



© Dmitrii_Guzhanin/iStock/Getty Images Plus

Scientific evidence in nutrition policy¹

Peter von Philipsborn

Abstract

The global food system is facing enormous challenges which call for decisive political action. Scientific evidence can help to identify promising policy options, and to assess the intended effects and the unintended consequences of these. Policy decisions should not be made on the basis of individual studies, but should consider the entire body of available evidence. In line with calls for a pluralism of methods, this body of evidence includes various forms of direct and indirect evidence. The following article outlines the diverse evidence base for three key policies: regulation of food advertising, food taxation, and nutrition education. Particularities of nutrition policy research call for a broad dialogue between the scientific community, relevant societal and political actors, and the public.

Keywords: Nutrition policies, food system, evidence-based public health, public engagement with science

Citation

von Philipsborn P: Scientific evidence in nutrition policy. *Ernährungs Umschau* 2022; 69(1): 10–7.

This article is available online:

DOI: 10.4455/eu.2022.003

Peer reviewed

Manuscript (overview) received: 13 September 2021

Revision accepted: 30 November 2021

Why do we need nutrition policies?

The global food system is both a miracle and a disaster – these are the opening words of the UK's national food strategy, published in July 2021 [1]. This is a concise and pertinent diagnosis. Indeed, contrary to prophecies of Malthusian² doom, the global food system today produces sufficient food for more than seven billion people. Highly complex, internationally networked production systems and supply chains ensure that a growing proportion of the world's population can choose from a historically unique variety of foods all year round, with minimal effort and at reasonable prices [1]. But the challenges facing the food system are also gigantic, and experts are all too familiar with them: The food system is responsible for a quarter to a third of global greenhouse gas emissions, and is the main driver behind biodiversity and habitat loss, land degradation and the loss of freshwater reserves [1–3]. Each year, billions of sentient beings live and die in often miserable conditions for the production

¹ The article is based on an online plenary lecture at the scientific congress of the German Society for Nutrition on 12 March 2021.



of animal-based foods, which raises legitimate questions of ethics and responsibility [4]. The prevalence of diet-related chronic diseases is on the rise worldwide and is growing particularly rapidly in the Global South [5].

These challenges are systemic in nature and cannot be addressed through changes in individual behavior alone [5, 6]. They require organized efforts of society, and therefore call for political action. They represent problems of governance that are in many regards new in terms of their objectives and their complexity [6]. This raises the question of what role science can play in finding appropriate solutions.

The concept of evidence-based policy making

The idea that scientific evidence can contribute to more effective, equitable or otherwise better policy-making is old and can be traced back to ancient sources. The idea gained particular momentum in the 18th century, in the age of the European Enlightenment. A modern influence that had a formative effect, especially in the health sector, was the development of the concept of evidence-based medicine and health care since the 1990s [7]. According to a widely used definition, the concept of evidence-based medicine refers to health-related decision-making based on the systematic and deliberate integration of three aspects:

1. the best available scientific evidence
2. the practical experience and expertise of health professionals and
3. the values and preferences of the patients or populations concerned [8].

The concept of evidence-based practice has since become a central paradigm of medicine and health care. For example, the World Health Organization [WHO] and numerous other international and national health organizations have committed themselves to an evidence-based approach [8]. The concept has subsequently been applied to other fields of practice, and terms such as evidence-based public health and evidence-based policy making have been coined [9, 10].

Central principles of evidence-based policy making can also be applied to nutrition policy. This applies to the basic triad of aspects that should be considered in decision-making [i.e., scientific evidence, the practical experience and expertise of relevant professionals, and the values and preferences of the affected population]. It also applies to the following principles, which are well established in evidence-based medicine and public health [10, 11]:

- Results of individual studies should not be used in isolation to justify decisions. In fact, the entire body of relevant evidence should be considered. This underlines the importance of methodologically rigorous systematic reviews and evidence-based guidelines.
- It strengthens our confidence in an assumption when different studies with different methodological approaches show consistent results. However, with a sufficiently large number of studies, it can usually be expected that individual studies will show divergent results due to statistical variance and methodological and natural heterogeneity. This in turn underlines the importance of the principle of considering the whole body of evidence.

