ANNUAL REVIEWS

Annual Review of Nutrition

Behavioral and Economic Interventions: A Path to Improved Dietary Behaviors

Hanin Hosni,[1,2] Marco A. Palma,[3] and Michelle S. Segovia[1]

[1]Department of Applied Economics and Statistics, University of Delaware, Newark, Delaware, USA

[2]Current affiliation: Department of Agricultural Economics, University of Kentucky, Lexington, Kentucky, USA

[3]Department of Agricultural Economics, Texas A&M University, College Station, Texas, USA; email: mapalma@tamu.edu

Annu. Rev. Nutr. 2025. 45:361–84

First published as a Review in Advance on May 14, 2025

The *Annual Review of Nutrition* is online at nutr.annualreviews.org

https://doi.org/10.1146/annurev-nutr-111124-101104

Keywords

financial incentives, nudging, choice architecture, food choice, healthy eating, review

Abstract

This narrative review provides a summary and critical discussion of the effectiveness of behavioral and economic interventions in promoting healthier eating habits. While financial incentives alter food choices through changes in prices and monetary incentives, behavioral nudges leverage human biases to subtly push individual choice toward welfare-enhancing options without restricting freedom of choice or using monetary instruments. Review articles and empirical studies were selected on the basis of predefined criteria, focusing on the impact of interventions on food purchase, consumption, and adiposity indicators. Our findings highlight the strengths and limitations of both approaches and reveal potential synergies and gains from financial and behavioral interventions. This narrative review identifies research gaps and provides recommendations for future investigations to enhance the effectiveness and scalability of interventions aimed at improving dietary behaviors.

Contents

1. INTRODUCTION

Over 4 billion people—more than half of the global population—are expected to become overweight or obese by 2035, up from 2.6 billion in 2020 (159). Excess weight is strongly associated with diet-related noncommunicable diseases (NCDs), such as obesity, hypertension, heart disease, stroke, diabetes, kidney disease, and cancer (159). Many chronic conditions are preventable, and improving dietary habits offers a promising way to reduce their incidence (158). Healthy dietary habits are defined by the consumption of more nutrient-dense food—including fruits and vegetables (FVs); legumes; whole grains; seeds and nuts; and lean meat, poultry, fish, and seafood—while limiting the intake of sugar, ultraprocessed foods, saturated fats, sodium, and alcohol (128). Despite widespread healthy-eating education and campaigns, obesity rates remain alarmingly high, suggesting difficulties for inducing healthy dietary changes with informational interventions alone (81).

Financial incentives are one way to influence behavior and encourage healthier food choices. There is a long history of using paternalistic macroeconomic tools (or carrot-and-stick approaches) for reducing consumption of unhealthy food through taxation (sticks) or incentivizing healthy food consumption through subsidies (carrots) (5). Fiscal measures are used to modify relative prices to influence consumer food choice. For instance, consumers might choose whole-grain bread over low-fiber options or opt for unsweetened beverages instead of sugar-sweetened ones in response to price changes from direct policy interventions.

Nudging is an alternative approach that exploits inherent human behavior biases to influence choices without monetary incentives while preserving freedom of choice. In their seminal work, Thaler & Sunstein (141) define a nudge 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" (p. 6). Behavioral nudges have emerged as a potential path to implement affordable and scalable outcomes. This narrative review discusses both financial incentives and behavioral nudges as vehicles to change and maintain food-related behavior toward healthier nutritional outcomes. **Figure 1** presents a summary of the selected interventions. We devote a richer discussion to behavioral nudges because they are less understood and there is limited

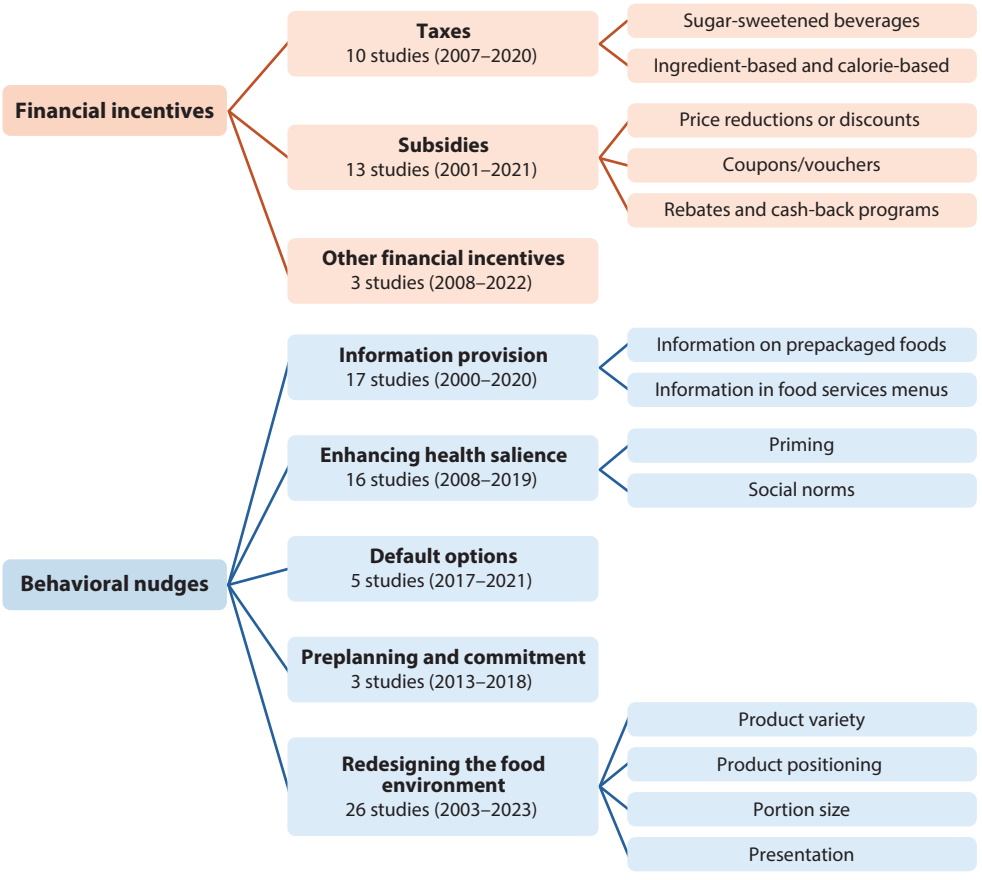

Figure 1

Economic interventions using financial incentives and nonmonetary behavioral nudges to improve dietary behaviors.

evidence regarding their long-term effects compared with financial incentives, which have a long-standing tradition and presence in the existing literature. By surveying the current body of evidence, this narrative review seeks to identify gaps in research and practice and ultimately offer guidance for future investigations and potential promising interventions with the potential for sustained effects for influencing healthier dietary habits.

We use a narrative review approach (105) to selectively synthesize existing research on the role of behavioral and economic interventions in improving dietary behaviors. To ensure a comprehensive and systematic selection of relevant studies, two graduate research assistants conducted the literature search under the first author's guidance. The three authors met regularly to review progress, resolve discrepancies, and maintain consistency. We predefined clear inclusion and exclusion criteria for selecting relevant studies; although most papers cover research conducted in the United States, we were not restricted to a specific geographical area and included studies from all over the world. We included systematic reviews and individual empirical studies that investigate the impact of financial incentives and/or nudges on adults' (un)healthy food intake and sales (primary outcomes) or adiposity indicators (i.e., weight, body mass index, etc.) (secondary outcomes) regardless of the duration of the intervention (if any). Studies that captured changes in

adiposity or any other health indicator resulting from nonnutritional change (e.g., exercising) were excluded.

2. FINANCIAL INCENTIVES

This section focuses on taxes and subsidies that can be used as punishment (sticks) and reward (carrots). We also discuss to a lesser extent other financial incentives designed to influence individual food choice such as cash rewards, lotteries, and deposit contracts. A table summarizing the selected research on financial incentives can be found in **Supplemental Table 1**.

Supplemental Material >

2.1. Taxes

Governments have frequently resorted to directly influencing dietary choices and combating obesity and NCDs by taxing specific food categories to reduce their consumption. These types of taxes, sometimes referred to as fat taxes, can target products at various stages of the supply chain, from production to retail, and focus on entire categories such as sugar-sweetened beverages (SSBs) or specific nutrients such as fat and sodium.

SSBs, such as sodas, fruit drinks, and energy drinks, are a significant source of added sugars in the American diet, contributing ~145 kcal per day, or 6.5% of daily calories (125). Research on SSB taxes is often divided into two categories. Some studies look at SSB taxes that are implemented at the country or municipality level. For example, Cawley et al. (21) suggest that SSBs taxes in cities such as Philadelphia, Oakland, and Seattle had little to no aggregate impact on SSBs purchases, with some evidence of increased purchases of the targeted beverages outside city limits, to avoid the tax (20). Other studies estimated that a 20% tax on SSBs could lead to yearly weight reductions ranging from 2 to 4 lb among adults (39). While these studies emphasize that ignoring substitution between beverage types can lead to an overestimation of weight loss by up to 30%, Finkelstein et al. (45) did not find evidence that a 20% SSB tax would cause consumers to substitute sugary foods and showed that complementary foods could contribute to decreasing energy purchases.

On the other hand, ingredient-based taxes target specific food ingredients that exceed predefined thresholds, aiming to reduce consumption by raising prices (28) and ultimately encouraging manufacturers to reformulate products. Substitution might arise here as well, as Jensen & Smed (66) reported that although a fat tax decreased the consumption of butter, margarine, and oils by 10–15%, some consumers shifted to cheaper oil alternatives. A key policy question that still remains is whether taxes should target specific ingredients or entire product categories. Previous studies argue that taxing specific nutrients, such as sugar or fat, is more effective than taxing sweetened product categories, as it lowers the consumption of unhealthy products with less financial impact on consumers (92) and limits the likelihood of substituting untaxed, unhealthy products (70). Others suggest that calorie-based taxes, which are less studied, might be the most effective as they directly target reductions in caloric intake or specific substances known to cause chronic disease (3), whereas taxes on specific ingredients impact only certain foods, potentially leading consumers to switch to other (untaxed) high-calorie alternatives.

