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Obesity trends in the United States: are government interventions and public health programs effective in preventing this problem?

By

Nadiya Dubrovina¹, Veronika Grimberger²

¹Bratislava University of Economics and Management, INFER; Vira Dubrovina, NGO "Vivat Sokrat

²hoganova UG Karlsruhe Germany, INFER; Jana Peliova, University of Economics in Bratislava



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Corresponding author

Nadiya Dubrovina

Abstract

The problem of obesity in the USA is a significant medical and social challenge for public health and economics. This issue requires comprehensive study at the macroeconomic, local (regional), and individual behavioral levels. The need to develop various government and public programs aimed at preventing obesity and supporting healthy lifestyle trends is clear. However, it is important to understand which methods of government regulation and public health support are more effective, and which are less effective.

The purpose of this article is to conduct a systematic review of the literature related to obesity in the United States and to analyze obesity trends in different states over a period of 2011-2022.

Many states in the USA have seen a steady upward trend in obesity rates, it can be concluded that many government programs aimed at preventing obesity and reducing these rates have been weak in the long term.

Keywords: obesity, tendency, regional feature, government interventions, public health programs

JEL: H2, H3, I1

Introduction

The American Medical Association recognized obesity as a disease in 2013². Based on surveys of respondents presented in the CDC Behavioral Risk Factor Surveillance Survey (BRFSS) database (<https://www.cdc.gov/brfss/>), in 2011, the average value of respondents with various degrees of obesity was 27.58%, and in 2022 this figure increased to 33.71%, that is, by more than 5%.

Moreover, over the period 2011-2022, the increase in the percentage of respondents with various degrees of obesity was more than 8%. For example, in Arizona (8.13%), Illinois (8.39%), Ohio (8.4%), Oklahoma (8.89%), West Virginia (8.62%), South Dakota (8.66%), and in states such as Delaware, Georgia, Nevada, Tennessee, Wisconsin, and Wyoming, the percentage of respondents with varying degrees of obesity increased by more than 9% over the specified period. In 2022, in a number of states, such as Alabama, Ohio, Tennessee, Mississippi, and Oklahoma, the percentage of respondents with varying degrees of obesity was more than 38-40%, and in states such as Louisiana and West

Virginia, it exceeded 40%. Thus, in many US states, there is a steady trend of increasing population with varying degrees of obesity.

Thus, the problem of obesity in the USA is a significant medical and social challenge for public health and economics. This issue requires comprehensive study at the macroeconomic, local (regional), and individual behavioral levels. The need to develop various government and public programs aimed at preventing obesity and supporting healthy lifestyle trends is clear. However, it is important to understand which methods of government regulation and public health support are more effective, and which are less effective.

The purpose of this article is to conduct a systematic review of the literature related to obesity in the United States and to analyze obesity trends in different states over a period of 2011-2022.

¹Corresponding author: Veronika Grimberger, e-mail: grimberger.vero@gmail.com

²Lazarus E, Ortiz-Pujols S. Increasing clinical awareness of obesity as a serious, chronic, relapsing, and treatable disease. *Am J Manag Care*.



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Review of literature sources

Thow et al. (2010) conduct a systematic review of published and reported literature up to 2009 to assess the effects of food taxes and subsidies on consumption, body weight, and chronic disease. The authors identify 24 relevant studies meeting their inclusion criteria (8 empirical, 16 modelling), mostly from high-income countries. Their findings suggest that fiscal interventions (taxes or subsidies) can shift consumption in the intended direction (e.g., reduce consumption of unhealthy food, increase consumption of healthier items) and that larger interventions tend to yield larger impacts. However, they caution that many studies may overstate effects by ignoring substitution to other foods, and they note the overall low quality of evidence, especially for body weight and health outcomes, and the dearth of studies in low- and middle-income settings. The authors conclude that taxes and subsidies have potential as population-level health tools, but they call for more rigorous empirical evaluation, particularly in developing countries.

It should be noted, that Thow et al. (2010) make a valuable and timely contribution by consolidating the state of knowledge at the intersection of fiscal policy and population health. Its main merit lies in laying out what is known, clearly identifying gaps, and providing a roadmap for future work. While the conclusions must be tempered by the limitations of the underlying evidence base, the article is influential in drawing attention to fiscal policy as a potentially powerful tool in the fight against obesity and chronic disease. For those designing policy or empirical research in this area, it remains a useful and thought-provoking reference.

Pineda et al. (2024) present a systematic literature review that aggregates and critically assesses empirical and experimental evidence on health taxes imposed on foods high in fat, salt, and sugar (HFSS). Their objective is to synthesize what is known about how such taxes influence consumption, health outcomes (where data permit), and unintended consequences (such as substitution effects, business impacts, and equity concerns). The authors analyze 20 studies from diverse settings (13 observational, 7 experimental) and evaluate study quality, risk of bias, and certainty of evidence (e.g. via ROBINS-I, ROB-2, and GRADE frameworks). The authors assumed such policy implications:

- HFSS food taxes can be effective tools for improving diet and reducing consumption of unhealthy products, particularly when implemented at sufficiently high rates and combined with complementary policies (e.g., subsidies, healthy food access).
- Careful tax design and implementation are critical, considering substitution effects, equity concerns, retailer impacts, and the need for robust evaluation frameworks.
- Policies should also consider context-specific factors, such as existing dietary patterns, income levels, market structures, and consumption elasticities.