- The best *available* evidence should be used. This implies, among other things, that in the absence of direct evidence it is necessary and appropriate to consider indirect forms of evidence. However, the more indirect the evidence, the more caution should be exercised in interpreting it.
- Our confidence in an assumption is strengthened when the assumption is *plausible*, i.e., when it is consistent with established knowledge about basic biological, psychological, social and political mechanisms of action. Such knowledge can be derived from basic research in the natural and social sciences, as well as from related fields of research.

Besides these general principles, there are also a number of specific challenges that arise when principles of evidence-based practice are applied to policy-making [10, 11]. In evidence-based medicine and nutrition, randomized controlled trials [RCTs] are of particular importance. RCTs are considered the most reliable method for investigating the effects of exposures and interventions on individual health outcomes, and for proving causal relationships. Indeed, evidence from RCTs also provides an important basis for nutrition policy decisions. For example, RCTs have shown that regular consumption of sugar-sweetened beverages promotes weight gain. This insight has contributed to the adoption of sugar-sweetened beverage taxes in many countries [12, 13].

However, there are also many questions relevant to nutrition policy that cannot be investigated adequately with RCTs. RCTs are particularly well suited to study interventions that directly address and primarily affect the individual, and whose effects materialize within relatively short periods of time [as is the case with many clinical interventions]. By contrast, measures adopted on a population level which aim at systemic and long-term effects often cannot be investigated with RCTs, or only to a limited extent. This applies to many nutrition policy measures.

Therefore, it is particularly important in evidence-based nutrition policy to consider dif-

² From the discrepancy between the exponential growth of the (world) population and the merely linear increase in food production, Thomas Robert Malthus (1766–1834) deduced a cycle of rise and collapse of economic systems or states.

ferent forms of direct and indirect evidence, and to use diverse methodological approaches [10]. These include modelling studies as well as quasi-experimental studies, the development of which has made great strides in recent years. These are non-randomized studies that attempt to distinguish causality from mere correlation through methodologically innovative approaches. Examples include interrupted time series studies and studies with synthetic control groups [14].

The need for such methodological pluralism is increasingly recognized in evidence-based public health, too [15].

◆ Figure 1 illustrates the principle of an interrupted time series study with the example of the sugary drinks industry levy introduced in the UK. The study looked at two categories of drinks: soft drinks (which are covered by the levy) and, as a control group, milk and fruit juice drinks (which are exempt from the levy). For both beverage categories, the proportion of products offered with a sugar content of more than 5 g per 100 mL (the threshold

above which the levy becomes due) was calculated. Before the announcement of the industry levy, there were hardly any changes over time in both categories. After the announcement, the share of highly sweetened products in the taxable beverage category began to decline rapidly, with a further abrupt drop from the time the levy was introduced. There was no corresponding decline in the control group of non-taxable beverages (◆ Figure 1). The authors conclude that the levy is an effective incentive for beverage producers to reduce the sugar content of their products [46].

Furthermore, nutrition policy measures are often political in the sense that their evaluation is not limited to questions of effectiveness. Rather, they often touch upon fundamental political values such as human rights and individual autonomy, which must be taken into account accordingly [10, 11].

In the subsequent paragraphs, the application of these principles will be illustrated with three examples.

Example 1:

Regulation of food advertising

Numerous national and international health and nutrition organizations recommend that marketing to children of nutritionally unfavorable foods should be restricted by law in order to promote healthy diets and to prevent diet-related diseases [16, 17]. There are at least four forms of indirect evidence for the effectiveness of this approach [18]:

1. Exposure to food advertising increases the consumption of unhealthy foods, total energy intake and the risk of obesity.

A large number of observational and intervention studies have shown that exposure to food advertising is associated with increased consumption of the advertised foods, as well as with less healthy dietary patterns, higher total energy intake and an elevated risk of obesity [19, 20]. This implies that a reduction in advertising exposure through appropriate measures should lead to a reduction of these unfavorable outcomes. Besides, this clearly refutes the frequently voiced claim that food advertising merely shapes brand preferences without influencing dietary patterns and disease risks.