Despite their effect on reducing the consumption of unhealthy products and their potential for substantial revenue generation for the government, taxes should be approached with caution. For instance, individuals might associate higher prices with higher quality or uniqueness and potentially increase the demand for taxed unhealthy foods (112); individuals may value their freedom of choice, resulting in a backlash of higher consumption (161); or taxes may produce stronger adverse effects on vulnerable subpopulations such as low-income households (38). Some studies claim that although taxes may place a heavy financial burden on low-income groups,

this regressivity may diminish in the long run if these groups benefit from decreased sugar consumption and the prevention of related health issues (41).

In the United States, fat taxes are often applied at the point of sale; therefore, consumers do not necessarily see the increased price at the time of purchase (84). Identical sales taxes can impact purchasing behavior differently depending on how separably visible and understandable they are at the point of purchase. In this regard, experimental findings reveal that consumers show a greater response to a 20% tax on unhealthy lunch foods when the tax is simply added to the displayed price, compared with when the tax is added separately later at checkout because it increases the salience of the tax and perhaps by implication highlights the unhealthy nature of the product (25). Also, the tax pass-through rate, which measures how much of the tax is reflected in the retail price increase, can vary on the basis of the relative elasticities of supply and demand; producers and distributors might absorb part or all of the tax to avoid a decrease in sales revenue. Additionally, to avoid an ingredient-based tax while keeping retail prices stable, manufacturers may alter the product's nutritional quality by switching to more expensive ingredients or changing production processes. As a result, low-income households may face costlier and less available products, while higher-income households might still have access to high-quality products without experiencing the same price increases.

2.2. Subsidies

Subsidies, known as thin subsidies, aim to promote healthier diets by reducing the prices of healthy foods, making them more affordable relative to other food offerings. Subsidies can be delivered through various mechanisms, including well-studied approaches such as price reductions and coupons/vouchers as well as less popular channels such as rebates and cash-back programs.

Price reductions through subsidies are effective. For example, an average 31% price reduction led to a 10–42% increase in sales of healthy snacks at worksite vending machines (50). Also, a 50% price reduction on salads sold in cafeterias led to an 83% increase in sales (75). Most studies in the topic employed a fixed subsidy level, limiting the examination of dose–response relationships and the subsidy size effect on the outcome. Exceptions include the study by French et al. (49), who found that 10%, 25%, and 50% price discounts on low-fat snacks increased sales by 9%, 39%, and 93%, respectively. Few pricing studies included follow-up periods to assess long-term dietary changes. Michels et al. (93) observed sustained effects with a twofold increase 5 weeks after a 20% price reduction, whereas Mhurchu et al. (91) noted sustained effects after 6 months and a halving of effects after 12 months as a response to a 12.5% price reduction. While most studies focused on the impact of price reductions on food choice and sales, a few used food frequency questionnaires or dietary recalls to measure consumption (7). Evidence on the differential effects of price discounts across populations with varying characteristics is sparse. Blakely et al. (12) is one of the few studies examining the heterogeneous effects of price discounts on food purchases across ethnic and socioeconomic groups, finding no significant differences by household income or education, but variations by ethnicity.

Coupons/vouchers are subsidy mechanisms often targeted to specific subpopulations such as low-income households participating in federal nutrition assistance programs, for instance, the Supplemental Nutrition Assistance Program and the Women, Infants, and Children (WIC) program. For instance, many studies have found that vouchers for FVs increase WIC participants' consumption of these products (60, 61). Although scarce, studies using other sample populations show similar results (145). Evidence on whether restricting voucher benefits to purchases of only FVs improves overall dietary intake or whether it is more efficient to distribute benefits more frequently (weekly versus monthly) remains limited. However, Basu et al. (8) found that limiting vouchers to FVs and increasing distribution frequency from monthly to weekly did not improve

consumption of FVs or reduce calorie-dense food purchases. The declining value of vouchers relative to rising food costs, challenges in accessing registered retailers, ease of use, and barriers to program enrollment can also impact the vouchers' effectiveness (89).

The literature comparing the effectiveness of different subsidy mechanisms is scarce. Few studies show that vouchers have the dual impact of lowering prices and providing an informational boost, which potentially makes them more effective than simple price discounts. If coupon usage is low, their overall effect would be less than that of a pure price discount (40). Although less studied, rebates and cash-back programs[1] have been found to increase the sales of targeted FVs (100) and vegetable-rich meals at restaurants (99). However, their use may not be as straightforward as price reductions due to the imposed cognitive burden of calculating rebate values, especially among less-educated consumers (101). Imperfect understanding of which items qualify for the rebate could result in errors that can decrease rebate impacts.

While the resulting increase in real income from these subsidies could lead to higher overall food expenditures, including for unhealthy foods, since the subsidy is often very small as a proportion of total income or even food expenditures, its effect is likely minimal (4). In fact, findings on the optimal magnitude of subsidies are inconclusive. Andreyeva et al. (5) argue that subsidies for healthy foods would need to be relatively large to create substantial changes in consumer purchases and ultimately improve the diet and health of a population. Conversely, Cash et al. (19) indicate that a 1% reduction in the price of FVs could potentially prevent nearly 10,000 cases of coronary heart disease and ischemic strokes in the United States. The authors suggest that even a modest subsidy on these foods could be an effective strategy for delivering significant health benefits, particularly among disadvantaged populations. Most subsidy studies focus on low-income populations, leading to calls for targeted subsidies for food-stamp recipients to help reduce health disparities. Such measures could enable low-income families to consume healthier foods at levels closer to those of wealthier households (58). Expanding subsidies to include higher-income individuals is unlikely, as the high cost of subsidies has made policymakers hesitant to implement them more broadly.

2.3. Comparing the Effects of Taxes Versus Subsidies

Taxes and subsidies are among the most extensively studied policy tools for addressing diet-related health issues, as they can influence consumption habits and generate revenue to help prevention measures and offset health-care costs associated with obesity. Cawley et al. (22) conducted a field experiment comparing the effects of framing 10% price changes as either a subsidy or a tax. While no significant overall differences were found, lower-income households in the subsidy-framed condition purchased more unhealthy food than those in the condition framed as a tax. Papoutsi et al. (104) found that when both a fat tax and a subsidy were applied simultaneously, parents' choices of food for their children shifted toward healthier options, although child pestering weakened the effect. Darmon et al. (35) reported that low-income women bought fewer subsidized and more taxed foods than medium-income women; hence, they benefited less from subsidies and paid more taxes, increasing the socioeconomic inequalities in nutrition outcomes. Similarly, Muller et al. (98) analyzed experimental data to explore the distributional effects of fat taxes and thin subsidies on women with very low (i.e., €700 or less) to medium (i.e., over €1,050) incomes. Their findings suggest that both policies are generally regressive and often benefit higher-income individuals. The combined subsidy/tax approach led to significant nutritional improvements

[1]While rebates require consumers to pay the full price up front and submit a claim for the refund, cash-back programs are typically applied automatically during or after the transaction.

among the higher-income participants, potentially exacerbating health disparities between income groups.

When taken as a whole, taxes and subsidies are shown to effectively promote healthier eating by boosting the consumption of nutritious foods and reducing the purchase of items high in fat, sodium, and sugar. Additionally, the revenue generated from these taxes can be used to support and improve prevention efforts for NCDs, potentially reducing their impact on society and lowering related health-care costs. Some research even claims that implementing subsidies alongside taxes can effectively offset the financial burden imposed by the taxes. For instance, Valizadeh & Ng (146) found that depending on how the tax is passed on to consumers and the subsidy rates, subsidies on FVs can completely counterbalance the tax burden on those who purchase large amounts of SSBs.

2.4. Other Less Popular Financial Incentives to Promote Healthy Food

It is important to note that there are other less popular financial incentives that may also influence food-related behavior. Cash rewards, for instance, have been mostly tested among children, with very limited focus on adults. List et al. (82) found that introducing a small cash reward for purchasing fresh produce more than doubled the number of cups of fresh produce purchased at a grocery store, and even after the incentives were removed, the treatment group continued to purchase more produce. Also, Franckle et al. (48) reported that in-store gift cards reduced the purchase of SSBs among customers at a community supermarket. Lotteries and deposit contracts are additional mechanisms that have mostly been used in weight-loss studies (153), with promising results that could be extended to food choices. In particular, lottery incentives involve offering participants the opportunity to receive lottery tickets that provide a chance to win a prize if they fulfill predefined conditions. While these incentives rely on price and income effects, their effectiveness is influenced by the expected value of the prizes, considering the chances of winning. On the other hand, in the deposit contracts, individuals commit their own money up front as a deposit, which they reclaim only if they meet specific conditions. This is an underexplored area that may produce positive results while reducing potential implementation costs by adding, for example, lottery rewards that incentivize positive behavior but reduce the implementation cost of the program.

3. BEHAVIORAL NUDGES

Nudges are designed to guide individuals toward more beneficial choices without restricting their freedom of choice (140). Sunstein (137) states that, to ethically influence behavior, a nudge should (*a*) enhance people's welfare, (*b*) maintain freedom of choice, (*c*) treat all individuals with respect to uphold dignity, and (*d*) ensure individuals' ability to make their own decisions; Roberts (118) adds a fifth principle that is of particular importance for nutrition interventions: (*e*) distributive justice to ensure that all individuals, and particularly those vulnerable or at high risk, also benefit from the nudge. In consumer research, most nudges have been nutritional information provision and modifications to the environment in which consumers make food decisions. Nudges can have several taxonomies and classification, such as those by Bauer & Reisch (9); in this article, we classify nudges into five main categories. A summary of the selected research on behavioral nudges can be found in **Supplemental Table 2**.

Supplemental Material >

3.1. Information Provision

Information provision strategies aim to influence consumer food choices by increasing awareness and understanding of nutritional content. These interventions typically involve nutrition

labeling on prepackaged foods and calorie and nutrient information displayed on food service menus, enabling more informed decisions at the point of purchase.

