1 635 657)	103 247 (14 853–250 627)	94 963 (12 361–267 311)
Ages ≥65	231	0.3 (0.1–0.5)	24.7 (22.7–26.8)	812 458 (226 030–2 424 935)	517 800 (209 314–994 182)	67 653 (15 239–304 601)	43 914 (7232–176 926)
Men overall	1890	0.6 (0.2–0.9)	24.8 (23.1–26.6)	2 662 201 (525 146–6 807 159)	1 826 824 (724 002–3 570 888)	195 612 (34 136–631 960)	160 241 (22 989–506 700)
Both sexes overall	3830	0.5 (0.2–0.9)	25.3 (23.3–27.3)	4 219 061 (777 896–11 254 286)	3 506 602 (138 5313–6 921 496)	386 695 (66 453–1 265 343)	414 097 (56 912–1 389 314)
Country income level							
High income	763	0.5 (0.3–0.6)	26.7 (25.0–28.5)	280 243 (167 025–583 031)	881 425 (394 880–1 562 988)	50 087 (25 564–133 452)	44 740 (15 407–155 255)
Upper middle income	1530	0.7 (0.3–1.1)	26.3 (24.4–28.2)	619 316 (203 775–2 447 285)	1 376 986 (568 380–2 649 568)	69 435 (17 044–365 715)	79 980 (19 886–345 074)
Lower middle income	1210	0.6 (0.2–1.0)	25.2 (23.2–27.2)	2 753 266 (375 163–6 534 363)	1 074 097 (370 326–2 298 304)	211 883 (21 492–572 887)	204 356 (18 242–608 452)
Low income	323	0.3 (0.1–0.5)	22.1 (19.8–24.4)	566 236 (31 933–1 689 606)	174 095 (51 727–410 636)	55 290 (2353–193 290)	85 021 (3377–280 533)
Australia and New Zealand							
Women							
Ages 20–44	3.6	0.4 (0.2–0.6)	26.0 (25.2–26.9)	173 (106–259)	554 (206–1191)	53 (33–80)	39 (18–74)
Ages 45–64	3.35	0.2 (0.1–0.3)	28.8 (27.7–29.9)	319 (219–457)	1148 (432–2503)	180 (122–256)	182 (83–344)
Ages ≥65	1.94	0.1 (0.1–0.2)	27.8 (26.9–28.8)	644 (474–853)	1396 (544–2927)	150 (100–213)	96 (46–177)
Women overall	8.89	0.2 (0.1–0.4)	27.4 (26.4–28.4)	1136 (800–1569)	3097 (1183–6621)	383 (254–548)	317 (147–595)
Men							
Ages 20–44	3.57	0.4 (0.2–0.6)	26.9 (26.2–27.6)	410 (267–601)	713 (257–1529)	36 (20–59)	25 (12–48)
Ages 45–64	3.28	0.2 (0.1–0.3)	28.9 (28.2–29.7)	872 (626–1176)	1628 (611–3414)	194 (123–281)	117 (55–224)
Ages ≥65	1.64	0.1 (0.1–0.2)	27.9 (27.1–28.6)	830 (615–1091)	1672 (633–3439)	177 (114–255)	53 (25–102)
Men overall	8.48	0.2 (0.1–0.4)	27.8 (27.0–28.5)	2112 (1509–2868)	4012 (1501–8382)	407 (256–595)	196 (92–374)
Both sexes overall	17.4	0.2 (0.1–0.4)	27.6 (26.7–28.4)	3248 (2308–4437)	7109 (2683–15 003)	790 (511–1144)	513 (239–969)
Canada and United States							
Women							
Ages 20–44	45	1.6 (1.2–2.0)	26.4 (25.7–27.0)	10 059 (6559–13 985)	46 638 (22 427–79 711)	1608 (1022–2448)	1297 (632–2466)
Ages 45–64	46.1	0.8 (0.6–1.0)	29.2 (28.4–30.1)	21 516 (15 138–28 549)	117 050 (55 317–198 511)	5942 (4009–8354)	6632 (3309–12 439)
Ages ≥65	25.6	0.6 (0.4–0.7)	28.0 (27.2–28.8)	24 760 (18 351–32 226)	114 732 (53 922–194 331)	4240 (2850–6161)	3283 (1648–6002)
Women overall	117	1.0 (0.8–1.2)	27.7 (26.9–28.5)	56 335 (40 048–74 759)	278 420 (131 666–472 553)	11 790 (7881–16 963)	11 211 (5589–20 906)
Men							
Ages 20–44	46.3	1.8 (1.3–2.2)	27.2 (26.6–27.7)	21 980 (14 596–31 212)	64 555 (30 299–108 124)	1283 (733–2170)	948 (450–1731)
Ages 45–64	44.2	0.9 (0.7–1.1)	29.1 (28.5–29.8)	50 846 (36 756–66 835)	160 750 (74 845–268 450)	6624 (4074–10 105)	4690 (2251–8367)
Ages ≥65	19.4	0.6 (0.5–0.8)	27.9 (27.3–28.5)	28 821 (21 554–36 844)	111 961 (50 940–188 457)	4076 (2550–6098)	1766 (862–3175)
Men overall	110	1.1 (0.8–1.4)	27.9 (27.3–28.5)	101 648 (72 907–134 891)	337 267 (156 083–565 031)	11 983 (7357–18 373)	7404 (3563–13 273)
Both sexes overall	226	1.1 (0.8–1.3)	27.8 (27.1–28.5)	157 983 (112 955–209 650)	615 686 (287 750–1 037 584)	23 773 (15 238–35 336)	18 616 (9151–34 179)
East and Southeast Asia							
Women							
Ages 20–44	341	0.9 (0.4–1.3)	24.9 (23.4–26.4)	43 502 (5336–261 258)	66 098 (24 272–144 241)	7540 (706–50 420)	8651 (679–74 288)
Ages 45–64	238	0.4 (0.2–0.7)	26.6 (24.7–28.5)	52 701 (7184–220 062)	135 713 (50 776–273 544)	11 095 (1499–48 858)	23 984 (2383–100 452)
Ages ≥65	101	0.3 (0.1–0.5)	24.5 (21.6–27.5)	241 385 (11 010–970 152)	110 547 (38 953–245 152)	25 084 (1042–129 905)	36 381 (1480–187 636)
Women overall	680	0.5 (0.2–0.9)	25.2 (23.1–27.3)	337 588 (23 529–1 451 472)	312 357 (114 002–662 937)	43 719 (3248–229183)	69 015 (4542–362 376)