The paper extracts lessons about the effective design of HFSS

taxes—tax bases, rates, combinations with subsidies, mitigation of regressivity, avoidance of harmful substitutions, and implementation challenges. These insights are especially useful for policymakers in low- and middle- income countries seeking to adopt or refine such taxes.

The paper by Lisa M. Powell and Frank J. Chaloupka (2009) investigates the relationship between food prices, dietary behavior, and obesity, and examines the potential of taxes and subsidies as public health policy tools to combat obesity. The authors synthesize economic and epidemiological evidence to understand how price changes influence consumption patterns and body weight outcomes in the U.S., especially among children, adolescents, and low-income populations.

The authors recommend comprehensive fiscal strategies that include:

- Taxes on energy-dense, nutrient-poor foods and beverages.
- Subsidies to make healthy foods more affordable.
- Complementary education and information campaigns to enhance behavioral responses.

Powell and Chaloupka conclude that fiscal policies affecting food prices—particularly taxes on unhealthy foods and subsidies for healthier options—can play a meaningful role in improving dietary habits and reducing obesity rates. While the effects are modest individually, these interventions can be powerful when integrated with broader public health strategies. The paper highlights the importance of price mechanisms as levers for shaping health behavior and underscores the need for empirical evaluations of real-world tax and subsidy programs.

Efrat & Efrat's "*Tax Policy and the Obesity Epidemic*" offers a broad, conceptual, and policy-oriented analysis of how tax instruments might be used (or have been used) to combat obesity in the United States. The authors are forthright about the limitations of the existing evidence and the need for more rigorous empirical evaluation, especially causal studies of tax policies on health outcomes. The authors find that while tax policies targeting diet and activity have theoretical appeal, the empirical evidence is quite limited and inconclusive regarding their effectiveness on health outcomes like obesity. They show that most existing tax proposals in the U.S. are modest in scope and face substantial legal, administrative, and political challenges.

Efrat & Efrat's highlight that tax policies may help shift consumption patterns or encourage physical activity, but behavioral responses (e.g. substitution to untaxed unhealthy goods) and heterogeneous effects across income groups complicate the expected outcomes. They stress that for taxes to be effective, they must be appropriately sized, well-targeted, and complemented with other interventions (education, regulation, infrastructure) to overcome behavioral barriers. The paper concludes that more rigorous empirical research and policy experimentation are needed to assess whether and how tax instruments can contribute meaningfully to reducing obesity rates.

The contribution of the research helps to frame how tax tools might be used to influence diet and health, especially in the U.S. context. Its main value lies in conceptual structuring and bringing together cross-disciplinary perspectives.

However, because it does not present new empirical evidence and sometimes glosses over heterogeneity, substitution, or political feasibility challenges, it is best viewed as a theoretical / policy primer rather than a definitive guide. With revisions to broaden comparative scope and deepen treatment of behavioral and distributional dynamics, it would be a strong candidate for publication in a health law or public health economics venue.

Novak & Brownell (2012) argue that the obesity epidemic cannot be adequately addressed through individual-level interventions (education, clinical treatment, counseling) alone. They emphasize the importance of policy and governmental action to reshape the “default” environment or context that influences food choice and physical activity. They advance a framework of “default conditions” (the ambient cues, availability, pricing, marketing, portion sizes, and built environment) that nudge population behavior. The paper proposes that modifying these defaults through regulatory, fiscal, and environmental policies can yield larger, sustainable shifts in population health.

The paper’s main contribution is in framing obesity as a public policy problem and articulating the role of governmental interventions in shifting environmental defaults, not merely urging individual behavior change.

However, the paper acknowledges that taxes on unhealthy foods may be regressive, but does not thoroughly explore mitigation strategies (e.g., subsidies for healthy foods, revenue recycling, targeted programs) or distributional trade-offs. Although obstacles like industry pushback and political resistance are discussed, the paper could deepen this by considering case studies or comparative policy failures/successes, legal constraints, feasibility in various governance settings, and more detailed strategies for overcoming opposition.

Franck et al. examines the concept of implementing a “junk food tax” as a policy tool to help counter the increasing prevalence of obesity in North America. The authors explore the advantages, challenges, and trade-offs of such a tax, including different tax design options (nutrient-based vs. food/beverage-category based), how consumer behavior might respond, and how revenue could be used to support health improvements. In the paper the authors conclude that while the concept of taxing junk food holds promise as part of an obesity prevention strategy, its effectiveness depends heavily on tax design, size, revenue use, and complementary policies. Franck et al. caution that small excise taxes are likely to generate substantial revenue but unlikely to have large effects on obesity rates unless the tax is large enough to affect behavior meaningfully. They emphasize that tax policy alone is unlikely to solve the obesity epidemic but could contribute meaningfully if integrated into a broader set of interventions. Pilot pricing interventions and rigorous evaluation are needed to better understand real-world impacts. A well-designed junk food tax can

shift consumption and generate revenue, but to influence obesity meaningfully it must be fairly large, carefully targeted, paired with subsidies or health programs, designed to mitigate equity concerns, and supported by strong evaluation and implementation frameworks.