3.1.1. Nutritional information on prepackaged foods. The Nutrition Labeling and Education Act of 1990 mandates that food manufacturers display nutritional information on packaged food products. Information can be provided on the back of package (BOP) or front of package (FOP). BOP labels typically include nutrition tables per serving and ingredient lists (121). There is evidence that nutrition tables help decrease the intake of calories from fat, cholesterol, and sodium (73), while increasing the intake of fiber and iron (150). However, other studies have found a weak effect on snacking behavior but not on other dietary components (e.g., fat, fiber) (106). FOP labels are designed to supplement the BOP nutrition table by summarizing the product's nutritional content. These labels present information in different formats, with traffic light (TL) labels being the most widely studied FOP format. For instance, evidence suggests that TL labels can help participants distinguish product healthiness without affecting the perceived tastiness of healthier options (78). The red color in TL labels, indicating low nutritional quality, was found to have a stronger and longer effect on reducing willingness to pay (WTP) for breakfast cereals than green or yellow labels (88). Guideline daily amount (GDA) and rating systems are other widely used FOP formats that have proven effective at promoting healthier purchases (24, 42).

While Hawley et al. (59) suggest that TL labels are more effective than GDA and other types of labels, Crosetto et al. (32) found that this is true only for time-constrained subjects. However, when subjects do not face time constraints, GDA performs better than TL labels, suggesting that color-coded labels are easier to process under time pressure. In a later study, Crosetto et al. (33) found that although all FOP formats improved nutritional quality, NutriScore was the most effective, followed by Health Star Rating. To reveal further insights on how labels are processed by consumers, several studies have used functional magnetic resonance imaging to compare the brain activation areas when using colors (i.e., TL) or numbers (i.e., GDA) in food labels. Although Enax et al. (44) argued that different colors elicit activation in different brain regions associated with self-control (red) and pleasure/reward expectation (green), Prevost et al. (114) concluded that, despite the expedited responses observed with color coding, both colors and numbers were evaluated by brain regions associated with the processing of arithmetic and complex information. For increased effectiveness, it is recommended that the label be large and placed in the top-right corner of the package to increase its salience, which aligns with eye-tracking studies demonstrating that the upper screen positions generate higher attention, with slightly higher attention and choices among products in the upper right position (102). In addition, Crosetto et al. (33) suggests that only nutrients with the greatest impact on population health should be highlighted.

Sociodemographic and behavioral characteristics should be considered when evaluating label effectiveness, especially among vulnerable populations. Tailoring labels to specific groups can improve outcomes, as demonstrated by a study on a rural American reservation where tailored labels increased WTP for heathier foods (56). Health consciousness also influences responses to labels, with some studies suggesting that calorie labels have the greatest impact on those who are the least health-conscious (43). Additionally, many consumers struggle with quantitative information such as serving sizes and daily intake percentages, creating confusion when comparing products (17). This highlights the need for simpler and clearer labeling. Finally, it is important to mention that FOP labels have been criticized for being self-regulated by the food industry, often failing to meet standard nutritional criteria or including claims without universally accepted definitions, leading experts to suggest that the industry's involvement in designing labeling systems should be scrutinized (116).

3.1.2. Nutritional information in food service menus. The Patient Protection and Affordable Care Act (ACA) of 2010 stipulates that restaurants with 20 or more locations must provide calorie information to patrons (46). In 2023, food expenditures at away-from-home establishments accounted for 58.5% of total food spending (133), increasing the interest of researchers in the impact of the ACA law on consumer behavior. For example, Bollinger et al. (13) found that after New York City's menu label law was passed, average calories per transaction at Starbucks decreased by 6%. This effect was driven mainly by food orders, with no significant change observed for beverage calories. In a five-year follow-up after the ACA, Cantor et al. (16) found no statistically significant changes over time in levels of calories or other nutrients purchased or in the frequency of visits to fast-food restaurants in New York City.

The impact of menu labeling on food choice has been the focus of many studies. For example, Cawley et al. (23) provided a group of patrons with menus containing calorie counts and another group with unlabeled menus. Menus with calorie labeling resulted in a 3% reduction in the number of calories ordered, along with fewer appetizers and entrées being chosen. Pulos & Leng (115) examined how adding nutrient information to restaurant menus affected customer food choices and found that, on average, entrées sold after labeling contained fewer calories, less fat, and less sodium than those sold before labeling. An emerging literature in economics documents that consumers sometimes intentionally avoid information to enjoy an action guilt-free. In a food context, Sunstein (138) shows that some people may choose to avoid calorie information to indulge in more delicious food and consume more calories. This emerging view, departing from the conventional information economics concept that information is always valuable, provides a good example of the complexity of individual decision-making in the presence of nutritional information.

3.2. Enhancing Health Salience

Enhancing the salience of health-related goals at the decision stage is a promising strategy for promoting healthy eating. Subtle cues, such as verbal prompts, sensory stimuli, and social comparisons, can increase the cognitive accessibility of health goals, thereby nudging individuals toward more nutritious food choices.

3.2.1. Priming. Human nature is attracted to rewarding hedonic behaviors (76), such as indulging in high-sugar desserts and fried foods that stimulate an immediate sense of gratification. Prompting to recall healthy eating intentions at the time of decision-making using priming techniques influences choice (62). Priming can be done using a verbal cue, for example, to state that "chocolate can make people happy, but fat," which led participants to eat less chocolate (15). Adding a reminder such as "Are you also watching your weight?" on restaurant menus induced customers to choose low-calorie meals more often (103). Similarly, adding a dish-of-the-day label to vegetable-rich meals increased their selection and consumption (129). Verbal priming was also leveraged by several healthy eating campaigns, such as Choose Less, Weigh Less, which encouraged portion control (53), and Go for 2&5®, which promoted daily fruit and vegetable intake (113); both were found to improve nutrition knowledge, attitudes, and consumption behavior. A systematic review by Abril & Dempsey (1) found that campaigns combining stop (i.e., preventing unhealthy food intake) and go (i.e., promoting healthy food) messaging were more effective than those with a singular focus. Despite their effectiveness, healthy eating campaigns must avoid reinforcing stigma, as anti-obesity campaigns blaming individual behaviors for obesity have raised concerns about stigmatization of overweight and obese people (160).

Priming can also be achieved through subtle nonexplicit cues using odors, images, or sculptures portraying athletic bodies. For example, exposure to high-caloric food aromas has led to a reduction in consumption of unhealthy alternatives (31), while exposure to pear smell has increased

fruit dessert choices (52). Mors et al. (97) argue that odor exposure did not significantly influence food choices and that participants exposed to cucumber odor reported a lower positive mood than those in the bread odor condition. Using slim human-like sculptures as health cues reduced the consumption of chips (136) and increased the choice of healthy snacks at vending machines (135). The effectiveness of priming cues depends on people caring about healthy eating or having related goals, such as weight loss, that could be activated with the stimuli at the decision time (47).

3.2.2. Social norms. Social norms effectively provide implicit codes of appropriate conduct, which can influence individuals' food choices, particularly since eating is a highly social and cultural activity (63). For example, installing placards on grocery shopping carts informing shoppers of the average number of fresh produce items bought and the most common FVs sold at a supermarket resulted in a higher proportion of fresh produce purchases (107). On the other hand, Cheung et al. (26) found that advertising yogurt shakes as the best-selling choice among customers did not significantly affect the sales. Further, social psychology distinguishes descriptive norms from injunctive norms. Descriptive norms define the behavior of peers in a social setting, while injunctive norms describe the behavior considered to be acceptable or unacceptable by peers (27). In addition to testing an unhealthy descriptive norm, "Every day more than 150 students have a burger for lunch here," and a healthy descriptive norm, "Every day more than 150 students have a tossed salad for lunch here," Mollen et al. (95) tested an injunctive norm, "Have a tossed salad for lunch!" Their findings suggest that both healthy social norms signs (i.e., descriptive and injunctive) increased the number of healthy food choices relative to the unhealthy descriptive norm message. However, while the healthy descriptive norm message resulted in more healthy choices compared with the norm-absent control condition, those exposed to an injunctive norm message did not make significantly more healthy food choices than those in the control condition.

Robinson et al. (120) found that descriptive social norms were more effective on low consumers of FVs compared with the health message and the injunctive norm with no aggregate effects for the overall population in a previous study (119). This is likely because high consumers of FVs were already aware of their benefits and adhering to the norm. The observed null effect of the injunctive norm compared with the descriptive norm could be due to the specific nature of each norm. While descriptive norms tend to change depending on the situation, injunctive norms are more like a universal cultural guide on how to behave and what is the right thing to do in general, which is known to most people. Consequently, descriptive norm messages can alter people's perception and change their behavior, but injunctive norm messages target already-existing beliefs (95). Additionally, since injunctive norms interventions are mainly based on telling people what to do, they can cause reactance. Hence, rather than simply saying "You should eat more FVs," Hogg & Reid (65) suggest that this injunctive norm could be coupled with some terms such as "Your doctor believes you should eat more FVs" and "Your children would want you to eat more FVs" to enhance the norm acceptability and credibility.

3.3. Default Options

People tend to stick with predetermined design features despite the availability of additional alternatives to customize their experience. This is a phenomenon known as the status quo bias or default effect (69), widely studied in many contexts such as organ donations (67) and pension savings (139) but with limited applications in the food domain. While people can freely choose the side dishes to accompany their main meal choice, the default picture tends to influence choice. Friis et al. (51) showed that providing a preportioned salad as the default option increased the intake of salads; however, it did not decrease total energy intake. Loeb et al. (83) studied the effect of default menu options (healthy or unhealthy) in a community center where parents were asked to

make a breakfast choice for their child. They found that all parents given the healthy menu option stuck to the default option and that parents given the standard menu option did not request the healthier menu, suggesting a strong status quo bias. Similarly, Van Kleef et al. (148) conducted an experiment where half of the participants were offered a whole wheat bun as the default alternative and the other half were offered a white bun as the default. While all of them could switch their alternative, almost all participants stuck with the default option in both treatments, showcasing the potential large effects of defaults to induce a desirable outcome. Coffino et al. (30) demonstrated that using a default online shopping cart can improve the nutritional quality of food purchased among low-income food-insecure individuals, and a more recent study confirmed its effectiveness over a month of repeated purchases (29).

Although default options can effectively and subtly change behavior, it is important to note that the power of defaults to influence behavior is limited under strong preferences or highly liked foods (e.g., preferences for fries as a side dish with hamburger) (148). In addition, the default option approach is mainly used in binary decisions that are unfamiliar and infrequent, which is very different from food choices where people face many options and make decisions repeatedly throughout the day. Since accepting the default option is not a personal choice, it may also feel less rewarding to people, as they won't own their decision (148). More work needs to be done to understand the role of choosing a default on subsequent choices and any longer-term consumption effects.

