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RESEARCH ARTICLE

Equitability of Individual and Population Interventions to Reduce Obesity: A Modeling Study in Mexico

Dèsirée Vidaña-Pérez, MSc,[1] Ariela Braverman-Bronstein, MPH,[1] Rodrigo Zepeda-Tello, MSc,[1] Dalia Camacho-García-Formentí, MSc,[1] M. Arantxa Colchero, PhD,[2] Juan A. Rivera-Dommarco, PhD,[3] Barry M. Popkin, PhD,[4,5] Tonatiuh Barrientos-Gutierrez, PhD[1]

Introduction: Modeling studies have estimated the potential impact and cost effectiveness of interventions to reduce obesity; few have focused on their equity across socioeconomic groups. This study aims to compare the equitability of individual- and population-level interventions to reduce obesity in Mexico.

Methods: Mathematical models were implemented to estimate the expected effect of 2 sugar-sweetened beverage tax scenarios (10% and 20%) and bariatric surgery, pharmacotherapy, and dietary advice as individual interventions to reduce body weight. Individual interventions were modeled using meta-analytical weight change, inclusion and exclusion criteria, and the probability of access to healthcare services. For the tax, investigators obtained the baseline consumption of sugar-sweetened beverages from the National Health Survey 2012 and applied the reduction in sales observed in 2016 to estimate the caloric change and weight reduction. Implementation costs and cost per person, per kilogram, and equity were calculated for all interventions over a 1-year timeframe.

Results: The 20% tax produced the largest estimated increase (4.50%) in normal BMI prevalence, was the most cost effective, and had the largest and most equitable decrease in obesity across socioeconomic categories. Pharmacotherapy and bariatric surgery produced sizable decreases in obesity prevalence (3.68% and 1.18%), particularly among the middle and high socioeconomic groups, whereas dietary advice had the lowest impact on normal and obese categories.

Conclusions: Individual interventions were effective in reducing obesity; yet, they were more expensive and less equitable than population interventions. Obesity in Mexico affects all socioeconomic groups; available interventions need to be carefully analyzed to tailor a national strategy that is both effective and equitable.

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INTRODUCTION

Obesity interventions at the individual and population levels are a global health priority.[1] Clinical interventions usually target individuals who are living with obesity to reduce the health risks associated with excess weight; yet, they have little effect in preventing new obesity cases.[2] Population-based interventions aim to control the population determinants of excess weight, aiming to shift the whole

From the [1]Center for Population Health Research, National Institute of Public Health, Cuernavaca, Mexico; [2]Center for Health Services Research, National Institute of Public Health, Cuernavaca, Mexico; [3]General Director, National Institute of Public Health, Cuernavaca, Mexico; [4]Department of Nutrition, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina; and [5]UNC Carolina Population Center, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

Address correspondence to: Tonatiuh Barrientos-Gutierrez, PhD, Center for Population Health Research, National Institute of Public Health, Av. Universidad #655, Col. Sta. Ma. Ahuacatitlán, Cuernavaca, México, CP 62100. E-mail: tbarrientos@insp.mx.

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distribution toward lower weight.[3] Population-wide interventions, such as food labeling and food taxes, are relatively new, and their potential benefits compared with those of clinical interventions are unknown.

Public health interventions should aim to be equitable, producing larger gains for vulnerable groups.[4] Clinical interventions, such as weight loss programs, rely on behavioral changes that require motivation, knowledge, and resources, which tend to work better for high-SES individuals.[5,6] By contrast, population-level interventions are structural, requiring less individual participation, which could make them more equitable.[7] Analyzing the equity perspective of clinical and population interventions is critical to understanding their potential role to reduce disparities.

This study aims to compare the cost effectiveness and equity of clinical- and population-level interventions to reduce obesity. The expected 1-year weight reduction for the Mexican population is estimated under 5 scenarios: bariatric surgery, pharmacotherapy, dietary advice, and the effect of a 10% and 20% population-wide sugar-sweetened beverage (SSB) tax.

