CHAPTER 9

The Behavioral Economics of Healthy and Sustainable Food Consumption

Gerrit Antonides

1 Introduction

Food consumption has been driven by other factors than its nutritional value already for a long time. With superior technology and rising income, it has become possible to produce more exciting types of food and also to consume and enjoy it more than ever before. The world food consumption is expected to increase by 50% in 2050 and animal-based food by 70% (Searchinger et al. 2019). Though increasing consumer welfare, this development also creates problems for both individuals and society. In addition to a growing world population and a trend of urbanization, further increasing the demand for food, the production of food has become more voluminous and more intensive, while agricultural resources have remained limited. The one quarter of available land for agriculture on the planet is already fully in use for food production, although this

G. Antonides (✉)
Department of Social Sciences, Wageningen University, Wageningen, The Netherlands
e-mail: gerrit.antonides@wur.nl

M. Altman (ed.), *Constructing a More Scientific Economics*, Palgrave Advances in Behavioral Economics,
https://doi.org/10.1007/978-3-030-83928-4_9

land is increasingly degraded due to intensive or unsustainable production methods (Moomaw et al. 2012). These developments are severely threatening world food security. Another adverse effect of animal-based agricultural production is its 14.5% share of global annual greenhouse gas emissions (Gerber et al. 2013). Other effects of increasing food consumption are health problems, inequality in food consumption, and food waste.

Overconsumption of energy-dense food, together with an increasingly sedentary lifestyle, causes an energy imbalance between calories consumed and calories expended, leading to obesity and overweight. In 2016, 39% of the world population aged 18 years or over were overweight (BMI > 25) and 13% were obese (BMI > 30), respectively, 18% and 7% for children and adolescents (WHO 2020a). In the US, 42.5% of the adult population is considered obese (Hales et al. 2020). Overweight and obesity increase the incidence of heart diseases, strokes, type 2 diabetes, and certain types of cancer, possibly leading to premature death and lead to annual public medical costs in the US of $150 billion (MacEwan et al. 2014).

Although the probability of dying from overweight is larger than in the case of underweight (WHO 2020a), inequality is another issue related to food overconsumption. In 2008, 18% of the global population consumed 39% of grain and 41% of animal protein (Moomaw et al. 2012). Since food import increases in developed countries drives up global food prices, developing countries are adversely affected by the increasing proportion of income spent on food (HLPE 2011). Hirvonen et al. (2020) estimated that 1.58 billion people cannot afford the EAT-Lancet reference diet, which is "a universal reference diet that is healthy for both humans and the planet, minimizing chronic disease risks and maximizing human wellbeing" (p. e59).

Although estimates differ, food losses and food waste in both the food chain and within the household amount to 1/3–1/2 of total food consumption (Stenmarck et al. 2016; FAO 2011). In North America and Oceania, 42% of food is lost or wasted, whereas in North-Africa, non-industrialized Asia, and Latin America, the percentage is less than 20 (World Resources Institute 2019). