The effects of a sugar tax: a literature review

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The World Health Organisation (WHO) recommends limiting the consumption of free sugars to less than 10%, ideally to under 5%, of daily energy intake. With a daily energy requirement of 2,000 kcal, this corresponds to a maximum of 25 to 50 g. Added sugars include all monosaccharides and disaccharides that are added by the manufacturer or the consumer, or that occur naturally in honey, syrups, fruit juices or fruit juice concentrates (WHO 2025). In many countries, including Germany, actual consumption exceeds the amounts recommended by the WHO. Through drinks alone, people in Germany consume almost 26 g of sugar daily (Foodwatch 2026). High sugar consumption is associated with an increased risk of overweight and obesity (Malik/Hu 2022), dental caries (Valenzuela et al. 2021), type 2 diabetes (Malik et al. 2010), cardiovascular diseases (Meng et al. 2021) and certain types of cancer (Llaha et al. 2021). To reduce sugar consumption, the WHO recommends taxing sugary drinks. Whilst corresponding excise duties have already been introduced in over 100 countries worldwide, the introduction of a sugar tax in Germany has been under discussion for several years but has not yet been implemented (WHO 2025). Instead of binding tax regulation, the German government has so far relied on voluntary commitments by the food industry to reduce sugar content (Fischbacher et al. 2025). However, an assessment of sugar consumption and its consequences does not necessarily imply the need for taxation. From a regulatory perspective, it must be clarified whether state intervention in the form of a consumption-steering tax yields demonstrable benefits compared to alternative measures – such as public education or voluntary commitments by the industry. A paternalistic intervention in consumer sovereignty requires evidence that there are empirically verifiable deficits in personal responsibility and that consumer protection cannot be achieved through other measures (Buchanan 1978; Camerer et al. 2003).

>> This study is a narrative, structured literature review based on a targeted search for relevant studies of various types of evidence to assess the health impacts of sugar taxes. Some of the studies examine the effects of taxing sugary drinks in countries where such taxes have already been implemented. In addition, simulation studies are available that model the potential impacts of a sugar tax. A focus is placed on modelling for the German context.

Summary

Introduction: The introduction of a sugar tax has been under discussion in Germany for some time.

Methods: This narrative literature review examines the evidence on the health impacts of a sugar tax and assesses how realistic the expectations associated with a sugar tax are, given the current state of the research.

Results: Simulations for Germany that use models to forecast potential effects consistently show long-term health gains and cost

savings. Findings from observational studies that empirically examine the real-world effects of taxes already in place, however, are mixed.

Discussion: Overall, there is strong evidence to suggest that long-term health effects can only be expected through the combined effect of a range of different preventive measures.

Keywords

Sugar tax, Sugary drinks, Simulation studies, Observational studies

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2. Implementation and design of sugar taxes

More than 100 countries worldwide have now introduced excise duties at national level on at least one category of sugary drinks. In addition, some countries have taxes at regional level (e.g. in Catalonia, Spain) and at local authority level (e.g. in some cities in the USA). Most sugar taxes apply exclusively to sugary drinks, with fruit juices or flavoured milk drinks often being exempt. Other foods, such as sweets, are rarely taxed (WHO 2025). The focus on sugary drinks can be justified primarily by the fact that taxing them is easily justified from a public health perspective: they are high in calories, contain few nutrients and have a low satiating effect, meaning they quickly contribute to a high total calorie intake. At the same time, manufacturers can reformulate their drinks relatively easily by reducing sugar content. A tax on sugary drinks targets a clearly defined product group, which reduces resistance from consumers and industry. A tax on sugar as a whole, on the other hand, would have far-reaching agricultural and trade policy implications and would therefore be significantly more controversial from a social and economic perspective.

Although the introduction of a sugar tax in Germany has been the subject of political and technical debate for years, it has not yet been implemented. In other countries, too, the introduction of sugar taxes has in some cases met with considerable resistance, leading some countries to withdraw their plans or to abolish taxes that had already been introduced (Schmacker/Smed 2020). A common criticism of sugar taxes is their potentially regressive effect, as people on lowerincomes would pay a larger proportion of their income in taxes compared to higher-income groups. As they also tend to consume more sugary drinks, this burden could be further exacerbated.[1] The food and drink industry points out that the calorie balance is decisive and that weight gain does not depend on individual foods. Sugary products could therefore form part of a balanced diet. Furthermore, consideration should be given to potential job losses in industry and agriculture, as well as to restrictions on citizens' freedom of choice. Instead, the industry points to mandatory labelling and consumer responsibility (Schaller/Mons 2018).

