Designing politically feasible policies to enhance healthy and sustainable diets – empirical insights.

Dissertation

to obtain the doctoral degree

of the Faculty of Agricultural Sciences at the Georg-August University of Göttingen

presented by

Simone Lydia Wahnschafft

born in Boston.

Göttingen, December 2024

D7

1. Speaker: Prof. Dr. Achim Spiller

2. Correspondent: Prof. Dr. Yasemin Boztug

Day of the oral exam: 30. September 2024

Table of Contents

CHAPTER 1. INTRODUCTION

1.1

Designing politically feasible policies to enhance healthy and sustainable diets – overview of key concepts.

Author: Simone Wahnschafft[a]

a. Research Training Group in Sustainable Food Systems, University of Göttingen, Heinrich-Düker-Weg 12, 37073 Göttingen, Germany

Background

To echo the simple yet salient message that opens the EAT Lancet Commission's summary report on fostering healthy diets from sustainable food systems: **food** is the single more powerful lever we have to optimize both human health and environmental sustainability [1]; however, food systems today are far from realizing this potential.

First, from a health perspective, shifts in dietary patterns over the past several decades have come to underpin a global epidemic of diet-related disease. As it stands, dietary risk factors account for one in every five deaths globally [2]. Though specific dietary patterns still vary widely across country, cultural, and socioeconomic lines, unhealthy dietary patterns are characterized by key trends of concern on a global scale [3],[4]. The high and ever-rising consumption of ultra-processed foods (UPFs), for example, is one such trend [5],[6]. UPFs, such as packaged sweet and savory snacks and sugar-sweetened-beverages (SSBs), are generally energy dense, high in dietary components with health-harming effects (I.e., sodium, sugar, saturated fats, and trans-fatty acids), and laden with cosmetic food additives and/or other industrial ingredients, many with unknown health effects [7]. Another key concern is the rise in excessive consumption of animal-based products [8], particularly red and processed meats, which are associated with an increased risk of a suite of chronic diseases and mortality [9]. Finally, dietary patterns have become increasingly characterized by insufficient intake of key foods and nutrients that are key to maintaining good health, such as fruits, vegetables, legumes, whole grains, nuts and seeds [2]. Together, these trends in dietary patterns constitute a major risk factor for chronic disease morbidity – including overweight/obesity [10], cancer [11], respiratory diseases [12], neurodegenerative diseases [13], and cardiometabolic diseases [14] - as well as premature mortality [15]. The high and rising prominence of unhealthy dietary patterns and their sequalae of disease is also a fundamental issue of societal equity, as food insecurity, disproportionately patterned along socio-economic and racial/ethnic lines, is associated with a higher risk for an unhealthy diet and associated adverse health consequences [16],[17].

From an environmental perspective, the current state of agricultural production systems that supply these unhealthy dietary patterns exerts immense strain on Earth's natural systems. Current estimates indicate that food production accounts for just over a quarter (26%) of global greenhouse gas emissions, half of the use of habitable land, and the most (78%) of global ocean and freshwater eutrophication [18]. The rise of meat production to meet global demand is particularly concerning, as it is a major source of greenhouse gas (GHG) emissions, land use change, and biodiversity loss, amongst other environmental impacts [19].

Taken together, unhealthy dietary patterns carry immense economic ramifications globally, estimated to account for 12.7 trillion USD annually in hidden health, social and environmental costs [20]. Such trends have led numerous bodies, including prominent multilateral organizations [21],[22],[23] and independent experts [24],[25],[26] to a state of agreement that dramatic shifts towards healthier and more sustainable dietary patterns are urgently needed. For the purposes of this dissertation, we align our definition of these needed shifts with those established by the EAT Lancet Commission's definition of a universal healthy reference diet (HRD) to promote human health while improving food system sustainability, which is characterized by the following: (1) protein intake primarily from plants, including soy foods, other legumes, and nuts, fish or alternative sources of omega-3 fatty acids several times per week with optional modest consumption of poultry and eggs, and low intakes of red meat, if any, especially processed meat; (2) fat intake mostly from unsaturated plant sources, with low intakes of saturated fats, and no partly hydrogenated oils; (3) carbohydrate intake primarily from whole grains with low intake of refined grains and less than 5% of energy from sugar; (4) consumption of at least five servings of fruits and vegetables per day, not including potatoes; and (5) moderate dairy consumption [25]. Based on the current gaps between this diet and current dietary patterns considered on a global scale, this would require: (1) an increase in the consumption of vegetables, fruits, whole grains, legumes, and nuts; (2) relatively stable consumption of fish, poultry and dairy; and (3) a decrease in consumption of red meats, starchy vegetables (e.g.,

potatoes), eggs, added sugars and refined grains [25]. Global adoption of the HRD could avoid an estimated 11.1 million deaths per year, reducing premature mortality by 19% [27].

To achieve these desired shifts in dietary behaviors, governments have at their disposal a suite of public policy measures [28], which can be classified along two relevant dimensions. First, public policy measures can target different entry points in the food system, from production, to distribution, preparation, consumption and waste [29]. Of these, shifting the quality of the collective physical, economic, policy and sociocultural conditions in which people make daily food choices – otherwise known as the food environment [30] – is a particularly important lever for shifting dietary behaviors [31], and is therefore foundational to this dissertation. Second, public policy measures to shift behaviors towards healthier and more sustainable diets can be delineated based on their intended effect on people's choices [29].

It is useful here to introduce two relevant frameworks in accordance with these classification dimensions of public policy measures, as both are foundational to this work. The former, the Healthy Food Environment Policy Index (Food-EPI) (see *Figure 1*), defines key policy measures to improve the healthfulness of food environments, as well as key capacities – or 'infrastructure supports' - needed to realize their adoption [32]. The index, developed and applied by an international, multi-disciplinary network of researchers to define and assess gaps in policy adoption and guide priority policy recommendations, delineates 40 'best practice' policies that should be adopted across seven key policy domains for improving food environments: food composition, labelling, promotion, provision, retail, prices and trade. To date, this assessment has been adapted and applied around the world to identify a suite of priority policy actions to improve the healthiness of food environments at local [33], national [34],[35] and supra-national [36] levels.

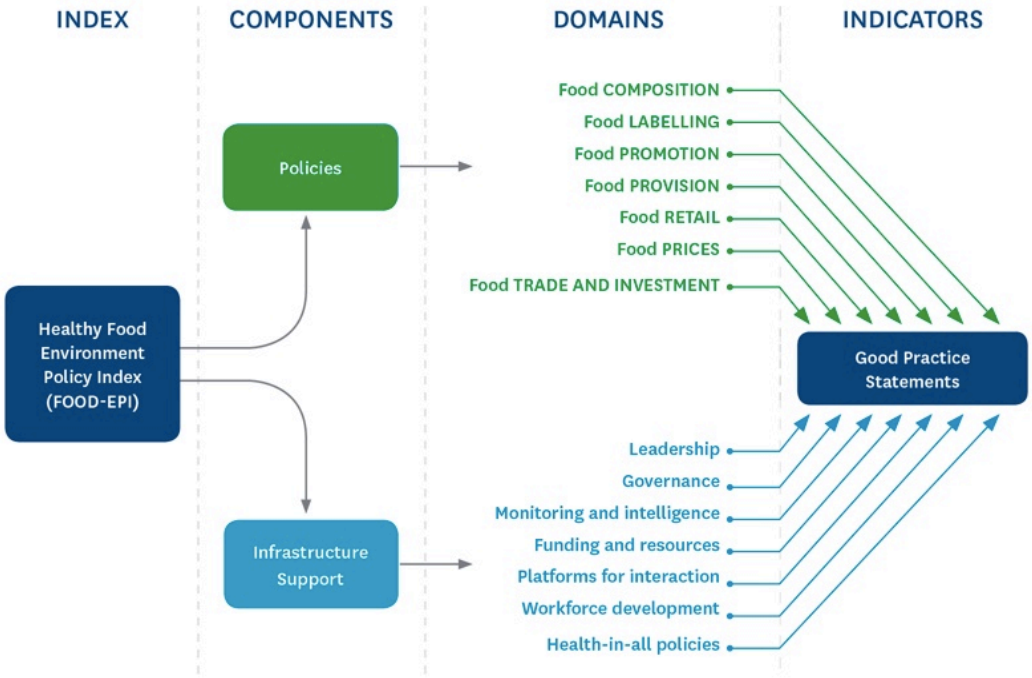


Figure 1. The Healthy Food Environment Policy Index (Food-EPI)

The latter framework, known as the Nuffield ladder, delineates interventions that seek to shift health behaviors, such as that of food choices, based on their intended effect on choice (see *Figure 2*) [37]. Namely, interventions are placed on a scale from those that 'do nothing' or aim solely to provide information (e.g., campaigns; education programs), through those that aim to enable or guide choice (e.g., nudges, taxes, subsidies and/or price reductions), up to those that aim to restrict or even eliminate choice (e.g., sales bans, mandatory standards). According to the foundational liberal values underpinning the ladder, the higher the rung of the ladder, the greater the level of intervention – or 'intrusiveness' – on individual choice, and the greater the justification needed to adopt it [37].

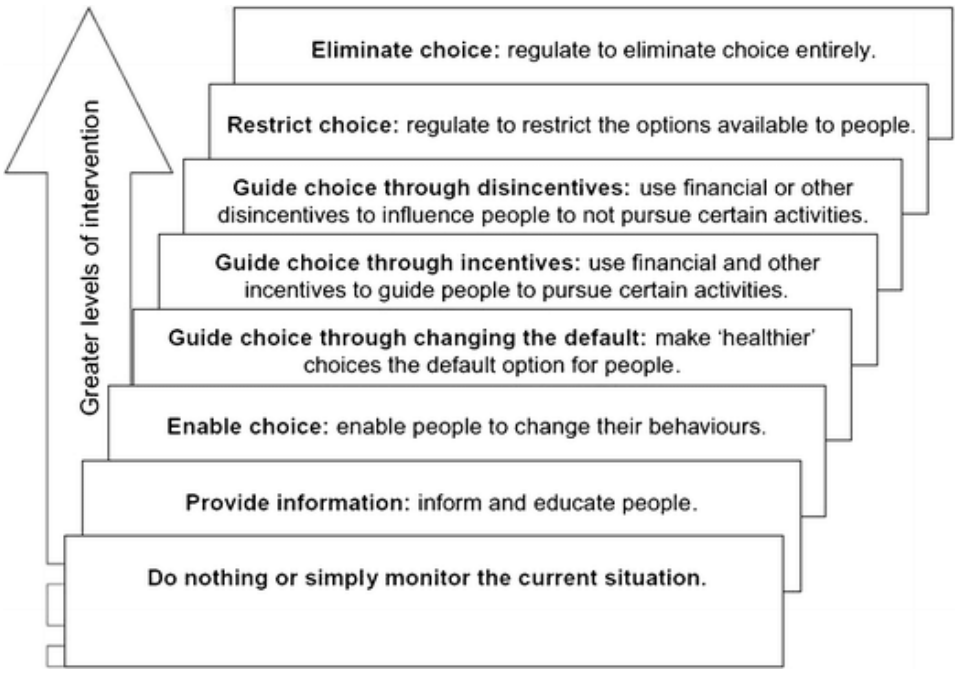


Figure 2. Nuffield Ladder of Interventions

Together, these two frameworks help characterize a suite of policy measures that can be adopted by governments to improve the quality of food environments and promote shifts in dietary behaviors. They also provide a helpful foundation to understand the nature and extent of current gaps in policy adoption that hinder meaningful shifts towards healthier and more sustainable diets. For instance, results from the Food-EPI compared across multiple countries indicate several common measures that are high priority for adoption, including setting standards for nutrients of concern in processed foods, unhealthy food and beverage taxation, fruit and vegetable subsidies, improvement of school food environments, front-of-pack (FOP) labelling, and restrictions on unhealthy food marketing to children [34],[35]. These policies are generally those that sit higher on the Nuffield ladder – I.e., are more intrusive on individual choice. According to the World Health Organization (WHO) country capacity survey on the prevention and control of non-communicable diseases (NCDs), most countries to date have favored the adoption of interventions such as education (75% of countries) and media campaigns (61%) to foster individual dietary behavior change over regulatory actions, such as sugary drink taxes (25%), FOP labelling schemes (25%), and restrictions on child-directed marketing (31%) [38]. While education and information form

an important area of intervention, alone they are not enough to realize meaningful improvements in dietary behaviors [39],[40], and can in fact run the risk of exacerbating health inequities [41],[42]. Thus, there is, in general, an observed inverse relationship between the intrusiveness of a given measure and the anticipated effectiveness, as well as impact on equity [40]. Scholars have posited that this inverse relationship hinges on *agency* – I.e., the personal resources one must use to benefit from the intervention. Namely, interventions that emphasize information and education alone require individuals to exercise additional resources to benefit from the intervention, thereby predisposing those with greater resources in society, be them educational, fiscal, social, or time-bound in nature, to benefit [40]. With such reliance of many countries on interventions with relatively low effectiveness, it is perhaps unsurprising, though altogether sobering, to note that no country to date has successfully stemmed the tide of diet-related disease [43]. Furthermore, even in countries that have made progress on adopting certain priority policy measures for improving food environments, it has been limited in scope. Indeed, cross-country comparisons of the Food-EPI assessment tool indicate that none of the assessed countries had an overall high score [34],[35], indicating that several countries have adopted a select number of single measures rather than a suite – or 'package' - of cohesive measures aimed at addressing multifaceted drivers of unhealthy food environments [34]. This is the case despite rising international guidance on the need for a coherent 'package' or 'mix' of measures to achieve transformative change in diets for both health and sustainability [23],[44],[45].

Thus, despite the existence of nearly two decades of recommendations from authoritative national and international organizations on effective and cost-saving policy options [46], [47],[48],[49], as well as successive commitments made by country governments through platforms such as the World Health Assembly [50],[51],[52], policy responses to shift dietary behaviors to date have been largely inadequate. Political inertia has been highlighted as a key explanation for such slow and inconsistent progress [53],[54],[55]. This inertia, as defined by the Lancet Commission on the Global Syndemic of Obesity, Undernutrition, and Climate Change, encompasses three key pillars: 1) inadequate political leadership and

governance, 2) strong opposition to policy adoption by powerful commercial interests, and 3) a lack of demand for policy action by the public [53]. This dissertation aims to provide insights as to how these dimensions of political inertia might be mitigated, and thereby the political feasibility of policies enhanced, to realize critically needed advancements in the promotion of healthy and sustainable diets. The rest of this chapter delineates the dissertation's structure and provides an overview of each paper. For a visual summary of the dissertation, see *Table 1*.

Table 1. Dissertation overview

Chapter 1. Introduction	
Chapter 2. **Designing politically feasible policy 'packages' to comprehensively improve food environments.**	**2.1** Examining public support for comprehensive policy packages to tackle unhealthy food environments: insights from a conjoint experiment **2.2** How can advocates leverage power to advance comprehensive regulation on ultra-processed foods? Learning from advocate experience in Argentina
Chapter 3. **Designing politically feasible nudge strategies to promote healthy and sustainable diets.**	**3.1** Public acceptance of default nudges to promote healthy and sustainable food choices **3.2** A choice architect's guide to the (autonomous) galaxy: a scoping review of nudge intrusiveness in food choices
Chapter 4. Discussion and outlook	
Appendices	

Chapter 2. Designing politically feasible policy 'packages' to comprehensively improve food environments.

This chapter focuses first and foremost on the concept of policy 'packages', referring to "a combination of policy measures designed to address one or more policy objectives, created in order to improve the effectiveness of the individual policy measures, and implemented while minimizing possible unintended effects, and/or facilitating interventions' legitimacy and feasibility" [56]. The focus on policy packages is situated in the reality that meaningful improvements to dietary patterns can only be achieved by tackling the multiple policy domains that culminate in unhealthy food environments, such as those defined by the Food-EPI: food composition, labelling, promotion, provision, retail, prices and trade [53]. It is also situated in the small, yet promising precedent set by a handful of countries that have adopted food environment policy packages to date. These countries, particularly in Latin America, have jointly introduced front-of-package (FOP) nutrition labels on ultra-processed foods (UPFs) with accompanying measures, including restrictions on child-directed marketing, bans on sales of labelled products in specific settings (e.g., schools, social support programs), and supports to improvements in nutrition education and procurement policies [57],[58],[59]. Emerging evaluations of these policies have demonstrated their effectiveness at reducing child-directed marketing [60],[61] and sales [62],[63],[64] of UPFs, as well as declines in dietary intake of sugars, saturated fats and sodium amongst children [65], without negative impacts to labor outcomes [66]. This chapter is divided into two papers.

The former focuses on the issue of public support, with the understanding that it is a key element of political feasibility in liberal democracies in which policymakers must navigate acting in the public interest while maintaining public favor for re-election. Specifically, drawing on insights from a conjoint experiment conducted amongst eligible voters in Germany, this study examines public support for policy packages to tackle unhealthy food

environments. Individual measures that were chosen to comprise the evaluated policy packages were drawn from those to be prioritized for the German context based on the Food-EPI assessment [67]. Selected measures were also chosen to reflect a range of intended effects on individual choice, as defined by the Nuffield ladder, with the rationale being that public support for individual nutrition policy measures tends to be highest for those interventions that are the least intrusive on choice, which tend to also be the least effective [68]. This paper also examines key individual drivers of support (or lack thereof) for policy packages amongst voters, including various socio-demographic and attitudinal variables that have been shown to influence support for individual nutrition policy measures. As such, this paper examines how policy packages to tackle unhealthy food environments might be optimally designed and communicated to foster public support.

The latter paper pivots from a hypothetical policy package to a real-world one, and from the issue of public support to those of food governance and powerful commercial interests as key bottlenecks to political feasibility. Specifically, this paper examines the policy process of the Promotion of Healthy Eating law adopted in Argentina in 2021 [69], a food environment policy package which jointly introduced (1) mandatory FOP warning labels on UPFs, (2) restrictions on child-directed marketing of UPFs, and (3) improvements to school food environments, including banning the sale or offering of UPFs and investing in improvements to nutrition education. Drawing on a thematic analysis of power dynamics gleaned through semi-structured interviews with advocates, this paper examines the key strategies they used to harness power, and therefore elevate political feasibility of the law's adoption, throughout the policy process, particularly in the face of powerful commercial interests that sought to undermine it.

Chapter 3. Designing politically feasible nudge strategies to promote healthy and sustainable diets.

Chapter 3 turns to consider political feasibility in the context of another rapidly growing policy sphere for promoting healthy and sustainable diets – nudging. Referring to interventions that alter the context in which individuals make choices – or 'choice

architecture – without forbidding them any options or significantly changing their economic incentives [70], nudges have become increasingly adopted by governments around the world [71] for their potent promise to be both effective and uphold individual autonomy. Once again, this chapter is divided into two papers.

The former turns again to the issue of public support. Namely, drawing on insights gleaned from an online experiment conducted amongst eligible voters in Germany, this study examines opportunities to tinker with the design of nudges aiming to shift behaviors towards healthier and/or more sustainable dietary choices to increase public support. This study focuses specifically on *default* nudges, with a default referring to a pre-set course of action that takes effect if nothing is specified by the decision-maker. Nudges that alter the default option to promote shifts in behavior are particularly promising amongst nudging strategies with regard to anticipated effectiveness [72] but tend to garner the least public support [73],[74]. As in the first paper of Chapter 2, this study also examines key drivers of support (or lack thereof) amongst voters, including socio-demographic and attitudinal variables.

The second paper hones in on the issue of autonomy, which is fundamental to the legitimacy of nudge strategies and has been of key concern to ethical evaluations of nudging to date [75]. The rationale for its undertaking is situated in the observed lack of a systematic framework to evaluate the intrusiveness of nudges on autonomy from the perspective of the design of nudges themselves. Indeed, most empirical nudging studies examine nudge intrusiveness by self-reported *perceived* intrusiveness, which is a) subject to wide variation that impedes the possibility of making overall judgements on intrusiveness; and b) particularly in the case of hypothetical nudges, subject to sensitivities in the wording used to describe nudge interventions. Thus, drawing on a scoping review of food choice nudge studies, this paper introduces a typology of three mechanisms of nudge design that, when not considered, could unduly intrude upon autonomy: (1) the effort needed to opt-out of the nudge, delineated along economic and physical sub-dimensions; (2) the affective influence employed by the nudge, such as social reference messaging and emotional appeals; and (3) the degree of non-transparency exhibited, including of the nudge itself and of non-nudged alternative options. This typology can support choice architects to discern how nudges

might better protect consumer autonomy, and ultimately better uphold it in pursuit of behavior change.

Chapter 4. Discussion and outlook.

This dissertation closes with a synthesis of insights gleaned across all four papers as they relate to enhancing the political feasibility of healthy and sustainable diets.

References

1. EAT-Lancet Commission (2019) 'Summary Report of the EAT-Lancet Commission: Healthy Diets from Sustainable Food Systems,' Available at: https://eatforum.org/eat-lancet-commission/eat-lancet-commission-summary-report/
2. GBD 2017 Diet Collaborators (2019) 'Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017,' *The Lancet* 393(10184):1958-1972. Available at https://doi.org/10.1016/S0140-6736(19)30041-8
3. Popkin, B. (2004) 'The Nutrition Transition: an Overview of World Patterns of Change,' Nutrition Reviews 62:S140-143. Available at https://doi.org/10.1111/j.1753-4887.2004.tb00084.x
4. Popkin B. and C. Hawkes (2016) 'Sweetening of the global diet, particularly beverages: patterns, trends, and policy responses,' *The Lancet Diabetes & Endocrinology* 4(2):P174-186. Available at https://doi.org/10.1016/S2213-8587(15)00419-2
5. Scrinis G. and C. Monteiro (2022) 'From ultra-processed foods to ultra-processed dietary patterns,' Nature Food 3:671-673. Available at https://doi.org/10.1038/s43016-022-00599-4

6. Moodie R., Bennett E., Leung Kwong E.J., Santos T.M., Pratiwi L., Williams J. and P. Baker (2021) 'Ultra-Processed Profits: The Political Economy of Countering the Global Spread of Ultra-Processed Foods – A Synthesis Review on the Market and Political Practices of Transnational Food Corporations and Strategic Public Health Responses,' *International Journal of Health Policy and Management* 10(12):968-982. Available at https://www.ijhpm.com/article_4050.html
7. Srour B., and M. Touvier (2021) 'Ultra-processed foods and human health: What do we already know and what will further research tell us?' *eClinicalMedicine* 32(100747). Available at https://doi.org/10.1016/j.eclinm.2021.100747
8. Gonzalez N., Marques M., Nadal M., and J.L. Domingo (2020) 'Meat consumption: Which are the current global risks? A review of recent (2010–2020) evidence,' *Food Research International* 137:109341. Available at https://doi.org/10.1016/j.foodres.2020.109341
9. Richi E.B., Baumer B., Conrad B., Darioli R., Schmid A. and U. Keller (2015) 'Health Risks Associated with Meat Consumption: A Review of Epidemiological Studies,' *International Journal for Vitamin and Nutrition Research* 85(1). Available at https://doi.org/10.1024/0300-9831/a000224
10. Hruby A., Manson J.E., Qi L., Malik V.S., Rimm E.B., Sun Q., Willett W.C. and F.B. Hu (2016) 'Determinants and Consequences of Obesity,' *American Journal of Public Health* 106:1656-1662. Available at https://doi.org/10.2105/AJPH.2016.303326
11. Zhang F.F., Cudhea F., Shan Z., Michaud D.S., Imamura F., Eom H., Ruan M., Rehm C.D., Liu J., Du M., Kim D., Lizewski L., Wilde P. and D. Mozaffarian (2019) 'Preventable Cancer Burden Associated With Poor Diet in the United States,' *JNCI Cancer Spectrum* 3(2). Available at https://doi.org/10.1093/jncics/pkz034
12. Wypych T.P., Marsland B.J., and N.D.J. Ubags (2017) 'The Impact of Diet on Immunity and Respiratory Diseases,' *Annals of the American Thoracic Society* 14(5). Available at https://doi.org/10.1513/AnnalsATS.201703-255AW
13. Bianchi V.E., Herrera P.F., and R. Laura (2019) 'Effect of nutrition on neurodegenerative diseases: a systematic review,' *Nutritional Neuroscience* 24(10). Available at https://doi.org/10.1080/1028415X.2019.1681088

14. Liese A., Krebs-Smith S.M., Subar A., George S.M., Harmon B.E., Neuhouser M.L., Boushey C.J., Schap-Tusa R.E., and J. Reedy (2015) 'The Dietary Patterns Methods Project: Synthesis of Findings across Cohorts and Relevance to Dietary Guidance1, 2, 3, 4,' *The Journal of Nutrition* 145(3):393-402. Available at https://doi.org/10.3945/jn.114.205336
15. Wang D.D., Li Y., Afshin A., Springmann M., Mozaffarian D., Stampfer M.J., Hu F.B., Murray C.J. and W.C. Willett (2019) 'Global Improvement in Dietary Quality Could Lead to Substantial Reduction in Premature Death,' *The Journal of Nutrition* 149(6):1065-1074.
16. Brandt E.J., Mozaffarian D., Leung C.W., Berkowitz S.A., and V.L. Murthy (2023) 'Diet and Food and Nutrition Insecurity and Cardiometabolic Disease,' *Circulation Research* 132:1692-1706. Available at https://www.ahajournals.org/doi/abs/10.1161/CIRCRESAHA.123.322065
17. Smith J.C., Gordon-Larsen P., Siddiqi A., and B.M. Popkin (2012) 'Is the burden of overweight shifting to the poor across the globe? Time trends among women in 39 low- and middle-income countries (1991-2008),' *International Journal of Obesity* 36:1114-1120. Available at https://doi.org/10.1038/ijo.2011.179
18. Poore J. and A.T. Nemecek (2018) 'Reducing food's environmental impacts through producers and consumers,' *Science* 360(6392):987-992. Available at https://www.science.org/doi/10.1126/science.aaq0216
19. Djekic I. (2015) 'Environmental Impact of Meat Industry – Current Status and Future Perspectives,' *Procedia Food Science* 5:61-64. Available at https://doi.org/10.1016/j.profoo.2015.09.025
20. Food and Agriculture Organization (FAO) (n.d.) 'Beyond the price tag: examining the hidden costs of agrifood systems to enhance their true value.' Available at https://www.fao.org/interactive/state-of-food-agriculture/en/#:~:text=In%202020%2C%20the%20health%20hidden,and%20negatively%20impacting%20the%20economy.

21. Food and Agriculture Organization (FAO) and World Health Organization (WHO) (2019) 'Sustainable healthy diets – Guiding principles. Rome. Available at https://openknowledge.fao.org/server/api/core/bitstreams/03bf9cde-6189-4d84-8371-eb939311283f/content
22. World Bank Group (2016) 'Future of Food: Shaping the Global Food System to Deliver Improved Nutrition and Health.' Available at: https://documents1.worldbank.org/curated/en/474831468186561685/pdf/104757-WP-Future-of-Food-Nut-Health-Web-PUBLIC.pdf
23. European Commission (2020) 'Farm to Fork Strategy for a fair, healthy, and environmentally-friendly food system.' Available at: https://food.ec.europa.eu/system/files/2020-05/f2f_action-plan_2020_strategy-info_en.pdf
24. Mannar V., Micha R., Allemandi L., Afshin A., Baker P., Battersby J., Bhutta Z., Corvalan C., Di Cesare M., Chen K., Dolan C., Hayashi C., Fonsaca J., Grummer-Strawn L., Rao A., Rosenzweig C., and D. Schofield (2020) '2020 Global Nutrition Report: Action on Equity to End Malnutrition,' Bristol, UK: Development Initiatives. Available at https://globalnutritionreport.org/reports/2020-global-nutrition-report/
25. Willett W., Rockstrom J., Loken B., Springmann M., Lang T., Vermeulen S., Garnett T., Tilman D., DeClerck F., Wood A., Jonell M., Clark M., Gordon L.J., Fanzo J., Hawkes C., Zurayk R., Rivera J.A., De Vries W., Sibanda L.M., Afshin A., Chaudhary A., Herrero M., Agustina A., Branca F., Lartey A., Fan S., Crona B., Fox E., Bignet V., Troell M., Lindahl T., Singh S., Cornell S.E., Reddy K.S., Narain S., Nishtar S., and C.J.L. Murray (2019) 'Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems,' *The Lancet* 393(10170):447-492. Available at https://doi.org/10.1016/S0140-6736(18)31788-4
26. HLPE (2017) 'Nutrition and food systems. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security,' Rome. Available at https://openknowledge.fao.org/handle/20.500.14283/i7846e

27. Springmann M., Wiebe K., Mason-D''Croz D., Sulser T.B., Rayner M., and P. Scarborough (2018) 'Health and nutritional aspects of sustainable diet strategies and their association with environmental impacts: a global modelling analysis with country-level detail,' *The Lancet Planetary Health* 2(10):E451-461. Available at https://doi.org/10.1016/S2542-5196(18)30206-7
28. Mozaffarian D., Angell S.Y., Lang T., and J.A. Rivera (2018) 'Role of government policy in nutrition – barriers to and opportunities for healthier eating,' *BMJ* 361. Available at https://doi.org/10.1136/bmj.k2426
29. Downs S.M., Ahmed S., Fanzo J., and A. Herforth (2020) 'Food Environment Typology: Advancing an Expanded Definition, Framework, and Methodological Approach for Improved Characterization of Wild, Cultivated, and Built Food Environments toward Sustainable Diets,' *Foods* 9(4):532. Available at doi: 10.3390/foods9040532
30. Turner C., Aggarwal A., Walls H., Herforth A., Drewnowki A., Coates J., Kalamatianou S., and S. Kadiyala (2018) 'Concepts and critical perspectives for food environment research: A global framework with implications for action in low- and middle-income countries,' *Global Food Security* 18:93-101. Available at https://doi.org/10.1016/j.gfs.2018.08.003
31. Vadiveloo M.K., Sotos-Prieto M., Parker H.W., Yao Q. and A.N. Thorndike (2021) 'Contributions of Food Environments to Dietary Quality and Cardiovascular Disease Risk,' *Current Atherosclerosis Reports* 23(14). Available at https://doi.org/10.1007/s11883-021-00912-9
32. Swinburn B., Vandevijvere S., Kraak V., Sacks G., Snowdon W., Hawkes C., Barquera S., Friel S., Kelly B., Kumanyika S.,L'Abbe M., Lee A., Lobstein T., Ma J., Macmullan J., Mohan S., Monteiro C., Neal B., Rayner M., Sanders D., Walker C., and INFORMAS (2013) 'Monitoring and benchmarking government policies and actions to improve the healthiness of food environments: a proposed Government Healthy Food Environment Policy Index,' *Obesity Reviews* 14(1):24-37. Available at https://doi.org/10.1111/obr.12073

33. Karbasy K., Vanderlee L., and M. L'Abbe (2019) 'Supporting healthier food environments in the City of Toronto: Current policies and priority actions,' Available at www.labbelab.utoronto.ca/Local-Food-EPI-2019
34. Vandevijvere S., Barquera S., Caceres G., Corvalan C., Karupaiah T., Kroker-Lobos M.F., L'Abbe M., Ng S.H., Phulkerd S., Ramirez-Zea M., Rebello S.A., Reyes M., Sacks G., Sanchez-Nochez C.M., Sanchez K., Sanders D., Spires M., Swart R., Tangcharoensathien V., Tay Z., Taylor A., Tolentino-Mayo L., Van Dam R., Vanderlee L., Watson F., Whitton C., and B. Swinburn (2019) 'An 11-country study to benchmark the implementation of recommended nutrition policies by national governments using the Healthy Food Environment Policy Index, 2015-2018,' *Obesity Reviews* 20(2):57-66. Available at https://doi.org/10.1111/obr.12819
35. Pineda E., Poelman M.P., Aaspollu A., Bica M., Bouzas C., Carrano E., Miguel-Etayo P., Djojosoeparto S., Gabrijelcic Blenkus M., Graca P. Geffert K., Hebestreit A., Helldan A., Henjum S., Huseby C.S., Gregorio M.J., Kamphuis C., Laatikainen T., Lovhaug A.L., Leydon C., Luszczynska A., Maki P., Martinez J.A., Raulio S., Romaniuk P., Roos G., Salvador C., Sassi F., Silano M., Sotlar I., Specchia M.L., de Arriaga M.T., Terragni L., Torheim, L.E., Tur J.A., von Philipsborn P., Harrington J.M. and S. Vandevijvere (2022) 'Policy implementation and priorities to create healthy food environments using the Healthy Food Environment Policy Index (Food-EPI): A pooled level analysis across eleven European countries,' *The Lancet Regional Health Europe* 23:100522. Available at https://doi.org/10.1016/j.lanepe.2022.100522
36. Djojosoeparto S.K., Kamphuis C.B.M., Vandevijvere S., Harrington J.M. and M.P. Poelman on behalf of the JPI-HDHL Policy Evaluation Network (2021) The Healthy Food Environment Policy Index (Food-EPI): European Union. An assessment of EU-level policies influencing food environments and priority actions to create healthy food environments in the EU. Utrecht, Utrecht University, The Netherlands. Available at https://www.jpi-pen.eu/images/reports/Food-EPI_EU_FINAL_20210305.pdf

37. Nuffield Council on Bioethics (2007) 'Public health: ethical issues' Available at https://www.nuffieldbioethics.org/publications/public-health/guide-to-the-report/policy-process-and-practice
38. World Health Organization (WHO) (2019) 'Assessing national capacity for the prevention and control of noncommunicable diseases: report of the 2019 global survey' Geneva: World Health Organization; 2020. Licence: CC BY-NC-SA 3.0 IGO. Available at https://www.who.int/publications/i/item/9789240002319
39. Brambila-Macias J. Shankar B., Capacci S., Mazzocchi M., Perez-Cueto F.J., Verbeke W., and W.B. Traill (2011) 'Policy Interventions to Promote Healthy Eating: A Review of What Works, What Does Not, and What is Promising,' *Food and Nutrition Bulletin* 32(4): Available at https://doi.org/10.1177/156482651103200408
40. Adams J., Mytton O., White M., and P. Monsivais (2016) 'Why Are Some Population Interventions for Diet and Obesity More Equitable and Effective Than Others? The Role of Individual Agency,' *PLoS Medicine* 13(5):e1002045. Available at https://doi.org/10.1371/journal.pmed.1002045
41. Lorenc T., Petticrew M., Welch V., and P. Tugwell (2012) 'What types of interventions generate inequalities? Evidence from systematic reviews,' *Journal of Epidemiology & Community Health* 67(2):190-193. Available at doi: 10.1136/jech-2012-201257
42. Beauchamp A., Backholer K., Magliano D., and A. Peeters (2014) 'The effect of obesity prevention interventions according to socioeconomic position: a systematic review,' *Obesity Reviews* 15(7):541-554. Available at https://doi.org/10.1111/obr.12161
43. Roberto C.A., Swinburn B., Hawkes C., Huang T., Costa S.A., Ashe M., Zwicker L., Cawley J.H., and K.D. Brownell (2015) 'Patchy progress on obesity prevention: emerging examples, entrenched barriers, and new thinking,' T*he Lancet* 385(9985):2400-2409. Available at https://doi.org/10.1016/S0140-6736(14)61744-X
44. Hawkes C., Jewell J., and K. Allen (2013) 'A food policy package for healthy diets and the prevention of obesity and diet-related non-communicable diseases: the NOURISHING framework,' *Obesity Reviews* 14(2):159-168. Available at https://doi.org/10.1111/obr.12098

45. Pan-American Health Organization (PAHO) (2014) ‘Plan of Action for the Prevention of Obesity in Children and Adolescents.’ Available at https://iris.paho.org/handle/10665.2/49138
46. World Health Organization (WHO) (2002) Global Strategy on Diet, Physical Activity and Health. Geneva: World Health Organization. Available at https://iris.who.int/bitstream/handle/10665/43035/9241592222_eng.pdf?sequence=1
47. World Health Organization (WHO) (2013) Global action plan for the prevention and control of noncommunicable diseases 2013-2020. Geneva: World Health Organization. Available at https://iris.who.int/bitstream/handle/10665/94384/?sequence=1
48. World Health Organization (WHO) (2017) Tackling NCDs: 'best buys' and other recommended interventions for the prevention and control of noncommunicable diseases. Geneva: World Health Organization. Available at https://www.who.int/publications/i/item/WHO-NMH-NVI-17.9
49. Gaziano T.A., Suhrcke M., Brouwer E., Levin C., Nikolic I. and R. Nugent (2017) Disease Control Priorities 3 (DCP3), Chapter 19: Costs and Cost-Effectiveness of Internvetions and Policies to Prevent and Treat Cardiovascular and Respiratory Diseases. World Bank. Washington, D.C. Available at https://www.dcp-3.org/sites/default/files/chapters/DCP3%20CVRD_Ch%2019.pdf
50. World Health Organization (2004) WHA57.17 Global strategy on diet, physical activity and health. Geneva: World Health Organization. Available at https://apps.who.int/gb/ebwha/pdf_files/WHA57/A57_R17-en.pdf
51. World Health Organization (2013) WHA66.10 Follow-up to the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases. Geneva: World Health Organization. Available at https://cdn.who.int/media/docs/default-source/ncds/governance/2013-resolution-which-adopted-gap.pdf?sfvrsn=a6a2dc48_7&ua=1

52. World Health Organization (2023) Political declaration of the third high-level meeting of the General Assembly on the prevention and control of non-communicable diseases and mental health. Geneva: World Health Organization. Available at https://apps.who.int/gb/ebwha/pdf_files/WHA76/A76(9)-en.pdf
53. Swinburn B.A., Kraak V.I., Allender S., Atkins V.J., Baker P.I., Bogard J.R., Brinsden H., Calvillo A., De Schutter O., Devarajan R., Ezzati M., Friel S., Goenka S., Hammond R.A., Hastings G., Hawkes C., Herrero M., Hovmand P.S., Howden M., Jaacks L.M., Kapetanaki A.B., Kasman M., Kuhnlein H.V., Kumanyika S.K., Larijani B., Lobstein T., Long M.W., Matsudo V.K.R., Mills S.D.H., Morgan G., Morshed A., Nece P.M., Pan A., Patterson D.W., Sacks G., Shekar M., Simmons G.L., Smit W., Tootee A., Vandevijvere S., Waterlander W.E., Wolfenden L., and W.H. Dientz (2019) 'The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report,' *The Lancet* 393:791-846. Available at http://dx.doi.org/10.1016/S0140-6736(18)32822-8
54. Pereira T.N., Bortolini G.A., and R. de Freitas Campos (2023) 'Barriers and Facilitators Related to the Adoption of Policies to Reduce Ultra-Processed Foods Consumption: A Scoping Review,' *International Journal of Environmental Research and Public Health* 20(6):4729. Available at doi: 10.3390/ijerph20064729
55. Baker P., Hawkes C., Wingrove K., Demaio A.R., Parkhurst J., Thow A.M., and H. Walls (2017) 'What drives political commitment for nutrition? A review and framework synthesis to inform the United Nations Decade of Action on Nutrition,' *BMJ Global Health* 0:e000485. Available at doi:10.1136/bmjgh-2017-000485
56. Givoni M., Macmillen J., Banister D., and E. Feitelseon (2012) 'From Policy Measures to Policy Packages,' *Transport Reviews* 33(1):1;20. Available at https://doi.org/10.1080/01441647.2012.744779
57. Crosbie E., Gomes F.S., Olvera J., Rincón-Gallardo Patiño S., Hoeper S., and A. Carriedo (2023) A policy study on front-of-pack nutrition labeling in the Americas: emerging developments and outcomes,' *The Lancet Regional Health Americas* 18:100400. Available at https://doi.org/10.1016/j.lana.2022.100400

58. Paraje G., Colchero A., Wlasiuk J.M., Sota A.M., and B.M. Popkin (2021) 'The effects of the Chilean food policy package on aggregate employment and real wages,' *Food Policy* 100:102016. Available at https://doi.org/10.1016/j.foodpol.2020.102016
59. Global Health Advocacy Incubator (GHAI) (2022) 'Argentina President Signs One of World's Strongest Health Food Policy Laws,' Available at https://www.advocacyincubator.org/news/2022-11-29-argentina-president-signs-one-of-worlds-strongest-health-food-policy-laws
60. Stoltze F.M., Reyes M., Lindsey Smith T., Correa T., Corvalan C., and F.R.D. Carpentier (2019) 'Prevalence of Child-Directed Marketing on Breakfast Cereal Packages before and after Chile's Food Marketing Law: A Pre- and Post-Quantitative Content Analysis,' International Journal of Environmental Research and Public Health 16(22):4501. Available at https://doi.org/10.3390/ijerph16224501
61. Carpentier F.R.D., Correa T., Reyes M., and L.S. Taillie (2019) 'Evaluating the impact of Chile's marketing regulation of unhealthy foods and beverages: pre-school and adolescents children's changes in exposure to food advertising on television,' Public Health Nutrition 23(4):747-755. Available at https://doi.org/10.1017/S1368980019003355
62. Taillie L.S., Bercholz M., Popkin B., Reyes M., Colchero M.A., and C. Corvalan (2021) 'Changes in food purchases after the Chilean policies on food labelling, marketing and sales in schools: a before and after study,' *The Lancet Planetary Health* 5(8):e526-533. Available at https://doi.org/10.1016/S2542-5196(21)00172-8
63. Taillie L.S., Reyes M., Colchero M.A., Popkin B. and C. Corvalán (2020) '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* 17(2):e1003015. https://doi.org/10.1371/journal.pmed.1003015
64. Gobierno de Chile (2019) 'Hoja Informativa: Evaluación Ley de Alimentos Nº20,' Available at https://www.minsal.cl/wp-content/uploads/2019/08/EVALUACION-LEY-DE-ALIMENTOS_julio-2019_02.pdf

65. Fretes G., Corvalán C., Reyes M., Taillie L.S., Economos C.D., Wilson N.L.W., and S.B.Cash (2023) 'Changes in children's and adolescents' dietary intake after the implementation of Chile's law of food labelling, advertising, and sales in schools: a longitudinal study,' *International Journal of Behavioral Nutrition and Physical Activity* 20(1):40. Available at doi: 10.1186/s12966-023-01445-x.
66. Paraje G., Colchero A., Wlasiuk J.M., Sota A.M., and B.M. Popkin (2021) 'The effects of the Chilean food policy package on aggregate employment and real wages,' *Food Policy* 100:102016. Available at https://doi.org/10.1016/j.foodpol.2020.102016
67. von Philipsborn P., Geffert K., Klinger C., Hebestreit A., Stratil J, Rehfuess E.A., and PEN Consortium (2022) 'Nutrition policies in Germany: a systematic assessment with the Food Environment Policy Index,' *Public Health Nutrition* 25(6):1691:1700. Available at doi: 10.1017/S1368980021004742
68. Diepeveen S.,Ling T., Suhrcke M., Roland M., and T.M. Marteau (2013) 'Public acceptability of government intervention to change health-related behaviours: a systematic review and narrative synthesis,' *BMC Public Health* 13(756). Available at https://doi.org/10.1186/1471-2458-13-756
69. Gobierno Argentino (2021) Ley 27642 PROMOCIÓN DE LA ALIMENTACIÓN SALUDABLE. Available at https://www.boletinoficial.gob.ar/detalleAviso/primera/252728/20211112
70. Thaler R.H. and C.R. Sunstein (2008) Nudge: Improving Decisions About Health, Wealth, and Happiness. Yale University Press.
71. Halpern D., and M. Sanders (2016) 'Nudging by Government: Progress, Impact & Lessons Learned,' *Behavioral Science & Policy* 2(2):1-89. Available at https://doi.org/10.1177/237946151600200206
72. Johnson E.J., Shu S.B., Dellaert B.G.C., Fox C., Goldstein D.G., Haubl G., Larrick R.P., Wayne J.W., Peters E., Schkade D., Wansink B., and E.U. Weber (2012) 'Beyond nudges: Tools of a choice architecture,' *Marketing Letters* 23:487-504. Available at https://doi.org/10.1007/s11002-012-9186-1
73. Jung J.Y., and B.A. Mellers (2023) 'American attitudes toward nudges,' Judgement and Decision Making 11(1):62-74. Available at doi:10.1017/S1930297500007592

74. Van Gestel L.C., Adriaanse M.A., and D.T.D. de Ridder (2021) 'Who accepts nudges? Nudge acceptability from a self-regulation perspective,' *PLoS One* 16(12):e0260531. Available at doi: 10.1371/journal.pone.0260531.
75. Kuyer P. and B. Gordijn (2023) 'Nudge in perspective: A systematic literature review on the ethical issues with nudging,' *Rationality and Society* 35(2). Available at https://doi.org/10.1177/10434631231155005

CHAPTER 2. DESIGNING POLITICALLY FEASIBLE POLICY 'PACKAGES' TO COMPREHENSIVELY IMPROVE FOOD ENVIRONMENTS

2.1

Examining public support for comprehensive policy packages to tackle unhealthy food environments: insights from a conjoint experiment

Authors: Simone Wahnschafft[a], Achim Spiller[b], Yasemin Boztuğ[c] Peter von Philipsborn[d] and Dominic Lemken[e]

a. Research Training Group in Sustainable Food Systems, University of Göttingen, Heinrich-Düker-Weg 12, 37073 Göttingen, Germany
b. Department of Agricultural Economics and Rural Development, Marketing for Food and Agricultural Products, University of Göttingen, Platz der Göttinger Sieben 5, 37073 Göttingen, Germany
c. Department of Business Administration, University of Goettingen, 37073, Goettingen, Germany
d. Chair of Public Health and Health Services Research, Institute for Medical Information Processing, Biometry, and Epidemiology (IBE), LMU Munich, Munich 80539, Germany Pettenkofer School of Public Health, Munich, Germany
e. Institute for Food and Resource Economics, University of Bonn, Nußallee 21, 53115 Bonn, Germany

This article has been accepted in this final form for publication in ***Public Health Nutrition***. The full citation will be available upon publication.

Declarations

Author Contributions: Conceptualization, design, and implementation of the survey were led by S.W. with input from D.L., A.S., Y.B. and P.V.P. Analysis was done by S.W. and D.L. Interpretation of results, drafting, and editing of the manuscript was done by S.W. with input from D.L., A.S., and P.V.P.

Financial Support: The authors gratefully acknowledge the financial support of the German Research Foundation (DFG) through the Sustainable Food Systems Research Training Group (RTG 2654). The DFG had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. The study described in this manuscript received no specific funding.

Ethical Standards Disclosure: This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the Ethics Committee at Georg-August-Universität Göttingen. Written informed consent was obtained from all subjects/patients.

Conflict of Interest: None

Acknowledgements: None

Data Availability: The data and analysis code supporting the conclusions of this article are available via https://doi.org/10.7910/DVN/GJFKBX

Abstract

Objective: This study examines public support—and its drivers—for comprehensive policy packages (i.e., bundles of coherent policy measures introduced together) aimed at improving food environments.

Design: Participants completed an online survey with a choice-based conjoint experiment, where they evaluated pairs of policy packages comprising up to seven distinct food environment measures. After choosing a preferred package or opting for a single policy, participants designed their ideal policy package. Based on their choices, respondents were categorized as resistant, inclined, or supportive towards policy packaging according to their frequency of opting out for single measures and the number of policies they included in their ideal package.

Setting: The study was conducted in Germany via an online survey.

Participants: The sample included 1,200 eligible German voters, recruited based on age, gender, and income quotas.

Results: Based on both opt-out frequency (44.7%) and ideal policy packaging (72.8%) outcomes, most respondents were inclined towards policy packages. The inclusion of fiscal incentives and school-based measures in packages enhanced support, while fiscal disincentives reduced it. Key drivers of support included beliefs about the importance of diet-related issues and the role of government in regulation, while socio-demographic factors, political leaning, and personal experience with diet-related disease had minimal impact.

Conclusions: The results reveal public appetite for policy packages to address unhealthy food environments, contingent on package design and beliefs about the issue's severity and legitimacy of intervention. Public health advocates should design and promote policy packages aligned with public preferences, especially given anticipated opposition from commercial interests.

Key Words: Policy packaging, Food environments, Public support, Conjoint experiment

Introduction

Effectively and equitably addressing the global rise of unhealthy diets and the burden of chronic disease requires comprehensive public policies to improve the environments where people make daily food choices. Over the past decade, various evidence-based frameworks[1,2] and international policy guidelines[3] have emerged to outline essential measures for healthier food environments. While policy recommendations differ slightly, they all emphasize the need for comprehensive action. For instance, the Healthy Food Environment Policy Index (Food-EPI), a widely used framework, defines seven key domains for food environment policies: food composition, labeling, promotion, provision, retail, prices, and trade food composition, labelling, promotion, provision, retail, prices and trade[2].

Despite the clarity of these recommended actions, policy uptake has been slow[4]. Many government strategies have focused on the provision of education and information to encourage healthier individual behaviors[5], which alone overlook the environmental factors shaping dietary choices. Additionally, countries implementing food environment policies often do so on a small scale, adopting one or two isolated measures that lack the integration needed to tackle the complex drivers of unhealthy diets[6].

Recently, a more comprehensive approach to improving food environments, known as policy packaging, has begun to gain traction. Policy packaging involves combining multiple policy measures designed to meet shared objectives, enhancing each measure's effectiveness while reducing unintended consequences and improving feasibility[7]. This approach was first implemented by Chile in 2016 with a food environment policy package regulating the labelling, marketing, and availability of ultra-processed foods and beverages, especially for children and adolescents. Several evaluations have since shown that this package significantly improved relevant public health outcomes, such as food purchasing behavior and dietary intake[8,9]. Although countries in Europe have not yet adopted this approach[10], guidance for the region emphasizes the need for a coordinated policy ‘mix’ (I.e., package) to foster sustainable, healthy diets[11].

In this paper, we examine public support for food environment policy packages in Germany, where recent national guidance has also highlighted the need for a comprehensive approach to improve food environments[12]. We explore public support for these policy packages for three main reasons. First, while public support is not the only factor limiting policy adoption, it has been identified as a major obstacle, alongside strong industry opposition and a lack of political leadership[13]. Public opinion has influenced policy outcomes in real-world cases, such as the soda ban in New York City and Denmark's fat tax, both of which faced public backlash and industry pressure, leading to their failure[14,15]. Second, previous studies examining public support for food policies have focused on comparing support across single policy measures[16,17], with a key message emerging that public support is often lowest for policies that are most effective and equitable in improving food choices[18]. However, as this comparison of policy measures against one another does not align with current policy guidance towards integrated, comprehensive policymaking, it is important to examine public support in the context of policy packages. Finally, research in other policy areas suggests that packaging policies can mitigate opposition to less popular policies by pairing them with popular ones[19,20]. In the food environment policy arena, increased support for sugary drinks taxes has been observed when revenues are earmarked to 'compensate' for the perceived 'costs', such as by funding programs for disease prevention or improvement of healthcare services[21], highlighting the potential of policy packages to enhance public support that we aim to expand upon in this paper.

Several aspects of policy design have been demonstrated to influence public support for policies to foster healthier food environments. One such aspect is the effect of the measure on individual choice. Here, it is useful to introduce the Nuffield Ladder of Intervention, a framework used to taxonomize public health measures based on their level of intrusiveness on individual choice, from measures that enable choice to those that restrict it[22]. Generally, policies that are more restrictive on individual choice tend to be more effective and equitable in their effects, but face lower public support, thereby posing a challenge to the political feasibility of adopting effective policies[18,23]. Simplified further, measures can be

characterized here as those that either 'pull' individuals towards desired behaviors (I.e., inform or enable choice, guide by incentive) or 'push' them away from undesired behaviors (I.e., restrict or eliminate choice, guide by disincentive). Accordingly, push measures tend to be less popular than pull measures[24]. Another influential aspect of policy design is the mechanism of action. Previous studies demonstrate that 'fiscal' measures, I.e., taxes and subsidies, carry high visibility of policy costs and benefits relative to non-fiscal policies, or 'behavioral' policies, and may therefore be particularly polarizing to public support[19]. Finally, the population that is targeted by a policy measure has also been found to modulate support, with higher support observed for those measures that target those perceived to be particularly vulnerable to unhealthy food environments, such as children and adolescents or adults of low socioeconomic status[18].

To examine public support for policy packages to improve the healthfulness of food environments, we take advantage of the recently conducted Food-EPI assessment in Germany. Based on input from a national, multi-sectoral expert panel, this assessment put forth a list of priority policy measures that should be adopted in the German context to improve the food environment based on anticipated population health impact, feasibility of adoption, and equity of impact[25]. Drawing upon a selected sub-set of seven priority policy measures from this assessment, we examine the following questions:

- To what extent do voters support policy packages to improve the healthfulness of food environments?
- How does the design of the policy package influence support for policy packages?
- Which characteristics of voters themselves influence support for policy packages?

Methods

Experimental Design

We conducted a conjoint experiment embedded in an online survey, a method commonly used to assess voter preferences for public policies[26]. In this experiment, respondents evaluated a series of pairs of policy packages consisting of different combinations of up to seven policy measures. The selected measures were chosen to cover differences in three design features known to influence support for food environment policies: (a) the effect of the measure on individual choice, (b) the mechanism of action (fiscal vs. behavioral), and (c) the target population (general public vs. children and adolescents) (see *Table 1)*. We categorized each measure's impact on individual choice based on its place on the Nuffield Ladder of Intervention and as either a 'push' or 'pull' measure. Each policy measure was presented individually to respondents before the experiment with the description written in *Table 1*, which was taken from the Food-EPI assessment. We also added an estimated government cost or revenue impact to the description of each measure to help respondents consider policy trade-offs. Estimates were divided into three categories based on available data[12]: (a) under 500 million Euros, (b) 500 million to 1 billion Euros, and (c) 1 to 10 billion Euros (see *Supplementary Material (Table A1))*.

Table 1. Overview of selected policy measures for food environment policy packages, including characterization by their policy design features, including effect on individual choice, mechanism of action, and target population. Policy measures are organized from least to most intrusive on choice according to the Nuffield ladder.

Policy measure	Description	Policy design features		
		Effect on individual choice	Mechanism of action	Target population
Nutrition education in schools	The government could promote high quality nutrition education in kindergartens and schools by upgrading the corresponding content in the curricula of existing subjects and/or upgrading the teaching of home economics. *Expected government spending: 500 million – 1 billion Euros*	Inform (Pull)	Behavioral	Children and adolescents

Action plan to promote tap water consumption	The government could introduce measures to promote tap water consumption, including requiring food service establishments to provide tap water free of charge or for a small service fee, offering free tap water in workplace cafeterias and canteens, and promoting tap water consumption in schools and kindergartens. *Expected government spending: 500 million euros*	Enable (Pull)	Behavioral	General
Decrease value-added tax (VAT) on healthy foods	The government could decrease the value-added tax (VAT) on healthy food products, such as fruits, vegetables, pulses, and whole grains. *Reduced government revenue: 1-10 million Euros*	Guide by incentive (Pull)	Fiscal	General
Increase value-added tax (VAT) on unhealthy foods	The government could increase the value-added tax (VAT) on unhealthy food products, such as packaged foods high in sugar, salt, and/or saturated fat. *Expected government revenue: 1-10 million Euros*	Guide by disincentive (Push)	Fiscal	General
Sugary drinks tax	The government could introduce a tax specifically on sugary drinks, such as sodas, cola drinks, energy drinks and iced teas. This tax would increase the price of sugary drinks, with higher price increases for drinks with higher sugar content. *Expected government revenue: 1-10 million Euros*	Guide by disincentive (Push)	Fiscal	General
Mandatory nutrition standards in kindergartens and schools	The government could introduce mandatory, publicly funded implementation of the nutrition standards of the German Nutrition Society (DGE) in schools and kindergartens. This would oblige cafeterias in schools and kindergartens to offer meals and snacks that align with national nutrition recommendations. *Expected government spending: 1-10 billion Euros*	Restrict (Push)	Behavioral	Children and adolescents
Mandatory nutrition standards in public institutions	The government could introduce mandatory implementation of the nutrition standards of the German Nutrition Society in public institutions, such as public offices, clinics, senior citizen facilities and universities. This would obligate cafeterias in public institutions to offer meals and snacks that align with national nutrition recommendations. *Expected government spending: 1-10 million Euros*	Restrict (Push)	Behavioral	General

The conjoint experiment consisted of eight choice tasks, with respondents randomly divided to complete four tasks each. The conjoint experiment followed a paired profile design, in which two policy package profiles were displayed side by side in each choice task (see *Figure 1* for a sample choice task), following evidence that respondent choices in this design have been found to most closely resemble real-world voting behavior[27]. In each policy package, each of the seven policy measures was either absent or present (I.e., seven attributes, with two levels each).

Choice Task 1 of 4

Policymakers are currently considering which of the policies you just read about to include or not include in an overall package of measures for promoting healthy diets in Germany.
We will now ask you to evaluate different policy packages in a series of four tasks. For each task, we will show you two proposed policy packages side-by-side: 'policy package A' and 'policy package B'.
An 'X' symbol besides a policy indicates that it is included in the policy package.
For each of the tasks, please look at the policy packages carefully, compare them, and indicate your preferences through the corresponding questions.

	Policy package A	Policy package B
Mandatory nutrition standards in public institutions	X	
Sugary drinks tax		X
Increased value-added tax (VAT) on unhealthy foods		X
Action plan on the promotion of drinking water	X	
Decreased value-added tax (VAT) on healthy foods		X
Mandatory nutrition standards in public institutions		X
Nutrition education in schools	X	

How much do you personally support policy package A?

1	2	3	4	5	6	7
Strongly oppose	Oppose	Somewhat oppose	Neither oppose nor support	Somewhat support	Support	Strongly support

How much do you personally support policy package B?

1	2	3	4	5	6	7

Strongly oppose	Oppose	Somewhat oppose	Neither oppose nor support	Somewhat support	Support	Strongly support

Which policy package do you prefer?

q Policy Package A

r Policy Package B

***Now imagine that you have the choice between supporting policy package A or one single individual policy included within the package. Which would you prefer?**

q Policy package A

r An individual policy within policy package A

****Which individual policy within policy package A do you most prefer?**

s Mandatory nutrition standards in public institutions

t Action plan on the promotion of drinking water

u Nutrition education in schools

*contingent on selection of policy package A in previous question

**contingent on selection of option 2 in previous question

Figure 1. Example of paired profile design shown in each task of the conjoint experiment. Note: The order of attributes is randomized at the start and then kept constant per respondent. All questions were mandatory.

To avoid ordering effects, the order in which the tasks were presented was randomized. In addition, respondents were randomized to one of three versions of the choice tasks with regard to the order of the attributes (I.e., policy measures) in the package, which was then held constant throughout all choice tasks to avoid cognitive overload. The conjoint experiment was generated following a D-efficient design[28] using priors calibrated based on a pre-test (N = 94) to select choice sets that allow for an improved estimation of preference for individual policies. For the full conjoint experiment design, see *Supplementary Material 1 (Table A2)*.

Following similar conjoint experiments examining public support for packages in other policy arenas[19,20], respondents first indicated their support for each of the two policy packages on a Likert scale ranging from 1 (I.e., 'strongly oppose) to 7 (I.e., strongly support) and were subsequently prompted to indicate their preferred policy package of the two in a binary forced choice. We then included two novel approaches to examining public support for policy packages, which form the backbone of this analysis. First, upon selection of a

policy package, respondents were asked whether they truly preferred the package they had selected or rather any one measure within the package, and, if the latter, were given the opportunity to opt out of the package for the single measure. Second, upon completing the conjoint experiment, respondents were asked to indicate, if given the opportunity, which of the policy measures they would include to design their own ideal policy package. Here, respondents were free to 'drag and drop' anywhere from zero to all seven policies into their ideal policy package.

Apart from those used to set quotas, items used to ascertain individual characteristics of respondents, such as socio-demographics and health variables, were integrated in the survey following the conjoint experiment and are described in greater detail in another section. The survey was written first in English, translated into German by a native speaker, and pilot-tested amongst a heterogeneous population of German adults (N = 18), who provided feedback on the survey structure and phrasing of questions. The pilot testing feedback was used for minor changes in question wording and ordering throughout the survey. For the full survey instrument, see *Supplementary Material 2*. This study was provided clearance by the Ethics Committee at the University of Göttingen. The study has been pre-registered and is available at https://osf.io/whjba/.

Respondent Selection

The survey was administered online through a market research firm to a sample representing the German voting population, with quotas set for age, gender, and income based on national statistics[29-31]. The sample size (N=1,200) exceeded the minimum recommended for conjoint experiments to ensure reliability[32]. Respondents under the age of 18 or those who indicated ineligibility to vote in national elections were screened out, as were respondents who failed either of two attention checks that were integrated into the survey. Respondents (N = 88) who completed the survey in less than 10 minutes (<60%of the median response time) were also excluded, as it was assumed that they did not have time to adequately process and evaluate the scenarios. A comparison of summary statistics before and after dropping these participants demonstrated negligible differences to the

distribution of quota variables, indicating that these participants did not differ notably from the remainder of the participants.

Measuring Respondent Characteristics

Socio-demographic variables included age, gender, income, region, parental status, and political leaning. We classified regions as either former East or West Germany based on whether or not respondents resided in any of the five states that were once considered part of the German Democratic Republic (GDR) or rather in former West Germany. Political leaning was measured on a 10-point scale and grouped as far left (0-1), center left (2-4), center (5-6), center right (7-8), or far right (9-10). Health status was assessed through body-mass index (BMI) and a binary variable indicating any diagnosis of diabetes, hypertension, cardiovascular disease, and/or high cholesterol. We also examined the role of beliefs about food policy, with respondents indicating their level of agreement with three statements: awareness (I.e., 'the high consumption of unhealthy foods and beverages causes serious problems for society'), legitimacy (I.e., It is legitimate to establish collective rules for the consumption of unhealthy foods and beverages), and social norm ('It is generally accepted that the consumption of unhealthy foods and beverages should be reduced'). All were assessed via seven-point Likert scales, with statements drawn from a recently developed model of food policy acceptability drivers[33].

Data Analysis

Support for policy packages was analyzed across three outcomes. First, support ratings for each policy package on the Likert scale were collapsed into a binary variable, with a score of 5 ('I somewhat support') to 7 ('I strongly support') indicative of support. Second, we examined the frequency of opting out of policy packages in favor of single measures, recorded as a binary outcome ('opt out') and as an ordinal variable capturing how often respondents opted out across tasks ('opt out frequency'). Third, we analyzed participants' ideal policy packages, developing an ordinal 'ideal policy package density' variable based on the number of policy measures respondents placed in their ideal policy package. We used 'opt-out frequency' and 'ideal package density' variables to classify respondents into

three groups: (1) resistant to packaging (high opt-out frequency, low ideal policy package density), (2) inclined towards packaging but sensitive to design (moderate frequency, moderate density), and (3) supportive of packaging (low frequency, high density). For a summary of the construction of the support tendency categories, based on the latter two outcomes of interest, see *Table 2*.

Table 2. Support tendencies towards policy packages for improving food environments based on A) opt out frequency and B) ideal policy package density.