METHODS

A total of 5 interventions were selected, 3 on the basis of international guidelines for weight loss[8,9] and 2 population-level interventions (SSB tax at 10% and 20%). For obesity, behavioral counseling is the most recommended intervention[9]; however, in some cases, pharmacotherapy is recommended.[10] For obesity Grades II and III, bariatric surgery is indicated to attain long-term weight loss.[11] Taxes are population-based policy interventions aimed at reducing the consumption of SSB by influencing purchasing behaviors.[12]

Clinical interventions were assessed by (1) identifying their meta-analytical effects and dropout rates; (2) constructing flowcharts containing their inclusion and exclusion criteria; and (3) applying the expected weight reduction to individuals complying with inclusion criteria, considering dropout rates. The impact of the SSB tax was assessed by (1) obtaining pretax SSB consumption in the Mexican population from the 2012 National Survey of Health and Nutrition (ENSANUT), (2) reducing consumption by the observed change in purchases 1 year after the tax was implemented,[13] and (3) estimating the weight change as a function of the overall or SES-specific reduction in calorie intake from SSB using the model of Hall et al.[14] Costs obtained from published studies and public data from Mexico were applied to the number of people undergoing each intervention. The differential impact of each intervention across SES was modeled considering the proportion of people with obesity at baseline and the probability of accessing weight control services in the Mexican healthcare system. Equity was then evaluated comparing the impact of each intervention across SES.

Study Sample

Data were collected from ENSANUT 2012, a nationally representative survey involving 45,000 households.[15] Detailed anthropometric and dietary intake data were collected from a representative subsample of participants from October 2011 and May 2012.[16] Analyses were restricted to adults (aged ≥20 years) with no missing data on anthropometric and dietary data.

Measures

Body weight (kilogram) and height (meter) were directly measured using standardized procedures and instruments.[15] Subjects were classified according to the World Health Organization (WHO) standards for BMI into normal (<25 kg/m^2), overweight (≥25 to <30 kg/m^2), or obese (≥30 kg/m^2).

Sex and age were self-reported. Older Mexican adults tend to consume fewer calories from SSBs than younger adults[17,18]; thus, the population was divided into age groups: young adults (aged 20−39 years), adults (aged 40−59 years), and elderly (aged ≥60 years). SES was obtained from ENSANUT 2012's SES index and was divided into tertiles (low, middle, and high).[19]

Inclusion criteria considered health and anthropometric information following international guidelines.[20,21] Bariatric surgery was modeled for people with a BMI >40 kg/m^2 or BMI >35 kg/m^2 with diabetes or cardiovascular disease diagnosis, people who were nonsmokers, people who were aged <65 years (excluding pregnant or breastfeeding women), and people who visited their health services to detect excess weight 12 months before the ENSANUT survey (Appendix Text 1, available online, and Appendix Figure 1, available online). A random dropout rate of 11.2% was applied to reflect the proportion of people who decline surgery.[22] The meta-analytical weight loss estimate of 21.27 kg over 1 year was applied to the remaining individuals.[23]

Pharmacotherapy consisted of the prescription of 120 mg of orlistat for 1 year, with inclusion criteria based on the recommendations for orlistat treatment.[24] Orlistat was modeled for individuals with overweight or obesity (BMI >30 kg/m^2 or >27 kg/m^2) with comorbidities such as diabetes, hypertension, or cardiovascular disease, who visited their health services to detect excess weight 12 months before the ENSANUT survey, excluding pregnant or breastfeeding women (Appendix Text 1, available online, and Appendix Figure 2, available online). A random dropout rate of 33% was applied to reflect treatment abandonment,[25] then the meta-analytical weight loss estimate of 2.87 kg over 1 year was applied to all the remaining individuals.[26]

Dietary advice consisted of dietary advice provided by a nutritionist once a month for 12 months, modeling a high-protein and low-carbohydrate diet. People with BMI ≥25 kg/m^2 who visited their health services to detect excess weight 12 months before ENSANUT, excluding pregnant or breastfeeding women, were modeled (Appendix 1, available online, and Appendix Figure 3, available online). Assuming a random dropout rate of 30%, the meta-analytical weight loss estimate of 0.39 kg was applied to all the remaining individuals to reflect the effect of full adherence to dietary advice.[27]