3.4. Preplanning and Commitment Devices

Although it is common for individuals to set goals for improving dietary habits, temptation and self-control problems often lead to deviations from the initial goal. Preplanning and commitment devices are voluntary self-binding mechanisms that can help people avoid future temptations; examples include preordering food or grocery items, preselecting a grocery list to buy at the supermarket, and committing to following a specific diet and informing other people to increase accountability (6). VanEpps et al. (149) showed that imposing a (longer) time delay between placing an order and picking up the meal is associated with reductions in the meal calorie content. Sadoff & Samek (127) found that introducing a commitment device where a food delivery program participant ordered food from a restricted menu rather than a full menu significantly increased healthy food choices. They also found that committing to ordering from a restricted menu did not decrease participants' satisfaction with the food selection, suggesting that this type of intervention may work for individuals with specific dietary needs.

3.5. Redesigning the Food Environment

Choice architecture is the design of the environments in which people make decisions (141) to help people make heathier food choices. The general principle is to deliberately facilitate access to healthy food and make it more difficult to consume unhealthy food. Examples include increasing the variety and saliency of healthy food accessible to consumers by placing heathier options at eye level and closer to the customer to provide quick access, or listing healthier choices at the top of restaurant menus, or altering portion sizes and food presentation.

3.5.1. Product variety. Researchers argue that access to heathier food is highly associated with healthier diets (10). For instance, low-income and minority communities, who disproportionally suffer from obesity and diet-related chronic diseases, generally have fewer supermarkets in proximity than other communities and live in highly populated areas with smaller convenience stores (79). In these locations, stores heavily advertise high-caloric and preprocessed foods such as chips, sugary items, and SSBs and are less likely to carry fresh produce. Dannefer et al. (34) conducted

one of the largest corner-store interventions, which included 55 stores in New York City. They found that increasing the stock of healthy foods increased their sales from 5% to 16% despite the lack of space and refrigeration. Lawman et al. (80) suggested that relying on more variety and accessibility to heathier products alone may be insufficient and should be coupled with marketing, educational, and pricing strategies for better results.

The impact of variety on actual food consumption has been studied in more controlled settings. For example, Meengs et al. (90) found that proposing a variety of three different vegetables (carrots, broccoli, and snap peas) increased their consumption compared with serving one only, demonstrating that enhancing vegetable variety in meals can effectively boost intake. Another study analyzed the snack choice of participants randomized into three conditions with varying healthiness levels of snack options (109). Those in the condition with more unhealthy snack options were nearly 3 times more likely to pick a less-healthy snack, while those facing more healthy options were 2.5 times more likely to choose a healthier snack, compared to the condition with an equal mix of both options.

3.5.2. Product positioning. Strategically positioning food items to increase their visibility and convenience in the supermarket's shelves or placing meals at the top of a restaurant menu are among the subtle changes to choice architecture used to nudge consumers toward better dietary choices. For example, Dayan & Bar-Hillel (36) found that items placed at the top or the bottom of a menu were twice as popular as those placed in the middle. The menu display format was also found to affect food choice; middle options were preferred in horizontal displays, while edge items were chosen more in vertical displays (74). In a pictorial-style menu that displayed a salad alongside three unhealthy food options in a horizontal line, participants were significantly more likely to choose the salad when it was placed separately and away from the unhealthy options, rather than in the middle of them (72). Studies focusing on food proximity argue that since greater distance involves greater effort to reach the food, making calorie-dense foods less accessible and low-calorie foods more accessible could result in significant weight loss (126).

Research investigating the long-term effects of positional interventions is scarce. It is possible that the effects of changing the positioning of products may be short-lived, as people may eventually find their go-to product. Van Gestel et al. (147) replicated a previous study by Kroese et al. (77) but over a longer period and found that the previously observed positive effect of repositioning healthy food products at the checkout counter remained robust over a four-week period. A review of the impact of store product placement on dietary outcomes emphasizes that despite the large number of null results, more (or less) prominent positioning of healthy (or unhealthy) foods relates to better dietary-related behaviors (132). The vulnerability of the repositioning nudge may be explained by strong consumer preferences for certain products, which makes them less nudgeable. For example, de Wijk et al. (37) found that most consumers continued to buy the same type of bread even when its location changed, suggesting that a typical consumer of white bread may not select whole grain bread just because it is encountered first, and vice versa.

3.5.3. Portion size. The portion size of foods consumed at home, restaurants, and fast-food establishments has increased since the 1970s, with the portion size of meals and beverages in many restaurants exceeding the recommendations of the US Department of Agriculture and the Food and Drug Administration (11). Experimental evidence has shown that increased portion sizes can distort consumer perceptions regarding appropriate food portions (85). In this regard, research suggests that in the same way that the availability of supersized portions has normalized larger portions, reducing food portion sizes might recalibrate people's perception of normal portion size and induce the selection of smaller portions (122). In a five-day laboratory experiment, Haynes et al. (57) found that reductions in the portion size of main meals resulted in a significant decrease

in daily food intake. Also, additional food consumption did not offset this reduction even when portions were reduced to the point where they were no longer perceived as normal. Similarly, Rolls et al. (124) served participants 25% smaller meals across two days and found that participants reduced their caloric intake by 231 kcal per day, although they reported similar levels of hunger and fullness.

Portion-size framing can also influence food choice. For instance, Just & Wansink (68) varied the naming of portion sizes between treatments, with small portions labeled as "half" and larger portions labeled as "regular" in the first treatment. In the second treatment, the small portions were labeled as "regular," and the larger portions were labeled as "double." The results indicate that upgrading from a "regular" to a "double" portion size is relatively much more valuable than upgrading from a "half" to a "regular" portion size. Also, people left more food uneaten when the portion was labeled as a "double" size. Building on these findings, a recent study used anthropomorphic labels for signaling the portion size of the food items on a restaurant menu. In particular, the "small" and "large" portions were labeled as "slim" and "regular" in one treatment to reflect a desirable body weight, while "regular" and "plus size" were used in another treatment to imply a less ideal body image. The "regular" and "plus size" labels were found to increase the selection of small portions by 14.3%, with overweight/obese individuals being 23.4% more likely to choose a small portion item under this label compared with the "slim" and "regular" labels (71).

The success of portion-size interventions relies mainly on identifying the potential adoption barriers. First, if consumers' meal satisfaction decreases and they engage in compensatory behavior (e.g., purchase of two of the smaller portions or supplementary items), the intervention may fail (71). Second, cooperation with the food industry is required; in 2012, the New York City Board of Health passed a regulation prohibiting the sale of SSBs in containers exceeding 16 oz. The regulation was fiercely rejected by the beverage industry and was struck down by the state's highest court in 2014. Opponents of the policy claimed that it would mainly hurt businesses and low-income consumers (117). In this context Vermeer et al. (152) investigated consumer and manufacturer acceptability of point-of-purchase interventions aimed at reducing portion size and found that consumers agreed with reducing portion size of energy-dense, unhealthy foods. However, they were hesitant about a general portion-size reduction in supermarkets and restaurants as they were afraid of being controlled by food manufacturers and that the new size would not meet their energy requirements.

3.5.4. Presentation. In the same way that reduced portion sizes have been shown to lower energy intake, some studies suggest that dishware size, shape, and color may have a similar effect because consumers use them as anchors by which to determine the appropriate amount to eat. For example, Wansink & Van Ittersum (156) reported that Chinese buffet diners with large plates served themselves 52% more, ate 45% more, and wasted 135% more food than those with smaller plates. Wansink & Van Ittersum (155) also found that subjects poured more liquid into short, wide glasses than tall, narrow ones due to an overestimation of the height of the glass as an indicator of liquid amount. As for the impact of spoon and fork size, Mishra et al. (94) emphasize that it is case specific, as while diners in a restaurant consumed more from smaller rather than from larger forks, this effect reversed in a lab setting. When combining both plate size and spoon size, Wansink et al. (157) found that a large bowl and a large serving spoon led people to serve themselves 56.8% more ice cream than those given a smaller bowl and a smaller serving spoon. On the other hand, a study by Rolls et al. (123) found that serving adults the same lunch menu with different-sized plates had no effect on energy intake. This was later supported by a review that confirmed that altering container size and cutlery often yields inconclusive results in self-service settings (134).

In addition to shape and size, there is evidence that the color of the plate in which the food is served can also affect the perceived food attractiveness. For example, a strawberry mousse served on a white plate was perceived to be sweeter and more delicious than the same dessert presented on a black plate; similarly, hot chocolate served in red cups was enjoyed more than hot chocolate served in white cups (110). As for the impact of color on food intake, Genschow et al. (54) found that subjects consumed fewer pretzels when they were presented on a red plate compared with a white or blue plate, hypothesizing that the red color's association with visceral factors of danger, avoidance, and warning may have led to reduced food intake. At the point of purchase, Tijssen et al. (144) demonstrated that packaging healthier alternatives in warmer, saturated, and less bright colors can explicitly enhance sensory expectations and perceptions, while implicitly improving attractiveness. Furthermore, varying the size and number of food pieces has been shown to affect energy intake and food quantity estimations. Consumers in a marketing study stated that a snack packet with an image of 15 pretzels contain a greater number of pretzels than a package containing an image of 3 pretzels, even though the actual quantity of pretzels in both packages was equal (86). Likewise, Marchiori et al. (87) found that adults ate more when served 10 large candies than when the same candies were cut into 20 bite-sized pieces.

4. MULTICOMPONENT INTERVENTIONS

Previous research has combined and compared interventions to better understand how mixing them can enable them to work together or against one another in influencing consumer behavior. Combining approaches requires careful theoretical analysis for the predicted effects. Combining information provision and choice architecture is the most studied mixture in the literature. For instance, in an online shopping experiment, in the presence of FOP nutrition labels, offering healthier food-swap recommendations improved the proportion of healthy choices and nutritional quality of the basket compared with providing only FOP nutrition labels (131). Also, combining TL food labels with product positioning was effective in reducing calories purchased in a hospital cafeteria (142). Nudges combining positioning with priming have also been evaluated in previous studies. Payne & Niculescu (108) showed that the placement of FVs at checkout coupled with cashiers' suggestions on healthier options significantly increased sales of FVs. However, in another study, priming customers with healthful messages and changing the positioning of probiotic vegetables had no effect on their sales (14). Similarly, combining priming with other nudges such as calorie information (2) and healthy default options (96) did not yield any significant effect on purchases of healthy items.