Support tendency	Outcome variable	
	Opt out frequency	**Ideal policy package density**
Resistant	High (opted out of 3-4 of policy packages)	Low (selected 0-1 measures in ideal policy package)
Inclined	Moderate (opted out of 1-2 policy packages)	Moderate (selected 2-5 measures in ideal policy package)
Supportive	Low (never opted out)	High (selected 6-7 measures in ideal policy package)

Next, we utilized both the conjoint experiment and ideal policy packaging exercise to examine the effect of policy package design features on support. First, we used two fixed effects logistic regression models to assess how each of the seven policy measures influenced support for packages: one model examined whether each measure's presence or absence affected support, and the other looked at opting out[34]. Both models controlled for whether measures appeared in "package A" or "package B." The marginal effects of each measure are shown visually, with full regression results available in *Supplementary Material 1 (Table A3)*. Based on these findings, each policy measure was categorized as having a 'positive,' 'negative,' 'neutral,' or 'unclear' effect on support, depending on statistical significance and direction of impact.

In the ideal package exercise, we descriptively analyzed patterns to see which single measures or combinations of measures were commonly chosen by respondents. We also looked at how certain features of policy design—i.e., the effect on individual choice, mechanism of action, and target population—appeared in respondents' preferred packages.

Finally, we assessed the influence of respondent characteristics on support using two ordinal logistic regression models based on opt-out frequency and ideal package density outcomes[35]. Marginal effects are displayed visually, with complete results in *Supplementary Materials (Table A4)*. Health and socio-demographic variables were standardized to compare their relevance, and multi-collinearity checks showed all variables were suitable for separate analysis[36].

Results

Participant Characteristics

The final cleaned data set (N = 1,112) closely resembles the general population based on quota variables, though with slight over-representation of older age groups due to the exclusion of respondents under the age of 18. For a summary of sample statistics and comparisons to available national statistics, see *Table 3*.

Table 3. Summary of sample statistics and comparison to available German national statistics for respondent characteristics.

Variable	**N**	**Percentage**	
		Sample	Population*
Gender†			
Female	533	47.9	49.2
Male	574	51.6	50.8
Age‡			
18-24	89	8.00	7.00
25-34	154	13.8	13.0
35-44	165	14.8	13.0
45-54	172	15.5	13.0
55-64	222	20.0	16.0
Income (Euro, Monthly Net)			
<1000	54	4.90	4.90
1000-1500	146	13.1	12.9
1501-2000	137	12.3	11.8
2001-2500	147	13.2	13.5
2501-5000	391	35.2	34.7

>5000	237	21.3	22.2
Employment			
Working (full-time, part-time)	650	44.7	67.9
Unemployed (temporarily or fully)	19	1.71	3.0
Retired	326	29.3	-
Other (Homemaker, disability status, student)	117	10.5	-
Regional residence[§]			
Former GDR	187	16.8	27.7
Former West Germany	925	83.2	72.3
Parental status of child <18 years of age			
Yes	247	22.2	
No	865	77.8	
BMI			
Underweight (BMI<18)	16	1.44	2.3
Normal weight (18<BMI<25)	479	43.1	44.2
Overweight (25<BMI<30)	392	35.3	34.5
Obese (BMI>30)	196	17.6	19.0
Prevalence of nutrition-related disease			
Hypertension	344	30.9	31.8
Heart disease	98	8.81	12.0
Diabetes	120	10.8	7.2
High cholesterol	236	21.4	-
Political leaning			
Left (far)	86	7.73	
Left (center)	297	26.7	
Center	540	48.6	
Right (center)	156	14.0	
Right (far)	33	2.97	
Political party support[¶]			
CDU	107	22.1	22.5
CSU	21	4.30	6.00

SPD	108	22.3	26.4
FDP	40	8.30	8.70
Grune	113	23.4	14.0
Die Linke	32	6.61	5.00
AfD	51	10.5	10.1
Other	12	2.48	7.30

* Population data sources: Age[29], Gender [30], Income[31], Employment [30], Regional residence[37], BMI [38], Hypertension[39], Heart disease[40], Diabetes[41], Political party support [42].
†Five respondents either did not identify as male or female or elected not to report their gender.
‡Two respondents did not report age.
§ Former GDR includes Mecklenburg-Vorpommern, Brandenburg, Sachsen, Sachsen-Anhalt, and Thüringen.
¶ Includes 484 respondents (43.5% of cleaned sample) who stated they did support a particular party in the 2021 Bundestag election. CDU = Christian Democratic Union of Germany; CSU = Christian Social Union in Bavaria; SPD = Social Democratic Party of Germany; FDP = Free Democratic Party; AfD = Alternative for Germany

Support for Policy Packages

On average, 65.4% of respondents supported the food environment policy packages presented in the conjoint experiment. The package with the lowest support (43.0%) included a sugary drinks tax and mandatory nutrition standards for public institutions, making it the only package with less than majority support. In contrast, the package with the highest support (81.1%) included enhanced nutrition education in schools, a plan to promote drinking water, and mandatory nutrition standards in schools and public institutions.

Despite relatively high support indicated for policy packages, respondents opted out relatively frequently for single policy measures – this occurred in almost half (46.6%) of all tasks. Looking at the respondent level, just under half (44.7%) were inclined to support policy packages, demonstrating a moderate tendency to opt out of selected policy packages to instead prefer single measures within those policy packages. Another 34.3% were resistant to packaging, preferring single policies in nearly all choice tasks (see *Table 4*).

Table 4. Distribution of respondents' support tendencies for food environment policy packages based on (A) opt out frequency and (B) ideal policy package density. Number of respondents listed in the top row of each cell; percentage of total respondents listed in the bottom row.

	(B) Ideal policy package density			
	Supportive *High density*	**Inclined**	**Resistant** *Low density*	

			Moderate density		**Total**
(A) Opt-out frequency	**Supportive** *Low frequency*	81 (7.28)	138 (12.4)	16 (1.44)	235 (21.1)
	Inclined *Moderate frequency*	88 (7.91)	362 (32.5)	46 (4.14)	496 (44.7)
	Resistant *High frequency*	31 (2.79)	310 (27.9)	40 (3.59)	381 (34.3)
	Total	200 (18.0)	810 (72.8)	102 (9.17)	1,112 (100)

Interestingly, resistance to policy packages decreased when respondents were allowed to design their own ideal packages: 81.4% of those resistant to the fixed packages in the conjoint experiment were still inclined to support packaging when able to select measures themselves. Overall, the majority of participants (72.8%) were inclined towards policy packaging here, stopping just short of including all or almost all the available measures into their ideal policy package. Notably, those supportive of combining all or nearly all measures (18.0%) nearly doubled those resistant to packaging (9.17%) in the ideal package task. A small subset of respondents (4.23%) showed inconsistent preferences between the conjoint experiment and the ideal policy package task; however, most respondents were inclined toward supporting some form of food policy package, with package design appearing to play a crucial role in support.

Effects of Policy Package Design on Support

We observed both positive and negative effects of different policy measures on whether respondents (a) supported a package and/or (b) opted out in favor of a single measure (see *Figure 2*). Fiscal disincentives, such as a value-added tax (VAT) increase on unhealthy foods, showed the greatest negative impact. Including this measure lowered the odds of supporting a package by 0.65 (95% CI: 0.56–0.74) and increased the odds of opting out by 1.68 (95% CI: 1.36–2.07). Similarly, while the sugary drinks tax did not significantly affect support for a package, it more than doubled the likelihood of opting out (OR = 2.12; 95% CI:

1.66–2.70). These fiscal measures were only selected as single preferred policies by 7.73% and 11.9% of respondents, respectively, reflecting their low support for stand-alone adoption.

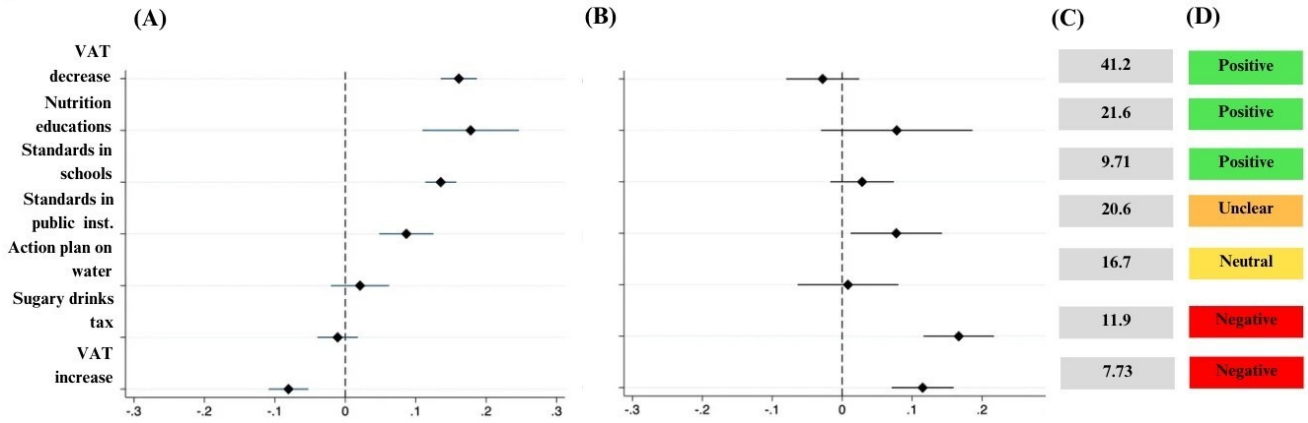


Figure 2. Effect of seven policy measure attributes on support for food environment policy packages, including (A) marginal effects on support for policy packages, (B) marginal effects on opting out of policy packages, (C) percentage of respondents who preferred the measure as a single measure in lieu of a package, and (D) overall effect on policy package support based on (A) support and (B) opt out outcomes. For the full regression results tables, see *Supplementary Material 1 (Table A3)*.

Conversely, adding a fiscal incentive, such as a VAT decrease on healthy foods, had one of the strongest positive effects on support, more than doubling the odds of respondents supporting a package (OR = 2.39; 95 CI: 2.03–2.81). This measure was also popular as a standalone policy, favored by 41.2% of respondents, and did not significantly increase the likelihood of opting out of a policy package, indicating it was well-accepted both individually and as part of a broader package.

No behavioral policy measure had a distinctly negative impact on support. Implementing mandatory nutrition standards in public institutions showed mixed effects. While it increased the likelihood of supporting a package (OR = 1.60; 95 CI: 1.30–1.96), it also raised the odds of opting out (OR = 1.60; 95 CI: 1.30–1.96). In contrast, mandatory nutrition standards in kindergartens and schools had a clearly positive effect, more than doubling the odds of support (OR = 2.08; 95 CI: 1.81–2.40) without increasing the odds of opting out. Nutrition education in schools showed a similar positive effect (OR = 2.61; 95 CI: 1.85–3.71) and did not affect opt-out odds. An action plan to promote drinking water access demonstrated no significant effect on support.

These patterns were largely corroborated by respondents' choices when designing their own ideal packages. Fiscal disincentives remained the least popular: only 34.5% of respondents included the VAT increase in their ideal package, and 43.4% included the sugary drinks tax (see *Table 5*). In contrast, the VAT decrease was most popular, selected by 82.3% of respondents. Again, school-based standards were preferred over public institution standards, with 66.6% including the former and 41.2% the latter.

Table 5. Combinations of policy measures placed in ideal policy package (percentage of respondents who placed these combinations into their ideal policy package). Boxes in grey indicate the percentage of respondents who placed a given policy measure listed in the first column (e.g., 82.3% of respondents included a VAT decrease in their ideal policy package).

Policy measure (N)	VAT decrease	Nutrition education	Standards - schools	Standards - public	Action plan on water	Sugary drinks tax	VAT increase
VAT decrease (915)	82.3						
Nutrition education (828)	65.2*	74.5					
Standards – schools (741)	57.9*	57.2*	66.6				
Standards – public (458)	36.9	36.1	38.0	41.2			
Action plan on water (592)	48.2	43.7	39.2	27.9	53.3		
Sugary drinks tax (482)	39.3	34.3	30.9	19.6	23.8	43.4	
VAT increase (384)	32.4	27.5	24.7	16.9	20.1	29.3	34.5

*policy combinations selected by a majority (>50%) of respondents as part of an ideal policy package

Three specific measure combinations were selected by a majority (>50%) of respondents as part of their ideal package. The VAT decrease was commonly paired with mandatory school standards (57.9%) and nutrition education (65.2%). Additionally, a combination of school standards and nutrition education focused on children was favored by 57.2% of respondents.

Examining the packaging of policies by design features, most respondents (81.5%) preferred packages that included both push and pull measures. Few respondents preferred either only fiscal (4.23%) or only behavioral measures (6.38%) in their ideal package, with most favoring a mix (82.9%). Likewise, most respondents (73.1%) preferred a combination of policies targeting both the general population and children. Finally, similar proportions of respondents supported packages with only those policies that demonstrated a 'positive' effect on support in the conjoint experiment (44.6%) as packages that also included policies that demonstrated a 'negative' effect on support in the conjoint experiment (48.3%).

Table 6. Design preferences for ideal policy packages, by policy measure design features. Results are expressed as the percentage of the total population (n:1,112) of respondents.

Policy measure design feature			**Percentage of total participants who included measures with [A], [B], or [A] + [B] features in ideal policy package**		
	[A]	**[B]**	**[A]**	**[B]**	**[A] + [B]**
Effect on individual choice	Push	Pull	0.99	11.1	81.5
Mechanism	Fiscal	Behavioral	4.23	6.38	82.9
Targeting	Children and adolescents	General population	1.89	9.62	82.0
Effect on policy package support	Negative	Positive	0.27	44.6	48.3

Effects of Respondent Characteristics on Support

Respondents who a) believed the high consumption of unhealthy food and beverages causes problems for society; and b) believed it legitimate to intervene on this consumption were significantly more likely to be supportive of policy packaging. This relationship was exhibited both in reducing the frequency with which respondents opted out of set policy packages in the conjoint experiment (OR_a = 0.66; 95% CI: 0.55-0.80 | OR_b = 0.72; 95% CI: 0.62-0.83) and increasing the number of policy measures selected as part of an ideal policy package (OR_a = 1.24; 95% CI: 1.01-1.51 | OR_b = 1.75; 95% CI: 1.48-2.05). Conversely, low accordance with these beliefs increased the odds of resistance towards policy packaging, again across both the opt out frequency and ideal policy package density outcomes (see *Figure 3*).

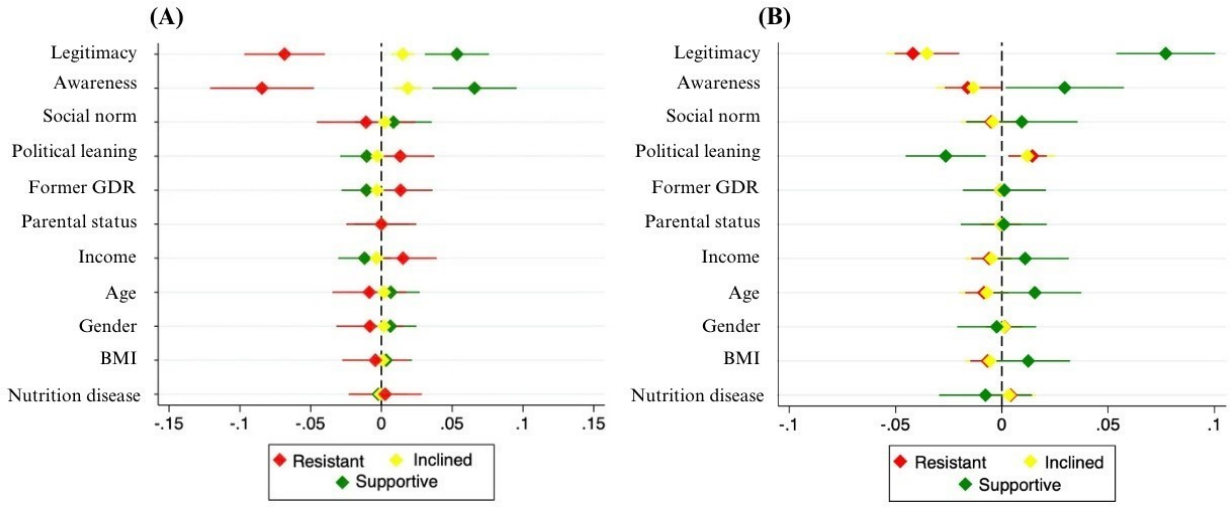


Figure 3. Marginal effects of respondent beliefs, political orientation, socio-demographics, and health status characteristics on captured support tendency for food environment policy packaging (I.e, supportive, inclined, resistant), as reflected by (A) opt out frequency and (B) ideal policy package density. For the full regression results table, see *Supplementary Material 1 (Table A4)*.

The effect of these beliefs was inconsistent in predicting inclination towards policy packaging across the two outcomes, as high accordance with these beliefs increased the odds of being inclined for the former and decreased them for the latter. This inconsistency suggests that these beliefs are more influential at the extremes of policy package support

(i.e., resistance vs. strong support). Meanwhile, the belief that others in society also support intervention had no significant impact on support for packaging in either outcome.

Political conservatism significantly affected support for policy packaging, but only in the designing ideal packages. Namely, conservatives were less likely to fully support packaging and more likely to be either resistant or moderately inclined toward it (OR = 0.83; 95% CI: 0.72–0.95) Despite the high prevalence of overweight, obesity (52.9%), and diet-related diseases (43.2%) in the sample, these health factors did not significantly affect support for packaging. Overall, beliefs and political leaning were the strongest predictors of support for food environment policy packages, while other socio-demographic factors were largely irrelevant.

Discussion

We demonstrate that there is an appetite amongst the public for improving food environments through comprehensive policy packages. Illustratively, all but one policy package received majority support, even though respondents were introduced to the anticipated costs of each policy measure prior to the conjoint experiment. In both their tendency to opt out of policy packages in the conjoint experiment and design their own ideal policy packages, respondents demonstrated an overall inclination to policy packages; however, they demonstrated that policy package design mattered to their support. Our results add nuance to our understanding of public support for policies aimed at healthier food environments. For example, while previous studies suggest higher support for “pull” measures (those that inform, enable, or incentivize healthy choices) over “push” measures (those that restrict or penalize unhealthy choices), our findings suggest that when integrated policymaking is possible, preferences are more complex. Indeed, when given the chance to design their own interventions, most respondents chose combinations that included both push and pull measures, as well as both fiscal and behavioral measures, and both measures targeted at children/adolescents and at adults. In addition, although some measures showed clear positive or negative impacts on support in the conjoint experiment, a near majority of respondents still preferred ideal packages that combined both positive and

negative measures, aligning with research suggesting that bundling less popular policies with popular ones can increase overall support[19,20].

Our study suggests promising opportunities to create effective and publicly supported policy packages by focusing on school food environments. In Germany, mandatory standards for schools and kindergartens were rated as a high-priority policy by experts in the Food-EPI assessment due to their expected impact on health, equity, and feasibility[25]. Our results show strong public support for these standards, particularly when combined with investments in nutrition education in schools. This is relevant in the German context, where a previous attempt to introduce a "meat-free day" in workplace cafeterias met with strong public backlash[43]. Our findings suggest that similar standards focused on schools would likely be better received and could serve as the foundation for a broader policy package to improve food environments. Evidence from Chile shows how school-focused policies can drive positive attitudinal and behavioral changes. For example, Chilean mothers reported that schools became central to promoting healthier food behaviors, and young children even influenced their parents' attitudes and purchasing decisions[44]. This recommendation could also apply in other EU countries, where improving school food environments is a key recommendation for promoting healthier food choices[18].

Finally, our findings on the factors driving support for policy packages have important implications for advocacy efforts. In accordance with previous surveys conducted amongst citizens in Europe[16], beliefs about the importance of nutrition policy were more influential in driving support (particularly at the extremes of support and resistance) than socio-demographic factors or personal experience with diet-related diseases. The latter, while striking given a high prevalence of diet-related disease in our sample, is not altogether unsurprising, as previous studies have been mixed in terms of reception for policy action amongst those who are particularly targeted by it[45], including amongst overweight/obese individuals[17,46], parents of children and/or adolescents[21,46], and frequent consumers of unhealthy foods and beverages, including sugary drinks[21,46] and fast food[16]. These findings emphasize that public support for food environment policy packages cannot be easily pinpointed along socio-demographic, chronic disease status, or even political lines, but

rather cuts across these delineations of voters. These results suggest that communication efforts that emphasize the role of environmental factors in shaping dietary behaviors could be key to fostering public support. This is highly relevant in contexts like Germany, where many people believe that diet-related diseases like obesity are primarily due to individual choices, such as overeating or lack of exercise, and see personal responsibility as central to a healthy diet [47].

Regarding limitations, while preferable to standard survey approaches to elicit more rigorous assessments of support[18], conjoint experiments are still subject to a degree of social desirability bias[48]. We tried to reduce this by including estimated government spending or revenue to help respondents consider trade-offs. In terms of the opt-out outcome, we were mindful of potential status quo bias, as policy packages were presented as the default option[49]. To address this, we compared support across both the conjoint experiment and ideal package tasks, where respondents actively chose measures. Interestingly, contrary to what would be expected based on status quo bias, we found resistance to packaging was higher when packages were the default and lower when respondents could fully customize their ideal package. However, it's important to note that this does not fully mirror real-world policymaking, where respondents may not engage with policies in such depth. In addition, we provided detailed descriptions of each policy measure, though real-world exposure to policy information is often more limited. However, we found this structure important for respondents to have the best opportunity to understand each policy measure before evaluating them in a complex policy package.

Going forward, additional research should further examine the role that individual beliefs play in underpinning support – or lack thereof – for policy packages. Namely, while this study found a significant influence of beliefs related to the issue of unhealthy diets and legitimacy to intervene, it would be important to understand which perceptions regarding policy packages, such as their effectiveness, equitable impact, and coherence across policy measures best predict support. In addition, recommendations for policy packages to improve food environments increasingly integrate health as a component of a broader concept of sustainability, which also encompasses social, environmental, and animal

welfare goals[11,12], which are not included in this study and should be reflected in future studies. Finally, while our study provides valuable insights into public preferences for food environment policy packages, we recognize that our structured, experimental approach may not fully reflect the complexities of real-world public opinion. In practical settings, public support can be influenced by dynamic factors such as media framing, political partisanship, and lobbying by commercial interests, which were not fully addressed in this study. Future research should explore these elements to better understand how public support may evolve in response to real-world pressures and political discourse.

Despite these limitations, our study provides foundational evidence that the public is generally supportive of policy packages to make meaningful changes in food environments. This is especially important given political inertia that stems in part from a perceived lack of public demand for action[15]. When effectively leveraged, as demonstrated for example in the adoption of a food environment policy package in Argentina[50], public support can help mitigate imbalances of power between health and industry interests, making policy passage more achievable. Thoughtful policy design and clear communication will be essential to build strong public support for effective food environment policies.

References

1. Hawkes C., Jewell J. and K. Allen (2013) 'A food policy package for healthy diets and the prevention of obesity and diet-related non-communicable diseases: the NOURISHING framework,' *Obesity Reviews* 14(S2):159-168. Available at: https://doi.org/10.1111/obr.12098
2. Swinburn B., Vandevijvere S. and C. Walker et al. (2013) 'Monitoring and benchmarking government policies and actions to improve the healthiness of food environments: a proposed Government Healthy Food Environment Policy Index,' *Obesity Reviews* 14(S1):24-37. Available at: https://doi.org/10.1111/obr.12073
3. World Health Organization (WHO) (2017) Tackling NCDs: 'best buys' and other recommended interventions for the prevention and control of noncommunicable

diseases. Geneva: World Health Organization. Available at https://www.who.int/publications/i/item/WHO-NMH-NVI-17.9

4. Roberto C.A., Swinburn B., and K.D. Brownell et al. (2015) 'Patchy progress on obesity prevention: emerging examples, entrenched barriers, and new thinking,' *The Lancet* 385(9985):2400-2409. Available at https://doi.org/10.1016/S0140-6736(14)61744-X
5. World Health Organization (WHO) (2019) 'Assessing national capacity for the prevention and control of noncommunicable diseases: report of the 2019 global survey' Geneva: World Health Organization; 2020. License: CC BY-NC-SA 3.0 IGO. Available at https://www.who.int/publications/i/item/9789240002319
6. Vandevijvere S., Barquera S., and B. Swinburn et al. (2019) 'An 11-country study to benchmark the implementation of recommended nutrition policies by national governments using the Healthy Food Environment Policy Index, 2015-2018,' *Obesity Reviews* 20(2):57-66. Available at https://doi.org/10.1111/obr.12819
7. Givoni M., Macmillen J., and E. Feitelson et al. (2013) 'From Policy Measures to Policy Packages,' *Transport Reviews* 33(1):1-20. Available at: https://doi.org/10.1080/01441647.2012.744779
8. Taillie L.S., Bercholz M., and C. Corvalan et al. (2021) 'Changes in food purchases after the Chilean policies on food labelling, marketing and sales in schools: a before and after study,' *The Lancet Planetary Health* 5(8):e526-533. Available at https://doi.org/10.1016/S2542-5196(21)00172-8
9. Fretes G., Corvalán C., and S.B.Cash et al. (2023) 'Changes in children's and adolescents' dietary intake after the implementation of Chile's law of food labelling, advertising, and sales in schools: a longitudinal study,' *International Journal of Behavioral Nutrition and Physical Activity* 20(1):40. Available at doi: 10.1186/s12966-023-01445-x.
10. Pineda E., Poelman M.P., and S. Vandevijvere et al. (2022) 'Policy implementation and priorities to create healthy food environments using the Healthy Food Environment Policy Index (Food-EPI): A pooled level analysis across eleven European

countries,' *The Lancet Regional Health Europe* 23:100522. Available at https://doi.org/10.1016/j.lanepe.2022.100522

11. European Commission, Directorate-General for Research and Innovation, Group of Chief Scientific Advisors (2023) 'Towards sustainable food consumption – Promoting healthy, affordable and sustainable food consumption choices,' Publications Office of the European Union. Available at: https://data.europa.eu/doi/10.2777/29369
12. Federal Ministry of Food and Agriculture (BMEL) (2020) 'Policies for a more sustainable diet: Developing an integrated diet policy and shaping fair diet environments - WBAE report,' Opinion of the Scientific Advisory Board for Agricultural Policy, Nutrition and Consumer Health Protection (WBAE) at the BMEL, June 2020. Available at: https://www.bmel.de/SharedDocs/Downloads/DE/_Ministerium/Beiraete/agrarpolitik/wbae-gutachten-nachhaltige-ernaehrung.html
13. Swinburn B.A., Kraak V.I., and W.H. Dientz et al. (2019) 'The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report,' *The Lancet* 393:791-846. Available at http://dx.doi.org/10.1016/S0140-6736(18)32822-8
14. Fairchild A.L. (2013) 'Half Empty or Half Full? New York's Soda Rule in Historical Perspective,' *The New England Journal of Medicine* 368:1765-1767. Available at: doi:10.1056/NEJMp1303698
15. Bødker M., Pisinger C., and T. Jørgensen et al. (2015) 'The rise and fall of the world's first fat tax,' *Health Policy* 119(6):737-742. Available at: doi: 10.1016/j.healthpol.2015.03.003
16. Mazzocchi M., Cagnone S., Bech-Larsen T., and W.B. Traill et al. (2014) 'What is the public appetite for healthy eating policies? Evidence from a cross-European survey,' *Health Economics, Policy and Law* 10(3):267-292.
17. Kwon J., Cameron A.J., and G. Sacks et al. (2019) 'A multi-country survey of public support for food policies to promote healthy diets: Findings from the International Food Policy Study,' *BMC Public Health* 19:1205. Available at:

https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7483-9

18. Diepeveen S., Ling T., and T.M. Marteau et al. (2013) 'Public acceptability of government intervention to change health-related behaviours: a systematic review and narrative synthesis,' *BMC Public Health* 756. Available at: doi: 10.1186/1471-2458-13-756
19. Fesenfeld L.P., Wicki M., and T. Bernauer et al. (2020) 'Policy packaging can make food system transformation feasible,' *Nature Food* 1:173-182. Available at: https://www.nature.com/articles/s43016-020-0047-4
20. Wicki M., Huber R.A., and T. Bernauer (2019(a.)) 'Can policy-packaging increase public support for costly policies? Insights from a choice experiment on policies against vehicle emissions,' *Journal of Public Policy* 1-27. Available at: https://doi.org/10.1017/S0143814X19000205
21. Eykelenboom M., van Stralen M.M., and C.M. Renders et al. (2019) 'Political and public acceptability of a sugar-sweetened beverages tax: a mixed-method systematic review and meta-analysis,' *International Journal of Behavioral Nutrition and Physical Activity* 16:78. Available at: doi: 10.1017/S1368980020001500
22. Nuffield Council on Bioethics (2007) 'Public health: ethical issues,' Nuffield Council on Bioethics, London. Available at: https://www.nuffieldbioethics.org/publications/public-health/guide-to-the-report/policy-process-and-practice
23. Adams J., Mytton O., and P. Monsivais et al. (2016) 'Why Are Some Population Interventions for Diet and Obesity More Equitable and Effective Than Others? The Role of Individual Agency,' *PLoS Medicine* 13(5): e1002045. Available at: https://doi.org/10.1371/journal.pmed.1001990
24. De Groot J.I.M. and G. Schuitema (2012) 'How to make the unpopular popular? Policy characteristics, social norms and the acceptability of environmental policies,' *Environmental Science & Policy* 19-20:100-107

25. von Philipsborn P., Geffert K., and E. A. Rehfuess et al. (2022) 'Nutrition policies in Germany: a systematic assessment with the Food Environment Policy Index,' *Public Health Nutrition* 25(6):1691-1700. Available at: doi: 10.1017/S1368980021004742
26. Abramson S.F., Kocak K., and A. Magazinnik (2022) 'What Do We Learn about Voter Preferences from Conjoint Experiments?' American Journal of Political Science 66(4):1008-1020. Available at: https://doi.org/10.1111/ajps.12714
27. Hainmueller J. Hangartner D., and T. Yamamoto (2014) 'Validating vignette and conjoint survey experiments against real-world behavior,' *PNAS* 112 (8) 2395-2400. Available at: https://doi.org/10.1073/pnas.1416587112
28. Hensher D.A., Rose J.M. and W.H. Greene (2012) Applied Choice Analysis: A Primer. Cambridge University Press. Available at https://doi.org/10.1017/CBO9780511610356
29. Statistisches Bundesamt (2022(b.)) '15th Coordinated Population Projection for Germany' Available at: https://service.destatis.de/bevoelkerungspyramide/index.html#!a=31,67&l=en&g
30. Statistisches Bundesamt (2022(a.)) 'Population by nationality and sex,' Available at: https://www.destatis.de/EN/Themes/Society-Environment/Population/Current-Population/Tables/liste-current-population.html;jsessionid=C958D1FA9B47AAB283181647170B06B8.live732#616588
31. Bundeszentrale für politische Bildun (2018) 'Households by monthly net household income in euros, shares in percent,' Available at: https://www.bpb.de/kurz-knapp/zahlen-und-fakten/soziale-situation-in-deutschland/61754/einkommen-privater-haushalte/
32. Rose J.M. and M.C.J. Bliemer (2013) 'Sample size requirements for stated choice experiments,' *Transportation* 40:1021-2041. Available at: https://doi.org/10.1007/s11116-013-9451-z
33. Espinosa R., and A. Nassar (2021) 'The Acceptability of Food Policies,' *Nutrients* 13(5):1483. Available at: https://doi.org/10.3390/nu13051483

34. Allison P.D. (2009) 'Fixed Effects Regression Models,' Newbury Park, CA: SAGE. Available at: https://methods.sagepub.com/book/fixed-effects-regression-models
35. Long J.S., and J. Freese (2014) 'Regression Models for Categorical Dependent Variables Using Stata,' 3rd ed. College Station, TX: Stata Press. Available at: https://www.stata.com/bookstore/regression-models-categorical-dependent-variables/
36. James G., Witten D., Hastie T., and R. Tibshirani (2013) 'An Introduction to Statistical Learning: With Applications,' in R. 1st ed. 2013, Corr. 7th printing 2017 edition. Springer. Available at: https://static1.squarespace.com/static/5ff2adbe3fe4fe33db902812/t/6009dd9fa7bc363aa822d2c7/1611259312432/ISLR+Seventh+Printing.pdf
37. Statistisches Bundesamt (2021) 'Population by nationality and federal states,' Available at: https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Bevoelkerung/Bevoelkerungsstand/Tabellen/bevoelkerung-nichtdeutsch-laender.html
38. Schienkiewitz A., Kuhnert R., and G.B.M. Mensink et al. (2022) 'Overweight and obesity among adults in Germany – Results from GEDA 2019/2020 – EHIS,' *Journal of Health Monitoring* 7(3):21.28. Available at: doi: 10.25646/10293
39. Hannelore N., Kuhnert R. and S. Born (2017) '12-Month prevalence of hypertension in Germany,' *Journal of Health Monitoring* 2(1):51-57. Available at: DOI 10.17886/RKI-GBE-2017-016 ISSN 2511-2708
40. Dornquast C., Kroll L.E., and M. A. Busch et al. (2016) 'Regional Differences in the Prevalence of Cardiovascular Disease,' *Deutsches Ärzteblatt International* 113(42): 704–711. Available at: doi: 10.3238/arztebl.2016.0704
41. Tönnies T., Röckl S., and R. Brinks et al. (2019) 'Projected number of people with diagnosed Type 2 diabetes in Germany in 2040,' *Diabetic Medicine* 36(10):1217-1225. Available at: https://doi.org/10.1111/dme.13902
42. Bundeswahlleiterin (2021) 'Bundestagswahl 2021 - Ergebnisse - Der Bundeswahlleiter,'

https://www.bundeswahlleiterin.de/bundestagswahlen/2021/ergebnisse/bund-99.html (Accessed 2023).

43. Angerer, Carlo (2013) "Hands off my sausage: German uproar over weekly meat ban plan." NBC News https://www.nbcnews.com/news/world/hands-my-sausage-german-uproar-over-weekly-meat-ban-plan-flna6c10857360 (Accessed 2023).
44. Correa T., Fierro C., and C. Corvalan et al. (2019) 'Responses to the Chilean law of food labeling and advertising: exploring knowledge, perceptions and behaviors of mothers of young children,' *International Journal of Behavioral Nutrition and Physical Activity* 16(21). Available at: https://doi.org/10.1186/s12966-019-0781-x
45. Aschemann-Witzel J., Bech-Larsen T. and S. Capacci (2016) 'Do Target Groups Appreciate Being Targeted? An Exploration of Healthy Eating Policy Acceptance,' *Journal of Consumer Policy* 39:285-306. Available at: https://link.springer.com/article/10.1007/s10603-016-9327-7
46. Hagmann D., Siegrist M., and C. Hartmann (2018) 'Taxes, labels, or nudges? Public acceptance of various interventions designed to reduce sugar intake,' *Food Policy* 79:156-165. Available at: https://doi.org/10.1016/j.foodpol.2018.06.008
47. Bayer S., Drabsch T., and C. Holzapfel et al. (2020) 'Responsibility of Individuals and Stakeholders for Obesity and a Healthy Diet: Results From a German Survey,' *Frontiers in Psychology* 11. Available at: https://doi.org/10.3389/fpsyt.2020.00616
48. Horiuchi Y., Markovich Z, and T. Yamamoto (2021) 'Does Conjoint Analysis Mitigate Social Desirability Bias?' *Political Analysis* 30(4):535-549. Available at: https://doi.org/10.1017/pan.2021.30
49. Kahneman D., Knetsch J.L., and R.H. Thaler (1991) 'Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias,' Journal of Economic Perspectives 5(1):193-206. Available at: https://www.aeaweb.org/articles?id=10.1257/jep.5.1.193
50. Wahnschafft S., Spiller A., and B.A. Graciano (2024) 'How can advocates leverage power to advance comprehensive regulation on ultra-processed foods? learning

from advocate experience in Argentina,' *Globalization and Health* 20(68). Available at: https://doi.org/10.1186/s12992-024-01069-1

Supplementary Material 1

Table A1. Cost and/or revenue scale for policy measures and available sources. 'Low' is <500 million, 'medium' is 500 million – 1 billion, and 'high' is 1-10 billion.

Policy instrument	Cost Dimension	Figure Available	Range	Additional explanation
Mandatory nutrition standards for schools and kindergartens	Government spending	For state-funded daycare and school meals, additional state expenditures of approx. 5.5 billion per year can be assumed for state-funded daycare and school catering	High	Even if this is not funding the meals entirely, it is well over 1 billion threshold for 'high', so even if the costs were lower, this still provides a safe estimate.
Increase VAT on unhealthy foods	Expected government revenue	Danish fat tax generated $216 million in new revenue in 15 months before it was repealed	High	Germany's population is over 15x that of Denmark, likely placing anticipated revenue well above the 1 billion 'high' threshold.
Decrease VAT on healthy foods	Reduced government revenue	The recommended reduction (7% to 5%) in the value-added tax on fruit and vegetables leads to a total of revenue shortfall of around EUR 0.5 billion per year	High	The estimate given of 0.5 billion is for reduction in VAT from 7% to 5% and only on fruits and vegetables. The recommended measure from the FOOD-EPI assessment for Germany is from 19% to 7% and is also on whole grains and legumes. In this case, revenue would likely exceed 1 billion.
Sugary drink tax	Expected government revenue	1.89 billion euro per year	High	Estimated to be above 1 billion in the context of Germany.

Mandatory nutrition standards for public institutions	Government spending	Not available.	High	Assumed to be similar to adopting mandatory nutrition standards in kindergartens and schools.
Action plan on the promotion of drinking water	Government spending	Not available.	Low	Consensus reached amongst authors that one-time spending on infrastructure for drinking water (I.e., fountains) would cost under 500 million.
Nutrition education in schools	Government spending	Not available.	Medium	Consensus reached amongst collaborators.

Table A2. Conjoint experiment design. '1' indicates policy was present in the package.

Choice task	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8
Policy package	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B
VAT dec	1	0	0	1	0	1	1	0	0	1	0	1	1	0	0	0
Nutr. Ed	1	0	0	1	1	0	1	0	1	0	0	0	1	0	1	0
Water plan	0	1	0	1	0	1	0	1	1	0	0	0	0	1	0	1
Stand. school	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1
Stand. public	1	0	1	0	0	1	1	0	1	0	0	0	0	1	0	1
Sugar tax	0	1	1	0	1	0	0	1	0	1	0	0	1	0	0	1
VAT inc	1	0	0	1	0	1	0	1	0	1	0	0	0	1	1	0

Table A3. Logistic regressions of policy design attributes on (A) odds of supporting (binary) for policy package; and (B) odds of opting out of policy package.

	(A) Support for policy package				(B) Opt out of policy package			
	Odds Ratio	Standard Error	95% Confidence Interval		Odds Ratio	Standard Error	95% Confidence Interval	
VAT dec	2.390***	(0.197)	2.032	2.810	0.882	(0.104)	0.699	1.112
Nutr. Ed	2.616***	(0.465)	1.847	3.705	1.422	(0.352)	0.875	2.309
Water plan	1.120	(0.129)	0.893	1.405	1.038	(0.173)	0.749	1.438
Stand. school	2.079***	(0.148)	1.808	2.391	1.137	(0.121)	0.922	1.402
Stand. public	1.597***	(0.167)	1.301	1.962	1.418*	(0.215)	1.053	1.909

Sugar tax	0.943	(0.074)	0.808	1.100	2.121**	(0.263)	1.663	2.704
VAT inc	0.647***	(0.046)	0.563	0.744	1.680**	(0.180)	1.361	2.074
package A	0.499***	(0.104)	0.332	0.753	0.330**	(0.095)	0.187	0.581
Observations	5920				2764			

Exponentiated coefficients; Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table A4. Ordered logistic regressions of voter characteristics (health status, socio-demographics, political orientation, and beliefs) on (A) opt out tendency and (B) ideal policy package density.

	(A) Opt out frequency				(B) Ideal policy package density			
	Odds Ratio	**Standard Error**	**95% Confidence Interval**		**Odds Ratio**	**Standard Error**	**95% Confidence Interval**	
Nutrition disease	1.013	(0.066)	0.892	1.150	0.946	(0.076)	0.808	1.108
BMI	0.979	(0.057)	0.873	1.098	1.094	(0.079)	0.949	1.260
Gender	0.961	(0.057)	0.856	1.079	0.983	(0.067)	0.859	1.124
Age	0.959	(0.063)	0.844	1.090	1.118	(0.090)	0.955	1.310
Income	1.078	(0.064)	0.959	1.211	1.083	(0.082)	0.934	1.255
Parental status	0.999	(0.062)	0.885	1.129	1.007	(0.075)	0.869	1.165
Former GDR	1.069	(0.061)	0.956	1.195	1.009	(0.073)	0.876	1.161
Political leaning	1.067	(0.064)	0.948	1.202	0.826**	(0.057)	0.721	0.947
Social norm	0.948	(0.083)	0.799	1.125	1.070	(0.104)	0.885	1.293
Awareness	0.661***	(0.063)	0.549	0.796	1.238**	(0.126)	1.014	1.512
Legitimacy	0.715***	(0.052)	0.619	0.825	1.745***	(0.144)	1.484	2.052
/								
Cut1	-4.631***	0.391			0.690	(0.383)	-0.061	1.441
Cut2	-2.502***	0.369			4.972	(0.430)	4.129	5.814
Observations	1099				1099			

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Supplementary Material 2

Survey Instrument

Section 0: Declaration of Consent

Thank you for your interest in this survey!

This survey is conducted for research purposes. This study is for scientific purposes only and does not pursue any commercial or political objectives.

Participation in this study is voluntary. The answers are completely anonymous. The information you provide will not be stored or used in any way that could reveal your personal identity.

You can cancel the survey at any time by simply closing your browser. All responses received up to this point will be deleted. There are no negative
Consequences if you decide to cancel the survey.

Please note: You must be 18 years of age or older to participate in this study.

If you have any further questions, please feel free to contact us:

Simone Wahnschafft
Sustainable Food Systems RTG
Department of Agricultural Economics and Rural Development
Heinrich-Düker Weg 12
37073 Göttingen
Enamel: simone.wahnschafft@uni-goettingen.de

ELECTRONIC CONSENT: Please select your choice below.

By clicking the "Agree" button, you confirm that:

- You have read the information listed above
- You voluntarily agree to participate.
- You are at least 18 years old

❑ Agree
❑ Reject *[End of Survey]*

Timing Mark

Page Break

Section 1: Introduction to the Survey

Welcome to this survey! We are very grateful for your participation.

The aim of this study is to better understand public opinion on food policy. Our research will only produce meaningful results if you carefully read and consider each question and express your true personal opinion. Thank you for taking this into account!

The survey will take no more than 25 minutes to complete.

Timing Mark

Page Break

Section 2: Socio-demographic data (quotas)

Q2.1 [Gender]. What is your gender?

- ❑ Male
- ❑ Female
- ❑ Miscellaneous
- ❑ Don't want to make a statement about it

Timing Mark

Page Break

Q2.2 [Age] What age group do you belong to?

- ❑ Under 18
- ❑ 18-24
- ❑ 35-44
- ❑ 45-54
- ❑ 55-64
- ❑ 65+

Timing Mark

Page Break

Q2.3 [Income] What is your net monthly household income?

The household net income is calculated by subtracting from the gross household income (all income of the household from employment, from assets, from public and non-public transfer payments and from subletting) income/wage tax, church tax and solidarity surcharge as well as compulsory social security contributions.

- ❑ Under €1,000
- ❑ €1,001 - €1,500
- ❑ 1.501 – 2.000 €
- ❑ 2.001 - 2.500 €
- ❑ 2.501 – 5.000 €

- ❑ €5,001 and above

Timing Mark

Page Break

Q2.4 [Eligibility] If the Bundestag election were to take place today, would you be eligible to vote?

- ❑ Yes
- ❑ Yes *[screened out]*

Timing Mark

Page Break

Section 3: Policy Descriptions and Comprehension Tasks

Q3.1 [Instruments]

Seven measures are being considered by policy makers in Germany to improve the nutritional health of the population. Each of these seven measures is described in the following pages.

Please read EACH description carefully and answer the relevant questions.

Tax on sugary drinks.

The government could introduce a tax specifically on sugary drinks, such as sodas, cola drinks, energy drinks and iced teas. This tax would increase the price of sugary drinks, with higher price increases for drinks with higher sugar content.

Expected government revenue: 1-10 million Euros

Please indicate the extent to which you agree or disagree with the individual statements on this page for the following action:

Q3.2.1 [Effectiveness_Tax] *The measure will be effective in promoting healthier diets among the population.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.2.2 [Coerciveness_Tax] *The measure will restrict freedom of choice.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree

- ❑ Agree
- ❑ Totally agree

Q3.2.3 [Fairness_Tax] *The measure is unfair to people with low incomes.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.2.4. [Majority_Tax] *A majority of citizens would agree to the implementation of this policy.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.2.5 [Support_Tax] To what extent do you personally support or oppose this measure?

- ❑ Strongly oppose
- ❑ Oppose
- ❑ Slightly oppose
- ❑ Neither support nor oppose
- ❑ Slightly support
- ❑ Support
- ❑ Strongly support

Timing Mark

Page Break

Increase value-added tax (VAT) on unhealthy foods

The government could increase the value-added tax (VAT) on unhealthy food products, such as packaged foods high in sugar, salt, and/or saturated fat.

Expected government revenue: 1-10 million Euros

Please indicate the extent to which you agree or disagree with the individual statements on this page for the following action:

Q3.3.1 [Effectiveness_VATinc] *The measure will contribute effectively to the promotion of healthier diets among the population.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree

- ❑ Totally agree

Q3.3.2 [Coerciveness_VATinc] *The measure will restrict freedom of choice.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.3.3 [Fairness_VATinc] *The measure is unfair to low-income people.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.3.4. [Majority_VATinc] *A majority of citizens would agree to the implementation of this policy.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.3.5 [Support_VATinc] To what extent do you personally support or oppose this measure?

- ❑ Strongly oppose
- ❑ Oppose
- ❑ Slightly oppose
- ❑ Neither support nor oppose
- ❑ Slightly support
- ❑ Support
- ❑ Strongly support

Timing Mark

Page Break

Decrease value-added tax (VAT) on healthy foods

The government could decrease the value-added tax (VAT) on healthy food products, such as fruits, vegetables, pulses, and whole grains.

Reduced government revenue: 1-10 million Euros

Please indicate the extent to which you agree or disagree with the individual statements on this page for the following action:

Q3.4.1 [Effectiveness_VATdec] *The measure will effectively contribute to the promotion of healthier diets among the population.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.4.2 [Coerciveness_VATdec] *The measure will restrict freedom of choice.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.4.3 [Fairness_VATdec] *The measure is unfair to people with low incomes.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.4.4. [Majority_VATdec] *A majority of citizens would agree to the implementation of this policy.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.4.5 [Support_VATdec] To what extent do you personally support or oppose this measure?

- ❑ Strongly oppose
- ❑ Oppose
- ❑ Slightly oppose
- ❑ Neither support nor oppose
- ❑ Slightly support
- ❑ Support
- ❑ Strongly support

Timing Mark

Page Break

Nutrition education in schools.

The government could promote high quality nutrition education in kindergartens and schools by upgrading the corresponding content in the curricula of existing subjects and/or upgrading the teaching of home economics.

Expected government spending: 500 million – 1 billion Euros

Please indicate the extent to which you agree or disagree with the individual statements on this page for the following action:

Q3.5.1 [Effectiveness_NutEd] *The measure will effectively contribute to the promotion of healthier diets in the population*.

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.5.2 [Coerciveness_NutEd] *The measure will restrict freedom of choice*.

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.5.3 [Fairness_NutEd] *The measure is unfair to low-income people*.

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.5.4. [Majority_NutEd] *A majority of citizens would agree to the implementation of this policy*.

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.5.5 [Support_NutEd] To what extent do you personally support or oppose this measure?

- ❑ Strongly oppose
- ❑ Oppose
- ❑ Slightly oppose
- ❑ Neither support nor oppose

- ❑ Slightly support
- ❑ Support
- ❑ Strongly support

Timing Mark

Page Break

Mandatory nutrition standards in kindergartens and schools

The government could introduce mandatory, publicly funded implementation of the nutrition standards of the German Nutrition Society (DGE) in schools and kindergartens. This would oblige cafeterias in schools and kindergartens to offer meals and snacks that align with national nutrition recommendations.

Government spending: 500 million euros

Please indicate the extent to which you agree or disagree with the individual statements on this page for the following action:

Q3.6.1 [Effectiveness_K&S] *The measure will be effective in promoting healthier diets among the population.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.6.2 [Coerciveness_K&S] *The measure will restrict freedom of choice.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.6.3 [Fairness_K&S] *The measure is unfair to low-income people.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.6.4. [Majority_K&S] *A majority of citizens would agree to the implementation of this policy.*

- ❑ Strongly disagree
- ❑ Disagree

- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.6.5 [Support_K&S] To what extent do you personally support or oppose this measure?

- ❑ Strongly oppose
- ❑ Oppose
- ❑ Slightly oppose
- ❑ Neither support nor oppose
- ❑ Slightly support
- ❑ Support
- ❑ Strongly support

Timing Mark

Page Break

Mandatory nutritional standards for other public institutions.
The government could introduce mandatory implementation of the nutrition standards of the German Nutrition Society in public institutions, such as public offices, clinics, senior citizen facilities and universities. This would obligate cafeterias in public institutions to offer meals and snacks that align with national nutrition recommendations.

Expected government spending: 1-10 million Euros

Please indicate the extent to which you agree or disagree with the individual statements on this page for the following action:

Q3.7.1 [Effectiveness_Public] *The measure will contribute effectively to the promotion of healthier diets in the population*.

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.7.2 [Coerciveness_Public] *The measure will restrict freedom of choice*.

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.7.3 [Fairness_Public] *The measure is unfair to low-income people.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.7.4. [Majority_Public] *A majority of citizens would agree to the implementation of this policy.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.7.5 [Support_Public] To what extent do you personally support or oppose this measure?

- ❑ Strongly oppose
- ❑ Oppose
- ❑ Slightly oppose
- ❑ Neither support nor oppose
- ❑ Slightly support
- ❑ Support
- ❑ Strongly support

Timing Mark

Page Break

Action plan to promote tap water consumption.

The government could introduce measures to promote tap water consumption, including requiring food service establishments to provide tap water free of charge or for a small service fee, offering free tap water in workplace cafeterias and canteens, and promoting tap water consumption in schools and kindergartens.

Expected government spending: 500 million euros

Please indicate the extent to which you agree or disagree with the individual statements on this page for the following action:

Q3.8.1 [Effectiveness_Water] *The measure will contribute effectively to the promotion of healthier diets among the population.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree

- ❑ Totally agree

Q3.8.2 [Coerciveness_Water] *The measure will limit freedom of choice.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.8.3 [Fairness_Water] *The measure is unfair to people with low incomes.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.8.4. [Majority_Water] *A majority of citizens would agree to the implementation of this policy.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q3.8.5 [Support_Water] To what extent do you personally support or oppose this measure?

- ❑ Strongly oppose
- ❑ Oppose
- ❑ Slightly oppose
- ❑ Neither support nor oppose
- ❑ Slightly support
- ❑ Support
- ❑ Strongly support

Q3.9 [Attention_screen] Which of the following measures did you read NOTHING about in this section?

- ❑ Tax on sugary drinks
- ❑ Reformulation of Salt Content in Packaged Foods
- ❑ Nutrition education in schools

Timing Mark

Page Break

Section 4: Choice Experiment Introduction

Q4.1 [Choice_Experiment]

Policymakers are currently considering which of the measures you just read about should be included in an overall package to promote healthy eating in Germany and which should not.

We will now ask you to evaluate different sets of measures in a series of five tasks. For each task, we will show you two proposed sets of measures side by side: "Package A" and "Package B". A "☑" next to an action indicates that it is included in the package.

For each of the five tasks, please carefully look at the packages of measures, compare them and answer the corresponding questions.

Timing Mark

Page Break

Section 5: Choice Experiment

Note: This is an example of a selection task. Each participant will answer a series of 8 choices, including the follow-up questions listed here.

Q5.1 [CT1.1]

	Policy package A	Policy package B
Increase in Value Added Tax (VAT) on unhealthy foods		☑
Reduction of Value Added Tax (VAT) on healthy food		
Tax on sugary drinks	☑	
Binding quality standards for daycare and school catering.	☑	
Mandatory nutritional standards for other public institutions.		☑
Action plan to promote tap water consumption	☑	
Nutrition education in schools.		☑

Q5.2 [CT1.2] To what extent do you personally support policy package A?

- ❑ Strongly oppose
- ❑ Oppose
- ❑ Slightly oppose
- ❑ Neither support nor oppose

- ❑ Slightly support
- ❑ Support
- ❑ Strongly support

Q5.3 [CT1.3] To what extent do you personally support policy package B?

- ❑ Strongly oppose
- ❑ Oppose
- ❑ Slightly oppose
- ❑ Neither support nor oppose
- ❑ Slightly support
- ❑ Support
- ❑ Strongly support

Q5.4 [CT1.4] Which policy package do you prefer?

- ❑ Policy package A
- ❑ Policy package B

Q5.5 [CT1.5] Now imagine that you had the choice between policy package [A/B] or one single individual policy included within the package. What would you prefer?

- ❑ Policy package [A/B]
- ❑ An individual policy within policy package [A/B]

Q5.6 [CT1.6] Which individual measure within package [A/B] do you most prefer? [Depending on the answer to the question "A single measure within the package of measures [A/B]" in the previous question]

- ❑ Tax on sugary drinks
- ❑ Binding quality standards for daycare and school catering.
- ❑ Action plan to promote tap water consumption
- ❑ Nutrition education in schools.
- ❑ Mandatory nutritional standards for other public institutions.
- ❑ Increase in VAT on unhealthy food
- ❑ Reduction of VAT on healthy food

Q5.7 [Attention_screen_2] What consumer behaviour is being sought to change by the policies described above?

- ❑ Eating habits
- ❑ Energy consumption in households
- ❑ Use of the car

Q5.8 [Ideal_Package] You have completed the section on the evaluation of the packages of measures.

Now imagine that you could put together your ideal package of measures from the seven measures that politicians in Germany are currently considering.

Please indicate which measures you would include in your ideal package of measures by dragging the measures into the box below.

Note: You can select as many or as few actions for the package as you want. The order in which you place the policy measures in the ideal package does not matter.

- ❑ Sugary drinks tax
- ❑ Mandatory nutrition standards in kindergartens and schools
- ❑ Mandatory nutrition standards in other public institutions
- ❑ Action plan to promote tap water consumption
- ❑ Nutrition education in schools.
- ❑ Increase VAT on unhealthy food
- ❑ Decrease VAT on healthy food

Your ideal package of measures

Section 6: Mode of Action – Topic Beliefs

For each of the following statements, please indicate the extent to which you agree or disagree.

Q7.1 [Awareness] *The high consumption of unhealthy foods and beverages causes serious problems for society.*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q7.2 [Legitimacy] *It is legitimate to establish collective rules for the consumption of unhealthy foods and beverages*

- ❑ Strongly disagree
- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Q7.3 [Social_Norm] *It is generally accepted that the consumption of unhealthy foods and beverages should be reduced*

- ❑ Strongly disagree

- ❑ Disagree
- ❑ I neither agree nor disagree
- ❑ Agree
- ❑ Totally agree

Section 7: Co-Variates

Q8.1 [Height] How tall are you (in centimeters)?

_ _ [*Open box]*

Timing Mark

Page Break

Q8.2 [Employment] Which statement best describes your employment status?

- ❑ Full-time employment
- ❑ Part-time employment
- ❑ Temporarily Exempt
- ❑ Unemployed
- ❑ Pensioner
- ❑ Housewife/husband
- ❑ Permanently unable to work
- ❑ Student
- ❑ Other

Timing Mark

Page Break

Q8.3 [Weight] How much do you weigh (in kilograms)?

_ _ [*Open box]*

Timing Mark

Page Break

Q8.4 [Region] Please select the state in which you currently reside:

- ❑ Baden-Württemberg
- ❑ Bavaria
- ❑ Berlin
- ❑ Brandenburg
- ❑ Bremen
- ❑ Hamburg
- ❑ Hesse
- ❑ Mecklenburg-Western Pomerania

- ❑ Lower Saxony
- ❑ North Rhine-Westphalia
- ❑ Rhineland-Palatinate
- ❑ Saarland
- ❑ Saxony
- ❑ Saxony-Anhalt
- ❑ Schleswig-Holstein
- ❑ Thuringia

Timing Mark

Page Break

Q8.5 [Parental_Status] Are you the parent of a child under the age of 18?

- ❑ Yes
- ❑ No

Timing Mark

Page Break

Q8.6 [Nutrition_related disease] Have you ever been told by a doctor that you have any of the following diseases?

	Yes	No	I don't want to say
Hypertension			
High cholesterol			
Heart disease			
Diabetes			

Timing Mark

Page Break

Q8.7 [Political_leaning] Political issues are referred to as "left" and "right". How would you rate your own views on a scale from left (1) to right (10)?

Timing Mark

Page Break

Q8.8 [Party_affiliation] Do you consider yourself a supporter of a particular political party, or is there one party you feel closer to than another?

- ❑ Yes
- ❑ No
- ❑ I don't know

Timing Mark

Page Break

Q8.9 [Party_identification] Which party is this?

- ❑ CDU - Christian Democratic Union of Germany
- ❑ CSU – Christian Social Union in Bavaria
- ❑ SPD – Social Democratic Party of Germany
- ❑ FDP – Free Democratic Party
- ❑ Greens - Alliance 90 / The Greens
- ❑ - The Linke – Linkspartei
- ❑ AfD – Alternative for Germany
- ❑ Other party (please specify) *[Open]*

CHAPTER 2. DESIGNING POLITICALLY FEASIBLE POLICY 'PACKAGES' TO COMPREHENSIVELY IMPROVE FOOD ENVIRONMENTS

2.2

How can advocates leverage power to advance comprehensive regulation on ultra-processed foods? Learning from advocate experience in Argentina

Authors: Simone Wahnschafft[a], Achim Spiller[b], Andrea Graciano[c]

b. Research Training Group in Sustainable Food Systems, University of Göttingen, Heinrich-Düker-Weg 12, 37073 Göttingen, Germany
c. Marketing for Food and Agricultural Products, Department of Agricultural Economics and Rural Development, Georg-August-Universität Göttingen, Platz der Göttinger Sieben 5, 37073 Göttingen, Germany, ORCID: 0000-0002-1367-4528
d. Free Chair of Food Sovereignty, School of Nutrition of the Faculty of Medical Sciences at the University of Buenos Aires, Marcelo Torcuato de Alvear 2202, Buenos Aires, Argentina

This article has been published in this form in ***Globalization and Health*** and can be cited as follows:

Wahnschafft, S., Spiller, A., & Graciano B.A. How can advocates leverage power to advance comprehensive regulation on ultra-processed foods? Learning from advocate experience in Argentina. *Globalization and Health* 20, 68 (2024). https://doi.org/10.1186/s12992-024-01069-1

Declarations

Author Contributions: Simone Wahnschafft: Conceptualization, methodology, data collection, data analysis (lead), writing-original draft, review and editing; Achim Spiller: supervision; Andrea Graciano: data analysis (support), reviewing and editing.

Financial Support: The authors gratefully acknowledge the financial support of the German Research Foundation (DFG) through the Sustainable Food Systems Research Training Group (RTG 2654). The DFG had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Ethical Standards Disclosure: All participants provided informed consent to participate in the study. Ethical approval for this work was obtained from the Ethics Committee at Georg-August-Universität Göttingen (21.11.2022). Consent for use of data from interviews conducted has been obtained from all research participants.

Conflict of Interest: None

Acknowledgements: The authors gratefully acknowledge Oscar Cabrera and Valentina Castagnari of the Global Center for Legal Innovation on Food Environments at Georgetown University for their guidance on the conceptualization of the project, and Patricia Aguirre, Lorena Allemandi, and Carolina Delgado for their guidance and support during the fieldwork phase of the project.

Data Availability: The datasets generated and/or analyzed during the current study are not publicly available due to them containing information that could compromise research participant privacy/consent, but are available, with restrictions applied, from the corresponding author on reasonable request.

Abstract

Background: The use of corporate power to undermine public health policy processes is increasingly well understood; however, relatively little scholarship examines how advocates can leverage power to promote the successful adoption of public health policies. The objective of this paper is to explore how advocates leveraged three forms of power – structural, instrumental and discursive – to promote the passage of the Promotion of Healthy Eating Law (Ley 27,642) in Argentina, one of the most comprehensive policies to introduce mandatory front-of-package (FOP) warning labels and regulate the marketing and sales of ultra-processed foods (UPFs) adopted to date.

Methods: We conducted seventeen semi-structured interviews with advocates from different sectors, including civil society, international agencies, and government. Both data collection and analysis were guided by Milsom's conceptual framework for analyzing power in public health policymaking, and the data was analyzed using hybrid deductive and inductive thematic analysis.

Results: Advocates harnessed structural power through the leveraging of revolving doors, informal alliances, and formal coalitions, enabling them to convene discussion spaces with decision-makers, make strategic use of limited resources, and cultivate the diverse expertise (e.g., research, nutrition science, advocacy, law, political science, activism and communications) needed to support the law through different phases of the policy process. Advocates wielded instrumental power through amassing an armada of localized evidence to promote robust policy design, building technical literacy amongst themselves and decision-makers, and exposing conflicts of interest to harness public pressure. Adopting a rights-based discourse, including of children and adolescents and of consumers to transparent information, enabled advocates to foster a favorable perception of the law amongst both decision-makers and the public. Key contextual enablers include a political window of opportunity, the COVID-19 pandemic, and the ability to learn from the regional precedent of similar policies.

Conclusions: Public health policymaking, particularly when encroaching upon corporate interests, is characterized by stark imbalances of power that hinder policy decisions. The strategies identified in the case of Argentina provide important insights as to how advocates might harness and exercise structural, instrumental, and discursive power to counter corporate influence and promote the successful adoption of comprehensive UPF regulation.

Introduction

Since their emergence in the mid-20th century, ultra-processed foods (UPFs) have rapidly taken center stage in changing dietary patterns around the world. Including such products as packaged sweet and savory snacks and sugary drinks, UPFs are generally energy dense, high in dietary components with health-harming effects (e.g., sodium, sugar, saturated fats, and trans-fatty acids), and laden with cosmetic food additives and/or other industrial ingredients, many with unknown health effects [1]. In some high-income countries (HICs), UPFs already account for 50-60% of daily energy intake, and low- and middle-income countries (LMICs) are following suit [2]. In fact, annual sales growth of UPFs in middle-income countries (MICs) already far surpass that of HICs [3] and sales volume are anticipated to reach HIC levels by 2024 [4]. Chronic consumption of UPFs is associated with higher risk for a suite of chronic diseases, including obesity, cardiovascular disease, cancer, type II diabetes, asthma, and depression [5]. The agro-industrial complex needed to support the cultivation of basic ingredients, manufacturing and mass distribution of UPFs, increasingly at the expense of traditional, minimally processed foods, contributes to a host of adverse environmental outcomes, such as land degradation, climate change, and agrobiodiversity loss [6, 7].