The 2014 SSB tax implemented in Mexico, which increased the price by 1 peso/L (10% price increase), was modeled. Nondairy and nonalcoholic beverages with added sugar were subject to taxation,[24] including carbonated beverages, industrialized juices, and industrialized flavored water. After 2 years of implementation, a 7.6% average 1-year reduction in SSB purchase was observed (by SES: 14.3% low, 11.7% middle, 5.6% high).[13] Pretax SSB consumption was retrieved from the ENSANUT 2012 food frequency questionnaire, and the observed reduction to taxed beverages was modeled according to each individual's SES. A 39% compensation for the reduced calories was assumed (Appendix Text 2, available online, and Appendix Figure 4, available online).[28] For the 20% tax scenario, twice the average effect by SES was assumed on the basis of previous evidence suggesting that tax effects over consumption and purchases are linear.[29]

Costs of the interventions were estimated from the healthcare system standpoint and were obtained from 2 public institutions, the National Health Ministry and the Mexican Institution of Social Security, because they provide health care for more than half of the population (Mexican Institution of Social Security, 30.42%; National Health Ministry, 36.55%).[15] Total cost of implementation for a 1-year timeframe included direct costs for each intervention, such as administrative and operating costs (physician office visits, surgery, and pharmacotherapy for individual interventions) or development and implementation costs (SSB tax). To estimate cost per person, the total cost of implementation of each intervention was divided by the population reached. Cost per kilogram was estimated by dividing the total cost over the total number of kilograms reduced by each individual because of each intervention. Costs were standardized to September 2017, adjusting for inflation using the National Consumer Price Index,[30] and were converted to U.S. dollars[31] (Appendix Text 3, available online).

Statistical Analysis

Bodyweight change was estimated using the dynamic weight change model proposed by Hall and colleagues,[14] assuming that the SSB tax would lead to a reduction in consumption that would be followed by a proportional weight reduction. The model uses a system of differential equations to predict the expected body weight change of an individual using energy intake and expenditure, sex, age, height, body weight, and physical activity level.[32] The model was implemented to each person in ENSANUT 2012. To obtain the expected reduction in weight after 1 year, the counterfactual was a population with no changes in physical activity nor in energy intake. Final weights were transformed to BMI and BMI categories (normal, overweight, obese) to estimate the prevalence changes. All analyses were conducted in R, version 3.4.1.[33] Sampling weights and design were considered for all population-level estimates and their uncertainty intervals (Appendix Text 2, available online).

RESULTS

Table 1 shows the baseline characteristics of the population by BMI category. Female adults accounted for 55% of the sample. The largest age group was participants aged <40 years (46.0%). Overall, 30.2% of participants had normal weight, 36.7% had overweight, and 33.1% had obesity. By age, adults aged 40−59 years had the highest prevalence of obesity (40.4%), whereas adults aged >60 years had the lowest (25.2%). The highest prevalence of obesity was observed in high-SES participants (36.9%), and the lowest was observed in low-SES participants (28.6%).

Table 2 shows the expected relative changes with respect to baseline for each BMI category by intervention. The expected absolute changes can be found in Appendix Table 1 (available online). A 20% SSB tax scenario would have the highest impact, increasing the prevalence of people in the normal category by almost 4.50% (∼794,000 people) and decreasing obesity by 2.75% (∼485,000 people) in 1 year. Even though orlistat and bariatric surgery did not have an impact on the normal category, they produced a 3.68% (−1.22 percentage points) and 1.18% (−0.39 percentage points) decrease in

Table 1. Characteristics of the Adult Mexican Population by BMI Categories (ENSANUT 2012)

Characteristics	Total N=58.4[a] (100%)	BMI category: Normal *n*=17.6[a] (30.2%)	Overweight *n*=21.4[a] (36.7%)	Obese *n*=19.4[a] (33.1%)
Sex, %				
Male	44.4	34.9	38.9	26.2
Female	55.6	26.4	34.9	38.6
Age groups, years, %				
20–39	46.0	37.4	31.6	31.0
40–59	34.5	19.6	40.0	40.4
≥60	19.5	32.1	42.7	25.2
SES, %				
Low	35.0	32.8	38.4	28.6
Medium	32.6	27.2	38.6	34.2
High	32.4	30.1	32.9	36.9

Note: Total sampled population was 2,577 (normal BMI=704, overweight=979, and obese=894). The percentage in the total column sums vertically 100% within the characteristic (e.g., sex), and within BMI categories, the percentage in columns sums horizontally to 100% by row (e.g., female prevalence of normal weight, overweight, and obesity).
[a]Expanded population in millions.
ENSANUT, National Survey of Health and Nutrition.