2. Effectiveness when implemented as part of a policy mix. One of the countries with the most comprehensive public regula-

Interrupted time series studies

Interrupted time series (ITS) analyses are frequently used to evaluate nutrition policies at the population level. First, a target parameter is defined (e.g., sales of sugar-sweetened beverages). Subsequently, a series of data points are collected for this parameter before and after the implementation of the measure. This series of data points (the time series) can be used to examine whether there has been a deviation from the expected trend after the implementation of the measure.

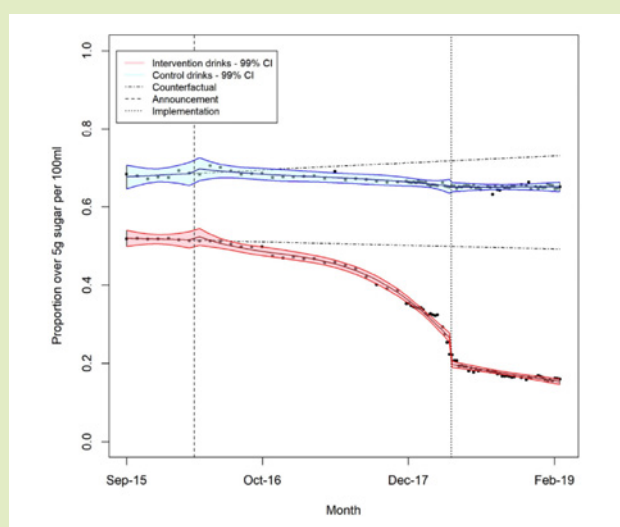


Fig. 1: Results of an interrupted time series analysis of the effectiveness of the UK sugary drinks industry levy (graphic taken from [46], Creative Commons Attribution License.)

tion of food marketing directed towards children is Chile. In 2016, Chile restricted food marketing to children for processed foods with elevated levels of sugar, salt, saturated fat and energy. At the same time, warning labels in the form of black stop signs were made mandatory on such products, and binding nutrition standards for schools and kindergartens were introduced [21, 22]. As a result, the average sugar-sweetened beverage consumption of the Chilean population decreased by 23 mL/capita/day, corresponding to a reduction of about 30%. Furthermore, the share of processed foods with an unfavorable nutritional profile in the total supply decreased from 51% to 44% [21, 22]. As the three measures were introduced at the same time, it is not possible to quantify their respective contribution to the overall effect. However, the results show that a nutrition policy package that includes effective advertising regulation can have relevant effects at the population level.

3. Effectiveness of advertising restrictions for alcohol and tobacco control. Advertising restrictions are well established in the prevention of harmful alcohol and tobacco consumption. Their effectiveness in this field has been demonstrated by various quasi-experimental studies [23, 24]. Despite the differences between these product groups, this can also be taken as an indication of the effectiveness of advertising restrictions in reducing the consumption of unhealthy foods and non-alcoholic beverages.

4. High expenditures on advertising for unhealthy foods, and its profitability. In 2017 in Germany, 870 million € were spent on advertising for confectionery alone [25]. By contrast, only approximately 17 million € were spent on fruit and vegetable advertising [26]. This discrepancy is explained, among other things, by the significantly higher profit margins of processed foods compared to vegetables and fruit [27]. Moreover, fresh or minimally processed foods are mostly generic products that can hardly be advertised in a manufacturer-specific way. The effectiveness of advertising for increasing sales is well established in the marketing literature.

Taken together, these four forms of indirect evidence make it likely that effective legal restrictions on marketing to children of unhealthy foods and beverages can contribute to healthier dietary patterns. The evidence for



this is not definitive, and implementation should be accompanied by methodologically sound evaluations. Of note, advertising restrictions – like any other individual measure – can be expected to have only limited effects when implemented in isolation. This underlines the need for a package of measures [28].

Example 2:

Food taxation

The WHO and other health organizations recommend that the tax system should be used to promote healthy and sustainable dietary patterns [6, 16, 29, 30]. There are different forms of direct and indirect evidence for the effectiveness of this approach.

1. Direct evidence from quasi-experimental studies. The strongest direct evidence exists for the effectiveness of taxes on sugar-sweetened beverages. Such taxes have been adopted by around 50 countries worldwide. The effectiveness of taxes on sugar-sweetened beverages has been investigated in a considerable number of quasi-experimental studies. These showed an average price elasticity of around -1, i.e., a tax-induced price increase of 1% leads on average to a decrease in consumption of around -1% [31]. In addition, there is further, but less extensive direct evidence for the effectiveness of taxes on confectionery and savory snacks, with price elasticities ranging from -0.5 to -1.1 [32, 33].