For the past two decades, scholars have sought to identify explanations for shifting dietary patterns and the consequent burden of chronic disease. For example, the ‘nutrition transition’ emerged in the early 2000s as a prevailing model to explain shifts from traditional dietary patterns towards ‘Western’ diets characterized by high UPF consumption, pointing

to variables like economic development, modernization, urbanization, and increased wealth as drivers of the transition [8, 9]. More recently, scholars have stressed the importance of adopting a political economy approach, placing actors and the power relationships between them at the heart of analysis, to examine how power has been consolidated amongst national and transnational food and beverage companies to favor the widespread availability, affordability and accessibility of UPFs [10, 11, 12]. Such analyses have pointed to factors such as trade and investment liberalization [13, 14], increasing market concentration [15], and the rise of hybrid food governance arrangements, such as public-private partnerships [16, 17], as key drivers of corporate power in food governance. This consolidation of power is not unique to food: in 2018, of the world's largest economies, 29 were countries and 71 were corporations [18]. The commercial determinants of health (CDoH) have emerged as an increasingly prominent area of research and discourse to call attention to this formidable influence corporations now wield in shaping health outcomes [19].

This emerging body of literature on corporate power in food governance has also increasingly been called upon to explain why, despite calls to action on the need for regulatory approaches [20], and guidance on policies needed to ameliorate unhealthy food environments characterized by widespread UPFs [21, 22, 23, 24], policy responses to date have been glaringly inadequate [12]. Indeed, country governments to date have predominantly favored the adoption of interventions targeting individual behavior change, such as education (75% of countries) and media campaigns (61%) over regulatory actions on UPFs, such as front-of-pack (FOP) labelling schemes (25%), and restrictions on child-directed marketing (31%) [25]. Corporate political activity (CPA), referring to industry efforts to influence public policy, research and practice, plays a major role in preventing, weakening, or delaying regulatory approaches for improving food environments [26]. Researchers have increasingly sought to catalogue and monitor CPA in policy processes to regulate UPFs [27], as well as on other health-harming commodities like breastmilk substitutes [28] and alcohol [29], around the world [30, 31, 32].

Despite pervasive challenges to regulate UPF consumption in the face of contemporary corporate power dynamics, a small precedent of success has been set by a handful of countries in the adoption of UPF regulatory policies. Most of these countries are in Latin America, where UPF consumption has grown exponentially in the 21st century [33], alongside the prevalence of diet-related disease morbidity and mortality [34]. In 2016, Chile became the first country worldwide to jointly introduce a package of three policy measures to address unhealthy food environments: (1) mandatory FOP warning labels on UPFs, (2) restrictions on child-directed marketing of UPFs, and (3) a ban on UPF sales in schools [35]. This approach to bundle, or package, several policy measures into one intervention aligns with international guidance to comprehensively address multiple drivers of unhealthy food environments [22, 23]. Other countries in the region have since followed suit to adopt similar policies, though with quite variable outcomes in terms of policy design (e.g., type of FOP label, types of food marketing restricted), stringency (e.g., nutrient profile model specifications), and comprehensiveness of policies adopted (i.e., FOP labels packaged with additional measures or labels alone) [36]. CPA to prevent, delay, or weaken regulatory action has been well-documented as a major challenge through these policy processes, including in Chile [37], Colombia [38], Mexico [39], Uruguay [40], and Brazil [41].

While a growing scholarship has been dedicated to de-mystifying the ins and outs of how CPA – or the 'corporate playbook' – is used to protect industry interests and stymie public health policy, comparatively little scholarship has been devoted to examining how public health advocates can counter this activity and successfully promote the adoption of public health regulatory policies. Those studies that have been conducted predominantly examine the role and strategies of advocates, particularly within civil society, to counter industry interference and advance regulation in the realm of tobacco control [42, 43, 44, 45, 46, 47], as well as sugary drink taxes [48, 49, 50, 51, 52], and health-harming commodities more broadly [53, 54, 55]. A small body of studies were identified that sought to learn from the experience of advocates in UPF regulation in Latin America to date, including in Chile [35,

56], Mexico [56], Brazil [56], Uruguay [40], and Peru [57]. However, only a few of these studies [50, 52, 53, 57] directly engage with concepts and/or empirical analyses of power in these policy processes. Power analysis is an important tool to build a nuanced understanding of how and why the strategies employed by different stakeholders to further their interests do (or do not) result in desired outcomes [58]. Empirical analyses of power in real-world policy experiences have been identified as a key gap in research in public health governance [59, 60], and are sorely needed to develop a 'public health playbook' of strategies to counter and proactively minimize corporate influence [61]. The aim of this paper therefore is to examine how advocates were able to exercise power to promote the recent adoption of the food environment policy package, the Promotion of Healthy Eating Law (Ley 27,642), in Argentina. The remainder of this section provides an overview of key concepts and trends in UPF regulation, as well as an overview of the Argentinian regulation, before delving into the methods.

Regulating Ultra-Processed Foods: Key Concepts and Trends

Though the concept first emerged in the 1980s [62], the term 'ultra-processed foods' began to rise to prominence in 2009 with the emergence of the NOVA classification, a system that categorizes food products across four different levels (e.g., (1) unprocessed or minimally processed foods, (2) processed culinary ingredients, (3) processed foods, and (4) ultra-processed foods) according to the type, intensity, and purpose of food processing [63]. Within this system, UPFs refer to those foods with the highest level of processing, I.e., those that have 'undergone intense industrial physical, chemical, or biological processes (e.g., hydrogenation, moulding, extruding, preprocessing by frying) or that contains industrial substances not usually found in domestic kitchens (eg, maltodextrin, hydrogenated oils, or modified starches), cosmetic additives (eg, dyes, emulsifiers, artificial sweeteners), or flavouring agents' [63],[64].

While the most prominently used definition of UPFs hinges on the level of processing, several countries have begun to move forward on UPF regulation using a 'nutrient based' approach rather than one based on the level of processing. That is to say that these policies aim to regulate the labelling, marketing, and sales of UPFs based on their level of 'critical nutrients,' such as calories, added sugars, sodium, saturated fats, and trans fats. This approach continues to be subject to debate, as the nutrient-based approach to regulation generally does not take into account several components of UPFs with detrimental effects on health that are related to the degree of processing, such as artificial sweeteners, colorants, preservatives, thickeners, and emulsifiers [64].

This nutrient-based approach underpins the UPF regulatory approaches that have emerged in several countries in Latin America over the past decade, particularly with the adoption of mandatory FOP warning labels and accompanying marketing and sales restrictions that began in Chile and that have since been adopted in Peru, Uruguay, Mexico, Colombia, and Venezuela [36]. While these policies follow a similar general approach, they are characterized by important nuances in policy design that enable some to be considered more robust than others from a regulatory perspective.

First, with regard to FOP labelling schemes, these nuances include aspects such as the mandated size of the label and the use of contrasting background devices to improve the salience of the label on product packaging [36]. Which nutrients are to be labelled is also a key issue, with some countries expanding beyond the scope of those nutrients such as sugars, sodium, and fats to also label colorants and caffeine [36]. Another important aspect is the phrasing of the warning label itself, with some countries moving towards the use of the stronger "excess in" rather than "high in" phrasing [36]. The nutrient profile model (NPM) used to define the threshold of the label is also critical, with the NPM developed by the Pan-American Health Organization (PAHO) [65] considered to be best practice for the region of the Americas [36]. Finally, with regard to those measures that accompany FOP labels, important differences are present in the scope of marketing restrictions, with some

countries moving beyond those focused solely on child-directed marketing to also include restrictions on health or nutrition claims, endorsements, and other persuasive elements for products with warning labels [36]. These nuances are further explored in the following section, which lays out the key tenets achieved in the Argentinian regulation, as well as how they compare to other regulatory precedents in the region.

The Promotion of Healthy Eating Law

In keeping with regional trends, sales and consumption of UPFs in Argentina have increased throughout the 21st century, now constituting nearly 26% of daily energy intake [66]. The Promotion of Healthy Eating Law (Ley 27,642) [67], also commonly referred to as the 'front-of-package nutrition labelling law' (ley de etiquetado frontal) was adopted in 2021 to regulate the labelling, marketing, and sale of UPFs. Since its passage, the law has been deemed to be one of the strongest and most comprehensive food policy laws globally due to several aspects of the policy design, expanded upon below [68].

First, the FOP labelling system adopted follows the latest regional guidance [69] and nationally generated evidence [70, 71, 72, 73, 74] on the most effective design for decreasing UPF consumption. Specifically, the law includes the mandatory introduction of black octagonal warning labels, which are to be added to the front of UPFs deemed in "excess" of sugars, total fats, saturated fats, sodium, and/or calories, taking the phrasing of the labels further than those of several others in the region, including Chile, Colombia and Peru [36]. In addition, the labelling system adopted by the law includes two pre-cautionary labels related to the presence of caffeine and sweeteners in UPFs to be avoided in children and prohibits the use of health claims on products containing at least one warning label, both of which are otherwise only addressed in UPF regulation in Mexico [36]. The Argentinian regulation has also been identified as the strongest in the region with regard to the mandated size of the warning labels on product packaging, meeting the PAHO recommendation that all labels together should occupy at least 30% of the main product display panel [36, 69] Finally, the adoption of PAHO's NPM as the basis of the warning labels in Argentina can be regarded as a critical success, which has otherwise only been achieved in Mexico [36]. Other

countries in the region, including Uruguay, Peru, and Venezuela, sought to adopt the PAHO NPM, but ultimately adopted less stringent systems [36, 40].

Another strength of the policy is the presence and scope of accompanying measures included in the policy package related to marketing, namely the prohibition of advertising, marketing, and sponsorship of all products with at least one warning label towards children and adolescents, including the use of children's characters, cartoons, celebrities, athletes, influencers and more. These restrictions apply both to product packaging and advertising in traditional and digital media. Finally, the law stands out for the comprehensiveness of included measures directed towards improving food environments. For instance, the law prohibits the sale, offering, and marketing of products with at least one warning label on school premises and introduces mandatory nutrition education at all levels of education. Public procurement, such as that which would affect social support programs, is also affected by the law, obligating the prioritization of products without warning labels when comparing procurement offers.

There are also several notable aspects of the law related to the policy process itself that distinguish it as a robust policy case. For example, the fact that UPF regulation in Argentina was ultimately adopted through the Legislative branch in the form of a law, rather than the Executive branch in the form of a decree, is important, as it offers the policy a greater degree of protection from changing political forces. This can be distinguished from, for instance, the labelling policy adopted in Uruguay, which was adopted as a decree through the Executive branch and became subject to several changes throughout the policy adoption process that eroded the scope of the initial proposal [40]. The Argentinian case is also notable for the degree of support with which it was passed through both chambers of the National Congress: first in the Senate (64 votes in favor, 3 votes against, 0 abstentions) and then the Chamber of Deputies (220 votes in favor, 22 votes against, 16 abstentions). This degree of support is notable in a country where industry holds high financial and political power. Agriculture and agro-industry together constitute one of the most importance industries in Argentina, accounting for an estimated 8% of GDP, 20% of employment and 54% of exports [75]. In addition, food and beverage processing accounts for over half of agro-

industrial production [75]. Sugar is also an important agricultural product, particularly in the northwest provinces of Salta, Jujuy, and Tucumán, where politicians have previously leveraged their power to prevent the introduction of regulatory policies, such as a sugary drinks tax [76]. A final notable facet regarding the politics of UPF regulation in Argentina is that of trade, as Argentina is a member of the Southern Common Market (MERCOSUR), a regional trade agreement between Argentina, Brazil, Uruguay and Paraguay. Argentina's membership in MERCOSUR is relevant in the context of a growing literature on the role of trade agreements in hindering regulation of health-harming commodities [77, 78, 79, 80, 81, 82] and emerging evidence on the strategy used by food industry actors to insist on harmonization of FOP labelling policies at the regional level in order to hinder advancement on national front-of-package labelling policies in the bloc [40, 41].

Methods

Conceptual Framework

We utilized Milsom's conceptual framework for analyzing power in public health policymaking [80] to guide the conduct and analysis of in-depth, semi-structured interviews with identified advocates of the law leading up to its adoption in 2021. Drawing upon a synthesis of existing political economy and power frameworks –most notably Fuchs and Lederer's framework on business power in global governance [83], Lukes' Three Dimensions of Power [84], the 'Three Is' framework [85],[86],[87],[88], and Gaventa's power cube [89] – this framework details how actors can harness power to either successfully promote health policy decisions or hinder them, delineating three key forms of power that actors can exercise: instrumental, structural and discursive (see *Figure 1*).

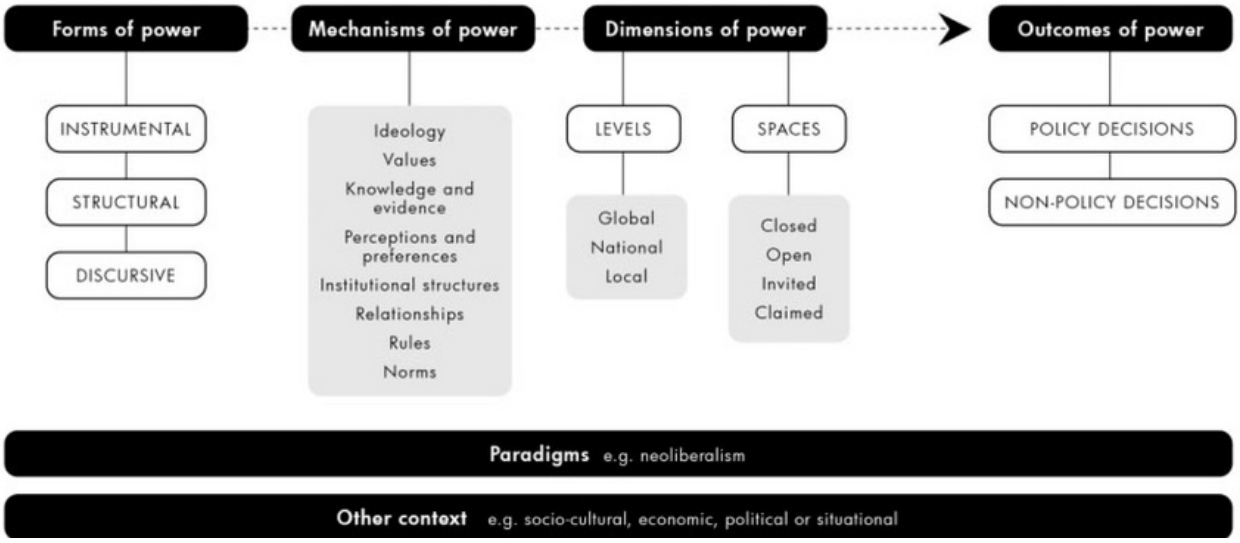


Figure 1. Conceptual framework for analyzing power in public health policymaking.

The former, which is usually the most visible, refers to direct influence actors can exercise to advance their interests through their actions. The latter two forms are generally more hidden, with structural power encompassing aspects like agenda-setting and rule-setting power, as well as the capacity to secure a 'seat at the table' in decision-making spaces. Finally, discursive power refers predominantly to how actors influence the way in which issues are discussed (e.g., framing) in decision-making spaces. These forms of power can be exercised through several mechanisms, such as existing institutional structures, the use of knowledge and evidence, and the cultivation of relationships, and can be exercised across different dimensions, including at local, national or global levels, and in spaces that are either closed, open, invited or claimed. These aspects sit within political, economic, socio-cultural or situational contexts that either hinder or enable the exercise of power. Milsom and colleagues recently applied this framework to examine how corporations exercise power through the international trade regime to hinder policy decision-making on UPFs [80, 81, 82]. In this paper, we turn rather to the context of a successful policy decision (I.e., policy adoption) to examine, from their own perspective, how advocates were able to leverage power to advance the passage of the Promotion of Healthy Eating Law (Ley 27,642).

Identifying Policy Advocates

We used three types of documents to identify policy advocates for interviews: media articles, press releases, and grey literature (I.e., reports). We devised the following set of search terms to identify and collate these documents: 'etiquetado frontal,' 'rotulado', 'promoción de alimentación saludable,' 'restricción de la comercialización'. First, we applied these terms to a systematic search of nine media outlets that represent a range of political leanings from left-wing to conservative, as identified from the BBC media guide in Argentina [90] (see *Supplementary Materials, Table A1*). Then, through an initial screening of these documents, we identified websites of stakeholder organizations that were identified as working to advance the law through the policy process, which we searched with the same terms for press releases and grey literature relevant to the analysis (see *Supplementary Materials, Table A2*). We then screened all sources identified using the search terms to ensure they met the following inclusion criteria: (1) focused on Ley 27,642 or reference to agenda-setting on policy measures ultimately included in the law in Argentina (I.e., FOP labelling, marketing restrictions, and/or improving school food environments); (2) included a description of policy process milestone(s) (e.g., meetings held, stakeholders involved, actions and decisions taken, industry arguments and counter-arguments, etc.); (3) were published in English or Spanish; and (4) were published up until the adoption of the law in 2021 (see *Supplementary Materials, Table A3*). We then used these sources to construct a database of relevant organizations and individuals who were highlighted as advocates of the policy, subsequently inviting a first set of advocates from civil society to participate in the study by email. Email outreach included a description of the project aims, a document with additional information for participants, and a copy of the consent form. These outreach materials were reviewed and approved, alongside the interview guide, by the Ethics Committee at Georg-August-Universität Göttingen prior to data collection. This phase of the research was also used to construct an overview of key stakeholders and milestones in the policy process, both of which are available in the *Supplementary Materials (Table A4, Table A5*).

Conducting Interviews

We conducted seventeen policy advocate interviews, including stakeholders with roles across civil society, academia, international development agencies, and both the Executive and Legislative branches of government (see *Table 1)*. While we conducted our initial outreach to civil society stakeholders, we decided not to limit our definition of 'advocate' to civil society stakeholders alone, but rather to allow participants to define who would be important stakeholders to speak to who fit this description. We accomplished this by way of snowball sampling, as each participant was asked at the end of the interview to identify additional advocates they would recommend be included in the study. We followed recently published guidance on the principle of determining sample size for saturation (I.e., the point at which little or no relevant new codes and/or categories are to be found in data) a priori in qualitative research, which is identified as 9-17 interviews for studies with homogenous populations and narrow research objectives, as in this case [91]. In addition, we ensured that we continued with interviews until we continued to hear the same names recommended and no new themes emerged during interviews. Based on indicated participant preferences, interviews were conducted either directly in English, or in Spanish with the support of simultaneous interpretation. Apart from one interview conducted with two policy advocates simultaneously, participants were interviewed alone. Interviews were conducted in person in Buenos Aires or online using teleconferencing, again depending on participant preference. Participants were required to provide informed consent that they agreed to have the interview recorded. Recordings were transcribed in the original language of the participant's interview and, in the case of Spanish transcriptions, translated into English with the support of a professional translation service in Argentina.

Table 1. Number and type of policy advocates interviewed

Stakeholder Type*	Number of policy advocates
Civil society	6
Professional nutrition organization	3
Academia	1
International development agency	2
Executive branch (Ministry of Health)	2
Legislative branch (Advisor, Legislator)	3

	Total	**17**

*Refers to identified main role during the policy process, not necessarily current role

Informed by Milsom's conceptual framework, the interview guide first prompted participants to reflect on both the perceived challenges and key strategies to their work in advocating for the law. This line of questioning often brought participants naturally to the topic of grappling with corporate influence; however, if not, this topic was then broached with direct questions on perceived power asymmetries and intervention points upon CPA. Participants were also asked to reflect on lessons learned from the policy process and contextual factors they believed enabled the law to advance. See *Supplementary Materials, Annex 2* for the interview guide.

Analyzing Data

The interview transcripts were analyzed using thematic analysis, following a hybrid deductive and inductive approach [92, 93]. First, the primary researcher (S.W.) developed a codebook based on Milsom's conceptual framework, applying it to the analysis of the interview transcripts in MAXQDA software. Throughout this process, additional codes were developed inductively to capture key themes, including advocate challenges, strategies, lessons learned, contextual enablers, and reflections on power and outcomes through the policy process. Then, a second researcher (A.G.) coded two of the transcripts using both the deductive and inductive codes, which were then reviewed by both researchers to resolve any discrepancies in coding. Following an overview of the policy process, the findings are organized according to the three forms of power of Milsom's conceptual framework, with relevant information related to the mechanisms and dimensions of power integrated throughout each of the three sections. Additional sections on contextual enablers and reflections on outcomes of the policy process are also included. Some data sourced from the document review is integrated throughout the results to provide additional context to the analysis of the interview data.

Results

Overview of the Policy Process

Proposals on FOP warning labelling in Argentina began to emerge in 2016 [94], the same year in which Chile officially implemented its law on food labelling and advertising (Ley 20,606) and PAHO published its NPM to define limits for critical nutrients in UPFs. One advocate on the ramifications of the NPM in Argentina:

"It's a very small book that was very revolutionary. In the sense that it paved the way, in all countries, to regulate. That is the main precedent." [Advocate, International Development Agency]

As the topic began to gain momentum in Argentina, two parallel approaches emerged to move forward on FOP labelling: one through the Executive branch and the other through the Legislative branch. The former was developed through the convening of an inter-ministerial working group beginning in 2018, led by the Ministry of Health and in partnership with the Ministry of Agriculture, Livestock and Fisheries and the Ministry of Productive Development. This inter-ministerial initiative emphasized the need to work with stakeholders from different sectors throughout the development of the proposal, including civil society, academia, professional nutrition organizations, and the food and beverage industry [95]. This initiative also sought to advance on labelling through changes agreed upon both within the National Food Commission (CONAL), which oversees the implementation of the Argentine Food Code, and with other members of MERCOSUR [96]. Following several changes to the proposal made between 2018-2020, in part due to a change in the government administration in 2019, the Executive branch reached a finalized proposal, which it presented in meetings with both CONAL [97] and MERCOSUR [98] around the same time that the bill began to be debated in the National Congress.

The latter approach, which was ultimately passed into law, was a bill proposed in the Senate in early October 2020. This bill was reached through a negotiation process that unified 15

different bills drafted by legislators from different political parties in the years preceding to address unhealthy food environments [99]. Upon receiving a positive opinion from the internal commissions of Health and of Industry, the bill was swiftly given half sanction by the Senate later the same month, promptly moving to the Chamber of Deputies for consideration by relevant internal commissions. The bill was then assigned to be debated by six commissions, though this was later reduced to four: General Legislation; Social Action and Public Health; Consumer Defense User and Competition; and Industry. Almost a year after the half-sanction in the Senate, and following the positive opinion given by the four commissions in July, the bill was passed into law by the Chamber of Deputies in October 2021.

Contextual Enablers

Advocates pointed to several contextual factors that shaped the successful adoption of the law. First, the COVID-19 pandemic opened a window of opportunity by elevating the protection of public health as a priority value both amongst the public and decision-makers, as well as the legitimacy of the public sector as an entity to intervene upon the private sector:

"…the state was recognized, at the moment, as an actor that could guarantee our health; so, it was also related to this bill. If we let the market act independently and autonomously, all factories would be open, all enterprises would be open, and the virus would have spread more and increased the rate of deaths and everything. And people were scared at the time, so the state was seen as a positive influence in society, which has changed now." [Advocate, Advisor to Legislator]

The COVID-19 pandemic, particularly during the lockdown that characterized the debate of the law in the Senate, was also identified as an important factor that shifted access to discussion spaces with decision-makers throughout the process. For instance, one advocate in civil society noted that the shift to online communication helped their organization, which was newer and characterized by few resources, access discussion spaces where the law was being debated, as well as convene spaces to bring together advocates and legislators to discuss the topic. Another advocate highlighted that the virtual

nature of policymaking at this time may have also mitigated lobbying and heightened transparency in the early stages of the legislative process:

"…The legislators were at home, in their provinces. It was not possible for the industry to visit them in their offices. And there are things that are not going to be negotiated via Zoom…Personally, I think the pandemic helped make the committee's discussion transparent, it's posted on YouTube. There weren't any twists, lobbying, or at least it was less common, because people could not travel through the streets here. We had a very strict quarantine." [Advocate, International Development Agency]

In general, advocates noted that they were readily invited, alongside industry and other stakeholders, to participate in spaces that debated the policy in both the Executive and Legislative branches, enabling them to share data and arguments with decision-makers. The only notable exception related to discussions undertaken at the level of MERCOSUR.

Advocates also pointed to several political factors that shifted perceptions of the bill in Congress, including shortened ideological distances in Congress following the change in administration in 2019 and the fact that FOP labelling laws passed in other countries in the region were adopted by governments that came from similar ideological perspectives as the two major coalitions in Congress at the time. The latter lent the bill a degree of credibility as an innovative and politically viable measure:

"…the previous experience in other countries was helpful because they leaned more towards the center-right, Chile, for example; and my coalition, [Party A], also center-right, saw them as an inspiration. And if Chile was doing this, then it was a modern dynamic and innovative proposal and not some old-fashioned policy. But we also saw the experience in Uruguay, which is center-left, so [Party B] could learn from them too. So, we had this context." [Advocate, Advisor to Legislator]

Another political factor that enabled the law's successful passage was its bi-partisan support in Congress. This support was due in part to the fact that the bill that was ultimately

debated in Congress was reached through the negotiation process that unified previous bills drafted by legislators from different political parties in the years preceding. This political neutrality was also further reinforced by the fact that the unified bill was proposed by two Senators who came from the same province but each from a different political party that constituted the two main coalitions at the time.

"The fact that we managed to present a bill that was not affiliated to any political party is very important because it allowed us to receive support from both parties without any political divide." [Advocate, Civil Society]

Structural Power

Convening Spaces and Knowledge Exchange

As early momentum began to build on UPF regulation in Argentina, advocates were able to capitalize on growing attention to the topic to elevate it on the legislative agenda by organizing a series of conferences, beginning in 2016 and continuing through the legislative debate of the law [94, 100, 101, 102, 103], which convened stakeholders across civil society, the Executive branch (e.g., national ministries), the Legislative branch, academia, and professional nutrition organizations, amongst others. These spaces were convened via a partnership of international agencies, led by PAHO. A key activity facilitated by advocates throughout these meetings was to invite champions of UPF regulations passed in other countries in the region, beginning with representatives from Chile, and proceeding with those from Uruguay, Mexico and Peru. Inviting stakeholders to learn from regional precedents was not only advantageous for building political momentum, but for learning from previous experiences to foresee challenges, such as CPA, that would ensue as the proposal for regulation began to gain ground:

"It was like a regional training, not only were we debating this, but other countries as well; so, before Argentina, also other countries went along, Perú went along, Uruguay went along, then Mexico went along, and each country benefiting from the previous experience of other

countries. So, when we learned from the experience in Chile, we knew how the food industry would react, what their strategies would be…" [Advocate, Academia]

Revolving Doors

The ability to convene these spaces with decision-makers was enabled in part by existing relationships advocates held, some of which were cultivated through prior health policy processes, including tobacco control and regulation on sodium content in foods. Several participants pointed to the importance of 'revolving doors' in this respect, referring to the importance of seasoned advocates who either held multiple roles at one time or changed roles across sectors during the policy process, bringing their knowledge, expertise, and networks with them to new positions:

"We have the same people in different organizations, for instance, I mentioned three that I belong to, and you take this to the agenda of the organization." [Advocate, Academia]

Informal Alliances

Informal alliances were identified as key to overcoming roadblocks faced by any one organization or sector. This emerged, for instance, in the context of the tension between the Executive and Legislative proposals that were developing simultaneously in the years leading up to the official proposal of the bill in Congress. Both proponents and opponents sought to leverage these two institutional approaches to UPF regulation to their respective advantage to either promote or hinder the law from advancing. For example, the Coordinator of Food Product Industries (COPAL), an umbrella entity representing the interests of the food and beverage industry, supported the proposal furthered by the Executive branch rather than the bill. Advocates identified this as CPA, as the Executive proposal was inferior to the Legislative approach for several reasons, including higher susceptibility to shifts in political climate, lower alignment with best practice in both scope and stringency of proposed regulation, and the fact that pursuing a regional agreement with other members of MERCOSUR would significantly delay the process, as well as place the debate in an arena in which industry and trade interests were paramount. Indeed, stakeholders representing

industry interests often used their resources to disseminate the argument that Argentina was not allowed to regulate without agreement at the level of MERCOSUR to stifle support for the bill in Congress:

"…they started to say that we could not move forward with the law because it went against our integration within the MERCOSUR, even though legally it was not the case. But they still claimed this, which confused legislators." [Advocate, Advisor to Legislator]

Advocates leveraged structural power in the face of this challenge through informal alliances with advocates across different positions. Particularly for those advocates facing institutional constraints, such as those positioned within the Executive branch, the importance of informal alliances was key:

"…the best option was always the bill, and even then, we knew that a bill would not involve the Executive Branch we worked at. So, it was our priority to ally with the organizations that would work closely with deputies and senators to try and convince them to be in favor of this policy." [Advocate, Ministry of Health]

Within civil society, informal alliances also allowed advocates to collectively permeate spaces where misinformation was spread to decision-makers to undermine the bill. This was the case, for instance, for some conferences held by professional nutrition organizations with known conflicts of interest. As one advocate explained:

"…thankfully we were able to work together with other civil society organizations. Whenever one was not able to participate, the others would be there to support them. So, in certain meetings they would say: "Let's invite [Organization A] because they aren't as antagonistic as [Organization B]". But, thanks to our alliance with other organizations, we were always able to speak for each other, to empower each other." [Advocate, Professional Nutrition Organization]

<u>Coalition Building</u>

Formal alliances, in the form of coalitions [104, 105, 106] also helped advocates harness structural power through different stages of the policy process. For example, the resources developed by the National Coalition to Prevent Childhood Obesity [107], formed in 2017 with

support from UNICEF [108], lent a collective voice of legitimacy to the positions advocated by a handful of organizations working at the forefront of the process:

"...that was also a very important support because it is different to say to the legislature "[Organization A] has this policy brief", no, this policy brief is supported by more than 40 organizations representative from all the country. That is, well, the legislators paid a lot of attention." [Advocate, Civil Society]

During the legislative debate, formal coordination across civil society organizations also became an important strategy for building capacity both within and across organizations. This was particularly the case when five civil society organizations collectively secured a grant funded by Bloomberg Philanthropies and managed by the Global Health Advocacy Incubator (GHAI). With the support of the grant, these organizations were able to expand and diversify their own activities in support of the law, as well as to organize activities collectively. The latter was identified as a challenge by several advocates, as it required novel coordination across organizations with different reputations, approaches, and leadership structures; however, it was also noted as a key strategy to harness collective action and effectively counter corporate power:

"I mean, the inequality of arms was evident from the beginning: the industry has all the means for advertising, for paying nutritionists, to go in the media to demonize the law, and we had nothing. But this influx of money through GHAI to the organization allowed us to counteract that." [Advocate, Academia]

Instrumental Power

Wielding Evidence

The generation and dissemination of knowledge and evidence was one of the key activities advocates led to influence the policy process (see *Table 2* for a summary of key studies). For instance, a series of studies led by the research-oriented civil society organization, the Inter-American Heart Foundation (FIC) in 2015-2018 demonstrated the widespread exposure of children and adolescents to different forms of UPF marketing in Argentina [109, 110, 111], elevating the issue of the need for regulation. Along a similar vein, two studies conducted by

the Ministry of Health – the 4th National Survey of Risk Factors (2018) [112] and the 2nd National Survey of Nutrition and Health (2019) [113] - provided updated evidence on UPF consumption trends in Argentina and the burden of diet-related chronic disease to underscore the extent of the challenge in Argentina.

Table 2. Knowledge and evidence documents generated by policy advocates in Argentina

Document	Relevance to policy process	Year of publication	Author(s)*
- Food advertising aimed at boys and girls on Argentine TV	Examine prevalence of and exposure to UPF marketing amongst children and adolescents	2015	FIC
- Marketing techniques aimed at boys and girls in processed food packaging in Argentina		2017	
- Food advertising on Argentinean television: are ultra-processed foods in the lead?		2018	
- Exposure of boys, girls and adolescents to digital marketing of food and beverages in Argentina		2021	UNICEF
- 4th National Survey of Risk Factors	Examine the nutrition and prevalence of diet-related diseases and associated risk factors in the population	2018	MOH
- Argentina National Survey of Nutrition and Health, 2018-2019 (ENNyS 2)		2019	
- Sugary drinks in Argentina: burden of disease and impact of health interventions		2020	IECS
- Lessons learned from tobacco control: court decisions that ratify public health policies	Develop an understanding of the political and regulatory landscape	2020	FIC
- Front warning labelling bill: economic arguments that support it		2020	
- Regulatory mapping: front food labelling		2020	
- Front food labelling in Argentina and Brazil: legal barriers and facilitators		2020	FIC and IDEC
- Conflict of interest and interference of the food industry in the design of healthy eating policies		2020	Various
- Evaluation of the performance of the front of package warning labelling compared to other models in Argentina	Supporting evidence for effective policy design	2020	MOH
- Analysis of the level of concordance of nutrient profile systems with the Dietary Guidelines for the Argentine Population		2020	
- Evaluation of nutrient profile systems Nutritional for the definition of a front of package labelling policy in Argentina		2020	FIC
- Survey to evaluate the influence of three front of package labelling systems in the perception of		2021	

	healthiness and the purchase intention of certain products - Opinion survey on front labelling of warnings in food and drinks	

*FIC = Inter-American Heart Foundation; MOH = Ministry of Health; IECS = Institute of Clinical and Health Effectiveness; IDEC = Brazilian Institute for Consumer Protection; Various = published by the National Coalition to Prevent Obesity in Children and Adolescents representing a network of civil society organizations in Argentina

Generating evidence was also key to influencing the design of the regulation. As discussions in both the Executive and Legislative branches began to gain momentum, industry and associated stakeholders sought to influence the design of the proposed regulation in ways that would be more favorable to corporate interests, such as the type of FOP labelling scheme and the NPM to be adopted. In 2017, for example, COPAL released a proposal calling for the adoption of a label following the Guideline Daily Amount (GDA) model used in the United Kingdom [114], which has been demonstrated in studies to be less effective than warning labels in shaping consumer understanding, attitudes, and choices [69, 71]. Similarly, the industry argued for a NPM that defined excess nutrients on a 'per gram' basis [115], which would have made it easier for companies to evade the labels than with the PAHO NPM. To counter these instances of CPA in the policy process, advocates pointed to the importance of locally generated evidence demonstrating to support arguments for the proposed policy design:

"What was one of the arguments of the industry? "Okay, okay, how do we know that the, let's say, this front labelling with this black octagon, is the most effective for Argentina? Because this has been effective in Chile, but how do we know if it is effective in Argentina?" So, we have evidence, we have scientific evidence, but this scientific evidence has not been validated here." [Advocate, Academia]

As such, both the Ministry of Health and FIC conducted studies to compare the performance of different labelling schemes amongst the Argentine population [70, 71, 72], as well as to demonstrate that the proposed PAHO NPM was in the greatest accordance with the dietary guidelines for the Argentine population compared to other models [73, 74]. One participant

pointed to the importance of involving multiple organizations in the generation of evidence to support effective policy design:

"Another strategy was to work hand to hand with the Ministry of Health, and we agreed on what evidence we have to produce, at the same time, both of us: to have a study from the Ministry of Health that says that the octagon warning level was the best, and another study, that says the same, but from the Civil Society. So, it is not only the Civil Society that has this evidence, but the Ministry of Health, too. And the same with the nutrient profile system." [Advocate, Civil Society]

Building Technical Literacy

This tenet of instrumental power refers both to the building of technical literacy amongst advocates themselves and amongst decision-makers. Regarding the former, advocates synthesized knowledge on key aspects of the policy process, such as the legal and political landscape surrounding the law. For instance, advocates in civil society led a series of analyses on legal aspects that would influence the policy process, particularly through a collaborative regional study with other countries in MERCOSUR. This included a mapping of the national regulatory framework on FOP labelling [116], an analysis of legal barriers and facilitators to FOP labelling [117], and a report on legal lessons learned from the precedent of tobacco control [118]. Civil society advocates also worked to consolidate knowledge of the political landscape, such as by mapping decision-makers in Congress to understand their stances and guide targeted advocacy:

"One of our main strategies was to monitor and study the members of the Senate and the Chamber of Deputies; to identify how much power of decision they had within their commissions.... We also wanted to identify who our champions were going to be, also the ones who were never going to agree to this law, and the ones we could be able to sway in our favor. So, we mostly focused on those we could convince, and that's when we asked legislators to have meetings with them and their advisors." [Advocate, Civil Society]

Conducting targeted advocacy efforts, such as through one-on-one meetings with key legislators and/or their advisors, was used as a strategy to build technical literacy on the bill in Congress. This proved to be particularly important in the face of CPA that targeted technical aspects of the law. For example, resistance during the later phases of the legislative debate did not oppose the law itself, but rather focused on the need for 'modifications' to the text of the law, which, if heeded, would have stalled the passage of the bill. This was particularly the case with Article 6, which established the PAHO NPM as the foundation for the adoption of FOP warning labels and was highlighted by industry stakeholders as a system that would unfairly affect their products [119]. In this context, advocates described the importance of holding meetings with legislators to clarify key concepts:

"We talked to legislators and advisors; we explained why the bill was written the way it was written; that we must use PAHO's nutrient profile system; that the industry kept insisting on using a different profile system. You can base the law on unlimited profiles and the law would end up a mess. So, we explained to them the importance of each and every article of the law, that the law must be approved unchanged." [Advocate, Professional Nutrition Organization]

In addition, conducting targeted advocacy was identified as an important approach to advocacy in the context of unequal resources:

"....they [the industry] knew that they had to engage with all political actors, not just "some". On the other hand, NGOs and civil society have fewer resources, so they concentrated their relationships with key stakeholders." [Advocate, Advisor to Legislator]

<u>Exposing Conflicts of Interest and Harnessing Public Pressure</u>

Another key population that advocates sought to influence was the public, accomplished through the strategic use of communication channels. For example, advocates described using traditional and social media to expose industry tactics and encourage accountability of decision-makers, including 'naming and shaming' those who had conflicts of interest. Other identified strategies to harness public pressure included conducting communication

campaigns with national coverage in public spaces, radio, digital and print media, such as the, “Don’t let them cover your eyes,” (“Que no te tapen los ojos”) [120] campaign, and making use of a digital platform, ‘Activá el Congreso’ [121], which enabled individuals to write directly to legislators. The involvement of advocates who could more effectively reach the public, such as journalists, influencers, youth activist groups and celebrities, was vital to harnessing public pressure. Bringing the debate surrounding the law into the public domain was noted as a key strategy to counter imbalances of power through the policy process:

“…one more thing about this imbalance is that it is only possible to restore it if civil society plays a very aggressive role on the internet, in the media, employing certain communication strategies.…If the discussion had only taken place within the Chambers, we probably would have lost the case.” [Advocate, Legislator]

Leveraging public pressure proved particularly critical at junctures in the legislative debate where it seemed that the bill would not successfully advance due to interference. For example, following the half-sanction of the bill in the Senate, the bill was assigned for consideration by an unusually high number of commissions within the Chamber of Deputies [122], a strategy advocates identified as one motivated by conflicts of interest held by the President of the Chamber of Deputies to hinder the passage of the bill. One advocate on the importance of public pressure in overcoming this obstacle:

“that's when Civil Society launched campaigns on Twitter denouncing the number of committees that the bill was assigned to; that made [the President of the Chamber of Deputies], who in another context would not have changed his mind, feel singled out and decide to reduce the number of committees to three, although they finally ended up being four.” [Advocate, Legislator]

Once the commissions in the Chamber of Deputies issued a positive opinion on the bill, the final vote in the Chamber of Deputies remained as the final step to adopt the bill. Advocates described another instance at this point in the process where political factors almost

prevented the passage of the law, in which one of the two major political parties did not present with a quorum at the session in which the law was to be put to a vote, placing the bill at risk of losing parliamentary status if not approved before the end of the year [123]. Again, advocates pointed here to the importance of public pressure to overcome this obstacle:

"Another enabling factor appears when society starts to personally start caring about the law. This was very apparent when the Chamber of Deputies didn't reach a quorum on the bill… then began to circulate a very strong campaign in social media, where the public would call out these people and say, "How come they don't want to vote on a bill that involves the health of the people?". To me, that was a very compelling moment, I didn't know that the bill had affected society in this way." [Advocate, Professional Nutrition Organization]

Discursive Power

Generating Counterarguments

Over the course of roughly a year from when the bill was first proposed in 2020 to its passage in 2021, the topic of FOP labelling transformed from a relatively niche and technical topic predominantly discussed within institutional spaces, to one of great political and public interest, with its own hashtag (#EtiquetadoClaroYA) on social media. This transformation reflects a shift in the dominant discourse surrounding the implications of the law for society. Advocates worked to shape the discourse surrounding the law, which required that they be poised to counter a range of economic, technical, legal, and ethical arguments made by the industry and associated stakeholders throughout the policy process (see *Table 3 f*or a summary of key arguments and counterarguments).

Table 3. Common arguments used to oppose the proposed regulation and advocate counterarguments through the policy process of the Promotion of Healthy Eating Law in Argentina [109, 110, 111].

Type of argument	Argument	Counterargument
	The proposed regulation…	

Economic	...will cause job losses and low wages in the food sector.	In Chile, minimal negative impacts have been observed regarding industry employment with the adoption of FOP labelling.
	...will generate additional costs for the sector of the food industry.	The food industry has the resources to adopt the measures without suffering significant economic impacts.
	...will negatively affect the Argentine sugar sector.	Sugar is mostly produced for biofuels, which would not be impacted by the law.
	...will reduce sales.	Food companies generally have a portfolio of different products, some with and some without labels. Companies can also reformulate.
	...will harm companies by prohibiting them from advertising their products.	The regulation does not prohibit all advertising. In addition, it is an opportunity for companies to advertise the absence of seals for a competitive advantage.
	...will disproportionately punish small- and medium-sized enterprises (SMEs).	The law contemplates deadlines for major adaptations with the possibility of extension for SMEs.
Legal	...is not legal because it would not be standardized across MERCOSUR countries.	The economic bloc of MERCOSUR recognizes the States Parties the right to legislate for the protection of the public health of its citizens. Other countries in the bloc have introduced FOP labels at the national level.
	...is not legal because it would not align with WTO standards.	WTO recognizes the right of States to legislate and take measures that they deem necessary to protect public health. See the precedent of tobacco.
	...is not legal because it contradicts provisions of the Codex Alimentarius.	Codex Alimentarius guidelines constitute a minimum floor on which to advance in terms of public policies, but not a limit.
	...will introduce barriers to free trade due to differing packaging requirements.	The regulation applies only to Argentina and would not affect products exported to other countries.
	...will harm the export of Argentine food by creating barriers to international trade	Provisions under the WTO TBT agreement would ensure that the labelling regulation would not introduce undue barriers to trade.
	...contravenes the Argentine Food Code because it will present false information about the real nutrient content of food.	The use of the PAHO nutrient profile model and warning labels has been shown to be the most effective at communicating the nutrient content of food and would enhance transparency rather than hinder it.
	...will violate intellectual property	This has been refuted through the precedent of tobacco and UPF regulation in Chile, where such lawsuits have been dismissed.
Technical/ scientific	...has not been shown to decrease overweight or obesity rates.	A period of ample time is needed to observe public health impacts; The motivation for the law should remain consistent with its objective, which is to offer

		people timely, clear, accurate and true information that enable healthier consumption choices.
	...does not address the root problem of poor diets, which are based on individual choices.	There is ample evidence to support the role of UPF consumption as the root cause of obesity epidemic.
	...has no empirical evidence to show that it will change consumer choices.	Empirical evidence was collected in Argentina demonstrating that the warning label had the highest impact on consumer intention to purchase.
	...uses a nutrient profile model with no empirical evidence behind it and is against the dietary guidelines in Argentina.	A comparison of eight nutrient profile systems found that the PAHO nutrient profile demonstrated the highest accordance with the dietary guidelines in Argentina.
	...uses a nutrient profile model that does not promote reformulation.	The aim of the labels is not to encourage reformulation, but to inform consumers. However, evidence from Mexico demonstrates the potential for reformulation.
	...will result in over 90% of products being labelled, completely overwhelming consumers.	The law applies only to UPFs, which do not encompass such a high percentage of foods sold in retail settings.
Ethical/ social	...misrepresents the nutritional value of certain products.	The label's use depends on the chemical composition of each product.
	...demonizes packaged food.	The law seeks to protect consumers' right to information, not to demonize.
	...is a law for rich people/the first world in a context of economic decline and rising food insecurity.	Consumption of UPFs carries disproportionately negative health and economic ramifications for the most vulnerable sectors of the population, and thus is a high priority in this context.
	...will prevent the free delivery of products containing at least one label, preventing donation of food to vulnerable populations in the context of rising food insecurity.	The law will not prohibit the donation of products without warning labels, which would be better for the health of the most vulnerable sectors of the population.
	...confuses consumers and therefore harms individual freedom of choice.	This law upholds the consumer right to transparent information, thereby better enabling freedom of choice, particularly in the context of misleading marketing practices.
	...is not the appropriate approach to shift diets. Education is needed for better choices.	Education and campaigns are important components and should be part of a comprehensive policy to improve food environments. Campaigns are not substitutes to labels, but complements.

Acronyms: MERCOSUR = Southern Common Market, WTO = World Trade Organization; TBT = Technical Barriers to Trade Agreement, PAHO = Pan-American Health Organization, UPFs = Ultra-Processed Foods,

Advocates noted that economic arguments, particularly given the context of economic instability and decline in Argentina, gained the most traction against the law:

"...the strongest argument in a country in Latin America is about, we are going to lose jobs, employment is going to be affected, which is also an argument that the industry is going to go broke, that the industry cannot endure this... I mean, the rest is more debatable, but the economic factor is important and that is where the industry went." [Advocate, International Development Agency]

In this context, emerging evidence from Chile demonstrating that neither aggregate employment nor average real wages were affected by food labelling regulation helped support advocates to address these concerns in Argentina [127, 128, 129]. Advocates also spoke to the importance of emphasizing the economic ramifications of not acting in the form of rising healthcare costs.

Rights-Based Framing

To address ethical arguments, framing was key. Namely, advocates spoke to the importance of framing the law in communication with decision-makers not just within the paradigm of public health, but other values, such as the right of consumers to transparent information regarding the content of their food:

"...that was very important, to focus on the consumers' right, not focusing only in that eating better was important, but you have to know what you are eating, then you decide, no? And that was very important to convince the legislators." [Advocate, Civil Society]

This rights-based framing was also important in harnessing public support, and was pursued in communication campaigns led by civil society, such as the aforementioned "Don't let them cover your eyes," ("Que no te tapen los ojos") campaign, with the slogan, "It is our right to know if a food has excess fat, sugar and/or sodium" [120]. This framing helped to turn the commonly used argument by the industry of individual responsibility and choice on its head by presenting the labels as a tool to enhance individual autonomy rather than hinder it. Another key framing for the law that fostered public support was the protection of vulnerable populations, particularly children and adolescents, from deceptive industry practices:

“I think it was a combination of different narratives, but I would say that the need to protect children and vulnerable social groups was what penetrated the most through society and, also, the industry's lies…All of this sparked interest and a feeling of alarm at the same time.” [Advocate, Civil Society]

Extending narratives beyond the confines of a nutritional perspective to align the framing of the law with the priority values of different movements also brought more advocates into the fold, such as consumer organizations and environmental activists, reaching a broader audience over time.

“I think it was a combination of different narratives, but I would say that the need to protect children and vulnerable social groups was what penetrated the most through society and, also, the industry's lies…All of this sparked interest and a feeling of alarm at the same time.” [Advocate, Civil Society]

Reputation Management

The credibility that advocates carried in the arguments they made hinged on their reputation. As such, reputation management was an important aspect of advocates’ work throughout the policy process. For some organizations, particularly those comprised of nutrition professionals, managing internal conflicts of interest was critical. This was the case with the Argentine Federation of Graduates in Nutrition (FAGRAN), an umbrella organization of the Colleges and Associations of Graduates in Nutrition. The work done by the organization to reach an organizational position free of conflicts of interest, spearheaded by a change in leadership in 2018, was a critical factor in providing a degree of legitimacy to the voice of these advocates coming from the field of nutrition. The ability of organizations like FAGRAN to position themselves as entities free of conflicts of interest became a useful tool to spotlight those entities who could not do the same:

“…we told everyone who we were and we told them that we had no conflict of interest. And when you work on the law, people are more willing to listen to what you are saying. On the other hand, whenever we would hear arguments against the law, we knew those people and

organizations always had conflict of interest. So, we requested that everyone who participated in the discussion must state whether they were had any conflict of interest or not, and if they did, then what kind of conflict of interest it was." [Advocate, Professional Nutrition Organization]

Outcomes of Power: Reflections on Policy Decision

The law was seen as a key milestone in a broader effort to regulate the widespread availability of UPFs and promote healthier food environments. Advocates spoke particularly of the importance of adopting mandatory FOP warning labels, which define the parameters of products that should be targeted by future regulations. As one advocate explained:

"...these labels are a gateway to other regulations. That is, everything works together: environment, advertising, sponsorship, labelling and taxes. Increasing taxes on sugary drinks. But the gateway is FOP labelling. It will make it easier to discuss a tax when the product has three labels" [Advocate, International Development Agency]

Advocates also spoke to the importance of the fact that the law included not only FOP labels, but other components that work synergistically to promote healthier food environments:

"I think that one of the greatest advantages is that you have in a piece of regulation a lot of – you are able to regulate a lot of the aspects included in what should be a healthier food environment. And that's also something coming from tobacco. When you regulate and you have a tobacco control law, it's not only about regulating the environment. It's also about regulating the cigarette package. It's also about regulating the promotion and advertising and sponsorship of tobacco products. So this was a similar rationale." [Advocate, Civil Society]

Ultimately, despite pervasive attempts to prevent or hinder the passage of the law, as well as undermine its scope, the law was passed in accordance with the recommendations made by advocates throughout the policy process. Though advocates pointed to many

challenges regarding the road ahead for successful implementation of the law, this milestone was regarded as an important success:

"we enacted the exact law we wanted to enact. I thought it was going to be modified. Because sometimes they propose a good bill and it ends up as a weak law. Ours was whole. It was complete." [Advocate, International Development Agency]

Discussion

This paper examines how advocates were able to harness and exercise structural, instrumental and discursive power to guide the adoption of a regulation on the labelling, marketing and sale of UPFs. Several lessons can be learned from the insights shared by advocates on the Argentine experience on UPF regulation.

First, advocates must take pages from the 'corporate playbook' to effectively counter it, particularly to garner structural power. Corporations often pool political, financial and technical resources to undermine public health action, such as through the activities of umbrella entities like COPAL in Argentina. Capacity building to cultivate a collective voice of advocates to promote public health policy decisions is vital [130]. Through informal alliances and formal coalitions that united organizations across the country, advocates in Argentina were able to collectively access discussion spaces, make strategic use of limited resources, cultivate a unified narrative in their arguments and demands, and harness the diverse expertise needed to counter industry interference and effectively reach both decision-makers and the public. Some of the skillsets of those who worked to advocate for the law in Argentina, such as legal experts, trade analysts, political strategists, and communications specialists, have historically been considered outside the purview of public health, despite being vital to achieving meaningful improvements in health policy [131]. Capacity building initiatives to train, recruit and integrate these skillsets into public health efforts are therefore critical to strengthening the 'public health playbook' against corporate power in public health policy decisions [4, 61]. In Argentina and in other public health regulatory policy processes worldwide [45, 46, 49, 51, 132], support from

international health groups is an important enabler of capacity building. United Nations (UN) agencies play an important role. In Argentina, for example, PAHO and UNICEF took on many key capacity building roles throughout the process, including convening multi-sectoral discussion spaces for agenda-setting and providing financial and technical support for research, advocacy, and communications in support of the law. Advocates also took a page from the corporate playbook by cultivating structural power through the use of 'revolving doors,' where several policy champions either moved between or worked across different roles within civil society organizations, academia, professional organizations, national Ministries, and/or international development agencies throughout the policy process, bringing their knowledge, expertise, and networks with them.

Advocates wielded instrumental power by amassing an armada of evidence - localized to the Argentine population, free of conflicts of interest, and corroborated by both the public sector and civil society - to support the rationale for and robust design of the law. While this degree of scientific output is certainly a testament to the extent of advocates' work to support the policy process, it also alludes to a key challenge to meaningful health policy change in the face of corporate influence: an over-reliance on a strict evidence-based approach [82, 133]. In other contexts, particularly those with limited capacity to conduct health policy research, consolidating such a wealth of localized evidence may very well not be possible. Fostering international communities of practice in which advocates and decision-makers can exchange the knowledge and evidence cultivated from the experience of other countries that have successfully advanced on adopting UPF regulation, as was also done through regional knowledge exchange facilitated by advocates in Argentina, will be important. As demonstrated in the precedent of tobacco control [46, 134], international networks of advocates can also play an important role in defending national regulations against corporate attempts to undermine them.

Several lessons can also be gleaned from Argentina's experience cultivating discursive power in the context of this law, particularly on the implications of FOP warning labels. For

one, advocates emphasized the importance of framing the labels as autonomy-enhancing tools that provide transparent information as key to building support amongst decision-makers and the public. This framing is particularly important in the context of prevailing neoliberal paradigms that purport the importance of individual responsibility and autonomy in decision-making, which are often exploited by industry actors to undermine regulation [133, 135], as it positioned the law as one that would better enable individual autonomy rather than limit it. Previous literature has demonstrated a limited commitment from both national governments in Latin America and international health groups to adopting a rights-based discourse for UPF regulation [58], indicating an important area for improvement. In addition to this advantage with framing, advocates also understood that mandatory FOP warning labels provided an important foundation for comprehensive UPF regulation by delineating the health-harming commodity that must be regulated. This is particularly important in the context of UPFs where, unlike in the case of tobacco, for example, industry stakeholders can more readily argue health benefits associated with UPFs, in some cases even adding beneficial micronutrients as a tactic to resist regulatory approaches [136]. Together, these insights suggest that pursuing the adoption of mandatory FOP warning labels could be an important foundation for pursuing other important regulations to improve the healthfulness of food environments. Indeed, in Argentina, FOP warning labels were adopted as the foundation of a suite of reinforcing measures that also prohibited the marketing, donation and sales of labelled products in particular settings, including schools and social support programs. FOP warning labels could also support the introduction of additional priority policies to limit the availability and affordability of labelled UPFs and promote that of healthy, minimally processed food products, such as taxes and subsidies [136]. The potential of FOP warning labels to open the door to additional regulation could also be applicable in other contexts; however, additional research, such as that which examines the influence of the order in which policy measures are introduced on political and public support for climate policy [137, 138, 139], is needed to examine the generalizability of this strategy outside the Argentine context. In addition, as in Argentina and other cases [140, 141], it must be noted that industry stakeholders can still capitalize on neoliberal

narratives of individual responsibility to successfully undermine FOP warning labels, despite their function as an information-provision tool.

Besides cultivating greater support amongst decision-makers and the public, advocates observed that expanding the need for UPF regulation beyond the confines of a public health narrative also brought additional advocates into the fold in Argentina, such as consumer associations, youth activists, and influencers, all of which contributed to expanding support for the law. By the late stages of the legislative process, the law was seen by many as not only a matter of public health, but one of protecting human rights, safeguarding against corporate control and political corruption, and fostering a more equitable society. This experience in Argentina corroborates a key strategy that has been identified as vital to building a 'public health playbook,' against modern corporate power in public health policymaking: linking with other social movements to cultivate collective solidarity [61]. This is certainly the case for climate and sustainability activism, for example, which continues to garner strong civic engagement worldwide [142]. The connections between the production and consumption of UPFs and environmental outcomes must be strengthened in research, in advocacy, and in policy decisions [143]. Other discursive strategies employed in Argentina further corroborate those that have been identified as vital to building a 'public health playbook,' including the importance of debunking corporate arguments, of exposing industry tactics to the public, and of leading by example against conflicts of interest by developing rigorous standards against them within public health organizations [61].

This study is subject to a few limitations. First, this paper focuses on a single case study, limiting the generalizability of the findings to other contexts. For instance, Argentina has a strong legacy of civil society activities and activism related to health policy issues, as demonstrated in the precedent of tobacco control [144] and reproductive rights [145], for example. This foundation of civil society action in Argentina, which featured prominently in advancing the law, is already distinctly different to even that of neighboring country, Uruguay, where, for example, civil society was identified to play a limited role during the UPF regulation policy process [40]. Conversely, in Chile, Brazil and Mexico, civil society played a similarly prominent role as in Argentina in advocating for UPF regulation [56]. However,

those in Argentina noted that they were readily invited alongside other stakeholders, including food and beverage industry actors, to speak within relevant spaces in the Legislative and Executive branch, which was not the case in contexts like Mexico and Brazil, thereby limiting the influence of civil society in advancing UPF regulation [56]. Such differences in the experiences of UPF regulation within the region point to the challenge of extrapolating the results to other contexts. Another limitation is the retrospective examination of a successful policy decision, which may have introduced bias regarding the importance of certain strategies and enablers. We attempted to mitigate this bias by triangulating information from interviews with that synthesized from a review of media articles, press releases, and reports written leading up to the passage of the law. In addition, we had limited access to stakeholders who participated in certain spaces where the policy was discussed, limiting our insights into power dynamics at play in these spaces. For instance, a burgeoning area of research examines how international trade agreements are being leveraged to hinder nutrition policy action [77, 78, 79, 80, 81, 82]. Several advocates spoke broadly to the challenge of an alternative proposal to reach a regional agreement on FOP labelling through MERCOSUR; however, we were not able to explore the influence of corporate power, or strategies to counter it, at this level of governance in depth due to limited access to stakeholders involved in those discussions. The influence of the politicized nature of the topic must also be acknowledged here. Namely, in certain instances, participants noted that they could not be completely forthcoming with their experience for fear of political backlash, though these instances were limited in number and scope. Consolidating lessons learned from advocate experiences addressing corporate power in supra-national food governance, as in the case of tobacco [79, 146], thus constitutes an important area of future research. Finally, while out of scope for the purposes of this paper, advocates noted that additional strategies were vital to support the successful implementation of the law in the face of continued corporate attempts to undermine it following its passage, highlighting an additional area of future research to support advocates in their work to promote robust public health policy decisions.

Conclusions

The use of corporate power to undermine UPF regulatory decisions is increasingly well-documented; however, analyses of how power can be leveraged to promote successful policy decisions are scant. Learning from the small precedent of countries that have managed to successfully adopt robust regulation on UPFs is an important opportunity to strengthen this knowledge in pursuit of a 'public health playbook' against corporate power. Leveraging a framework designed to analyze the role of power in public health policymaking, we demonstrate how advocates wielded structural, instrumental, and discursive power to support the passage of the Promotion of Healthy Eating Law in (Ley 27,642) in Argentina. The experience of advocates in Argentina carry important lessons that may be applicable to other countries looking to advance on the topic, including the importance of cultivating a collective movement in support of regulation, the need for synthesis of knowledge and evidence to weather corporate interference, and the promise of shaping dominant discourse so as to better reach both decision-makers and the public.