Table 2. Baseline Prevalence of Normal Weight, Overweight, and Obesity and the Expected Relative Changes After 1 Year of Simulated Interventions According to Sex and Age

Categories	Baseline Prevalence	Advice, % (UI)[a]	Bariatric, % (UI)[a]	Orlistat, % (UI)[a]	Tax 10%, % (UI)[a]	Tax 20%, % (UI)[a]
Overall						
Normal	30.2	0.62 (0.19, 0.97)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	1.69 (0.56, 3.17)	4.50 (2.41, 7.12)
Overweight	36.7	0.08 (−0.36, 0.55)	1.04 (0.72, 1.64)	3.30 (3.60, 7.17)	−0.05 (−1.52, 1.39)	−1.25 (−3.55, 0.91)
Obese	33.1	−0.65 (−0.93, 0.34)	−1.18 (−1.81, −0.80)	−3.68 (−8.58, −1.08)	−1.51 (−2.65, −0.60)	−2.75 (−4.12, −1.57)
Sex						
Male						
Normal	34.9	0.77 (0.14, 1.20)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	2.18 (0.30, 4.76)	6.10 (2.52, 10.91)
Overweight	38.9	−0.51 (−1.01, 0.13)	0.80 (0.56, 0.88)	2.91 (2.85, 6.99)	0.36 (−2.42, 3.19)	−2.06 (−6.48, 2.13)
Obese	26.2	−0.27 (−0.38, −0.10)	−1.18 (−2.08, −0.69)	−4.27 (−10.99, −3.43)	−3.43 (−6.59, −1.05)	−5.10 (−8.72, −2.25)
Female						
Normal	26.4	0.45 (0.00, 0.71)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	1.21 (0.04, 2.74)	2.80 (1.11, 4.82)
Overweight	34.9	0.54 (−0.14, 1.15)	1.32 (0.77, 2.30)	3.69 (2.15, 8.67)	−0.40 (−1.60, 0.62)	−0.52 (−2.23, 1.17)
Obese	38.6	−1.19 (−1.29, −0.32)	−1.19 (−0.19, −0.10)	−3.34 (−8.27, −1.53)	−0.47 (−0.98, −0.08)	−1.45 (−2.43, −0.63)
Age, years						
20–39						
Normal	37.4	0.99 (0.20, 1.54)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	1.74 (0.35, 3.59)	3.53 (1.63, 5.92)
Overweight	31.6	−0.29 (−1.39, 0.85)	0.16 (0.10, 0.18)	3.45 (2.52, 7.84)	−0.32 (−2.90, 2.41)	−0.63 (−3.95, 2.81)
Obese	31.0	−0.908 (−1.55, −0.14)	−0.16 (−0.19, −0.10)	−3.51 (−9.19, −1.65)	−1.77 (−3.89, −0.29)	−3.61 (−6.14, −1.49)
40–59						
Normal	19.6	0.20 (0.00, 0.32)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	1.22 (0.00, 3.36)	5.40 (1.73, 10.25)
Overweight	40.0	0.38 (0.20, 0.73)	1.38 (1.17, 2.71)	4.95 (2.61, 10.24)	0.73 (−0.80, 2.52)	−1.00 (−3.74, 1.57)
Obese	40.4	−0.47 (−0.73, −0.32)	−1.36 (−2.69, −1.16)	−4.90 (−11.18, −1.96)	−1.29 (−2.91, −0.26)	−1.66 (−3.34, −0.48)
≥60						
Normal	32.1	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	0.00 (0.00, 0.00)	2.19 (0.00, 7.41)	6.15 (0.11, 16.77)
Overweight	42.7	0.00 (0.00, 0.01)	2.06 (0.86, 2.42)	0.40 (0.32, 2.54)	−0.87 (−4.63, 1.74)	−2.67 (−9.75, 2.75)
Obese	25.2	0.00 (0.00, 0.00)	−3.45 (−4.05, −1.44)	−0.67 (−4.25, −0.44)	−1.31 (−3.49, 0.00)	−3.29 (−7.04, −0.42)