2. Indirect evidence from RCTs. In addition, there are various RCTs examining the effects of price increases not due to taxes. (Taxes, which are usually adopted by governments and implemented at the national or regional level, are usually not amenable to randomization.) For example, a Cochrane review showed that price increases on sugar-sweetened beverages reduce their consumption [34].

3. Indirect evidence for other product groups. Like for advertising restrictions, the effectiveness of taxes as an approach to reducing harmful alcohol and tobacco consumption is well established [23, 35].

4. Economic plausibility. It is a well-established, well-studied basic assumption of economics that consumers and companies respond to price signals, and that – apart from a few special cases – price increases lead to a decrease in consumption, and price decreases to an increase in consumption [36]. There are no valid reasons why this principle should not also apply to most food groups relevant to nutrition policy [29].

Example 3:

Nutrition education and awareness-raising

Nutrition education and awareness-raising are considered by many governments, including the German government, as a preferred approach to promoting healthy and sustainable diets. In the scientific community, it is generally recognized that nutrition education alone has limited effects on dietary behavior – although this applies also to other interventions implemented in isolation [28]. However, as part of a comprehensive strategy, nutrition education and awareness-raising is a well-justified approach, for which the following arguments, among others, can be cited:

1. Effectiveness in conjunction with environmental interventions. Behavioral interventions [e.g. nutrition education] can often usefully complement environmental interventions and increase their effectiveness. This is especially true when behavioral interventions are long-term and comprehensive, and contain practical and action-oriented elements [37, 38].

2. [Nutrition] education as a goal and value in itself. Education and the possibility of lifelong learning are a central, universal human right and are recognized as such in Article 26 of the Universal Declaration of Human Rights and Article 13 of the International Covenant on Economic, Social and Cultural Rights [39]. This also includes nutrition education [40]. Individuals have a right to learn about and understand how their diet affects their health, their well-being, as well as the world around them. This holds true regardless of the effects of nutrition education on dietary behaviors and individual health outcomes.



© Volha Maksimava/iStock/Getty Images Plus



© Drazen Zigic/iStock/Getty Images Plus

3. The political role of nutrition education. Nutrition policies depend on public support for them, which requires a public understanding of their necessity. Nutrition education can contribute to this, especially if it is not limited to teaching individual nutrition skills, but also addresses the social and political dimensions of nutrition [40–42].

The role of the scientific community

Scientific evidence on complex social problems is generally not unequivocal and definitive. This holds also true for the evidence on nutrition policies. Given the magnitude and urgency of the challenges facing the global food system, the incompleteness of our knowledge should not be a justification for inaction. Rather, it underlines the need to make comprehensive use of the available evidence and to carefully weigh it up. Besides, it calls for an evaluation of measures that are newly implemented, and for a self-critical, reflective stance.

In this context, the role of the scientific community is not limited to generating knowledge and publishing and discussing it in academic forums. The implementation of nutrition policies is the result of societal and political discussion, negotiation and decision-making [41, 42]. Researchers should therefore enter into a dialogue with relevant social and political actors and with the public, and involve them in the research process in suitable formats [43, 44]. There are various ways in which experts can contribute with their expertise to the above-mentioned processes. This includes, among others, the use of social media, blog



articles, podcasts and newspaper interviews, as well as involvement in professional organizations, citizens' groups and political parties [43]. This social and political role of science is in line with the expectations of the general public: in a representative survey of the German population, 75% of respondents agreed that scientists should speak out publicly when research results are not taken into account in political decision-making [45].

Conflict of Interest

The author declares no conflict of interest according to the International Committee of Medical Journal Editors.