	DALYs per Million Adults Attributable to SSBs (95% UI)					Percentage of DALYs Attributable to SSBs (95% UI)				
Total†	CVD‡	Diabetes Mellitus§	Cancersβ	Musculoskeletal¶	Total†	CVD‡	Diabetes Mellitus§	Cancersβ	Musculoskeletal¶	Total†
734 880 (260 247–1 760 532)	230 (42–698)	290 (110–600)	27 (5–103)	26 (4–112)	573 (203–1373)	2.5 (0.9–6.6)	3.5 (1.3–7.1)	0.2 (0.1–0.7)	0.2 (0.0–0.5)	0.4 (0.2–0.9)
1 451 903 (472 003–3 185 858)	795 (119–2167)	1089 (429–2152)	135 (23–405)	202 (28–629)	2221 (722–4874)	1.2 (0.4–3.1)	4.7 (1.8–9.1)	0.2 (0.1–0.6)	0.4 (0.1–1.4)	0.8 (0.3–1.7)
1 494 795 (461 518–3 634 885)	2537 (414–7300)	2035 (820–4014)	235 (38–808)	301 (36–1120)	5108 (1577–12 420)	0.9 (0.2–3.0)	4.2 (1.6–8.2)	0.3 (0.0–1.0)	0.5 (0.1–2.0)	0.8 (0.3–2.1)
3 681 578 (1 193 768–8 581 275)	699 (113–1996)	754 (297–1504)	86 (15–284)	114 (15–396)	1652 (536–3851)	1.5 (0.5–4.2)	4.1 (1.6–8.1)	0.2 (0.1–0.7)	0.4 (0.1–1.3)	0.7 (0.3–1.5)
1 131 107 (387 637–2 420 754)	466 (89–1207)	351 (135–709)	19 (3–58)	16 (3–47)	852 (292–1823)	2.9 (1.0–6.9)	6.1 (2.3–12.1)	0.2 (0.0–0.6)	0.1 (0.0–0.5)	0.5 (0.2–0.9)
2 271 946 (656 182–4 517 436)	1907 (280–4308)	1307 (520–2535)	160 (23–388)	147 (19–414)	3521 (1017–7002)	1.4 (0.4–4.1)	4.9 (1.9–9.5)	0.2 (0.0–0.8)	0.5 (0.1–1.6)	0.8 (0.3–1.7)
1 441 825 (532 366–3 725 193)	3510 (977–10477)	2237 (904–4295)	292 (66–1316)	190 (31–764)	6230 (2300–16 095)	1.1 (0.2–3.2)	3.7 (1.4–7.2)	0.2 (0.0–0.8)	0.5 (0.1–1.8)	0.8 (0.3–1.8)
4 844 878 (1 576 185–10 663 382)	1208 (238–3088)	829 (328–1620)	89 (15–287)	73 (10–230)	2198 (715–4837)	1.8 (0.6–4.7)	4.9 (1.9–9.6)	0.2 (0.0–0.7)	0.4 (0.1–1.3)	0.7 (0.3–1.5)
8 526 456 (2 769 953–19 244 657)	952 (175–2539)	791 (313–1561)	87 (15–285)	93 (13–313)	1924 (625–4342)	1.6 (0.5–4.5)	4.5 (1.7–8.9)	0.2 (0.1–0.7)	0.4 (0.1–1.3)	0.7 (0.3–1.5)
1 256 495 (699 247–2 292 130)	336 (200–699)	1057 (473–1874)	60 (31–160)	54 (18–186)	1507 (838–2748)	1.0 (0.6–2.4)	4.4 (1.8–8.2)	0.1 (0.1–0.3)	0.1 (0.0–0.4)	0.5 (0.3–1.1)
2 145 716 (948 946–5 564 122)	353 (116–1397)	786 (324–1512)	40 (10–209)	46 (11–197)	1225 (542–3175)	1.5 (0.7–3.4)	6.1 (2.5–11.7)	0.2 (0.1–0.5)	0.3 (0.1–0.9)	0.8 (0.4–1.6)
4 243 602 (998 925–9 058 923)	1902 (259–4514)	742 (256–1588)	146 (15–396)	141 (13–420)	2931 (690–6258)	1.6 (0.5–4.8)	4.6 (1.6–9.6)	0.2 (0.0–0.8)	0.4 (0.1–1.4)	0.8 (0.3–1.8)
880 643 (122 835–2 329 483)	1420 (80–4238)	437 (130–1030)	139 (6–485)	213 (8–704)	2209 (308–5843)	2.6 (0.3–8.4)	2.1 (0.7–4.6)	0.4 (0.0–1.5)	0.7 (0.0–2.9)	0.5 (0.1–1.5)
818 (456–1479)	39 (24–58)	124 (46–267)	12 (7–18)	9 (4–17)	183 (102–331)	1.1 (0.7–1.5)	1.2 (0.4–2.6)	0.1 (0.1–0.2)	0.0 (0.0–0.1)	0.1 (0.1–0.2)
1829 (1060–3196)	95 (65–136)	343 (129–747)	54 (36–76)	54 (25–103)	546 (316–954)	0.4 (0.3–0.6)	1.9 (0.7–3.7)	0.1 (0.1–0.1)	0.1 (0.0–0.2)	0.2 (0.1–0.3)
2286 (1383–3792)	331 (244–439)	718 (280–1505)	77 (51–109)	50 (24–91)	1176 (711–1950)	0.2 (0.2–0.3)	1.6 (0.6–3.2)	0.1 (0.0–0.1)	0.1 (0.0–0.1)	0.2 (0.1–0.3)
4933 (2898–8467)	116 (82–161)	317 (121–678)	39 (26–56)	32 (15–61)	505 (297–868)	0.6 (0.4–0.8)	1.6 (0.6–3.2)	0.1 (0.1–0.1)	0.1 (0.0–0.1)	0.2 (0.1–0.3)
1184 (682–2025)	92 (60–134)	159 (57–342)	8 (4–13)	6 (3–11)	264 (152–452)	1.3 (0.9–1.7)	2.7 (1.0–5.6)	0.1 (0.0–0.1)	0.0 (0.0–0.0)	0.2 (0.1–0.3)
2811 (1711–4663)	266 (191–359)	496 (186–1041)	59 (37–86)	36 (17–68)	857 (522–1422)	0.5 (0.4–0.7)	1.8 (0.7–3.6)	0.1 (0.0–0.1)	0.1 (0.0–0.1)	0.2 (0.2–0.4)
2732 (1670–4525)	507 (376–667)	1022 (387–2103)	108 (70–156)	33 (15–63)	1670 (1021–2766)	0.2 (0.2–0.3)	1.3 (0.5–2.6)	0.1 (0.0–0.1)	0.0 (0.0–0.1)	0.2 (0.1–0.3)
6727 (4063–11 213)	225 (161–305)	427 (160–893)	43 (27–63)	21 (10–40)	716 (433–1194)	0.7 (0.5–0.9)	1.9 (0.7–3.9)	0.1 (0.0–0.1)	0.0 (0.0–0.1)	0.2 (0.1–0.3)
11 660 (6962–19 680)	170 (121–232)	371 (140–783)	41 (27–60)	27 (12–51)	609 (364–1028)	0.6 (0.4–0.8)	1.7 (0.7–3.5)	0.1 (0.0–0.1)	0.0 (0.0–0.1)	0.2 (0.1–0.3)
59 603 (34 939–93 195)	178 (116–248)	827 (398–1413)	29 (18–43)	23 (11–44)	1057 (619–1652)	2.5 (1.8–3.4)	6.5 (2.9–11.5)	0.2 (0.1–0.4)	0.1 (0.0–0.1)	0.6 (0.3–1.0)
151 139 (88 769–236 152)	467 (329–620)	2541 (1201–4309)	129 (87–181)	144 (72–270)	3281 (1927–5126)	1.1 (0.8–1.3)	9.0 (4.2–15.0)	0.2 (0.1–0.2)	0.2 (0.1–0.4)	0.9 (0.5–1.4)
147 015 (86 073–227 384)	966 (716–1257)	4475 (2103–7579)	165 (111–240)	128 (64–234)	5734 (3357–8868)	0.5 (0.4–0.6)	7.4 (3.4–12.2)	0.1 (0.1–0.2)	0.1 (0.1–0.3)	0.8 (0.4–1.3)
357 756 (209 781–556 731)	440 (313–584)	2173 (1028–3689)	92 (62–132)	88 (44–163)	2793 (1638–4346)	1.4 (1.0–1.8)	7.6 (3.5–12.9)	0.2 (0.1–0.3)	0.1 (0.1–0.3)	0.7 (0.4–1.2)
88 767 (52 997–134 444)	377 (250–535)	1107 (520–1855)	22 (13–37)	16 (8–30)	1523 (909–2306)	3.1 (2.2–4.2)	12.9 (5.8–21.8)	0.2 (0.1–0.4)	0.1 (0.0–0.1)	0.8 (0.4–1.3)
222 910 (135 121–330 714)	1151 (832–1513)	3638 (1694–6076)	150 (92–229)	106 (51–189)	5045 (3058–7485)	1.3 (1.0–1.7)	9.1 (4.0–15.0)	0.2 (0.1–0.3)	0.2 (0.1–0.4)	1.1 (0.6–1.7)
146 625 (85 561–223 353)	1489 (1114–1904)	5785 (2632–9737)	211 (132–315)	91 (45–164)	7576 (4421–11540)	0.6 (0.4–0.7)	6.2 (2.8–10.5)	0.1 (0.1–0.1)	0.1 (0.1–0.3)	0.8 (0.5–1.3)
458 302 (273 679–688 510)	834 (598–1107)	2768 (1281–4638)	98 (60–151)	61 (29–109)	3762 (2246–5651)	1.7 (1.2–2.2)	9.4 (4.2–15.8)	0.2 (0.1–0.3)	0.1 (0.1–0.3)	0.9 (0.5–1.4)
816 058 (483 460–1 245 241)	632 (452–839)	2463 (1151–4151)	95 (61–141)	74 (37–137)	3265 (1934–4982)	1.5 (1.1–2.0)	8.5 (3.9–14.3)	0.2 (0.1–0.3)	0.1 (0.1–0.3)	0.8 (0.5–1.3)
125 791 (37 694–501 434)	100 (12–603)	153 (56–333)	17 (2–116)	20 (2–172)	290 (87–1158)	2.5 (0.6–7.2)	4.4 (1.6–8.8)	0.2 (0.0–0.7)	0.2 (0.0–0.7)	0.6 (0.2–1.5)
223 492 (73 317–596 369)	221 (30–923)	569 (213–1148)	47 (6–205)	101 (10–421)	938 (308–2502)	1.1 (0.2–3.7)	5.4 (2.1–10.6)	0.2 (0.0–0.7)	0.5 (0.1–1.9)	1.1 (0.4–2.7)
413 397 (67 327–1 465 240)	2398 (109–9638)	1098 (387–2435)	249 (10–1291)	361 (15–1864)	4107 (669–14 556)	1.0 (0.1–3.7)	4.5 (1.7–9.0)	0.3 (0.0–1.1)	0.7 (0.1–2.7)	1.1 (0.3–2.7)
762 680 (178 337–2 563 042)	437 (30–1880)	405 (148–859)	57 (4–297)	89 (6–469)	988 (231–3320)	1.5 (0.3–4.9)	4.8 (1.8–9.5)	0.2 (0.0–0.8)	0.4 (0.1–1.8)	1.0 (0.3–2.3)