[a]%: Percentage change relative to baseline.
UI, uncertainty intervals.

obesity. The 10% SSB tax increased the normal category by 1.69% (0.52 percentage points) and decreased obesity by 1.51% (−0.50 percentage points). Dietary advice decreased obesity by 0.65% (0.18 percentage points) and increased the normal category by the same amount. By sex, all interventions followed a similar pattern, differing only in the magnitude of change. By age group, the 20% SSB tax produced larger increases in the normal BMI category as age increased; yet, obesity reductions were larger in the group aged 20−39 years (−3.61%, −1.12 percentage points) than in other age groups.

Figure 1 shows the expected absolute change in prevalence of normal and obese categories for each intervention by SES. Dietary advice produced the smallest

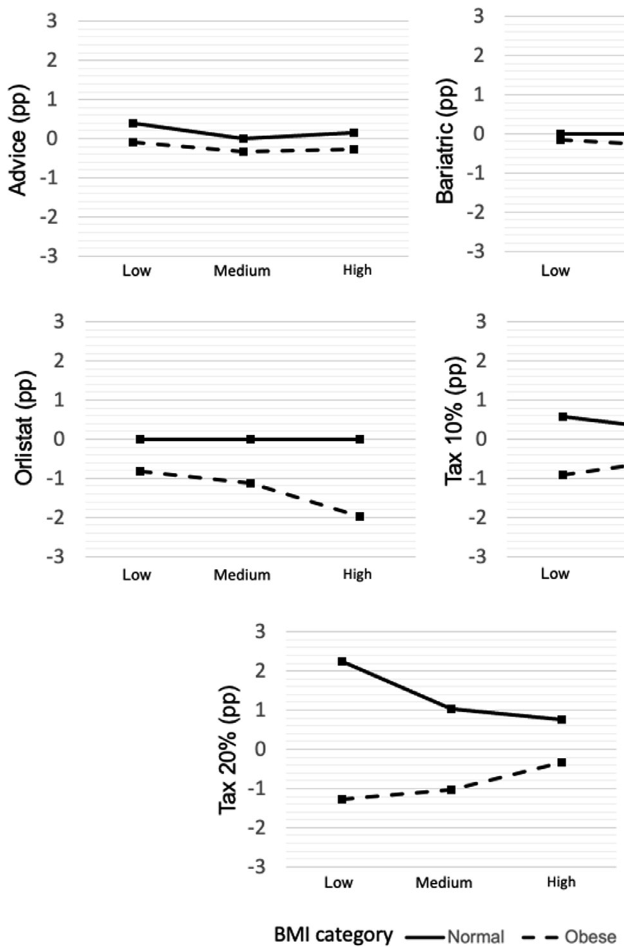

Figure 1. Absolute prevalence change for each intervention by SES on normal and obese categories.
pp, percentage point.

change in normal and obese categories across SES. Bariatric surgery and orlistat produced decreases in obesity prevalence largely in high-SES individuals (0.83 percentage points and 1.47 percentage points, respectively), with no gain in normal-weight prevalence for either intervention. The 10% SSB tax produced obesity decreases mainly in the low- and middle-SES groups (0.90 percentage points and 0.52 percentage points, respectively) and increases in the normal category, particularly in the low- and high-SES groups (0.57 points and 0.74 points). In the 20% SSB tax scenario, obesity decreased for all SES groups, although larger decreases were observed for people in the low- and middle-SES groups (1.29 percentage points and 1.06 percentage points, compared with 0.34 percentage points in high-SES individuals). The 20% SSB tax also produced the largest gains in the prevalence of normal weight, being larger for participants of low (2.25 percentage points) and middle (1.03 percentage points) SES than for those of high SES (0.75 percentage points). The expected absolute and relative changes are shown in Appendix Tables 2 and 3 (available online).