Dr. med. Peter von Philipsborn

Institute for Medical Information Processing, Biometry and Epidemiology (IBE)
Pettenkofer School of Public Health
Ludwig-Maximilians-Universität München (LMU Munich)
Elisabeth-Winterhalter-Weg 6, 81377 Munich/Germany
pphilipsborn@ibe.med.uni-muenchen.de

References

1. National Food Strategy: The Plan. An independent review for government. www.nationalfoodstrategy.org/ (last accessed on 4 September 2021).
2. Willett W, Rockström J, Loken B, et al.: Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. *Lancet* 2019; 393: 447–92.
3. Crippa M, Solazzo E, Guizzardi D, Monforti-Ferrario F, Tubiello FN, Leip A: Food systems are responsible for a third of global anthropogenic GHG emissions. *Nature Food* 2021; 2: 198–209.
4. Renner B, Arens-Azevêdo U, Watzl B, Richter M, Virmani K, Linseisen J for the German Nutrition Society (DGE): DGE position statement on a more sustainable diet. *Ernährungs Umschau* 2021; 68(7): 144–54.
5. Branca F, Lartey A, Oenema S, et al.: Transforming the food system to fight non-communicable diseases. *BMJ* 2019; 364: 1296.
6. Wissenschaftlicher Beirat für Agrarpolitik Ernährung und gesundheitlichen Verbraucherschutz (WBAE) beim BMEL: Politik für eine nachhaltigere Ernährung: Eine integrierte Ernährungspolitik entwickeln und faire Ernährungsumgebungen gestalten. www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Beiraete/agrarpolitik/wbae-gutachten-nachhaltige-ernaehrung.html (last accessed on 24 September 2020).
7. Djulbegovic B, Guyatt GH: Progress in evidence-based medicine: a quarter century on. *Lancet* 2017; 390: 415–23.
8. Yamey G, Volmink J: An Argument for Evidence-Based Policy-Making in Global Health. In: Brown WG, Yamey G, Wamala S, (eds.): *The Handbook of Global Health Policy*: John Wiley & Sons, Ltd 2014; p. 133–56.

Anzeige

© arthobbit/thinkstock/Getty Images



Peer-Review-Beiträge der ERNÄHRUNGS UMSCHAU sind als englischer Volltext frei zugänglich (CC-BY-NC-ND). Die deutsche Printausgabe erreicht Monat für Monat knapp 10000 LeserInnen. Die ERNÄHRUNGS UMSCHAU ist die auflagenstärkste deutschsprachige Abonnementzeitschrift für Ernährungsfachkräfte.*

Erhöhen Sie die Sichtbarkeit Ihrer Publikation durch Freischaltung des deutschen Artikels!

Auch via social media:

www.instagram.com/ernaehrungsumschau/

www.facebook.com/EUmschau/

www.twitter.com/EUmschau

Mehr Informationen:

www.ernaehrungs-umschau.de/fachzeitschrift/hinweise-fuer-autoren/

kontakt@ernaehrungs-umschau.de

*8425 Druckexemplare pro Ausgabe – IWW-Durchschnitt für die Zeit vom 01.07.2020–30.06.2021