References

1. Srour B, Touvier M. Ultra-processed foods and human health: What do we already know and what will further research tell us? EClinicalMedicine 2021;32:100747. doi:10.1016/j.eclinm.2021.100747
2. Scrinis G, Monteiro C. From ultra-processed foods to ultra-processed dietary patterns. Nature Food. 2022;3(9):671–3. doi:10.1038/s43016-022-00599-4
3. Monteiro CA, Moubarac J -C., Cannon G, Ng SW, Popkin B. Ultra-processed products are becoming dominant in the Global Food System. Obesity Reviews. 2013;14(S2):21–8. doi:10.1111/obr.12107
4. Moodie R, Bennett E, Kwong EJ, Santos TM, Pratiwi L, Williams J, et al. Ultra-processed profits: The Political Economy of countering the global spread of ultra-processed foods – a synthesis review on the market and political practices of transnational food

corporations and Strategic Public Health responses. International Journal of Health Policy and Management. 2021; doi:10.34172/ijhpm.2021.45

5. Monteiro CA, Cannon G, Levy RB, Moubarac J-C, Louzada ML, Rauber F, et al. Ultra-processed foods: What they are and how to identify them. Public Health Nutrition. 2019;22(5):936–41. doi:10.1017/s1368980018003762
6. Leite FH, Khandpur N, Andrade GC, Anastasiou K, Baker P, Lawrence M, et al. Ultra-processed foods should be central to global food systems dialogue and action on Biodiversity. BMJ Global Health. 2022;7(3). doi:10.1136/bmjgh-2021-008269
7. Anastasiou K, Baker P, Hendrie GA, Hadjikakou M, Boylan S, Chaudhary A, et al. Conceptualising the drivers of ultra-processed food production and consumption and their environmental impacts: A group model-building exercise. Global Food Security. 2023;37:100688. doi:10.1016/j.gfs.2023.100688
8. Popkin BM. The nutrition transition: An overview of world patterns of change. Nutrition Reviews. 2004;62. doi:10.1111/j.1753-4887.2004.tb00084.x
9. Shekar M, Popkin B. Obesity Health and economic consequences of an impending global challenge. Washington, DC: World Bank Group; 2020. https://www.worldbank.org/en/topic/nutrition/publication/obesity-health-and-economic-consequences-of-an-impending-global-challenge
10. Harris, J., Anderson, M., Clément, C. and Nisbett, N. (Eds) The Political Economy of Food, IDS Bulletin 50.2, Brighton: IDS. 2019;2(13). doi:10.19088/1968-2019.112
11. Baker P, Lacy-Nichols J, Williams O, Labonté R. The Political Economy of healthy and Sustainable Food Systems: An introduction to a special issue. International Journal of Health Policy and Management. 2021;10(12):734–44. doi:10.34172/ijhpm.2021.156
12. Baker P, Machado P, Santos T, Sievert K, Backholer K, Hadjikakou M, et al. Ultra-processed foods and the Nutrition Transition: Global, regional and National Trends, Food Systems Transformations and political economy drivers. Obesity Reviews. 2020;21(12). doi:10.1111/obr.13126

13. Rayner G, Hawkes C, Lang T, Bello W. Trade liberalization and the diet transition: A public health response. Health Promotion International. 2006;21(suppl_1):67–74. doi:10.1093/heapro/dal053
14. Friel S, Gleeson D, Thow A-M, Labonte R, Stuckler D, Kay A, et al. A new generation of trade policy: Potential risks to diet-related health from the Trans Pacific Partnership Agreement. Globalization and Health. 2013;9(1):46. doi:10.1186/1744-8603-9-46
15. Van Dam I, Allais O, Vandevijvere S. Market concentration and the healthiness of packaged food and non-alcoholic beverage sales across the European Single Market. Public Health Nutrition. 2022;25(11):3131–6. doi:10.1017/s1368980022001926
16. Moodie R, Stuckler D, Monteiro C, Sheron N, Neal B, Thamarangsi T, et al. Profits and pandemics: Prevention of harmful effects of tobacco, alcohol, and ultra-processed food and Drink Industries. The Lancet. 2013;381(9867):670–9. doi:10.1016/s0140-6736(12)62089-3
17. Clapp J, Scrinis G. Big Food, nutritionism, and Corporate Power. Globalizations. 2016;14(4):578–95. doi:10.1080/14747731.2016.1239806
18. Anaf J, Baum F, Fisher M, Friel S. Civil Society Action Against Transnational Corporations: Implications for Health Promotion. Health Promotion International. 2019;35(4):877–87. doi:10.1093/heapro/daz088
19. The Lancet. Unravelling the commercial determinants of health. The Lancet. 2023;401(10383):1131. doi:10.1016/s0140-6736(23)00590-1
20. Moodie R, Stuckler D, Monteiro C, Sheron N, Neal B, Thamarangsi T, et al. Profits and pandemics: Prevention of harmful effects of tobacco, alcohol, and ultra-processed food and Drink Industries. The Lancet. 2013;381(9867):670–9. doi:10.1016/s0140-6736(12)62089-3
21. World Health Organization (WHO). Global action plan for the prevention and control of Noncommunicable Diseases 2013-2020. World Health Organization; 2013. https://www.who.int/publications/i/item/9789241506236

22. Hawkes C, Jewell J, Allen K. A food policy package for healthy diets and the prevention of obesity and diet-related non-communicable diseases: The nourishing framework. Obesity Reviews. 2013;14(S2):159–68. doi:10.1111/obr.12098
23. Swinburn B, Vandevijvere S, Kraak V, Sacks G, Snowdon W, Hawkes C, et al. Monitoring and benchmarking government policies and actions to improve the healthiness of food environments: A proposed government healthy food environment policy index. Obesity Reviews. 2013;14(S1):24–37. doi:10.1111/obr.12073
24. Fanzo J, Arabi M, Burlingame B, Haddad L, Kimenju S, Miller G, Nie F, Recine E, Serra-Majem L, Sinha D. Nutrition and food systems. A report by the High-Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. 2017. https://www.fao.org/documents/card/en/c/I7846E/
25. World Health Organization (WHO). Assessing national capacity for the prevention and control of noncommunicable diseases: report of the 2019 global survey. World Health Organization; 2020.
26. Baker P, Hawkes C, Wingrove K, et al. What drives political commitment for nutrition? A review and framework synthesis to inform the United Nations Decade of Action on Nutrition. BMJ Glob Health 2018;0:e000485. doi:10.1136/bmjgh-2017-000485
27. Mialon M, Swinburn B, Sacks G. A proposed approach to systematically identify and monitor the corporate political activity of the food industry with respect to public health using publicly available information. Obesity Reviews. 2015;16(7):519–30. doi:10.1111/obr.12289
28. Cossez E, Mialon M. Corporate political activity of the baby food industry in France. European Journal of Public Health. 2021;31(Supplement_3). doi:10.1093/eurpub/ckab164.788
29. Paixão MM, Mialon M. Help or hindrance? the alcohol industry and alcohol control in Portugal. International Journal of Environmental Research and Public Health. 2019;16(22):4554. doi:10.3390/ijerph16224554

30. Mialon M. Analysis of corporate political activity strategies of the food industry: Evidence from France. Public Health Nutrition. 2018;21(18):3407–21. doi:10.1017/s1368980018001763
31. Mialon M, Gomes F da. Public health and the ultra-processed food and drink products industry: Corporate political activity of major transnationals in Latin America and the Caribbean. Public Health Nutrition. 2019;22(10):1898–908. doi:10.1017/s1368980019000417
32. Huse O, Reeve E, Zambrano P, Bell C, Peeters A, Sacks G, et al. Understanding the corporate political activity of the Ultra - processed food industry in East Asia: A Philippines case study. Globalization and Health. 2023;19(1). doi:10.1186/s12992-023-00916-x
33. Pan-American Health Organization (PAHO). Ultra-processed food and drink products in Latin America: Trends, impact on obesity, policy implications. Washington, D.C.: PAHO; 2015. https://iris.paho.org/bitstream/handle/10665.2/7699/9789275118641_eng.pdf
34. Pan American Health Organization (PAHO). NCDs at a Glance: NCD Mortality and Risk Factor Prevalence in the Americas. Washington, D.C.: PAHO; 2019. https://iris.paho.org/handle/10665.2/51696#:~:text=Noncommunicable%20diseases%20(NCDs)%2C%20principally,the%20Region%20of%20the%20Americas
35. Villalobos Dintrans P, Rodriguez L, Clingham-David J, Pizarro T. Implementing a food labelling and marketing law in Chile. Health Systems & Reform. 2020;6(1). doi:10.1080/23288604.2020.1753159
36. Crosbie E, Gomes FS, Olvera J, Rincón-Gallardo Patiño S, Hoeper S, Carriedo A. A policy study on front–of–pack nutrition labelling in the Americas: Emerging developments and outcomes. The Lancet Regional Health - Americas. 2022;18:100400. doi:10.1016/j.lana.2022.100400
37. Mialon M, Corvalan C, Cediel G, Scagliusi FB, Reyes M. Food industry political practices in Chile: “the economy has always been the main concern.” Globalization and Health. 2020;16(1). doi:10.1186/s12992-020-00638-4

38. Mialon M, Gaitan Charry DA, Cediel G, Crosbie E, Scagliusi FB, Perez Tamayo EM. 'I had never seen so many lobbyists': Food industry political practices during the development of a new nutrition front-of-pack labelling system in Colombia. Public Health Nutrition. 2020;24(9):2737–45. doi:10.1017/s1368980020002268
39. Crosbie E, Carriedo A, Schmidt L. Hollow threats: Transnational Food and beverage companies' use of international agreements to fight front-of-pack nutrition labelling in Mexico and beyond. International Journal of Health Policy and Management. 2022; doi:10.34172/ijhpm.2020.146
40. Ares G, Antúnez L, Cabrera M, Thow AM. Analysis of the policy process for the implementation of nutritional warning labels in Uruguay. Public Health Nutrition. 2021;24(17):5927–40. doi:10.1017/s1368980021002469
41. Mialon M, Khandpur N, Amaral Mais L, Bortoletto Martins AP. Arguments used by trade associations during the early development of a new front-of-pack nutrition labelling system in Brazil. Public Health Nutrition. 2020;24(4):766–74. doi:10.1017/s1368980020003596
42. Matthes BK, Kumar P, Dance S, Hird T, Carriedo Lutzenkirchen A, Gilmore AB. Advocacy counterstrategies to tobacco industry interference in policymaking: A scoping review of peer-reviewed literature. Globalization and Health. 2023;19(1). doi:10.1186/s12992-023-00936-7
43. Patanavanich R, Glantz S. Successful countering of tobacco industry efforts to overturn Thailand's ends ban. Tobacco Control. 2020;30(e1). doi:10.1136/tobaccocontrol-2020-056058
44. Bhatta DN, Crosbie E, Bialous SA, Glantz S. Defending comprehensive tobacco control policy implementation in Nepal from tobacco industry interference (2011–2018). Nicotine & Tobacco Research. 2020;22(12):2203–12. doi:10.1093/ntr/ntaa067
45. Bhatta DN, Bialous S, Crosbie E, Glantz S. 2020. Exceeding WHO Framework Convention on Tobacco Control (FCTC) Obligations: Nepal Overcoming Tobacco Industry Interference to Enact a Comprehensive Tobacco Control Policy. Nicotine & Tobacco Research. 2020;22(12):2213-2223. doi.org/10.1093/ntr/ntz177

46. Crosbie E, Perez S, Copa PC, Monje AK, Machin N, Lopez G, et al. Tobacco control in Bolivia: Transnational Civil Society efforts in securing a comprehensive law. Nicotine & Tobacco Research. 2022;24(8):1300–4. doi:10.1093/ntr/ntac036
47. Willemsen MC, Been JV. Accelerating tobacco control at the national level with the smoke-free generation movement in the Netherlands. npj Primary Care Respiratory Medicine. 2022;32(1). doi:10.1038/s41533-022-00321-8
48. Fuster M, Burrowes S, Cuadrado C, Bernal AV, Lewis S, McCarthy B, Shen GC. Understanding policy change for obesity prevention: learning from sugar-sweetened beverage taxes in Mexico and Chile. Health Promotion International. 2021;36(1):155-164. doi:10.1093/heapro/daaa045
49. Carriedo A, Koon AD, Encarnacion LM, Lee K, Smith R, Walls H. The political economy of sugar-sweetened beverage taxation in Latin America: lessons from Mexico, Chile and Colombia. Globalization and Health 2021;17(5). doi:10.1186/s12992-020-00656-2
50. Thow AM, Karim SA, Mukanu MM, Ahaibwe G, Wanjohi M, Gaogane L, Amukungo HJ, Ruhara CM, Ngoma T, Asiki G, Erzse A, Hofman K. The political economy of sugar-sweetened beverage taxation: an analysis from seven countries in sub-Saharan Africa. Global Health Action. 2021;14(1). doi:10.1080/16549716.2021.1909267
51. James E, Lajous M, Reich MR. The Politics of Taxes for Health: An Analysis of the passage of the sugar-sweetened beverage tax in Mexico. Health Systems & Reform. 2020;6(1). doi:10.1080/23288604.2019.1669122
52. Carriedo A, Lock K, Hawkins B. Policy process and non-state actors' influence on the 2014 Mexican soda tax. Health Policy and Planning. 2020;35(8):941–52. doi:10.1093/heapol/czaa060
53. Smith SL. Factoring civil society actors into health policy processes in low- and middle-income countries: A Review of Research Articles, 2007–16. Health Policy and Planning. 2019;34(1):67–77. doi:10.1093/heapol/czy109
54. Mialon M, Vandevijvere S, Carriedo-Lutzenkirchen A, Bero L, Gomes F, Petticrew M, et al. Mechanisms for addressing and managing the influence of corporations on Public

Health Policy, research and practice: A scoping review. BMJ Open. 2020;10(7). doi:10.1136/bmjopen-2019-034082

55. Townsend B, Johnson TD, Ralston R, Cullerton K, Martin J, Collin J, et al. A framework of NGO inside and outside strategies in the commercial determinants of Health: Findings from a narrative review. Globalization and Health. 2023;19(1). doi:10.1186/s12992-023-00978-x
56. Gomez E. Getting to the root of the problem: the international and domestic politics of junk food industry regulation in Latin America. Health Policy and Planning 36(10):1521-1533. doi: 10.1093/heapol/czab100
57. Diez-Canseco F, Cavero V, Cano JA, Saavedra-Garcia L, Taillie LS, Dillman Carpentier FR, Miranda JJ. Design and approval of the nutritional warnings policy in Peru: Milestones, key stakeholders and policy drivers for its approval. PLoS Global Public Health 3(6):e0001121. doi: 10.1371/journal.pgph.0001121
58. Harris J, Anderson M, Clément C, Nisbett N. (Eds) The Political Economy of Food, IDS Bulletin 50.2, Brighton: IDS. 2019;2(13). doi:10.19088/1968-2019.112
59. Marten R, Hanefeld J, Smith R. Commission on global governance for health: What about power? The Lancet. 2014;383(9936):2207. doi:10.1016/s0140-6736(14)61076-x
60. Gore R, Parker R. Analysing power and politics in health policies and systems. Global Public Health. 2019;14(4):481–8. doi:10.1080/17441692.2019.1575446
61. Lacy-Nichols J, Marten R, Crosbie E, Moodie R. The Public Health Playbook: Ideas for challenging the corporate playbook. The Lancet Global Health. 2022;10(7). doi:10.1016/s2214-109x(22)00185-1
62. Logan AC, D'Adamo CR, Pizzorno JE, Prescott SL. "Food faddists and pseudoscientists!" Reflections on the history of resistance to ultra-processed foods. Explore. 2024;20(4):470-476. doi: 10.1016/j.explore.2023.12.014
63. Monteiro CA. Nutrition and health. The issue is not food, nor nutrients, so much as processing. Public Health Nutrition. 2009;12(5):729-731. doi: 10.1017/S1368980009005291

64. Touvier M, da Costa Louzada ML, Mozaffarian D, Baker P, Juul F, Srour B. Ultra-processed foods and cardiometabolic health: public health policies to reduce consumption cannot wait. British Medical Journal. 2023;383: e075294. doi: 10.1136/bmj-2023-075294
65. Pan-American Health Organization (PAHO). Pan American Health Organization Nutrient Profile Model. Pan American Health Organization. 2016;34. https://iris.paho.org/handle/10665.2/18621. Accessed 24 Jan 2024.
66. Zapata ME, Arrieta E, Beltramo B, Rovirosa A. Ultra-processed food consumption in Argentina according to income level and its association with the intake of healthy foods. Nutrition Bulletin. 2023;48(3):317-328. doi: 10.1111/nbu.12624
67. Argentine Government. Ley de promoción de la alimentación saludable. Argentina.gob.ar. https://www.argentina.gob.ar/salud/ley-de-promocion-de-la-alimentacion-saludable#:~:text=Promueve%20el%20derecho%20a%20la,envasados%20y%20bebidas%20sin%20alcohol.&text=La%20Ley%20N%C2%B0%2027.642,como%20Ley%20de%20Etiquetado%20Frontal. Accessed 24. Jan 2024.
68. Argentina president signs one of World's strongest health food policy laws. GHAI; 2021. https://www.advocacyincubator.org/featured-stories/2021-12-10-argentina-president-signs-one-of-worlds-strongest-health-food-policy-laws#:~:text=The%20new%20law%20was%20published,the%20front%20of%20the%20package. Accessed 24 Jan 2024.
69. Pan-American Health Organization (PAHO). Front-of-package labeling as a policy tool for the prevention of noncommunicable diseases in the Americas. 2020. https://iris.paho.org/handle/10665.2/52740. Accessed 24 Jan 2024.
70. Ministry of Health. Etiquetado frontal nutricional de alimentos. 2018. https://bancos.salud.gob.ar/sites/default/files/2020-01/0000001380cnt-2019-06_etiquedato-nutricional-frontal-alimentos.pdf
71. Castronuovo L, Tiscornia MV, Guarnieri L, Martins E, Gomes FS, Allemandi L. Efficacy of different front-of-package labelling systems in changing purchase intention and product

healthfulness perception for food products in Argentina. Rev Panam Salud Publica. 2022;46:e137. doi:0.26633/RPSP.2022.137

72. Fernández AA, González García G, Vizzotti C, Costa AS, Abriata MG. Evaluación del desempeño del Etiquetado Frontal de Advertencia frente a otros modelos en Argentina. 2020. https://bancos.salud.gob.ar/recurso/evaluacion-del-desempeno-del-etiquetado-frontal-de-advertencia-frente-otros-modelos-en. Accessed 24 Jan 2024.
73. Tiscornia MV, Castronuovo L, Guarnieri L, Martins E, Allemandi L. Evaluación de los sistemas de perfiles nutricionales para la definición de una política de etiquetado frontal en Argentina. Rev. argent. salud pública. 2020;12:17-17. http://www.scielo.org.ar/scielo.php?script=sci_arttext&pid=S1853-810X2020000200017&lng=es
74. Fernández A, García G, Vizzotti C, Costa A, Abriata M. Análisis del nivel de concordancia de Sistemas de perfil de nutrientes con las Guías Alimentarias para la Población Argentina. 2020. https://bancos.salud.gob.ar/recurso/analisis-del-nivel-de-concordancia-de-sistemas-de-perfil-de-nutrientes-con-las-guias. Accessed 24 Jan 2024.
75. Ministry of Agriculture. The Agri-Food and Agro-Industry Sectors in Argentina. 2011. https://ealem.cancilleria.gob.ar/userfiles/Agronegocios_02_HoracioColombetLicMarianoLaffaye.pdf Accessed 24 Jan 2024.
76. Bobbio S. Would Argentina benefit from a soda tax? O'Neill Institute for National & Global Health Law. ancos.salud.gob.ar/sites/default/files/2020-01/0000001380cnt-2019-06_etiquedato-nutricional-frontal-alimentos.pdf. Accessed 24 Jan 2024.
77. Thow AM, Jones A, Hawkes C, Ali I, Labonté R. Nutrition labelling is a trade policy issue: Lessons from an analysis of specific trade concerns at the World Trade Organization. Health Promotion International. 2017; doi:10.1093/heapro/daw109
78. Garton K, Thow AM, Swinburn B. International Trade and Investment Agreements as Barriers to Food Environment Regulation for Public Health Nutrition: A Realist Review. International Journal of Health Policy and Management. 2020; 10(12):745-765. doi: 10.34172/ijhpm.2020.189.

79. von Tigerstrom B. How do international trade obligations affect policy options for obesity prevention? Lessons from recent developments in trade and tobacco control. Canadian Journal of Diabetes. 2013;37(3):182-188. doi:10.1016/j.jcjd.2013.03.402
80. Milsom P, Smith R, Baker P, Walls H. Corporate power and the international trade regime preventing progressive policy action on non-communicable diseases: a realist review. Health Policy and Planning. 2020;36(4). doi:10.1093/heapol/czaa148
81. Milsom P, Smith R, Modisenyane SM, Walls H. Do international trade and investment agreements generate regulatory chill in public health policymaking? A case study of nutrition and alcohol policy in South Africa. Globalization and Health. 2021;17(104). doi:10.1186/s12992-021-00757-6
82. Milsom P, Smith R, Modisenyane SM, Walls H. Does International Trade and investment liberalization facilitate corporate power in nutrition and alcohol policymaking? applying an integrated political economy and Power Analysis Approach to a case study of South Africa. Globalization and Health. 2022;18(1). doi:10.1186/s12992-022-00814-8
83. Fuchs D, Lederer MML. The Power of Business. Business Power and Global Governance. 2007;9(3):1-10. https://ideas.repec.org/a/bpj/buspol/v9y2008i3n1.html
84. Lukes, S. Power: A Radical View. London: McMillan. https://voidnetwork.gr/wp-content/uploads/2016/09/Power-A-Radical-View-Steven-Lukes.pdf
85. Hall A. The role of interests, institutions, and ideas in the comparative political economy of the industrialized nations. In: Lichbach I, Zuckerman AS (eds). Comparative Politics: Rationality, Culture, and Structure. Cambridge: Cambridge University Press. 1997;174–98.
86. Lavis JN, Ross SE, Hurley J et al. Examining the role of health services research in public policymaking. The Milbank Quarterly. 2022;80:125–54. doi: 10.1111/1468-0009.00005.
87. Gauvin FP. Understanding policy developments and choices through the “3-i” framework: interests, ideas and institutions. Briefing Note. Montréal, Québec: National Collaborating Centre for Healthy Public Policy. 2014.

88. Shearer JC, Abelson J, Kouyate B, Lavis JN, Walt G. Why do policies change? Institutions, interests, ideas and networks in three cases of policy reform. Health Policy and Planning. 2016; 31: 1200–11. doi:10.1093/heapol/czw052
89. Gaventa J. Finding the spaces for change: a power analysis. IDS Bulletin 2006; 37: 23–33.
90. Argentina media guide. BBC; 2023. https://www.bbc.com/news/world-latin-america-18707517. Accessed 24 Jan 2024.
91. Hennink M, Kaiser BN. Sample sizes for saturation in qualitative research: A systematic review of empirical tests. Social Science & Medicine. 2022;292:114523. doi:10.1016/j.socscimed.2021.114523
92. Fereday J, Muir-Cochrane E. Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development. International Journal of Qualitative Methods. 2006;5(1):80–92. doi:10.1177/160940690600500107
93. Proudfoot K. Inductive/deductive hybrid thematic analysis in mixed methods research. Journal of Mixed Methods Research. 2022;17(3):308–26. doi:10.1177/15586898221126816
94. Pan-American Health Organization (PAHO). OPS pide avanzar en regulación de alimentos ultraprocesados en jornada en el Senado de la Nación. Organización Panamericana de la Salud. 2016. https://www.paho.org/es/noticias/24-10-2016-ops-pide-avanzar-regulacion-alimentos-ultraprocesados-jornada-senado-nacion. Accessed 23 Jan 2024.
95. Ministry of Health. Etiquetado frontal: González García recibió a integrantes de la COPAL. Argentina.gob.ar. 2020. https://www.argentina.gob.ar/noticias/etiquetado-frontal-gonzalez-garcia-recibio-integrantes-de-la-copal. Accessed 23 Jan 2024.
96. Hacker D. Ministro de Salud Rubinstein con infobae: “El Etiquetado frontal de los alimentos es una advertencia sanitaria”. Infobae; 2018. https://www.infobae.com/salud/2018/06/06/ministro-de-salud-adolfo-rubinstein-con-infobae-el-etiquetado-frontal-de-los-alimentos-es-una-advertencia-sanitaria-a-los-consumidores-para-saber-que-tienen-en-la-mano/. Accessed 24 Jan 2024.

97. National Food Commission (CONAL). Reunión ordinaria de los días 15, 16 y 17 de septiembre de 2020. 2020. http://www.conal.gob.ar/sitio/_pdf/20200917184700.pdf
98. Ministry of Health. Ministerio de Salud presentó a la COPAL los ejes centrales del proyecto de etiquetado frontal de alimentos. Argentina.gob.ar. 2020. https://www.argentina.gob.ar/noticias/ministerio-de-salud-presento-la-copal-los-ejes-centrales-del-proyecto-de-etiquetado-frontal. Accessed 23 Jan 2024
99. Argentine Senate. Órdenes Del Día. https://www.senado.gob.ar/parlamentario/parlamentaria/ordenDelDiaResultadoLink/2020/375. Accessed 24 Jan 2024.
100. Pan-American Health Organization (PAHO). Piden nuevas leyes que ayuden a prevenir la obesidad y proteger a los consumidores - OPS/OMS. 2017. https://www.paho.org/es/noticias/31-5-2017-piden-nuevas-leyes-que-ayuden-prevenir-obesidad-proteger-consumidores. Accessed 23 Jan 2024.
101. Argentine Government. Rubinstein inauguró jornada sobre etiquetado frontal de alimentos y salud en Diputados. 2018. https://www.argentina.gob.ar/noticias/rubinstein-inauguro-jornada-sobre-etiquetado-frontal-de-alimentos-y-salud-en-diputados. Accessed 23 Jan 2024.
102. Argentine Government. Autoridades de Salud y OPS inauguraron encuentro sobre etiquetado frontal en el marco del MERCOSUR. 2019. https://www.argentina.gob.ar/noticias/autoridades-de-salud-y-ops-inauguraron-encuentro-sobre-etiquetado-frontal-en-el-marco-del. Accessed 23 Jan 2024.
103. United Nations Children's Fund (UNICEF). La Coordinación de ONU en Argentina, la OPS/OMS, UNICEF y FAO presentan una Jornada sobre la Ley de Alimentación Saludable. 2021. https://www.unicef.org/argentina/comunicados-prensa/jornada-alimentacion-saludable. Accessed 23 Jan 2024.
104. Network of Lawyers for Food Sovereignty (REDASA). https://www.redasa.org/. Accessed 24 Jan 2024.

105. Network of Free Chairs of Food Sovereignty and Related Groups (RED CALISAS). Informe anual de la situación de la soberanía alimentaria en argentina. 2022. https://redcalisas.org/. Accessed 24 Jan 2024.

106. United Nations Children's Fund (UNICEF). Narda Lepes se sumó al pedido por la urgente sanción de la ley de etiquetado frontal de alimentos. 2021. https://www.unicef.org/argentina/comunicados-prensa/Narda-Lepes-se-sumo-al-pedido-ley-etiquetado-frontal-alimentosl. Accessed 24 Jan 2024.

107. National Coalition to Prevent Childhood Obesity. https://www.prevenirobesidadinfantil.org/materiales/. Accessed 24 Jan 2024.

108. United Nations Children's Fund. Informe Annual de Actividades Argentina 2017. 2017. https://www.unicef.org/argentina/media/1351/file/Informe%20anual%202017.pdf. Accessed 24 Jan 2024.

109. FIC Argentina. Informe de investigación: Publicidad de alimentos dirigida a niños y niñas en la TV Argentina. FIC Argentina; 2015. https://www.ficargentina.org/investigaciones/informe-de-investigacion-publicidad-de-alimentos-dirigida-a-ninos-y-ninas-en-la-tv-argentina/. Accessed 23 Jan 2024.

110. FIC Argentina. Reporte de investigación: Técnicas de marketing dirigidas a niños y niñas en envases de alimentos procesados de Argentina (2017). FIC Argentina; 2017. https://www.ficargentina.org/investigaciones/reporte-de-investigacion-tecnicas-de-marketing-dirigidas-a-ninos-y-ninas-en-envases-de-alimentos-procesados-de-argentina-2017/. Accessed 23 Jan 2024.

111. Allemandi L, Castronuovo L, Tiscornia MV, Ponce M, Schoj V. Food Advertising on argentinean television: Are ultra-processed foods in the lead? Public Health Nutrition. 2017;21(1):238–46. doi:10.1017/s1368980017001446

112. Ministry of Health, National Institute of Statistics and Censuses (INDEC). 4° Encuesta Nacional de Factores de Riesgo. Resultados definitivos. - 1a ed. 2019. https://bancos.salud.gob.ar/recurso/4ta-encuesta-nacional-de-factores-de-riesgo-2019-informe-definitivo

113. Ministry of Health. 2° Encuesta Nacional de Nutrición y Salud ENNYS 2. Resumen ejecutivo. 2019. https://bancos.salud.gob.ar/recurso/2deg-encuesta-nacional-de-nutricion-y-salud-indicadores-priorizados

114. Coordinator of Food Product Industries (COPAL). Propuesta de Etiquetado Frontal. 2017https://copal.org.ar/2017/10/01/propuesta-de-etiquetado-frontal/. Accessed 24 Jan 2024.

115. Etiquetado frontal: qué piensan y qué cuestionan las entidades de la industria alimenticia. Perfil; 2021. https://www.perfil.com/noticias/economia/etiquetado-frontal-la-industria-de-alimentos-advierte-sobre-conflictos-en-el-mercosur.phtml. Accessed 24 Jan 2024.

116. Brazilian Institute for Consumer's Defense (IDEC), Inter-American Heart Foundation (FIC). An analysis of regulatory scenarios on food labeling in Brazil and Argentina within the overall context of MERCOSUR. 2020. https://idl-bnc-idrc.dspacedirect.org/server/api/core/bitstreams/f7a164fe-ac28-45c8-b4fb-167963f33a52/content. Accessed 24 Jan 2024.

117. Rios B, Cerra B, Cury Chaddad C. Etiquetado frontal de alimentos en Argentina y Brasil: barreras y facilitadores jurídicos, Microjuris Argentina al Día. AL DÍA | ARGENTINA. 2020. https://aldiaargentina.microjuris.com/2020/04/21/etiquetado-frontal-de-alimentos-en-argentina-y-brasil-barreras-y-facilitadores-juridicos/. Accessed 23 Jan 2024.

118. FIC Argentina. Lessons learned from tobacco control: court decisions that ratify public health policies. FIC Argentina; 2020. https://www.ficargentina.org/wpcontent/uploads/2019/12/2001_argumentos_juridicos_ingles.pdf. Accessed 23 Jan 2024.

119. Ley de etiquetado frontal: la Copal busca modificar el proyecto para que "atienda al sector productivo." BAE Negocios; 2021. https://www.baenegocios.com/economia/Ley-de-etiquetado-frontal-la-Copal-busca-modificar-el-proyecto-para-que-atienda-al-sector-productivo-20210707-0118.html. Accessed 24 Jan 2024.

120. “Que no te tapen los ojos”: la campaña que exige el etiquetado de advertencias en alimentos y bebidas. Infobae; 2021. https://www.infobae.com/salud/2021/07/04/que-no-te-tapen-los-ojos-la-campana-que-exige-el-etiquetado-de-advertencias-en-alimentos-y-bebidas/. Accessed 24 January
121. Activa el Congreso. https://activaelcongreso.ar/. Accessed 24 January 2024.
122. Octógonos negros: de qué se trata el proyecto de ley de etiquetado frontal de alimentos que hoy se trata en comisiones en Diputados. La Nacion; 2021. https://www.lanacion.com.ar/sociedad/octogonos-negros-de-que-se-trata-el-proyecto-de-ley-de-etiquetado-frontal-de-alimentos-que-hoy-se-nid13072021/. Accessed 24 Jan 2024.
123. FIC Argentina. No hubo quórum en la Cámara de Diputados para tratar el proyecto de etiquetado de alimentos. FIC Argentina; 2021. https://www.ficargentina.org/que-no-te-tapen-los-ojos-la-campana-para-exigir-un-etiquetadoclaroya/. Accessed 23 Jan 2024.
124. FIC Argentina. Etiquetado frontal de advertencias: guía para identificar y responder a los argumentos de la industria alimenticia y sus aliados. 2020. https://www.ficargentina.org/wp-content/uploads/2020/11/2011_guia.pdf. Accessed 24 Jan 2024.
125. National Coalition to Prevent Childhood Obesity. Mitos y realidades del etiquetado frontal de advertencia. 2020. https://fagran.org.ar/wp-content/uploads/2020/10/2010_Mitos_Realidades_Etiquetado.pdf. Accessed 24 Jan 2024.
126. FUNDEPS. Draft Law “Promotion of Healthy Eating”: refutation of arguments of the food industry. 2021. https://fundeps.org/en/healthy-eating-refutation-arguments-food-industry/. Accessed 24 Jan 2024.
127. Paraje G, Colchero A, Wlasiuk JM, Sota AM, Popkin BM. The effects of the Chilean food policy package on aggregate employment and real wages. Food Policy. 2021;100:102016. doi:10.1016/j.foodpol.2020.102016

128. Paraje G, Montes de Oca D, Wlasiuk JM, Canales M, Popkin BM. Front-of-pack labeling in Chile: Effects on employment, real wages, and firms' profits after three years of its implementation. Nutrients. 2022;14(2):295. doi:10.3390/nu14020295

129. Barahona N, Otero C, Otero S. Equilibrium effects on food labeling policies. Available at SSRN: doi.10.2139/ssrn.3698473

130. Baker P, Brown AD, Wingrove K, Allender S, Walls H, Cullerton K, et al. Generating political commitment for ending malnutrition in all its forms: A system dynamics approach for strengthening nutrition actor networks. Obesity Reviews. 2019;20(S2):30–44. doi:10.1111/obr.12871

131. Freudenberg N, Lee K, Buse K, Collin J, Crosbie E, Friel S, et al. Defining priorities for action and research on the commercial determinants of Health: A Conceptual Review. American Journal of Public Health. 2021;111(12):2202–11. doi:10.2105/ajph.2021.306491

132. Paarlberg R, Mozaffarian D, Micha R. Viewpoint: Can U.S. local soda taxes continue to spread? Food Policy. 2017;71:1–7. doi:10.1016/j.foodpol.2017.05.007

133. Baker P, Gill T, Friel S, Carey G, Kay A. Generating political priority for regulatory interventions targeting obesity prevention: An australian case study. Social Science & Medicine. 2017;177:141–9. doi:10.1016/j.socscimed.2017.01.047

134. Crosbie E, Sosa P, Glantz SA. Defending strong tobacco packaging and labelling regulations in Uruguay: Transnational Tobacco Control Network versus Philip Morris International. Tobacco Control. 2017;27(2):185–94. doi:10.1136/tobaccocontrol-2017-053690

135. Phulkerd S, Collin J, Ngqangashe Y, Thow AM, Schram A, Schneider CH, Friel S. How commercial actors used different types of power to influence policy on restricting food marketing: a qualitative study with policy actors in Thailand. BMJ Open. 2022;12:e063539. doi:10.1136/bmjopen-2022-063539

136. Popkin BM, Barquera S, Corvalan C, Hofman KJ, Monteiro C, Ng SW, Swart EC, Taillie LS. Towards unified and impactful policies to reduce ultra-processed food consumption

and promote healthier eating. The Lancet Diabetes & Endocrinology. 2021;9(7):462-470. doi:10.1016/S2213-8587(21)00078-4

137. Pahle M, Burtraw D, Flachsland C, Kelsey N, Biber E, Meckling J, et al. Sequencing to Ratchet up climate policy stringency. Nature Climate Change. 2018;8(10):861–7. doi:10.1038/s41558-018-0287-6

138. Leipprand A, Flachsland C, Pahle M. Starting low, reaching high? sequencing in EU Climate and Energy Policies. Environmental Innovation and Societal Transitions. 2020;37:140–55. doi:10.1016/j.eist.2020.08.006

139. Fesenfeld LP, Maier M, Brazzola N, Stolz N, Sun Y, Kachi A. How information, social norms, and experience with novel meat substitutes can create positive political feedback and demand-side policy change. Food Policy. 2023;117:102445. doi:10.1016/j.foodpol.2023.102445

140. Barlow P, Thow AM. Neoliberal discourse, actor power, and the politics of nutrition policy: A qualitative analysis of informal challenges to nutrition labelling regulations at the World Trade Organization, 2007–2019. Social Science & Medicine. 2021;273:113761. doi:10.1016/j.socscimed.2021.113761

141. Mais LA, Mialon M, Hassan BK, Marcos J, Peres D, dos Santos MG, Martins APB, Coutinho JG, Carvalho CMP. Do they really support “your freedom of choice”? FoPNL and the food industry in Brazil. Frontiers in Nutrition. 2023;9:921498. doi: 10.3389/fnut.2022.921498

142. Fisher DR, Nasrin S. Climate activism and its effects. WIREs Climate Change. 2020;12(1). doi:10.1002/wcc.683

143. Seferedi P, Scrinis G, Huybrechts I, Woods J, Vineis P, Millett C. The neglected environmental impacts of ultra-processed foods. The Lancet Planetary Health. 2020;4(10:-437-438. doi:10.1016/S2542-5196(20)30177-7

144. Alderete M, Gutkowski P, Shammah C. Health is Not Negotiable: Civil Society against the Tobacco Industry’s Strategies in Latin America. 2012. https://theunion.org/sites/default/files/2020-11/reportes_de_casos_lsns_ingles.pdf

145. Ramos S, Keefe-Oates B, Romero M, Ramon Michel A, Krause M, Gerdts C, Yamin AE. Step by Step in Argentina: Putting Abortion Rights into Practice. International Journal of Women's Health. 2023;15:1003-1015. doi:10.2147/IJWH.S41297

146. McHardy J. The WHO FCTC's lessons for addressing the commercial determinants of health. Health Promotion International. 2021;36(1):39-52. doi:10.1093/heapro/daab143

Supplementary Materials – Annex 1

Table A1. Number of media articles related to the policy process for Ley 27,642 reviewed, by media outlet

Source		Description*	Number of Articles
Press	*Clarín*	Popular daily	54
	La Nación	Respected conservative daily	47
	Crónica	Tabloid daily	16
	El Cronista	Business	19
	La Prensa	Argentina's oldest newspaper	4
	Pagina 12	Left-wing daily	13
News agencies/ internet	*Télam*	State-run	50
	Noticias Argentinas	Set up by privately-owned newspapers	21
	Infobae	News portal	45
		Total	**269**

*According to BBC Media Guide to Argentina. Available at https://www.bbc.com/news/world-latin-america-18707517

Table A2. Number of press releases and reports related to the policy process for Ley 27,642 reviewed, by stakeholder organization website searched.

Stakeholder Org.		Press Releases	Reports	Total
Public sector	*Gobierno Argentina*	12	0	12
	Ministerio de Salud	0	1	1
Civil society	*FIC*	24	1	25
	FUNDEPS	4	4	8
	FAGRAN	18	4	22
	PAHO Argentina	17	1	18

International development agencies	*UNICEF Argentina*	10	10	20
			Total	**106**

Table A3. Summary of documents reviewed, by year they were published.

Document Type	**Year of Publication**						**Total**
	2016	**2017**	**2018**	**2019**	**2020**	**2021**	
Media articles	2	2	7	4	41	213	269
Press releases	2	3	9	14	25	30	83
Reports	1	1	1	4	10	5	22
						Total	374

Table A4. Major milestones in the policy process leading up the adoption of the Promotion of Healthy Eating law.

Period	**Date**	**Milestone**
Agenda setting	Feb 8, 2016	PAHO publishes a nutrient profile model to define critical limits for sugar, salt, and fat in ultra-processed foods.
	May 27, 2016	Chile's law on food labelling and advertising (Ley 20,606) comes into force.
	Sep 6, 2016	Argentine government announces the creation of the National Healthy Eating and Obesity Prevention Program in the Ministry of Health, with plans to establish agreements with the food industry on composition, labeling and marketing.
	June 2017 - 2020	PAHO and UNICEF begin to organize a series of meetings inviting key champions from successful policy precedents in the region, beginning with Senator Gilardi from Chile and continuing with stakeholders from Peru, Uruguay and Mexico. Several stakeholders are convened, including civil society and legislators in Congress.
	June 2017	At an event organized by PAHO, UNICEF, and directorates of the Chamber of Deputies, Argentina approves the five-year Action Plan for the Prevention of Obesity in Children and Adolescents, which established four axes of regulation.
	June 2018	Alongside other countries in MERCOSUR, the Ministry of Health signs an agreement with other countries to promote the FOP labelling in Argentina.
	Aug 2018	Officials, legislators, experts, academics, and civil society leaders call for the establishment of FOP labeling in Argentina during a conference held at the National Congress by the PAHO and UNICEF and the

		Chamber of Deputies. [event: the Conference on Consumer Rights, Front Labeling of Foods and Health].
	Sep 2018	The president of Uruguay signs a decree to establish front of package labelling.
	Sep 2018	The Special Rapporteur on the right to food, Hilal Elver, visits Argentina, pointing out that the standards on labeling and nutritional information do not comply with international recommendations.
	May 2019	First meeting on Frontal Labelling of Food and Beverage products is held in MERCOSUR, looking to move forward on the framework signed by health ministers in 2018 on FOP labelling.
	July 2019	Conference on Obesity Prevention held this week in the Chamber of Deputies of the Nation, carried out by PAHO, UNICEF, the General Directorate of Parliamentary Diplomacy of Congress and the Observatory of Human Rights of the Senate. Uruguayan experience presented. Several legislators also present bills to incorporate regulations that help prevent obesity, such as front labeling, limiting advertising directed at children and protecting school environments.
	August 5, 2019	A declaration signed by more than 100 organizations and leaders in the field of health was published, where they request that the governments of Latin America enact effective policies for front labeling of warnings to promote the right to information, health and proper nutrition.
	Oct 27, 2019	Alberto Fernández of the center-left Peronist Frente de Todos (Front for All) coalition defeated current President Mauricio Macri of the center-right Juntos por el Cambio.
Legislative passage - Senate	Aug 2020	Minister of Health holds a working meeting with the national ministers of Productive Development, and of Agriculture, Livestock and Fisheries, in which they harmonized the work and the inter-ministerial coordination that concluded in the presentation of a project for frontal nutritional labeling of food. Plans are made to present at next meeting of CONAL in September
	Oct 2020	The bill is given a joint positive opinion from the Health and Industry Commissions of the Senate.
	Oct 2020	The Ministry of Health ratifies its commitment to advance policies against obesity and overweight during the Conference on childhood obesity and overweight, in which the author of Mexico's front food labeling law presented the new regulations of that country. National legislators also participate when the Senate is advancing a project to incorporate labeling in the country.
	Oct 2020	The bill is given half sanction in the Senate (64 in favor, 3 against, no abstentions).
	Oct 2020	UNICEF, PAHO, and the Food and FAO launch a campaign to ask the sanction of the front food labeling bill that this Thursday was approved by the Senate of the Nation and sent to the Chamber of Deputies.

Legislative passage – Chamber of deputies	Nov 2020	More than 100 scientific, academic, civil society and health organizations from across the Latin American region signed a declaration requesting the National Deputies to approve the food labeling project without delays or changes.
	Mar 4, 2021	A few days before the start of the Ordinary Sessions, FIC Argentina launches the *#DeFrente* campaign so that the Chamber of Deputies of the Nation approves, without changes or further delays, the bill that seeks to implement a Front labeling on food and beverages.
	Apr 14, 2021	A meeting of CONAL is held to discuss the FOP labelling project put forth by the Executive branch, which would also go through MERCOSUR. Civil society speaks out against this initiative because it is less robust than the legislative approach.
	Jun 28, 2021	A communication campaign organized by civil society, *Que no te tapen los ojos,* is published in public, radio, digital and print media to request that the Chamber of Deputies approve, without further delays or changes, the project for front labeling of warnings on food and beverages.
	Jul 13, 2021	The bill is approved by four internal Commissions (General Legislation; Social Action and Public Health; Consumer Defense User and Competition; Industry) of the Chamber of Deputies.
	Sep 2, 2021	PAHO and UNICEF host a Conference on the Law for the Promotion of Healthy Eating, aimed at legislators, decision makers of the Executive Branch and civil society, which seeks to generate a contribution from the international perspective to the legislative agenda of front labeling in Argentina, again bringing many guests from other countries to speak on their regulatory experiences.
	Oct 5, 2021	The bill is supposed to be discussed, but is not due to the lack of a quorum reached amongst the ruling party
	Oct 26, 2021	The bill is passed by an almost absolute majority (220 votes in favor, 22 against).

CONAL = National Nutrition Commission; COPAL = Coordinator of Food Product Industries; FAO = Food and Agricultural Organization of the United Nations; FIC = Inter-American Heart Foundation; FOP = front-of-package; MERCOSUR = Southern Common Market; PAHO = Pan-American Health Organization; UNICEF = United Nations Children's Fund

Table A5. Key stakeholders in the policy process leading up to the adoption of the Promotion of Healthy Eating law.

Type	Stakeholder
Legislative branch	• National Congress: Senate (Senado), Chamber of Deputies (Camara de Diputados)

	• Policy champions: Senator Sagasti (Mendoza, Frente de Todos), Senator Cobos (Mendoza, Juntos por el Cambio)
Executive branch	• Ministry of Health *(Ministerio de Salud de Argentina)* • Ministry of Agriculture, Livestock and Fishery *(Ministerio de Agricultura, Ganadería y Pesca)* • Ministry of Productive Development *(Ministerio de Desarrollo Productivo – MDP)* • National Food Institute (Instituto Nacional de Alimentos – INAL) • National Agrifood Health and Quality Service (SENASA) • National Administration of Medicines, Food and Medical Technology (ANMAT)
International organizations	• United Nations Children's Fund (UNICEF) • Pan-American Health Organization (PAHO) • Food and Agriculture Organization of the United Nations (FAO)
Industry and associated organizations	• Coordinator of Food Product Industries (Coordinadora de industrias de Productos Alimenticios – COPAL) • Argentine Sugar Center (Centro Azucarero Argentino - CAA) • United States Chamber of Commerce in Argentina (Cámara de Comercio de los Estados Unidos en Argentina - AmCham Argentina)
Civil society	• Interamerican Heart Foundation (Fundacion Interamericana de Corazon – FIC) • Foundation for the Development of Sustainable Policies (Fundación para el Desarrollo de Políticas Sustentables - FUNDEPS) • SANAR Foundation (Fundación SANAR) • Collective Conscious (Consciente Colectivo) • Consumers of Argentina (Consumidores Argentinos)
Academia	• Free Chair of Food Sovereignty, University of Buenos Aires (Cátedra Libre de Soberanía Alimentaria – CaLiSA)
Professional nutrition association	• Argentinian Federation of Nutritionists (Federación Arg. de Graduados En Nutrición - FAGRAN)
Inter-agency coalitions	• National Coalition to Prevent Childhood Obesity (Coalición Nacional para Prevenir la Obesidad Infantil) • Network of Lawyers for Food Sovereignty (Red de Abogadas y Abogados por la Soberanía Alimentaria - REDASA) • Network of Free Chairs of Food Sovereignty and Related Groups (Red de Cátedras Libres de Soberanía Alimentaria y Colectivos Afines – RED CALISA) • Association of Chefs and Businessmen linked to Argentine Gastronomy (Asociación de Cocineros y empresarios ligados a la Gastronomía Argentina – ACELGA)

CHAPTER 3. DESIGNING POLITICALLY FEASIBLE NUDGE STRATEGIES TO PROMOTE HEALTHY AND SUSTAINABLE DIETS

3.1

Public acceptance of default nudges to promote healthy and sustainable food choices

Authors: Simone Wahnschafft[a], Dominic Lemken[b], Carolin Eggers[c]

a. Research Training Group in Sustainable Food Systems, University of Göttingen, Heinrich-Düker-Weg 12, 37073 Göttingen, Germany
b. Institute for Food and Resource Economics, University of Bonn, Nußallee 21, 53115 Bonn, Germany
c. University of Göttingen

This article has been published in this form in ***BMC Public Health*** and can be cited as follows:

Lemken, D., Wahnschafft, S. & Eggers, C. Public acceptance of default nudges to promote healthy and sustainable food choices. *BMC Public Health* 23, 2311 (2023). https://doi.org/10.1186/s12889-023-17127-z

Declarations

Author Contributions: Conceptualization of the study and survey design was led by D.L. and implemented by C.E. Literature search was done jointly by S.W. and D.L. Data collection was done jointly by C.E. and D.L. The presented analysis was conducted by D.L. Interpretation of results, writing, and editing of the manuscript was led by S.W., with contributions by D.L.

Financial Support: The authors gratefully acknowledge the financial support of the German Research Foundation (DFG) through the Sustainable Food Systems Research Training Group (RTG 2654) and the project 'Key food choices and climate change' (Project No. 431972934). The DFG had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. The study described in this manuscript received no specific funding. Open Access funding enabled and organized by Projekt DEAL.

Ethical Standards Disclosure: All participants provided informed consent to participate in the online survey. The Ethics Committee of the University of Göttingen reviewed consent materials and study procedure and provided an exemption from requiring ethics approval. The formal waiver is available upon request.

Conflict of Interest: None

Acknowledgements: We acknowledge support by the Open Access Publication Funds/transformative agreements of the University of Göttingen.

Data Availability: The data and analysis code supporting the conclusions of this article are available via GRO.data: https://doi.org/10.25625/XGYIU2. The regression model is available via GitHub: https://github.com/dlemken/Acceptance_default.

Abstract

Background: Default nudges are an increasingly prominent tool for promoting healthy and sustainable food choices; however, questions of acceptance remain. While default nudges are more acceptable to the public than traditionally paternalistic tools that aim to restrict choice, they are also the least acceptable amongst nudging strategies. Little research has investigated the aspects of default nudge design that can be leveraged to better uphold freedom of choice, increase public acceptance, and therefore heighten legitimacy of default nudges. Consequently, this study examines public acceptance of five food choice default nudges with demonstrated precedent of effectiveness, as drawn from research studies and/or real-world policies, along with a design variation of each anticipated to increase acceptance. Three drivers of acceptance – perceived intrusiveness, perceived effectiveness, and own behavior – are examined.

Methods: An online survey was administered in Germany (N = 451) to a sample representative of the adult population on quotas of age, gender and income. Acceptance and drivers were measured using seven-point Likert scales. Significant differences in median acceptance of the nudge were determined and displayed graphically. Ten proportional odds ordered logit models were applied and estimated using a maximum likelihood approach to investigate the mechanisms of nudge acceptance.

Results: Examined changes in nudge design, particularly decreasing costliness of opting out and increasing transparency, increased the acceptance of three of the five nudges (N2.2: $p = 0.000$; N3.2: $p = 0.000$; N4.2: $p = 0.008$). Perceived intrusiveness emerged as the most prominent driver of acceptance (negative relationship), followed by perceived effectiveness (positive relationship). Own engagement in the target behavior of the nudge and socio-demographic variables demonstrated negligible impact on acceptance.

Conclusions: Mitigating the costliness of opting out and improving nudge transparency emerge as key opportunities for choice architects to improve public acceptance, and

thereby potentially identify 'sweet spots' in designing default nudges that are both effective and acceptable. The protection of individual freedom of choice and effectiveness are key aspects for choice architects to communicate to increase acceptance.

Background

In a concerted effort to integrate the health and sustainability agendas for food system transformation, the EAT Lancet Commission published the planetary health reference diet (HRD) in 2019, establishing the first scientific targets for a dietary pattern to promote both healthy diets and sustainable food production on a global scale by 2050 [1]. Meeting the HRD targets in most industrialized countries will require stark increases in the consumption of fruits, vegetables, nuts, wholegrain cereals, and unsaturated fatty acids, as well as decreases in the consumption of meat, dairy products, saturated fatty acids, and sugars [1].

To achieve such shifts, governments have at their disposal several behavior change interventions to promote population-level behavior change. One framework that is commonly used to taxonomize these interventions is the Nuffield Ladder of Intervention, which introduces individual freedom to choose as a key guiding concept [2]. Namely, the ladder distinguishes between ‘soft’ interventions (I.e., those on the lower rungs of the ladder), such as information and education, which infringe the least on individual choice and ‘hard’ interventions (I.e., those on the top rungs of the ladder), such as mandatory standards or bans, which intrude most heavily on individual choice. Following the foundational liberal values underpinning the ladder, the general principle for policymakers to follow is that, when possible and effective, soft measures are to be preferred over hard ones.

In the arena of policymaking for shifting food choices for health and sustainability reasons, most governments to date have favored the use of soft interventions [3]; however, these interventions have often been found to be either (a) ineffective at promoting long-term behavior change, particularly compared to interventions higher on the ladder; or (b) effective

at promoting behavior change amongst those who are already better positioned in society to achieve the desired behavior change, thereby generating inequities along socioeconomic lines [4, 5]. One of the key reasons that has been posited for persistent reliance on soft interventions, despite evidence of low effectiveness, is the issue of acceptance: acceptance of hard interventions, which impinge more heavily on individual freedom of choice, may be low amongst several relevant stakeholders [4]. A systematic review of studies on public acceptance of policies to shift health-related behaviors offers support for this rationale, finding low public acceptance of interventions higher on the Nuffield Ladder relative to those interventions lower on the ladder [6, 7]. Low public acceptance is also inextricably linked to low policymaker acceptance, particularly in democratic contexts in which policymakers must navigate acting in the public interest while maintaining public favor for re-election.

It is in the context of this effectiveness-acceptance trade-off where the appeal of Thaler's and Sunstein's nudge can be easily understood. Thaler and Sunstein essentially posit that it is possible for governments and implementing institutions to effectively change behavior while maintaining individual freedom of choice. Such a balance may be achieved by use of a nudge, which refers to a shift in the way choices are presented to decision-makers (I.e., the choice architecture) that predictably alters behavior in the population without barring any options or significantly changing economic incentives [8]. In little over a decade since its first inception, nudging has already become a prominent consideration in the policymaking toolbox, as many governments and international development agencies have integrated 'nudge units' to guide policy and operational decision-making [9].

Growing evidence points to one particularly effective nudging strategy: the default nudge [10]. Default nudges, which have been highlighted for their potential to promote healthy and sustainable food choices across several studies [11,12,13], refer to a particular type of nudge in which the 'default' option - i.e., the outcome that arises when a decision-maker does not make an active choice – is altered by a choice architect to promote a shift in behavior.

While default nudges are a very promising tool from an effectiveness standpoint, questions of acceptance remain. Namely, while default nudges have been found to be relatively more acceptable to the public than more traditionally paternalistic tools that aim to restrict or eliminate choice [14], default nudges have also been found to be the least acceptable to the public amongst nudging strategies [15, 16].

Public acceptance has been raised as a key consideration in designing ethical nudges, as it serves as a proxy to understanding the extent to which each nudge aligns with the preferences of the population impacted by the nudge and thus the extent to which each nudge is legitimate [17, 18]. Indeed, while nudging first emerged with a promise to find the ethical 'sweet spot' in shifting behavior without infringing on individual freedom to choose, several objections have been raised by critics on the extent to which nudges really do so, particularly if they prey upon cognitive biases and heuristics in such a way that individuals end up choosing options that run counter to their actual preferences [17].

It is also of fundamental importance to understand the mechanisms underpinning public acceptance, or lack thereof. This importance draws from communication research, particularly the theory and empirical evidence for the effect of framing, defined as 'the process by which a communication source constructs and defines a social or political issue for its audience' [19]. Namely, the specific conceptualizations that are used to frame policies have been found to exert an, albeit moderate, influence on public attitudes towards those policies across several policy arenas, including those related to promoting healthy and sustainable food choices [20, 21]. Thus, understanding the factors associated with acceptance offers insights for levers that can be acted upon in the communication of a nudge to increase public acceptance.

Given the salience of public acceptance in designing successful nudges that carefully navigate the effectiveness-acceptance trade-off, this study aims to investigate public acceptance of a series of nudges designed to promote healthy and sustainable food choices amongst consumers in Germany. Germany makes for an applicable study context, as Germany has been highlighted as a pioneering country in the application of behavioral

insights, with a 'nudge unit' based within the Federal Chancellery since 2015 [22]. In addition, public acceptance of health nudges in general has been found to be quite high in Germany [23], a context with limited adoption of more traditionally paternalistic nutrition policy instruments despite a persistently high burden of diet-related disease [24, 25]. This study is guided by two research questions, each expanded upon below.

Q1. What design changes improve public acceptance of default nudges for promoting healthy and sustainable food choices?

Given the understanding that nuances in nudge design carry large implications in terms of acceptance, and thereby legitimacy, of nudge adoption [26], this study explores the effect of shifts in the design of nudges on public acceptance. Specifically, five nudge scenarios are evaluated, as well as one variation of each nudge in which an element of the nudge design is varied (see Fig. 1). The selected nudges were adapted from nudges that have been demonstrated in the literature to be promising from an effectiveness standpoint for promoting various healthy and/or sustainable food choices. All but one (nudge 4) can be classified as default nudges. For each of the nudges, the second variation is anticipated to increase acceptance.

Q2. How do perceived effectiveness, perceived intrusiveness, and engagement in the targeted nudge behavior influence the acceptance of default nudges for promoting healthy and sustainable food choices?

This study investigates the influence of three mechanisms on public acceptance of the five proposed nudge scenarios and their variations. These mechanisms were selected based on the following two criteria: (a) they are highlighted in the literature as particularly prominent drivers of nutrition policy acceptance amongst the public; and/or (b) if found to play a role in acceptance of default nudges, they are actionable levers for improving the communication of default nudges to increase acceptance. The first mechanism, which captures the extent to which the public believes the default nudge to be effective at achieving the desired shift in behavior, has been found to be one of the strongest predictors of nutrition policy acceptance in previous studies [27, 28], including specifically for nudges

to shift food choices [29, 30]. Perceived intrusiveness, or the extent to which people believe the default nudge to limit freedom of choice, is another salient mechanism that has been found to mediate acceptance of a range of nutrition policies [26, 28, 31]. Finally, this study examines the impact of self-reported engagement in the behavior that is targeted by each nudge, as this has also been found to mediate nutrition policy acceptance [6].

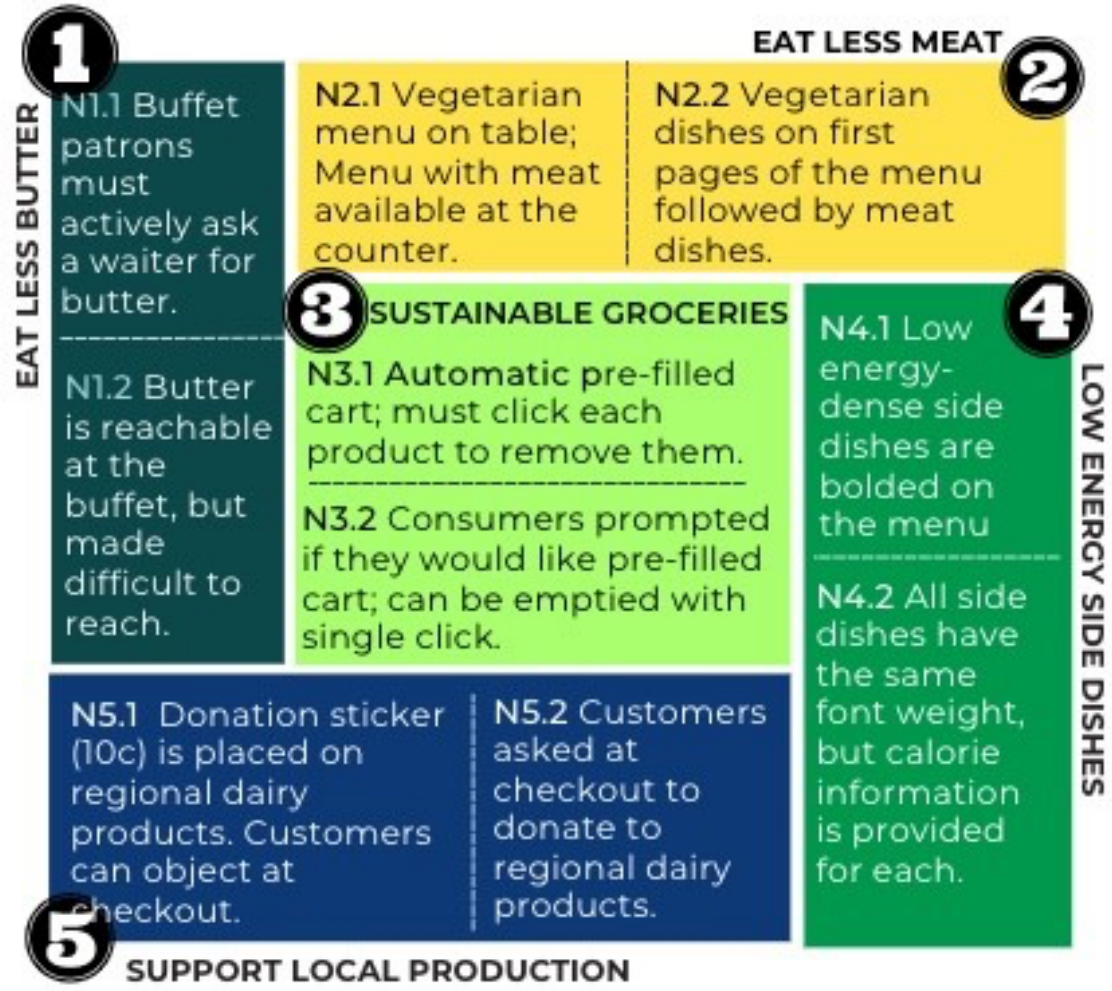


Figure 1. Summary of five default nudge scenarios and respective variations examined.

Methods

Study Procedure

Following a few socio-demographic questions for the purposes of quota sampling, participants were asked to evaluate five nudge designs, as well as a variation for each nudge design. Each nudge scenario followed an identical procedure. First, participants were asked how they typically behave in a specific setting, such as whether they typically consume butter at a restaurant buffet when the following nudge scenario focused on butter consumption. Then, participants were briefly introduced to the nudge scenario in a descriptive manner to avoid influencing perceptions. Participants were subsequently asked to rate their "acceptance" of the nudge scenario on a seven-point Likert scale (ranging from − 3 "full rejection" to 0 "indifferent" to + 3 "full acceptance), as well as their perceived freedom to choose, whether they believed the nudge would effectively change their personal behavior, and whether they believed the nudge would effectively change the behavior in general. The perceived effectiveness on personal behavior was dropped from the data analysis because the relationship with acceptance is mediated by the perceived effectiveness in general (bivariate correlations ranging between 0.3 and 0.85). The same evaluation was then conducted for the variation of the nudge scenario to compare the scenarios. The order in which the five nudge scenarios were presented to participants was randomized to avoid ordering effects. However, the variation of a nudge scenario always followed the original nudge scenario. For a full summary of statements used to measure mechanisms underpinning acceptance, see *Supplementary Materials (Table S1)*.

Overview of Default Nudge Scenarios

Nudge 1. Eat Less Butter. The first nudge was drawn from a study conducted amongst students in Denmark, in which a shift in the positioning of butter at a buffet from easily within reach of consumers to available only upon request was found to effectively decrease uptake from 0.7 to 0.3 butter packages consumed per person [32].

Nudge 2. Eat Less Meat. The second nudge was adapted from a study conducted on the campus of a large university in the United States, in which the provision of a default menu with vegetarian options was found to increase the choice of vegetarian meals in a school canteen amongst recipients compared to conventional menu options (OR = 4.10) [11].

Nudge 3. Climate-Friendly Groceries. The third nudge investigated examines the acceptance of a pre-filled climate-friendly grocery cart in an online supermarket setting. The precedent for the effectiveness of this default nudge was demonstrated amongst low-income consumers in the U.S., in which randomization to a pre-filled nutritionally balanced online grocery cart was found to decrease total calories and energy density of purchases amongst recipients over the course of five weeks compared to a control group [12].

Nudge 4. Low Energy Density Dishes. The fourth nudge draws upon the results of manipulations to a restaurant menu conducted by Dalrymple et al. in a U.S. theme park, in which increasing the font weight and centrality of low energy side dishes on a menu increased selection of low-energy side dishes to 42.2% compared to 18.1% in the normal menu with all side dishes displayed the same [33].

Nudge 5. Donation for Regional Dairy Products. The fifth and final nudge concerns generating support for local dairy farmers by way of a default donation sticker placed on dairy products, which can be opted out of by way of an in-store coupon in a supermarket setting. This nudge was drawn from a real-world policy adopted by one grocery store chain in Sweden in 2015 that generated an extra 28,000 krona (~ 2.500 EUR) per dairy farm in donations over just 6 months [34].

A summary of the variations of each nudge examined, as well as the design element varied across the variations, can be found in *Table 1*.

Table 1. Summary of five nudge scenarios, variations, and design element varied across variations.

Nudge	Variation 1	Variation 2	Design element varied

1.	*Eat Less Butter*	Patrons must actively ask a waiter for butter.	Butter is reachable for patrons at the buffet, but it is made to be difficult to reach.	Shift in nudge intrusiveness by decreasing the 'social' cost of opting out.
2.	*Eat Less Meat*	A vegetarian menu is placed on the table. A normal menu with meat options is available but must be actively fetched at the counter.	A menu with both meat and vegetarian meal options is placed at the table; however, vegetarian dishes are placed on the first page of the menu.	Shift in nudge intrusiveness by decreasing the 'physical' cost of opting out.
3.	*Climate-Friendly Groceries*	Consumers are automatically provided a pre-filled cart and must click products individually to remove them if they are not desired.	Consumers are presented with a choice about receiving a pre-filled cart, which can be emptied with a single click.	Increased nudge transparency.
4.	*Low-Energy Side Dishes*	Low energy dense side dishes are bolded on the menu.	All side dishes have the same font weight, but calorie information is provided by each side dish on the menu.	Shift from a salience nudge to an information nudge.
5.	*Donations for Regional Dairy Products*	A 10-cent donation sticker is placed on regional milk products, to which customers must actively object at checkout.	The cashier asks the customer if they agree to a donation on regional milk products in their cart at checkout.	Shift in nudge intrusiveness from a default structure to a forced active choice.