Table 3 shows the estimated total cost, cost per person, the cost per kilogram in U.S. dollars, and the total kilograms reduced for all interventions. Bariatric surgery had the highest cost of implementation ($8,814 million) and the smallest reach (860,000 people). Dietary advice and orlistat had similar net costs ($2,670 and $2,805 million); dietary advice reached more people than orlistat (7.9 vs 4.6 million people). Bariatric surgery was the most expensive intervention ($10,000 per person), followed by orlistat ($607 per person), dietary advice ($338 per person), and the SSB tax ($0.09 per person). However, when estimating the cost per kilogram lost, dietary advice was the most expensive intervention ($866 per kg), followed by bariatric surgery ($485 per kg), orlistat ($212 per kg), and the SSB tax ($0.31 per kg). Bariatric surgery had a better incremental cost-effectiveness ratio than dietary advice and orlistat, but it was $1,387.43 more expensive to lose 1 kilogram with this intervention

Table 3. Total Population Treated, Total Cost of Implementation, Cost Per Person, and Cost Per Kilogram Reduced by Intervention After 1 Year ($)

Intervention	N (95% CI)[a]	Cost (95% CI)[b]	Cost per person (95% CI)	Cost per kg reduced (95% CI)	Total kg lost (95% CI)[c]
Advice	7.91 (6.98, 8.84)	2,670.69 (2,356.57, 2,984.80)	337.59 (302.06, 382.59)	865.62 (750.20, 1,125.30)	3.09 (2.09, 3.98)
Orlistat	4.62 (3.89, 5.34)	2,805.70 (2,364.04, 3,247.36)	607.56 (524.93, 721.07)	211.69 (189.86, 243.02)	13.25 (9.73, 17.10)
Bariatric	0.86 (0.54, 1.17)	8,814.11 (5,595.41, 12,032.81)	10,305 (7,548.56, 16,233.01)	484.49 (436.47, 544.38)	18.19 (10.28, 27.57)
Tax 10%	46.04 (44.11, 47.98)	3.95 (3.95, 3.95)	0.09 (0.08, 0.09)	0.31 (0.28, 0.34)	12.84 (11.56, 14.12)
Tax 20%	46.04 (44.11, 47.98)	3.95 (3.95, 3.95)	0.09 (0.08, 0.09)	0.15 (0.14, 0.17)	25.70 (23.14, 28.27)

[a]N in millions. The number of people considered for each intervention varies according to the inclusion criteria.
[b]Cost in millions.
[c]Total kilograms lost in the population in millions.

than it was with the SSB tax (Appendix Table 4, available online).

DISCUSSION

This paper aimed to compare the expected population weight reduction and their equitability under individual- and population-level interventions. The modeled individual interventions reduced body weight and modified the prevalence of obesity but did not change the prevalence of normal weight. Orlistat had a larger impact on body weight and produced a lower cost per kg than dietary advice. Orlistat and bariatric surgery did not have an impact on the normal category but decreased obesity, which are positive outcomes. Bariatric surgery had the largest cost per person, 4 times higher than orlistat or dietary advice and 8 times higher than the SSB tax; yet, it showed a moderate effect to reduce obesity, and the cost per kg reduced was lower than that of dietary advice. By sex, all interventions followed a similar pattern, differing only in the magnitude of change. By age group, the 20% SSB tax produced larger increases in the normal BMI category as age increased; yet, obesity reductions were larger in the group aged 20−39 years, likely related to their highest SSB consumption.[34] In this study, bariatric surgery and orlistat interventions showed larger modeled benefits for middle and high SES, whereas the SSB tax was more equitable, benefiting all people but particularly those in the low-SES group. The tax was also cost effective, producing sizable reductions in BMI at a comparably lower cost.

Individual SES has complex and changing associations with obesity, particularly in middle-income countries.[35] If one were to focus on reducing the obesity gap only on the basis of the highest obesity prevalence group, aiming to reduce obesity in the high-SES individuals (baseline prevalence=36.9%) should get them closer to the low-SES prevalence (28.6%). This aim could be attained using individual-level interventions because people in the high-SES category have better access to health care. However, individual-level interventions under current healthcare access in Mexico would produce little benefit for low-SES people. A different equity perspective is to produce benefits for the whole population, but particularly for vulnerable groups, such as those observed with the SSB tax. It could be argued that taxes are regressive because food and beverage expenditures represent a higher proportion of income for the poor. However, if health benefits among the poor are larger, taxation in the long run could be progressive.[36] If not, tax revenue could be invested in interventions to curb obesity, increasing the benefits for the whole population and particularly for underserved communities targeted by the SSB industry and financially burdened by obesity-related noncommunicable diseases.[37]