Fincham (2011) argues that obesity is a pervasive, universal health threat (crossing socioeconomic strata) with serious short- and long-term consequences. He emphasizes that health professionals—including pharmacists—should engage in interventions at both the individual and population levels, and that efforts should be documented, evaluated, and integrated into education, research, and practice. Obesity and overweight do not respect socioeconomic boundaries; the problem is prevalent across income groups, geographies, and age groups. In 2011 (and still today), raising the alarm about obesity’s public health burden is well justified. The article helps bring this message to a pharmacy audience, which is less commonly addressed in obesity policy discourse. The author recommends that obesity-related interventions and their evidence be incorporated into professional education, research agendas, and routine practice frameworks. However, the interventions and roles for health professionals are described broadly; there is limited specificity about what exactly pharmacists should do in different settings (community, hospital, outpatient). As a recommendation, we could suggest: to enrich the commentary with case examples or pilot programs involving pharmacists in obesity prevention, to make the recommendations more concrete; to include a framework or role-map that outlines specific roles and actionable steps for pharmacists (e.g. screening, counseling, referral, collaboration with public health).

In the paper the authors (Wright et al., 2017) aim to draw out lessons for policy—i.e. what works (or doesn’t), what rate of tax seems meaningful, what tax design features matter, what challenges exist (political, public support, regressivity, substitution, revenue predictability) for implementing such taxes. Evidence suggests that high rates of taxes (those which increase prices by ~20% or more) are more likely to yield meaningful reductions in consumption of unhealthy products and improvements in health-related outcomes. Lower tax rates often produce only modest or no detectable effects. This paper makes a strong and useful contribution to the health policy literature by systematically pulling together evidence on health-taxes beyond just tobacco/alcohol, and by offering lessons for real policy design. For those crafting or advocating health taxes (e.g. sugar, SSBs, unhealthy food), this is one of the go-to reviews. Suggesting the improvement for future research, we can assume next: more studies in low- and middle-income countries to test how context influences effectiveness; use standardized measures of tax rates, product definitions, and consumption outcomes to allow meta-analyses or pooled estimates.

Consumption of sugar-sweetened beverages (SSBs) is rising globally and contributes significantly to caloric intake and obesity risk. While many studies focus on the health impacts of SSB taxation, less is known about the political and public acceptability of implementing such taxes—yet acceptability is a crucial factor for policy adoption and sustainability.



Eykelenboom et al. (2019) in their research aim to fill that gap by conducting a mixed-methods systematic review combined with meta-analysis to synthesize both qualitative and quantitative evidence on how acceptable SSB taxes are to politicians, policy-makers, and the public, and what beliefs or factors influence that acceptability. The authors searched four electronic databases (PubMed, Embase, Scopus, Web of Science) up to November 14, 2018, without date or language restriction, using keywords related to “SSBs,” “tax,” and “acceptability.” They included studies that assessed political acceptability, public acceptability, or beliefs and attitudes related to SSB taxes.

Public support for SSB taxation is modest when framed neutrally (~42%), but is higher (~66%) when tax revenue is clearly committed to health goals. Political acceptability is harder to quantify (few quantitative studies), but qualitative evidence suggests major hurdles from industry influence, political risks, and design complexity.

To enhance acceptability, the authors recommend:

1. Addressing mismatches between public beliefs and scientific evidence (e.g. correct misconceptions).
2. Transparently framing tax revenue use—preferably for health programs.
3. Clear communication of the tax’s purpose.
4. Building political prioritization and addressing implementation barriers.

The authors note large heterogeneity in results and the limited methodological quality of many studies, and call for more rigorous longitudinal and cross-country research, especially in low- and middle-income settings.

The Congressional Budget Office report (2015) examines how the federal government might estimate the effects (both in health and budgetary terms) of policies aimed at reducing obesity. Rather than presenting novel empirical findings, it focuses on the methodological challenges, evidence gaps, and recommendations for future research needed so that policy proposals targeting obesity can be rigorously assessed. The CBO notes that, while obesity is associated with substantial costs in healthcare and lost productivity, existing evidence does not provide strong confidence that federal policies targeting obesity would yield significant net savings to the federal budget over the policy scoring horizon. The report identifies gaps in empirical evidence that hinder confident projection of policy impacts: few high-quality studies link obesity interventions to long- term medical cost savings; limited data on how federal programs (e.g. Medicare, Medicaid) would adopt or incorporate such interventions; insufficient standardization across studies in measuring weight change, health outcomes, and cost parameters. Overall, the CBO emphasizes caution in expecting large near-term federal budget savings from obesity-targeted policies, while not dismissing their health value or longer-term potential returns.

The policy brief by Elizabeth Vestal (2012) discusses the potential use of taxation (especially on sugar-sweetened beverages) and zoning / land-use regulation (limiting fast food outlets, creating

“healthy food enterprise zones”) as tools for local and state governments—particularly in Virginia— to influence the food environment and address obesity. Obesity prevalence in the U.S. and Virginia is high and rising, with associated health risks (diabetes, heart disease, cancer) and high medical costs. Because obesity generates public costs via Medicare/Medicaid, governments have incentives to intervene. The brief reviews evidence linking SSB consumption to obesity, noting that beverage calories have increased notably over recent decades. The brief suggests that taxes and zoning are promising tools but must be carefully designed, evaluated, and complemented by other policies (education, subsidies, infrastructure). It encourages Virginia localities to explore their legal capacity for such interventions, consider pilot programs, monitor effects, and engage communities in implementation. The author emphasizes the need for ongoing research to assess whether these tools reduce obesity, not just change environments.