Data Analysis

To answer the first research question, acceptance between the original scenario and variation are compared, as well as displayed graphically to visualize the effects of the variation on full refusal, indifference and full support. In addition, we apply a median test for equality of matched pairs of observations, previously explained by Snedecor and Cochran [35]. The null hypothesis is that the median of the differences is zero; no further assumptions are made about the distributions. The null hypothesis is rejected for p-values smaller than 0.05. The test speaks to the probability of one nudge variation being more accepted than another. I. For the second research question regarding the mechanisms of nudge acceptance, ten proportional odds ordered logit models are applied. The models are estimated using the maximum likelihood approach. Such a model can be thought of as

multiple binary logistic regressions on the relative probability to be in one category rather than the next lower one [36]. The explanatory variables have been standardized to compare. Odds ratios (ORs) are presented graphically. The value of "1" implies no OR change across the values of the independent variable. The model for all 10 scenarios is presented within a single table. All models control for sociodemographic characteristics of consumers.

Participants

451 participants completed the survey (see *Table 2*). They were recruited by a market research firm to be representative of German consumers on quotas of age, gender and income. The survey was pre-tested amongst 50 participants from different educational backgrounds. To minimize selection bias, participants received minimal information on the survey content prior to participation. To ensure data quality, attention checks were included in the survey and participants who failed were unable to complete the survey. In addition, participants who took less than 5 min (approximately half of median time, one third of mean time) to complete the questionnaire, were excluded, as it is assumed that they did not have time to adequately process and evaluate the scenarios. The cleaned data set includes 409 participants.

Table 2. Sample description and quoted variables.

Variable	N (409)	Freq [%]	Pop. [%]
Gender			
Female	219	53.7	50.9
Male	189	46.3	49.1
Age			
18-24	10	2.4	11.1
25-34	83	20.3	19.1
35-44	95	23.2	18.0
45-54	79	19.3	21.8
55-64	97	23.7	20.9
65-70	45	11	9.1
Income (Euro, Monthly Net)			
<900	20	4.9	4.9

900-1300	32	7.8	8.4
1301-1500	19	4.6	4.5
1501-2000	52	12.7	11.8
2001-2600	52	12.7	13.5
2601-3600	71	17.4	17.8
3601-5000	71	17.4	16.9
>5000	92	22.5	22.2

Population mean for age and gender based on UN data [37] and income based on Bundeszentrale für politische Bildung [38]. One Person did not identify with male or female.

Note, participants above 70 years old have not been included. The recruitment of participants in the highest income group took a few days longer than other participants, however, we do not expect the delayed data collection to systematically influence results.

Results

Acceptance of Default Nudge Designs

Q1. What design changes improve public acceptance of default nudges for promoting healthy and sustainable food choices?

Examined changes in the design increased the acceptance of three of the five nudges (see *Table 3*). First, placing the vegetarian dishes on the first pages of the menu rather than having patrons actively fetch a non-vegetarian menu at the counter (I.e., physical cost) was found to significantly increase the acceptance of the nudge ($p(chi^2) = 0.00$). A similar increase in acceptance was observed for the shift in nudge transparency from a pre-filled, climate-friendly shopping cart to instead offering consumers a choice whether they would prefer a pre-filled grocery cart option ($p(chi^2) = 0.000$), as well as for a shift in the labelling of low energy dishes on the menu from a salience nudge (I.e., bolded text) to an information nudge (I.e., calorie information) ($p(chi^2) = 0.008$). Conversely, no significant difference in acceptance was observed for the examined decrease in the social cost of opting out of the

butter nudge at a buffet, nor for the shift to ask consumers whether they would like to donate for regionally produced milk products at checkout rather than actively object to a donation sticker.

Table 3. Mean acceptance of default nudge scenarios.

Acceptance	N	Mean	Std. Dev.	Full refusal (%)	Indifference (%)	Full acceptance (%)	P-value
N1.1	407	.246	2.24	20.15	15.72	24.82	
N1.2	408	.127	2.077	18.14	22.55	19.36	0.1604
N2.1	409	-.012	2.2	22.0	17.85	20.29	
N2.2	409	1.509	1.875	8.56	11.25	44.74	0.000
N3.1	409	.029	2.179	22.74	18.09	18.83	
N3.2	409	.858	1.876	9.78	24.21	27.87	0.000
N4.1	409	1.438	1.707	5.62	16.38	38.39	
N4.2	409	1.66	1.718	5.62	14.67	48.9	0.008
N5.1	409	.988	2.104	11.74	13.45	37.9	
N5.2	409	.968	1.989	11.49	17.6	33.5	0.3853

Test-statistic for the p-values is based on a non-parametric sample test on the equality-of-medians [33]. It tests the null hypothesis that the samples were drawn from populations with the same median.

Regarding the effect of the design changes on the variation of acceptance, some noteworthy trends can be observed (see *Figure 2*). The original iterations of both the second (I.e., default vegetarian menu) and third nudge (I.e., pre-filled online shopping cart) were quite controversial, with 22.0% and 22.8% of participants indicating full refusal and 20.3% and 18.8% indicating full acceptance, respectively. The design change to reduce the physical cost of opting out of the vegetarian nudge is shown to most strongly mitigate nudge controversy, more than halving the share of participants indicating full refusal (-13.4%) and doubling the share of full acceptance (+24.5%). The shift in the transparency of the pre-filled online grocery cart nudge was also observed to decrease controversy, but rather by shifting participants towards a higher share of both indifference (+6.1%) and full acceptance (+9.0%). The first nudge concerning butter accessibility was also highly controversial in its original iteration; however, the proposed design shift to eliminate the social cost of opting out did not significantly mitigate the controversy of the nudge. The fourth and fifth nudges were less controversial to participants than the first three in their original iterations, as each were fully acceptable to a relatively high share of participants in the first place: 38.4% and 37.9%,

respectively. For these latter nudges with relatively high acceptance in the beginning, only the shift in menu labelling of side dishes slightly increased full acceptance (+10.5%).

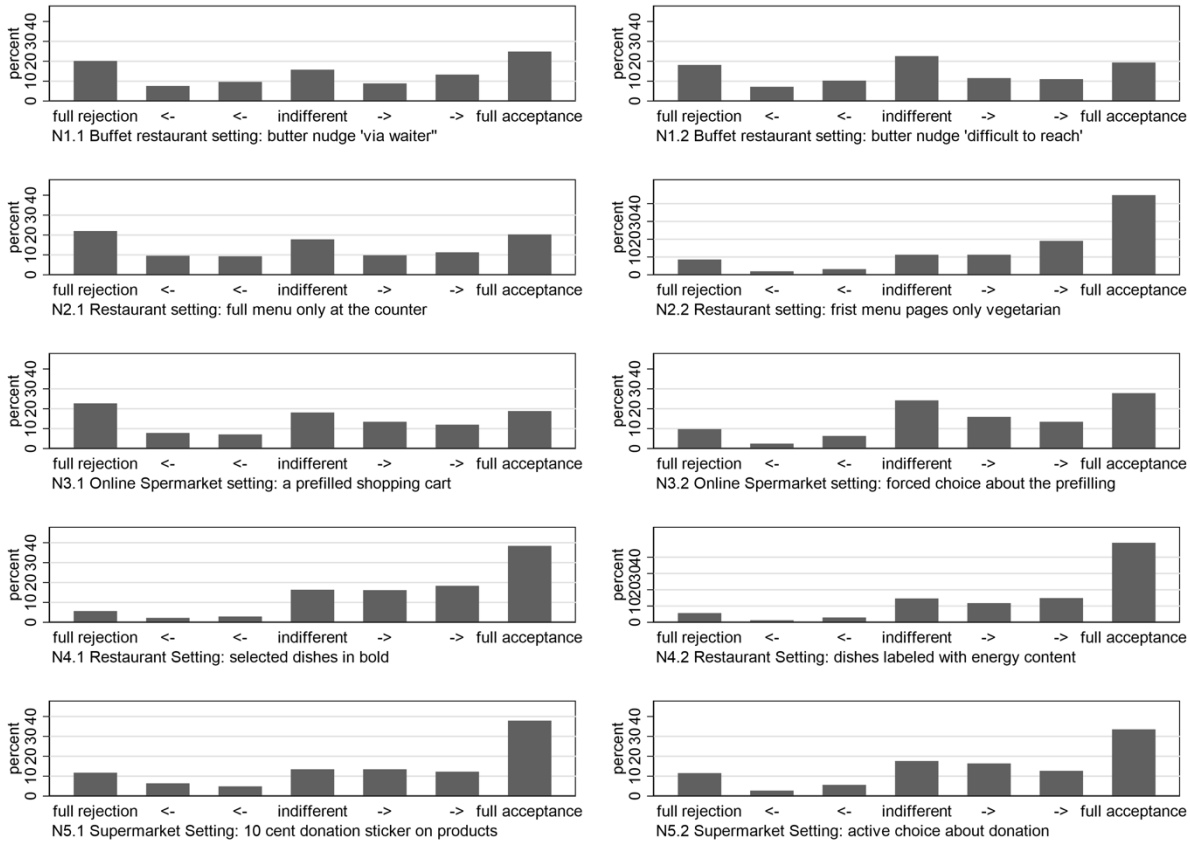


Figure 2. Public acceptance of five nudge designs and their variations. Frequencies in percent (7-point Likert scale) ranging from -3 “full rejection” to 0 “indifferent” to +3 “full acceptance". Description of nudges is summarized in Table 1

Drivers of Default Nudge Acceptance

Q2. How do perceived effectiveness, perceived intrusiveness, and engagement in the targeted nudge behavior influence the acceptance of default nudges for promoting healthy and sustainable food choices?

The perceived intrusiveness of the nudge on individual freedom to choose was found to be the most influential mechanism underpinning acceptance, or lack thereof (see *Figure 3)*. While the strength of the inverse relationship between perceived intrusiveness and

acceptance varied, with the strongest association for the first (OR N1.1 = 0,24; OR N1.2 = 0,30) and second nudges (OR N2.1 = 0,21; OR N2.2 = 0,27), the observed relationship is consistent: the higher the perceived intrusiveness of the nudge on individual freedom, the lower the acceptance. Perceived effectiveness was also found to be a salient driver, with participants indicating higher acceptance of nudges they deemed to be effective at shifting the desired behavior. Engagement in the targeted behavior of the nudge exhibited a negative association with acceptance, though the strength of the association was not comparable to that of either perceived intrusiveness or perceived effectiveness. The fifth nudge is a notable outlier in several respects. First, participants who generally reported higher acceptance of nudges they perceived to be effective reported the opposite for the fifth nudge: the more effective the nudge was perceived to be in increasing donations, the less acceptable it was (OR N5.1 = 0,38; OR N5.2 = 0,48). In addition, those who stated they would donate to support local agriculture found the proposal of a default nudge surrounding this behavior to be less acceptable than those who did not regularly donate (OR N5.1 = 0,62; OR N5.2 = 0,64). Relative to the behavioral and attitudinal mechanisms examined, socio-demographics were observed to carry a small influence on acceptance and were inconsistent in their effect on acceptance across the nudge scenarios.

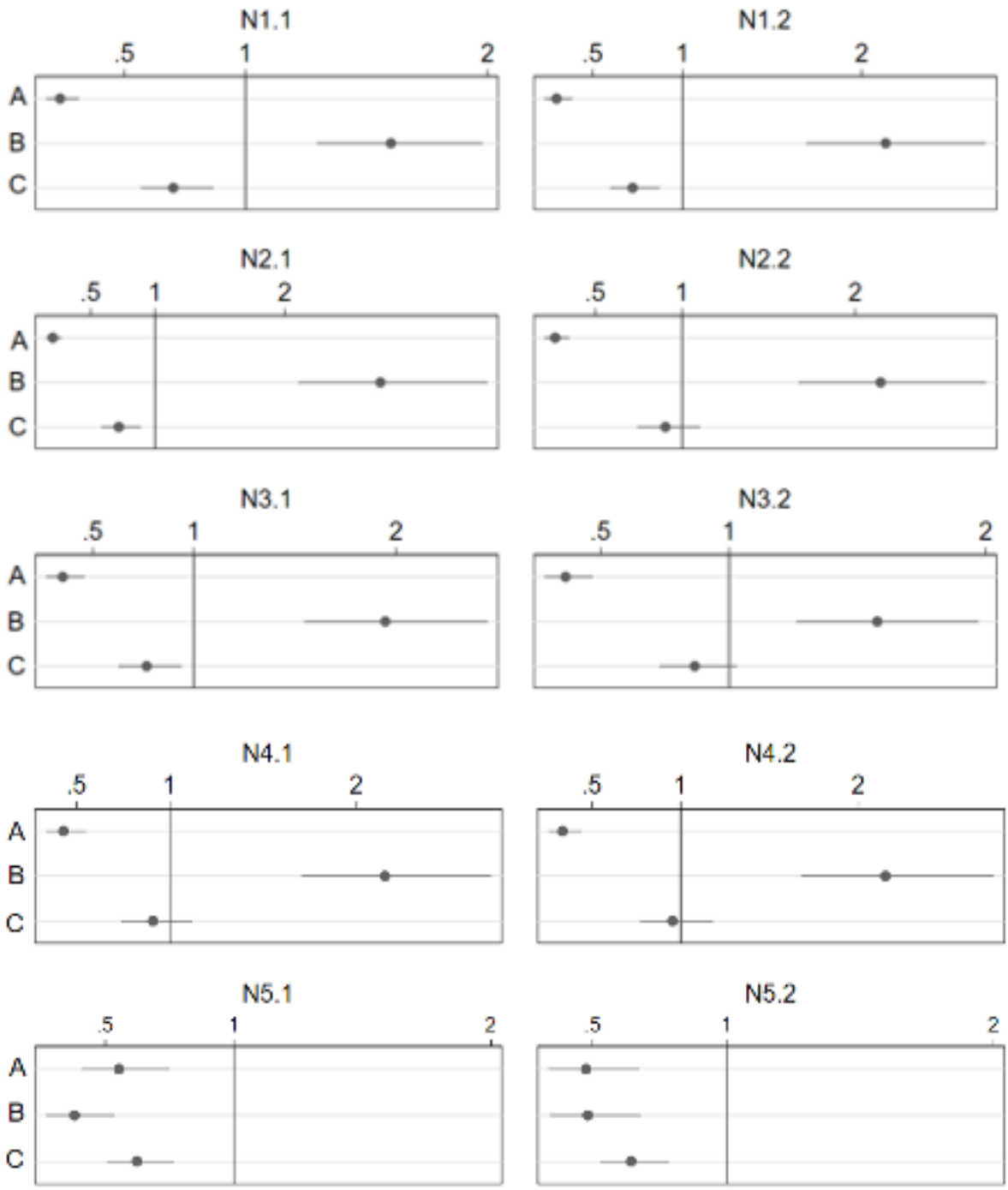


Figure 3. The effect of anticipated drivers on acceptance of studied nudges, expressed as odds ratios (N=409). (A) perceived intrusiveness, (B) perceived effectiveness, (C) engagement in the target behavior (own behavior). Estimated odds-ratio are displayed with 95% confidence-intervals. All sociodemographic variables are controlled for. For a full regression table, which also includes socio-demographic variables not displayed here, see *Supplementary Materials (Table S2)*.

Discussion

On Intrusiveness

The results point first and foremost to intrusiveness as a key concept in designing and communicating default nudges that are both effective and acceptable. First, we highlight that the highest increase in acceptance observed across nudge variations pertained to a change in the intrusiveness of the nudge design. Namely, eliminating the physical effort of opting out of a default vegetarian menu transformed a highly contested nudge into a widely accepted one. Second, we highlight the observed preponderance of *perceived* intrusiveness as a key driver of nudge acceptance, or lack thereof. Namely, for all nudges examined, people's perception of the nudge's infringement on their individual freedom to choose emerged as the leading factor explaining acceptance, or lack thereof. The importance of perceived intrusiveness is striking, particularly given that existing studies to date examining the effect of shifts in the design and communication of default nudges on acceptance have focused much more squarely on the role of other drivers, such as perceived effectiveness [30,39] and individual characteristics, such as own behavior [39] and socio-demographics [7]. We therefore posit that there is a salient and under-recognized opportunity for choice architects to calibrate effective and acceptable default nudges by (a) more actively applying design changes to mitigate the costliness of opting out to better preserve individual freedom to choose, as aligned with nudging theory; and (b) actively communicating the preservation of consumer freedom to choose as a central consideration of the nudge design to increase acceptance.

On Effectiveness

Another key concept highlighted in this study is that of effectiveness. The results of this study indicate that concerns of effectiveness and acceptance must be weighed and carefully calibrated for each nudge to discover 'sweet spots'. For example, removing the social effort of having to ask a waiter for butter in a buffet setting is not found to significantly increase acceptance of the nudge, but it is likely to carry negative consequences for effectiveness, and thus is not a promising design shift for balancing the effectiveness-

acceptance trade-off [37]. Conversely, removing the physical effort of deselecting a default vegetarian menu transforms acceptance. While this design change may carry some dilution of effectiveness, it sharply increases the acceptance and thereby the probability of successfully introducing a first nudge in a sustainable direction. In another example, shifting from a salience nudge of low energy side dishes to an information nudge design, specifically calorie labeling, increases acceptance; however, the effect magnitude is just 0.22 on the 7-point acceptance scale, presenting a small difference between two highly accepted nudges. This result is in line with other studies that find such labeling nudges to be among the most acceptable food policies for healthier eating [7,40]. Thus, effectiveness considerations can be prioritized in this context. Menu labelling policies, highlighted in a recent Cochrane review for their moderate potential to decrease calories consumed in restaurant settings [41], have become increasingly applied, with countries like the U.S. and U.K. introducing mandatory calorie labelling policies for large chain restaurants. Adoption of nudge designs that make healthier choices more salient in food environments, such as increasing the size of healthy options relative to unhealthy choices [42] or shifts in menu positioning of healthy items [43] are relatively less common, though a systematic review of salience nudging studies identified a consistent positive influence for healthier food choices [44]. However, the same systematic review identified a dearth of salience nudges for food choices, pointing to a gap in research and application for adopting potentially effective and acceptable nudges for shifting food choices.

Perceived effectiveness is another key aspect of acceptance: consumers need to believe in the intervention's success in order to prefer it over the status quo [39]. However, the opposite can also be true, as observed in the case of the fifth nudge concerning donations. If the effectiveness of a nudge hinges on a strong form of implied endorsement, which is often described as a psychological mechanism of defaults [40,26], then people grow particularly wary of effective interventions. A similar result was observed in a cross-country survey in the acceptance of nudges, which noted low acceptance of nudges related to donations, which the authors posit relates to loss aversion: in general, people do not favor

default rules that they perceive would take people's money without their explicit consent [45].

Looking into absolute acceptance values, we highlight the heterogeneity in the responses. We observe with several nudges that a majority identifies with either full rejection or full acceptance. This trend points to the challenges for restaurants, caterers and policy makers to implement effective nudging policies as part of their overall business model or agenda that will be strongly opposed by a substantial share. That said, this study points to one particularly exciting nudge in the context of balancing effectiveness and acceptance. Namely, the fifth nudge, drawn from a real-world policy in Sweden that raised substantial donations for local dairy farmers, demonstrates that a default that clearly does not impose physical effort, substantial time, or money to opt-out of is clearly accepted by most consumers. This real-world example is relevant because policy debates on the transformation of the agricultural and food systems often discuss how to generate money to provide the agricultural sector options to restructure production units. In Germany, the "Borchert Kommission" has introduced several key policies to create a level-playing field for domestic producers when burdening them with additional costs for the transformation. Such nudging policies are not currently considered but could be a way to collect purpose-specific revenues without burdening poorer consumers with additional household spending.

On Transparency

This study also highlights the issue of nudge transparency, which is found to play a significant role in acceptance of a default nudge to shift climate-friendly grocery shopping. Informing consumers about the default option of a pre-packed grocery cart made a substantial difference to acceptance. Transparency is regularly discussed as a key concept to increase the legitimacy of nudges, as it ensures that consumer autonomy is respected [26] and has been studied as a key driver in nudge acceptance [46]. Although transparency can be perceived as paternalistic by some, it also fits well into a world that demands an increasing number of decisions [47], in which such a nudge can help encourage shoppers inclined towards certain behaviors – such as climate friendly or healthy purchases - to more

conveniently and effectively live out those values in their shopping behavior. In general, transparent nudges are often similarly effective to non-transparent ones [26,42,48], although some context dependencies are still involved. Thus, transparent nudges are generally preferable to non-transparent ones given the similar effectiveness and the edge on acceptance.

On Own Behavior

The fourth and final concept touched upon in this study as a driver of nudge acceptance is that of engagement in the targeted behavior of the nudge. The expected deleterious effect of nudges on consumer welfare, such as the costs imposed upon consumers to opt-out of an option that they would regularly reject, is considered a key barrier of nudge acceptance [49]. Previous studies do indicate an association between own engagement in a targeted health behavior and acceptance of policies aimed at changing it [6], such as for interventions related to reducing the consumption of sugary drinks amongst regular consumers [7,50]. However, such results are characterized by small effect sizes [7] and inconsistency [51].

The results of this study indicate a weak relationship between engagement in the target behavior of the nudge and nudge acceptance. We therefore challenge this straightforward assumption regarding own-behavior and intervention acceptance and recommend giving a low priority to actual behavior while instead considering behavioral intentions of consumers. Indeed, attitudinal factors such as individual sugar consciousness [7,28] and health consciousness [52] have been found to be drivers of acceptance of a range of healthy eating interventions. Consumers may accept nudges because they feel that they help them to achieve a better version of themselves.

Limitations and Future Directions

A key limitation to acknowledge is the study's focus on a limited set of design elements. While some critical aspects, such as transparency and the cost of opting out, were explored in this study, other potentially influential elements, like customization, were not examined. Furthermore, we did not compare how similar variations in nudge transparency might manifest across different nudge domains. These limitations present opportunities for future

research to systematically investigate the relationship between nudge design and acceptance more comprehensively.

Moreover, while our survey did not touch on particularly sensitive topics, it is important to recognize the potential presence of social desirability bias when relying on self-reported measures to assess both mechanisms and acceptance of interventions related to personal well-being and pro-social behaviors [53, 54]. Although complete avoidance of this bias is challenging, we took deliberate steps to maintain neutrality in the language used to describe nudges and other measurements, minimizing any implied endorsement of specific behaviors or responses. Additionally, it's worth noting that each nudge variation was subject to the same systematic bias, allowing for meaningful comparisons within variations but making it challenging to draw causal conclusions when comparing across different nudges due to numerous altered factors.

Conclusions

This study was driven by two research aims: (1) to identify which design changes improve public acceptance of default nudges for promoting healthy and sustainable food choices; and (2) to examine how attitudinal and behavioral drivers – perceived effectiveness, perceived intrusiveness, and engagement in the targeted nudge behavior - influence the acceptance of default nudges for promoting healthy and sustainable food choices. With regard to the former, the results indicate that mitigating the costliness of opting out and improving the transparency of the nudge are key opportunities for choice architects to improve public acceptance, and thereby potentially identify 'sweet spots' in designing default nudges that are both effective and acceptable. With regard to the latter, perceived intrusiveness was found to play the most prominent role in predicting acceptance, followed by perceived effectiveness. Consequently, the protection of individual freedom of choice and effectiveness of default nudging strategies emerge as key aspects for choice architects to communicate to the public to increase acceptance.

References

1. Willett W, Rockström J, Loken B, Springmann M, Lang T, Vermuelen S, et al. Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems. The Lancet. 2019;393(10170):447-492.
2. Nuffield Council on Bioethics. Public health: ethical issues. Nuffield Council on Bioethics, London. 2007.
3. Roberto CA, Swinburn B, Hawkes C, Huang TTK, Costa SA, Ashe M, Zwicker L, Cawley JH, Brownell, KD. Patchy progress on obesity prevention: emerging examples, entrenched barriers, and new thinking. The Lancet. 2015;385(9985):2400-2409.
4. Adams J, Mytton O, White M, Monsivais P. Why Are Some Population Interventions for Diet and Obesity More Equitable and Effective Than Others? The Role of Individual Agency. PLoS Medicine. 2016;13(5):e1002045.
5. Ghesla C, Grieder M, Schubert R. Nudging the poor and the rich – A field study on the distributional effects of green electricity defaults. Energy Economics. 2020;86:104616.
6. Diepeveen S, Ling T, Suhrcke M, Roland M, Marteau TM. Public acceptability of government intervention to change health-related behaviours: a systematic review and narrative synthesis. BMC Public Health. 2013;756.
7. Hagmann D, Siegrist M, and Hartmann C. Taxes, labels, or nudges? Public acceptance of various interventions designed to reduce sugar intake. Food Policy. 2018;79:156-165
8. Thaler RH, Sunstein CR. Nudge. Improving decisions about health, wealth, and happiness. Penguin. 2009.
9. Afif Z. “Nudge units” – where they came from and what they can do. World Bank Blogs. 2017.
10. Hummel D, Maedche A. How effective is nudging? A quantitative review on the effect sizes and limits of empirical nudging studies. Journal of Behavioral and Experimental Economics. 2019;80:47-58.
11. Campbell-Arvai V, Arvai J, Kalof L. Motivating sustainable food choices: the role of nudges, value orientation, and information provision. Environmental Behavior. 2014;46:453–475.

12. Coffino JA, Han GT, Evans W, Luba R, Hormes JM. A Default Option to Improve Nutrition for Adults with Low Income Using a Prefilled Online Grocery Shopping Cart. Journal of Nutrition Education and Behavior. 2021;53(9):759-769.
13. Reisch LA, Sunstein CR. Plant-Based by Default. One Earth. 2021;4(9):1205-1208.
14. Kwon J, Cameron AJ, Hammond D, White CM, Vanderlee L, Bhawra J, Sacks G. A multi-country survey of public support for food policies to promote healthy diets: Findings from the International Food Policy Study. BMC Public Health. 2019;19:1205
15. Yang JY, Mellers BA. American attitudes toward nudges. Judgement and Decision Making. 2016;11(1):62-74.
16. Van Gestel LC, Adriaanse MA, de Ridder DTD. Who accepts nudges? Nudge acceptability from a self-regulation perspective. PLoS ONE. 2021;16(12):e0260531.
17. Sunstein CR, Reisch LA. Trusting Nudges: Toward a Bill of Rights for Nudging (1st ed.). Routledge. 2019.
18. Engelen B. Ethical Criteria for Health-Promoting Nudges: A Case-by-Case Analysis. The American Journal of Bioethics. 2019;19(5):48-59.
19. Nelson TE, Oxley ZM, Clawson RA. Toward a Psychology of Framing Effects. Political Behavior. 1997;19: 221-246.
20. Whitley CT, Gunderson R, Charters M. Public receptiveness to policies promoting plant-based diets: framing effects and social psychological and structural influences. Journal of Environmental Policy & Planning. 2017;20(1):45-63
21. McGlynn J, McGlone MS. Desire or Disease? Framing Obesity to Influence Attributions of Responsibility and Policy Support. Health Communication. 2018;34(7):689-701.
22. Afif Z, Islan WW, Calvo-Gonzalez O, Dalton AG. Behavioral Science Around the World: Profiles of 10 Countries (English). eMBeD brief. Washington, D.C.: World Bank Group. 2019.
23. Krisam M, Maier M, Janßen R, Krisam J. What do Germans really think about health-nudges? BMC Public Health. 2021;21:821.

24. Schienkiewitz A, Kuhnert R, Mensink GBM et al. Overweight and obesity among adults in Germany – Results from GEDA 2019/2020 – EHIL. Journal of Health Monitoring 2022;7(3):21.28.
25. Hannelore N, Kuhnert R, Born S. 12-Month prevalence of hypertension in Germany. Journal of Health Monitoring 2017;2(1):51-57.
26. Lemken D. Options to design more ethical and still successful default nudges: a review and recommendations. Behavioural Public Policy. 2021;1-33.
27. Bos C, Van der Lans IA, Van Rijnsoever FJ, Van Trijp HCM. Consumer Acceptance of Population-Level Intervention Strategies for Healthy Food Choices: The Role of Perceived Effectiveness and Perceived Fairness. Nutrients. 2015;7(9):7842-7862.
28. Espinosa R, Nassar A. The Acceptability of Food Policies. Nutrients. 2021;13(5):1483
29. Petrescu DG, Hollands GJ, Couturier D-L, Ng Y-L, Marteau TM. Public Acceptability in the UK and USA of Nudging to Reduce Obesity: The Example of Reducing Sugar-Sweetened Beverages Consumption. PLoS ONE. 2016;11(6):e0155995.
30. Reynolds JP, Archer S, Pilling M, Kenny M, Hollands GJ, Marteau TM. Public acceptability of nudging and taxing to reduce consumption of alcohol, tobacco and food: A population-based survey experiment. Social Science Medicine. 2019;236:112395.
31. Nguyen L, Steur HD. Public Acceptability of Policy Interventions to Reduce Sugary Drink Consumption in Urban Vietnam. Sustainability. 2021;13:13422.
32. Mikkelsen BE, Romani AQ. Does buffet choice architecture affect intake? The effect of relocating butter at a breakfast buffet on food intake. Journal of Foodservice Business Research. 2016;():1-8.
33. Dalrymple JC, Radnitz C, Loeb KL, Keller KL Optimal defaults as a strategy to improve selections from children's menus in full-service theme park dining. Appetite. 2020;152:104697.
34. Jordbruksaktuellt. Mjölkkrona möjliggörs genom höjt inköpspris. 2015. Accessed at www.ja.se/artikel/48466/mjlkkrona-mjliggrs-genom-hjt-inkpspris.html
35. Snedecor GW, Cochran WG. Statistical Methods. 8th Edition, Iowa State University Press, Ames. 1989.

36. McKelvey RD, Zavoina W. A statistical model for the analysis of ordinal level dependent variables. The Journal of Mathematical Sociology. 2010;4(1):103-120.
37. The UNdata Database. http://data.un.org/Data.aspx?d=POP&f=tableCode%3A22. Accessed 15 December 2022.
38. Bundeszentrale für politische Bildung. https://www.bpb.de/kurz-knapp/zahlen-und-fakten/soziale-situation-in-deutschland/61754/einkommen-privater-haushalte/. Accessed 15 December 2022.
39. Cadario R, Chandon P. Effectiveness or consumer acceptance? Tradeoffs in selecting healthy eating nudges. Food Policy. 2019;85:1-6.
40. Reisch LA, Sunstein CR, Gwozdz W. Beyond carrots and sticks: Europeans support health nudges. Food Policy. 2017;69:1-10.
41. Crockett RA, King SE, Marteau TM, Prevost AT, Bignardi G, Roberts NW, Stubbs B, Hollands GJ, Jebb SA. Nutritional labelling for healthier food or non-alcoholic drink purchasing and consumption. Cochrane Database Syst Rev. 2018;2(2):CD009315.
42. Michels L, Schmitt K, Ochmann J, Laumer S, Tiefenbeck V. Is It All About Transparency? The Effectiveness and Ethics of a Digital Salience Nudge. ECIS Research Papers. 2021;25.
43. Dayan E, Bar-Hillel M. Nudge to nobesity II: Menu positions influence food orders. Judgement and Decision-Making. 2011;6(4):333-342.
44. Wilson AL, Buckley E, Buckley JD, Bogomolova S. Nudging healthier food and beverage choices through salience and priming. Evidence from a systematic review. Food Quality and Preference. 2016;51:47-64.
45. Sunstein CR, Reisch LA, Rauber J. A worldwide consensus on nudging? Not quite, but almost. Regulation & Governance. 2017;12(1):3-22.
46. Felsen G, Castelo N, and Reiner PB. Decisional enhancement and autonomy: public attitudes towards overt and covert nudges. Judgment and Decision Making. 2013;8(3):202-213.
47. Wansink B, Sobal J. Mindless Eating: The 200 Daily Food Decisions We Overlook. Environment and Behavior. 2007;39(1):106-123.

48. Bruns H, Kantorowicz-Reznichenko E, Klement K, Jonsson ML, Rahali B. Can nudges be transparent and yet effective? Journal of Economic Psychology. 2018;65:41-59.
49. Sunstein CR. The Storrs Lectures: Behavioral Economics and Paternalism. Yale Law Journal, Forthcoming. 2012.
50. Eykelenboom M, van Stralen, MM, Olthof MR, Schoonmade LJ, Steenhuis IHM, Renders CM. Political and public acceptability of a sugar-sweetened beverages tax: a mixed-method systematic review and meta-analysis. International Journal of Behavioral Nutrition and Physical Activity. 2019;16:78.
51. Julia C, Méjean C, Vicari F, Péneau S, Hercberg S. Public perception and characteristics related to acceptance of the sugar-sweetened beverage taxation launched in France in 2012. Public Health Nutrition. 2015;18(14):2679-88.
52. Mazzocchi M, Cagnone S, Bech-Larsen T, Niedzwiedzka B, Saba A, Shankar B, Verbeke W, Traill WB. What is the public appetite for healthy eating policies? Evidence from a cross-European survey. Health Economics, Policy and Law. 2014;10(3):267-292.
53. Caputo A. Social Desirability Bias in self-reported well-being Measures: Evidence from an online survey. Universitas Psychologica. 2017;16(2).
54. Lanz L, Thielmann I, Gerpott FH. Are social desirability scales desirable? A meta-analytic test of the validity of social desirability scales in the context of prosocial behavior. Journal of Personality 2021;90(2):203-221.

Supplementary Materials

Table S1. Statements used to measure mechanisms (own behavior, perceived intrusiveness, perceived effectiveness) of nudge acceptance.

Nudge	Item	Statement	Responses
1	Own behavior	Do you normally take butter at a breakfast buffet?	Binary [Rather yes, Rather no]
	Perceived intrusiveness	The described situation restricts your decision.	Seven-point Likert scale
	Perceived effectiveness	The described situation reduces overall butter consumption.	Seven-point Likert scale
2	Own behavior	What do you usually choose in a restaurant?	Binary [A vegetarian meal, A non-vegetarian meal]
	Perceived intrusiveness	The described situation restricts your decision.	Seven-point Likert scale
	Perceived effectiveness	The described situation reduces overall meat consumption.	Seven-point Likert scale
3	Own behavior	Do you normally buy dairy or meat products?	Three responses [Rather none, Rather little, Rather a lot]
	Perceived intrusiveness	The described situation restricts your decision.	Seven-point Likert scale
	Perceived effectiveness	The described situation reduces overall consumption of dairy or meat products.	Seven-point Likert scale
4	Own behavior	Which do you normally order in a restaurant?	Binary [Rather side dishes with low calorie content (salad, vegetables); Rather side dishes with high calories content (fries, mayonnaise)]
	Perceived intrusiveness	The described situation restricts your decision.	Seven-point Likert scale
	Perceived effectiveness	The described situation reduces overall consumption of side dishes with high caloric content.	Seven-point Likert scale
5	Own behavior	Do you usually donate money to domestic agriculture?	Binary [Rather yes, Rather no]

	Perceived intrusiveness	The described situation restricts your decision.	Seven-point Likert scale
	Perceived effectiveness	The described situation reduces the consumption of regional products in total	Seven-point Likert scale

Table S2. Ordinal regression models on the acceptance of a default nudge scenario. 1.row: odds ratio; 2.row p-values

	N1.1	N1.2	N2.1	N2.2	N3.1	N3.2	N4.1	N4.2	N5.1	N5.2
perceived intrusiveness	0.235***	0.298***	0.209***	0.269***	0.352***	0.364***	0.432***	0.337***	0.553***	0.475***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
perceived effectiveness	1.602***	2.132***	2.741***	2.146***	1.947***	1.577***	2.152***	2.151***	0.380***	0.481***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
engagement in target behavior	0.703**	0.723***	0.719**	0.905	0.767*	0.867	0.910	0.955	0.623***	0.644***
	(0.001)	(0.001)	(0.002)	(0.327)	(0.010)	(0.106)	(0.375)	(0.673)	(0.000)	(0.000)
gender	0.930	1.048	0.972	0.770**	0.901	1.075	0.883	1.134	0.836	0.842
	(0.440)	(0.626)	(0.770)	(0.008)	(0.264)	(0.428)	(0.200)	(0.215)	(0.061)	(0.064)
age	0.908	0.951	0.889	0.842	0.802*	0.838	1.004	1.029	0.693***	0.817*
	(0.289)	(0.581)	(0.232)	(0.062)	(0.016)	(0.060)	(0.970)	(0.788)	(0.000)	(0.029)
East Germany	0.966	0.952	1.035	0.988	0.978	0.899	1.184	1.053	1.038	1.036
	(0.715)	(0.569)	(0.720)	(0.897)	(0.774)	(0.264)	(0.059)	(0.590)	(0.688)	(0.673)
education	0.904	0.943	0.821	1.151	0.855	0.910	0.826	0.796*	0.986	0.880
	(0.322)	(0.566)	(0.063)	(0.177)	(0.103)	(0.324)	(0.081)	(0.040)	(0.886)	(0.163)
income	1.075	1.154	1.180	1.076	1.178	1.181	1.306*	1.239*	1.025	1.194*
	(0.442)	(0.112)	(0.092)	(0.491)	(0.072)	(0.061)	(0.011)	(0.031)	(0.784)	(0.044)
Observations	399	400	401	401	401	401	401	401	401	401

* $p < 0,05$, ** $p < 0,01$, *** $p < 0,001$

CHAPTER 3. DESIGNING POLITICALLY FEASIBLE NUDGE STRATEGIES TO PROMOTE HEALTHY AND SUSTAINABLE DIETS

3.2

A choice architect's guide to the (autonomous) galaxy: a scoping review of nudge intrusiveness in food choices

Authors: Simone Wahnschafft[a], Ainslee Erhard[a], Dominic Lemken[b]

a. Research Training Group in Sustainable Food Systems, University of Göttingen, Heinrich-Düker-Weg 12, 37073 Göttingen, Germany
b. Institute for Food and Resource Economics, University of Bonn, Nußallee 21, 53115 Bonn, Germany

This article has been published in this form in ***Humanities & Social Sciences Communications*** and can be cited as follows:

Lemken, D., Erhard, A., & Wahnschafft, S. A choice architect's guide to the (autonomous) galaxy: a systematic scoping review of nudges intrusiveness in food choices. *Humanities & Social Sciences Communications* 11, 1030 (2024). https://doi.org/10.1057/s41599-024-03555-8

Declarations

Author Contributions: The article is a joint first authorship contribution, as all authors have contributed to each section of the manuscript with equal shares. S.W., A.E., D.L.: Literature review, Conceptualization, Implementation, Methodology, Writing – original draft, Writing – review & editing.

Financial Support: The authors gratefully acknowledge the financial support of the German Research Foundation (DFG) through the Sustainable Food Systems Research Training Group (RTG 2654). The DFG had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Ethical Standards Disclosure: This article does not contain any studies with human participants performed by any of the authors.

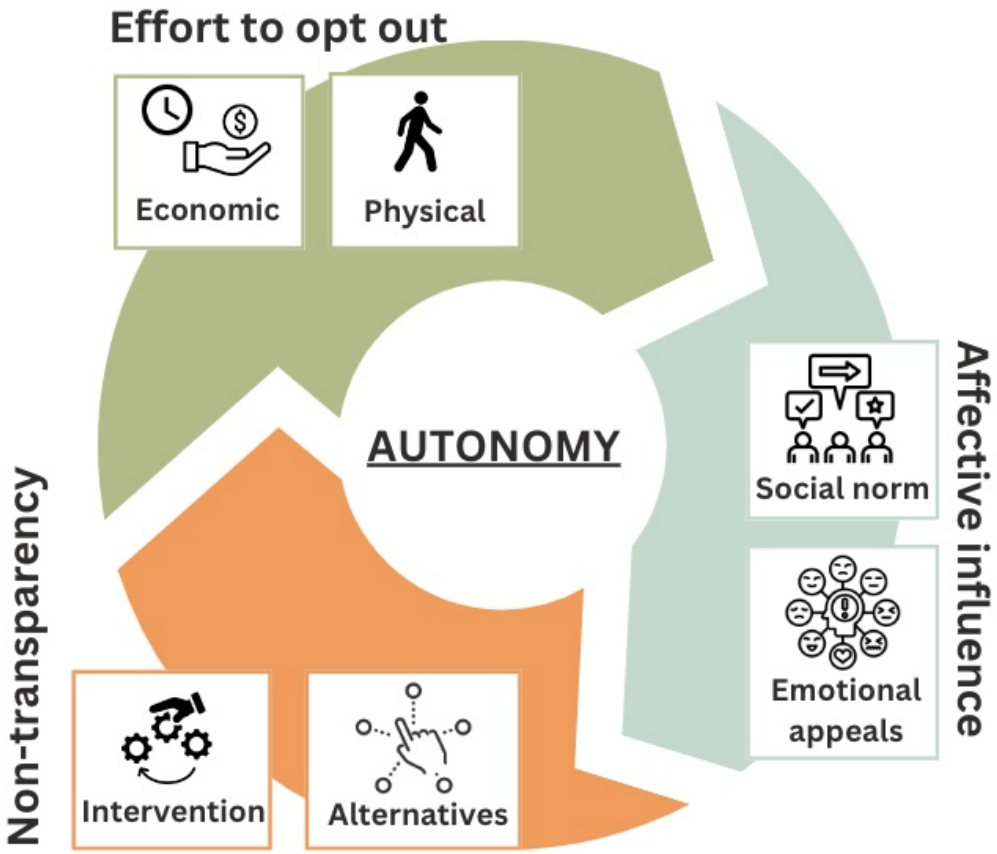
Conflict of Interest: None

Acknowledgements: The opinions expressed and the decision to publish are solely the authors responsibility. The authors wish to thank Sanchayan Banerjee (Editorial Board) who gave very insightful comments on how to improve an earlier version of the manuscript.

Data Availability: The reviewed studies are included in the supplementary file S1 (https://uni-bonn.sciebo.de/s/Cbs0Wtj90HtRecK). This includes information on how the studies' characteristics inform on the typology.

Abstract

In seeking to uphold consumer autonomy in the design and implementation of nudge interventions, choice architects must concern themselves with preserving both the availability of options made to consumers (freedom of choice), and the capacity of consumers to deliberate and choose (agency). Leveraging a scoping review of nudges related to food choice, a common policy arena for nudge interventions, we develop a typology of three mechanisms that, when not considered, could unduly intrude upon autonomy: (1) the effort to opt-out, delineated along economic and physical sub-dimensions; (2) affective influence, such as social reference messaging and emotional appeals; and (3) non-transparency, including of the nudge itself and of non-nudged alternative options. This typology can support choice architects to discern how nudges might better protect consumer autonomy, and ultimately uphold it in pursuit of behavior change.



Introduction

In 1962, former US president J.F. Kennedy formulated the Consumer Bill of Rights. The bill introduced the right to choose, defined as the right "to be assured, wherever possible, access to a variety of products and services at competitive prices". The principle of consumer autonomy has been built on this right to choose and remains a foundational principle of liberal democracies today. In this context, Thaler and Sunstein's (2008) "Nudge," defined as "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives," emerged with the powerful promise to design interventions that respect consumer autonomy but manipulate the status quo of decision making in order to shift behavior.

Since the original definition, the concept of nudging has been further refined. Hansen (2016) extends the definition by emphasizing that nudges are intentional attempts to influence behavior in predictable ways by leveraging cognitive boundaries, biases, routines, and habits that often hinder rational decision-making. He argues that nudges exploit these inherent characteristics independently of forbidding or adding rationally relevant choices, changing incentives, or providing factual information and rational argumentation.

While nudging has become influential in recent years, it is not without controversy. Indeed, the extent to which nudges truly preserve consumer autonomy has become a key point of most ethical discussions in the scientific literature. A recent systematic review stated that 86% of ethical contributions to the nudging topic address autonomy (Kuyer & Gordijn, 2023). The concept of autonomy in decision-making encompasses at least two integral aspects: freedom of choice and agency (Vugts et al., 2020). These facets, while distinct, are intricately connected, collectively contributing to the overall understanding of consumer autonomy.

Freedom of Choice entails the absence of restrictions on (rationally relevant) available options. In this context, it is important to consider whether, and to what extent nudges provide individuals with a genuine opportunity to resist the influence of a nudge (Kuyer & Gordijn, 2023; Saghai, 2013). This discussion sometimes pits effectiveness against autonomy, arguing that nudges can be either highly effective or easily resistible (Floridi, 2016; Mills, 2018). However, this dichotomy oversimplifies the issue, as there are instances where nudges can be easily resisted and still prove effective, leading to the question of how to navigate this trade-off. This scoping review provides further empirical support of resistible, yet effective nudges.

Agency refers to an individual's capacity to deliberate, critically reflect, and make choices (Vugts et al., 2020). Dold and Lewis (2023) further illuminate this distinction between these two aspects of autonomy by introducing the concepts of “opportunity freedom” (availability of choices) and “process freedom” (capacity to make reasoned decisions). While opportunities alone do not necessarily make one feel in control of their life, process freedom allows for control over the choice process and fosters the sense of being the “author of one’s life”. This is not necessarily the same as a rational decision outcome (Engelen, 2019). Outcome rationality pertains to evaluating the most rational decision irrespective of the decision-making process, while process rationality seeks to understand the feasibility of a rational reflective process in the context of a given decision. The latter is what agency-respecting choice architects can strive to do. Nudges that undermine a decision-maker's ability to reason threaten the agency dimension of autonomy (Vugts et al., 2020).

In summary, autonomy requires not only having options, but also the internal capacity to reflect on those options and freedom to act on them to achieve personal goals (Kuyer & Gordijn, 2023). Increasing agency through nudging can enhance desirable outcomes. For example, a study on charitable giving found that offering a list of donation options along with a default amount resulted in higher overall donations compared to providing just a single default option (Banerjee, John, et al., 2023). As Sunstein (2015) has long advocated, effective nudge design can preserve both agency and freedom of choice, ensuring that the

success of the nudge, such as increased donation amounts, does not come at the expense of individual agency.

There remains a substantial gray area with regard to determining when a nudge does or does not, as well as to what extent, preserve autonomy. “Perceived intrusiveness” has emerged as a key construct to investigate the concept in survey research on nudge approval, with researchers regularly prompting consumers to indicate the extent to which they believe a nudge intrudes upon their capacity to choose - essentially their agency in the choice (Evers et al., 2018; Hagman et al., 2015, 2022; Yi et al., 2022). Up to 30% of the differences in approval of nudges is estimated to be explained by perceived intrusiveness alone, making it a very important concept to predict acceptance (Evers et al., 2018). However, “perceived intrusiveness” is not an ideal concept to judge the preservation of autonomy. For instance, when it comes to certain nudges, the level of controversy often stems from the fact that people tend to either strongly favor or strongly oppose their perceived intrusiveness, leading to polarized opinions among many individuals (Lemken et al., 2023). A judgment based on mean values of opinions would ignore a substantial group of citizens who voice concern or support with respect to autonomy. Moreover, it is worth noting that citizens may blend their views regarding the legitimacy of the nudge's objective with their perception of its intrusiveness. This has been evidenced, for instance, in the case of Dutch public servants who generally support behavioral interventions but perceived simple reminders as paternalistic in an application targeting a behavior deemed unnecessary (Dewies et al., 2021). Additionally, the approach of having survey participants assess hypothetical scenarios rather than immersing them in real-life nudged decision-making situations is extremely sensitive to the specific wording employed. Consequently, there is a need for a more concrete and universally applicable conceptual framework in this regard.

The idea of this article, therefore, is to develop a typology of how nudges may hinder autonomy. The resulting typology will assist choice architects, policymakers, and other relevant stakeholders in critical thinking and systematic evaluation of nudges with respect to autonomy. Importantly, it provides the dimensions along the lines that choice architects

have to think about when assessing or altering nudge design in pursuit of maintaining autonomy. Guided by the typology, choice architects may be able to identify nudge interventions that balance both respect for individual autonomy and effectiveness, or alternatively be poised to acknowledge the limits of nudging principles as to argue why more intrusive policy measures are demanded (Sunstein and Reisch, 2014).

We note a caveat for our investigation: while we are focusing on autonomy, there are additional aspects influencing the ethicality of nudges beyond the scope of this study. The Nudge FORGOOD framework does address autonomy under "respect," acknowledging the importance of autonomy and the freedom to choose (Lades & Delaney, 2022). However, the framework also mentions other ethical concerns, such as the fairness of a policy's redistributive effects, the availability of alternative policy options, citizens' opinions on the goals addressed with a nudge, and the legitimacy of the choice architect to act out the role (Lades & Delaney, 2022). Furthermore, some authors have counted in the concept of self-constitution to the fundamental principles of autonomous decision-making (Vugts et al., 2020). Presently, there remains uncertainty regarding whether nudges can actually impact higher-order preferences that make up self-constitution or if nudging someone to make a choice against their higher-order preferences merely serves to make the manipulation more apparent (Nys & Engelen, 2017). The ongoing debate on this subject has yet to reach a definitive conclusion, and it presents challenges in terms of operationalization at this stage, which are not considered in the typology of this study.

The typology is developed and discussed in the context of nudges related to food choice. The rationale for focusing specifically on nudges related to food choice is three-fold. First, the food we eat can either support or threaten human health and environmental sustainability, thereby carrying a major impact on our well-being (Willett et al., 2019). As such, it is vital to understand how nudges impact our autonomy in this context in order to avoid undue infringement over basic human needs. Second, food is not just a matter of practical sustenance, but also an emotional, cultural, and moral aspect of our lives. Nudging food choices can therefore be particularly sensitive, and have the potential to be

perceived as more intrusive than nudges applied in other behavioral domains (Sunstein et al., 2019). Finally, nudges on food choice address daily routine decisions that are made intuitively and instinctively (i.e., according to 'System 1' thinking) making them capable of greatly impacting individuals' daily lives and habits (Wansink & Sobal, 2007). Taken together, nudges aimed at influencing food choices have the potential for far-reaching implications.

The manuscript is structured as follows. In the method section, we provide an account of our approach to conducting a scoping review, where we delve into food nudging studies to identify the mechanisms that underlie autonomy and their representation in the empirical literature. In the results section, we demonstrate the ways in which nudge studies can impact autonomy and introduce a typology to better understand the nudge elements relevant to an autonomy assessment. The discussion section will then expand upon how these typologized dimensions have been addressed within the scientific literature and suggest potential applications for the typology in future research.

Methods

In the following, we describe the eligibility criteria, search procedure, title and abstract screening, data extraction and data synthesis of the scoping review:

Eligibility Criteria

The current review adhered to the scoping review methodology recommended by the PRISMA-ScR reporting guidelines. An overview of the article selection process is illustrated (*Figure 1*). We included articles published in peer-reviewed journals, excluding reviews, pertaining to empirical research on nudging individuals to choose healthy and/or sustainable foods, across any food consumption setting. Only articles that explicitly described their interventions as nudges were considered. Articles using the term "nudging" informally to denote behavior influence, without aligning their interventions with nudge terminology, were excluded. The publication date criterion considered studies published

within the last ten years of the search period (01/2014 to 12/2023). Additionally, only articles written in the English language were included in our search.

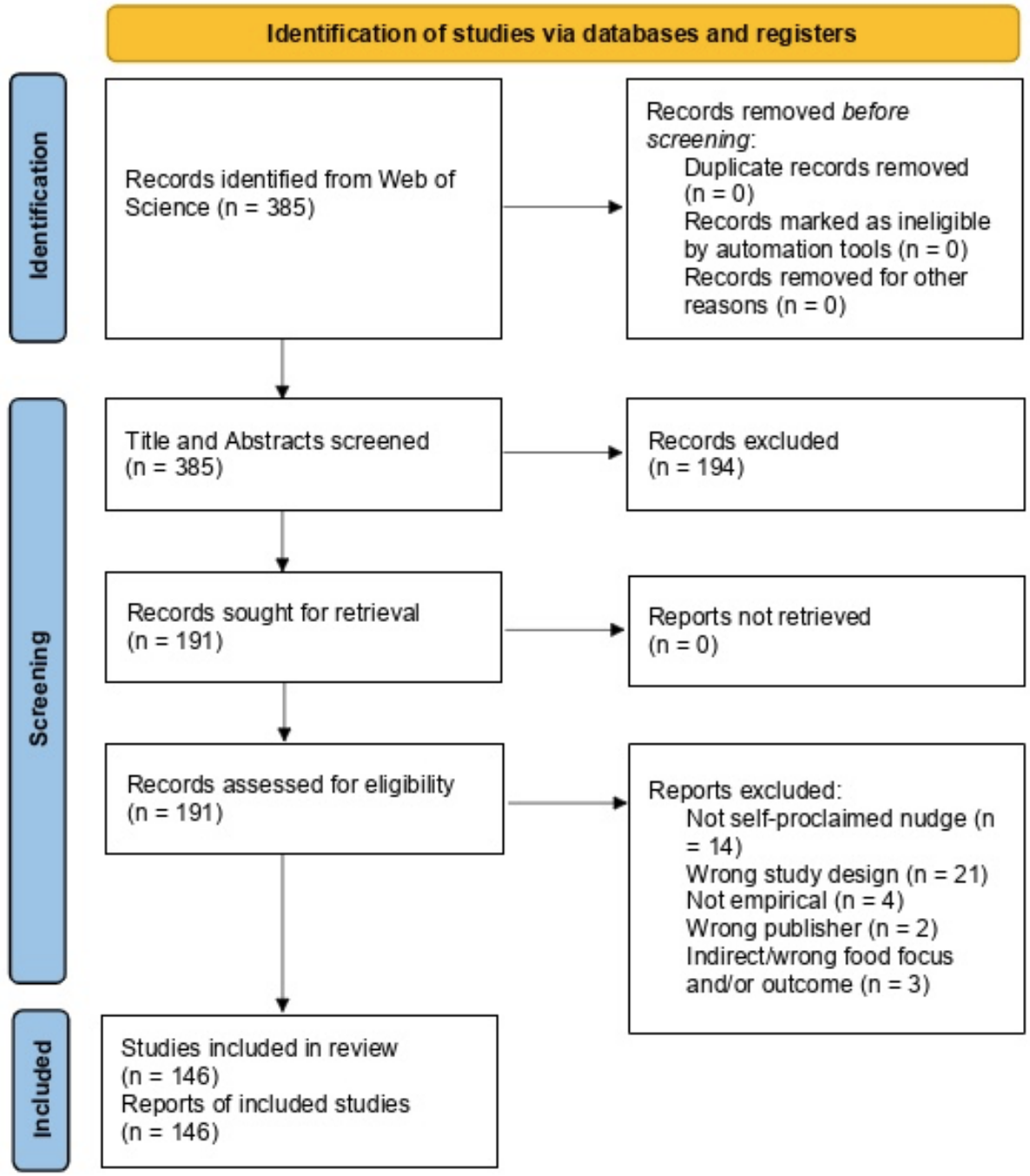


Figure 1. PRISMA flow chart.

Search Procedure

After initial screening procedures, a systematic search was carried out on the Web of Science platform in January 2024. Various combinations of Boolean search terms were used in alignment with the research questions and defined research boundaries. Specifically, the search criteria included ((“Nudg*" OR "Choice Architecture”) AND (“Health*” OR “Sustain*”) AND (“Food” OR “Diet”)) within the topic field. Documents published in MDPI journals were omitted, resulting in the removal of 55 articles. The search was focused on the most pertinent Research Areas, which yielded over forty studies each. i.e., (("Behavioral Sciences" OR "Psychology" OR "Food Science Technology" OR "Public Environmental Occupational Health" OR "Business Economics" OR "Nutrition Dietetics" OR "Environmental Sciences Ecology")), thereby removing 87 articles. The systematic search yielded 385 articles.

Screening

The selected articles underwent a title and abstract screening process by the three investigators based on predefined inclusion/exclusion criteria. Article were excluded if they: i) were commentaries or theoretical contributions to the literature, ii) were not aimed at health or sustainability outcomes or were aimed at sustainability outcomes indirectly related to sustainability in food systems (i.e., reducing packaging or plastics, improving recycling), or iii) the study design did not allow to observe individual behavior. We considered various outcome measures, such as dietary outcomes (e.g., food choice), health metrics (e.g., BMI, weight, nutrient status), economic parameters (e.g., sales), and sustainability indicators (e.g., GHG emissions). In full-text screening, we also excluded studies i) combining nudges with non-nudge interventions, including a number of combinations with pricing strategies, ii) qualitative studies without empirical effectiveness examinations or without testing a nudge altogether, iii) studies lacking a nudge setup description or not yet implementing the nudge. A total of 146 articles remained for data extraction after the screening.

Data extraction, synthesis and typology development

A single author (AE or SW) conducted data extraction utilizing a software for managing systematic reviews, with open-ended questions on each study (Supplementary file S1), outlining the i) study population ii) target behavior addressed with the nudge and choice setting, iii) status quo or control choice architecture, iv) nudge description, and v) nudge type — as campaigns, commitments, information mechanisms, transactional shortcuts, improved design strategies, warnings and reminders (Thaler & Sunstein, 2008), vi) the classification of nudges according to the intrusiveness typology developed in this article, and lastly vii) whether the study observed significant, non-significant results with regard to the main outcome measure(s). The process of classifying nudges according to intrusiveness mechanisms involved assessing the nudge description to determine if it influences a mechanism relevant to autonomy. Subsequently, for those that do affect a mechanism, the assessment determines if this influence could potentially hinder autonomy. Any uncertainties identified by the authors were annotated and subsequently cross-verified by a second review author. For the typology of mechanisms that can hinder autonomy, we consolidated a preliminary set of identified studies. Each nudge was discussed amongst the research team to identify key mechanisms underpinning intrusiveness common across studies. The initial typology development was facilitated by an exercise amongst the authors, where a subset of the preliminary studies was considered for how the nudge design could be hypothetically modulated to reflect lower and higher degrees of intrusiveness. In addition, anonymous reviewers and colleagues with expertise in the field have commented on the initial typology, which has greatly helped to further develop it.

The typology was integrated into the review process to evaluate a systematically selected set of studies to discern whether the typology appropriately captured the intrusiveness of the included nudge designs, or whether the definition needed to be expanded. While the overall typology was found to appropriately encompass intrusiveness mechanisms, the process proved useful for refining sub-dimensions within each mechanism. In the result section, we provide example studies that call into question the preservation of autonomy concerning the typologized mechanisms. Additionally, the complete set of studies, encompassing further examples and the authors' classification for intrusiveness, is also

accessible (see *Supplementary file S1*). Furthermore, we identified key criteria to operationalize a measurement of intrusiveness by sub-dimensions to facilitate critical thinking as to how nudges might be modulated to mitigate intrusiveness. Although we may not establish a definitive threshold for determining minimal or high intrusiveness, the criteria we outline can assist choice architects in making better evaluations.

Results

The total sample of food nudge studies (N=146) encompassing 251 interventions was reviewed and evaluated by intrusiveness on individual autonomy. We delineate the overarching mechanisms of nudges that might alter an individual's autonomy: (1) the effort to opt out; (2) the affective influence, and (3) non-transparency (see *Figure 2)*.

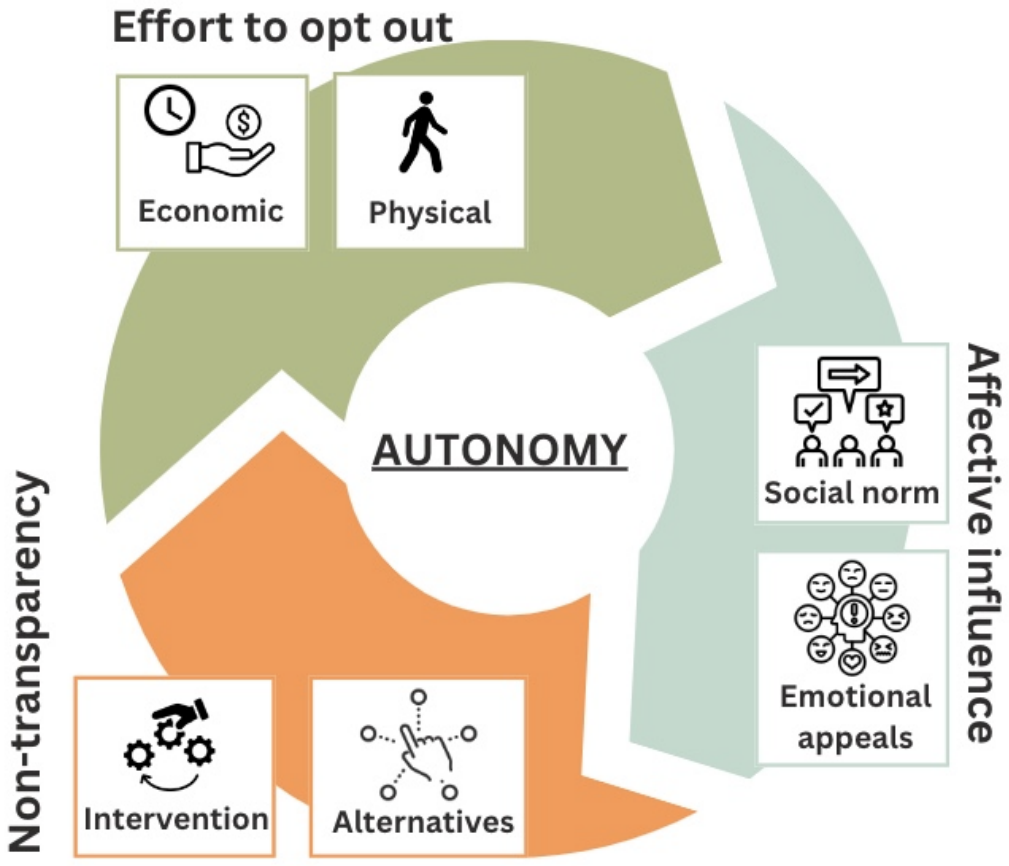


Figure 2. A typology of nudge intrusiveness.

Of the 251 interventions reviewed, 74 (29.4%) altered the effort to opt out, 127 (50.6%) leveraged affective influence, and 164 (65.3%) exhibited non-transparency. Of those interventions that altered the effort needed to opt out of the nudged option, the majority (70.3%) acted upon this mechanism in such a way that did not pose threats to autonomy; however, just under a third (29.7%) of these studies employed obstacles to opting out that run the risk of hindering autonomous decision-making, either by the degree of physical (Ni=11) or economic effort (Ni=11) required to realize preferences against the nudged option. The majority (88.3%) of interventions that leveraged affective influence did not pose threats to autonomy; however, a handful of these studies posed threats to autonomous decision-making by either the extent of their exploitation of social norm influence (Ni=5) or emotional appeal (Ni=10). Finally, of those studies that posted risks to autonomy under the umbrella of non-transparency, the bulk were characterized as imperfect due to non-transparency of the intervention itself (Ni=125), and a few were marked as threatening autonomy due to non-transparency of alternatives (Ni=4). A summary of frequencies of intrusiveness by nudge type and intrusiveness mechanism can be found in *Supplementary file S2*.