Sugar taxes are usually structured as excise duties, typically levied on specific product categories at the manufacturer level. In the public debate, it is generally assumed that manufacturers pass on the sugar tax to end consumers via higher prices, thereby creating an incentive effect.[2] The tax can be structured either as a quantity tax or as a value-based tax (ad valorem). Ad valorem taxes are levied as a percentage of the product price

at a specific point in the production or distribution chain, usually between the manufacturer and the wholesaler or retailer (e.g. 10% of the manufacturer's price). Volume taxes, on the other hand, are calculated based on the volume of the beverage (e.g. €1 per litre) or sugar content (e.g. €0.10 per gram of sugar per 100 ml). Taxation is applied either at a flat rate or on a sliding scale based on volume or sugar content. Graduated taxes based on sugar content can create incentives for manufacturers to reduce the sugar content of their products. One example is the Soft Drinks Industry Levy (SDIL) introduced in the UK in 2018, under which drinks containing less than 5 g of sugar per 100 ml are tax-free, whilst those containing 5 to 8 g of sugar are subject to a levy of £0.18 per litre and those containing 8 g or more of sugar are subject to a levy of £0.24 per litre. Furthermore, sugar taxes can be levied as value-added, sales or import taxes (WHO 2025).

3. Effects on purchasing and consumption behaviour

Several systematic reviews show that taxes on sugary drinks lead to a decline in purchase and sales figures, as well as to lower consumption of the taxed products (Redondo et al. 2018; Teng et al. 2019; Itria et al. 2021; Andreyeva et al. 2022). In a meta-analysis, Andreyeva et al. (2022) estimate that demand for sugary drinks reacts strongly to tax-induced price increases (price elasticity: -1.59). It is also noted that the tax rate should not be set too low and should amount to at least 10% in order to bring about changes in consumption behaviour (Itria et al. 2021; Redondo et al. 2018).

Taxes on sugary drinks influence not only the demand for the taxed products but also for potential substitutes. The aim is to encourage consumers to switch to healthier alternatives such as water. However, there is a possibility that sugary drinks will be replaced by other high-calorie, untaxed foods, which would weaken the effectiveness of the tax. However , the evidence regarding such substitution effects is inconclusive (Andreyeva et al. 2022; García-Chávez et al. 2025).

Furthermore, for an effect on consumption behaviour and health to materialise, it is crucial to what extent the tax is passed on to consumers in the form of a price increase, so that an incentive effect can take hold. According to Andreyeva et al. (2022), an average of 82% of taxes is passed on to consumers in the form of higher prices.

4. Health effects

4.1 Simulation studies

Simulation studies forecast the long-term effects of a sugar tax for countries where such a tax has not yet been introduced by combining international epidemiological and economic evidence with national data in a mathematical model. The results depend heavily on the underlying assumptions and are therefore subject to a corresponding degree of uncertainty (Emmert-Fees et al. 2024; Nawroth/Kumar 2024; Laxy/Emmert-Fees 2025; Nawroth/Kumar 2025). Modelling studies are also available for Germany (see Table 1).

Schwendicke/Stolpe (2017) model the effects of a 20% sales tax on sugary and artificially sweetened drinks on BMI, overweight and obesity in the population aged 15 to 79. The simulation shows a decline in the mean

BMI as well as in the prevalence of overweight and obesity. Overall, this could prevent around 1,028,000 cases of overweight and 479,000 cases of obesity. The strongest effects are observed among men and in the 20–29 age group.

In a further study, Emmert-Fees et al. (2023) model the effects of a tax on sugary drinks on changes in the prevalence of stroke, coronary heart disease and type 2 diabetes, and the associated cost savings in the population aged 30 to 90 in Germany over the period 2023 to 2043. The authors model three scenarios: (1) a 20% ad valorem tax on sugary drinks, (2) a 20% tax extended to include fruit juice, and (3) a tiered tax that results in a 30% reduction in sugar content. The simulation results show that, depending on the scenario, up to 109,700 cases of obesity, 244,100 cases of type 2 diabetes, 4,500 strokes and 69,800 cases of coronary heart disease could be prevented. Furthermore, up to 252,400 quality-adjusted life years (QALYs) could be gained and up to €16.0 billion in costs saved. The strongest effects are observed for the graduated tax.