Population- and individual-level interventions are difficult to compare because they have different targets and measuring scales. For example, on average, an individual under the 10% SSB tax is expected to reduce 0.2 kg (0.44 lb) in 1 year; from an individual perspective, it is a small change, particularly if compared with the theoretical 20 kg reduction of bariatric surgery.[23] However, if the effect of bariatric surgery is averaged across the population, the reduction would amount to 0.3 kg (0.66 lb) per person, showing that the SSB tax has a similar effect at the population level to that of the most extreme individual weight intervention (Appendix Table 5, available online). This comparison is relevant, considering that the industry argues that the average calories reduced by the SSB tax are few (6.4%) and that the impact on population weight is null.[38] Obesity is a complex problem, and it would be naive to expect a single intervention to drastically reduce its prevalence. Evidence from this study suggests that clinical interventions could impact groups differently. For example, orlistat reached 4 million people and showed an overall higher reduction in the obesity prevalence, particularly in the middle- and high-SES groups, whereas bariatric surgery reached fewer than 1 million people and had a concentrated effect on the high-SES group. Combining both clinical and population-level interventions could allow a wider reach of the population to reduce obesity.

Cost effectiveness and equity are key considerations for obesity interventions. To the authors' knowledge, this is the first attempt made globally to analyze clinical and population interventions at the national level. Previous studies have shown that pharmacotherapy and dietary advice can be cost effective and generate large health gains.[39] However, these interventions are successful only when large sectors of the population have access to the healthcare system, which is not the case in most low- and middle-income countries.[39] Similarly, bariatric surgery is highly effective for people with morbid obesity; however, the intervention is costly, can cause serious side effects, and requires ample access to health care.[40] By contrast, population-wide interventions, such as tax, are incorporated into the everyday life of the whole population, influencing people with and without obesity independent of their healthcare access.[41] With the lowest cost of implementation, the SSB tax was more cost effective than any of the individual-level interventions analyzed in this study. In this study, a relatively small tax (10%) produced a 1.51% change in the obesity prevalence, benefiting all SES groups.

Limitations

Some limitations must be mentioned. The impact of weight loss was modeled over 1 year, which is a short timeframe when considering obesity interventions; however, available information for long-term effects of clinical interventions is limited, requiring stronger assumptions. By modeling a short-term scenario, a best-case scenario for all clinical interventions was provided because the authors are not considering the weight regain that usually follows these interventions.[42] The model assumes that people would maintain the same weight if no intervention occurred (steady-state assumption). Indirect costs of individual interventions were not considered, which could underestimate the real cost and further increase the cost gap with respect to the tax. The equity estimates rely on self-reported healthcare service use, which may not reflect the complex healthcare decision-making process; for instance, if clinical interventions were to be provided free of cost, more people could be interested in being treated. The model is highly dependent on the local conditions of Mexico. Countries with low SSB consumption could find clinical interventions to be more cost effective; however, the modeling platform used in this study could be extended to other countries. No data for a 20% tax in Mexico exist; thus, investigators had to rely on previous literature showing that the impacts of SSB taxes over purchases are linear to estimate the expected impact of a potential 20% tax. Finally, the model does not account for the consequences generated by the SSB tax, such as reformulation, which could help produce larger decreases in body weight.[43]

CONCLUSIONS

Population and individual interventions differ in characteristics and scope. The SSB tax is cost effective and could modify the BMI distribution for the entire population; clinical interventions are effective to reduce weight in high-risk and high-SES individuals. To reduce obesity, both approaches need to be considered. Individual interventions will help to treat individuals with or at high risk of obesity, whereas population interventions will act on the whole population, reducing and preventing new cases of excess weight. The importance of population-wide interventions needs to be emphasized in policy making. To control the current obesity epidemic, additional population-wide interventions such as reformulation, front-of-package nutrition labeling, and higher taxes must be considered.

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SUPPLEMENTAL MATERIAL

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