(*Continued*)

Table 4. Continued

	Population Characteristics			Number of DALYs Attributable to SSBs (95% UI)			
	Population	Mean SSB Intake (Servings/d)	Mean BMI (kg/m²)	CVD‡	Diabetes Mellitus§	Cancersβ	Musculoskeletal¶
Men							
Ages 20–44	352	0.9 (0.4–1.4)	24.1 (22.8–25.5)	88 199 (12 895–393 677)	76 211 (29 010–154 587)	4449 (494–19 905)	3536 (432–13 127)
Ages 45–64	243	0.5 (0.2–0.7)	25.2 (23.7–26.7)	153 823 (16 420–557 260)	145 043 (54 636–293 663)	13 398 (1697–40 947)	16 893 (1570–60 715)
Ages ≥65	84.6	0.3 (0.2–0.5)	23.9 (22.0–25.8)	236 311 (16 201–1 229 854)	85 066 (32 508–176 977)	27 019 (1619–215 283)	16 121 (942–102 011)
Men overall	680	0.6 (0.3–0.9)	24.3 (22.7–25.9)	478 333 (45 516–2 180 791)	306 319 (116 153–625 226)	44 866 (3810–276 135)	36 550 (2944–175 853)
Both sexes overall	1360	0.6 (0.3–0.9)	24.8 (22.9–26.6)	815 921 (69 045–3 632 262)	618 677 (230 155–1 288 163)	88 585 (7058–505 318)	105 565 (7486–538 229)
East/Central Eurasia							
Women							
Ages 20–44	60.4	0.4 (0.2–0.6)	24.3 (22.3–26.3)	6687 (2880–17 236)	17 253 (5092–43 821)	751 (302–2019)	757 (263–1784)
Ages 45–64	55.5	0.2 (0.1–0.3)	28.0 (25.6–30.4)	16 929 (8580–29 657)	33 426 (10 337–85 735)	2790 (1355–5077)	3815 (1350–8390)
Ages ≥65	32.5	0.1 (0.1–0.2)	27.6 (24.0–31.1)	39 042 (1 4017–166 425)	29 247 (9463–70 097)	2253 (856–7102)	2656 (679–11 622)
Women overall	148	0.2 (0.1–0.4)	26.5 (23.8–29.2)	62 658 (25 477–213 318)	79 926 (24 893–199 653)	5793 (2513–14 197)	7228 (2292–21 797)
Men							
Ages 20–44	59.7	0.4 (0.2–0.6)	25.3 (23.5–27.0)	25 573 (12 021–50 703)	20 702 (6121–51 122)	566 (213–1371)	490 (169–1192)
Ages 45–64	47.3	0.2 (0.1–0.3)	27.2 (25.3–29.2)	51 698 (25 795–102 375)	32 181 (9826–78 698)	3025 (1308–6353)	2208 (756–5400)
Ages ≥65	17.6	0.1 (0.1–0.2)	26.4 (24.0–28.8)	30 889 (12 279–110 774)	16 525 (5222–38 531)	1701 (673–4952)	847 (232–3141)
Men overall	125	0.3 (0.1–0.4)	26.2 (24.2–28.2)	108 161 (50 095–263 852)	69 409 (21 169–168 352)	5293 (2194–12 675)	3545 (1158–9734)
Both sexes overall	273	0.2 (0.1–0.4)	26.3 (24.0–28.7)	170 819 (75 572–477 170)	149 335 (46 062–368 005)	11 086 (4708–26 872)	10 773 (3449–31 530)
Latin America and Caribbean							
Women							
Ages 20–44	88.1	1.7 (0.7–2.7)	26.4 (24.5–28.3)	20 231 (11 217–34 984)	98 436 (41 292–182 108)	2985 (1449–6155)	3673 (1510–7479)
Ages 45–64	54.2	0.8 (0.3–1.4)	28.9 (26.7–31.1)	30 068 (17 678–51 607)	206 008 (87 896–382 255)	6269 (3230–11 478)	12 640 (5174–26 028)
Ages ≥65	22.7	0.6 (0.3–1.0)	26.8 (23.8–29.9)	29 093 (15 669–59 087)	164 436 (69 037–306 255)	3771 (1731–8177)	4931 (1875–11 862)
Women overall	165	1.1 (0.4–1.7)	27.2 (24.8–29.6)	79 392 (44 564–145 678)	468 879 (198 225–870 618)	13 025 (6411–25 810)	21 244 (8559–45 369)
Men							
Ages 20–44	85.6	1.8 (0.7–2.9)	25.2 (23.6–26.8)	35 314 (20 390–58 766)	121 160 (51 509–224 711)	1606 (755–3095)	2294 (926–4807)
Ages 45–64	50.3	0.9 (0.3–1.5)	26.6 (24.8–28.4)	53 094 (32 118–89 724)	233 094 (98 549–432 220)	4061 (2139–7159)	7829 (3174–16 611)
Ages ≥65	17.9	0.7 (0.3–1.1)	25.2 (23.1–27.4)	33 828 (19 127–69 167)	142 331 (58 743–264 426)	2597 (1333–5295)	2691 (1008–6728)
Men overall	154	1.2 (0.4–1.9)	25.6 (23.7–27.4)	122 237 (71 635–217 657)	496 584 (208 800–921 357)	8264 (4227–15 549)	12 814 (5108–28 146)
Both sexes overall	319	1.1 (0.4–1.8)	26.4 (24.2–28.5)	201 629 (116 199–363 336)	965 464 (407 026–1 791 975)	21 289 (10 638–41 358)	34 058 (13 667–73 516)
North Africa and Middle East							
Women							
Ages 20–44	66.1	0.6 (0.2–1.1)	27.0 (25.7–28.3)	12 731 (6052–25 713)	37 908 (13 277–83 700)	982 (461–1989)	1246 (498–2593)
Ages 45–64	32.8	0.3 (0.1–0.6)	30.5 (28.8–32.1)	12 492 (6428–21 695)	50 952 (18 414–110 019)	1110 (566–1990)	3770 (1480–7759)
Ages ≥65	11.2	0.3 (0.1–0.4)	28.3 (25.8–30.8)	9885 (4252–26 282)	34 536 (12 924–72 621)	416 (182–1059)	1249 (407–3710)
Women overall	110	0.4 (0.1–0.7)	28.4 (26.5–30.2)	35 108 (16 732–73 690)	123 397 (44 615–266 339)	2508 (1210–5039)	6265 (2385–14 062)
Men							
Ages 20–44	71.6	0.7 (0.2–1.1)	26.1 (24.9–27.2)	22 944 (11 640–43 242)	49 709 (17 626–106 374)	504 (214–1049)	891 (349–1901)
Ages 45–64	33.5	0.3 (0.1–0.6)	27.8 (26.5–29.1)	21 313 (11 343–35 722)	53 721 (19 533–112 453)	594 (276–1075)	2525 (978–5327)
Ages ≥65	9.67	0.3 (0.1–0.4)	26.4 (24.7–28.1)	10 576 (5113–28 404)	29 478 (10 930–60 885)	297 (133–788)	671 (228–2155)
Men overall	115	0.4 (0.2–0.7)	26.6 (25.2–28.0)	54 833 (28 096–107 367)	132 907 (48 089–279 713)	1395 (623–2912)	4088 (1555–9383)
Both sexes overall	225	0.4 (0.2–0.7)	27.5 (25.9–29.1)	89 942 (44 828–181 058)	256 304 (92 704–546 052)	3903 (1833–7951)	10352 (3940–23 445)
South Asia							
Women							
Ages 20–44	224	0.3 (0.1–0.5)	21.6 (20.1–23.2)	161 612 (13 397–421 698)	63 895 (19 728–142 776)	16 834 (1267–57 540)	13 509 (702–40 691)
Ages 45–64	122	0.2 (0.0–0.3)	22.1 (20.3–24.0)	331 469 (14 304–891 167)	106 165 (34 086–226 102)	50 720 (2242–156 917)	63 622 (2267–191 320)
Ages ≥65	40.1	0.1 (0.0–0.2)	20.6 (18.0–23.2)	332 328 (46 536–653 573)	74 360 (28 880–152 361)	25 555 (2584–58 894)	29 896 (3312–68 673)
Women overall	385	0.2 (0.1–0.3)	21.4 (19.3–23.4)	825 409 (74 237–1 966 438)	244 420 (82 694–521 238)	93 109 (6093–273 351)	107 028 (6282–300 684)
Men							
Ages 20–44	238	0.4 (0.1–0.6)	21.2 (19.6–22.7)	361 696 (33 983–832 009)	82 398 (26 816–183 165)	12 771 (1034–35 964)	9673 (552–26 553)
Ages 45–64	126	0.2 (0.0–0.3)	21.6 (19.8–23.5)	807 618 (41 130–1 640 736)	140 143 (48 397–292 875)	63 770 (2954–145 853)	47 102 (1996–118 867)