1: Proponents of sugar taxes argue that, in the long term, the health benefits would particularly benefit these population groups due to higher consumption rates and prevalence of obesity, thereby offsetting the regressive nature of the tax.

2: The passing-on of the tax to the end consumer (tax incidence) depends largely on the price elasticity of demand. As empirical evidence suggests that there is at least moderate price elasticity for sugary drinks due to numerous substitution options, a complete passing-on of the tax is unlikely. Furthermore, the extent to which the tax is passed on varies depending on the product and the market power of the suppliers (Marshall 2013).

Putra et al. (2025) analyse the effects of a tax on sugary drinks and mandatory calorie labelling on restaurant menus in Germany and Belgium on the prevalence of obesity and cardiovascular mortality among 30- to 89-year-olds over the period 2022 to 2041. In both countries, all modelled tax scenarios show reductions in obesity prevalence and deaths from cardiovascular disease. The greatest effect in Germany is seen with a 30% tax combined with reformulation by manufacturers (a 2.7 percentage point reduction in obesity prevalence, 16,000 prevented cardiovascular deaths). The effects are more pronounced among people with lower levels of education. Mandatory calorie labelling on menus brought even greater benefits in Germany.

Taking into account various scenarios with different tax rates, Emmert-Fees et al. (2024) model the effects of a 20% VAT on sugary drinks on overweight, obesity, type 2 diabetes and the associated healthcare costs and disability-adjusted life years (DALYs) over the lifespan of the German population aged 20 and over. The results suggest that the number of obesity cases could fall by around 210,800 among men and 80,800 among women. In the long term, this could prevent 76,700 DALYs and save around €2.37 billion in healthcare costs. The authors point out that the projected effects depend heavily on the assumptions made.

Schwendicke et al. (2016) estimate the impact of a 20% sales tax on sugary drinks in Germany on cases of dental caries and treatment costs among 14- to 79-year-olds over a ten-year period. The microsimulations

indicate around 750,000 fewer cases of dental caries and savings of approximately €80 million. The strongest effects are observed among younger people and those on low incomes.

Simulationsstudien im deutschen Kontext

Studie	Studienpopulation + Zeithorizont	Steuer	Outcomes	Ergebnisse
Schwendicke et al. (2016)	Deutsche Bevölkerung (14–79 Jahre) **Zeithorizont:** 10 Jahre	20%-Verkaufssteuer auf zuckerhaltige Getränke	Karies, Behandlungskosten	• 750.000 weniger Kariesfälle • Kosteneinsparungen von 80 Mio. Euro • stärkste Effekte bei Jüngeren und Personen mit niedrigem Einkommen
Schwendicke/ Stolpe (2017)	Deutsche Bevölkerung (15–79 Jahre) **Zeithorizont:** bis Erreichen eines neuen Gleichgewichts	20%-Verkaufssteuer auf zuckerhaltige und künstlich gesüßte Getränke	BMI, Übergewicht, Adipositas	• 1.028.000 weniger Übergewichtsfälle • 479.000 weniger Adipositasfälle • größte Rückgänge bei Männern und bei 20- bis 29-Jährigen
Emmert-Fees et al. (2023)	Deutsche Bevölkerung (30–90 Jahre) **Zeithorizont:** 20 Jahre (2023–2043)	20%-Ad-valorem-Steuer auf zuckerhaltige Getränke (+ weitere Szenarien)	Adipositas, Schlaganfall, koronare Herzkrankheit (KHK), Typ-2-Diabetes, Qualitätsadjustierte Lebensjahre (QALYs), Kosteneinsparungen	• 132.100–244.100 weniger Typ-2-Diabetes-Fälle • 1.900–4.500 weniger Schlaganfälle • 39.200–69.800 weniger KHK-Fälle • 31.600–109.700 weniger Adipositasfälle • 106.000–252.400 gewonnene QALYs • Kosteneinsparungen von 9,6–16,0 Mrd. Euro • stärkste Effekte für die gestaffelte Steuer
Emmert-Fees et al. (2024)	Deutsche Bevölkerung (20+ Jahre) **Zeithorizont:** gesamte Lebensspanne	20%-Mehrwertsteuer auf zuckerhaltige Getränke (+ weitere Szenarien)	Übergewicht, Adipositas, Typ-2-Diabetes, Kosteneinsparungen, Krankheitsbereinigte Lebensjahre (DALYs)	• 210.800 (Männer) bzw. 80.800 (Frauen) weniger Adipositasfälle • 86.400 weniger Typ-2-Diabetes Neuerkrankungen • 76.700 verhinderte DALYs • Kosteneinsparungen von 2,37 Mrd. Euro
Putra et al. (2025)	Deutsche Bevölkerung (30–89 Jahre) **Zeithorizont:** 20 Jahre (2022–2041)	Ad-valorem-Steuer auf zuckerhaltige Getränke (unterschiedliche Szenarien)	Adipositasprävalenz, Mortalität durch Herz-Kreislauf-Erkrankungen	• größter Effekt bei 30%-Steuer + Zuckerreduktion durch Hersteller • geringere Adipositasprävalenz (-2,7 Prozentpunkte) • 16.000 weniger Todesfälle durch Herz-Kreislauf-Erkrankungen • stärkere Effekte bei Personen mit niedrigerer Bildung