These intrusiveness mechanisms, and their respective sub-dimensions, are not necessarily independent, and rather can interact. In addition to the examples highlighted in our results, which pose minimal risk to autonomy, there are nudges that operate independently of our defined intrusiveness mechanisms. For example, information provision or self-nudging emerged as interventions that do not align with any intrusiveness mechanism. In one such study, participants were informed about nudges before autonomously selecting their own, such as a reminder to increase fruit consumption (van Rookhuijzen et al., 2023). As another example, a few studies added options to the choice set (Attwood et al., 2020; Gill et al., 2022), which does not intrude via any mechanism. However, it is important to note that, while these were self-proclaimed nudges, such interventions do not necessarily adhere to the definition of a nudge, as they alter the choice set. In the remainder of this paper, we draw upon examples from the literature that act upon a mechanism relevant to autonomy to better illustrate each concept (see *Table 1* for a summary).

Table 1. Example food choice nudges identified in the scoping review organized by intrusiveness mechanism.

Intrusiveness mechanism			Example nudge			
Mechanism		**Definition**	**Reference**	**Target behavior and setting**	**Control**	**Nudge description**
Effort to opt-out	Economic	Modulating the time and/or monetary resources required to opt-out	Coffino et al., 2020	Healthier grocery purchases in online grocery store	Provision of nutrition information before purchasing groceries online, without pre-filled shopping cart	Pre-filled online shopping cart containing a selection of groceries tailored to meet participants' personalized nutritional needs with the option to delete, add, exchange, or keep items before finalizing their purchase
			Lai et al., 2020	Choice of white (vs. chocolate) milk in school lunchroom	Status quo lunchroom	Glow-in-the-dark bracelet (worth $0.20) attached to white (but not chocolate) milk cartons
	Physical	Modulating the physical resources required to opt-out	Campbell-Arvai et al., 2014	Choice of vegetarian meal in university cafeteria	Dining facility menu with both vegetarian and non-vegetarian options listed on the same menu.	Vegetarian default menu, with patrons informed verbally and in writing about second menu containing meat posted 3.5 meters away
			Baskin et al., 2016	Snack consumpti	Snack station located 2	Snack station located 5.3

				on in the workplace	meters from the beverage station	meters from the beverage station
Affective influence	Social norm	Activating social norms	Loeb et al., 2017	Choice of healthier breakfast menu for child at community center	Unhealthy default breakfast menu with unhealthy items and neutral video shown to parents prior to	Video shown to parents with messaging, e.g., "Making health easy for your child means making the best choices for him or her", followed by presentation of a default menu offering an unhealthy breakfast combo, where healthy options were listed in smaller font at the bottom and available upon request
			Policastro et al., 2017	Healthier beverage choice in college food retail setting	No messaging	In a dining hall, posters displayed messages on calorie savings and/or charity donations, i.e., if customers chose fountain water over soda, the proceeds would go to a local soup kitchen
		Eliciting a salient	Caso et al., 2023	Self-reported future	No messaging	Text provided that either focused on the

		emotional response		meat consumption in online survey		irreversible consequences of a high intake of red and processed meat in terms of death, capturing the influence at a global, or individual level, i.e. increased risk of cancer and other chronic diseases
			Mecheva et al., 2021	Healthy snack choice in school	Healthy (banana) and unhealthy (Chocolate cake) snack displayed side by side	Healthy (banana) and unhealthy (Chocolate cake) snack displayed side by side and a happy, green smiley face placed next to healthy snack and red sad face next to unhealthy one
Non-Transparency	Non-Transparency of intervention	Modulating visibility of the presence and/or purpose of an intervention	Kroese et al., 2016	Choice of snack in train station snack shop	Unhealthy snacks placed next to cash register, with healthy snacks available elsewhere in the shop	Healthy snacks placed next to cash register, with unhealthy snacks available elsewhere in the shop; a sign was posted near the register saying "we help you make healthier choices"
	Non-Transparency of alternatives	Modulating the visibility of available alternatives	Diaz-Beltran et al., 2023	Choice of fast-food meal combo in a hypothetic	Traditional combo menu, featuring unhealthy side and	Healthy default combo menu, featuring healthy sides and drinks combined with main meal,

		al fast food restaurant	drink combined with main meal, whereas healthy alternatives were included separately on the menu	whereas unhealthy alternatives were included separately on the menu; no clear instructions were provided on the menu about the option to modify combos free of additional charge
	Mikkelsen et al., 2021	Healthy beverage purchases in vocational school canteen	Status quo beverage cooler	Sugar sweetened beverages were placed at the bottom of beverage cooler, where they were less visible and a frosted film covered the glass front

Note. Examples provided in Table 1 represent a sub-sample of studies selected from the larger sample of review studies (N = 146) for illustrative purposes.

Mechanism 1: Effort to Opt Out

The effort to opt-out refers to the resources demanded of individuals in order to realize a preference against the nudged option. This requisite effort can be modulated along two sub-dimensions that are relevant to autonomy – (a) economic and (b) physical. The former consists of both time and monetary resources, as both underpin economic thinking. The second sub-dimension includes various physical activities such as walking, reaching, and carrying. Substantial effort – either physical or economic – would constitute a restriction to individual agency.

Economic resources.

By definition, nudging explicitly promises to keep economic incentives constant (Thaler & Sunstein, 2008). This conceptualization of economic incentives must include time, as it is a vital tenet of economic thinking (DeSerpa, 1971) and is closely connected to monetary resources. Despite this reality, altering the time it takes to opt out of a nudge is frequently employed in nudge designs. For example, one study in a corporate cafeteria limited access to all inclusive payment terminals where all items could be purchases, but not to the payment terminal where only designated low-calorie and mostly meat-free items could be purchased. In effect, this could increase wait times for the non-nudged alternatives by considerable amounts in what the authors refer to as the "hassle factor" (Bauer et al., 2021).

Besides obvious examples where researchers directly manipulate time resources, there can also be more hidden time costs in opting out of nudged options. In digital environments, for instance, opting out of a pre-selected option is just a quick click away. While this alone is not intrusive, the cumulative effect of facing numerous preselected items, each demanding individual action for removal, can become significant. In two studies, online grocery shopping carts were pre-filled with nutritious groceries such that shoppers could delete, add, exchange, or keep items in their cart. With upwards of twenty items preloaded into the carts, the time investment required to opt out of each individual selection could become considerable, unless efficient design features enable the selection of multiple options at once (Coffino et al., 2020, 2021).

Considering the over 200 food choices we make on a daily basis (Wansink & Sobal, 2007), even a five minute demand to opt out can be a significant ask. In contrast, durations of less than one minute — such as the time required to request an alternative from a restaurant server (e.g., (Ferrante et al., 2022; Gravert & Kurz, 2021; Radnitz et al., 2023) — should be considered negligible and can hardly be avoided in the implementation of any decision.

Monetary incentives are seldom associated with nudging due to their general exclusion from the nudge framework, with the exception of near negligible (dis)incentives that are easy and cheap to avoid (e.g., 5 cent plastic bags in supermarkets) (Hansen, 2016). Therefore, pricing strategies are only considered as complements to be used with nudging tools (Kraak et al.,

2017). Nevertheless, some nudges can indirectly influence the monetary cost of opting out. For example, the bundling of products, changes in portion sizes, and use of non-monetary rewards can lead to increased relative purchasing costs of non-nudged options. Imagine a scenario where a burger is either bundled with a side of fries or a side salad. In cases where it is not possible to switch the bundled side free of charge, or if the information regarding this option is not readily evident (Diaz-Beltran et al., 2023), customers may end up paying extra to add on the additional desired side. In this self-proclaimed nudge instance, the current state of affairs determines how a basic marketing strategy — the bundling of options — alters financial incentives on the decision-making process.

Regarding portion sizes, a restaurant intervention increased the default portion size of vegetables and decreased the portion size of meat in their dishes (Qi et al., 2022). In this scenario, the original size of components needs to be offered at the same price to avoid any monetary incentives. This particular study did not grant this alternative to the default option, effectively restricting choice.

Rewards or gifts employed as nudges, though potentially negligible in monetary value, may limit personal autonomy. Consider an intervention in which glow-in-the-dark bracelets of relatively low material value were affixed to white (but not chocolate) milk cartons in a school cafeteria (Lai et al., 2020). In this scenario, choosing chocolate milk incurs a financial disadvantage, particularly for young children who might place excessive value on such items. This issue is echoed by the long-standing debate in the US concerning toy incentives in kids' meals at fast-food establishments, with some advocating for their prohibition due to concerns about limited autonomy and the negative influence on children.

Conversely, this review included multiple studies that successfully employed economic incentives without casting doubt on the preservation of individual autonomy. These approaches included strategies such as monetary framing (Carroll et al., 2018; Policastro et al., 2017; Yi et al., 2022), e.g., healthy food bundles offered without a discount, framed as “5 items for $5” (Carroll et al., 2018), or scarcity cues (Fennis et al., 2020; van Rookhuijzen et al., 2021) (e.g., “available while supplies last”).

Physical resources.

Physical effort has been identified as a key component of the desire for "convenience" that drives food choices (Wales, 2009). Campbell-Arvai and colleagues (2014) leverage this desire for physical convenience by serving a default vegetarian menu at the tables, while informing verbally and in writing of a second menu with meat options posted on the wall approximately 3.5 meters away from their table, observing significant increases in the percentage of patrons selecting vegetarian meals relative to the control condition. Baskin and colleagues (2016) also observe significant declines in snacks selected by employees in a large company when the snack station was placed an additional 2 meters away from the beverage station in the company break room. Other changes that require seemingly small shifts in physical effort navigating the space available, such as by placing healthy (unhealthy) items closer (further) within reach (Knowles et al., 2019; Quinn et al., 2018; Seward et al., 2016; van Rookhuijzen & de Vet, 2021) can result in significant changes in behavior. Less obvious applications within this category are changes to encourage smaller portion sizes, such as providing smaller spoons or plates for self-service. The degree of physical effort required to opt out of the nudged option distinguishes between a minor rearrangement of choices and a more intrusive one that may compromise individual agency to choose freely against the nudged option.

Mechanism 2: Affective Influence

Engaging emotionally-laden eating goals through "healthy eating calls" and "hedonic enhancements" have been classified as affectively-oriented nudging (Cadario & Chandon, 2020). We build upon this consideration of nudges that aim to influence decision-making through affective means – i.e. emotions – to also include social norm nudges. Social norms possess the capacity to encroach upon personal autonomy in decision-making situations where privacy or discretion is lacking, thereby making individuals feel unable to opt out of a nudge due to peer pressure and fear of social judgment.

Social norms.

Social norms serve as codes of conduct to guide socially appropriate action and have been found to strongly influence food choice, including quantity, healthiness, and hedonic evaluation of food consumed (Higgs & Thomas, 2016). By conforming to social norms, individuals experience positive emotions associated with social acceptance and belonging. In the case of sustainable consumption, for example, individuals have been found to experience feelings of satisfaction when they choose ethical or environmentally-friendly foods, in what is called “warm glow” (Iweala et al., 2022). Conversely, fear of social judgments around non-conformity can also have powerful steering effects on individuals (Higgs, 2015). The effect is moderated by group identity (or lack thereof) (Liu et al., 2019).

Social norms can be cued by setting defaults (e.g., Coffino et al., 2020, 2021; Dalrymple et al., 2020; Diaz-Beltran et al., 2023; Gravert & Kurz, 2021; Hansen et al., 2021), which individuals tend to view as an implicate recommendation or normative option (Everett et al., 2015). Alternatively, re-configuring menu designs to position or otherwise frame certain choices as the normal option (e.g., Bacon & Krpan, 2018; Bergeron et al., 2019; Boronowsky et al., 2022; Campbell-Arvai et al., 2014; van Kleef et al., 2018) and altering default portion or plate sizes (Davidson et al., 2021; Libotte et al., 2014; Qi et al., 2022; Zhang et al., 2024). Social norms can also come in the form of explicit messaging that conveys a descriptive norm (Gottselig et al., 2023; Jesse et al., 2021; McGrath, 2023; Otto et al., 2020; Reinholdsson et al., 2023; Suleman et al., 2022) such as signage that reads "most people choose fruit and vegetables" (Bauer et al., 2022) or a recommendation or injunctive norm such as “improve your score” when grocery shopping (De Bauw et al., 2022; Kroese et al., 2016; Panzone et al., 2021).

We argue that the intrusiveness of this class of interventions is contingent upon the presence of social pressure. On this note, privacy is a key factor which facilitates discretion in decision-making, enabling individuals to make choices without immediate social repercussions. The connection between privacy and decision-making has been previously explored (Acquisti et al., 2016; Huh et al., 2014). In settings that offer anonymity or a degree of discreteness, individuals may have more agency in their choices. In such environments,

the use of social norms to subtly guide decisions, while still allowing for individual discretion, can be seen as an autonomy-preserving intervention. However, in embedded choice settings characterized by a highly social environment, the presence of strong social norms should be considered as a potential threat to autonomy, as individuals may feel compelled to conform to the prevailing social expectations in public settings. Relevant examples identified in this review include prompts at checkout counters encouraging patrons to choose fountain water over soda to support a local soup kitchen (Policastro et al., 2017), instructions given to parents in community settings to make healthy choices for their children (Loeb et al., 2017), and requests for patrons to downsize to smaller meals to combat food waste (Qi et al., 2022).

The impact of social messages varies between a communal cafeteria setting with frequent social interactions and more detached decision contexts (e.g., online grocery stores). Since the social dynamics of decision environments are often not described in the nudging literature, we cannot conclusively address the utilization of social norms in highly social settings. However, we highlight the potential risk to individual agency in such scenarios where social pressure is empirically confirmed.

Emotional appeals.

In the realm of food nudges, choice architects can aim to elicit a salient emotional response to make nudged options more appealing and/or make non-nudged options less appealing. Concerns to autonomy arise in the event that the effectiveness of a nudge hinges on the motivation to elicit negative emotions, such as fear, anger, sadness, shame, guilt, envy, disgust, or contempt (Plutchnik, 2001). A recent review of studies examining the relationship between affective influence and agency observed that negative stimuli were associated with a lower sense of agency, as indicated through both self-reporting and implicit measures (Kaiser et al., 2021). Loss aversion, and the resulting negativity bias, in which humans tend to pay heightened attention to, learn from, and consider negative information relative to positive information during decision-making (Rozin & Royzman, 2001; Vaish et al., 2008), may also be a pertinent consideration to agency. As such, careful consideration must be

taken in the use of information that could be construed as negative to ensure that such interventions promote autonomy rather than hinder it.

This discussion is particularly relevant in the context of interventions meant to “warn” consumers against adverse health and/or environmental impacts of certain food choices. In the case of front-of-package nutrition labels, several studies have demonstrated that these tools enhance consumer understanding of the nutrition composition of packaged foods and beverages (Temple, 2020). Several studies focused specifically on warning labels, which label foods “high in” or in “excess of” sugar, salt, and/or saturated fats, have found that consumers indicate high acceptance of these labels and consider them useful to inform purchases (Bopape et al., 2021; Sato et al., 2019; Vargas-Meza et al., 2019). However, choice architects should be wary of other “warning”-type interventions that may cross the line into emotional manipulation. For instance, Aldrovandi and colleagues (2015) examine the effect of presenting rank information (e.g., "you are in the most unhealthy 10% of eaters") on students’ willingness to pay for healthy foods, an intervention which runs a higher risk of effectiveness based on triggering shame. This intervention also overlaps with social norm messaging. Similarly, Caso and colleagues (2023) test the influence of fear-based messages that communicate the irreversible consequences of a high intake of red and processed meat in terms of disease and death on self-reported future meat consumption.

On the other hand, several studies were identified in this review which leveraged emotional appeals without linking to negative emotions or posing a risk to autonomy, such as those that sought to highlight healthy and/or sustainable options through the use of hedonic descriptions or sensory appeals , or adding smiley faces (Mecheva et al., 2021) or cartoon characters to healthy options (Ozturk et al., 2020).

Mechanism 3: Non-Transparency

A prominent criticism on nudges is that they shift behaviors through manipulation of biases. In this context, transparency has emerged as a key concept to preserve consumer autonomy (Hansen et al., 2021; Michaelsen 2024; Wachner et al., 2020). The concept has generally been defined as making both the existence of the nudge and its intended objective known

(Michaelsen, 2024). We incorporate and broaden the concept of transparency to also evaluate whether, and to what degree, the nudge clarifies alternatives to the nudged choice — a topic scarcely addressed in the literature on the ethics of nudging.

Non-transparency of intervention.

To date, the empirical literature on nudging offers limited insights into whether individuals can actually recognize a nudge and its intended purpose. On the one hand, attempts by choice architects to openly disclose nudges often go unnoticed, indicating that people frequently fail to understand the information meant to enhance transparency. Various studies have reported accuracy rates around or below 50% in tests with simple multiple-choice questions designed to check for manipulation awareness (Michaelsen, 2024). On the other hand, there is evidence that individuals can often identify nudges even without explicit notification, implying individuals might recognize nudges even when they are not overtly disclosed (Michaelsen, 2024). In this review, our attention centers on the actions of choice architects that affect the autonomy of individuals, encompassing deliberate efforts to inform about the presence or aim of the nudge. Several studies have aimed to explore the effects of enhancing the transparency of nudges, with the goal of ensuring that their effectiveness is not solely due to exploiting cognitive biases.

For example, consider a nudge intervention to shift the default options at the cash register from unhealthy to healthy snacks in a store. By placing a sign stating "we help you make health(ier) choices" (Cheung et al., 2019; Kroese et al., 2016), the sign informs on the purpose of the nudge in the shop. In some cases, these communications directly highlight the implementation of an intervention. For example, in an aforementioned study in an online supermarket, participants encountered a shopping cart preloaded with selections intended to mirror a "nutritionally balanced grocery shopping cart tailored to their gender and age", effectively making them aware of the intervention's purpose and existence (Coffino et al., 2021).

Messages conveying transparency can either directly highlight the purpose or presence of a nudge, or they might necessitate more advanced inferential reasoning through indirect cues,

such as health-related posters in the decision-making environment that lack a clear spatial or thematic connection to the specific nudges implemented (Antunes et al., 2024). The latter method signifies a compromise on autonomy protection, despite its potential to help consumers recognize the intentional design of the choice architecture. Another aspect worth noting in detecting interventions is the frequency of exposure (singularity) to both the choice and the choice architecture. Interventions aimed at frequent patrons are more likely to be noticed as a change, particularly by customers dissatisfied with the nudged choice, who will promptly opt-out. The frequency of exposure serves as a safeguard against misleading nudges (Lemken, 2020). In contrast, irregular visitors may have difficulty discerning the nudge.

Enhancing the transparency of interventions is one approach to enable a deliberative process. However, it's worth noting that a lack of transparency in nudges does not necessarily obstruct the deliberative process. In addition to instances where individuals frequently identify the nudge, and choice architects are recommended to disclose this, there are also scenarios where such disclosure is not necessary. This is clear for purely descriptive nudges which automatically point to the presence of the intervention, for example, simple labels indicating "organic" or "local" meal quality (Migliavada et al., 2022). Another example is the use of floor arrows to direct customers towards healthier food choices in retail and/or food serving settings (Allan & Powell, 2020; Bauer et al., 2021; Chapman et al., 2019; Luomala et al., 2023). The awareness of the nudge requires some level of processing the intervention; otherwise, the intervention cannot be effective or suspected of working in the dark. In such cases, additional transparency messages seem unnecessary. This becomes even more evident for self-nudges (van Rookhuijzen et al., 2023) or the provision of commitment tools (Jia et al., 2022; Panzone et al., 2024; Samek, 2019), where cognitive reflection on the choice is inevitable, and consumers actively modify the choice architecture according to their preferences. Further transparency is not deemed necessary.

Non-transparency of alternatives.

In decision-making processes, ensuring transparency regarding alternatives is paramount. A significant concern arises when alternatives become invisible. This poses a threat to consumer autonomy by reducing the choice set that is actually considered and limiting the ability to make informed choices. A nudge designed to change visibility of alternatives acts upon transparency of options, though without necessarily making options invisible. In most cases, the nudge intends to increase visibility of nudged options but accidentally influences the prominence of alternatives. The extent of this influence varies widely, ranging from subtle interventions like positioning meat alternatives alongside meat products in supermarkets, to harmonize the chance of finding such products (Vandenbroele et al., 2021), to more intrusive ones where consumer awareness of alternatives is severely limited, rendering their freedom to choose practically theoretical. A deliberative decision-making process necessitates, at the very least, a reasonable opportunity to notice the presence of alternatives. This requirement becomes particularly concerning when choice architects actively conceal alternatives to impede deliberation, such as hiding sugary beverages at the bottom of coolers behind frosted film on the glass front (Mikkelsen et al., 2021).In this case, the use of frosted film presents an intentional barrier to the deliberation process. A modified version of this study, which merely repositions sugary drinks to the bottom of coolers, might be viewed more favorably because it merely re-organizes products based on available space. The latter constitutes a forced choice architectural decision that must prioritize products.

Achieving complete parity in product presentation is often impractical or impossible. Numerous studies (e.g., Meeusen et al., 2023; Young et al., 2020) explore repositioning nudges that simply change the positioning of nudged and non-nudged options to alter visibility, without making options invisible. It is crucial to understand that the status quo should not serve as the benchmark for evaluating visibility in a particular context; rather, the focus should be on how difficult it becomes to notice an option. Additionally, there may also exist methods to purposefully decrease the visibility of alternatives without unduly limiting consumers' ability to consider them. For instance, implementing a nudge on an online

ordering platform could involve adding a partially opaque white layer over the images and product information of unhealthy products (Michels et al., 2023).

Several researchers have noticed the autonomy issue that arises when alternatives become challenging to consider due to their lack of visibility. To address this, researchers have devised a workaround by still reducing the visibility of alternatives while actively referencing them to increase the likelihood that consumers are aware of the possibility to opt-out (Campbell-Arvai et al., 2014; Erhard et al., 2023; Gravert & Kurz, 2021). For instance, this approach might involve presenting a default plant-based meal with an option to opt-out to a meat meal with a simple click (Erhard et al., 2023). This setup aims to enable a reflective choice process, allowing consumers to evaluate the nudged option first while being explicitly informed of alternative choices, typically with minimal effort required in switching. Therefore, such prompts can serve as a choice architectural tool to enhance autonomy and possibly preserve effectiveness. It's worth noting a nuance in this approach. Choice architects can choose to explicitly name alternatives or simply prompt their existence. For example, Gravert and Kurz (2021) redesigned an “a la carte” menu to offer a choice between a vegetarian and fish dish versus a meat and fish dish, informing patrons that they could request meat without providing further description of the dish. While providing more information is generally beneficial from an autonomy perspective, the cognitive deliberation process may have its limits in real-world settings.

Another interesting nudge approach that may maintain autonomy yet initially hides alternatives requires that options be made unavailable or not visible during the initial phase of making a future or delayed selection. All choices are then revealed upon a second evaluation at the time of the final decision (Schlegel et al., 2021). While this commitment nudge aims to engage consumers in a more thorough decision-making process, empirical evidence may find most consumers do not reassess their options, leading them to perceive a more restricted choice set mistakenly.

Discussion

In this paper, we delve into a crucial topic: autonomy preservation in nudging strategies. Namely, drawing upon insights from existing literature, we have constructed a typology for evaluating and categorizing the diverse mechanisms that underlie the intrusiveness of nudges in the context of food choices. In devising these three mechanisms – effort to opt-out, affective influence, and non-transparency – and relative sub-dimensions, we lay the foundation for a more sophisticated comprehension of how nudges can affect an individual's ability to make independent and deliberate choices. Here, we discuss how each mechanism has previously been touched upon by other researchers and how to move forward with the typology, including summarizing possible criteria from the results that can be used by choice architects to evaluate nudge intrusiveness along the identified mechanisms (see *Table 2*).

Table 2. Proposed measurement criteria for each intrusiveness mechanisms.

Mechanism	**Sub-dimension**	**Intrusiveness criteria** **Potential evaluative criteria of nudge intrusiveness**
Effort to opt out	Economic resources	❑ Search time ❑ Transaction time (e.g., form filling, making a call, walking or traveling a distance) ❑ Use of nudge 'stacking' ❑ Monetary and material costs of opting-out (e.g. missing out on material rewards or gifts)
	Physical resources	❑ A demand on fitness (standing up, walking, reaching)
Affective influence	Social norm	❑ Non-privacy, degree of discreteness
	Emotional appeals	❑ Negative emotional cues that drive decision making (fear, anger, sadness, shame, guilt, envy, disgust, contempt)

Non-Transparency	Non-Transparency of intervention	❑ Lack of direct or indirect disclosure of the presence and/or purpose of the nudge (e.g. indirect hints via posters on topic of intervention) ❑ Singularity of decision
	Non-Transparency of alternatives	❑ Non-visibility of alternative options or prompts ❑ Non-existence of prompts to alternatives

On Effort to Opt Out

The first criterion that choice architects and other relevant stakeholders should consider in evaluating the intrusiveness of a nudge is whether, and to what extent, a degree of effort is required to opt out. In terms of *economic resources*, this could refer to elements of time, such as search time needed to identify an alternative option, or transaction time needed to execute the decision against a nudged option, such as by filling out a form or making a call. Depending on the size, the use of monetary aspects, such as foregone material gifts or rewards for those who opt out, and the extent to which these might be valued by those to be nudged, should also be considered as a potentially autonomy-threatening dimension. In terms of *physical resources* required to opt out, this involves a demand on fitness of some sort, such as standing up, walking, or reaching.

In contrast to the studies reviewed, where opting out required significant effort, it's often observed in practice that the collective effort to opt out of individual nudges — termed "nudge stacking" — is more prevalent. Nudge stacking has been identified as objectionable to the paternalism libertarian framework in that multiple nudges can sum up to a “shove” (Coons & Weber, 2013). In addition to the time and effort to opt out, nudge stacking also relates to non-transparency insofar as layered nudges make it more difficult for even watchful decision-makers to identify the mechanism behind nudges and therefore easier for choice architects to hide nudges (Ivanković & Engelen, 2019). The prevalence of nudge stacking in the marketplace is one reason why market nudges have been identified as particularly autonomy-threatening (Ivanković & Engelen, 2024) (Ivankovic & Engelen, 2023).

This has particular relevance in online environments. Consider frequently employed “dark pattern” nudges in which multiple buttons that should be clicked in order to proceed as desired are in bigger font, centered, and/or boldly colored to draw attention, while alternatives are tucked away in small corners of the screen (Reisch, 2020).

On Affective Influence

Another crucial aspect for evaluating the intrusiveness of nudges is their affective influence, encompassing *social norms* and *emotional appeals*. *Social norms* may leverage social pressures and normative expectations. Negative social norm messages meant to discourage behaviors can have a somewhat stronger impact on affect compared to positive messages designed to encourage behavior. This is primarily attributed to the well-documented “negativity bias,” where humans tend to pay heightened attention to, learn from, and consider negative information during decision-making (Rozin & Royzman, 2001; Vaish et al., 2008). Nonetheless, such negative normative cues need not necessarily pose a threat to autonomy. Substantial social pressure limiting deliberation can primarily be anticipated in settings where decisions are made publicly and are subject to controversy.

Emotional appeals tap into negative emotional cues such as fear, anger, sadness, shame, guilt, envy, disgust, and contempt, driving decision-making processes. Relatedly, emotional responses to negative stimuli tend to be stronger than those to positive stimuli (Vaish et al., 2008). This heightened emotional reactivity, particularly under stress, can potentially impede an individual's ability to process information rationally. It's important to emphasize that, in response to text-based warning messages, which can sometimes be found on ultra-processed foods, any potential impact on agency remains relatively manageable, as most individuals can still engage in a deliberation process when reflecting on a written message. However, the emotional processing of graphics (consider cigarette packaging in many countries) can be involuntary, so that agency is reduced for better or worse. Not yet considered are stimuli that trigger positive emotions. Positive emotional stimuli have been found to be associated with an increased sense of agency (Kaiser et al., 2021) and improved

decision-making processes (Tran et al., 2012). Skillful use of these stimuli presents a promising opportunity to implement effective nudging interventions that preserve autonomy.

On Non-Transparency

A significant criticism of nudges involves their potential to manipulate biases and influence behavior without individuals' awareness. Transparency has thus become crucial for preserving consumer autonomy. For *non-transparency of intervention*, we consider the lack of direct or indirect disclosure regarding the presence and purpose of the nudge. This includes instances where nudges are subtly hinted at, such as through posters on the topic of intervention. The singularity of decision refers to the frequency of exposure to both the choice and the choice architecture. Interventions targeting frequent patrons are more likely to be noticed as changes, providing a safeguard against misleading nudges, whereas irregular visitors may struggle to discern the nudge (Lemken, 2020). Finally, *non-transparency of alternatives* entails assessing the visibility of alternative options or prompts, as well as the absence of prompts directing individuals to consider alternative choices.

Providing a transparency statement transforms an intervention into a "double nudge," potentially amplifying its impact on behavior and individual agency. This is crucial for nudges that sidestep traditional decision-making processes (Michaelsen, 2024; Wachner et al., 2020). Yet, many nudges in this review, such as messaging nudges and self-nudging strategies, clearly do not bypass decision-making processes. For other nudges, adopting a precautionary approach, the inclusion of a disclosure statement seems helpful, with initial studies showing that it does not compromise effectiveness while boosting agency (Bruns et al., 2018; Cheung et al., 2019; Dranseika & Piasecki, 2020), identifying a potential sweet spot for autonomy enhancement. However, the applicability of this approach across different settings and how well such nudges target specific audiences still warrants investigation.

Decision-making is often characterized by bounded rationality, suggesting that decisions, especially in the food domain (Wansink & Sobal, 2007), are not always based on rational thinking, even without the influence of nudges. Nudges can encourage more thoughtful consideration of options without requiring explicit transparency. Nonetheless,

incorporating a transparency message for decisions that occur less frequently is recommended to safeguard autonomy. In certain scenarios, where more intricate reflection is achievable, ethical nudging becomes particularly pertinent, aligning with behavioral public policy's goal of enhancing citizen autonomy (Banerjee, Grüne-Yanoff, et al., 2023). For example, the “nudge+” initiative aims to bolster citizen empowerment by promoting critical analysis and transparent assessment of nudges in advance (Banerjee, Galizzi, et al., 2023; Banerjee, Grüne-Yanoff, et al., 2023). This approach facilitates individuals in maintaining decision-making autonomy, marking a progression towards more ethical nudging practices where feasible.

The risk of overlooking alternatives was acknowledged before. (Lades & Delaney, 2022) explain how default settings, which dictate the outcome if individuals take no action, could cause busy and rationally limited individuals to perceive that they lack choice. Consequently, the freedom of choice for these individuals is diminished when they are unaware of the available options (Lades & Delaney, 2022). In general, this design feature was widely overlooked in ethical nudge assessments despite the substantial autonomy risks of the invisibility of alternatives, while a number of empirical studies in the review have reported on efforts to make individuals aware of alternatives to the nudged option. For autonomy-enhancing nudges, we recommend to not purposefully lower the visibility of alternatives or explicit prompts to alternatives in case the intervention may have reduced the visibility of non-nudged options (see *Table 2*).

Limitations

This review focuses exclusively on food choice nudges, which may limit the generalizability of the findings to other domains such as health, finance, or environmental behaviors. Additionally, nudges and their impact on behavior can change over time as individuals become more aware of them. This study does not account for the dynamic nature of nudges and how repeated exposure might alter their effectiveness and intrusiveness, nor does it consider other dimensions that are important to an ethical evaluation of nudging, such as fairness, consent, and the potential for manipulation. The emphasis on autonomy may

overlook other critical factors that influence the acceptance and effectiveness of nudges, such as cultural values, social norms, and individual differences in decision-making processes. A more holistic ethical analysis is necessary to fully understand the implications of nudge strategies. Finally, this study is limited in its ability to assess autonomy threats of nudging in the case of nudges that are used as part of broader policy mixes and integrated with other policy tools (Merkelbach et al., 2021; Holz et al., 2023).

Policy Implications

The developed typology of nudge intrusiveness provides a framework for choice architects and policymakers to design and evaluate nudges that respect individual autonomy. This framework can guide the creation of interventions that are less intrusive while still promoting desired behaviors, potentially increasing public acceptance and the ethical validity of nudging practices. By highlighting the mechanisms through which nudges can undermine autonomy — such as effort to opt out, affective influence, and non-transparency — this study informs policymakers about key ethical considerations necessary when implementing nudge strategies. It underscores the importance of maintaining transparency and providing easy opt-out options to uphold consumer autonomy, ensuring that nudge strategies are both effective and ethically sound.

Future Directions

There remain open ethical questions for nudging. For instance, the deliberative nature of increasing transparency (of an intervention or alternatives) often translates to increased cognitive effort. In principle, furnishing consumers with more information neither constrains freedom of choice nor diminishes personal agency. For instance, the inclusion of nutritional labels, nudge disclosures, or details on alternatives serve an informative purpose. As such, we argue that cognitive effort aimed at prompting deliberation enhances autonomy by enabling informed decision-making. However, there is a level of information which risks overwhelming the deliberation process, but additional cognitive effort does not automatically translate into an autonomy risk. This boundary condition and the cognitive effort required to resist nudging attempts might be considered a threat under other ethical

frameworks. In line with this, we question the overuse of disclosures to alert decision-makers to the presence and purpose of nudges to be burdensome or even autonomy-threatening (think nudge stacking). This is an area for future research on the kind of context that demands and allows for disclosures. Relatedly, there is a link between individuals' awareness of their own limited cognitive capabilities and willingness to outsource regulatory mechanisms to governments (Grelle & Hoffman, 2024; Kukowski et al., 2023). This is an interesting area to explore with regard to cognitive effort and nudge acceptance.

Future studies could also explore complementing the use of this typology by assessing decision-maker's opinions on nudge elements. Rather than solely inquiring about their sense of freedom to choose, as in the traditional perceived intrusiveness approach, more focused questions based on the typology presented here can be devised. For instance, gauging perceived social pressure from peers may shed light on the autonomy in decision-making regarding affective influence. While this approach remains subjective and potentially contentious, employing more targeted questions minimizes the likelihood of conflating ethical concerns unrelated to autonomy, such as opinions on the nudge's objectives and similar matters. Additionally, this approach ensures that patrons are confronted with a cognitive concept commonly understood, while the freedom to choose and consumer autonomy remains a topic not widely comprehended even among researchers.

Conclusions

Offering a more nuanced understanding of the factors influencing nudge intrusiveness, our paper adds a valuable perspective to the ongoing discourse surrounding the legitimacy and feasibility of employing nudge strategies. As behavioral interventions continue to exert a significant influence on public behavior, our typology serves as a valuable resource for encouraging critical thinking and responsible decision-making among choice architects. Ultimately, the insights presented herein can serve as a compass for a more ethical use of nudges, ensuring that these interventions align with societal values and uphold individual

autonomy. Autonomy-preserving nudges will find it easier to gather widespread support in public policy and with private actors, although they should not be misunderstood as a necessarily sufficient solution to an underlying problem. Depending on the success of lowly intrusive policy measures, a restriction of autonomy can be demanded to improve the functioning of markets or mitigate environmental issues. While nudges may alter decision-making environments, they should be assessed against alternatives like subsidies or taxes, which also influence free choice but are commonly accepted (Lades & Delaney, 2022; Mukerji & Mannino, 2023). Nevertheless, redesigning nudges to lowly intrusive policy instruments could be the smallest common denominator to initiate behavioral change.

References

Acquisti, A., Taylor, C. R., & Wagman, L. (2016). The Economics of Privacy (SSRN Scholarly Paper 2580411). https://doi.org/10.2139/ssrn.2580411

Aldrovandi, S., Brown, G. D. A., & Wood, A. M. (2015). Social norms and rank-based nudging: Changing willingness to pay for healthy food. Journal of Experimental Psychology. Applied, 21(3), 242–254. https://doi.org/10.1037/xap0000048

Allan, J. L., & Powell, D. J. (2020). Prompting consumers to make healthier food choices in hospitals: A cluster randomised controlled trial. The International Journal of Behavioral Nutrition and Physical Activity, 17, 86. https://doi.org/10.1186/s12966-020-00990-z

Antunes, A. B. S., Hassan, B. K., Pinto, R. L., Sichieri, R., & Cunha, D. B. (2024). A choice architecture intervention targeting school meals and water frequency intake: A school-based randomized trial. Appetite, 193, 107118. https://doi.org/10.1016/j.appet.2023.107118

Attwood, S., Chesworth, S. J., & Parkin, B. L. (2020). Menu engineering to encourage sustainable food choices when dining out: An online trial of priced-based decoys. Appetite, 149, 104601. https://doi.org/10.1016/j.appet.2020.104601

Bacon, L., & Krpan, D. (2018). (Not) Eating for the environment: The impact of restaurant menu design on vegetarian food choice. Appetite, 125, 190–200. https://doi.org/10.1016/j.appet.2018.02.006

Banerjee, S., Galizzi, M. M., John, P., & Mourato, S. (2023). Immediate backfire? Nudging sustainable food choices and psychological reactance. Food Quality and Preference, 109, 104923. https://doi.org/10.1016/j.foodqual.2023.104923

Banerjee, S., Grüne-Yanoff, T., John, P., & Moseley, A. (2023). It's Time We Put Agency into Behavioural Public Policy (SSRN Scholarly Paper 4325117). https://doi.org/10.2139/ssrn.4325117

Banerjee, S., John, P., & Gerver, M. (2023). Embedding the Default in a Multiple-choice List Increases Opting Out (SSRN Scholarly Paper 4551862). https://doi.org/10.2139/ssrn.4551862

Baskin, E., Gorlin, M., Chance, Z., Novemsky, N., Dhar, R., Huskey, K., & Hatzis, M. (2016). Proximity of snacks to beverages increases food consumption in the workplace: A field study. Appetite, 103, 244–248. https://doi.org/10.1016/j.appet.2016.04.025

Bauer, J. M., Aarestrup, S. C., Hansen, P. G., & Reisch, L. A. (2022). Nudging more sustainable grocery purchases: Behavioural innovations in a supermarket setting. Technological Forecasting and Social Change, 179, 121605. https://doi.org/10.1016/j.techfore.2022.121605

Bauer, J. M., Bietz, S., Rauber, J., & Reisch, L. A. (2021). Nudging healthier food choices in a cafeteria setting: A sequential multi-intervention field study. Appetite, 160, 105106. https://doi.org/10.1016/j.appet.2021.105106

Bergeron, S., Doyon, M., Saulais, L., & Labrecque, J. (2019). Using insights from behavioral economics to nudge individuals towards healthier choices when eating out: A restaurant experiment. In FOOD QUALITY AND PREFERENCE (Vol. 73, pp. 56–64).

Bopape, M., Taillie, L. S., Frank, T., Murukutla, N., Cotter, T., Majija, L., & Swart, R. (2021). South African consumers' perceptions of front-of-package warning labels on unhealthy foods and drinks. PLOS ONE, 16(9), e0257626. https://doi.org/10.1371/journal.pone.0257626

Boronowsky, R. D., Zhang, A. W., Stecher, C., Presley, K., Mathur, M. B., Cleveland, D. A., Garnett, E., Wharton, C., Brown, D., Meier, A., Wang, M., Braverman, I., & Jay, J. A. (2022). Plant-based default nudges effectively increase the sustainability of catered

meals on college campuses: Three randomized controlled trials. Frontiers in Sustainable Food Systems, 6. https://doi.org/10.3389/fsufs.2022.1001157

Bruns, H., Kantorowicz-Reznichenko, E., Klement, K., Jonsson, M. L., & Rahali, B. (2018). Can nudges be transparent and yet effective? In JOURNAL OF ECONOMIC PSYCHOLOGY (Vol. 65, pp. 41–59).

Cadario, R., & Chandon, P. (2020). Which Healthy Eating Nudges Work Best? A Meta-Analysis of Field Experiments. Marketing Science, 39(3), 465–486. https://doi.org/10.1287/mksc.2018.1128

Campbell-Arvai, V., Arvai, J., & Kalof, L. (2014). Motivating Sustainable Food Choices: The Role of Nudges, Value Orientation, and Information Provision. Environment and Behavior, 46(4), 453–475. https://doi.org/10.1177/0013916512469099

Carroll, K. A., Samek, A., & Zepeda, L. (2018). Food bundling as a health nudge: Investigating consumer fruit and vegetable selection using behavioral economics. Appetite, 121, 237–248. https://doi.org/10.1016/j.appet.2017.11.082

Caso, G., Rizzo, G., Migliore, G., & Vecchio, R. (2023). Loss framing effect on reducing excessive red and processed meat consumption: Evidence from Italy. Meat Science, 199, 109135. https://doi.org/10.1016/j.meatsci.2023.109135

Chapman, L. E., Sadeghzadeh, C., Koutlas, M., Zimmer, C., & De Marco, M. (2019). Evaluation of three behavioural economics “nudges” on grocery and convenience store sales of promoted nutritious foods. Public Health Nutrition, 22(17), 3250–3260. https://doi.org/10.1017/S1368980019001794

Cheung, T. T. L., Gillebaart, M., Kroese, F. M., Marchiori, D., Fennis, B. M., & De Ridder, D. T. D. (2019). Cueing healthier alternatives for take-away: A field experiment on the effects of (disclosing) three nudges on food choices. BMC Public Health, 19(1), 974. https://doi.org/10.1186/s12889-019-7323-y

Coffino, J. A., Han, G. T., Evans, E. W., Luba, R., & Hormes, J. M. (2021). A Default Option to Improve Nutrition for Adults With Low Income Using a Prefilled Online Grocery Shopping Cart. Journal of Nutrition Education and Behavior, 53(9), 759–769. https://doi.org/10.1016/j.jneb.2021.06.011

Coffino, J. A., Udo, T., & Hormes, J. M. (2020). Nudging while online grocery shopping: A randomized feasibility trial to enhance nutrition in individuals with food insecurity. Appetite, 152, 104714. https://doi.org/10.1016/j.appet.2020.104714

Coons, C., & Weber, M. (Eds.). (2013). Paternalism: Theory and Practice (1st ed.). Cambridge University Press. https://doi.org/10.1017/CBO9781139179003

Dalrymple, J. C., Radnitz, C., Loeb, K. L., & Keller, K. L. (2020). Optimal defaults as a strategy to improve selections from children's menus in full-service theme park dining. Appetite, 152, 104697. https://doi.org/10.1016/j.appet.2020.104697

Davidson, K. A., Kropp, J. D., Mullally, C., & Rahman, Md. W. (2021). Can Simple Nudges and Workshops Improve Diet Quality? Evidence from a Randomized Trial in Bangladesh. American Journal of Agricultural Economics, 103(1), 253–274. https://doi.org/10.1111/ajae.12099

De Bauw, M., De La Revilla, L. S., Poppe, V., Matthys, C., & Vranken, L. (2022). Digital nudges to stimulate healthy and pro-environmental food choices in E-groceries. Appetite, 172, 105971. https://doi.org/10.1016/j.appet.2022.105971

DeSerpa, A. C. (1971). A Theory of the Economics of Time. The Economic Journal, 81(324), 828–846. https://doi.org/10.2307/2230320

Dewies, M., Schop-Etman, A., Rohde, K. I. M., & Denktaş, S. (2021). Nudging is Ineffective When Attitudes Are Unsupportive: An Example from a Natural Field Experiment. Basic and Applied Social Psychology, 43(4), 213–225. https://doi.org/10.1080/01973533.2021.1917412

Diaz-Beltran, M., Almanza, B., Byrd, K., Behnke, C., & Nelson, D. (2023). Fast-Food Optimal Defaults Reduce Calories Ordered, as Well as Dietary Autonomy: A Scenario-Based Experiment. Journal of the Academy of Nutrition and Dietetics, 123(1), 65-76.e2. https://doi.org/10.1016/j.jand.2022.06.005

Dold, M., & Lewis, P. (2023). A neglected topos in behavioural normative economics: The opportunity and process aspect of freedom. Behavioural Public Policy, 1–11. https://doi.org/10.1017/bpp.2023.11

Dranseika, V., & Piasecki, J. (2020). Transparent Defaults and Consent for Participation in a Learning Health Care System: An Empirical Study. In JOURNAL OF EMPIRICAL RESEARCH ON HUMAN RESEARCH ETHICS (Vol. 15, Issue 4, pp. 261–270). https://doi.org/10.1177/1556264620904272

Engelen, B. (2019). Nudging and rationality: What is there to worry? Rationality and Society, 31(2), 204–232. https://doi.org/10.1177/1043463119846743

Erhard, A., Boztug, Y., & Lemken, D. (2023). How do defaults and framing influence food choice? An intervention aimed at promoting plant-based choice in online menus. Appetite, 107005. https://doi.org/10.1016/j.appet.2023.107005

Everett, J. A. C., Caviola, L., Kahane, G., Savulescu, J., & Faber, N. S. (2015). Doing good by doing nothing? The role of social norms in explaining default effects in altruistic contexts. European Journal of Social Psychology, 45(2), 230–241. https://doi.org/10.1002/ejsp.2080

Evers, C., Marchiori, D. R., Junghans, A. F., Cremers, J., & De Ridder, D. T. D. (2018). Citizen approval of nudging interventions promoting healthy eating: The role of intrusiveness and trustworthiness. BMC Public Health, 18(1), 1182. https://doi.org/10.1186/s12889-018-6097-y

Fennis, B. M., Gineikiene, J., Barauskaite, D., & van Koningsbruggen, G. M. (2020). Nudging health: Scarcity cues boost healthy consumption among fast rather than slow strategists (and abundance cues do the opposite). Food Quality and Preference, 85, 103967. https://doi.org/10.1016/j.foodqual.2020.103967

Ferrante, M. J., Johnson, S. L., Miller, J., & Bellows, L. L. (2022). Switching up sides: Using choice architecture to alter children's menus in restaurants. Appetite, 168, 105704. https://doi.org/10.1016/j.appet.2021.105704

Floridi, L. (2016). Tolerant Paternalism: Pro-ethical Design as a Resolution of the Dilemma of Toleration. Science and Engineering Ethics, 22(6), 1669–1688. https://doi.org/10.1007/s11948-015-9733-2

Gill, T., Lei, J., & Kim, H. J. (2022). Adding more portion-size options to a menu: A means to nudge consumers to choose larger portions of healthy food items. Appetite, 169, 105830. https://doi.org/10.1016/j.appet.2021.105830

Gottselig, V., Wuppermann, A., & Herrmann, C. (2023). Effects of green nudges on consumer valuation of sustainable food: A discrete choice experiment. GAIA - Ecological Perspectives for Science and Society, 32(2), 233–240. https://doi.org/10.14512/gaia.32.2.6

Gravert, C., & Kurz, V. (2021). Nudging à la carte: A field experiment on climate-friendly food choice. Behavioural Public Policy, 5(3), 378–395. https://doi.org/10.1017/bpp.2019.11

Hagman, W., Andersson, D., Västfjäll, D., & Tinghög, G. (2015). Public Views on Policies Involving Nudges. Review of Philosophy and Psychology, 6(3), 439–453. https://doi.org/10.1007/s13164-015-0263-2

Hagman, W., Erlandsson, A., Dickert, S., Tinghög, G., & Västfjäll, D. (2022). The effect of paternalistic alternatives on attitudes toward default nudges. Behavioural Public Policy, 6(1), 95–118. https://doi.org/10.1017/bpp.2019.17

Hansen, P. G., Schilling, M., & Malthesen, M. S. (2021). Nudging healthy and sustainable food choices: Three randomized controlled field experiments using a vegetarian lunch-default as a normative signal. Journal of Public Health (Oxford, England), 43(2), 392–397. https://doi.org/10.1093/pubmed/fdz154

Higgs, S. (2015). Social norms and their influence on eating behaviours. Appetite, 86, 38–44. https://doi.org/10.1016/j.appet.2014.10.021

Higgs, S., & Thomas, J. (2016). Social influences on eating. Current Opinion in Behavioral Sciences, 9, 1–6. https://doi.org/10.1016/j.cobeha.2015.10.005

Huh, Y. E., Vosgerau, J., & Morewedge, C. K. (2014). Social Defaults: Observed Choices Become Choice Defaults. Journal of Consumer Research, 41(3), 746–760. https://doi.org/10.1086/677315

Ivanković, V., & Engelen, B. (2019). Nudging, Transparency, and Watchfulness. Social Theory and Practice, 45(1), 43–73. https://doi.org/10.5840/soctheorpract20191751

Ivanković, V., & Engelen, B. (2024). Market nudges and autonomy. Economics & Philosophy, 40, 138–165. https://doi.org/10.1017/S0266267122000347

Iweala, S., Spiller, A., Nayga, R. M., Jr, & Lemken, D. (2022). Warm glow and consumers' valuation of ethically certified products†. Q Open, 2(2), qoac020. https://doi.org/10.1093/qopen/qoac020

Jesse, M., Jannach, D., & Gula, B. (2021). Digital Nudging for Online Food Choices. Frontiers in Psychology, 12. https://doi.org/10.3389/fpsyg.2021.729589

Jia, J., Levy, D. E., McCurley, J. L., Anderson, E., Gelsomin, E. D., Porneala, B., & Thorndike, A. N. (2022). Health Literacy, Numeracy, and Health Promotion: A Secondary Analysis of the Choosewell 365 Workplace Trial. American Journal of Preventive Medicine, 63(1), 93–101. https://doi.org/10.1016/j.amepre.2021.12.020

Kaiser, J., Buciuman, M., Gigl, S., Gentsch, A., & Schütz-Bosbach, S. (2021). The Interplay Between Affective Processing and Sense of Agency During Action Regulation: A Review. Frontiers in Psychology, 12. https://doi.org/10.3389/fpsyg.2021.716220

Knowles, D., Brown, K., & Aldrovandi, S. (2019). Exploring the underpinning mechanisms of the proximity effect within a competitive food environment. Appetite, 134, 94–102. https://doi.org/10.1016/j.appet.2018.12.005

Kraak, V. I., Englund, T., Misyak, S., & Serrano, E. L. (2017). A novel marketing mix and choice architecture framework to nudge restaurant customers toward healthy food environments to reduce obesity in the United States. Obesity Reviews, 18(8), 852–868. https://doi.org/10.1111/obr.12553

Kroese, F. M., Marchiori, D. R., & de Ridder, D. T. D. (2016). Nudging healthy food choices: A field experiment at the train station. Journal of Public Health, 38(2), e133–e137. https://doi.org/10.1093/pubmed/fdv096

Kuyer, P., & Gordijn, B. (2023). Nudge in perspective: A systematic literature review on the ethical issues with nudging. Rationality and Society, 35(2), 191–230. https://doi.org/10.1177/10434631231155005

Lades, L. K., & Delaney, L. (2022). Nudge FORGOOD. Behavioural Public Policy, 6(1), 75–94. https://doi.org/10.1017/bpp.2019.53

Lai, C.-Y., List, J. A., & Samek, A. (2020). Got Milk? Using Nudges to Reduce Consumption of Added Sugar. American Journal of Agricultural Economics, 102(1), 154–168. https://doi.org/10.1093/ajae/aaz022

Lemken, D. (2020). When do defaults stick and when are they ethical? - Taxonomy, systematic review and design recommendations (2001). https://doi.org/10.22004/ag.econ.307568

Lemken, D., Wahnschafft, S., & Eggers, C. (Eds.). (2023). Public acceptance of default nudges to promote healthy and sustainable food choices: Vol. forthcoming. BMC Public Health, Springer Nature.

Libotte, E., Siegrist, M., & Bucher, T. (2014). The influence of plate size on meal composition. Literature review and experiment. Appetite, 82, 91–96. https://doi.org/10.1016/j.appet.2014.07.010

Liu, J., Thomas, J. M., & Higgs, S. (2019). The relationship between social identity, descriptive social norms and eating intentions and behaviors. Journal of Experimental Social Psychology, 82, 217–230. https://doi.org/10.1016/j.jesp.2019.02.002

Loeb, K. L., Radnitz, C., Keller, K., Schwartz, M. B., Marcus, S., Pierson, R. N., Shannon, M., & DeLaurentis, D. (2017). The application of defaults to optimize parents' health-based choices for children. Appetite, 113, 368–375. https://doi.org/10.1016/j.appet.2017.02.039

Luomala, H. T., Järvinen, S., Peltola, J., Pennanen, K., & Sihvonen, J. (2023). Priming shoppers' well-being goal in grocery stores: Moving toward healthier food choices? Food Quality and Preference, 108, 104882. https://doi.org/10.1016/j.foodqual.2023.104882

McGrath, G. M. (2023). Using social norm nudges in supermarket shopping trolleys to increase fruit and vegetable purchases. Nutrition Bulletin, 48(1), 115–123. https://doi.org/10.1111/nbu.12604

Mecheva, M. de V., Rieger, M., Sparrow, R., Prafiantini, E., & Agustina, R. (2021). Snacks, nudges and asymmetric peer influence: Evidence from food choice experiments with

children in Indonesia. Journal of Health Economics, 79, 102508. https://doi.org/10.1016/j.jhealeco.2021.102508

Meeusen, R. E. H., van der Voorn, B., & Berk, K. A. (2023). Nudging strategies to improve food choices of healthcare workers in the workplace cafeteria: A pragmatic field study. Clinical Nutrition ESPEN, 53, 126–133. https://doi.org/10.1016/j.clnesp.2022.11.022

Michaelsen, P. (2024). Transparency and Nudging: An Overview and Methodological Critique of Empirical Investigations. https://doi.org/10.31234/osf.io/4cmxb

Michels, L., Ochmann, J., Schmitt, K., Laumer, S., & Tiefenbeck, V. (2023). Salience, transparency, and self-nudging: A digital nudge to promote healthier food product choices. European Journal of Information Systems, 0(0), 1–31. https://doi.org/10.1080/0960085X.2023.2229787

Migliavada, R., Ricci, F. Z., Denti, F., Haghverdian, D., & Torri, L. (2022). Is purchasing of vegetable dishes affected by organic or local labels? Empirical evidence from a university canteen. Appetite, 173, 105995. https://doi.org/10.1016/j.appet.2022.105995

Mikkelsen, B. E., Sudzina, F., Ørnbo, L. E., & Tvedebrink, T. D. O. (2021). Does visibility matter? – A simple nudge reduces the purchase of sugar sweetened beverages in canteen drink coolers. Food Quality and Preference, 92, 104190. https://doi.org/10.1016/j.foodqual.2021.104190

Mills, C. (2018). The Choice Architect's Trilemma. Res Publica, 24(3), 395–414. https://doi.org/10.1007/s11158-017-9363-4

Mukerji, N., & Mannino, A. (2023). Nudge Me If You Can! Why Order Ethicists Should Embrace the Nudge Approach. Journal of Business Ethics, 186(2), 309–324. https://doi.org/10.1007/s10551-022-05214-x

Nys, T. R., & Engelen, B. (2017). Judging Nudging: Answering the Manipulation Objection. Political Studies, 65(1), 199–214. https://doi.org/10.1177/0032321716629487

Otto, A. S., Davis, B., Wakefield, K., Clarkson, J. J., & Jeffrey Inman, J. (2020). Consumer Strategies to Improve the Efficacy of Posted Calorie Information: How Provincial

Norms Nudge Consumers to Healthier Consumption. Journal of Consumer Affairs, 54(1), 311–341. https://doi.org/10.1111/joca.12272

Ozturk, O. D., Frongillo, E. A., Blake, C. E., McInnes, M. M., & Turner-McGrievy, G. (2020). Before the lunch line: Effectiveness of behavioral economic interventions for pre-commitment on elementary school children's food choices. Journal of Economic Behavior & Organization, 176, 597–618. https://doi.org/10.1016/j.jebo.2020.03.027

Panzone, L. A., Auch, N., & Zizzo, D. J. (2024). Nudging the Food Basket Green: The Effects of Commitment and Badges on the Carbon Footprint of Food Shopping. Environmental and Resource Economics, 87(1), 89–133. https://doi.org/10.1007/s10640-023-00814-1

Panzone, L. A., Ulph, A., Hilton, D., Gortemaker, I., & Tajudeen, I. A. (2021). Sustainable by Design: Choice Architecture and the Carbon Footprint of Grocery Shopping. Journal of Public Policy & Marketing, 40(4), 463–486. https://doi.org/10.1177/07439156211008898

Paunov, Y., Wänke, M., & Vogel, T. (2019). Ethical defaults: Which transparency components can increase the effectiveness of default nudges? In Social Influence (Vol. 14, Issues 3–4, pp. 104–116).

Plutchnik, R. (2001). The Nature of Emotions (Plutchik, 2001). American Scientist, 89(4), Pp. 344 - 350. https://www.academia.edu/43620307/The_Nature_of_Emotions_Plutchik_2001_

Policastro, P., Palm, T., Schwartz, J., & Chapman, G. (2017). Targeted Calorie Message Promotes Healthy Beverage Consumption Better than Charity Incentive. Obesity, 25(8), 1428–1434. https://doi.org/10.1002/oby.21885

Qi, D., Li, R., Penn, J., Houghtaling, B., Prinyawiwatkul, W., & Roe, B. E. (2022). Nudging greater vegetable intake and less food waste: A field experiment. Food Policy, 112, 102369. https://doi.org/10.1016/j.foodpol.2022.102369

Quinn, E. L., Johnson, D. B., Podrabsky, M., Saelens, B. E., Bignell, W., & Krieger, J. (2018). Effects of a Behavioral Economics Intervention on Food Choice and Food

Consumption in Middle-School and High-School Cafeterias. Preventing Chronic Disease, 15, E91. https://doi.org/10.5888/pcd15.170377

Radnitz, C., Beezhold, B., Pilato, I., Drury, C. R., Fruchter, S., Murphy, B. D. G., & Loeb, K. L. (2023). Application of optimal defaults to increase selection of sustainable menu choices. Food Quality and Preference, 110, 104954. https://doi.org/10.1016/j.foodqual.2023.104954

Reinholdsson, T., Hedesström, M., Ejelöv, E., Hansla, A., Bergquist, M., Svenfelt, Å., & Nilsson, A. (2023). Nudging green food: The effects of a hedonic cue, menu position, a warm-glow cue, and a descriptive norm. Journal of Consumer Behaviour, 22(3), 557–568. https://doi.org/10.1002/cb.2129

Reisch, L. A. (2020). Nudging hell und dunkel: Regeln für digitales Nudging. Wirtschaftsdienst, 100(2), 87–91. https://doi.org/10.1007/s10273-020-2573-y

Rozin, P., & Royzman, E. B. (2001). Negativity Bias, Negativity Dominance, and Contagion. Personality and Social Psychology Review, 5(4), 296–320. https://doi.org/10.1207/S15327957PSPR0504_2

Saghai, Y. (2013). Salvaging the concept of nudge. Journal of Medical Ethics, 39(8), 487–493. https://doi.org/10.1136/medethics-2012-100727

Samek, A. (2019). Gifts and goals: Behavioral nudges to improve child food choice at school. Journal of Economic Behavior & Organization, 164, 1–12. https://doi.org/10.1016/j.jebo.2019.05.008

Sato, P. de M., Mais, L. A., Khandpur, N., Ulian, M. D., Martins, A. P. B., Garcia, M. T., Spinillo, C. G., Rojas, C. F. U., Jaime, P. C., & Scagliusi, F. B. (2019). Consumers' opinions on warning labels on food packages: A qualitative study in Brazil. PLOS ONE, 14(6), e0218813. https://doi.org/10.1371/journal.pone.0218813

Schlegel, I., Carstairs, S. A., & Ozakinci, G. (2021). The influence of supraliminal priming on energy density of food selection: A randomised control trial. BMC Psychology, 9(1), 48. https://doi.org/10.1186/s40359-021-00554-1

Seward, M. W., Block, J. P., & Chatterjee, A. (2016). A Traffic-Light Label Intervention and Dietary Choices in College Cafeterias. American Journal of Public Health, 106(10), 1808–1814. https://doi.org/10.2105/AJPH.2016.303301

Suleman, S., Sweeney-Magee, M., Pinkney, S., Charbonneau, K., Banh, K., Hale, I., & Amed, S. (2022). Evaluation of two social norms nudge interventions to promote healthier food choices in a Canadian grocery store. BMC Public Health, 22(1), 1946. https://doi.org/10.1186/s12889-022-14370-8

Sunstein, C. R., & Reisch, L. A. (2014). Automatically green: Behavioral economics and environmental protection. Harv. Envtl. L. Rev., 38(1), 127. http://dx.doi.org/10.2139/ssrn.2245657

Sunstein, C. R., Reisch, L. A., & Kaiser, M. (2019). Trusting nudges? Lessons from an international survey. Journal of European Public Policy, 26(10), 1417–1443. https://doi.org/10.1080/13501763.2018.1531912

Temple, N. J. (2020). Front-of-package food labels: A narrative review. Appetite, 144, 104485. https://doi.org/10.1016/j.appet.2019.104485

Thaler, R. H., & Sunstein, C. R. (2008). Nudge: Improving Decisions about Health, Wealth, and Happiness (Yale University Press, London, 978-0-300-14681-3). Yale University Press, London. https://books.google.de/books?id=dSJQn8egXvUC

Tran, V., Páez Rovira, D., & Sánchez Fernández, F. (2012). Emotions and Decision-Making Processes in Management Teams: A Collective Level Analysis. Journal of Work and Organizational Psychology, 28(1), 15–24. https://doi.org/10.5093/tr2012a2

Vaish, A., Grossmann, T., & Woodward, A. (2008). Not all emotions are created equal: The negativity bias in social-emotional development. Psychological Bulletin, 134(3), 383–403. https://doi.org/10.1037/0033-2909.134.3.383

van Kleef, E., Seijdell, K., Vingerhoeds, M. H., Wijk, R. A. de, & van Trijp, H. C. M. (2018). The effect of a default-based nudge on the choice of whole wheat bread. In APPETITE (Vol. 121, pp. 179–185).

van Rookhuijzen, M., & de Vet, E. (2021). Nudging healthy eating in Dutch sports canteens: A multi-method case study. In PUBLIC HEALTH NUTRITION (Vol. 24, Issue 2, pp. 327–337). CAMBRIDGE UNIV PRESS. https://doi.org/10.1017/S1368980020002013

van Rookhuijzen, M., de Vet, E., Gort, G., & Adriaanse, M. A. (2023). When nudgees become nudgers: Exploring the use of self-nudging to promote fruit intake. Applied Psychology: Health and Well-Being, 15(4), 1714–1732. https://doi.org/10.1111/aphw.12464

Vandenbroele, J., Slabbinck, H., Van Kerckhove, A., & Vermeir, I. (2021). Mock meat in the butchery: Nudging consumers toward meat substitutes. Organizational Behavior and Human Decision Processes, 163, 105–116. https://doi.org/10.1016/j.obhdp.2019.09.004

Vargas-Meza, J., Jáuregui, A., Contreras-Manzano, A., Nieto, C., & Barquera, S. (2019). Acceptability and understanding of front-of-pack nutritional labels: An experimental study in Mexican consumers. BMC Public Health, 19(1), 1751. https://doi.org/10.1186/s12889-019-8108-z

Vugts, Van den Hoven, M., De Vet, E., & Verweij, M. (2020). How autonomy is understood in discussions on the ethics of nudging. Behavioural Public Policy, 4(1), 108–123. Cambridge Core. https://doi.org/10.1017/bpp.2018.5

Wachner, J., Adriaanse, M., & De Ridder, D. (2020). The influence of nudge transparency on the experience of autonomy. Comprehensive Results in Social Psychology, 5(1–3), 49–63. https://doi.org/10.1080/23743603.2020.1808782

Wales, M.-E. (2009). Understanding the role of convenience in consumer food choices: A review article. SURG Journal, 2(2), Article 2. https://doi.org/10.21083/surg.v2i2.983

Wansink, B., & Sobal, J. (2007). Mindless Eating: The 200 Daily Food Decisions We Overlook. Environment and Behavior, 39(1), 106–123. https://doi.org/10.1177/0013916506295573

Yi, S., Kanetkar, V., & Brauer, P. (2022). Nudging food service users to choose fruit-and vegetable-rich items: Five field studies. Appetite, 173, 105978.