	DALYs per Million Adults Attributable to SSBs (95% UI)					Percentage of DALYs Attributable to SSBs (95% UI)				
Total†	CVD‡	Diabetes Mellitus§	Cancersβ	Musculoskeletal¶	Total†	CVD‡	Diabetes Mellitus§	Cancersβ	Musculoskeletal¶	Total†
172 396 (53 231–528 216)	196 (29–875)	169 (64–343)	10 (1–44)	8 (1–29)	383 (118–1173)	2.4 (0.6–6.7)	5.8 (2.0–11.8)	0.1 (0.0–0.4)	0.1 (0.0–0.5)	0.6 (0.2–1.4)
329 156 (89 301–871 090)	632 (67–2290)	596 (225–1207)	55 (7–168)	69 (6–250)	1353 (367–3580)	1.4 (0.3–4.3)	5.6 (2.0–11.0)	0.2 (0.0–0.6)	0.5 (0.1–1.7)	1.1 (0.4–2.5)
364 516 (61 902–1 706 625)	2795 (192–14 544)	1006 (384–2093)	320 (19–2546)	191 (11–1206)	4311 (732–20 182)	1.2 (0.1–3.6)	4.1 (1.5–8.2)	0.2 (0.0–0.8)	0.6 (0.0–2.1)	1.0 (0.3–2.3)
866 068 (204 434–3 105 931)	615 (59–2803)	394 (149–804)	58 (5–355)	47 (4–226)	1113 (263–3992)	1.7 (0.3–4.9)	5.2 (1.8–10.3)	0.2 (0.0–0.6)	0.4 (0.0–1.4)	0.9 (0.3–2.1)
1 628 748 (382 771–5 668 974)	526 (45–2343)	399 (148–831)	57 (5–326)	68 (5–347)	1051 (247–3657)	1.6 (0.3–4.9)	5.0 (1.8–9.9)	0.2 (0.0–0.7)	0.4 (0.0–1.6)	0.9 (0.3–2.2)
25 448 (11 085–57 788)	86 (37–222)	223 (66–566)	10 (4–26)	10 (3–23)	328 (143–746)	1.1 (0.4–5.0)	1.9 (0.6–4.3)	0.1 (0.0–0.4)	0.1 (0.0–0.1)	0.2 (0.1–0.5)
56 960 (28 529–112 668)	305 (155–535)	603 (186–1546)	50 (24–92)	69 (24–151)	1027 (514–2032)	0.3 (0.2–0.6)	2.5 (0.9–5.1)	0.1 (0.0–0.1)	0.1 (0.0–0.3)	0.3 (0.1–0.5)
73 197 (32 657–237 016)	1201 (431–5119)	900 (291–2156)	69 (26–218)	82 (21–358)	2252 (1005–7291)	0.3 (0.1–1.6)	2.3 (0.9–4.6)	0.1 (0.0–0.7)	0.2 (0.0–1.1)	0.3 (0.1–1.2)
155 605 (72 271–407 471)	379 (154–1289)	483 (150–1207)	35 (15–86)	44 (14–132)	941 (437–2463)	0.6 (0.2–2.4)	2.2 (0.8–4.7)	0.1 (0.0–0.4)	0.1 (0.0–0.5)	0.3 (0.1–0.8)
47 331 (24 300–87 712)	331 (156–656)	268 (79–662)	7 (3–18)	6 (2–15)	613 (315–1136)	1.0 (0.5–2.6)	4.3 (1.5–8.8)	0.1 (0.0–0.2)	0.0 (0.0–0.1)	0.2 (0.1–0.5)
89 113 (48 274–164 867)	1093 (545–2164)	680 (208–1663)	64 (28–134)	47 (16–114)	1884 (1020–3485)	0.4 (0.2–1.2)	2.7 (1.0–5.6)	0.1 (0.0–0.2)	0.1 (0.0–0.4)	0.3 (0.1–0.6)
49 962 (23 995–144 178)	1755 (698–6295)	939 (297–2189)	97 (38–281)	48 (13–178)	2839 (1363–8193)	0.3 (0.1–1.3)	1.8 (0.7–3.7)	0.1 (0.0–0.4)	0.1 (0.0–0.6)	0.2 (0.1–1.0)
186 407 (96 568–396 757)	761 (352–1856)	488 (149–1184)	37 (15–89)	25 (8–68)	1311 (679–2791)	0.6 (0.3–1.7)	2.9 (1.1–6.0)	0.1 (0.0–0.3)	0.1 (0.0–0.4)	0.2 (0.1–0.7)
342 012 (168 839–804 228)	555 (246–1551)	485 (150–1196)	36 (15–87)	35 (11–103)	1112 (549–2615)	0.6 (0.2–2.0)	2.6 (0.9–5.4)	0.1 (0.0–0.3)	0.1 (0.0–0.4)	0.2 (0.1–0.7)
125 324 (65 460–212 885)	177 (98–307)	864 (362–1598)	26 (13–54)	32 (13–66)	1099 (574–1868)	4.5 (2.4–8.1)	7.3 (2.9–14.2)	0.5 (0.2–1.1)	0.3 (0.1–0.6)	0.9 (0.4–1.6)
254 985 (132 029–440 829)	554 (326–952)	3799 (1621–7049)	116 (60–212)	233 (95–480)	4702 (2435–8129)	2.0 (1.1–3.4)	10.3 (4.3–19.2)	0.4 (0.2–0.7)	0.7 (0.3–1.6)	1.8 (0.9–3.2)
202 232 (100 088–362 843)	1281 (690–2602)	7243 (3041–13 489)	166 (76–360)	217 (83–522)	8907 (4408–15 981)	1.1 (0.5–2.7)	9.5 (3.9–17.7)	0.3 (0.1–0.9)	0.6 (0.2–1.9)	1.8 (0.9–3.5)
582 542 (297 578–1 016 557)	416 (233–763)	2456 (1038–4560)	68 (34–135)	111 (45–238)	3051 (1559–5324)	2.5 (1.3–4.7)	9.0 (3.7–17.0)	0.4 (0.2–0.9)	0.6 (0.2–1.4)	1.5 (0.7–2.8)