**ERNÄHRUNGS
FORSCHUNG
& PRAXIS UMSCHAU**



9. Cairney P: *The Politics of Evidence-based Policymaking*. London: Palgrave 2015.
10. von Philipsborn P, Rehfuess E: Evidenzbasierte Public Health. In: Schmidt-Semisch H, Schorb F (eds.): *Public Health*. Wiesbaden: Springer Nature 2021; 303–29.
11. Rehfuess EA, Zhelyazkova A, von Philipsborn P, Griebler U, De Bock F: Evidenzbasierte Public Health: Perspektiven und spezifische Umsetzungsfaktoren. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz* 2021; 64: 514–23.
12. De Ruyter JC, Olthof MR, Seidell JC, Katan MB: A trial of sugar-free or sugar-sweetened beverages and body weight in children. *N Engl J Med* 2012; 367: 1397–406.
13. Ebbeling CB, Feldman HA, Chomitz VR, et al.: A randomized trial of sugar-sweetened beverages and adolescent body weight. *N Engl J Med* 2012; 367: 1407–16.
14. Craig P, Cooper C, Gunnell D, et al.: Using natural experiments to evaluate population health interventions: new Medical Research Council guidance. *J Epidemiol Community Health* 2012; 66: 1182–6.
15. Rutter H, Savona N, Glonti K, et al.: The need for a complex systems model of evidence for public health. *Lancet* 2017; 390: 2602–4.
16. Schaller K, Effertz T, Gerlach S, Grabfelder M, Müller MJ: Prävention nichtübertragbarer Krankheiten – eine gesamtgesellschaftliche Aufgabe. Grundsatzpapier der Deutschen Allianz Nichtübertragbare Krankheiten (DANK). Berlin: Deutsche Allianz Nichtübertragbare Krankheiten (DANK) 2016. www.dank-allianz.de/files/content/dokumente/DANK-Grundsatzpapier_ES.pdf (last accessed 29 November 2021).
17. World Health Organization: A framework for implementing the set of recommendations on the marketing of foods and non-alcoholic beverages to children. www.who.int/dietphysicalactivity/framework_marketing_food_to_children/en/ (last accessed on 1 July 2020).
18. von Philipsborn P: Lebensmittel mit Kinderoptik und deren Bewerbung: Problemlage und Möglichkeiten der politischen Regulierung. www.vzbv.de/sites/default/files/downloads/2021/02/16/vzbv_philipsborn_bericht_kindermarketing_2021-02.pdf (last accessed on 18 February 2021).
19. Boyland EJ, Nolan S, Kelly B, et al.: Advertising as a cue to consume: a systematic review and meta-analysis of the effects of acute exposure to unhealthy food and non-alcoholic beverage advertising on intake in children and adults. *Am J Clin Nutr* 2016; 103: 519–33.
20. Sadeghirad B, Duhany T, Motaghipisheh S, Campbell NR, Johnston BC: Influence of unhealthy food and beverage marketing on children's dietary intake and preference: a systematic review and meta-analysis of randomized trials. *Obes Rev* 2016; 17(10): 945–59.
21. Taillie LS, Reyes M, Colchero MA, Popkin B, Corvalán C: An evaluation of Chile's Law of Food Labeling and Advertising on sugar-sweetened beverage purchases from 2015 to 2017: a before-and-after study. *PLoS medicine* 2020; 17: e1003015.
22. Reyes M, Smith Taillie L, Popkin B, Kanter R, Vandevijvere S, Corvalán C: Changes in the amount of nutrient of packaged foods and beverages after the initial implementation of the Chilean Law of Food Labelling and Advertising: a nonexperimental prospective study. *PLoS medicine* 2020; 17: e1003220.
23. Martineau F, Tyner E, Lorenc T, Petticrew M, Lock K: Population-level interventions to reduce alcohol-related harm: an overview of systematic reviews. *Preventive medicine* 2013; 57: 278–96.
24. WHO Regional Office for Europe: Making tobacco a thing of the past – Roadmap of actions to strengthen implementation of the WHO Framework Convention on Tobacco Control in the European Region 2015 – 2025. www.euro.who.int/en/health-topics/disease-prevention/tobacco/publications/2015/making-tobacco-a-thing-of-the-past-roadmap-of-actions-to-strengthen-implementation-of-the-who-framework-convention-on-tobacco-control-in-the-european-region-2015-2025-2015. (last accessed 30 November 2021).
25. statista: Werbeausgaben für Süßwaren in Deutschland in den Jahren 2000 bis 2017. <https://de.statista.com/statistik/daten/studie/197004/umfrage/werbeausgaben-fuer-schokolade-und-zuckerwaren-in-deutschland-seit-2000> (last accessed on 19 July 2020).
26. statista: Werbeausgaben für Früchte und Gemüse in Deutschland in den Jahren 2007 bis 2017. <https://de.statista.com/statistik/daten/studie/388528/umfrage/werbeausgaben-fuer-fruechte-und-gemuese-in-deutschland/> (last accessed on 19 July 2020).
27. Foodwatch: Kindermarketing für Lebensmittel: Freiwillige Selbstverpflichtungen auf dem Prüfstand. www.foodwatch.org/fileadmin/-DE/Themen/Kinderernaehrung/Marktstudie_Kinderlebensmittel_2021_foodwatch.pdf (last accessed on 4 September 2021).
28. Rutter H: The single most important intervention to tackle obesity. *Int J Public Health* 2012; 57: 657–8.
29. WHO: Fiscal policies for diet and the prevention of noncommunicable diseases. <https://apps.who.int/iris/bitstream/handle/10665/250131/9789241511247-eng.pdf?jsessionid=945FF538F803E6209AD4F426ED94E6E3?sequence=1> (last accessed on 30 November 2021).
30. Verbraucherzentrale Bundesverband (vzbv): Ökonomische Anreize für eine Zuckerreduktion bei Getränken setzen | Positionspapier des vzbv. www.vzbv.de/publikationen/oekonomische-anreize-fuer-eine-zuckerreduktion-bei-getraenken-setzen (last accessed on 6 September 2021).
31. Teng AM, Jones AC, Mizdrak A, Signal L, Genç M, Wilson N: Impact of sugar-sweetened beverage taxes on purchases and dietary intake: systematic review and meta-analysis. *Obesity Reviews* 2019; 20: 1187–204.
32. Batis C, Rivera JA, Popkin BM, Taillie LS: First-year evaluation of Mexico's tax on nonessential energy-dense foods: an observational study. *First-Year Evaluation of Mexico's Tax on Nonessential Energy-Dense Foods: An Observational Study*. *PLoS medicine* 2016; 13: e1002057.
33. WHO Regional Office for Europe: Good practice brief: public health product tax in Hungary. www.euro.who.int/__data/assets/pdf_file/0004/287095/Good-practice-brief-public-health-product-tax-in-hungary.pdf (last accessed on 30 November 2021).
34. von Philipsborn P, Stratil JM, Burns J, et al.: Environmental interventions to reduce the consumption of sugar-sweetened beverages and their effects on health. *Cochrane Database Syst Rev* 2019; CD012292.
35. Jha P, Peto R: Global effects of smoking, of quitting, and of taxing tobacco. *N Engl J Med* 2014; 370: 60–8.
36. Brownell KD, Farley T, Willett WC, et al.: The public health and economic benefits of taxing sugar-sweetened beverages. *N Engl J Med* 2009; 361: 1599–605.
37. Hyseni L, Elliot-Green A, Lloyd-Williams F, et al.: Systematic review of dietary salt reduction policies: evidence for an effectiveness hierarchy? *PLOS ONE* 2017; 12: e0177535.
38. Abdel Rahman A, Jomaa L, Kahale LA, Adair P, Pine C: Effectiveness of behavioral