Young, L., Rosin, M., Jiang, Y., Grey, J., Vandevijvere, S., Waterlander, W., & Ni Mhurchu, C. (2020). The effect of a shelf placement intervention on sales of healthier and less healthy breakfast cereals in supermarkets: A co-designed pilot study. Social Science & Medicine (1982), 266, 113337. https://doi.org/10.1016/j.socscimed.2020.113337

Zhang, Y., Duan, Y., Long, T., Wu, Y., Huang, J., Zhang, Y., & Li, M. (2024). The specially designed nudging tableware promotes healthy food choices: Evidence from a randomized crossover trial in normal-weight young adults. Physiology & Behavior, 273, 114412. https://doi.org/10.1016/j.physbeh.2023.114412

Supplementary File S1

Study ID	Population description	Target behavior and applied setting	Control/reference description	Nudge description	Physical resources	Economic resources	Social norms	Emotional appeals	(Non-)Transparency of intervention	(Non-)Transparency of alternatives
Aldrovandi 2015	Undergraduate students who previously reported consumption of either coffee or chocolate	Willingness to pay for coffee vs. orange juice AND chocolate vs. apple in hypothetical experiment	Participants not provided with any information prior to decision-making	Participants were told where they believed they ranked among the university student population for coffee (or chocolate) consumption, and what their actual rank position was (e.g., "you are in the most unhealthy 10% of eaters")	0	0	1	2	1	0
Allan 2020	Hospital visitors	Healthy snack purchases in hospital shop	Status quo hospital site	Point of purchase prompt displayed as eye-level sign on shelves that read "If you are trying to eat less, then choose a snack from the left", snack items displayed with calorie content information and ordered from lowest to highest calories	0	0	0	0	0	0
Andreani 2023	University students	Purchase intention of healthy and sustainable dishes in online survey	Dish displayed without a logo	Logo displayed with hypothetical canteen dishes either framing the choice as healthy or sustainable	0	0	0	0	0	0
Andreani 2023	University students	Purchase intention of healthy and sustainable dishes in online survey	Dish displayed without a logo	Logo displayed with hypothetical canteen dishes either framing the choice as the "chef choice"	0	0	1	1	2	0
Antunes 2024	Children	Healthy lunch choices in elementary schools	Status quo schools	Nudge included (1) banner of the daily school meal menu and two superheroes, (2) waterproof tablecloths, (3) posters on healthy eating habits, (4) displays with playful names, (5) prominent and transparent containers for fruits, and (6) colored	0	0	0	0	2	0

				footprints that led students to the drinking fountain						
Attwood 2020	University students	Choice of 'target' (base price) vegetarian dish in hypothetical online restaurant menu	Decoy absent from menu	Higher-priced 'decoy' vegetarian option added to existing items on menus	0	1	0	0	2	0
Bacon 2018	Adults	Choice of vegetarian meal in hypothetical restaurant	Menu with both vegetarian and non-vegetarian dishes, all presented in the same manner	Vegetarian dish on menu enclosed in a box and entitled 'Chef's Recommendation'	0	0	1	1	1	0
Bacon 2018	Adults	Choice of vegetarian meal in hypothetical restaurant	Menu with both vegetarian and non-vegetarian dishes, all presented in the same manner	Vegetarian dish on menu with more appealing description (e.g., "fresh seasonal risotto primavera")	0	0	0	1	1	0
Bacon 2018	Adults	Choice of vegetarian meal in hypothetical restaurant	Menu with both vegetarian and non-vegetarian dishes, all presented in the same manner	Vegetarian dishes on menu placed in a separate section at end of menu	0	0	0	0	2	0
Banerjee 2023	Adults	Choice of sustainable meal in hypothetical restaurant	Regular 'a la carte' menu with 36 items and equal number of vegetarian and non-vegetarian options, with no prompting prior to meal selection	Prompt to explicitly reflect on a green pledge before viewing a default set-menu with only 18 low emission items. An opt-out to free array menu was available on request	0	1	1	0	0	1
Banerjee 2023	Adults	Choice of sustainable meal in hypothetical restaurant	Regular 'a la carte' menu with 36 items and equal number of vegetarian and	A la carte menu with 36 items, traffic light labeling, and an explicit information	0	0	0	0	0	0

			non-vegetarian options, with no prompting prior to meal selection	disclosure about the labeling scheme						
Banerjee 2023	Adults	Choice of sustainable meal in hypothetical restaurant	Regular 'a la carte' menu with 36 items and equal number of vegetarian and non-vegetarian options, with no prompting prior to meal selection	Default set-menu with only 18 low emission items and an explicit information disclosure about the default menu. An opt-out to free array menu was available on request	0	1	1	0	0	1
Banerjee 2023	Adults	Choice of sustainable meal in hypothetical restaurant	Regular 'a la carte' menu with 36 items and equal number of vegetarian and non-vegetarian options, with no prompting prior to meal selection	Default set-menu with only 18 low emission items with no information disclosure about the default menu. An opt-out to free array menu was available on request	0	1	1	0	2	1
Banerjee 2023	Adults	Choice of sustainable meal in hypothetical restaurant	Regular 'a la carte' menu with 36 items and equal number of vegetarian and non-vegetarian options, with no prompting prior to meal selection	A la carte' menu with 36 items and traffic light labeling indicating environmental friendliness	0	0	0	0	0	0
Banerjee 2023	Adults	Sustainable meal choices in online menu	Regular menu with 36 items, including 18 vegetarian and 18 non-vegetarian items	Default shorter menu with 18 sustainable food items from regular menu, 12 vegetarian and 6 non-vegetarian, opt-out possible for regular menu. No information disclosure about the default menu	0	1	1	0	2	1

Banerjee 2023	Adults	Sustainable meal choices in online menu	Regular menu with 36 items, including 18 vegetarian and 18 non-vegetarian items	Default shorter menu with 18 sustainable food items from regular menu, 12 vegetarian and 6 non-vegetarian, opt-out possible for regular menu, and an information disclosure about it's concept and purpose	0	1	1	0	0	1
Banerjee 2023	Adults	Sustainable meal choices in online menu	Regular menu with 36 items, including 18 vegetarian and 18 non-vegetarian items	Regular menu with 36 items, which were colour coded using a traffic-lighting scheme, and an information disclosure about it's concept and purpose	0	0	0	0	0	0
Banerjee 2023	Adults	Sustainable meal choices in online menu	Regular menu with 36 items, including 18 vegetarian and 18 non-vegetarian items	Prompt displayed a pledge for an environmentally friendly diet, after making a decision, individuals were provided with default shorter menu with 18 sustainable food items from regular menu, 12 vegetarian and 6 non-vegetarian, opt-out possible for regular menu	0	1	1	0	0	1
Banerjee 2023	Adults	Sustainable meal choices in online menu	Regular menu with 36 items, including 18 vegetarian and 18 non-vegetarian items	Default shorter menu with 18 sustainable food items from regular menu, 12 vegetarian and 6 non-vegetarian, opt-out possible for regular menu. After menu choice, prompt displayed a pledge for an environmentally friendly diet, after which they could re-evaluate their order	0	1	1	0	0	1
Baskin 2016	Google employees	Snack consumption in the workplace	Snack station located near (6'5") to beverage station	Snack station located far (17'6") from the beverage station	2	1	0	0	2	0
Bauer 2021	Trainees, interns - customers at cafeteria	Choice of the 'green line' for lunch at corporate cafeteria	No reminders	Reminding messages to activate different goals related to choosing the Green Line: three pro-self frames (i.e., better health, better	0	0	1	1	0	0

				price, and better work performance) as well as one pro-social frame (better for the climate).						
Bauer 2021	Regular employees, trainees, interns, guests	Choice of the 'green line' for lunch at corporate cafeteria	Normal, unrestricted access to the 'all inclusive' payment terminals	Limiting easy access to the 'Green Line' alternative by reducing the number of 'all inclusive' payment terminals.	0	2	0	0	2	0
Bauer 2021	Regular employees, trainees, interns, guests	Choice of the 'green line' for lunch at corporate cafeteria	No stickers	Increasing salience of the 'Green Line' by sticking guiding green footprints on the floor from cafeteria entrance to 'Green Line' terminal.	0	0	0	0	2	0
Bauer 2022	Adults	Increase purchases of fruit and vegetables in the supermarket	Store without intervention	Bright colored signs with messaging "most people choose fruit and vegetables" placed in shopping carts, signs with recipe ideas also suggested vegetables to buy in the cart and around the store	0	0	1	0	0	0
Benito-Ostolaza 2021	Children	Healthy snack choice in school	No poster display/visual stimuli	Posters with a happy emoji surrounded by fruits (positive treatment), or posters with a sad emoji surrounded by highly processed and sugary foods (negative treatment)	0	0	1	2	0	0
Bergeron 2019	Adults	Choice of lighter dessert in experimental, self-service restaurant	A default order form provided to patrons with two dessert options, with one option described as 'the dessert of the day' patrons could check an additional box to opt for an alternative version of their dessert of	A default form provided to patrons with two dessert options, with one option described as ,'the dessert of the day,' patrons could check an additional box to opt for an alternative version of their dessert of choice, which was listed as 'richer' in fat and sugar	0	1	1	1	2	1

			choice, which was listed as 'lighter' in fat and sugar							
Biswas 2017	Restaurant patrons	Meal choice in restaurant	Normal lighting conditions	Low lighting condition, Bright lighting condition	0	0	0	0	2	0
Biswas 2017	University students	Choice between 100-calorie Oreos and chocolate covered Oreos (Written)	Nomal lighting	bright (vs. dim) ambient light	0	0	0	0	2	0
Biswas 2017	University students	Choice between 100-calorie Oreos and chocolate covered Oreos (Had to be said out loud)	Normal lighting	bright (vs. dim) ambient light	0	0	0	0	2	0
Bleasdale 2021	Patrons of food trucks	Sales of healthy vs. unhealthy items at food trucks	No sample	Provision of samples of healthy food items and point-of-purchase prompting (promotional signage; verbal cues)	0	0	0	1	0	0
Blom 2021	University science festival attendees	Healthy alternatives in a virtual reality supermarket	Status quo grocery setting	Healthy grocery items enclosed in an orange frame	0	0	0	0	2	0
Boronowsky 2022	University students	Plant-based meal choice in university catered event	Default meat online RSVP form, opt out to plant-based meal possible with the click of a button	Default plant-based online RSVP form, opt out to meat meal possible with the click of a button	0	1	1	0	2	1
Buratto 2024	Adults	Choice of plant-based meals in restaurant	Status quo menu with V (vegetarian) and PB (plant-based) symbols at baseline period	Menu with V (vegetarian) and PB (plant-based) symbols removed	0	0	0	0	2	0
Buratto 2024	Adults	Choice of plant-based meals in restaurant	Status quo menu with V (vegetarian) and PB (plant-based) symbols at baseline period	Menu with LE (low emissions) symbol added to vegetarian/plant-based dishes	0	0	0	0	0	0

Buratto 2024	Adults	Choice of plant-based meals in restaurant	Status quo menu with V (vegetarian) and PB (plant-based) symbols at baseline period	Menu with LE (low emissions) symbol added to vegetarian/plant-based dishes with a disclosure statement "A selection of dishes we would like you not only to taste for the amazing flavour but also for the environment,'	0	0	1	1	0	0
Byrd 2018	US adult consumers	Meal choice in an online menu	Menu with no nutrition information	Participants were randomly assigned to view menus that displayed either (1) calorie information, or (2) calories and sodium (numeric) info	0	0	0	0	0	0
Byrd 2018	US adult consumers	Meal choice in an online menu	Menu with no nutrition information	Participants were randomly assigned to view menu with calorie information and sodium warning symbol ("High sodium intake can increase blood pressure and risk of heart disease and stroke")	0	0	0	2	0	0
Calabro 2023	Young adults	Choice of water from a vending machine	Vending machine without beverage imagery on black background	Vending machine with various "wrappers", i.e., wrapper with branding e.g., Coca-cola logo or a red or blue background, wrapper with picture of water on back background, wrapper with picture of soft drink on back background, wrapper without imagery on red or blue background	0	0	0	0	2	0
Campbell-Arvai 2014	University students	Choice of vegetarian meal in university dining facility	Dining facility menu with both vegetarian and non-vegetarian options listed on the same menu	Vegetarian default menu, with patrons informed verbally and in writing about second menu containing meat options posted 3.5 meters away	2	1	1	0	2	1

Campbell-Arvai 2014	University students	Choice of vegetarian meal in university dining facility	Dining facility menu with both vegetarian and non-vegetarian options listed on the same menu	Vegetarian default menu including meat-free labeling and accompanying information on the environmental benefits of reducing meat consumption, with patrons informed verbally and in writing about second menu containing meat options posted 3.5 meters away	2	1	1	0	0	1
Carroll 2018	Participants recruited from the community	Purchases of fruits and vegetables in lab setting	No presentation of fruits and vegetable bundles	Fruit and vegetable bundles displayed	0	1	0	0	2	1
Caso 2023	Adults who eat meat	Self-reported future meat consumption in an online survey	No information message on the consequences of excessive meat consumption	Provision of a text that either focused on the irreversible consequences of a high intake of red and processed meat in terms of death, capturing the influence of the phenomenon at a global level (social nudge), or with a focus on the individual, the exposure to the increased risk of developing cancer and other chronic diseases linked to the regular and constant consumption of red or processed meat in the daily diet (individual nudge).	0	0	1	2	0	0
Chapman 2019	Rural residents	Healthier food choices in grocery and convenience stores	Status quo baseline	Floor arrows guided customers to the produce sections	0	0	0	0	1	1
Chapman 2019	Rural residents	Healthier food choices in grocery and convenience stores	Status quo baseline	Sign in produce section displayed a 'limited amount' message	0	1	0	0	1	1
Chapman 2019	Rural residents	Healthier food choices in grocery and convenience stores	Status quo baseline	Granola bars moved into the candy bar aisle	0	0	0	0	2	1

Chapman 2019	Rural residents	Healthier food choices in grocery and convenience stores	Status quo baseline	All three nudges implemented at once, i.e., Floor arrows guided customers to the produce sections, sign in produce section displayed a 'limited amount' message, and granola bars moved into the candy bar aisle	0	1	0	0	2	1
Cheung 2019	Take-away food vendor patrons	Sales of fresh fruit, bread roles, and yogurt at take-away food vendor	Fresh fruits were placed out-of-reach at the back of the vendor, two types of bread rolls were placed in separate containers together with croissants, the labels for the three yogurt options (i.e., bowl, cup, and shake) were placed flat on the counter	(1) Fresh fruits were relocated from the back to the front counter, (2) both types of bread rolls were placed together in one container, and croissants in another, (3) labels for the three yogurt options were redesigned with pictures (e.g., of fruits, muesli, containers) added to accompany the text, e.g. 'Bestselling choice!' and placed on the wall in clear view	0	1	1	0	2	1
Cheung 2019	Take-away food vendor patrons	Sales of fresh fruit, bread roles, and yogurt at take-away food vendor	Fresh fruits were placed out-of-reach at the back of the vendor, two types of bread rolls were placed in separate containers together with croissants, the labels for the three yogurt options (i.e., bowl, cup, and shake) were placed flat on the counter	In addition to the three nudges implemented in the first phase of the experiment, a disclosure message was displayed accompanying each individual nudge, i.e., "We help you make healthy choices"	0	1	1	0	0	1

Cioffi 2015	University students	Choice of healthy to-go meals and snack at university dining unit	Status quo dining unit pre-intervention	FDA nutrition facts panel added to pre-packaged meals and snacks	0	0	0	0	0	0
Coffino 2020	Food pantry patrons	Healthier grocery purchases in an online grocery store	Provision of nutrition information before purchasing groceries online	Provision of pre-filled online grocery shopping cart containing a variety of groceries selected to meet nutritional requirements based on participants' sex and age (i.e., staying within caloric range etc.) and told that they are free to delete, add, exchange, or keep all items in their cart prior to finalizing their purchase	0	2	1	0	2	0
Coffino 2021	Food pantry patrons	Diet quality (Healthy Eating Index [HEI 2015] scores), energy, and energy density of each online cart (i.e., grocery purchases)	No nudge	Participants in the default condition were instructed that the prefilled grocery cart represented a nutritionally balanced grocery shopping cart on the basis of their gender and age and that they could keep, delete, or exchange any or all of the items in their cart	0	2	1	0	0	0
Coombs 2021	Clients of urban food pantries	Self-reported dietary quality from food pantry	No labelling condition	Intervention used highly visible shelf labels to promote foods consistent with the USDA 2015-2020 Dietary Guidelines for Americans; shelf labels included a colorful thumbs up image and said ,'Healthy Choice,' English or Spanish	0	0	1	0	0	0
Coucke 2022	Adults	Sales of plant-based meat in supermarket	Status quo supermarket	Meat substitutes added to the butchery section and placed next to their equivalent meat products	0	0	0	0	2	0
Dalrymple 2020	Children	Lower-energy dense choices from children's menu in theme-park restaurant	Status quo free array children's menu	Default children's menu with lower-energy-dense items displayed centered on the menu in 20-point font,	0	0	1	0	2	1

				alternatives were displayed on the bottom of the menu in left-justified 10-point font.						
Davidson 2021	Adults and children (randomized at village level)	Diversity of food consumed in experimental buffet and household	No special plate provided	Plate printed with nutrition recommendations with food images and messages e.g., ,'Half plate of rice and at least four other varieties of food,' 'Eat a little more food during pregnancy'	0	0	1	0	0	0
DeBauw 2022	Adults	Nutritional quality (NQI) and environmental impact (EII) of the selected food baskets in grocery purchase in mock-up E-grocery store	No eco- or nutri-scores displayed	Eco- and nutri-scores displayed with individual products, grocery baskets, or both	0	0	0	0	0	0
DeBauw 2022	Adults	Nutritional quality (NQI) and environmental impact (EII) of the selected food baskets in grocery purchase in mock-up E-grocery store	No eco- or nutri-scores displayed	Eco- and nutri-scores displayed with both individual products and baskets as well as the average basket scores in the local province	0	0	1	0	0	0
DeBauw 2022	Adults	Nutritional quality (NQI) and environmental impact (EII) of the selected food baskets in grocery purchase in mock-up E-grocery store	No eco- or nutri-scores displayed	Eco- and nutri-scores displayed with both individual products and baskets as well as the average basket scores in the local province and a prompt to "improve your scores"	0	0	1	1	0	0
Deek 2022	Female university students	Healthy food and drink choices from hypothetical online fast-food menu	Participants primed with image displaying a simple graphic (knife and fork) that did not include food or drink items	Participants primed with healthy cue displaying a healthy meal (salad, water and yogurt) or with unhealthy cue displaying an unhealthy meal (burger, milkshake and brownies)	0	0	0	1	1	0
Diaz-Beltran 2023	US adults	Meal choice in a fast-food drive through simuation	Menu with traditional combos with high-calories sides and beverages by default; patrons	Optimal combos with low-calorie optimal sides and beverages by default; patrons could opt to switch low-calorie for high-calorie sides,	0	2	1	0	2	2

			could opt to switch high-calorie for low-calorie sides, but this information was not stated on the menu	but this information was not stated on the menu						
Diaz-Beltran 2023	Adults in the U.S.	Combo meal selection in hypothetical fast-food drive through	Traditional combo menu with high-calorie sides and beverages by default while low-calorie sides were included in separate section, sides and beverages could be customized via an open-ended question after selection was made	Optimal default menu with low-calorie sides and beverages by default while high-calorie items were included in separate section. Sides and beverages could be customized via an open-ended question after selection was made	0	2	1	0	2	0
dosSantos 2018	Adolescents and adults		Participants were asked to choose between three similar meals, one meat, one fish and one the VeggiEat dish	The target dish was labelled the 'Dish of the day'. All dishes were provided free of charge, displayed side by side in the same order and served in same portions	0	0	0	1	2	0
dosSantos 2020	Adolescents	Selection of vegetable-based meals in restaurant	Dishes were not communicated as "dish of the day"; menus offered three meals: one meat-based, one fish-based, and one vegetable-based	The vegetable-based dish, highlighted as the 'dish of the day', was communicated to patrons through menu labeling and verbal communication by food service staff. Menus offered three meals: one meat-based, one fish-based, and one vegetable-based	0	0	0	1	2	0

Downs 2015	Pedestrians recruited from busy public locations	Choice of lower calorie snack items in mobile research lab	Seven snacks offered - each depicted with a photograph - but no nutritional information	Seven snacks offered - each depicted with a photograph - with numeric calorie information; three forms were tested: one with calorie labels for each snack, one with calories plus a reference guideline for recommended daily intake of 2,000 calories per day, and the last with calories plus a recommended daily snack intake	0	0	0	0	0	0
Downs 2015	Pedestrians recruited from busy public locations	Choice of lower calorie snack items in mobile research lab	Seven snacks offered - each depicted with a photograph - but no nutritional information	Seven snacks offered - each depicted with a photograph - with contextualized numeric nutrition information. Three forms were tested: the snack's calculated percentage of daily calories recommended, the snack's calculated percentage of snack calories recommended, and the number of minutes running on a treadmill required to burn the item as calories	0	0	0	0	0	0
Erhard 2023	Adults	Plant-based meat choice in hypothetical online menu	Default meat menu with preselected meat meal requiring click of a button to opt-out to plant-based meat alternative	Default plant-based meat alternative with preselected plant-based meal requiring click of a button to opt-out to meat	0	1	1	0	2	1
Erhard 2023	Adults	Plant-based meat choice in hypothetical online menu	Default meat menu with preselected meat meal requiring click of a button to opt-out to plant-based meat alternative	Default plant-based meat alternative with preselected plant-based meal requiring click of a button to opt-out to meat and taste frame message displayed "We have selected the most tasty sausage for you"	0	1	1	1	0	1

Erhard 2023	Adults	Plant-based meat choice in hypothetical online menu	Default meat menu with preselected meat meal requiring click of a button to opt-out to plant-based meat alternative	Default plant-based meat alternative with preselected plant-based meal requiring click of a button to opt-out to meat and sustainability frame message displayed "We have selected the most sustainable sausage for you"	0	1	1	0	0	1
Fennessy 2023	Female prisoners	Choice of healthy meals (lunch, dinner, and dessert) from paper-based menu in female prison	Baseline period with status quo menu (no smiley emoticons)	Smiley face emoticon placed next to healthy foods in menu and 'Healthy Choice' label	0	0	1	0	0	0
Fennis 2020	University students	Consumption of grapes in laboratory setting	Grapes were presented as easy to grow and widely available in supermarkets throughout the year	Label displayed on grape packaging 'limited availability' and participants were told the grapes came from a specific region in Chile, were difficult to grow, and limited in supply	0	1	0	0	2	1
Fennis 2020	University students	Hypothetical intention to buy cranberries in survey	Online ad for cranberries with the description "Always there for you," and indicated that the cranberries were of a common species that grows in large areas, can be harvested anytime, and widely available	Online ad for cranberries with the description 'Limited availability' and indicated as a rare species that only grows in a specific area, which can be harvested only during a limited time and is only available in specialty stores during a limited times	0	1	0	0	2	1
Ferrante 2022	Children	Choice of healthier side in a university-based restaurant	Children's meal with default side of all fries, free of charge	Children's meals with default side, of small fries and large carrots, or small carrots and large fries, free of charge; option to opt-out for either only fries or only carrots was available upon request and written in small font at the bottom of the menu	0	1	1	0	2	1

Flores 2019	Cafeteria patrons	Lower-calorie dish choice and calories consumed in cafeteria and online menu	(Healthy or indulgent) desserts placed at the beginning of the cafeteria buffet/online menu	(Healthy or indulgent) desserts placed at the end of the cafeteria buffet/online menu	0	1	0	0	2	1
Garaus 2023	Adults	Dessert choice in an online menu	No claim on menu for 'healthy' dessert	Menu with a 'health claim' that modified the language of the healthy dessert to include words like 'low sugar' and 'light'	0	0	0	0	0	0
Garaus 2023	Adults	Dessert choice in an online menu	No claim on menu for 'healthy' dessert	Menu with a 'sensory claim' that modified the language of the healthy dessert to include words like to include words like 'sweet' and 'crunchy'	0	0	0	1	2	0
Gavrieli 2022	Employees	Amount of plant-based food taken per plate at self-service, buffets in workplace office cafeterias	Plant-based dishes with no appealing names on menu, e.g., "Collard Greens Vegetable Soup"	Plant-based dishes presented with appealing names on menu, e.g., "Sweet Velvety Soup with Collard Greens"	0	0	0	1	2	0
Gill 2022	University students	Choice of healthy foods in hypothetical imagined fast-food restaurant	Portion sizes on menu included S, M, and L for healthy food (carrot sticks)	Portion sizes on menu included S, M, L, and XL for healthy food (carrot sticks)	0	0	0	0	2	0
Gillebaart 2023	Adults	Choice of healthy snack in experimental supermarket	Shopping basket inlay with neutral pictures	Shopping basket inlay with pictures of healthy items	0	0	0	0	0	0
Gillebaart 2023	Academic professionals invited to evaluate a novel vegetable display	Participant evaluation of vegetable display in an academic environment	No nudge present	Monitor placed over vegetables with an animated character who gives a thumbs up when patrons choose a vegetable	0	0	1	1	0	0
Gillebaart 2023	Supermarket patrons	Vegetrable purchases in supermarket setting	Normal vegetable displays (I.e., no nudge)	Monitor placed over vegetables with an animated character who gives a	0	0	1	1	0	0

				thumbs up when you choose a vegetable						
Gottselig 2023	Adults	Willingness to pay for sustainable food products in conjoint experiment	No nudge prior to conjoint experiment	Respondents exposed to pictures randomly drawn from a set of nature pictures	0	0	0	0	2	0
Gottselig 2023	Adults	Willingness to pay for sustainable food products in conjoint experiment	No nudge prior to conjoint experiment	Social norm nudge presented to participants prior to conjoint experiment that communicates the percentage of consumers making more sustainable food choices	0	0	1	0	0	0
Gravert 2021	Employees	Vegetarian lunch meal selection from vegetarian, fish, and meat options in a restaurant	Lunch menu listed meat and fish options, with statement of a vegetarian option available on request	Lunch menu listed vegetarian and fish options, with statement of a meat option available on request	0	1	1	0	2	1
Gynell 2022	University students	Healthy snack choice in paper-based and online menus	Healthy items placed at the bottom of the menu	Healthy items placed on the top of the menu	0	0	0	0	2	1
Gynell 2022	University students	Healthy snack choice in paper-based and online menus	Healthy items placed at the bottom of the menu	Healthy items placed in the middle of the menu	0	0	0	0	2	1
Hansen 2021	Stakeholders within public health and consumer regulation, and master and PhD students	Choice of vegetarian lunch at conference buffet	A standard lunch registration sent online prior to the conference presenting a non-vegetarian buffet as the default, but allowing the active choice of a vegetarian option (I.e., At the conference a non-vegetarian buffet will be served for	A lunch registration sent online presenting a vegetarian buffet as the default, allowing the active choice of a non-vegetarian option (I.e., At the conference a vegetarian buffet will be served for lunch. Please state here if you would like to have a non-vegetarian dish prepared for you)	0	1	1	0	2	0

			lunch. Please state here if you would like to have a vegetarian dish prepared for you)							
Hawkins 2021	Students	Snack choice in lab setting while completing an online survey	Participants shown three sets of instagram images: one of low-energy dense (LED) food images, one of high energy dense (HED) images, and one of control images (interior design). All images presented with similar number of 'likes'	Participants shown three sets of instagram images: one of low-energy dense food images, one of high energy dense images, and one of control images (interior design). LED or HED images presented with high social endorsement (I.e., much higher numbers of 'likes')	0	0	1	0	2	0
Hielkema 2022	Adults	Choice of vegetarian dish in hypothetical menu	Menu including vegetarian dishes with an explicate vegetarian label, i.e., vegetarian, vegan, plant-based or meat-free (e.g., Vegetarian curry stew with coconut and sweet potatoes)	Menu including vegetarian dishes with a neutral label (e.g., "curry stew with coconut and sweet potatoes"), asterisk indicated dish was also suitable for vegetarians	0	0	0	0	2	0
Hielkema 2022	Adults	Choice of vegetarian burger in hypothetical restaurant	Default beef burger menu option with instructions to ask the waiter for vegetarian burger	Default vegetarian burger menu option with instructions to ask the waiter for vegetarian burger	0	1	1	0	2	0
Hielkema 2022	Adults	Choice of vegetarian burger in hypothetical restaurant	Vegetarian burger labeled on menu with conventional title	Vegetarian burger indulgently labeled as ,'Flame-grilled Black Bean Burger' on menu	0	0	0	1	2	0

Hoenink 2021	Supermarket shoppers	Beverage purchases in supermarket	No traffic-light labelling used to indicate relative sugar content of beverages	On-shelf traffic-light sugar labels implemented (I.e., green for the lowest sugar content, yellow for medium sugar content, and red for high sugar content). In addition, the shelf included a small poster explaining the meaning of the on-shelf sugar labels	0	0	0	0	0	0
Hubbard 2015	Students with disabilities at residential school	Increase choice and consumption of fruits, vegetables and whole grains, and reduce choice and consumption of refined grains in school lunchroom	Baseline period with status quo lunchroom, including sides bundled with entrees, fruit kept behind the counter, and desserts placed at eye level of children	Peanut butter and jelly sandwiches were moved to the back counter and made available only by request; fruit was moved to the beginning of the serving line; apples, bananas and oranges were separated into attractive and easy-to-reach baskets; an easy-to-eat fruit option (e.g. apple sauce) was available by request daily near the fresh fruit; the healthiest entree was placed earlier in line, followed by sides; sides were unbundled from the entrees; desserts were kept behind the counter, rather than serving them at eye level	2	1	1	0	2	2
Jesse 2021	Participants in an online survey	Choice of healthy/sustainable recipe in an online survey	No nudged recipe	Upon selection of 'vegetarian' preference for a recipe, one option is highlighted by using a different color background to emphasize it	0	0	0	0	2	0
Jesse 2021	Participants in an online survey	Choice of healthy/sustainable recipe in an online survey	No nudged sandwich recipe	Hybrid nudge adopted that combines a pre-selection of the nudged sandwich (default) on online menu and a social norm message (i.e., '90% of people liked this'). Participants could opt to a	0	1	1	0	2	0

				different sandwich with the click of a button						
Jesse 2021	Participants in an online survey	Choice of healthy/sustainable recipe in an online survey	No nudged pasta recipe	Nudged pasta recipe option is pre-selected for participants, who can opt out of it by clicking a buton	0	1	1	0	2	0
Jesse 2021	Participants in an online survey	Choice of healthy/sustainable recipe in an online survey	No nudged 'fish' recipe	Nudged 'fish' recipe option with social norm message (i.e., '90% of people liked this')	0	0	1	0	2	0
Jesse 2021	Participants in an online survey	Choice of healthy/sustainable recipe in an online survey	No nudged 'dessert' option	Text warning label to advise against the selection of an option that read "Please note that this dish contains alcohol/has a high amount of kilocalories per serving"	0	0	0	0	0	0
Jia 2022	Hospital employees	Improved food choices in hospital cafeteria	A standard letter delivered to participants each month with general health tips (e.g., eating fruits and vegetables, exercising regularly) over 12 months	Two emails per week and one letter per month delivered to participants over 12 months, a weekly e-mail provided each participant with a log of their cafeteria food purchases from the prior week, including traffic light labels for all items and total calories purchased, using each participant's daily calorie goal (i.e., for weight loss or maintenance) as a benchmark	0	0	1	1	0	0
Kattelmann 2014	University students	Improvements in weight, BMI, waist circumference, and intake of F&V, sugary drinks, whole grains, and dietary fat	Control group with no nudge intervention delivered	21 mini-educational lessons and emails delivered to participants online over 10 weeks; the messages addressed eating behavior, physical activity, stress management, and healthy weight management; simultaneously, participants used an app to view graphs of their goal(s), progress toward	0	0	1	0	0	0

				a goal, and recommendations for each target behavior						
Kee 2022	Customers at the State Fair	Choice of smaller portion size from lunch menu at State Fair restaurant	Status quo menu without labels, all foods were available in two sizes	Menu with green 'Low Calorie' label added next to the regular size portions, all foods were available in two sizes	0	0	0	0	0	0
Keegan 2019	University students	Selection of salad option from an online fast food menu with three other unhealthy options	Salad option positioned either in the middle or end of the other options, which are all equally spaced out in the online menu	Salad option is spaced further from the unhealthy options in the online menu	0	0	0	0	2	1
Kingham 2023	Undergraduate women	Choice of high nutritional value meals online fast-food menu	Menu presented a mix of high and low nutritional value items in each column or adjacent to one another	Menu presented high and low nutritional value items separately such that the space between the two columns was increased	0	0	0	0	2	1
Knowles 2019	University students	Selection of 'fruit' vs. chocolate' snack in lab setting	In the lab, two snack bowls were set up ,one with fruit and one with chocolate, both placed either 20 cm away or both placed 70 cm from participant	In the lab, two snack bowls were set up: one with fruit (20cm proximal) and one with chocolate (70cm distal), or alternatively, the fruit (70cm distal) and chocolate (20cm proximal)	2	0	0	0	2	0
Kongsbak 2016	Male university students	Vegetable consumption in self-serve lab buffet	Fruits and vegetables placed in the middle of the buffet and served as a mixed salad	Fruit and vegetables placed at the beginning of the buffet and individual salad ingredients separated into individual bowls	0	0	0	0	2	1

Kroese 2016	Customers at snack shop	Healthy choices at train station snack shop	No changes made to positioning of snacks in snack shop (i.e., unhealthy snacks at the cash register, as usual)	Healthy snacks placed at the cash register	0	0	0	0	2	1
Kroese 2016	Customers at snack shop	Healthy choices at train station snack shop	No changes made to positioning of snacks in snack shop (i.e., unhealthy snacks at the cash register, as usual)	Healthy snacks placed at the cash register and a sign posited saying "we help you make healthier choices"	0	0	1	0	0	1
Krpan 2020	Adults	Choice of vegetarian meal in hypothetical restaurant menu	Menu with vegetarian options grouped under the label "Vegetarian Main Courses"	Menu with vegetarian options grouped under the label 'Environmentally Friendly Main Courses for a Happy Planet' and other dishes listed under "Main Courses"	0	0	1	1	0	0
Krpan 2020	Adults	Choice of vegetarian meal in hypothetical restaurant menu	Menu with vegetarian options grouped under the label "Vegetarian Main Courses"	Menu with vegetarian options groups under the label 'Refreshing Main Courses for Relaxing Conversations' other dishes listed under "Main Courses"	0	0	0	1	2	0
Krpan 2020	Adults	Choice of vegetarian meal in hypothetical restaurant menu	Menu with vegetarian options grouped under the label "Vegetarian Main Courses"	Menu with vegetarian and non-vegetarian dishes mixed in the same section labeled as "Main Courses", and asterisks indicated which dishes were suitable for vegetarians	0	0	0	0	0	0
Kurz 2018	University students	Choice of vegetarian dish in university restaurant	University restaurant without nudge intervention offering three warm dish options (1 vegetarian, 1 meat, 1 fish)	University restaurant offering three warm dish options (1 vegetarian, 1 meat, 1 fish) where the the vegetarian option was repositioned from the middle to the top of the printed menu, and the dish was moved from behind the counter to a spot visible to	0	0	0	0	2	1

				customers at the point of decision-making						
Lai 2020	Children	Choice of white (vs. chocolate) milk in school lunchroom	Status quo lunchroom without prompt	Verbal prompt to children in the lunch line: 'try the white milk'	0	0	1	0	0	0
Lai 2020	Children	Choice of white (vs. chocolate) milk in school lunchroom	Status quo lunchroom without prompt	Verbal prompt to children in the lunch line "try the white milk, it tastes good'	0	0	1	1	0	0
Lai 2020	Children	Choice of white (vs. chocolate) milk in school lunchroom	Status quo lunchroom without prompt	Glow-in-the-dark bracelet (worth $0.20) was attached to white (but not chocolate) milk cartons	0	2	0	0	0	0
Langen 2022	Employees and students	Sustainable meal choice in workplace and school cafeterias	Baseline period without nudge intervention	Sustainable meals repositioned on the counter and on the menu to increase visibility	0	0	0	0	2	1
Langen 2022	Employees and students	Sustainable meal choice in workplace and school cafeterias	Baseline period without nudge intervention	Menu displayed descriptions food names for sustainable meals, e.g., "Westphalia meets Orient: spicy Munsterland tuber with chickpeas and arugula"	0	0	0	1	2	0
Langen 2022	Employees and students	Sustainable meal selection in workplace and school cafeterias	No nudge intervention	Signage at the food counter displayed sustainability traffic light label, i.e., combined calculation for environment, health and fairness dimensions	0	0	0	0	0	0
Langen 2022	Employees and students	Sustainable meal selection in workplace and school cafeterias	No nudge internvetion	Signage at the food counter displayed sustainability traffic light label, i.e., combined calculation for environment, health and fairness dimensions with an explanation of the label	0	0	0	0	0	0

Libotte 2014	University students	Composition of a meal and total meal energy selected from fake food lunch buffet in lab setting	Students given standard plate size	Students given large plate size	0	0	0	0	2	0
Lin 2022	Survey respondents	Willingness to pay for sustainably produced coffee in online discrete choice experiment	Coffee packaging presented with either no label, or up to three labels indicating pro-environmental choices: USDA organic, fair trade, and carbon trust labels	In addition to the pro-environmental labels, an additional claim is placed on one of the coffee options that states, 'this product is for green shoppers' in green color.	0	0	1	0	0	0
Liu 2022	University students	Reduction in food waste from online pizza menu	Menu displaying 3 size options, i.e., 1, 2 or 3-slices, any other number of slices could be written in the text box "other"	Menu with only 1 size option, i.e., 1-slice, any other number of slices could be written in the text box "other"	0	1	0	0	2	0
Loeb 2017	Parent-child dyads	Choice of healthier breakfast menu for child at community center	Unhealthy default breakfast menu with unhealthy items and neutral video shown to parents prior to breakfast selection	Video shown to parents with messaging, e.g., "Making health easy for your child means making the best choices for him or her", followed by presentation with a default menu that offers a healthy breakfast combo. Unhealthy options were listed in smaller font at the bottom and available upon request	0	1	2	1	0	1
Loeb 2017	Parent-child dyads	Choice of healthier breakfast menu for child at community center	Unhealthy default breakfast menu with unhealthy items and neutral video shown to parents prior to breakfast selection	Video shown to parents with neutral content about food safety, followed by presentation with a default menu that offers a healthy breakfast combo, unhealthy options were listed in smaller font at the bottom and available upon request	0	1	1	0	2	1

Loeb 2017	Parent-child dyads	Choice of healthier breakfast menu for child at community center	Unhealthy default breakfast menu with unhealthy items and neutral video shown to parents prior to breakfast selection	Video shown to parents with messaging, e.g., "Making health easy for your child means making the best choices for him or her", followed by presentation with a default menu that offers an unhealthy breakfast combo, healthy options were listed in smaller font at the bottom and available upon request	0	1	2	0	0	1
Luomala 2023	Shoppers at grocery store	Sales of organic products vs. calorie-dense products in grocery store	No nudge	Visual priming stimuli (floor stickers and shopping basket adds) and olfactory stimuli (basil scent diffusers, carrot sample tastings)	0	0	0	1	2	0
Manippa 2023	Adults	Healthy choice on hypothetical online menu	Menu with unhealthy items positioned on the left and healthy items on the right	Menu with healthy items positioned on the left and unhealthy items on the right	0	0	0	0	2	1
Manippa 2023	Adults	Healthy choice on hypothetical online menu	Menu with unhealthy items positioned on the left and healthy items on the right	Menu with healthy items positioned on the left and unhealthy items on the right	0	0	0	0	2	1
Marcano-Olivier 2019	School children	Fruit and vegetable consumption in school cafeteria	Status quo cafeteria	Five nudges implemented simultaneously: (1) brightly colored posters encouraging fruit consumption displayed; (2) attractive names added to fruit and vegetables (e.g., dinosaur tree broccoli); (3) attractive labels added to fruits and vegetables, (4) whole fruit servings replaced by sliced fruit placed into colorful bowls, (5) vegetables placed at the beginning of the line and fruit placed before dessert	0	0	0	1	0	1

McGrath 2023	Adults	Purchase of fruits and vegetables in grocery store	Trolley without divider placard	Trolley with placard covering the bottom of the shopping trolley indicating the recommended proportion fruits and vegetables, half of the placard read 'Fruits and Vegetables only' with images of produce, while the other half read 'Everything else'	0	0	0	0	0	0
McGrath 2023	Shoppers in supermarket	Fruit and vegetable purchase in supermarket	Shopping trolleys with no messaging	Placards giving the message that the majority of shoppers purchased fruit and vegetables at each shop were placed in shopping trolleys.	0	0	1	0	0	0
Mecheva 2021	Children	Healthy snack choice in school field experiment	Healthy (banana) and unhealthy (Chocolate cake) displayed side by side	Healthy (banana) and unhealthy (Chocolate cake) displayed side by side and a happy, green smiley face placed next to healthy snack and red sad face next to unhealthy one	0	0	1	1	0	0
Mecheva 2021	Children	Healthy snack choice in school field experiment	Healthy (banana) and unhealthy (Chocolate cake) displayed side by side	Healthy (banana) and unhealthy (Chocolate cake) displayed side by side and children first see a classmate (a peer of similar age and same gender, and who is a 'confederate' leaving the room with a banana	0	0	1	0	2	0
Mecheva 2021	Children	Healthy snack choice in school field experiment	Healthy (banana) and unhealthy (Chocolate cake) displayed side by side	Healthy (banana) and unhealthy (Chocolate cake) displayed side by side and children first see a classmate (a 'confederate' peer) leaving the room with a chocolate cake	0	0	1	0	2	0
Meeusen 2023	Hospital employees	Healthy (vs. unhealthy) meal purchases in hospital cafeteria	No changes to workplace cafeteria	Healthy choices placed at the front of the cafeteria, and unhealthy choices at the back	1	0	0	0	2	1

Meeusen 2023	Hospital employees	Healthy (vs. unhealthy) meal purchases in hospital cafeteria	No changes to workplace cafeteria	Signs emphasizing the health benefits of the products offered, as well as encouraging statements, were developed and placed next to healthy products	0	0	0	0	0	0
Menapace 2017	Adults	Choice of locally grown fruit toppings on ice cream in ice-cream parlor	Status quo menu without labeling	Menu with locally grown fruit options labeled as "Trentino fruits from an area particularly suited for high-quality production", i.e., a terroir label	0	0	0	0	0	0
Menapace 2017	Adults	Choice of locally grown fruit toppings on ice cream in ice-cream parlor	Status quo menu without labeling	Menu with locally grown fruit options labeled as "Only 0.03 kg of CO2 emitted by transporting 1 kg of fresh fruit"	0	0	0	0	0	0
Michels 2023	Adults	Choice of healthy foods in mock-up online supermarket	Status quo online ordering platform	Online ordering platform with opaque white layer added over picture and product information of unhealthy products	0	0	0	0	2	1
Michels 2023	Adults	Choice of healthy foods in mock-up online supermarket	Status quo online ordering platform	Online ordering platform with opaque white layer added over picture and product information of unhealthy products and a disclosure statement about the purpose of the nudge and the adverse health consequences of unhealthy diets	0	0	0	2	0	1
Michels 2023	Adults	Choice of healthy foods in mock-up online supermarket	Status quo online ordering platform	Online ordering platform without opaque white layer added over picture and product information of unhealthy products, a statement about the adverse health consequences of unhealthy diets	0	0	0	2	0	1

Michels 2023	Adults	Choice of healthy foods in mock-up online supermarket	Status quo online ordering platform without opaque white layer added over picture and product information of unhealthy products	Participants decided whether they would like the nudge or not, after viewing the online ordering platform with opaque white layer added over picture and product information of unhealthy products and a disclosure statement about the purpose of the nudge and the adverse health consequences of unhealthy diets	0	0	0	2	0	1
Michels 2023	Adults	Choice of healthy foods in mock-up online supermarket	Status quo online ordering platform without opaque white layer added over picture and product information of unhealthy products	Participants decided whether they would like the nudge or not, after viewing the online ordering platform with opaque white layer added over picture and product information of unhealthy products	0	0	0	2	0	1
Migliavada 2022	University students	Choice of vegetable dishes for lunch in university canteen	Status quo canteen without organic/local labeling	The three available vegetable dishes were labeled as "local"	0	0	0	0	1	0
Migliavada 2022	University students	Choice of vegetable dishes for lunch in university canteen	Status quo canteen without organic/local labeling	The three available vegetable dishes were labeled as "organic"	0	0	0	0	1	0
Migliavada 2022	University students	Choice of vegetable dishes for lunch in university canteen	Status quo canteen without organic/local labeling	The three available vegetable dishes were labeled as "organic & local"	0	0	0	0	1	0
Mikkelsen 2021	Vocational school students	Healthy beverage purchases in vocational school canteen	Status quo beverage cooler	Sugar sweetened beverages were placed at the bottom of beverage cooler, where they were less visible	2	0	0	0	2	1
Mikkelsen 2021	Vocational school students	Healthy beverage purchases in vocational school canteen	Status quo beverage cooler	Sugar sweetened beverages were placed at the bottom of beverage cooler, where they were less visible and a	2	0	0	0	2	2

				frosted film covered the glass front						
Missbach 2016	University students	Choice of low-calorie cereal bar from serving tray	Low-calorie cereal bar positioned on the left of two other higher-calorie bars	Low-calorie cereal bar positioned in the middle of two other higher-calorie bars	0	0	0	0	2	0
Mohr 2019	University students	Fewer calories ordered in hypothetical online fast food menu	Online ordering system prompts individuals to indicate their calorie goals for the meal before displaying status quo menu	Online ordering system prompts individuals to indicate their calorie goals for the meal before displaying menu with a virtual order assistant, featuring a human-like face with dynamic expressions, reflecting the calorie content of the shopping basket along with messages e.g., "Great choice!" and "Are you sure?"	0	0	1	2	1	0
Mohr 2019	University students	Fewer calories ordered in hypothetical online fast food menu	Status quo menu	Online ordering system prompts individuals to indicate their calorie goals for the meal before displaying menu with shopping basket calorie content and associated color-coding system (yellow, green, red)	0	0	0	0	0	0
Mohr 2019	University students	Fewer calories ordered in hypothetical online fast food menu	Status quo menu	Online ordering system prompts individuals to indicate their calorie goals for the meal before displaying menu with healthy options highlighted in green background	0	0	0	0	0	0
Montagni 2020	Employees	Healthy dish choice in workplace cafeterias	Status quo cafeteria	Healthy meal items in cafeteria labeled with a "Green Apple Label", and multiple educational elements around nutrition were delivered on-site and remote, i.e., webinars , "Lunch & Learns", TV slides,	0	0	0	0	0	0

				posters, tabling events, cooking demos, etc.						
Morren 2021	University students	Sustainable food choice in grocery stores reported via shopping receipts images	No information nudge received	In an online survey, personalized information nudges based on reported dietary choices were delivered about the health or environmental impacts of meat ingredients with suggested replacement ingredients	0	0	0	0	0	0
Mors 2018	Adults	Lunch choice in test room buffet	No intervention (i.e., odor priming) prior to lunch choice	Priming with either bread or cucumber odor prior to lunch selection	0	0	0	0	2	0
Ntoumanis 2022	Survey participants	Willingness to pay for sugar-free vs. sugar-containing food products in an online survey experiment	Participants listened to a control narrative irrelevant to food choices prior to decision-making	Participants listened to a narrative by a dietary specialist emphasizing the health risks of sugar consumption prior to decision-making	0	0	0	2	0	0
Oh 2022	Ice cream store patrons	Number and nutrition content of ice cream scoops purchased in store	Ice cream flavors partitioned into 'virtues' and 'vices' based on nutritional value and displayed in-store with 'virtue' flavors alternating with 'vice' flavors in both rows of the counter, ice cream was served by employees	Ice cream flavors partitioned into 'virtues' and 'vices' based on nutritional value and displayed in-store either with (1) 'virtue' flavors on the left/right or (2) 'virtue' flavors in the front/back row of the counter, ice cream was served by employees	0	0	0	0	1	0

Oh 2022	Ice cream store patrons	Number and nutrition content of ice cream scoops purchased in store	Ice cream flavors partitioned into 'virtues' and 'vices' based on nutritional value and displayed in-store with 'virtue' flavors alternating with 'vice' flavors in both rows of the counter, ice cream was served by employees	Ice cream flavors partitioned into 'virtues' and 'vices' based on nutritional value and displayed in-store either with (1) 'virtue' flavors on the left/right or (2) 'virtue' flavors in the front/back row of the counter and traffic light labels were added to the flavors (i.e., red for vice and green for virtue), ice cream was served by employees	0	0	0	0	1	0
Olstad 2014	Patrons at a community pool	Sales of healthy foods at an outdoor community pool concession stand	Status quo menu with item names, descriptors, prices and colorful photos	Appealing names added to healthy items on menu, unhealthy item names unchanged	0	0	0	1	2	0
Olstad 2014	Patrons at a community pool	Sales of healthy foods at an outdoor community pool concession stand	Status quo menu with item names, descriptors, prices and colorful photos	Appealing names added to healthy items on menu, unhealthy item names unchanged and a taste testing intervention, where small samples of healthy items were distributed to pool patrons	0	0	0	1	2	0
Otto 2020	Adults	Reduce calories ordered in chain cinnamon roll shop	No advertisement shown	Participants shown mock advertisement with the message "People at this store in this part of the city will order items with 250 calories on average."	0	0	1	0	0	0
Otto 2020	Adults	Reduce calories ordered in chain cinnamon roll shop	No advertisement shown	Participants shown mock advertisement with the message ,"People at other stores in other states across the country will order items with 250 calories on average."	0	0	1	0	0	0

Otto 2020	University students	Reduced calories ordered in hypothetical ice cream shop	Participants asked to imagine walking into an ice cream shop without messaging	Participants asked to imagine walking into an ice cream shop and a shop worker saying ,"On the [university name] campus, customers order on average 120 calories in ice cream toppings"	0	0	1	0	0	0
Otto 2020	University students	Reduced calories ordered in hypothetical ice cream shop	Participants asked to imagine walking into an ice cream shop without messaging	Participants asked to imagine walking into an ice cream shop and a shop worker saying "Worldwide, customers order on average 120 calories in ice cream toppings"	0	0	1	0	0	0
Ozturk 2020	School children	Healthy lunch entree selection in school cafeteria	Baseline status quo and control schools with free array menu	Menus designed by graphical artists to increase salience of healthy options using cartoons (e.g., dinosaurs and detectives) and food nicknames; morning slide shows also advertised healthy lunch options with corresponding cartoon themes	0	0	0	1	0	0
Panzone 2021	University students	Choice of products with low carbon footprint in experimental online supermarket	Participants prompted to spend $25 in online supermarket, with standard shop layout	Participants prompted to spend $25 in online supermarket; participants were informed that products had been rearranged into three aisles on the basis of their carbon footprint	0	0	0	0	0	1
Panzone 2021	University students	Choice of products with low carbon footprint in experimental online supermarket	Participants prompted to spend $25 in online supermarket, with standard shop layout	Participants prompted to spend $25 in online supermarket; participants were informed that products had been rearranged into three aisles on the basis of their carbon footprint; additionally, a banner was displayed above the shopping area that communicated a clear goal, 'Keep Carbon Low,' and	0	0	1	0	0	1

				rationale,'Caring for the environment is an important moral value. So, choose products with a lower carbon footprint.'						
Panzone 2023	Adults	Low carbon footprint of grocery purchases in experimental online supermarket	No commitments solicited before online shopping; carbon footprint and nutritional composition of each product could be viewed by moving a cursor over an icon	Participants were prompted to commit to purchasing a food basket with a low carbon footprint prior to shopping where participants could choose to commit or not; carbon footprint and nutritional composition of each product could be viewed by moving a cursor over an icon	0	0	1	0	0	0
Panzone 2023	Adults	Low carbon footprint of grocery purchases in experimental online supermarket	No commitments solicited before online shopping; carbon footprint and nutritional composition of each product could be viewed by moving a cursor over an icon	Participants were prompted to commit to purchasing a food basket with a low carbon footprint prior to shopping where participants were forced to commit; carbon footprint and nutritional composition of each product could be viewed by moving a cursor over an icon	0	0	1	0	0	0
Parkin 2022	Adults	Vegetarian dish choice from online menu	Status quo menu without V symbol	Menu with V symbol presented to the left of the dish name	0	0	0	0	0	0
Parkin 2022	Adults	Vegetarian dish choice from online menu	Status quo menu without V symbol	Menu with V symbol presented to the right of the dish name	0	0	0	0	0	0

Peeters 2022	Adults	Purchase of sustainably sourced meat products in hypothetical online farm-to-consumer membership platform where meat products were labeled according to the level of sustainability	Individuals were given a shopping assignment in farm-to-consumer platform without a self-assessment of biospheric values or opportunity to choose a membership	Participants were prompted to self-assess their own biospheric values and then choose which type of membership (three options varying in sustainability, animal welfare, and public health levels) to the farm-to-consumer platform they would like, after which they were given a shopping assignment in the platform where meat products were labeled according to the level of sustainability (same as the membership scheme)	0	0	1	0	0	0
Policastro 2017	University students	Healthier beverage choice in college food retail setting	No messaging intervention	In a dining hall, posters displayed messages on calorie savings in numerical values when switching from soda to water	0	0	0	0	0	0
Policastro 2017	University students	Healthier beverage choice in college food retail setting	No messaging intervention	In a dining hall, posters displayed messages on calorie savings and/or charity donations, i.e., if customers chose fountain water over soda, the proceeds would go to a local soup kitchen	0	1	2	0	0	0
Prusaczyk 2021	Online survey respondents	Willingness to order beef burger in hypothetical online survey	Besides an image of a burger, participants read a message informing them of the option between beef and beef-mushroom burgers and informed that the beef-mushroom burgers enhance the meaty flavor of the beef	Besides an image of a burger, participants read a message informing them of the option between beef and beef-mushroom burgers and informed that the beef-mushroom burgers enhance the meaty flavor of the beef; participants were informed that everyone would be served a beef-mushroom burger unless they specifically asked for an all-beef burger	0	1	1	0	0	1

Prusaczyk 2021	Online survey respondents	Willingness to order beef burger in online survey	Besides an image of a burger, participants read a message informing them of the option between beef and beef-mushroom burgers and informed that the beef-mushroom burgers enhance the meaty flavor of the beef	Participants were informed of the GHG emissions associated with beef consumption; then, besides an image of a burger, participants read a message informing them of the option between beef and beef-mushroom burgers and informed that the beef-mushroom burgers enhance the meaty flavor of the beef	0	0	0	1	0	1
Qi 2022	University students, staff, and faculty	Increased vegetable consumption and decreased food waste in sensory lab	Participants received message on a control topic (i.e., screen time among youth or financial literacy) before being served meal with larger proportion of meat (25% vegetables, 50 % meat, 25% rice) on small plate by default; they were then given the opportunity to downsize to a smaller meal at lower cost	Participants received message on a control topic (i.e., screen time among youth or financial literacy) before being served meal with larger proportion of vegetables (50% vegetables, 25 % meat, 25% rice) on small plate by default; they were then given the opportunity to downsize to a smaller meal at lower cost	0	2	1	0	2	0
Qi 2022	University students, staff, and faculty	Increased vegetable consumption and decreased food waste in sensory lab	Participants received message on a control topic (i.e., screen time among youth or financial literacy) before being served meal with larger proportion of meat (25% vegetables, 50 % meat, 25% rice) on small plate by	Participants received message on a control topic (i.e., screen time among youth or financial literacy) before being served meal with larger proportion of vegetables (50% vegetables, 25 % meat, 25% rice), on large plate by default; they were then given the opportunity to downsize to a smaller meal at lower cost	0	2	1	0	2	0

			default; they were then given the opportunity to downsize to a smaller meal at lower cost							
Qi 2022	University students, staff, and faculty	Increased vegetable consumption and decreased food waste in sensory lab	Participants received message on a control topic (i.e., screen time among youth or financial literacy) before being served meal with larger proportion of meat (25% vegetables, 50 % meat, 25% rice) on small plate by default; they were then given the opportunity to downsize to a smaller meal at lower cost	Participants received message on food waste before being served meal with larger proportion of vegetables (50% vegetables, 25 % meat, 25% rice) on small plate by default; they were then given the opportunity to downsize to a smaller meal at lower cost	0	2	2	0	0	0
Qi 2022	University students, staff, and faculty	Increased vegetable consumption and decreased food waste in sensory lab	Participants received message on a control topic (i.e., screen time among youth or financial literacy) before being served meal with larger proportion of meat (25% vegetables, 50 % meat, 25% rice) on large plate by default; they were then given the opportunity to downsize to a	Participants received message on food waste before being served meal with larger proportion of vegetables (50% vegetables, 25 % meat, 25% rice) on large plate by default; they were then given the opportunity to downsize to a smaller meal at lower cost	0	2	2	0	0	0

			smaller meal at lower cost							
Qiu 2023	University students	Liking and wanting of low-calorie food images in psychology lab	Participants asked to imagine eating yellow potato chips/cake for ten seconds three times in a row before rating liking/wanting of the potato chips and eight other food images (yellow, green, or red in color)	Participants asked to imagine eating yellow potato chips for ten seconds 30 times in a row before rating liking/wanting of the potato chips and eight other food images (yellow, green, or red in color)	0	0	0	0	2	0
Quinn 2018	Students in secondary schools	Selection of healthy target items (fruits, vegetables, low-fat milk) in school cafeterias	Status quo school cafeteria	Displaying fruits and vegetables in attractive ways	0	0	0	0	2	1
Quinn 2018	Students in secondary schools	Selection of healthy target items (fruits, vegetables, low-fat milk) in school cafeterias	Status quo school cafeteria	Create posters/signage promoting particular healthy foods (I.e., 'Fall is apple harvest time, get them at their best!')	0	0	0	0	0	1
Quinn 2018	Students in secondary schools	Selection of healthy target items (fruits, vegetables, low-fat milk) in school cafeterias	Status quo school cafeteria	Display milk in front of/on top of chocolate milk	2	0	0	0	2	2
Quinn 2018	Students in secondary schools	Selection of healthy target items (fruits, vegetables, low-fat milk) in school cafeterias	Status quo school cafeteria	Highlight healthy foods through labels, signs, or stickers	0	0	0	1	0	1
Quinn 2018	Students in secondary schools	Selection of healthy target items (fruits, vegetables, low-fat milk) in school cafeterias	Status quo school cafeteria	Give healthy food items creative names	0	0	0	1	2	0

Radnitz 2023	University students	Vegan menu choice in hypothetical and actual university dining hall	Free array menu with four vegan and four omnivore entrees featured prominently	Optimal default menu with four vegan entrees featured prominently as the default items, opt-out for four meat/poultry-based entrees listed in smaller text at bottom of menu and available on request	0	1	1	0	2	1
Radnitz 2023	University students	Vegan menu choice in hypothetical and actual university dining hall	Free array menu with four vegan and four omnivore entrees featured prominently	Sub-optimal default menu with four omnivore entrees featured prominently as the default items with opt-out for four vegan entrees listed in smaller text at bottom of menu and available on request	0	1	1	0	2	1
Reinholdsson 2023	Fast-food restaurant patrons	Choice of vegetarian meal from digital menu display in fast-food restaurant	Digital menu display with a grid of icons, including a 'green' section for vegetarian and vegan options	Message added to the 'green' section that reads 'Many here choose green!"	0	0	1	0	0	0
Reinholdsson 2023	Fast food restaurant patrons	Choice of vegetarian meal from digital menu display in fast-food restaurant	Digital menu display with a grid of icons, including a 'green' section for vegetarian and vegan options	Message added to the 'green' section icon that reads 'The green option tastes good!'	0	0	0	1	0	0
Reinholdsson 2023	Fast food restaurant patrons	Choice of vegetarian meal from digital menu display in fast-food restaurant	Digital menu display with a grid of icons, including a 'green' section for vegetarian and vegan options	Message added to the 'green' section icon that reads 'The green option feels good!'	0	0	1	1	0	0
Reinholdsson 2023	Fast food restaurant patrons	Choice of vegetarian meal from digital menu display in fast-food restaurant	Digital menu display with a grid of icons, including a 'green' section for vegetarian and vegan options	Position nudge implemented in which the 'green' section icon was moved from the 6th position (out of 10) to the 1st position	0	0	0	0	2	1

Samek 2019	School children	Choice of white rather than chocolate milk in cafeteria lunch line	Students given message prior to lunch informing them that white milk is the healthier choice	Students given the same message as the control group but, upon choosing white milk, get a smiley face sticker from the teacher	0	2	1	0	2	0
Samek 2019	School children	Choice of white rather than chocolate milk in cafeteria lunch line	Students given message prior to lunch informing them that white milk is the healthier choice	Students given goal-setting card prior to lunch prompting them to decide if they would like to commit to a goal of choosing healthier white milk that day	0	0	1	0	0	0
Saulais 2019	Patrons of self-service restaurant 'living lab'	Vegetable-rich meal selection in self-service restaurant lab	Two dish options presented side by side on the menu	Vegetarian dish made the 'dish of the day' on the menu, displayed in a separate text box to increase salience of the option	0	0	0	1	2	0
Schlegel 2021	University athletes	Choice of lower-energy dense snack (vs. higher-energy dense snack) after sports match in experiment	Pre-match questionnaire without priming question; after the match, athletes were then offered a single snack of their choice, from three lower-energy dense (apple, banana, orange) and three higher energy dense (chocolate bar, granola bar and biscuit)	Pre-match questionnaire with priming question, i.e., asked to choose one of three low-energy-dense options for consumption after the match; after the match, athletes were then offered a single snack of their choice, from three lower-energy dense (apple, banana, orange) and three higher energy dense (chocolate bar, granola bar and biscuit)	0	1	0	0	2	1
Schneider 2022	Children	Choice of new, healthy dish from children's restaurant menu	Regular children's menu with new, healthy dish included	Promotion of new, healthy dish on the menu with a fun, descriptive name, the use of comic characters to highlight the meal on the menu, and positioning the dish first on the menu as the 'recommended dish' by the restaurant	0	0	1	1	2	0