Table 1: **Simulation studies in the German context. Own representation.**

4.2 Observational studies

In addition, some observational studies analyse the effects of sugar taxes that have already been introduced. These are mostly quasi-experimental studies that compare health status before and after the introduction of the tax in one region with a control region without a tax. Due to the limited observation period, these studies generally focus on body mass index (BMI) and the prevalence of overweight and obesity. Many of the observational studies originate from the USA, where such taxes have been introduced in individual cities (Table 2). The effects of the UK's SDIL are also the focus of several empirical studies (Table 3).

USA

Liu et al. (2025) examine the effects of sugar-sweetened beverage taxation in the four Californian cities of Albany, Berkeley, Oakland and San Francisco on BMI and rates of overweight and obesity among people aged 20 to 65, compared with demographically comparable cities without such a tax. Overall, no significant differences in BMI or in the proportion of overweight or obese individuals are observed between cities with and without the tax. However, in certain subgroups – including adults aged 20 to 39, women, white individuals, and the city of Berkeley – the tax is associated with a small but significant reduction in mean BMI.

Young et al. (2024) report a significant decline in BMI among children and adolescents aged 2 to 19 following the introduction of the tax in the same Californian cities. Overall, however, no significant differences were observed in the proportion of overweight or obese children. Significant decreases were observed only in specific age groups (2–5 and 6–11 years) and among certain demographic groups (boys, Asian and white children).

Jones-Smith et al. (2024) show that the tax on sugary drinks introduced in Seattle in January 2018 led to a significant reduction in BMI among children aged between 2 and 18. Furthermore, Flynn (2023) reports decreases in average BMI among high school-aged adolescents in Philadelphia, San Francisco and Oakland, with these changes being particularly concentrated among females and non-white individuals.

Beobachtungsstudien aus den USA				
Studie	**Studienpopulation**	**Methodik + Intervention**	**Outcomes**	**Ergebnisse**
Liu et al. (2025a)	Erwachsene (20–65 Jahre)	Differences-in-Differences Steuer von 1 Cent pro fluid ounce (fl. oz.) in Albany, Berkeley, Oakland, San Francisco (Kalifornien)	BMI, Übergewicht, Adipositas	• keine Rückgänge des BMI und der Prävalenz von Übergewicht oder Adipositas • geringer Rückgang des BMI in einzelnen Untergruppen (20–39-Jährige, Frauen, weiße Personen, Stadt Berkeley)
Young et al. (2024)	Kinder und Jugendliche (2–19 Jahre)	Differences-in-Differences Steuer von 1 Cent pro fl. oz. in Albany, Berkeley, Oakland, San Francisco (Kalifornien)	BMI, Übergewicht, Adipositas	• Rückgang des BMI • insgesamt kein Rückgang der Prävalenz von Übergewicht oder Adipositas • Rückgang der Prävalenz von Übergewicht oder Adipositas in einzelnen Gruppen (2-5- und 6-11-Jährige, Jungen, asiatische und weiße Kinder)
Jones-Smith et al. (2024)	Kinder und Jugendliche (2–18 Jahre)	Differences-in-Differences Steuer von 1,75 Cent pro fl. oz. in Seattle (Washington)	BMI	• Rückgang des BMI
Chung und Xu (2025)	Erwachsene	Synthetic Control Method Syrup Tax im Bundesstaat Washington	Adipositas, Diabetes, Bluthochdruck, Cholesterin	• Rückgang der Adipositasraten • besonders ausgeprägt bei Hochschulabsolventen, Männern, Personen < 65 Jahren, weißen u. asiatischen Personen • kein Effekt auf Diabetes, Bluthochdruck, erhöhtes Cholesterin
Fletcher et al. (2010b)	Kinder und Jugendliche	Fixed-Effects-Modell Softdrink-Steuersatzänderungen (1990–2006) in mehreren US-Bundesstaaten	Adipositas	• kein Effekt
Fletcher et al. (2010a)	Erwachsene	Fixed-Effects-Modell Softdrink-Steuersatzänderungen (1990–2006) in mehreren US-Bundesstaaten	BMI, Adipositas, Übergewicht	• geringer Rückgang des BMI • besonders ausgeprägt bei Personen mit niedrigem Einkommen und Hispanics