160 374 (86 326–268 070)	316 (183–527)	1086 (462–2013)	14 (7–28)	21 (8–43)	1437 (773–2402)	5.2 (2.7–9.7)	12.4 (5.0–23.2)	0.3 (0.1–0.7)	0.2 (0.1–0.6)	0.8 (0.4–1.5)
298 078 (157 064–507 815)	1056 (639–1784)	4634 (1959–8593)	81 (43–142)	156 (63–330)	5926 (3123–10 096)	2.2 (1.2–4.0)	10.6 (4.5–19.8)	0.2 (0.1–0.5)	0.7 (0.2–1.6)	1.6 (0.8–2.8)
181 446 (91 832–323 350)	1889 (1068–3863)	7950 (3281–14 770)	145 (74–296)	150 (56–376)	10 135 (5129–18 061)	1.2 (0.6–3.3)	8.2 (3.4–15.6)	0.2 (0.1–0.5)	0.6 (0.2–2.0)	1.5 (0.7–3.0)
639 899 (335 222–1 099 235)	680 (398–1210)	2762 (1161–5124)	46 (24–86)	71 (28–157)	3559 (1864–6113)	2.9 (1.5–5.7)	10.4 (4.3–19.5)	0.2 (0.1–0.6)	0.5 (0.2–1.4)	1.3 (0.7–2.4)
1 222 440 (632 800–2 115 792)	544 (313–980)	2604 (1098–4834)	57 (29–112)	92 (37–198)	3297 (1707–5707)	2.7 (1.4–5.2)	9.7 (4.0–18.3)	0.3 (0.1–0.7)	0.5 (0.2–1.4)	1.4 (0.7–2.6)
52 867 (25 377–102 851)	145 (69–292)	431 (151–951)	11 (5–23)	14 (6–29)	601 (288–1169)	1.4 (0.7–2.7)	4.2 (1.6–8.4)	0.2 (0.1–0.3)	0.1 (0.0–0.2)	0.5 (0.2–1.0)
68 325 (33 214–129 147)	381 (196–661)	1553 (561–3353)	34 (17–61)	115 (45–236)	2082 (1012–3936)	0.6 (0.3–1.0)	5.3 (2.0–10.5)	0.1 (0.1–0.2)	0.2 (0.1–0.5)	0.9 (0.4–1.6)
46 086 (21 681–96 060)	886 (381–2356)	3096 (1158–6509)	37 (16–95)	112 (36–333)	4131 (1943–8610)	0.3 (0.2–0.9)	4.3 (1.7–8.7)	0.1 (0.0–0.3)	0.2 (0.1–0.7)	0.8 (0.3–1.6)
167 278 (80 272–328 058)	266 (127–558)	935 (338–2018)	19 (9–38)	47 (18–107)	1268 (608–2486)	0.8 (0.4–1.6)	4.6 (1.7–9.2)	0.1 (0.1–0.3)	0.2 (0.1–0.5)	0.7 (0.3–1.4)
74 048 (36 978–137 613)	243 (123–457)	525 (186–1125)	5 (2–11)	9 (4–20)	783 (391–1455)	1.5 (0.8–2.8)	7.3 (2.8–14.6)	0.1 (0.0–0.2)	0.1 (0.0–0.2)	0.6 (0.3–1.2)
78 153 (39 911–140 341)	635 (338–1065)	1602 (582–3353)	18 (8–32)	75 (29–159)	2330 (1190–4184)	0.7 (0.4–1.1)	5.0 (1.9–10.0)	0.1 (0.0–0.1)	0.2 (0.1–0.4)	0.8 (0.4–1.5)
41 022 (20 093–84 738)	1094 (529–2937)	3048 (1130–6296)	31 (14–82)	69 (24–223)	4242 (2078–8762)	0.4 (0.2–1.0)	3.8 (1.5–7.6)	0.0 (0.0–0.1)	0.2 (0.0–0.6)	0.7 (0.3–1.5)
193 223 (96 982–362 692)	398 (204–779)	964 (349–2030)	10 (5–21)	30 (11–68)	1402 (704–2632)	0.8 (0.4–1.6)	5.4 (2.1–10.7)	0.1 (0.0–0.1)	0.1 (0.0–0.4)	0.7 (0.3–1.4)
360 500 (177 254–690 750)	333 (166–671)	950 (344–2024)	14 (7–29)	38 (15–87)	1336 (657–2561)	0.8 (0.4–1.6)	5.0 (1.9–10.0)	0.1 (0.0–0.2)	0.2 (0.1–0.4)	0.7 (0.3–1.4)
255 850 (53 752–579 714)	543 (45–1418)	215 (66–480)	57 (4–193)	45 (2–137)	860 (181–1949)	4.5 (0.4–11.8)	1.7 (0.5–3.9)	0.5 (0.0–1.6)	0.3 (0.0–0.9)	0.4 (0.1–1.1)
551 976 (69 830–1 304 908)	2727 (118–7333)	874 (280–1860)	417 (18–1291)	523 (19–1574)	4542 (575–10 737)	3.4 (0.2–9.6)	2.4 (0.8–5.1)	0.6 (0.0–2.2)	1.1 (0.0–3.7)	0.9 (0.1–2.5)
462 139 (102 995–849 463)	8292 (1161–16 307)	1855 (721–3801)	638 (64–1469)	746 (83–1713)	11 531 (2570–21 194)	2.3 (0.2–6.3)	2.2 (0.8–4.5)	0.8 (0.1–2.6)	1.1 (0.1–3.6)	0.9 (0.2–2.4)
1 269 965 (226 577–2 734 084)	1798 (162–4284)	532 (180–1135)	203 (13–595)	233 (14–655)	2766 (494–5956)	3.4 (0.2–9.2)	2.1 (0.7–4.5)	0.6 (0.0–2.1)	0.8 (0.0–2.8)	0.8 (0.1–2.0)
466 539 (92 219–972 543)	1141 (107–2624)	260 (85–578)	40 (3–113)	31 (2–84)	1471 (291–3067)	4.9 (0.5–12.9)	2.9 (0.9–6.3)	0.4 (0.0–1.2)	0.2 (0.0–0.7)	0.5 (0.1–1.1)
1 058 632 (123 445–2 015 267)	6409 (326–13 021)	1112 (384–2324)	506 (23–1157)	374 (16–943)	8401 (980–15 993)	3.5 (0.2–10.0)	2.7 (0.9–5.5)	0.5 (0.0–1.7)	0.8 (0.0–2.8)	1.0 (0.1–2.5)