Moodie et al.’s (2013) paper offers valuable insights into the cost-effectiveness of fiscal policies for obesity prevention. The authors focus on the cost-effectiveness of interventions such as taxes and subsidies, emphasizing the need for more robust economic evaluations to inform policy decisions. The main purpose of the paper was to determine whether fiscal policies could be cost-effective tools for obesity prevention and to outline the need for more rigorous economic studies to support public health decision-making. The authors found that only a small number of studies had evaluated the cost-effectiveness of fiscal policies (like food taxes and subsidies) for obesity prevention. Despite this limited evidence base, most studies indicated that such policies are likely to be cost-effective - and in some cases, even cost-saving - in reducing obesity and improving population health. Taxes on energy-dense, nutrient-poor foods (e.g., sugary drinks, fast food) and subsidies for healthier foods (e.g., fruits and vegetables) have the potential to shift consumption patterns toward healthier diets. These changes could lead to population-level reductions in obesity rates and associated diseases such as type 2 diabetes and cardiovascular conditions. Moodie et al. concluded that while evidence is still emerging, fiscal policies show strong potential to be cost-effective public health strategies for reducing obesity. However, methodological improvements and more robust data are essential to strengthen the economic case for their widespread adoption.

The report (Task Force on Fiscal Policy for Health, 2024) examines the role of “health taxes” (excise taxes on tobacco, alcohol, and sugar-sweetened beverages) as a dual-purpose policy tool: improving public health by reducing the consumption of harmful products, and raising revenue for governments, especially in times of fiscal stress. The authors note that in recent years — amid the COVID-19 pandemic, global recession, inflation, geopolitical crises and rising poverty — the need for simple, effective policy tools is greater than ever. Health taxes remain under- utilised globally despite strong evidence of their effectiveness for both health and revenue generation. The report highlights that most countries have not even kept tax levels on harmful products in pace with inflation or income growth — in

many places these products have become more affordable. Health taxes are particularly timely given current global challenges: they improve population health (making societies more resilient to future crises), reduce demand on over-stretched health systems, and contribute to economic and fiscal stability. One of the report's most attention-grabbing claims is that raising health taxes so as to increase retail prices by about 50 % could generate around US\$3.7 trillion in additional revenue globally over five years (with US\$2.1 trillion in low- and middle-income countries), and save approximately 50 million premature deaths over 50 years. These figures are bold and offer a strong "headline" to push policy interest. While the modelling-based projections warrant cautious interpretation, the convergence of health and revenue benefits, coupled with relatively low "legislative implementation complexity" (for those with existing excise systems), makes this report a timely resource and rallying document.

Bleich and Mayne (2025) argue that the prevalence and health impacts of ultraprocessed foods (UPFs) demand a more vigorous government response in the United States. The authors note that UPFs—typically industrially formulated, pre-packaged products high in added sugar, saturated fats, sodium, and containing additives—make up more than 70 % of grocery-store items and over half of the average U.S. diet. They reference evidence linking higher consumption of UPFs to obesity, type 2 diabetes, cardiovascular disease, and adverse mental-health outcomes.

The paper reviews current federal and state policy efforts targeting UPFs and identifies key gaps:

- There is no standard federal definition of UPFs in the U.S., limiting the regulatory and research frameworks.
- Federal action to date has focused more on voluntary industry reforms and limited chemical/additive regulation rather than structural policies (taxes, front-of-pack labeling, reformulation mandates) that could reduce UPF consumption.
- State-level policies are fragmented and inconsistent, leading to a patchwork of regulation rather than a cohesive national strategy.

The paper calls for "urgent federal action ... to both reduce consumption of UPFs and improve their nutrient content to support better health, while also increasing access to and consumption of whole foods." The authors argue that without structural policy changes, the food system will continue to promote health-harming dietary patterns and the burden of diet-related chronic disease will persist. Thorndike et al. at the paper (2022) present a policy-statement rather than primary empirical research. The authors argue that in the United States, while much attention has focused on *food security* (i.e., sufficient calories or food quantity), a broader and more meaningful goal is *nutrition security* — defined as "an individual or household condition of having equitable and stable availability, access, affordability, and utilization of foods and beverages that promote well-being and prevent and treat disease."

They make the case that poor diet quality is a major contributor to cardiometabolic disease (e.g., obesity, cardiovascular disease, diabetes), and that existing food assistance policies and programs—though helpful—are not sufficient to achieve nutrition security or equity in nutrition across socio-economic, racial and ethnic groups. The statement emphasises that structural inequities (in income, geography, race/ethnicity, built environment, food retail access) drive differences in diet quality and health outcomes. The paper highlights the lack of a standard measure of nutrition security in the U.S., and calls for development of national metrics to monitor progress. Agencies administering food assistance programmes (e.g., Supplemental Nutrition Assistance (SNAP), Women, Infants and Children (WIC), school nutrition) should incorporate nutritional quality criteria (not just calories) and streamline access, reduce administrative burdens, and ensure stability across life-stages.

The paper effectively reframes the conversation around "nutrition security" rather than simply "food security," which is a meaningful advance. It draws attention to equity, the lifecycle dimensions of nutrition access and quality, and the gaps in current U.S. policies and programmes. While it serves more as a strategic roadmap than a detailed implementation blueprint, its focus on equity and health outcomes (especially cardiovascular health) links nutrition policy firmly to the major burden of chronic disease.