Although scarce, some studies combined both financial incentives and behavioral nudges. For instance, Schruff-Lim et al. (130) argue that although FOP nutritional information alone is not enough to change behavior, adding supporting interventions such as basket feedback and financial incentives is promising. Also, combining price discounts with priming messages has been found to decrease the purchases of unhealthy items (64) and increase spending on FVs (55). In addition to priming and price reduction, Payne & Niculescu (108) added a positioning nudge that placed FVs at the checkout section of a grocery store, resulting in greater sales of FVs. Similarly, a price reduction on default healthy food bundles was found to increase sales of FVs (18). Furthermore, combining cash rewards with a social norm and food-labeling nudge has been found to increase the sales of healthy foods among hospital employees (143). A study in a worksite cafeteria tested the effect of combining 14 nudging and social marketing strategies on sales of different food items (151). The findings revealed that the purchases of healthier sandwiches and FVs significantly increased under combined interventions, suggesting that executing effective strategies simultaneously can have a cumulative effect and could be more effective for heterogeneous groups.

In a survey where participants were asked to choose from a list of several nudges and financial incentives aimed at improving dietary choices, Pitts et al. (111) found that cash rewards (redeemable tokens when buying a certain amount of FVs), price discounts on healthy foods and beverages, and social recognition (those who purchased at least 10 different types of FVs would have their name and photograph posted in the store) were the top-ranked strategies. In a similar context, Vugts et al. (154) asked participants to rate the acceptability, patronizing degree, autonomy, and perceived efficacy of taxes and several nudges. They found that higher financial costs associated with the unhealthy choice are seen as much less acceptable and effective than lower financial gains in return for the healthy choice. Although findings from studies combining financial and behavioral interventions are scarce, existing evidence supports the claim that nudge-based approaches and financial incentives are complementary and could result in more forceful policies.

5. GENERAL DISCUSSION AND CONCLUDING RECOMMENDATIONS

As the prevalence of diet-related NCDs reaches alarming levels globally, there is increasing interest in scalable strategies to promote healthier food consumption. These strategies can be more paternalistic and macrolevel, such as fat taxes and thin subsidies, or benign and more cost effective, such as behavioral nudges. This narrative review discusses both strategies, with an emphasis on nudges as they are less understood.

Overall, the evidence suggests that the use of carrots (subsidies) and sticks (taxes) to influence food choice and consumption creates environments that generate positive outcomes, but it also may backfire when people become aware of such government influence. Behavioral nudges have also been shown to effectively encourage healthier diets using subtle influence in consumer choices without restricting options. These strategies can increase the selection and consumption of nutritious foods, often with minimal effort from consumers. However, like taxes and subsidies, nudges can also backfire if perceived as manipulative or if consumers feel their autonomy is being undermined, potentially leading to resistance or a preference for unhealthy options as a form of defiance. In fact, studies with null effects stated that the effectiveness of a nudge depends on its acceptance by the public. According to Vugts et al. (154), public acceptance of health-related interventions decreases when they are perceived to be more intrusive or to coerce people into a specific choice. Additionally, overreliance on nudges might reduce their long-term effectiveness if individuals do not develop intrinsic motivation and form the habit of choosing healthier choices. Emerging, although limited, research supports the combination of financial incentives with behavioral nudges to overcome the limitations of using each approach separately. For example, the evidence suggests that pairing strategies such as price reductions with nudges such as product positioning or labeling can enhance the effectiveness of promoting healthier food choices.

One of the most critical limitations of nudges often acknowledged in the literature is the duration of the interventions and the ability to run follow-ups to test for habit formation and long-term impact. This limitation may not be relevant in certain settings such as restaurants because many customers may be first-time visitors even if the intervention is tested over a relatively long period. Another limitation is the variability and the inconsistency in the outcome measures; these range from calories purchased to food choices with very limited measures of actual food intake. It is important to note that while measuring actual intake using 24-h dietary recalls gives a good approximation of calorie consumption, this measure may present some bias as participants are aware of being monitored and it depends on their proper recollection of data. In this regard, technological advances and artificial intelligence (AI) hold promise to reduce measurement error in dietary intake; for example, AI-driven food recognition apps can now analyze photos of meals to estimate calorie intake and nutrient composition more accurately. It is also important to highlight the

hypothetical nature of many studies in the literature, which may not fully capture real-world behavior and could limit the external validity of the results and their applicability and scalability to broader, real-world environments. Investigations of heterogeneous effects of both financial incentives and nudges on nutrition outcomes are scarce, which makes it challenging to understand whether they work equally well across diverse populations. This gap in the literature limits our ability to tailor interventions to specific groups, particularly vulnerable and at-risk subpopulations, for maximum effectiveness.

According to the evidence provided in this narrative review, we offer the following critical recommendations for opportunities for future research:

- Clearly define the immediate (food choice), mid-term (dietary change), and longer-term (health change) target outcomes.
- Report the statistical power of the tests used to detect intervention effects and effect size to allow for a robust interpretation of the key results.
- Use larger and more representative sample populations to enhance external validity and ensure findings are applicable to broader populations and contexts. Aim for national or even international samples that reflect diversity in terms of age, gender, ethnicity, and other socioeconomic characteristics. Cross-country comparisons could also offer insights into how cultural differences moderate the effects of interventions. Moreover, large samples allow for testing of heterogeneous effects across different subpopulations, particularly vulnerable or at-risk groups.
- Collect socioeconomic data and biomarkers, such as body mass or fat percentage, as well as behavioral traits such as cognitive restraint, impulsivity, eating disorders, and other behaviors that can strongly influence nutrition and health outcomes. This information can help design customized interventions that are culturally and demographically appropriate and reflect, for example, differences in local eating habits, preferences, education, and societal norms.
- Address the linkages between nudge-influenced behavior change and health outcomes by tracking participants longitudinally. Understanding whether these changes translate into reduced obesity rates, lower incidence of NCDs (e.g., diabetes, heart disease), and overall improvements in well-being is crucial.
- Expand the dependent variables beyond purchase and consumption to include consumer experience, satisfaction, and perception. It is important to evaluate how consumers feel about the changes in their choices and whether they believe the intervention improves their well-being. Additionally, considering ethical aspects by measuring consumers' reactions when they realize they have been nudged could provide valuable insights into the acceptability and sustainability of such interventions, especially among those perceived to be paternalistic and to limit autonomy.
- Explore methods to reduce resistance or reactance evoked by financial and behavioral interventions that can backfire if perceived as controlling or altering freedom of choice, potentially by increasing transparency about the goals of the interventions or framing them in a way that promotes autonomy and self-efficacy.
- Collaborate with relevant partners such as food retailers, food services, and other stakeholders who could facilitate the implementation of the intervention. Combining the intervention with purchasing data from businesses is essential for practical and scalable behavioral solutions. Furthermore, understanding the food suppliers' satisfaction with the outcomes (e.g., the fact that customers did not complain) and their concerns or challenges in adopting these interventions could help refine strategies that are mutually beneficial for businesses and consumers.

- Conduct comparative studies that combine nudges with financial incentives across different environments (supermarkets, restaurants, worksites, etc.) to identify the most effective strategies for various demographic groups and settings, maximizing public health benefits.
- Collaborate across fields such as psychology, behavioral economics, nutrition, public health, and marketing to develop multifaceted interventions that capture a more comprehensive picture of how food environments, decision-making processes, and health outcomes interact. Moreover, integrating behavioral economics principles into the design and evaluation of incentives can help better understand the mechanisms underlying eating habits.
- Explore how mobile apps, AI, and machine learning tools can be used to deliver real-time, personalized nudges on the basis of individual dietary patterns, food preferences, and health data. Testing the efficacy of these tech-driven nudges in changing food-related behavior over time would provide insights into their potential for public health.
- Promote reviews and special issues highlighting ineffective interventions. Publication bias may affect the dissemination of interventions that are unlikely to produce positive outcomes, but it is relevant to understand why these interventions are ineffective or whether they hold promise among specific subpopulations or in different contexts.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

LITERATURE CITED

1. Abril EP, Dempsey PR. 2019. Outcomes of healthy eating ad campaigns: a systematic review. *Prog. Cardiovasc. Dis.* 62(1):39–43
2. Allan JL, Johnston M, Campbell N. 2015. Snack purchasing is healthier when the cognitive demands of choice are reduced: a randomized controlled trial. *Health Psychol.* 34(7):750–55
3. Alston JM, Okrent AM, Parks JC. 2012. U.S. food policy and obesity. In *Public Health: Social and Behavioral Health*, ed. J Maddock. InTech
4. An R. 2013. Effectiveness of subsidies in promoting healthy food purchases and consumption: a review of field experiments. *Public Health Nutr.* 16(7):1215–28
5. Andreyeva T, Marple K, Moore TE, Powell LM. 2022. Evaluation of economic and health outcomes associated with food taxes and subsidies: a systematic review and meta-analysis. *JAMA Netw. Open* 5(6):e2214371
6. Au N, Marsden G, Mortimer D, Lorgelly PK. 2013. The cost-effectiveness of shopping to a predetermined grocery list to reduce overweight and obesity. *Nutr. Diabetes* 3(6):e77
7. Ball K, McNaughton SA, Le HN, Gold L, Mhurchu CN, et al. 2015. Influence of price discounts and skill-building strategies on purchase and consumption of healthy food and beverages: outcomes of the Supermarket Healthy Eating for Life randomized controlled trial. *Am. J. Clin. Nutr.* 101(5):1055–64
8. Basu S, Gardner CD, White JS, Rigdon J, Carroll MM, et al. 2019. Effects of alternative food voucher delivery strategies on nutrition among low-income adults. *Health Aff.* 38(4):577–84
9. Bauer JM, Reisch LA. 2019. Behavioural insights and (un)healthy dietary choices: a review of current evidence. *J. Consum. Policy* 42:3–45
10. Beaulac J, Kristjansson E, Cummins S. 2009. A systematic review of food deserts, 1966–2007. *Prev. Chronic Dis.* 6(3):A105
11. Benton D. 2015. Portion size: what we know and what we need to know. *Crit. Rev. Food Sci. Nutr.* 55(7):988–1004
12. Blakely T, Mhurchu CN, Jiang Y, Matoe L, Funaki-Tahifote M, et al. 2011. Do effects of price discounts and nutrition education on food purchases vary by ethnicity, income, and education? Results from a randomised, controlled trial. *J. Epidemiol. Commun. Health* 65(10):902–8