Table 2: **Observational studies from the USA. Author's own presentation.**

Other studies analyse the introduction of taxes or changes to tax rates on sugary drinks inUS states. Fletcher et al. (2010b) show that tax changes in several states between 1989 and 2006 led to a moderate decline in soft drink consumption among children and adolescents, but had no effect on body weight.

Fletcher et al. (2010a), on the other hand, find a very small but significant effect: a 1% tax increase reduces BMI by 0.003 points. Furthermore, the effects vary across population groups and are particularly pronounced among low-income individuals and Hispanics. Chung/Xu (2025) examine the effects of the syrup tax introduced in Washington in 2009, which is levied on the sale of syrup, on the prevalence of diabetes, high blood pressure and high cholesterol among individuals aged 18 and over. The results show that the tax is associated with a significant reduction in obesity rates, which is particularly pronounced among university graduates, men, people under 65, and white and Asian individuals. However, no effect is observed with regard to the prevalence of diabetes, high blood pressure or high cholesterol.

United Kingdom

According to current knowledge, the evidence regarding the health effects of the UK SDIL is limited to children and adolescents (see Table 3). Rogers et al. (2023b) examine changes in the prevalence of obesity among primary school children aged 4 to 5 and 10 to 11 following the introduction of the tax. Among girls aged 10 to 11, the prevalence fell by around 8%, whilst no changes were observed among boys or 4- to 5-year-olds. The observed effects were greatest among girls from schools in socially

deprived areas.

Furthermore, Rogers et al. (2024) analyse changes in the incidence of hospital admissions for asthma among children following the introduction of the tax. Overall, there was a 20.9% reduction in the incidence of hospital admissions, which was similar across all age groups and areas.

Rogers et al. (2023a) examine changes in the incidence of hospital admissions for the extraction of decayed teeth among children and adolescents aged 0 to 18 years. Overall, there was a relative reduction of 12.1%. Whilst reductions of 28.6% and 5.5% were observed in children aged 0 to 4 years and 5 to 9 years respectively, no change was observed in older children.

5. Conclusion

Sugar taxes, particularly on beverages, have been implemented in many countries worldwide. Regarding the health impacts of such taxes,there are several simulation studies that use models to predict potential effects, as well as observational studies thatempirically examine theactual impacts of taxes already in place.

For Germany, simulation studies consistently predict positive effects, including reductions in overweight, obesity, type 2 diabetes, dental caries and cardiovascular deaths, as well as associated cost savings. Observational studies from the US and the UK, however, paint a mixed picture: some studies suggest reductions in BMI or declining prevalence of overweight and obesity, whilst others find no or only very minor effects. Both study designs suggest that people with low socioeconomic status and younger people could benefit most.

Discrepancies between the results of simulation and observational studies may be due to methodological differences. Simulation studies are based on assumptions regarding changes in consumption and weight loss. Due to limited data availability, uniform price elasticities are usually assumed for the entire population, meaning that changes in consumption may be over- or underestimated. It is also frequently assumed that calories saved lead directly to a proportional reduction in weight. In reality, however, consumers often replace sugary drinks with other products, and individual metabolic differences influence weight change. Both factors are usually only taken into account in a simplified manner in models, meaning that these tend to predict more positive effects than can actually be expected. Observational studies, by contrast, capture real-world behaviour under complex everyday conditions. In this context, substitution effects can mitigate the tax-induced calorie reduction, meaning that actual weight loss is often lower. However, due to their generally limited observation periods, observational studies are only of limited suitability for capturing long-term health effects.