(*Continued*)

Table 4. Continued

	Population Characteristics			Number of DALYs Attributable to SSBs (95% UI)			
	Population	Mean SSB Intake (Servings/d)	Mean BMI (kg/m²)	CVD‡	Diabetes Mellitus§	Cancersβ	Musculoskeletal¶
Ages ≥65	36.5	0.1 (0.0–0.2)	20.7 (18.7–22.8)	402 157 (138 747–752 272)	74 420 (28 191–152 815)	23 845 (7007–48 948)	15 579 (3361–36 232)
Men overall	401	0.2 (0.1–0.4)	21.1 (19.3–22.9)	1 571 471 (213 861–3 225 017)	296 960 (103 403–628 856)	100 386 (10 995–230 765)	72 354 (5909–181 652)
Both sexes overall	786	0.2 (0.1–0.4)	21.2 (19.3–23.2)	2 396 880 (288 098–5 191 455)	541 380 (186 097–1 150 094)	193 494 (17 088–504 117)	179 382 (12 191–482 335)
Sub-Saharan Africa							
Women							
Ages 20–44	102	0.7 (0.2–1.2)	23.4 (22.0–24.8)	37 029 (6917–111 725)	30 816 (10 209–70 855)	2912 (412–10 073)	3804 (485–13 033)
Ages 45–64	46	0.3 (0.1–0.6)	24.7 (22.9–26.5)	49 411 (5112–166 467)	42 357 (15 102–91 405)	7557 (614–28 181)	15 404 (1348–60 247)
Ages ≥65	15.1	0.2 (0.1–0.4)	23.2 (20.0–26.4)	52 327 (3299–1902 99)	31 662 (10 880–68 345)	4481 (259–18 357)	7791 (365–33 591)
Women overall	163	0.4 (0.1–0.8)	23.6 (21.5–25.8)	138 767 (15 328–468 492)	104 835 (36 190–230 604)	14 950 (1285–56 611)	26 999 (2198–106 871)
Men							
Ages 20–44	103	0.8 (0.2–1.3)	22.1 (20.4–23.7)	57 263 (9026–184 052)	35 051 (11 296–81 630)	3024 (329–12 305)	3166 (357–12 434)
Ages 45–64	42.5	0.4 (0.1–0.6)	23.0 (21.1–24.8)	78 552 (7711–267 908)	46 511 (16 286–98 467)	8853 (711–34 537)	12 168 (937–49 004)
Ages ≥65	12.3	0.3 (0.1–0.5)	22.2 (19.9–24.6)	55 345 (3270–177 770)	24 201 (8211–51 487)	5327 (287–19 051)	5388 (223–21 842)
Men overall	158	0.5 (0.1–0.8)	22.4 (20.4–24.3)	191 160 (20 007–629 731)	105 762 (35 794–231 584)	17 203 (1327–65 893)	20 722 (1518–83 280)
Both sexes overall	320	0.5 (0.1–0.8)	23.0 (20.9–25.1)	329 927 (35 336–1 098 222)	210 597 (71 984–462 188)	32 153 (2612–122 505)	47 721 (3715–190 151)
Western Europe							
Women							
Ages 20–44	57.2	0.6 (0.4–0.7)	24.2 (22.6–25.7)	2785 (1408–7532)	10 643 (4376–20 716)	678 (372–1547)	512 (221–1096)
Ages 45–64	55.9	0.2 (0.2–0.3)	27.6 (25.7–29.5)	4620 (2981–6824)	19 279 (8111–36 767)	2322 (1474–3444)	2246 (998–4301)
Ages ≥65	42.9	0.2 (0.1–0.2)	27.7 (25.4–30.1)	13 062 (7646–37 354)	34 525 (15 355–62 560)	2805 (1576–6691)	1791 (712–4558)
Women overall	156	0.4 (0.3–0.5)	26.4 (24.4–28.3)	20 467 (12 035–51 710)	64 447 (27 843–120 044)	5806 (3422–11 682)	4550 (1931–9955)
Men							
Ages 20–44	58.4	0.7 (0.5–0.9)	25.9 (24.7–27.0)	5658 (3637–8272)	15 493 (6339–29 806)	474 (251–814)	340 (150–668)
Ages 45–64	54.8	0.3 (0.2–0.3)	28.2 (26.9–29.6)	12 886 (8760–17 955)	29 963 (12 733–55 416)	2728 (1571–4317)	1431 (643–2797)
Ages ≥65 r	31.9	0.2 (0.1–0.3)	27.5 (25.9–29.1)	13 700 (9123–18 760)	32 147 (13 937–57 165)	2614 (1523–3930)	797 (350–1540)
Men overall	145	0.4 (0.3–0.5)	27.1 (25.7–28.5)	32 245 (21 520–44 986)	77 603 (33 010–142 387)	5817 (3345–9061)	2569 (1143–5005)
Both sexes overall	301	0.4 (0.3–0.5)	26.7 (25.1–28.4)	52 712 (33 555–96 696)	142 050 (60 853–262 431)	11 622 (6767–20 743)	7118 (3074–14 960)

Countries are grouped into regions as follows: Australia/New Zealand – Australia, New Zealand; East/Central Eurasia – Albania, Armenia, Azerbaijan, Bulgaria, Bosnia and Herzegovina, Belarus, Czech Republic, Estonia, Georgia, Croatia, Hungary, Kazakhstan, Kyrgyzstan, Lithuania, Latvia, Moldova, Macedonia, Montenegro, Mongolia, Poland, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan; East/Southeast Asia – Brunei Darussalam, China, Fiji, Micronesia, Indonesia, Japan, Cambodia, Kiribati, Republic of Korea, Lao People's Democratic Republic, Sri Lanka, Maldives, Marshall Islands, Myanmar, Malaysia, Philippines, Papua New Guinea, Democratic People's Republic of Korea, Singapore, Solomon Islands, Thailand, Timor-Leste, Tonga, Taiwan, Viet Nam, Vanuatu, Samoa; Latin America/Caribbean – Argentina, Antigua and Barbuda, Bahamas, Belize, Bolivia, Brazil, Barbados, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Grenada, Guatemala, Guyana, Honduras, Haiti, Jamaica, Saint Lucia, Mexico, Nicaragua, Panama, Peru, Paraguay, El Salvador, Suriname, Trinidad and Tobago, Uruguay, Saint Vincent and the Grenadines, Venezuela; North Africa/Middle East – United Arab Emirates, Bahrain, Algeria, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Morocco, Oman, Occupied Palestinian Territory, Qatar, Saudi Arabia, Syrian Arab Republic, Tunisia, Turkey, Yemen; South Asia – Afghanistan, Bangladesh, Bhutan, India, Nepal, Pakistan; Sub-Saharan Africa – Angola, Burundi, Benin, Burkina Faso, Botswana, Central African Republic, Côte d'Ivoire, Cameroon, Democratic Republic of the Congo, Congo, Comoros, Cape Verde, Djibouti, Eritrea, Ethiopia, Gabon, Ghana, Guinea, Gambia, Guinea-Bissau, Equatorial Guinea, Kenya, Liberia, Lesotho, Madagascar, Mali, Mozambique, Mauritania, Mauritius, Malawi, Namibia, Niger, Nigeria, Rwanda, Sudan, Senegal, Sierra Leone, Somalia, São Tomé and Príncipe, Swaziland, Seychelles, Chad, Togo, United Republic of Tanzania, Uganda, South Africa, Zambia, Zimbabwe; Western Europe – Andorra, Austria, Belgium, Switzerland, Cyprus, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Ireland, Iceland, Israel, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Sweden. BMI indicates body mass index; CVD, cardiovascular disease; DALY, disability-adjusted life year; SSB, sugar-sweetened beverages; and UI, uncertainty interval.

Acknowledgments

The Global Burden of Diseases Nutrition and Chronic Disease Expert Group (NutriCoDE) authorship group includes the following:

Core Group: Dariush Mozaffarian, MD, DrPh, Renata Micha, PhD, and Peilin Shi, PhD, all at Tufts University Friedman School of Nutrition Science & Policy, Boston, MA, USA; Majid Ezzati, PhD, Imperial College London, London, UK; Saman Fahimi, MD, MPH, University of Cambridge, Cambridge, UK; Shahab Khatibzadeh, MD, MPH, Harvard School of Public Health, Boston, MA, USA; John Powles, MB, BS, MA, FFPH, University of Cambridge, Cambridge, UK.

Other Members: Ibrahim Elmadfa, PhD, Institute of Nutritional Sciences, University of Vienna, Vienna, Austria; Mayuree Rao, BA, The Warren Alpert Medical School of Brown University, Providence, RI, USA; Pattra Wirojratana, Harvard School of Public Health, Boston, MA, USA; Gitanjali Singh, PhD, Tufts University Friedman School of Nutrition Science & Policy, Boston, MA USA.

Dietary Exposure Imputation: Stephen S. Lim, PhD, Institute for Health Metrics and Evaluation, University of Washington, Seattle, Washington, USA; Kathryn G. Andrews, MPH, African Leaders Malaria Alliance, Dar es Salaam, Tanzania; Rebecca E Engell, BA, Institute for Health Metrics and Evaluation, University of Washington, Seattle, Washington, USA.