13. Bollinger B, Leslie P, Sorensen A. 2011. Calorie posting in chain restaurants. *Am. Econ. J. Econ. Policy* 3:91–128
14. Broers VJV, Van den Broucke S, Taverne C, Luminet O. 2019. Investigating the conditions for the effectiveness of nudging: Cue-to-action nudging increases familiar vegetable choice. *Food Qual. Prefer.* 71:366–74
15. Brunner TA. 2010. How weight-related cues affect food intake in a modeling situation. *Appetite* 55(3):507–11
16. Cantor J, Torres A, Abrams C, Elbel B. 2015. Five years later: Awareness of New York City's calorie labels declined, with no changes in calories purchased. *Health Aff.* 34(11):1893–900
17. Campos S, Doxey J, Hammond D. 2011. Nutrition labels on pre-packaged foods: a systematic review. *Public Health Nutr.* 14(8):1496–506
18. Carroll KA, Samek A, Zepeda L. 2018. Food bundling as a health nudge: investigating consumer fruit and vegetable selection using behavioral economics. *Appetite* 121:237–48
19. Cash SB, Sunding DL, Zilberman D. 2005. Fat taxes and thin subsidies: prices, diet, and health outcomes. *Acta Agric. Scand. C Food Econ.* 2:167–74
20. Cawley J, Frisvold D, Hill A, Jones D. 2019. The impact of the Philadelphia beverage tax on purchases and consumption by adults and children. *J. Health Econ.* 67:102225
21. Cawley J, Frisvold D, Jones D. 2020. The impact of sugar-sweetened beverage taxes on purchases: evidence from four city-level taxes in the United States. *Health Econ.* 29:1289–306
22. Cawley J, Hanks AS, Just DR, Wansink B. 2016. Incentivizing nutritious diets: a field experiment of relative price changes and how they are framed. NBER Work. Pap. 21929
23. Cawley J, Susskind A, Willage B. 2020. The impact of information disclosure on consumer behavior: evidence from a randomized field experiment of calorie labels on restaurant menus. *J. Policy Anal. Manag.* 39:1020–42
24. Cawley J, Sweeney MJ, Sobal J, Just DR, Kaiser HM, et al. 2015. The impact of a supermarket nutrition rating system on purchases of nutritious and less nutritious foods. *Public Health Nutr.* 18(1):9–14
25. Chen X, Kaiser HM, Rickard BJ. 2015. The impacts of inclusive and exclusive taxes on healthy eating: an experimental study. *Food Policy* 56:13–24
26. Cheung TT, Gillebaart M, Kroese FM, Marchiori D, Fennis BM, De Ridder DT. 2019. Cueing healthier alternatives for take-away: a field experiment on the effects of (disclosing) three nudges on food choices. *BMC Public Health* 19:974
27. Cialdini RB, Reno RR, Kallgren CA. 1990. A focus theory of normative conduct. Recycling the concept of norms to reduce littering in public places. *J. Pers. Soc. Psychol.* 58:1015–26
28. Chouinard HH, Davis DE, LaFrance JT, Perloff J. 2007. Fat taxes: big money for small change. *Forum Health Econ. Policy* 10(2). **https://doi.org/10.2202/1558-9544.1071**
29. Coffino JA, Han GT, Evans EW, Luba R, Hormes JM. 2021. A default option to improve nutrition for adults with low income using a prefilled online grocery shopping cart. *J. Nutr. Educ. Behav.* 53(9):759–69
30. Coffino JA, Udo T, Hormes JM. 2020. Nudging while online grocery shopping: a randomized feasibility trial to enhance nutrition in individuals with food insecurity. *Appetite* 152:104714
31. Coelho JS, Polivy J, Herman CP, Pliner P. 2009. Wake up and smell the cookies. Effects of olfactory food-cue exposure in restrained and unrestrained eaters. *Appetite* 52(2):517–20
32. Crosetto P, Muller L, Ruffieux B. 2016. Helping consumers with a front-of-pack label: numbers or colors? Experimental comparison between Guideline Daily Amount and Traffic Light in a diet-building exercise. *J. Econ. Psychol.* 55:30–50
33. Crosetto P, Lacroix A, Muller L, Ruffieux B. 2020. Nutritional and economic impact of five alternative front-of-pack nutritional labels: experimental evidence. *Eur. Rev. Agric. Econ.* 47:785–818
34. Dannefer R, Williams DA, Baronberg S, Silver L. 2012. Healthy bodegas: increasing and promoting healthy foods at corner stores in New York City. *Am. J. Public Health* 102(10):e27–31
35. Darmon N, Lacroix A, Muller L, Ruffieux B. 2014. Food price policies improve diet quality while increasing socioeconomic inequalities in nutrition. *Int. J. Behav. Nutr. Phys. Activ.* 11:66
36. Dayan E, Bar-Hillel M. 2011. Nudge to nobesity II: Menu positions influence food orders. *Judgm. Decis. Mak.* 6(4):333–42

37. de Wijk RA, Maaskant AJ, Polet IA, Holthuysen NTE, van Kleef E, Vingerhoeds MH. 2016. An in-store experiment on the effect of accessibility on sales of wholegrain and white bread in supermarkets. *PLOS ONE* 11(3):e0151915
38. Debnam J. 2017. Selection effects and heterogeneous demand responses to the Berkeley soda tax vote. *Am. J. Agric. Econ.* 99:1172–87
39. Dharmasena S, Capps O Jr. 2012. Intended and unintended consequences of a proposed national tax on sugar-sweetened beverages to combat the U.S. obesity problem. *Health Econ.* 21:669–94
40. Dong D, Leibtag E. 2010. *Promoting fruit and vegetable consumption: Are coupons more effective than pure price discounts?* Econ. Res. Rep. 96, US Department of Agriculture, Economic Research Service
41. Dubois P, Griffith R, O'Connell M. 2020. How well targeted are soda taxes? *Am. Econ. Rev.* 110:3661–704
42. Elshiewy O, Boztug Y. 2018. When back of pack meets front of pack: how salient and simplified nutrition labels affect food sales in supermarkets. *J. Public Policy Mark.* 37:55–67
43. Ellison B, Lusk JL, Davis D. 2013. Looking at the label and beyond: the effects of calorie labels, health consciousness, and demographics on caloric intake in restaurants. *Int. J. Behav. Nutr. Phys. Act.* 10:21
44. Enax L, Hu Y, Trautner P, Weber B. 2015. Nutrition labels influence value computation of food products in the ventromedial prefrontal cortex. *Obesity* 23(4):786–92
45. Finkelstein EA, Zhen C, Bilger M, Nonnemaker J, Farooqui AM, Todd JE. 2013. Implications of a sugar-sweetened beverage (SSB) tax when substitutions to non-beverage items are considered. *J. Health Econ.* 32:219–39
46. Food and Drug Administration, Department of Health and Human Services. 2014. Food labeling; nutrition labeling of standard menu items in restaurants and similar retail food establishments. *Fed. Regist.* 79:71155
47. Forwood SE, Ahern AL, Hollands GJ, Ng YL, Marteau TM. 2015. Priming healthy eating: You can't prime all the people all of the time. *Appetite* 89:93–102
48. Franckle RL, Levy DE, Macias-Navarro L, Rimm EB, Thorndike AN. 2018. Traffic-light labels and financial incentives to reduce sugar-sweetened beverage purchases by low-income Latino families: a randomized controlled trial. *Public Health Nutr.* 21(8):1426–34
49. French SA, Jeffery RW, Story M, Breitlow KK, Baxter JS, Hannan P, Snyder MP. 2001. Pricing and promotion effects on low-fat vending snack purchases: the CHIPS study. *Am. J. Public Health* 91(1):112–17
50. French SA, Hannan PJ, Harnack LJ, Mitchell NR, Toomey TL, Gerlach A. 2010. Pricing and availability intervention in vending machines at four bus garages. *J. Occup. Environ. Med.* 52(1S):S29–33
51. Friis R, Skov LR, Olsen A, Appleton KM, Saulais L, et al. 2017. Comparison of three nudge interventions (priming, default option, and perceived variety) to promote vegetable consumption in a self-service buffet setting. *PLOS ONE* 12(5):e0176028
52. Gaillet-Torrent M, Sulmont-Rossé C, Issanchou S, Chabanet C, Chambaron S. 2014. Impact of a non-attentively perceived odour on subsequent food choices. *Appetite* 76:17–22
53. Gase LN, Barragan NC, Robles B, Leighs M, Kuo T. 2015. A mixed-methods evaluation of the choose less, weigh less portion size health marketing campaign in Los Angeles County. *Am. J. Health Promot.* 29(6):e214–24
54. Genschow O, Reutner L, Wanke M. 2012. The color red reduces snack food and soft drink intake. *Appetite* 58(2):699–702
55. Griffith R, von Hinke Kessler Scholder S, Smith S. 2014. Getting a healthy start?: Nudge versus economic incentives. Work. Pap. 14/328, Centre for Market and Public Organisation, University of Bristol
56. Gustafson CR, Prate MR. 2019. Healthy food labels tailored to a high-risk, minority population more effectively promote healthy choices than generic labels. *Nutrients* 11(10):2272
57. Haynes A, Hardman C, Halford J, Jebb S, Mead B, Robinson E. 2020. Reductions to main meal portion sizes reduce daily energy intake regardless of perceived normality of portion size: a 5-day cross-over laboratory experiment. *Int. J. Behav. Nutr. Phys. Act.* 17(1):21
58. Hawkes C, Smith TG, Jewell J, Wardle J, Hammond RA, et al. 2015. Smart food policies for obesity prevention. *Lancet* 385:2410–21