- interventions to reduce the intake of sugar-sweetened beverages in children and adolescents: a systematic review and meta-analysis. *Nutr Rev* 2017; 76: 88–107.
39. UNESCO: Education 2030. Deutsche Fassung: www.unesco.de/bildung/agenda-bildung-2030 (last accessed 30 November 2021).
40. Bartsch S, Büning-Fesel M, Cremer M, et al.: Ernährungsbildung – Standort und Perspektiven. *Ernährungs Umschau* 2013; 2: M84–M95.
41. Akselrod S, Bloomfield A, Marmot M, Moran AE, Nishtar S, Placella E: Mobilising society to implement solutions for non-communicable diseases. *BMJ* 2019; 365: 1360.
42. Huang TTK, Cawley JH, Ashe M, et al.: Mobilisation of public support for policy actions to prevent obesity. *Lancet* 2015; 385: 2422–31.
43. von Philipsborn P, Garlich D, Wildner M, Loss J: Politische Umsetzung von Verhältnisprävention auf Bevölkerungsebene: Herausforderungen und Erfolgsfaktoren. *Gesundheitswesen* 2020; 82(05): 386–8.
44. Merner B, Lowe D, Walsh L, et al.: Stakeholder involvement in systematic reviews: lessons from Cochrane's Public Health and Health Systems Network. *Am J Public Health* 2021; 111: 1210–5.
45. Wissenschaft im Dialog: Wissenschaftsbarometer 2019. www.bosch-stiftung.de/sites/default/files/publications/pdf/2019-11/Broschuere_Wissenschaftsbarometer_2019.pdf (last accessed on 23 February 2020).
46. Scarborough P, Adhikari V, Harrington RA, et al.: Impact of the announcement and implementation of the UK Soft Drinks Industry Levy on sugar content, price, product size and number of available soft drinks in the UK, 2015–19: A controlled interrupted time series analysis. *PLoS medicine* 2020; 17: e1003025.