Beobachtungsstudien aus Großbritannien				
Studie	**Studienpopulation**	**Methodik + Intervention**	**Outcomes**	**Ergebnisse**
Rogers et al. (2024)	Kinder und Jugendliche (5–18 Jahre)	Interrupted Time Series Analysis Soft Drinks Industry Levy (SDIL)	Inzidenz der Krankenhausaufnahmen wegen Asthma	• Reduktion der Inzidenz der Krankenhausaufnahmen um 20,9% • unabhängig von Alter und Deprivationsgrad des Wohngebiets
Rogers et al. (2023b)	Kinder (4–5 und 10–11 Jahre)	Interrupted Time Series Analysis Soft Drinks Industry Levy (SDIL)	Adipositas	• Reduktion der Adipositasprävalenz bei 10–11-jährigen Mädchen um 8% • stärkste Reduktion in sozial benachteiligten Gebieten • keine Effekte bei Jungen und 4–5-jährigen Kindern
Rogers et al. (2023a)	Kinder und Jugendliche (0–18 Jahre)	Interrupted Time Series Analysis Soft Drinks Industry Levy (SDIL)	Inzidenz der Krankenhausaufnahmen zur Extraktion kariöser Zähne	• Reduktion der Inzidenz der Krankenhausaufnahmen um 12,1% (insgesamt) • Reduktion von 28,6% (0–4 Jahre) bzw. 5,5% (5–9 Jahre) • keine Veränderungen bei älteren Kindern • unabhängig vom Deprivationsgrad des Wohngebiets

Table 3: **Observational studies from the UK. Author's own presentation.**

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The results of the simulation studies plausibly demonstrate the chains of effects through which a tax on sugar-sweetened beverages can contribute to improving public health. However, observational studies suggest that these effects tend to be smaller under real-world conditions. Whether a tax has an incentive effect depends largely on its specific design and level. Similarly, the definition of the product groups subject to taxation is of central importance. As a significant proportion of sugar consumption occurs via other sugary products such as confectionery, total sugar intake may remain high, meaning that the desired health effects are only achieved to a limited extent. To achieve sustainable and substantial improvements in public health, a comprehensive package of measures is therefore required, combining fiscal instruments with further preventive measures such as awareness campaigns, advertising restrictions or nutrition education. <<

The Effects of a Sugar Tax: a Literature Review

Introduction: In Germany, the introduction of a sugar tax has been under discussion for some time.

Methods: The narrative literature review examines the evidence on the health effects of a sugar tax and assesses how realistic the expectations associated with such a tax are in light of the existing body of research.

Results: Simulation studies for Germany, which model potential effects, consistently predict long-term health gains and cost savings. Findings from observational studies, which empirically investigate the impacts of taxes already implemented, are, however, mixed.

Discussion: Overall, the evidence suggests that long-term health effects are likely to materialise only in combination with a range of

complementary prevention strategies.

Keywords

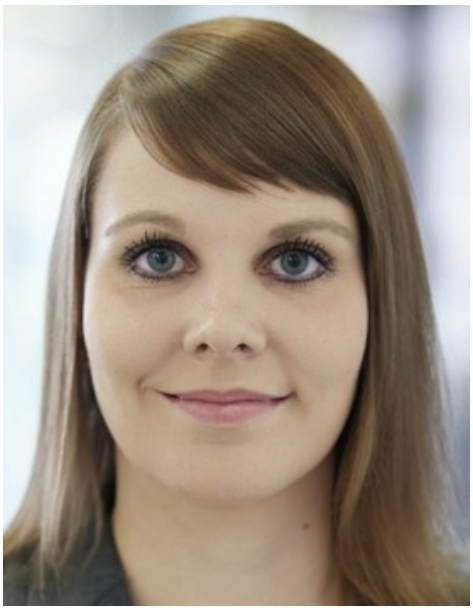
sugar tax, sugar-sweetened beverages, simulation studies, observational studies

Author declaration

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