59. Hawley KL, Roberto CA, Bragg MA, Liu PJ, Schwartz MB, Brownell KD. 2013. The science on front-of-package food labels. *Public Health Nutr.* 16(3):430–39
60. Herman DR, Harrison GG, Jenks E. 2006. Choices made by low-income women provided with an economic supplement for fresh fruit and vegetable purchase. *J. Am. Diet. Assoc.* 106(5):740–44
61. Herman DR, Harrison GG, Afifi AA, Jenks E. 2008. Effect of a targeted subsidy on intake of fruits and vegetables among low-income women in the Special Supplemental Nutrition Program for Women, Infants, and Children. *Am. J. Public Health* 98(1):98–105
62. Higgins ET, Kruglanski AW. 1996. Knowledge applicability, activation: accessibility, and salience. In *Social Psychology: Handbook of Basic Principles*, pp. 133–68. Guilford Publications
63. Higgs S. 2015. Social norms and their influence on eating behaviours. *Appetite* 86:38–44
64. Hillier-Brown FC, Summerbell CD, Moore HJ, Routen A, Lake AA, et al. 2017. The impact of interventions to promote healthier ready-to-eat meals (to eat in, to take away or to be delivered) sold by specific food outlets open to the general public: a systematic review. *Obesity Rev.* 18(2):227–246
65. Hogg MA, Reid SA. 2006. Social identity, self-categorization, and the communication of group norms. *Commun. Theory* 16:7–30
66. Jensen JD, Smed S. 2013. The Danish tax on saturated fat—short run effects on consumption, substitution patterns and consumer prices of fats. *Food Policy* 42:18–31
67. Johnson EJ, Goldstein D. 2003. Do defaults save lives? *Science* 302:1338–39
68. Just DR, Wansink B. 2014. One man's tall is another man's small: how the framing of portion size influences food choice. *Health Econ.* 23(7):776–91
69. Kahneman D, Knetsch JL, Thaler RH. 1991. Anomalies: the endowment effect, loss aversion, and status quo bias. *J. Econ. Perspect.* 5(1):193–206
70. Kalamov Z. 2020. A sales tax is better at promoting healthy diets than the fat tax and the thin subsidy. *Health Econ.* 29(3):353–66
71. Kee JY, Segovia MS, Palma MA. 2023. Slim or plus-size burrito? A natural experiment of consumers' restaurant choice. *Food Policy* 120:102483
72. Keegan E, Kemps E, Prichard I, Polivy J, Herman CP, Tiggemann M. 2019. The effect of the spatial positioning of a healthy food cue on food choice from a pictorial-style menu. *Eating Behav.* 34:101313
73. Kim SY, Nayga RM Jr., Capps O Jr. 2000. The effect of food label use on nutrient intakes: an endogenous switching regression analysis. *J. Agr. Resour. Econ.* 25:215–31
74. Kim J, Hwang E, Park J, Lee JC, Park J. 2019. Position effects of menu item displays in consumer choices: comparisons of horizontal versus vertical displays. *Cornell Hosp. Q.* 60(2):116–24
75. Kottke TE, Pronk NP, Katz AS, Tillema JO, Flottemesch TJ. 2013. The effect of price reduction on salad bar purchases at a corporate cafeteria. *Prev. Chronic Dis.* 10:E25
76. Krieglmeyer R, Deutsch R, De Houwer J, De Raedt R. 2010. Being moved: Valence activates approach-avoidance behavior independently of evaluation and approach-avoidance intentions. *Psychol. Sci.* 21(4):607–13
77. Kroese FM, Marchiori DR, De Ridder DT. 2016. Nudging healthy food choices: a field experiment at the train station. *J. Public Health* 38(2):e133–37
78. Kunz S, Haasova S, Rieß J, Florack A. 2020. Beyond healthiness: the impact of traffic light labels on taste expectations and purchase intentions. *Foods* 9(2):134
79. Larson NI, Story MT, Nelson MC. 2009. Neighborhood environments: disparities in access to healthy foods in the U.S. *Am. J. Prev. Med.* 36(1):74–81
80. Lawman HG, Vander Veur S, Mallya G, McCoy TA, Wojtanowski A, et al. 2015. Changes in quantity, spending, and nutritional characteristics of adult, adolescent, and child urban corner store purchases after an environmental intervention. *Prev. Med.* 74:81–85
81. Lindstrom KN, Tucker JA, McVay M. 2023. Nudges and choice architecture to promote healthy food purchases in adults: a systematized review. *Psychol. Addict. Behav.* 37(1):87–103
82. List JA, Samek A, Zhu T. 2022. Incentives to eat healthily: evidence from a grocery store field experiment. *Economica* 89(354):489–509
83. Loeb KL, Radnitz C, Keller KL, Schwartz MB, Zucker N, et al. 2018. The application of optimal defaults to improve elementary school lunch selections: proof of concept. *J. Sch. Health* 88(4):265–71

84. Lusk JL. 2014. Are sugar-sweetened beverage taxes a cost-effective means of reducing weight? *Can. J. Diabetes* 38:9–10
85. MacDiarmid JI, Loe J, Kyle J, McNeill G. 2013. It was an education in portion size: experience of eating a healthy diet and barriers to long-term dietary change. *Appetite* 71:411–19
86. Madzharov AV, Block LG. 2010. Effects of product unit image on consumption of snack foods. *J. Consum. Psychol.* 20:398–409
87. Marchiori D, Waroquier L, Klein O. 2011. Smaller food item sizes of snack foods influence reduced portions and caloric intake in young adults. *J. Am. Diet. Assoc.* 111:727–31
88. Marette S, Nabec L, Durieux F. 2019. Improving nutritional quality of consumers' food purchases with traffic-lights labels: an experimental analysis. *J. Consum. Policy* 42:377–95
89. McFadden A, Green JM, Williams V, McLeish J, McCormick F, et al. 2014. Can food vouchers improve nutrition and reduce health inequalities in low-income mothers and young children: a multi-method evaluation of the experiences of beneficiaries and practitioners of the Healthy Start programme in England. *BMC Public Health* 14:148
90. Meengs JS, Roe LS, Rolls BJ. 2012. Vegetable variety: an effective strategy to increase vegetable intake in adults. *J. Acad. Nutr. Diet.* 112(8):1211–15
91. Mhurchu CN, Blakely T, Jiang Y, Eyles HC, Rodgers A. 2010. Effects of price discounts and tailored nutrition education on supermarket purchases: a randomized controlled trial. *Am. J. Clin. Nutr.* 91(3):736–47
92. Miao Z, Beghin JC, Jensen HH. 2012. Taxing sweets: sweetener input tax or final consumption tax? *Contemp. Econ. Policy* 30(3):344–61
93. Michels KB, Bloom BR, Riccardi P, Rosner BA, Willett WC. 2008. A study of the importance of education and cost incentives on individual food choices at the Harvard School of Public Health cafeteria. *J. Am. College Nutr.* 27(1):6–11
94. Mishra A, Mishra H, Masters TM. 2012. The influence of bite size on quantity of food consumed: a field study. *J. Consum. Res.* 38(5):791–95
95. Mollen S, Rimal RN, Ruiter RAC, Kok G. 2013. Healthy and unhealthy social norms and food selection: findings from a field experiment. *Appetite* 65:83–89
96. Moran AJ, Khandpur N, Polacsek M, Thorndike AN, Franckle RL, et al. 2019. Make it fresh, for less! A supermarket meal bundling and electronic reminder intervention to promote healthy purchases among families with children. *J. Nutr. Educ. Behav.* 51(4):400–8
97. Mors MR, Polet IA, Vingerhoeds MH, Perez-Cueto FJA, de Wijk RA. 2018. Can food choice be influenced by priming with cucumber or bread odour? *Food Qual. Prefer.* 66:148–52
98. Muller L, Lacroix A, Lusk JL, Ruffieux B. 2017. Distributional impacts of fat taxes and thin subsidies. *Econ. J.* 127:2066–92
99. Nagatomo W, Saito J, Kondo N. 2019. Effectiveness of a low-value financial-incentive program for increasing vegetable-rich restaurant meal selection and reducing socioeconomic inequality: a cluster crossover trial. *Int. J. Behav. Nutr. Phys. Act.* 16:81
100. Olsho LE, Klerman JA, Wilde PE, Bartlett S. 2016. Financial incentives increase fruit and vegetable intake among Supplemental Nutrition Assistance Program participants: a randomized controlled trial of the USDA Healthy Incentives Pilot. *Am. J. Clin. Nutr.* 104(2):423–35
101. Olsho LE, Klerman JA, Bartlett SH, Logan CW. 2017. Rebates to incentivize healthy nutrition choices in the Supplemental Nutrition Assistance Program. *Am. J. Prev. Med.* 52(2):S161–70
102. Palma MA, Behe BK, Hall CR, Huddleston PT, Fernandez T. 2016. Tracking position premiums in discrete choice experiments. *Appl. Econ. Lett.* 23(18):1269–73
103. Papies EK, Veling H. 2013. Healthy dining: Subtle diet reminders at the point of purchase increase low-calorie food choices among both chronic and current dieters. *Appetite* 61:1–7
104. Papoutsi GS, Nayga RM, Lazaridis P, Drichoutis AC. 2015. Fat tax, subsidy or both? The role of information and children's pester power in food choice. *J. Econ. Behav. Organ.* 117:196–208
105. Paré G, Kitsiou S. 2017. Methods for literature reviews. In *Handbook of eHealth Evaluation: An Evidence-Based Approach*. University of Victoria
106. Patterson M, Bhargava S, Loewenstein G. 2017. An unhealthy attitude? New insight into the modest effects of the NLEA. *J. Behav. Econ. Policy* 1:15–26