Dietary Exposures – Corresponding Members (alphabetic order): Pamela A. Abbott, PhD, University of Aberdeen, United Kingdom;

	DALYs per Million Adults Attributable to SSBs (95% UI)					Percentage of DALYs Attributable to SSBs (95% UI)				
Total†	CVD‡	Diabetes Mellitus§	Cancersβ	Musculoskeletal¶	Total†	CVD‡	Diabetes Mellitus§	Cancersβ	Musculoskeletal¶	Total†
516 000 (201 633–914 121)	11 026 (3804–20 624)	2040 (773–4190)	654 (192–1342)	427 (92–993)	14 147 (5528–25 062)	2.6 (0.3–6.3)	2.0 (0.7–4.2)	0.5 (0.1–1.5)	0.8 (0.1–2.7)	0.9 (0.2–2.1)
2 041 171 (417 298–3 901 931)	3277 (446–6725)	619 (216–1311)	209 (23–481)	151 (12–379)	4257 (870–8137)	3.7 (0.3–9.7)	2.5 (0.9–5.3)	0.5 (0.0–1.5)	0.6 (0.0–2.1)	0.8 (0.1–1.9)
3 311 136 (643 875–6 636 016)	2554 (307–5531)	577 (198–1225)	206 (18–537)	191 (13–514)	3528 (686–7070)	3.5 (0.3–9.5)	2.3 (0.8–4.9)	0.6 (0.0–1.8)	0.7 (0.0–2.4)	0.8 (0.1–2.0)
74 561 (23 857–182 806)	261 (49–789)	218 (72–500)	21 (3–71)	27 (3–92)	526 (168–1291)	2.5 (0.6–8.2)	1.9 (0.6–4.2)	0.2 (0.0–0.7)	0.2 (0.0–0.7)	0.2 (0.1–0.5)
114 729 (28 738–315 748)	1075 (111–3622)	922 (329–1989)	164 (13–613)	335 (29–1311)	2496 (625–6871)	1.4 (0.2–5.4)	2.7 (0.9–5.7)	0.2 (0.0–0.9)	0.6 (0.1–2.5)	0.5 (0.1–1.4)
96 260 (18 857–288 885)	3466 (219–12 603)	2097 (721–4526)	297 (17–1216)	516 (24–2225)	6375 (1249–19 133)	1.4 (0.1–5.4)	2.6 (0.9–5.6)	0.4 (0.0–1.5)	0.8 (0.0–3.6)	0.7 (0.1–2.1)
285 550 (71 452–787 440)	685 (76–2312)	517 (179–1138)	74 (6–279)	133 (11–527)	1409 (353–3885)	1.8 (0.3–6.3)	2.4 (0.8–5.2)	0.3 (0.0–1.1)	0.5 (0.0–2.3)	0.5 (0.1–1.3)
98 504 (28 433–253 567)	400 (63–1286)	245 (79–570)	21 (2–86)	22 (2–87)	688 (199–1772)	3.7 (0.6–11.1)	3.3 (1.1–7.2)	0.3 (0.0–1.2)	0.2 (0.0–0.9)	0.3 (0.1–0.7)
146 083 (32 801–409 279)	1849 (182–6307)	1095 (383–2318)	208 (17–813)	286 (22–1154)	3439 (772–9635)	2.1 (0.3–8.1)	3.1 (1.1–6.5)	0.4 (0.0–1.9)	0.8 (0.1–3.4)	0.6 (0.1–1.7)
90 261 (15 464–248 934)	4495 (266–14 438)	1966 (667–4182)	433 (23–1547)	438 (18–1774)	7331 (1256–20 218)	1.8 (0.1–5.9)	2.3 (0.8–4.9)	0.5 (0.0–1.7)	0.9 (0.0–3.6)	0.7 (0.1–2.0)
334 848 (76 698–911 779)	966 (101–3182)	534 (181–1170)	87 (7–333)	105 (8–421)	1692 (388–4607)	2.6 (0.3–8.4)	2.9 (1.0–6.2)	0.4 (0.0–1.6)	0.6 (0.0–2.6)	0.5 (0.1–1.4)
620 398 (148 150–1 699 219)	824 (88–2742)	526 (180–1154)	80 (7–306)	119 (9–475)	1549 (370–4242)	2.2 (0.3–7.3)	2.6 (0.9–5.7)	0.3 (0.0–1.3)	0.6 (0.0–2.5)	0.5 (0.1–1.4)
14 618 (7626–28 381)	40 (20–108)	153 (63–298)	10 (5–22)	7 (3–16)	210 (110–408)	1.7 (0.8–5.0)	2.1 (0.8–4.2)	0.1 (0.1–0.4)	0.0 (0.0–0.1)	0.2 (0.1–0.4)
28 468 (16 517–46 842)	83 (53–122)	345 (145–658)	42 (26–62)	40 (18–77)	509 (295–838)	0.5 (0.3–0.7)	2.8 (1.2–5.2)	0.1 (0.1–0.1)	0.1 (0.0–0.1)	0.2 (0.1–0.4)
52 183 (30 457–104 202)	305 (178–872)	806 (358–1460)	65 (37–156)	42 (17–106)	1218 (711–2431)	0.3 (0.1–0.7)	2.8 (1.2–4.9)	0.1 (0.0–0.2)	0.1 (0.0–0.2)	0.3 (0.2–0.6)
95 269 (54 601–179 425)	122 (72–307)	383 (165–713)	34 (20–69)	27 (11–59)	566 (324–1066)	0.8 (0.4–2.1)	2.6 (1.1–4.8)	0.1 (0.1–0.3)	0.1 (0.0–0.1)	0.2 (0.1–0.5)
21 966 (12 471–36 564)	80 (51–116)	218 (89–419)	7 (4–11)	5 (2–9)	309 (175–514)	1.4 (0.9–2.1)	5.4 (2.1–10.1)	0.1 (0.0–0.2)	0.0 (0.0–0.0)	0.3 (0.1–0.5)
47 008 (28 553–73 400)	235 (160–328)	547 (232–1011)	50 (29–79)	26 (12–51)	858 (521–1340)	0.5 (0.3–0.7)	3.0 (1.2–5.5)	0.1 (0.0–0.1)	0.1 (0.0–0.1)	0.3 (0.2–0.6)
49 259 (30 216–75 369)	429 (286–587)	1007 (436–1790)	82 (48–123)	25 (11–48)	1543 (946–2360)	0.2 (0.2–0.3)	2.1 (0.9–3.8)	0.0 (0.0–0.1)	0.0 (0.0–0.1)	0.3 (0.2–0.4)
118 233 (71 241–185 333)	204 (136–285)	491 (209–902)	37 (21–57)	16 (7–32)	749 (451–1174)	0.7 (0.5–1.1)	3.5 (1.4–6.4)	0.1 (0.0–0.1)	0.0 (0.0–0.1)	0.3 (0.2–0.5)
213 503 (125 841–364 758)	162 (103–296)	435 (187–805)	36 (21–64)	22 (9–46)	655 (386–1118)	0.8 (0.4–1.6)	3.0 (1.2–5.6)	0.1 (0.0–0.2)	0.0 (0.0–0.1)	0.3 (0.1–0.5)

(Continued)

*CVD DALYs include those from ischemic heart disease, ischemic stroke, and hypertensive heart disease.
†Diabetes mellitus DALYs include those from the direct effects of SSBs on diabetes mellitus and the effects of SSBs on diabetes mellitus that are mediated through BMI.
‡Cancer DALYs include those from breast cancer, uterine cancer, esophageal cancer, colon and rectum cancers, pancreatic cancers, kidney cancers, and gall bladder cancer.
§Musculoskeletal DALYS include those from lower back pain and osteoarthritis.
||Total DALYs include those from CVD, diabetes mellitus, and cancers as described above.

Morteza Abdollahi, MD, MPH, National Nutrition and Food Technology Research Institute Iran; Enrique Abeyá Gilardon, MD, MPH, Ministerio de Salud, Argentina; Habibul Ahsan, MD, University of Chicago, USA; Mohannad Abed Alfattah Al Nsour, MD, Eastern Mediterranean Public Health Network (EMPHNET), Jordan; Suad N. Al-Hooti, MSc, Kuwait Institute for Scientific Research, Kuwait; Carukshi Arambepola, MD, Faculty of Medicine, University of Colombo, Sri Lanka; Hubert Barennes, PhD, Institut Francophone pour la Médecine Tropicale, Lao PDR; Simon Barquera, PhD, Instituto Nacional de Salud Publica (INSP), Mexico; Ana Baylin, MD, DrPH, University of Michigan, USA; Wulf Becker, PhD, National Food Agency, Sweden; Peter Bjerregaard, MD, DrMedSci, National Institute of Public Health, University of Southern Denmark, Denmark; Lesley T. Bourne, PhD, Environment and Health Research Unit, Medical Research Council, South Africa; Neville Calleja, MD, MFPH, Department of Health Information & Research, Malta; Mario V. Capanzana, PhD, Food and Nutrition Research Institute, Philippines; Katia Castetbon, PhD, Institut de Veille Sanitaire, France; Hsing-Yi Chang, DrPH, National Health Research Institutes, Taiwan; Yu Chen, PhD, New York University School of Medicine, United States; Melanie J. Cowan, MPH, WHO, Switzerland; Stefaan De Henauw, MD, PhD, Ghent University, Department of Public Health, Belgium; Eric L. Ding, ScD, Harvard Medical School and Harvard School of Public Health, USA; Charmaine A. Duante, MSc,