Schomaker 2022	Adults	Choice of healthy food items in online choice task	Participants prompted to make choices between healthy and unhealthy items in choice task	Participants prompted to make choices between healthy and unhealthy items in choice task, but prior to doing so, arrows are displayed that point in the direction of the healthy item.	0	0	0	0	2	0
Segovia 2023	Regular meat-eaters	Choice of plant-based meat alternatives in online supermarket	No messaging displayed next to meat and plant-based meat alternatives	Health message displayed next to meat and plant-based meat alternatives, i.e., "To reduce your risk of diabetes by 40%, eat one less serving of meat every day"	0	0	0	1	0	0
Segovia 2023	Regular meat-eaters	Choice of plant-based meat alternatives in online supermarket	No messaging displayed next to meat and plant-based meat alternatives	Environmental message displayed next to meat and plant-based meat alternatives, i.e., ,"To reduce your environmental impact by 40%, eat one less serving of meat every day"	0	0	1	1	0	0
Segovia 2023	Regular meat-eaters	Choice of plant-based meat alternatives in online supermarket	No messaging displayed next to meat and plant-based meat alternatives	Health and environmental message displayed next to meat and plant-based meat alternatives, i.e., "To reduce your risk of diabetes by 40%, eat one less serving of meat every day" and "To reduce your environmental impact by 40%, eat one less serving of meat every day"	0	0	1	1	0	0
Seward 2016	University students	Healthy food selection in university cafeteria	Status quo cafeteria sites	Traffic-light labeling added to dishes in cafeteria (I.e., red, yellow, green), healthier food and beverage items were made more accessible or convenient to reach, and serving lines were changes so that vegetables were at the beginning	1	0	0	0	0	1

Shin 2022	University students, staff, and faculty	Choice of low sugar content beverages in convenience store	Status quo refrigerator where beverage position was not changed	Sugar sweetened beverages moved from eye zone to non-eye zone in refrigerator	2	0	0	0	2	0
Slapo 2019	University students	Selection of environmentally friendly dishes in cafeteria	No labels added to dishes	Either (1) traffic-light labels (red, yellow, and green) were added to all dishes, (2) single green label was placed only on environmentally friendly dishes, or (3) single red label on least environmentally friendly dishes; additionally, posters were placed in the cafeteria to explain the labeling system and the climate impact of the different food categories	0	0	0	0	0	0
Slapo 2019	University students	Selection of healthy and sustainable target dishes from online preordering system of university canteen	Dishes presented on preordering system in free away without logos	A 'Healthy and Sustainable' logo was displayed next to names of target dishes	0	0	0	0	0	0
Soregaroli 2021	Restaurant patrons	Selection of wine with a low carbon footprint in a full service restaurant	Five wines labelled with a card that reports wine type and price (equal for each wine)	Five wines labelled with a card that reports wine type, price (equal for each wine), and CO2 emissions associated with each wine	0	0	0	0	0	0
Stein 2019	Food pantry patrons	Choice of target healthy items (e.g., kale, brown rice, whole-wheat pasta) from food pantry	No intervention	Recipes prepared and labeled using the healthy target items and offered to patrons for a tasting in the waiting room by a research assistant	0	0	0	1	2	0
Stein 2019	Food pantry patrons	Selection of target healthy items (e.g., kale, brown rice, whole-wheat pasta) from food pantry	No intervention	Recipes prepared and labeled using the healthy target items and offered to patrons for a tasting in the waiting room by a research assistant; additionally, bundles of recipe ingredients were placed on a table in the food pantry and offered the ingredients and recipe to	0	1	0	1	2	1

				make the meal that was being tasted						
Suleman 2022	Grocery store shoppers	Purchases of fruits and vegetables in grocery store	Baseline status quo	Grocery cart dividers installed in shopping carts to indicate how much of the cart should be filled with fruits and vegetables	0	0	0	0	2	0
Suleman 2022	Grocery store shoppers	Purchases of fruits and vegetables in grocery store	Baseline status quo	In addition to grocery cart dividers, plaques were installed inside all grocery carts with a message about how many fruits and vegetables were typically purchased in the store: 'In this store the average shopper buys at least 4 fruits or vegetables'	0	0	1	0	2	0
Tal 2015	Grocery store shoppers	Purchases of fruits and vegetables in grocery store	No sample provided	Samples of either cookies or apples offered to shoppers as they entered the store	0	0	0	1	2	0
Tal 2015	University students	Selection of healthier option in online experiment	No sample provided	Participants provided with either apple or cookie sample	0	0	0	1	2	0
Tal 2015	University students	Selection of low-calorie foods in virtual grocery market	No sample provided	Sample of chocolate milk provided accompanied by one of two messages: 1) "healthy, wholesome chocolate milk" or 2) 'rich, indulgent chocolate milk'	0	0	0	1	0	0
Thomas 2021	Nationally representative panel	Purchase of healthier packaged foods in grocery stores	Baseline period with no health star rating displayed	Health star rating displayed together with product nutrition fact label	0	0	0	0	0	0
Thomas 2021	University students/adults	Choice of healthier packaged foods in lab setting	No health star rating displayed together with product nutrition fact label	Health star rating displayed together with product nutrition fact label	0	0	0	0	0	0

Thorndike 2014	Patrons of hospital cafeteria	Increased purchases of 'green' and decreased 'red' products in hospital cafeteria	No labeling condition or choice architecture changes	Traffic-light labels applied to all items and the new labeling system was promoted to hospital employees and visitors, and permanent signage and menu board changes accompanied the labels	0	0	0	0	0	0
Thorndike 2014	Patrons of hospital cafeteria	Purchases of 'red' and 'green' products in hospital cafeteria	No labelling condition or choice architecture changes	Traffic-light labels applied to all items and the new labeling system was promoted to hospital employees and visitors, and permanent signage and menu board changes accompanied the labels; additionally, items were rearranged to make green items more apparent (e.g., placing baskets of bottled water throughout the cafeteria; and providing prepackaged salads next to the pizza counter)	0	1	0	0	0	1
Thorndike 2017	Grocery store shoppers using WIC benefits	Purchase of fruits and vegetables in WIC-eligible grocery store	Baseline status quo	Replacing usual displays in the front of the store (e.g., bakery display, chip display) with attractive display of fresh fruits and vegetables	0	0	0	0	2	1
Tonkin 2019	University students	Healthy food choices in experimental setting	Menu with a fork image on the front and a fork image on the inside where food options were listed	Two menu variations tested: 1) Fruit and vegetable basket depicted on cover of menu, fork image on the inside with food options, and 2) Fork image on the cover of the menu, fruit and vegetable basket depicted on the inside with food options	0	0	0	0	2	0
Valencic 2024	Adults	Choice of high-fiber foods in experimental online grocery store	Higher-fibre foods positioned at the bottom of the webpage within each food category, and	Higher-fibre foods positioned at the top of the webpage within each food category, and Fruits and Vegetables category listed first on the	0	0	0	0	2	1

			Fruits and Vegetables category listed last on the webpage of the online grocery store	webpage of the online grocery store						
van Rookhuijzen 2021	Sports canteen patrons	Choice of healthy products in sports canteen	Status quo baseline canteen	Healthier products placed at eye-level or more in sight or reach	1	0	0	0	2	1
Vandenbroele 2018	Grocery store shoppers	Portion size of sausage purchased in grocery store	150g sausage portion offered by default	Additional portion options - 125g and 100g packages of sausages - offered side by side	0	0	0	0	2	0
Vandenbroele 2021	Grocery store shoppers	Purchase of meat substitutes in grocery store	Meat product offered in the butchery, and meat substitute was available on a separate, vegetarian shelf in the vegetables and fruits department	Meat substitute remained on the vegetarian shelf but also appeared in the butchery, pairwise with the meat product and also in proximity to other sandwich offerings that contain meat	0	0	0	0	2	0
vanderMolen 2021	Grocery store shoppers	Healthy food purchases in virtual supermarket	Status quo supermarket	Orange colored arrows pointed from unhealthy low-fiber products to healthier high-fiber variants; orange colored frames around sections of the frozen vegetables; division, and smaller, individual orange colored frames around healthy low-fat dairy products	0	0	0	0	2	0
VanGestel 2018	Kiosk customers	Healthy food choice in a kiosk	Status quo food positioning, with unhealthy food products positioned at the checkout counter	Healthy foods repositioned at the checkout counter display, while unhealthy alternatives remained available in the store	1	0	0	0	2	1

vanKleef 2014	Children	Bread choice (wheat vs. white) during school breakfast session	Two baskets of bread rolls placed in the front of the classroom: one with regular-shaped white bread, and regular-shaped whole wheat bread	Two baskets of bread rolls placed in the front of the classroom according to one of the following conditions: 1) fun-shaped white bread, regular wheat bread; 2) fun-shaped wheat bread, regular white bread; 3) fun-shaped white and wheat bread	0	0	0	1	2	0
vanKleef 2015	Restaurant patrons	Choice of side dish in self-service restaurant	No verbal prompts	Addition of verbal prompt by employees, i.e., "Would you like to add orange juice for 50 cents?"; this was also done on separate weeks for other side dishes, including fruit salad and pancakes	0	1	0	0	2	0
vanKleef 2018	University students	Choice of whole wheat bread for a sandwich served in a university canteen	Free sandwich with white bun offered by default, with listed option to opt for a whole wheat bun instead	Free sandwich with whole wheat bun offered by default, with sign that listed option to opt for a white bun instead. The white bun alternative was clearly visible. The default free sandwich was framed as the "sandwich of the day"	0	1	1	1	2	1
vanRookhuijzen 2021	Sports canteen patrons	Choice of healthy products in sports canteen	Status quo baseline canteen	A picture of the grilled sandwich that was placed on the counter with the message that it was available while supplies last	0	1	0	0	2	1
vanRookhuijzen 2021	Sports canteen patrons	Choice of healthy products in sports canteen	Status quo baseline canteen	A picture of the grilled sandwich was placed on the counter	0	0	0	0	2	1
vanRookhuijzen 2021	Sports canteen patrons	Choice of healthy products in sports canteen	Status quo baseline canteen	Patrons who request a sports drink are automatically provided the zero-sugar version, with the regular version available upon request	0	1	1	0	2	0

VanRookhuijzen 2021	Adults	Hypothetical healthy food choice in questionnaire	Participants were prompted to choose one option they would like to consume from choice sets consisting of four options (2 healthy, 2 unhealthy)	Participants were prompted to choose one option they would like to consume from choice sets consisting of four options (2 healthy, 2 unhealthy) with one of the healthier products pre-selected	0	1	1	0	2	0
vanRookhuijzen 2023	Adults working from home with the intention to increase fruit consumption	Increased fruit consumption at home	Participants were not asked to self-nudge	Participants received an explanation on what nudges are and asked to choose one of six nudges to implement themselves (there were two accessibility, two salience, and two reminder nudges to choose from)	0	0	0	0	0	0
Vellinga 2022	Adults	Decreased meat purchases in virtual supermarket	No intervention prior to entering virtual supermarket	Participants exposed to an information nudge to create awareness regarding the environmental impact of meat production prior to entering virtual supermarket	0	0	0	0	0	0
Venema 2020	Individuals recruited from university campus	Reduced sugar added to tea in lab setting	Standard size teaspoon for adding sugar in tea offered (5 ml)	A small spoon (2.5 ml) for adding sugar in tea offered	2	0	0	0	2	0
Venema 2023	Hospital staff and visitors	Vegetarian sandwich choice in hospital canteen	Status quo hospital canteen	Combination of nudges adopted simultaneously. First, the vegetarian sandwich display was placed at eye-level with 'chef's recommendation' signage and a brief description of the cafe's sustainability goals. 'Chef's recommendation' stickers were placed on vegetarian sandwich bags. Finally, the vegetarian sandwiches were placed at the beginning of the canteen line	0	0	1	1	0	1

Walmsley 2018	University students	Purchases of fruits and vegetables in campus grocery store	Fruits and vegetables located at the back of the store	Fruits and vegetables moved to the aisle closes to the entrance with an entrance-facing display	0	0	0	0	2	1
Wongprawmas 2023	University students	Selection of healthy and sustainable target dishes from online preordering system of university canteen	Dishes presented on preordering system in free away without logos	A 'Healthy and Sustainable' logo was displayed next to names of target dishes	0	0	0	0	0	0
Wongprawmas 2023	University students	Selection of healthy and sustainable target dishes from online preordering system of university canteen	Dishes presented on preordering system in free array without any logo	'Healthy and Sustainable' dishes placed at the beginning of each dish category	0	0	0	0	0	0
Wongprawmas 2023	University students	Selection of healthy and sustainable target dishes from online preordering system of university canteen	Dishes presented on preordering system in free array without any nudging	'Healthy and Sustainable' dishes placed at the beginning of each dish category in addition to the 'Healthy and Sustainable' logo	0	0	0	0	0	0
Yi 2022	University students	Choice of added kale/spinach in smoothies on university campus venues	Status quo baseline period	Next to the cash register, a green poster prompted customers to add kale or spinach to their smoothie, another poster read "Are you getting your servings of veggies in? Try adding kale or spinach. Only $1.00"	0	1	1	0	2	0
Yi 2022	University students	Choice of fruit on university campus venues	Status quo baseline period	Next to fruit stand, a bright, yellow poster read "Try a FRESH whole fruit today! Only $1.00 (Grapefruit $1.25)"	0	1	1	0	2	0
Yi 2022	University students	Choice of large (vegetable) portion in self-serve barbecue station on campus venue	Status quo baseline period	Next to barbecue station, poster reminded customers of the greater value for money in choosing a larger bowl and displayed the price for medium and large bowls	0	1	0	0	2	0

Yi 2022	University students	Healthy choice (i.e., sandwiches with spinach) in deli sandwich station	Status quo baseline period were iceberg lettuce was placed in larger containers and closer to customers, without signage	In a custom-made deli station, baby spinach was placed closer to customers while the iceberg lettuce was placed farther away and a sign read ,"Did you know you can add spinach for no extra charge? Try it today!"	0	1	1	0	2	0
Yi 2022	University students	Increased consumption of salad at self-service salad bar	Medium plates stacked in the front row facing customers in line for the salad bar, whereas large plates were stacked in the middle row and small bowls in the back row	Large plates stacked in the front row facing customers in line for the salad bar, whereas medium plates were stacked in the middle row and small bowls in the back row	2	0	0	0	2	0
Young 2020	Shoppers in supermarket	Healthier cereal choice in supermarkets	Status quo supermarkets and pre-intervention period	Healthier breakfast cereals placed at eye-level on shelves	1	0	0	0	2	1
Zhang 2022	Young adults	Choice of vegetable dishes in hypothetical virtual reality (VR) restaurant	VR vegetable and meat dishes dishes displayed in red containers	VR vegetable dishes displayed in blue containers, while meat dishes are displayed in red containers	0	0	0	0	2	0
Zhang 2022	Young adults	Choice of vegetable dishes in hypothetical VR restaurant	VR vegetable and meat dishes dishes displayed in red containers	VR vegetable dishes displayed in red containers, while meat dishes are displayed in blue containers	0	0	0	0	2	0
Zhang 2022	Young adults	Choice of vegetable dishes in hypothetical VR restaurant	VR vegetable and meat dishes dishes displayed in red containers	VR vegetable and meat dishes displayed in blue containers	0	0	0	0	2	0
Zhang 2024	Adults	Vegetable consumption in lab setting	Status quo ordinary plate and bowl	Tableware painted with patterns of grains, meats, and vegetables and a marker line indicating the proportion of the bowl that fits 50 g of	0	0	1	0	0	0

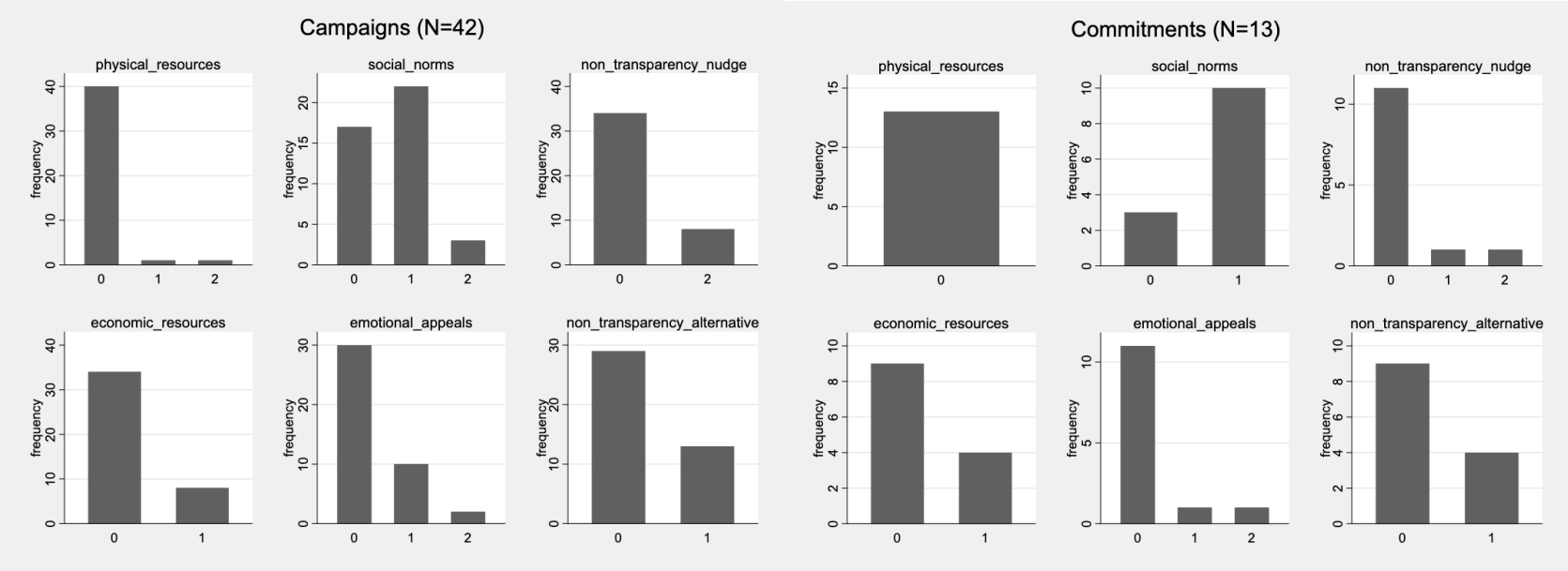
				rice, and recommended portions of vegetables and meats on the plate						
Zhou 2019	Adults ages 65 and older	Selection of novel plant-based dishes in various restaurant settings (senior centers, restaurant, private club)	Presentation of three dishes with equal opportunity: fish dish, meat dish, and veggie dish	Veggie dish labelled as the 'dish of the day'	0	0	0	1	2	0
Zhuo 2023	Adults	Sustainable choice within product categories in simulated online supermarket	In supermarket website, products in each product category were randomly ordered	In supermarket website, products in each product category were listed in the order of most sustainable to least sustainable, but no information about this ordering was given	0	0	0	0	2	0
Zhuo 2023	Adults	Sustainable choice within product categories in simulated online supermarket	In supermarket, products in each product category were listed in the order of most sustainable to least sustainable, but no information about this ordering was given	In supermarket, products in each product category were listed in the order of most sustainable to least sustainable, and a statement was shown in a box at the top of each product category page to reveal this ordering, i.e., "The products on this page have been ordered from the most environmentally sustainable to the least environmentally sustainable. This is to make it easier for you to choose a more sustainable product if you wish."	0	0	0	0	0	1

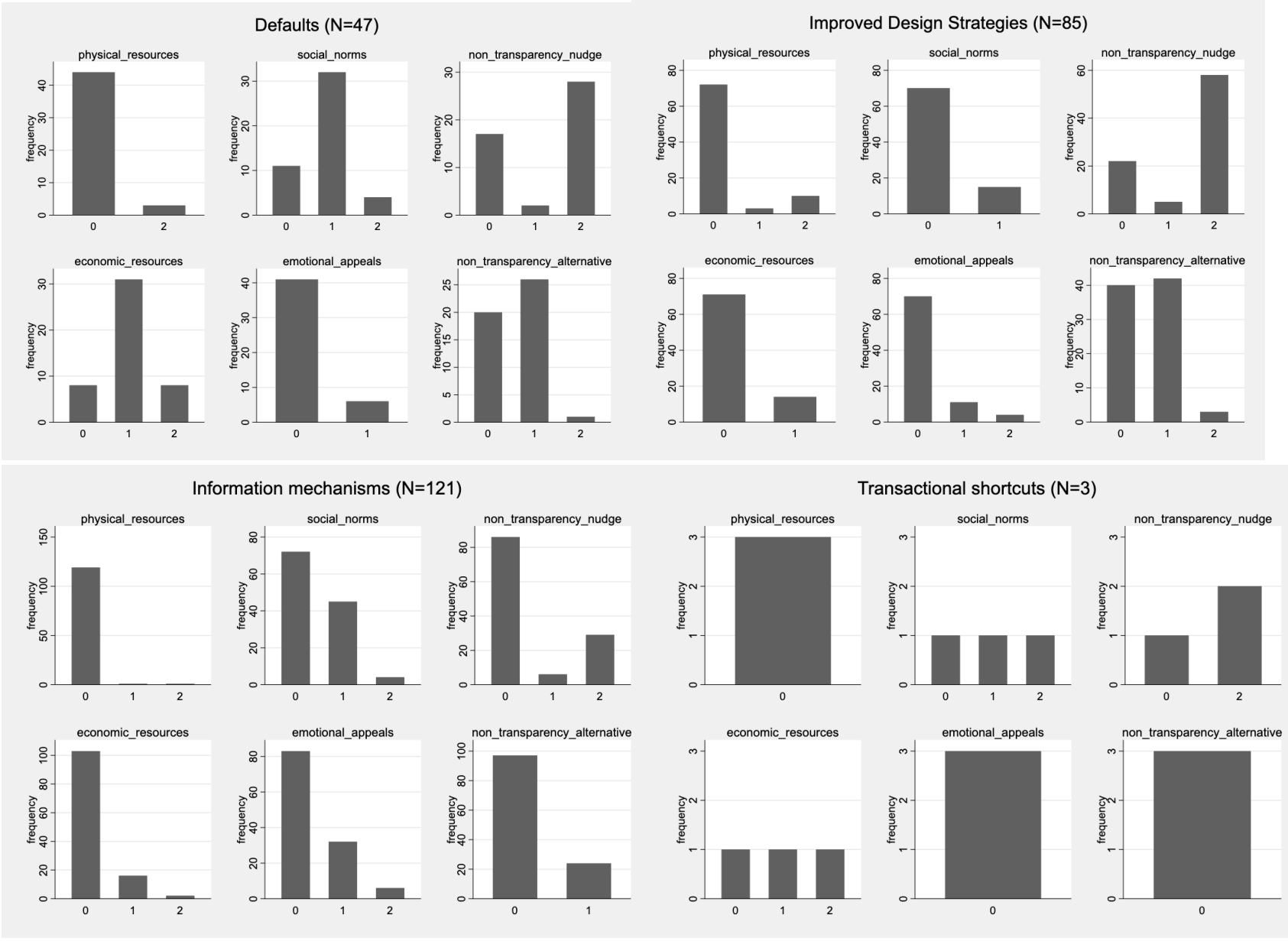
Supplementary File S2

Frequencies of Nudge intrusiveness by Nudge type and intrusiveness dimension

Nudge type: Campaigns, Commitments, Default, Improved design strategies, Information mechanisms, Other, Transaction shortcuts, Warnings and reminders

Intrusiveness dimensions: physical resources, economic resources, social norms, emotional appeals, non-transparency of nudge, non-transparency of alternatives




Defaults (N=47)
physical_resources
social_norms
non_transparency_nudge
economic_resources
emotional_appeals
non_transparency_alternative
Improved Design Strategies (N=85)
physical_resources
social_norms
non_transparency_nudge
economic_resources
emotional_appeals
non_transparency_alternative
Information mechanisms (N=121)
physical_resources
social_norms
non_transparency_nudge
economic_resources
emotional_appeals
non_transparency_alternative
Transactional shortcuts (N=3)
physical_resources
social_norms
non_transparency_nudge
economic_resources
emotional_appeals
non_transparency_alternative
frequency

X-axis: 0=Nudge is not applicable to this intrusiveness mechanism, 1= Nudge prays upon this intrusiveness mechanism but the degree is not considered intrusive, 2=Nudge might be intrusive, Note, a nudge could be categorized as more than one nudge type

CHAPTER 4. DISCUSSION AND OUTLOOK

4.1

Designing politically feasible policies to enhance healthy and sustainable diets – discussion.

Author: Simone Wahnschafft[a]

a. Research Training Group in Sustainable Food Systems, University of Göttingen, Heinrich-Düker-Weg 12, 37073 Göttingen, Germany

Discussion

As it stands, global dietary trends threaten the integrity of Earth's ecosystems and human health. Adoption of recommended measures to promote healthier and more sustainable diets has moved slower than the weight of evidence supporting them, as well as government commitments to them. Policy inertia has been identified as a major culprit behind this evidence-to-practice gap and encompasses three key pillars: 1) inadequate political leadership and governance, 2) strong opposition to policy adoption by powerful commercial interests, and 3) a lack of demand for policy action by the public [1]. This dissertation centers on these pillars of policy inertia, with the aim of identifying opportunities to heighten the political feasibility of promising policy measures to foster shifts towards healthy and sustainable diets. As outlined in the introduction, policy measures examined over the course of this dissertation are those that would seek to promote dietary behaviors in alignment with the Healthy Reference Diet (HRD) for humans and planet, which would require: (1) an increase in the consumption of vegetables, fruits, whole grains, legumes, and nuts; (2) relatively stable consumption of fish, poultry and dairy; and (3) a decrease in consumption of red meats, starchy vegetables (e.g., potatoes), eggs, added sugars and refined grains [2].

The first part, detailed in Chapter 2 and comprised of two papers, focused on the concept of policy packaging – the bundling of coherent policy measures – to improve the healthfulness of the food environments in which people make daily decisions surrounding food. This focus was situated in the reality that comprehensive, integrated policies are needed, as well as recommended by scientific experts [3], in order to realize meaningful shifts in population-level dietary patterns. It was also situated in the observed precedent of success from emerging 'real world' policy packages, such as those adopted by Chile and Argentina, to improve food environments by regulating the marketing and sales of ultra-processed foods (UPFs), with success referring both to the actual adoption of the policy packages despite powerful interests against them [4] and observed improvements in relevant public health outcomes since their adoption [5],[6],[7],[8],[9]. The first paper focused on the pillar of policy inertia related to a lack of public support for policy action, examining how food environment

policy packages might be designed and communicated to garner public support. The second focused predominantly on the issue of power, synthesizing lessons learned from advocates on how to successfully adopt a food environment policy package (e.g., the Promotion of Healthy Eating Law) in the face of powerful commercial interests that threaten to undermine it. The latter also offered important insights into key strategies to cultivate stronger political leadership and governance to advance on regulating UPFs. Together, these two papers offer important insights on the political feasibility of policy packaging to improve the healthfulness of food environments.

One key takeaway pertains to framing for political feasibility. Advocates in Argentina observed that the ability to harness public pressure in demand of the law was a key strategy to mitigate interference by corporate entities and associated stakeholders to attempt to delay or prevent its adoption. In this case, framing the law as not just an issue of public health, but one to elevate the autonomy of consumers by protecting their right to transparent information, was identified as critical to building support amongst the public, as well as amongst legislators. The importance of aligning the rationale for the adoption of food environment policy packages with the promotion of consumer autonomy also resonates with the results from the conjoint experiment conducted amongst German voters, as beliefs related to the legitimacy of government to intervene to improve dietary behaviors was identified as a key driver of public support for policy packages – more so than any socio-demographic characteristics, political orientation, or personal experience with diet-related disease. These results also resonate with additional literature examining public support for single nutrition policy measures, in which the perceived intrusiveness of a measure on autonomy has been identified as a critical driver of support, or lack thereof [10],[11],[12],[13]. Together, these results suggest that the proposed rationale for the adoption of food environment policy packages can and must align with the promotion of autonomy to have a chance at being politically feasible. The issue of autonomy has historically been a political bottleneck in the realm of nutrition policy, where perceptions of paternalism have undermined successful policy passage [14], often aided by industry narratives that demonize the ‘nanny’ state [15].

Both papers also offer insights into aspects of policy package design that should be considered to heighten political feasibility. First, the study conducted amongst German voters demonstrated that there are opportunities to mitigate the observed trade-off between public support and anticipated effectiveness and equity of measures through policy packaging. These results offer important nuance to the existing literature on nutrition policy acceptance, which had previously compared support for nutrition policy measures against one another rather than examining support for integrated policy packages [12],[16],[17]. On the one hand, voters behaved in some ways in accordance with trends identified in studies that compare support for single measures: measures that sought to inform or enable choice (e.g., nutrition education) or incentivize healthy choices (e.g., decrease VAT on healthy foods) demonstrated a clear positive effect on support for policy packages, while measures that sought to disincentivize unhealthy choices (e.g., increase VAT on unhealthy foods, sugary drinks tax) demonstrated a clear negative effect on support. However, examining support for policy packages rather than individual measures revealed that, when given the opportunity to design their own intervention, the majority of participants preferred a policy package that integrated measures aimed to inform, enable, or guide healthy choices by way of incentives with those that sought to discourage unhealthy choices through restriction or guidance by way of disincentives. The results resonate with those examining public support for policy packages in support of a transition towards renewable energy, which found that citizens do not express preferences for policy measures against each other, but rather prefer a combination of measures [18]. The results also resonate with those from other behavioral domains that highlight the potential to ‘compensate’ voters for perceived ‘costs’ of unpopular policies by bundling them together with popular ones to increase political feasibility of ambitious policy action [19],[20].

The insights gleaned from the Argentinian experience also offer important insights into the design of policy packages, particularly the importance of the inclusion of mandatory front-of-package (FOP) labels as a ‘gateway’ measure that define the scope of products that should be targeted by additional regulations, such as taxes or restrictions on marketing, sales, donation, and procurement. The inclusion of FOP warning labels as an integral

component of food policy packages also carries implications for framing aligned with autonomy enhancement, as this measure was foundational to the arguments made by advocates that the law protected the right of consumers to transparent information. These insights gleaned from Argentina's experience offers intriguing food for thought in contexts that have not yet pursued FOP labelling schemes, as well as others, such as many countries in the E.U., where FOP labelling has emerged as an isolated measure rather than the foundation of an integrated set of policy measures, as there is a chance to design policy packages that build on this foundation to improve food environments more robustly.

Both papers also point to the promise of measures directed towards children and adolescents to build political feasibility of food environment policy packages, both from the perspective of public support and political momentum. Amongst German voters, the same measure - the adoption of mandatory nutrition standards - was more acceptable to voters as a part of a comprehensive policy package when directed towards children and adolescents rather than adults. These results align with literature on drivers of public support for single nutrition policy measures, which have noted a higher acceptance of measures directed towards children and adolescents [10],[13]. They also resonate with lessons gleaned from advocate experience in Argentina, in which framing the law as an important tool to protect children and adolescents from deceptive industry practices through restrictions on child-directed marketing and sales of UPFs was identified as a key driver of successful policy adoption. This is salient in the context of Germany, as well as several other countries in the E.U., where the adoption of nutrition standards in kindergartens and schools has been identified through the Food-EPI assessment as one of the highest priorities for adoption [21],[22]. Early childhood education is often identified as an important arena in which to achieve long-term shifts in attitudes and behaviors surrounding food choices, with multicomponent interventions delivered in schools identified as particularly promising [23]. Indeed, in Chile, adopting a comprehensive policy package to improve school food environments, including banning sales of UPFs and investing in nutrition education, has led to a cultural shift in which young children have fostered heightened awareness amongst their families on the need to improve nutrition [24].

Finally, the examination of the policy process in Argentina yielded several insights into aspects of political feasibility that are crucial beyond the design and communication of policy packages themselves, including capacity building for food governance, mobilization of advocacy networks and coalitions, and the integration of professionals with diverse professional expertise (e.g., research, nutrition, law, political science, activism, communications) needed to support all phases of the policy process.

Part I – Key Results:

- Voters demonstrate an appetite for comprehensive policy packages to improve food environments
- Most voters prefer policy packages that combine both measures aimed to inform, enable, or incentivize healthy choices with those aimed to restrict or disincentivize unhealthy choices
- Most voters prefer policy packages with both fiscal and behavioral policy measures
- Most voters prefer policy packages with measures targeting both children/adolescents and adults
- Beliefs related to food environment policy packages are more important to generating support than socio-demographic characteristics, political orientation, or personal experience with diet-related disease
- Mandatory front-of-package warning labels and measures targeting exposure to unhealthy food environments amongst children and adolescents emerge as promising foundations for politically feasible food environment policy packages
- Emphasizing the right of consumers to transparent information (I.e., aligning with upholding consumer autonomy) is key to building public support for food environment policy packages
- Building structural power amongst advocates through informal networks and formal coalitions, supported by sufficient resources, is important to the political feasibility of food environment policy packages, particularly against corporate political activity used to undermine their passage
- Consolidating localized evidence, conducting targeted advocacy, and exposing conflicts of interest to harness public pressure are key activities to be conducted by advocates to heighten the political feasibility of food environment policy packages.

The second part of the dissertation, expanded upon in Chapter 3, examined political feasibility of nudges aimed at promoting healthier and/or more sustainable food choices. It

first considered political feasibility with regard to public support, particularly examining how changes to the design of default nudges with a precedent of effectiveness in shifting dietary behavior might be leveraged to heighten public support for nudge adoption, as well as which individual characteristics and beliefs underpin support. Political feasibility was then examined from the perspective of autonomy preservation, with the aim of identifying concrete aspects of nudge design that have the potential to threaten autonomy, and thus should be considered by choice architects to uphold autonomy while seeking to shift food choices. Both papers that comprise this section are situated in the reality that (even seemingly small) shifts in the design and/or communication of nudges can carry salient ramifications for political feasibility and both papers aim to provide insights on which shifts are particularly promising.

The core contribution here centers on the issue of intrusiveness on individual autonomy. This dissertation distinguishes between *perceived* intrusiveness, a self-report measure often used to assess threats to autonomy experienced by those targeted by nudges, and intrusiveness as a *dimension of nudge design* that can be modulated. Bridging insights drawn from both papers, it is clear that mitigating both forms of intrusiveness is crucial to the political feasibility of nudging strategies. First, as demonstrated in the study amongst German voters, *perceived* intrusiveness was the most salient driver of public support for food choice nudging strategies, or lack thereof. Namely, the lower the perceived intrusiveness of a nudge, the higher the degree of public support. This result resonates with those of previously conducted studies examining perceived intrusiveness as a driver of nutrition policy support [10],[11],[12],[13],[25]. Upholding autonomy is a central concern of the ethical legitimacy of nudging [26], and has received much attention in debates surrounding the ethicality of nudging [27],[28]. As such, understanding opportunities to modulate nudge designs to better uphold autonomy is key to political feasibility. In addition, the legitimacy of nudging from an ethical perspective affects the support for its adoption amongst key decision-makers and those targeted by nudges themselves.

The typology developed and applied in the second paper of Chapter 3 delineates three concrete aspects of nudge design that can be modulated to better uphold consumer

autonomy in pursuit of behavior change: a) the effort needed to opt out of the nudge, delineated along economic and physical dimensions; b) the affective influence employed by the nudge, distinguished by either acting upon social norms signaling or emotional appeals; and c) the degree of transparency of the nudge itself and/or the alternatives to the nudged option. Though preliminary in nature, cross-referencing of this typology with the design changes examined in the online experiment with German voters point to potential opportunities to realize synergistic improvements to different dimensions of political feasibility by realizing particular shifts in nudge design. For example, eliminating the physical effort needed to opt out of a vegetarian menu nudge, thereby decreasing the intrusiveness of the intervention, transformed it from a highly contested nudge into a widely accepted one. Similarly, increasing the transparency of a nudge to promote the selection of climate friendly groceries by explicitly asking shoppers whether they would prefer a climate-friendly grocery cart, thereby decreasing intrusiveness, significantly increased support. The latter resonates with observed higher public support for nudges that require a deliberate action on the part of people (i.e., 'system 2' nudges) over those that influence people automatically without them necessarily being aware of their effect (i.e., 'system 1' nudges) [29],[30], and points to the promise of achieving higher public support by designing more transparent nudges.

While we did not directly examine the effect of mitigating affective influence of nudges, the use of negative information in nudges to discourage unhealthy food choices has been shown to lead to greater negative emotions, perceived discouragement, reactance, and avoidance compared to the use of positive information to encourage healthy behaviors [31]. This observation, in conjunction with the observation that nudge interventions that aim to encourage healthy choices enjoy a higher degree of public support that those that aim to discourage unhealthy behaviors [32], indicates that efforts to mitigate negative emotional messaging, such as certain types of warning messages that function by triggering negative emotional states, would likely run in accordance with increased public support.

Ultimately, these trends indicate at least some degree of overlap between upholding autonomy as defined by the nudge itself and the perception of autonomy from the perspective of those to be nudged. Consequently, where appropriate, mitigating the effort

to opt out, affective influence, and/or non-transparency has the potential to improve both ethical legitimacy and public support – and thereby the political feasibility - for nudges to promote healthy and/or sustainable food choices.

An important potential trade-off to be considered in heightening political feasibility of nudge strategies is that of effectiveness. Indeed, previous literature have observed an inverse relationship between intrusiveness and acceptance of nudge strategies, and that support for food choice nudges tends to run counter to effectiveness, with higher support demonstrated for the least effective nudge strategies [25]. That said, there are some promising 'sweet spots' to be discussed here for designing politically feasible and effective nudges. For example, some studies have demonstrated that transparent nudges tend to be equally as effective as non-transparent nudges [26],[33],[34], suggesting that heightening the transparency of nudges may be a potential strategy to design nudges that uphold autonomy, are politically feasible, and are effective. In addition, several studies have shown that support for nudges, irrespective of which type, increases with their *perceived* effectiveness [35],[36],[37],[38], indicating that people do not necessarily oppose being effectively nudged, but are poor judges of which nudges are the most effective. In general, this observed relationship between perceived effectiveness and support indicates an opportunity for choice architects to heighten communication around nudge effectiveness to heighten political feasibility of nudge strategies. However, there are some exceptions in which this may backfire. As observed in this dissertation's study conducted amongst German consumers in the case of the donation nudge, perceived effectiveness can also run counter to support in contexts where people feel the nudge might take something away from them without their consent, which has been posited to be related to the phenomenon of loss aversion [35]. There may be other realms in which efforts to mitigate the intrusiveness of nudges to better protect autonomy, such as by reducing the effort needed to opt out or affective influence, may come at the expense of nudge effectiveness. This remains an area of future research as to identifying 'sweet spots' between the intrusiveness and effectiveness of nudge interventions.

Part II – Key Results:

- Perceived intrusiveness is the most prominent negative driver of public support for nudging strategies to promote healthy and/or sustainable food choices, while perceived effectiveness is the most prominent positive driver of support.
- Decreasing the effort needed to opt of a nudge and increasing the transparency of the nudge are promising design changes to increase public support
- Emphasizing the protection of consumer autonomy and the effectiveness of nudges emerge as key communication strategies to improve public support
- Mitigating the effort needed to opt out of a nudge along physical and/or economic lines is a key opportunity to design nudges to promote healthy and/or sustainable food choices that uphold consumer autonomy
- Reducing affective influence, which encompasses the use of both emotional appeals and social norms messaging, is a key opportunity to design nudges to promote healthy and/or sustainable food choices that uphold consumer autonomy
- Improving the transparency of nudge strategies, including of the nudge itself and of non-nudged alternatives, is a key opportunity to design nudges to promote healthy and/or sustainable food choices that uphold consumer autonomy

Outlook

In summary, global dietary trends pose a serious threat to the integrity of Earth's ecosystems and human health, necessitating urgent policy interventions. However, the adoption of recommended dietary measures has been hindered by significant policy inertia, which encompasses inadequate political leadership, strong opposition from powerful commercial interests, and a lack of public demand for policy action. This dissertation explores these challenges and identifies opportunities to enhance the political feasibility of policies aimed at promoting healthier and more sustainable diets.

Policy packaging emerges

References

1. Swinburn B.A., Kraak V.I., Allender S., Atkins V.J., Baker P.I., Bogard J.R., Brinsden H., Calvillo A., De Schutter O., Devarajan R., Ezzati M., Friel S., Goenka S., Hammond R.A., Hastings G., Hawkes C., Herrero M., Hovmand P.S., Howden M., Jaacks L.M., Kapetanaki A.B., Kasman M., Kuhnlein H.V., Kumanyika S.K., Larijani B., Lobstein T., Long M.W., Matsudo V.K.R., Mills S.D.H., Morgan G., Morshed A., Nece P.M., Pan A., Patterson D.W., Sacks G., Shekar M., Simmons G.L., Smit W., Tootee A., Vandevijvere S., Waterlander W.E., Wolfenden L., and W.H. Dientz (2019) 'The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission report,' *The Lancet* 393:791-846. Available at http://dx.doi.org/10.1016/S0140-6736(18)32822-8
2. Willett W., Rockstrom J., Loken B., Springmann M., Lang T., Vermeulen S., Garnett T., Tilman D., DeClerck F., Wood A., Jonell M., Clark M., Gordon L.J., Fanzo J., Hawkes C., Zurayk R., Rivera J.A., De Vries W., Sibanda L.M., Afshin A., Chaudhary A., Herrero M., Agustina A., Branca F., Lartey A., Fan S., Crona B., Fox E., Bignet V., Troell M., Lindahl T., Singh S., Cornell S.E., Reddy K.S., Narain S., Nishtar S., and C.J.L. Murray (2019) 'Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems,' *The Lancet* 393(10170):447-492. Available at https://doi.org/10.1016/S0140-6736(18)31788-4
3. European Commission, Directorate-General for Research and Innovation, Group of Chief Scientific Advisors (2023) 'Towards sustainable food consumption – Promoting healthy, affordable and sustainable food consumption choices,' Publications Office of the European Union. Available at: https://data.europa.eu/doi/10.2777/29369
4. Mialon M., Corvalan C., Cediel G., Scagliusi F.B., and M. Reyes (2020) 'Food industry political practices in Chile: "the economy has always been the main concern."' *Globalization and Health* 16(1). Available at: doi:10.1186/s12992-020-00638-4

5. Stoltze F.M., Reyes M., Lindsey Smith T., Correa T., Corvalan C., and F.R.D. Carpentier (2019) 'Prevalence of Child-Directed Marketing on Breakfast Cereal Packages before and after Chile's Food Marketing Law: A Pre- and Post-Quantitative Content Analysis,' International Journal of Environmental Research and Public Health 16(22):4501. Available at https://doi.org/10.3390/ijerph16224501
6. Carpentier F.R.D., Correa T., Reyes M., and L.S. Taillie (2019) 'Evaluating the impact of Chile's marketing regulation of unhealthy foods and beverages: pre-school and adolescents children's changes in exposure to food advertising on television,' Public Health Nutrition 23(4):747-755. Available at https://doi.org/10.1017/S1368980019003355
7. Taillie L.S., Bercholz M., Popkin B., Reyes M., Colchero M.A., and C. Corvalan (2021) 'Changes in food purchases after the Chilean policies on food labelling, marketing and sales in schools: a before and after study,' *The Lancet Planetary Health* 5(8):e526-533. Available at https://doi.org/10.1016/S2542-5196(21)00172-8
8. Fretes G., Corvalán C., Reyes M., Taillie L.S., Economos C.D., Wilson N.L.W., and S.B.Cash (2023) 'Changes in children's and adolescents' dietary intake after the implementation of Chile's law of food labelling, advertising, and sales in schools: a longitudinal study,' *International Journal of Behavioral Nutrition and Physical Activity* 20(1):40. Available at doi: 10.1186/s12966-023-01445-x.
9. Taillie L.S., Reyes M., Colchero M.A., Popkin B. and C. Corvalán (2020) '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* 17(2):e1003015. https://doi.org/10.1371/journal.pmed.1003015
10. Diepeveen S.,Ling T., Suhrcke M., Roland M., and T.M. Marteau (2013) 'Public acceptability of government intervention to change health-related behaviours: a systematic review and narrative synthesis,' *BMC Public Health* 13(756). Available at https://doi.org/10.1186/1471-2458-13-756

11. Reynolds J.P., Archer S., Pilling M., Kenny M., Hollands G.J., and T.M. Marteau (2019) Public acceptability of nudging and taxing to reduce consumption of alcohol, tobacco and food: A population-based survey experiment. Social Science Medicine 236:112395. Available at: DOI: 10.1016/j.socscimed.2019.112395
12. Hagmann D., Siegrist M., and C. Hartmann (2018) 'Taxes, labels, or nudges? Public acceptance of various interventions designed to reduce sugar intake,' Food Policy 79:156-165. Available at: https://doi.org/10.1016/j.foodpol.2018.06.008
13. Espinosa R., and A. Nassar (2021) 'The Acceptability of Food Policies,' Nutrients 13(5):1483. Available at: https://doi.org/10.3390/nu13051483
14. Fairchild A.L. (2013) 'Half Empty or Half Full? New York's Soda Rule in Historical Perspective,' The New England Journal of Medicine 368:1765-1767. Available at: doi:10.1056/NEJMp1303698
15. Mialon M., Swinburn B., and G. Sacks (2015) 'A proposed approach to systematically identify and monitor the corporate political activity of the food industry with respect to public health using publicly available information.' *Obesity Reviews*. 16(7):519–30. Available at doi:10.1111/obr.12289
16. Kwon J., Cameron A.J., and G. Sacks et al. (2019) 'A multi-country survey of public support for food policies to promote healthy diets: Findings from the International Food Policy Study,' BMC Public Health 19:1205. Available at: https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7483-9
17. Mazzocchi M., Cagnone S., Bech-Larsen T., Niedzwiedzka B., Saba A., Shankar B., Verbeke W., and W.B. Traill (2014) 'What is the public appetite for healthy eating policies? Evidence from a cross-European survey.' *Health Economics, Policy and Law*. 10(3):267-292.
18. Ingold K., Stadelmann-Steffen I., and L. Kammermann (2019) 'The acceptance of instruments in instrument mix situations: Citizens' perspective on Swiss energy transition,' Research Policy 48:103694. Available at: https://doi.org/10.1016/j.respol.2018.10.018

19. Wicki M., Huber R.A., and T. Bernauer (2019) 'Can policy-packaging increase public support for costly policies? Insights from a choice experiment on policies against vehicle emissions,' Journal of Public Policy 1-27. Available at: https://doi.org/10.1017/S0143814X19000205
20. Fesenfeld L.P., Wicki M., and T. Bernauer et al. (2020) 'Policy packaging can make food system transformation feasible,' Nature Food 1:173-182. Available at: https://www.nature.com/articles/s43016-020-0047-4
21. von Philipsborn P., Geffert K., Klinger C., Hebestreit A., Stratil J, Rehfuess E.A., and PEN Consortium (2022) 'Nutrition policies in Germany: a systematic assessment with the Food Environment Policy Index,' *Public Health Nutrition* 25(6):1691:1700. Available at doi: 10.1017/S1368980021004742
22. Pineda E., Poelman M.P., Aaspollu A., Bica M., Bouzas C., Carrano E., Miguel-Etayo P., Djojosoeparto S., Gabrijelcic Blenkus M., Graca P. Geffert K., Hebestreit A., Helldan A., Henjum S., Huseby C.S., Gregorio M.J., Kamphuis C., Laatikainen T., Lovhaug A.L., Leydon C., Luszczynska A., Maki P., Martinez J.A., Raulio S., Romaniuk P., Roos G., Salvador C., Sassi F., Silano M., Sotlar I., Specchia M.L., de Arriaga M.T., Terragni L., Torheim, L.E., Tur J.A., von Philipsborn P., Harrington J.M. and S. Vandevijvere (2022) 'Policy implementation and priorities to create healthy food environments using the Healthy Food Environment Policy Index (Food-EPI): A pooled level analysis across eleven European countries,' *The Lancet Regional Health Europe* 23:100522. Available at https://doi.org/10.1016/j.lanepe.2022.100522
23. Cauwenberghe E.V., Maes L., Spittaels H., van Lenthe F.J., Brug J., Oppert J-M, and I. De Bourdeaudhuij (2010) 'Effectiveness of school-based interventions in Europe to promote healthy nutrition in children and adolescents: systematic review of published and 'grey' literature' 103(6). Available at doi:10.1017/S0007114509993370
24. Correa T., Fierro C., and C. Corvalan et al. (2019) 'Responses to the Chilean law of food labeling and advertising: exploring knowledge, perceptions and behaviors of mothers of young children,' International Journal of Behavioral Nutrition and Physical Activity 16(21). Available at: https://doi.org/10.1186/s12966-019-0781-x

25. Evers C., Marchiori D.R., Junghans A.F., Cremers J. and D.T.D. De Ridder (2018) 'Citizen approval of nudging interventions promoting healthy eating: the role of intrusiveness and trustworthiness,' *BMC Public Health* 18(1182). Available at https://doi.org/10.1186/s12889-018-6097-y
26. Lemken D. (2021) 'Options to design more ethical and still successful default nudges: a review and recommendations,' B*ehavioural Public Policy* 8(2):349-381 Available at doi:10.1017/bpp.2021.33
27. Vugts A., Van den Hoven, M., De Vet, E., and M. Verweij (2020). 'How autonomy is understood in discussions on the ethics of nudging,' *Behavioural Public Policy*, *4*(1), 108–123. Available at https://doi.org/10.1017/bpp.2018.5
28. Kuyer P. and B. Gordijn (2023) 'Nudge in perspective: A systematic literature review on the ethical issues with nudging,' *Rationality and Society* 35(2). Available at https://doi.org/10.1177/10434631231155005
29. Felsen G., Castelo N., and P.B. Reiner (2023) 'Decisional enhancement and autonomy: public attitudes towards overt and covert nudges,' *Judgment and Decision Making* 8(3): 202-213. Available at doi:10.1017/S1930297500005933
30. Jung J.Y. and B.A. Mellers (2023) 'American attitudes toward nudges,' *Judgment and Decision Making* 11(1):62-74. Available at doi:10.1017/S1930297500007592
31. Grummon A.H., Musicus A.A., Moran A.J., Salvia M.G., and E.B. Rimm (2023) 'Consumer Reactions to Positive and Negative Front-of-Package Food Labels,' *American Journal of Preventive Medicine* 64(1):86-95. Available at https://doi.org/10.1016/j.amepre.2022.08.014
32. Vugts A., van den Heuvel E., and R.C. Havermans (2024) 'Factors affecting public acceptance of healthy lifestyle nudges,' *Social Science & Medicine* 350:116899. Available at https://doi.org/10.1016/j.socscimed.2024.116899
33. Michels L., Schmitt K., Ochmann J., Laumer S., and V. Tiefenbeck (2021) 'Is It All About Transparency? The Effectiveness and Ethics of a Digital Salience Nudge,' Conference: Twenty-Ninth European Conference on Information Systems (ECIS 2021). Available at https://aisel.aisnet.org/ecis2021_rp/25/

34. Bruns H., Kantorowicz-Reznichenko E., Klement K., Jonsson M.L., and B. Rahali (2018) 'Can nudges be transparent and yet effective?' Journal of Economic Psychology 65:41-59. Available at https://doi.org/10.1016/j.joep.2018.02.002
35. Djupegot I.L. and H. Hansen (2019) 'If It Works, I Like It: Consumer Acceptance of Food-Related Nudging,' *Journal of International Food & Agribusiness Marketing* 32(4). Available at https://doi.org/10.1080/08974438.2019.1668325
36. Bang H.M., Shu S.B., and E.U. Weber (2018) 'The role of perceived effectiveness on the acceptability of choice architecture,' *Behavioural Public Policy* 4(1): 50-70. Available at doi:10.1017/bpp.2018.1
37. Cadario R and P. Chandon (2019) 'Effectiveness or consumer acceptance? Tradeoffs in selecting healthy eating nudges,' *Food Policy* 85:1-6.
38. Petrescu D.G., Hollands G.J., Couturier D-L, Ng Y-L, and T.M. Marteau (2016) 'Public Acceptability in the UK and USA of Nudging to Reduce Obesity: The Example of Reducing Sugar-Sweetened Beverages Consumption,' *PLoS ONE* 11(6):e0155995.

APPENDICES

6.1

Designing politically feasible policies to enhance healthy and sustainable diets – appendices.

Author: Simone Wahnschafft[a]

a. Research Training Group in Sustainable Food Systems, University of Göttingen, Heinrich-Düker-Weg 12, 37073 Göttingen, Germany

List of Publications and Contributions

Peer-Reviewed Literature

Lemken, D., Erhard, A., & **Wahnschafft, S.** A choice architect's guide to the (autonomous) galaxy: a systematic scoping review of nudges intrusiveness in food choices. *Humanities & Social Sciences Communications* 11, 1030 (2024). https://doi.org/10.1057/s41599-024-03555-8

Lemken, D., **Wahnschafft, S**. & Eggers, C. Public acceptance of default nudges to promote healthy and sustainable food choices. BMC Public Health 23, 2311 (2023). https://doi.org/10.1186/s12889-023-17127-z

Wahnschafft, S., Spiller, A., & Graciano B.A. How can advocates leverage power to advance comprehensive regulation on ultra-processed foods? Learning from advocate experience in Argentina. *Globalization and Health* 20, 68 (2024). https://doi.org/10.1186/s12992-024-01069-1

Wahnschafft, S.*,* Spiller, A., Boztug, Y., von Philipsborn, P., & Lemken, D. Examining public support for comprehensive policy packages to tackle unhealthy food environments. *Public Health Nutrition – Forthcoming (Accepted for publication 02.12.2024)*

Conference Contributions

Lemken, D., Wahnschafft, S. & Eggers, C. (2023) Public acceptance of default nudges to promote healthy and sustainable food choices.

- Poster presentation, "17th World Congress in Public Health", Rome, Italy. May 2023.
- Poster presentation, "XVII European Association of Agricultural Economists (EAAE) Congress," Rennes, France. August 2023.

Lemken, D., Erhard A., & Wahnschafft, S. (2024) A choice architect's guide to the (autonomous) galaxy: A taxonomy of nudge intrusiveness.

- Oral presentation, "5th Global Food Security Conference," Leuven, Belgium. April 2024

Wahnschafft, S., Spiller, A., Boztug, Y., von Philipsborn P., & Lemken, D. (2023) Examining public support for comprehensive policy packages to tackle unhealthy food environments.

- Poster presentation, "16th European Public Health Conference," Dublin, Ireland. November 2023.

- Oral presentation, “32nd International Conference of Agricultural Economists (ICAE),” New Delhi, India. August 2024

Wahnschafft, S., Spiller, A., & Graciano A. (2023) How can advocates leverage power to advance comprehensive regulation on ultra-processed foods? Learning from advocate experience in Argentina

- Oral presentation, “RTG Sustainable Food Systems Symposium,” Göttingen, Germany. September 2024

Author's contributions

Chapter 2.1 'Examining public support for comprehensive policy packages to tackle unhealthy food environments: insights from a conjoint experiment'

Study concept and design: Simone Wahnschafft, Dominic Lemken, Yasemin Boztug

Literature review: Simone Wahnschafft

Data collection: Simone Wahnschafft, Dominic Lemken

Data analysis Simone Wahnschafft, Dominic Lemken

Draft of the manuscript: Simone Wahnschafft

Revision of the manuscript: Simone Wahnschafft, Dominic Lemken, Achim Spiller, Peter von Philipsborn

Corresponding author: Simone Wahnschafft

Chapter 2.2 'How can advocates leverage power to advance comprehensive regulation on ultra-processed foods? Learning from advocate experience in Argentina'

Study concept and design: Simone Wahnschafft

Literature review: Simone Wahnschafft

Data collection: Simone Wahnschafft

Data analysis Simone Wahnschafft, Andrea Graciano

Draft of the manuscript: Simone Wahnschafft

Revision of the manuscript: Simone Wahnschafft, Andrea Graciano, Achim Spiller

Corresponding author: Simone Wahnschafft

Chapter 3.1 'Public acceptance of default nudges to promote healthy and sustainable food choices'

Study concept and design: Carolin Eggers, Dominic Lemken

Literature review: Carolin Eggers, Simone Wahnschafft

Data collection: Carolin Eggers, Dominic Lemken

Data analysis Dominic Lemken

Draft of the manuscript: Simone Wahnschafft, Dominic Lemken

Revision of the manuscript: Simone Wahnschafft, Dominic Lemken

Corresponding author: Simone Wahnschafft

Chapter 3.2 ‘A choice architect’s guide to the (autonomous) galaxy: a scoping review of nudge intrusiveness in food choices’

Study concept and design: Dominic Lemken, Simone Wahnschafft, Ainslee Erhard

Literature review: Dominic Lemken, Simone Wahnschafft, Ainslee Erhard

Data collection: Dominic Lemken, Simone Wahnschafft, Ainslee Erhard

Data analysis Dominic Lemken, Simone Wahnschafft, Ainslee Erhard

Draft of the manuscript: Dominic Lemken, Simone Wahnschafft, Ainslee Erhard

Revision of the manuscript: Dominic Lemken, Simone Wahnschafft, Ainslee Erhard

Corresponding author: Dominic Lemken

List of Abbreviations

AfD: Alternative for Germany

BMI: Body-mass index

CDoH: Commercial determinants of health

CDU: Christian Democratic Union of Germany

CI: Confidence interval

CONAL: National Food Commission

COPAL: The Coordinator of Food Product Industries

CPA: Corporate political activity

CSU: Christian Social Union in Bavaria

CVD(s): Cardiovascular disease(s)

DFG: German Research Foundation

DGE: German Nutrition Society

EU: European Union

FAGRAN: Argentine Federation of Graduates in Nutrition

FAO: Food and Agricultural Organization of the United Nations

FDP: Free Democratic Party of Germany

FIC: Inter-American Heart Foundation

Food-EPI: Healthy Food Environment Policy Index

FOP: Front-of-package

FUNDEPS: Foundation for the Development of Sustainable Policies

GDA: Guideline Daily Amount

GDR: German Democratic Republic

GHAI: Global Health Advocacy Incubator

GHG(s): Greenhouse gas emission(s)

HIC(s): High-income countr(ies)

HRD: Healthy reference diet

IDEC: Brazilian Institute for Consumer Protection

IECS: Institute of Clinical and Health Effectiveness

LAC: Latin America and the Caribbean

LMIC(s): Low- and middle-income countr(ies)

MERCOSUR: Southern Common Market

MIC(s): Middle-income countr(ies)

MOH: Ministry of Health

NCD(s): Non-communicable disease(s)

NGO: Non-governmental Organization

OR: Odds ratio

PAHO: Pan-American Health Organization

RTG: Research training group

SD: Standard deviation

SSB(s): Sugar-sweetened beverage(s)

SME(s): Small- and medium sized enterprise(s)

SPD: Social Democratic Party of Germany

TBT: Technical Barriers to Trade Agreement

UN: United Nations

UNICEF: United Nations Children's Fund

UPF(s): Ultra-processed food(s)

US: United States

USD: United States dollars

VAT: Value-added tax

WHO: World Health Organization

WTO: World Trade Organization

Acknowledgements

“Attention is the rarest and purest form of generosity.” - Simone Weil

Scrawled on the inside cover of my journal, this quote has anchored me time and time again through the vicissitudes of this doctoral odyssey. Contrary to the conventional understanding of attention as an effortful, directed resource, Weil’s conception stands on a foundation of openness, receptivity – a ‘negative effort’ to remove preconceptions that limit our experience of the world in order to be truly open to that which may present itself to us.

As an illustrative anecdote from her time as a teacher, rather than administer conventional tests to learn geometry, Simone gathered her class together under a tree, providing a space for the students to openly reflect upon geometrical problems - not in pursuit of answers, but in pursuit of reflection in and of itself. The opportunity to cultivate *this* attention – as frustrating an endeavor as it can be fulfilling – is, from my perspective, the true value of the unstructured, unruly space that pursuing a doctorate provides.

I use the word odyssey to describe my journey with a hint of jest, but only just. It has been a personal and professional undertaking of great magnitude – one of both tumultuous change and torturous stand-still, often simultaneously so. But having had to reckon with the open ocean, and to not only learn to surrender to it, but find wonder in its rhythms, wisdom, and power, has been a deep privilege that I only hope has imprinted itself on my soul beyond the confines of this endeavor.

With Ithaca in sight, my prevailing feeling is one of gratitude.

First, to my primary supervisor, Prof. Dr. Achim Spiller, for his gentle guidance and support. To Prof. Dr. Dominic Lemken, for fielding every question with an unwavering patience that simply cannot be taught but provides a crucial safe space in which to learn. To Prof. Yasemin von Boztug and Prof. Peter von Philipsborn for their time, enthusiasm, and thoughtful insights shared throughout this journey.

To those who helped me find my footing upon arrival as an eager yet slightly disoriented researcher in Argentina, including Lorena Allemandi, Patricia Aguirre, Carolina Delgado, and Andrea Graciano.

To all those I had the privilege to meet at the O’Neill Institute at Georgetown University who made me feel warm and welcome despite the wintry weather, with a special thanks to Oscar Cabrera and Valentina Castagnari.

To my peers at the RTG in Sustainable Food Systems, for the laughter, coffee breaks, collaborations, adventures, and cycles of commiseration and celebration. Above all, for the feeling of *convivencia,* which unfortunately has no direct translation in my native tongue.

To my dearest friends, without whom I would undoubtedly have ended my journey at the behest of the Sirens of my own psyche that challenged me along the way. To Leá Lamotte and Luisa Müting who, *somehow*, have always held space for me to be myself without fear of judgement and whose souls I am deeply inspired by. To Gabrielle Kaye for the music, and for her love and guidance through a time of great personal doubt. To Bruno Paz, for his patient spirit. To Manuela Tobias, for her unwavering love that I could feel oceans away. To all others who helped me weather many a storm along the way.

And finally, to my family. To my sister, Kiara, and to my parents, Rachel and Oliver, for their steadfast love and support through it all. Words fail, as they always do, to capture the depth of sentiment, so I will keep it short: thank you and I love you.

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

GFA Graduiertenschule Forst- und Agrarwissenschaften

Göttingen; 22.04.2024
(Place, Date)

Wahnschafft, Simone
(Last name, First name)

23819531
(Matriculation No.)

Confirmation according to § 12 section 1 c) + appendix 2

I confirm that I have composed the present scientific treatise (thesis) independently using no other sources and resources than those stated. I have accepted the assistance of third parties only in a scope that is scientifically justifiable and compliant with the legal statutes of the examinations. In particular, I have completed all parts of the dissertation myself; I have neither, nor will I, accept unauthorised outside assistance either free of charge or subject to a fee.
Furthermore, I have not applied for an equivalent doctoral examination elsewhere and submitted the present thesis as a whole or in parts at another university.
I am aware of the fact that untruthfulness with respect to the above declaration repeals the admission to complete the doctoral studies and/or subsequently entitles termination of the doctoral process or withdrawal of the title attained.

Candidate's signature: .....