107. Payne CR, Niculescu M, Just DA, Kelly MP. 2015. Shopper marketing nutrition interventions: Social norms on grocery carts increase produce spending without increasing shopper budgets. *Prev. Med. Rep.* 2:287–91
108. Payne C, Niculescu M. 2018. Can healthy checkout end-caps improve targeted fruit and vegetable purchases? Evidence from grocery and SNAP participant purchases. *Food Policy* 79:318–323
109. Pechey R, Sexton O, Codling S, Marteau TM. 2021. Impact of increasing the availability of healthier versus less-healthy food on food selection: a randomised laboratory experiment. *BMC Public Health* 21:132
110. Piqueras-Fiszman B, Alcaide J, Roura E, Spence C. 2012. Is it the plate or is it the food? Assessing the influence of the color (black or white) and shape of the plate on the perception of the food placed on it. *Food Qual. Prefer.* 24:205–8
111. Pitts SBJ, Wu Q, Sharpe PA, Rafferty AP, Elbel B, et al. 2016. Preferred healthy food nudges, food store environments, and customer dietary practices in two low-income Southern communities. *J. Nutr. Educ. Behav.* 48(10):735–42
112. Plassmann H, O'Doherty J, Shiv B, Rangel A. 2008. Marketing actions can modulate neural representations of experienced pleasantness. *PNAS* 105(3):1050–54
113. Pollard CM, Miller MR, Daly AM, Crouchley KE, O'Donoghue KJ, Lang AJ, Binns CW. 2008. Increasing fruit and vegetable consumption: success of the Western Australian Go for 2&5® campaign. *Public Health Nutr.* 11(3):314–20
114. Prevost M, Hot P, Muller L, Ruffieux B, Cousin E, et al. 2018. Neural correlates of the healthiness evaluation processes of food labels. *Nutr. Neurosci.* 21:467–77
115. Pulos E, Leng K. 2010. Evaluation of a voluntary menu-labeling program in full-service restaurants. *Am. J. Public Health* 100(6):1035–39
116. Roberto CA, Bragg MA, Livingston KA, Harris JL, Thompson JM, et al. 2012. Choosing front-of-package labelling nutritional criteria: How smart were 'smart choices'? *Public Health Nutr.* 15:262–67
117. Roberto CA, Pomeranz J. 2015. Public health and legal arguments in favor of a policy to cap the portion sizes of sugar-sweetened beverages. *Am. J. Public Health* 105(11):2183–90
118. Roberts JL. 2018. Nudge-proof: distributive justice and the ethics of nudging. *Mich. Law Rev.* 116(6):1045–66
119. Robinson E, Harris E, Thomas J, Aveyard P, Higgs S. 2013. Reducing high-calorie snack food in young adults: a role for social norms and health-based messages. *Int. J. Behav. Nutr. Phys. Act.* 10:73
120. Robinson E, Fleming A, Higgs S. 2014. Prompting healthier eating: testing the use of health and social norm-based messages. *Health Psychol.* 33(9):1057–64
121. Rønnow HN. 2020. The effect of front-of-pack nutritional labels and back-of-pack tables on dietary quality. *Nutrients* 12(6):1704
122. Robinson E, Kersbergen I. 2018. Portion size and later food intake: evidence on the "normalizing" effect of reducing food portion sizes. *Am. J. Clin. Nutr.* 107:640–46
123. Rolls BJ, Roe LS, Halverson KH, Meengs JS. 2007. Using a smaller plate did not reduce energy intake at meals. *Appetite* 49(3):652–60
124. Rolls BJ, Roe LS, Meengs J. 2006. Reductions in portion size and energy density of foods are additive and lead to sustained decreases in energy intake. *Am. J. Clin. Nutr.* 83:11–17
125. Rosinger A, Herrick K, Gahche J, Park S. 2017. *Sugar-sweetened beverage consumption among U.S. adults, 2011–2014*. NCHS Data Brief 270, National Center for Health Statistics
126. Rozin P, Scott S, Dingley M, Urbanek JK, Jiang H, Kaltenbach M. 2011. Nudge to nobesity I: Minor changes in accessibility decrease food intake. *Judgm. Decis. Mak.* 6(4):323–32
127. Sadoff S, Samek A. 2019. Can interventions affect commitment demand? A field experiment on food choice. *J. Econ. Behav. Organ.* 158:90–109
128. Sapio S, Vecchio R. 2024. The effect of nudges on healthy food choices of individuals with a low socioeconomic position: a systematic literature review. *Trends Food Sci. Technol.* 147:104475
129. Saulais L, Massey C, Perez-Cueto FJ, Appleton KM, Dinnella C, et al. 2019. When are "dish of the day" nudges most effective to increase vegetable selection? *Food Policy* 85:15–27
130. Schruff-Lim EM, Van Loo EJ, van Kleef E, van Trijp HC. 2023. Turning FOP nutrition labels into action: a systematic review of label+ interventions. *Food Policy* 120:102479

131. Schruff-Lim EM, Van Loo EJ, van der Lans IA, van Trijp HC. 2024. Impact of food swap recommendations on dietary choices in an online supermarket: a randomized controlled trial. *Appetite* 194:107158
132. Shaw SC, Ntani G, Baird J, Vogel CA. 2020. A systematic review of the influences of food store product placement on dietary-related outcomes. *Nutr. Rev.* 78(12):1030–45
133. Sinclair W, Rivera-Cintron D, Zeballos E. 2024. U.S. consumers increased spending on food away from home in 2023, driving overall food spending growth. *Amber Waves*, Oct. 8. **https://www.ers.usda.gov/amber-waves/2024/october/u-s-consumers-increased-spending-on-food-away-from-home-in-2023-driving-overall-food-spending-growth**
134. Skov LR, Lourenco S, Hansen GL, Mikkelsen BE, Schofield C. 2013. Choice architecture as a means to change eating behaviour in self-service settings: a systematic review. *Obesity Rev*. 14(3):187–96
135. Stöckli S, Stämpfli AE, Messner C, Brunner TA. 2016. An (un)healthy poster: when environmental cues affect consumers' food choices at vending machines. *Appetite* 96:368–74
136. Stämpfli AE, Brunner TA. 2016. The art of dieting: Exposure to thin sculptures effortlessly reduces the intake of unhealthy food in motivated eaters. *Food Qual. Prefer.* 50:88–93
137. Sunstein CR. 2015. The ethics of nudging. *Yale J. Regul.* 32:413–50
138. Sunstein CR. 2019. Ruining popcorn? The welfare effects of information. *J. Risk Uncertain.* 58:121–42
139. Thaler RH, Benzartzi S. 2004. Save more tomorrow: using behavioural economics to increase employee saving. *J. Politi. Econ.* 112:164–87
140. Thaler RH, Sunstein CR. 2003. Libertarian paternalism. *Am. Econ. Rev.* 93(2):175–79
141. Thaler RH, Sunstein CR. 2008. *Nudge: Improving Decisions About Health, Wealth, and Happiness*. Yale University Press
142. Thorndike AN, Gelsomin ED, McCurley JL, Levy DE. 2019. Calories purchased by hospital employees after implementation of a cafeteria traffic light-labeling and choice architecture intervention. *Prev. Med.* 86:12–18
143. Thorndike AN, Riis J, Levy DE. 2016. Social norms and financial incentives to promote employees' healthy food choices: a randomized controlled trial. *Prev. Med.* 86:12–18
144. Tijssen I, Zandstra EH, de Graaf C, Jager G. 2017. Why a 'light' product package should not be light blue: effects of package colour on perceived healthiness and attractiveness of sugar- and fat-reduced products. *Food Qual. Prefer.* 59:46–58
145. Vadiveloo M, Guan X, Parker HW, Perraud E, Buchanan A, Atlas S, Thorndike AN. 2021. Effect of personalized incentives on dietary quality of groceries purchased: a randomized crossover trial. *JAMA Netw. Open* 4(2):e2030921
146. Valizadeh P, Ng SW. 2021. Would a national sugar-sweetened beverage tax in the United States be well targeted? *Am. J. Agric. Econ.* 103(3):961–86
147. Van Gestel LC, Kroese FM, De Ridder DT. 2018. Nudging at the checkout counter: a longitudinal study of the effect of a food repositioning nudge on healthy food choice. *Psychol. Health* 33(6):800–9
148. Van Kleef E, Seijdell K, Vingerhoeds MH, de Wijk RA, van Trijp HC. 2018. The effect of a default-based nudge on the choice of whole wheat bread. *Appetite* 121:179–85
149. VanEpps EM, Downs JS, Loewenstein G. 2016. Advance ordering for healthier eating? Field experiments on the relationship between the meal order-consumption time delay and meal content. *J. Mark. Res.* 53(3):369–80
150. Variyam JN. 2008. Do nutrition labels improve dietary outcomes? *Health Econ*. 17:695–708
151. Velema E, Vyth EL, Hoekstra T, Steenhuis IHM. 2018. Nudging and social marketing techniques encourage employees to make healthier food choices: a randomized controlled trial in 30 worksite cafeterias in The Netherlands. *Am. J. Clin. Nutr.* 107(2):236–46
152. Vermeer WM, Steenhuis IH, Seidell JC. 2009. From the point-of-purchase perspective: a qualitative study of the feasibility of interventions aimed at portion size. *Health Policy* 90(1):73–80
153. Volpp KG, John LK, Troxel AB, Norton L, Fassbender J, Loewenstein G. 2008. A randomized controlled trial of financial incentives for weight loss. *JAMA* 300(22):2631–37
154. Vugts A, van den Heuvel E, Havermans RC. 2024. Factors affecting public acceptance of healthy lifestyle nudges. *Soc. Sci. Med.* 350:116899

155. Wansink B, Van Ittersum K. 2003. Portion size me: downsizing our consumption norms. *J. Am. Dietetic Assoc.* 107:1103–6
156. Wansink B, Van Ittersum K. 2013. Portion size me: plate-size induced consumption norms and win-win solutions for reducing food intake and waste. *J. Exp. Psychol. Appl.* 19(4):320–32
157. Wansink B, Van Ittersum K, Painter JE. 2006. Ice cream illusions: bowls, spoons, and self-served portion sizes. *Am. J. Prev. Med.* 31(3):240–43
158. World Health Organization. 2024. Obesity and overweight. WHO. **https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight**
159. World Obesity Federation. 2023. World Obesity Atlas 2023. World Obesity. **https://www.worldobesity.org/resources/resource-library/world-obesity-atlas-2023**
160. Young R, Subramanian R, Hinnant A. 2016. Stigmatizing images in obesity health campaign messages and healthy behavioral intentions. *Health Educ. Behav.* 43(4):412–19
161. Zhang Y, Palma MA. 2021. Revisiting sugar taxes and sugary drink consumption: evidence from the random-coefficient demand model. *J. Agric. Resour. Econ.* 46(1):37–55