Taber et al. (2011) in their study investigate the association between changes in state-level policies regulating "junk food" in schools (specifically prohibitions or recommendations regarding vending machines, snack bars, concession stands and school parties) over the period 2000 to 2006, and subsequent soda consumption and body-mass index (BMI) percentile among adolescents in 2007. They examine the overall sample as well as stratified by race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, etc.). The authors conclude that although state policies appear to modestly reduce soda consumption and may help narrow racial/ethnic disparities in consumption, their magnitude is too small ultimately to effect BMI percentile changes in adolescents. Despite reduced soda intake, the study found no significant effect of state junk-food policies on BMI percentile among students of any racial/ethnic group. This may reflect the small magnitude of consumption changes, the short follow-up period, or substitution with other sugary drinks or foods.

State-level policies that restrict or limit the availability of junk food in schools are associated with modest reductions in soda consumption among adolescents, particularly among non-Hispanic Black students, but these policy changes do not have a measurable effect on BMI percentile.

The authors conclude that such policies can play a role in improving adolescent dietary behaviors and may help reduce racial/ethnic disparities in unhealthy beverage consumption.

However, because the magnitude of the change is small, these policies alone are unlikely to significantly impact obesity rates. Broader, more comprehensive nutrition and environmental policies are needed to achieve meaningful improvements in

adolescent health.

The study (Kim & Kawachi, 2006) presents a conceptual and empirical discussion of two related economic policy approaches to reducing obesity in the U.S.: (1) taxation of unhealthy foods and beverages (e.g., soft drinks, snack foods, fast foods), and (2) pricing incentives/disincentives (including subsidies for healthy foods and higher prices/taxes for less healthy foods) especially in institutional settings (schools, worksites). The authors review the rationale for such fiscal-policy interventions, summarize empirical evidence (including state-level tax data on soft drinks/snacks between 1991-98 and changes in obesity prevalence), and discuss implementation barriers, potential unintended consequences, and research gaps. The paper makes a clear case for fiscal approaches (taxes/subsidies) being legitimate tools in obesity prevention, drawing parallels to the successful use of taxes in tobacco control. This framing helps situate the topic within public health policy debates. The authors review economic rationales (e.g., externalities, individual time-inconsistent preferences, price elasticity) and link these to dietary behaviour and obesity outcomes. Although brief, the use of U.S. state-level soft drink/snack tax data connected to obesity prevalence change gives the paper a concrete anchor beyond purely conceptual discussion. However, while the paper reports “strong positive associations,” the specifics (effect sizes, confidence intervals, control for confounders) are less prominently reported, making it difficult for readers to assess the likely magnitude of impact. Because of limited empirical data at that time and the complexity of behaviour/food systems, the paper’s conclusions must be viewed as cautionary and provisional rather than definitive evidence for large impacts. With some enhancements—especially around quantification of effects, subsidy strategies, and policy design detail—it would further strengthen its utility for both researchers and policymakers.

Jacobson & Brownell (2000) examine the concept of levying small taxes on low-nutritional-value foods—namely soft drinks, snack foods (candy/chewing gum), and other “junk” consumables—as a dual-purpose public health intervention: (1) to raise revenue for health promotion programs, and (2) to potentially reduce consumption of unhealthy foods. They note that as of the time of writing, 18 U.S. states and one major city already levy special taxes on such items and generate approximately US\$1 billion annually from those taxes. While acknowledging that the current tax levels are probably too small to meaningfully affect consumption, they argue governments should adopt “dedicated excise-style” taxes on junk foods, and earmark the revenues for nutrition education, subsidies for healthier foods, and health-promotion programs. At a time when obesity and diet-related chronic diseases were becoming major public health concerns, the paper raises the important notion that fiscal tools (taxes) used in tobacco and alcohol control might be adapted for unhealthy food consumption. The authors emphasise that the value of such taxes is not only in changing behaviour but also in providing sustainable funding for health-promotion. They thus connect the revenue generation and health policy angles. While the paper motivates the

tax via diet-related health burdens, the direct pathway from tax to health outcome is not empirically established in the paper. Including estimates or models of potential health gains (e.g., reduced obesity incidence) would strengthen the case.

The study (Andreeva et al., 2022) conduct a comprehensive systematic review and meta-analysis of real-world, implemented taxes on sugar-sweetened beverages (SSBs) around the world. The aim is to assess associations of SSB taxation with outcomes including: prices of taxed beverages, sales/purchases volumes, consumption, diet and health outcomes (such as body weight, diet composition, pregnancy outcomes), product reformulation, and unintended consequences (such as employment or cross-border shopping). The authors conclude that SSB taxes do appear to work as intended in terms of generating higher prices and reducing sales of taxed beverages, which is an important step in addressing SSB consumption. However, they caution that the evidence remains limited for downstream outcomes such as overall consumption behavior, diet quality, body weight and health outcomes. They also note the substantial heterogeneity across studies and jurisdictions, and the need for more research on subgroup effects (e.g., by income, race/ethnicity) and on policy design features. While the paper emphasises this as a gap, the reliance on sales data rather than individual consumption or health outcomes limits the ability to infer health impact. Future iterations could perhaps include modelling of probable health effects even if empirical data lag.