Food and Nutrition Research Institute, Department of Science and Technology, Philippines; Pablo Duran, PhD, Dirección Nacional de Maternidad e Infancia, Ministerio de Salud de la Nación, Argentina; Ibrahim Elmadfa, Professor, Institute of Nutritional Sciences, University of Vienna, Austria; Heléne Enghardt Barbieri, National Food Agency, Uppsala, Sweden; Farshad Farzadfar, MD, ScD, Tehran University of Medical Sciences, Iran; Dulitha N. Fernando, PhD, Faculty of Medicine, University of Colombo, Sri Lanka; Aida Filipovic Hadziomeragic, MD, MSc, Institute of Public Health of Federation of Bosnia and Herzegovina, Bosnia and Herzegovina; Regina M. Fisberg, PhD, Faculty of Public Health, University of São Paulo, Brazil; Simon Forsyth, BA (UQ), School of Population Health, University of Queensland, Australia; Didier Garriguet, MSc, Statistics Canada, Canada; Jean-Michel Gaspoz, MD, MPH, Geneva University Hospitals and Faculty of Medicine of Geneva, Switzerland; Dorothy Gauci, Post Graduate Diploma (Epidemiology), Department of Health Information and Research, Malta; Brahmam N.V. Ginnela, MB, BS, DPH, National Institute of Nutrition, Indian Council of Medical Research, India; Idris Guessous, MD, Geneva University Hospitals, Switzerland; Martin C. Gulliford, FFPH, King's College London, UK; Wilbur Hadden; Christian Haerpfer, PhD, University of Aberdeen, United Kingdom; Daniel J. Hoffman, PhD, Rutgers, the State University of New Jersey, USA; Anahita Houshiar-Rad MSc, National Nutrition and Food Technology Research Institute Shahid Beheshti University of Medical Sciences, Iran; Inge Huybrechts, PhD, Ghent University, Department of Public Health, Belgium; Nahla C. Hwalla, PhD, American University of Beirut, Lebanon; Hajah Masni Ibrahim, SM, Ministry of Health, Brunei; Manami Inoue, MD, PhD, Epidemiology and Prevention Division, Research Center for Cancer Prevention and Screening, National Cancer Center, Japan; Maria D. Jackson, PhD, University of the West Indies, Jamaica; Lars Johansson, PhD, Norwegian Directorate of Health, Norway; Lital Keinan-Boker, MD, PhD, Ministry of Health, Israel; Cho-il Kim, PhD, Korea Health Industry Development Institute, Republic of Korea; Eda Koksal, PhD, Gazi University, Turkey; Hae-Jeung Lee; Yanping Li, PhD, Harvard School of Public Health, USA; Nur Indrawaty Lipoeto, PhD, Andalas University, Indonesia; Guansheng Ma, PhD, National Institute for Nutrition and Food Safety, Chinese Center for Disease Control and Prevention, China; Guadalupe L. Mangialavori, MS RD, Ministerio de Salud de la Nación (National Health Ministry), Argentina; Yasuhiro Matsumura, PhD, Bunkyo University, Japan; Stephen T. McGarvey, PhD, Brown University, USA; Mei Fen Chan; Gert B.M. Mensink, PhD, Robert Koch Institute, Germany; Rafael A. Monge-Rojas, PhD, Costa Rican Institute for Research and Education and Nutrition and Health (INCIENSA), Costa Rica; Abdulrahman O. Musaiger, PhD, Arab Center for Nutrition, Bahrain; Nagalla Balakrishna, PhD, National Institute of Nutrition, Hyderabad, India; Androniki Naska, PhD, Dept. of Hygiene, Epidemiology and Medical Statistics, University of Athens Medical School, Greece; Marga C. Ocke, PhD, National Institute for Public Health and the Environment, Netherlands; Maciej Oltarzewski, MSc, National Food and Nutrition Institute, Poland; Philippos Orfanos, MSc, Dept. of Hygiene, Epidemiology and Medical Statistics, University of Athens Medical School, Greece; Marja-Leena Ovaskainen, PhD, National Institute for Health and Welfare, Finland; Wen-Harn Pan, PhD, Division of Preventive Medicine and Health Services Research, Institute of Population Health Sciences, National Health Research Institutes, Taiwan; Demosthenes B. Panagiotakos, PhD, Harokopio University, Greece; Gulden A. Pekcan, PhD, Hacettepe University Department of Nutrition and Dietetics, Turkey; Stefka Petrova, MD, PhD, National Center of Public Health and Analyses, Bulgaria; Noppawan Piaseu, PhD, Mahidol University, Thailand; Christos Pitsavos, MD, Athens University Medical School, Greece; Luz Gladys Posada, RD, MS, Universidad de Antioquia, Colombia; Leanne M. Riley, MSc, WHO, Switzerland; Luz Maria Sánchez-Romero, MD MSc, National Institute of Public Health, Mexico; Rusidah BT. Selamat, MSc, Nutrition Division, Ministry of Health, Malaysia; Sangita Sharma; Abla Mehio Sibai, PhD, American University of Beirut Faculty of Health Sciences, Lebanon; Rosely Sichieri, MD, PhD, State University of Rio de Janeiro, Brazil; Chansimaly Simmala, MD, Institut of Tropical Medecin, Laos; Laufey Steingrimsdottir, PhD, Professor, Iceland; Gillian Swan; Elżbieta Halina. Sygnowska, MSc PhD, National Institute of Cardiology, Poland; Lucjan Szponar, MD;PhD, National Food and Nutrition Institute, Poland; Heli Tapanainen, MSc, National Institute for Health and Welfare, Finland; Robert Templeton; Anastasia Thanopoulou, MD, PhD, Diabetes Center, 2nd Department of Internal Medicine, National University of Athens, Hippokration General Hospital, Greece; Holmfridur Thorgeirsdóttir, MSc, Directorate of Health, Iceland; Inga Thorsdottir; Antonia Trichopoulou, MD, Hellenic Health Foundation, Greece; Shoichiro Tsugane, MD, PhD, National Cancer Center, Japan; Aida Turrini, MD, National Research Institute on Food and Nutrition, Italy; Sirje Vaask, PhD, Tallinn University of Technology, Estonia; Coline van Oosterhout, National Institute for Public Health and the Environment, Netherlands; J Lennert Veerman, PhD, The University of Queensland, Australia; Nowak Verena; Anna Waskiewicz, MSc, PhD., Institute of Cardiology, Department of Cardiovascular Diseases Epidemiology, Prevention and Health Promotion, Poland; Sahar Zaghloul, PhD., National Nutrition Institute, Egypt; Gábor Zajkás, MD, National Institute of Food and Nutrition Sciences, Hungary.

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CLINICAL PERSPECTIVE

Sugar-sweetened beverages (SSBs) increase obesity and type 2 diabetes mellitus and are now consumed worldwide. Yet, the impact of SSBs on global diabetes mellitus– and obesity-related diseases by nation, age, and sex has not been reported. We developed a global model incorporating diverse data sources across 187 countries, by age and sex, on the following: SSB intake patterns from individual-level dietary surveys and national food availability; effects of SSBs on adiposity and diabetes mellitus from meta-analyses of longitudinal cohort studies; impact of adiposity on diabetes mellitus, cardiovascular disease, and cancers from meta-analyses of international pooling projects; and numbers of cause-specific national deaths from the Global Burden of Diseases study. Using a comparative risk assessment model, in 2010, we estimated ~184 000 deaths/y and 8.5 million disability-adjusted life-years per year attributable to SSBs worldwide; 75% of deaths and 85% of disability-adjusted life-years occurred in low- and middle-income countries. Tremendous geographic variation was evident, with the largest burdens in Latin America and the Caribbean, and the smallest burdens in East Asia. Proportional impacts (percentage of disease attributable to SSBs) were highest in young adults, particularly young men. In Mexico, 1 in 3 diabetes mellitus– and obesity-related deaths in men <44 years of age were attributable to SSBs; and in the United States, 1 in 10 such deaths were attributable to SSBs. Given a dramatic inverse gradient between age and SSB intake in most nations, future health burdens could be even higher as younger populations age. Our findings highlight the large global health burdens, and the key geographic and demographic variation, as well, attributable to SSBs, providing the basis for targeted health policy and interventions.