Obesity should be understood and treated as a serious, chronic, relapsing, and treatable disease. To improve outcomes, the medical community must adopt multimodal, sustained strategies; overcome barriers such as stigma and lack of coverage; and integrate obesity care into standard clinical practice.

Thus, Lazarus & Ortiz-Pujols aim to reinforce the clinical view of obesity not merely as a behavioral issue or risk factor, but as a serious, chronic, relapsing, and treatable disease. They review the pathophysiology, epidemiology, comorbidities, barriers to care, and treatment modalities to support that framing, and to encourage clinicians, payers, and health systems to adopt a more medical and long-term approach to obesity management. The article notes that although the obesity arises from a complex interplay of genetic, physiologic, behavioral, sleep, environmental, and social determinants. Excess adiposity induces metabolic, hormonal, inflammatory, and endocrine dysfunctions. The authors argue that obesity meets the criteria for a disease: it impairs normal body function, has characteristic signs/symptoms, and leads to morbidity. The article emphasizes the evolving guideline environment: recent advances in anti-obesity medications and updated clinical practice guidelines enhance opportunities for more effective management.

Main results

In this study, we used BRFSS data to examine trends and regional differences in changes in obesity rates in the US population. The Behavioral Risk Factor Surveillance System (BRFSS)³ is the nation’s premier system of health-related telephone surveys that



collect state data about US residents regarding their health-related risk behaviors, chronic health conditions, health-care access, and use of preventive services. Established in 1984, BRFSS collects data in all 50 states as well as the District of Columbia and participating US territories. BRFSS completes more than 400,000 adult interviews each year, making it the largest continuously conducted telephone-based health survey system in the world. As is known, an individual's obesity level is measured using the BMI coefficient, which is calculated as the ratio of body weight (kg) to height (m), raised to the second power. If $25 \leq \text{BMI} < 29.9$, then it is overweight; if $\text{BMI} > 30.0$, then it is obese. Since regional studies use aggregated annual data, a weighted BMI coefficient is calculated based on the number of respondents who participated in the survey and the population of the region. The percentage of cases in which the body mass index (BMI) corresponds to obesity is then calculated.

Figure 1 shows the distribution of obesity prevalence by quartile in individual US states in 2011, 2016, and 2022.

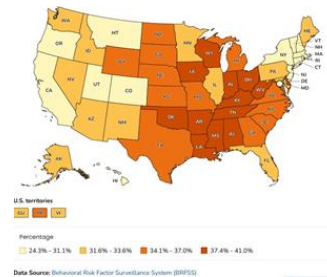
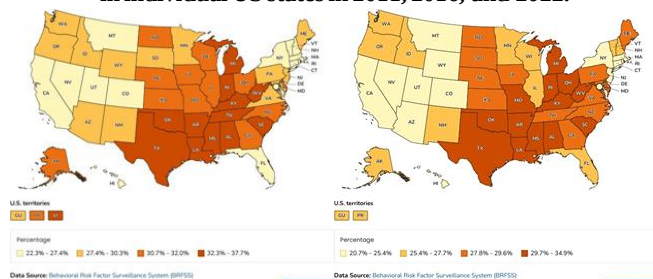


Fig. 1. Crude prevalence of the obesity in the different states in 2011 (left), 2016 (middle), 2022 (right)

Source: <https://www.cdc.gov/brfss/brfssprevalence/index.html#print>

³ <https://www.cdc.gov/brfss/index.html>

As Figure 1 shows, spatial patterns in the distribution of obesity rates are observed. States in the southern and southeastern United States have higher obesity rates, falling in the third and fourth quartiles. At the same time, states located in the western part have lower obesity prevalence rates, and these values belong to the first and second quartiles.

To demonstrate significant differences in the prevalence of obesity across states, a statistical analysis of data for the period 2011-2022 was conducted. The following indicators were calculated: mean, standard deviation, coefficient of variation, minimum and maximum values (Table 1).

Table 1. Descriptive Statistics for Indicator “Obesity” (%) in the different states of the USA

Name	Mean	Std.Dev.	Coef. Var.	Min	Max	Name	Mean	Std.Dev.	Coef. Var.	Min	Max
AL	35,7	2,6	7,2	32	39,9	MT	26,7	2,6	9,7	23,6	31,8
AK	30,3	2,5	8,1	25,7	34,2	NE	32,2	2,6	8	28,4	35,9
AZ	29,2	2,4	8,1	25,1	33,2	NV	28,1	2,7	9,5	24,5	33,5
AR	35,7	2	5,6	30,9	38,6	NH	28,4	1,9	6,7	26,3	31,8
CA	25,8	1,9	7,4	23,8	30,2	NJ	26,8	1,7	6,2	23,7	29,1
CO	22,5	1,7	7,8	20,2	25,1	NM	29,6	2,7	9	26,3	34,6
CT	27,2	2,1	7,8	24,5	30,6	NY	26,4	1,9	7,1	23,6	30,1
DE	32,2	3,2	9,9	26,9	37,9	NC	31,9	2,3	7,2	29,1	36
DC	23,3	1,1	4,7	21,7	24,7	ND	32,5	2,4	7,4	27,8	35,4
FL	27,9	2	7,1	25,2	31,6	OH	33,2	3	9	29,7	38,1
GA	31,9	2,5	7,7	28	37	OK	34,9	2,9	8,2	31,1	40
GU	30,8	2,8	9,2	27	34,4	OR	28,7	1,5	5,1	26,5	30,9
HI	23,7	1,4	5,8	21,8	25,9	PA	31	1,6	5,2	28,6	33,4
ID	29,3	1,9	6,5	26,8	33,2	PR	30,9	2,9	9,4	26,3	36
IL	30,9	2,1	6,8	27,1	34,2	RI	28,1	2	7,2	25,4	30,8
IN	33,7	2,3	6,9	30,8	37,7	SC	33,4	1,9	5,8	30,8	36,2

IA	33,5	2,9	8,5	29	37,4	SD	31,6	3,2	10,3	28,1	38,4
KS	32,9	2,5	7,5	29,6	36	TN	33,9	2,6	7,7	29,2	38,9
KY	34,8	2,9	8,4	30,4	40,3	TX	33,1	2,2	6,8	29,2	36,1
LA	36,1	2,1	5,7	33,1	40,1	UT	26,8	2,6	9,8	24,1	31,1
ME	30	1,6	5,5	27,8	33,1	VT	26,2	1,5	5,8	23,7	29
MD	30,5	2,1	6,8	27,6	34,3	VA	30,4	2,5	8,3	27,2	35,2
MA	24,7	1,6	6,5	22,7	27,4	WA	28	1,4	5,1	26,4	31,7
MI	32,8	1,8	5,5	30,7	36	WV	37,4	2,8	7,5	32,4	41
MN	28,6	2,7	9,6	25,5	33,6	WI	31,8	2,6	8,1	27,7	37,7
MS	37,4	2,2	6	34,6	40,8	WY	29	2,7	9,2	24,6	34,3
MO	32,9	2,6	7,8	29,6	37,2						

Source: own elaboration based on the data from BRFSS

As can be seen from Table 1, the coefficients of variation rates of obesity prevalence in a number of states did not exceed 6%, while in some states the variation rates of these values were close to 10%. In order to demonstrate that, in the country as a whole, there was a trend towards an increase in the prevalence of obesity over the period 2011–2022, the calculations presented in Table 2 were carried out.

Table 2. Descriptive Statistics for Indicator “Obesity” (%) in the USA

Year	Mean	Std.Dev	Coef.Var	Min	Max
2011	27,58	2,98	10,81	20,7	34,9
2012	27,98	3,31	11,85	20,5	34,7
2013	28,61	3,38	11,81	21,3	35,1
2014	29,18	3,36	11,5	21,3	35,9
2015	29,33	3,81	12,99	20,2	36,2
2016	29,78	3,67	12,33	22,3	37,7
2017	30,7	3,83	12,49	22,6	38,1
2018	31,3	3,84	12,26	23	39,5
2019	31,98	3,93	12,29	23,8	40,8
2020	32,09	4,03	12,55	24,2	39,7
2021	33,48	3,97	11,86	24,7	40,6
2022	33,71	4	11,86	24,29	41,02

Source: own elaboration based on the data from BRFSS

As can be seen from Table 2, the average values of the obesity prevalence rate calculated for all states for each year showed an increasing trend over the period 2011–2022. The coefficients of

variation for this indicator, calculated for each year, exceeded 10%, which demonstrates the persistent regional differences observed in the distribution of obesity prevalence rates in US states.

The dynamics of changes in the obesity prevalence rate in various states for the period 2011– 2022 are presented in Fig. 2 and in Fig.3. As can be seen from Fig. 2 - Fig.3, for all states there was a tendency for this indicator to increase over this period.

At the same time, obesity prevalence trends varied across different US states. Linear trend models were constructed to analyze obesity prevalence trends. Table 3 presents the characteristics of the linear trend models for obesity prevalence across different US states.

As follows from the calculations of the linear trend parameter estimates, the initial levels (intercept) and annual growth rates (slope) differ significantly across states. Thus, the initial level (estimate a_0 or intercept) in 2010, explained by various reasons related to the specific socio-economic characteristics of these states, also indicates some regional differences, and the estimate of the parameter a_1 indicates the annual explained increase in this indicator.

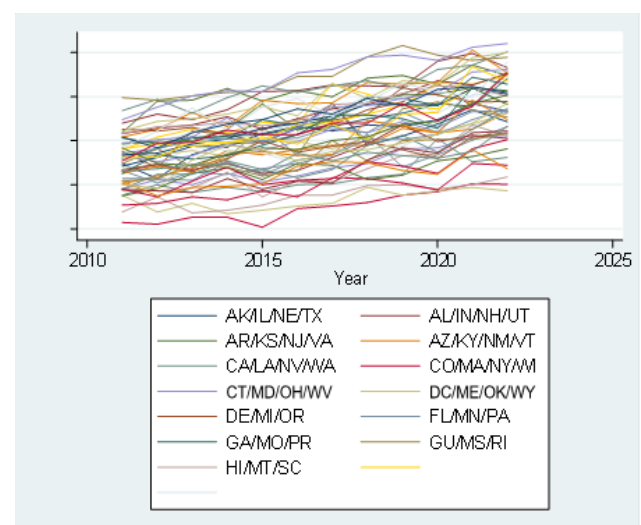


Fig. 2. The tendencies of the respondents with obesity in the different states during the period of 2011- 2022

Source: the plots built by the authors in STATA

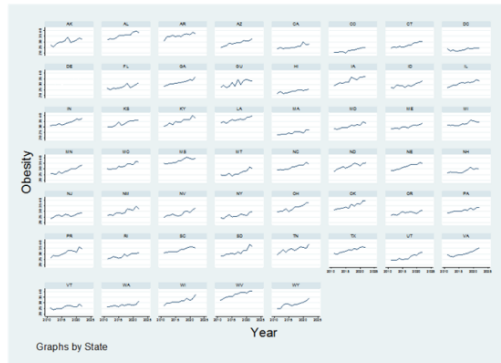


Fig. 3. The tendencies of the respondents with obesity in separate states of the USA during the period of 2011-2022

Source: the plots built by the authors in STATA

Table 3. The characteristics of linear trends for states of the USA during the period of 2011-2022

Name	a0 - intercept	a1 - slope	R – coefficient of correlation	Name	a0 - intercept	a1 - slope	R – coefficient of correlation
AL	31,285	0,674	0,945	MT	22,621	0,625	0,869
AK	26,874	0,534	0,78	NE	27,638	0,702	0,983
AZ	25,03	0,637	0,966	NV	23,878	0,653	0,884
AR	32,588	0,473	0,851	NH	25,542	0,443	0,838
CA	22,961	0,439	0,826	NJ	24,158	0,401	0,868
CO	19,534	0,457	0,944	NM	25,244	0,675	0,91
CT	23,537	0,562	0,951	NY	23,547	0,44	0,843
DE	26,893	0,81	0,916	NC	27,955	0,603	0,95
DC	21,967	0,207	0,68	ND	28,568	0,61	0,915
FL	25,023	0,442	0,805	OH	28,1	0,781	0,941
GA	27,578	0,659	0,964	OK	30,056	0,753	0,943
GU	26,764	0,622	0,791	OR	26,667	0,317	0,783
HI	21,556	0,337	0,887	PA	28,287	0,418	0,899
ID	26,453	0,435	0,824	PR	26,09	0,741	0,923
IL	27,29	0,555	0,957	RI	24,822	0,498	0,894
IN	29,664	0,619	0,953	SC	30,159	0,505	0,936
IA	28,655	0,74	0,933	SD	26,413	0,799	0,888
KS	28,833	0,631	0,925	TN	29,792	0,635	0,873
KY	29,874	0,753	0,935	TX	29,279	0,714	0,954
LA	32,69	0,528	0,925	UT	24,151	0,671	0,922
ME	27,252	0,428	0,936	VT	24,151	0,317	0,755

MD	26,973	0,536	0,931	VA	26,191	0,642	0,913
MA	22,136	0,391	0,883	WA	25,92	0,319	0,806
MI	30,031	0,427	0,857	WV	32,448	0,756	0,975
MN	23,893	0,731	0,959	WI	27,617	0,647	0,907
MS	33,746	0,563	0,911	WY	24,669	0,667	0,899
MO	28,5	0,674	0,941				

Source: own elaboration

As can be seen, the highest initial explained level of a_0 was observed for the state (MS) – Minnesota, and the lowest level of a_0 (intercept) was for CO – Colorado. The highest increase (the value of the parameter a_1 or slope) was observed in the state DE - Delaware (0.81). The big values of slope were observed for such states as: SD - South Dakota (0.799) and OH - Ohio (0.781). The slowest increase in the indicator of respondents with obesity was observed in the state of DC – District of Columbia (slope 0.207). The correlation coefficients (R) for the most given linear trend models were significantly high, exceeding 0.9, which indicates that the rates of respondents with obesity increased evenly from year to year in the given states, i.e. in accordance with the linear growth trend.

Thus, given that many states have seen a steady upward trend in obesity rates, it can be concluded that many government programs aimed at preventing obesity and reducing these rates have been weak in the long term.

Discussion and Conclusion

As the statistical analysis of data on obesity prevalence rates has shown, it is necessary to take into account spatial and temporal changes and apply spatial econometric methods. It is advisable to analyze the indicators of spatial autocorrelation and the presence of spatial regimes, and test various models of spatial econometrics to identify general and regional features of changes in obesity prevalence rates under the influence of explanatory variables and random factors. Spatial econometric models allow us to analyze regional specifics (socio-demographic characteristics of the population, for example, the age and sex structure of the population, ethnicity and race, level of education, income level). These models also allow us to identify those explanatory variables that make the greatest contribution to changes in obesity rates. For example, the consumption patterns of food and beverages, spending on healthy eating advertising, funding healthy eating programs in schools and universities, and the introduction of taxes on certain foods and high-carbohydrate carbonated drinks.

When analyzing data characterizing the dynamics of obesity prevalence rates in various states, it was suggested that various programs were insufficiently effective, which was also noted in a number of other studies. The relatively low effectiveness of targeted programs to reduce the prevalence of obesity may be due to the fact that the target groups, their size, and the range of social, educational, and medical programs were not assessed accurately

enough. Furthermore, it is difficult to track changes in individual behavior at the regional or state level in response to various social, educational, and economic programs aimed at preventing and reducing obesity rates. In this regard, it is necessary to conduct comprehensive studies using more advanced methods of collecting and tracking data, to develop guidelines for monitoring the results of weight loss programs and positive changes in eating habits, use a special software application on mobile phones or smartphones to more accurately track and interpret the results of state and public programs to prevent obesity and reduce these indicators in various social groups and regions.

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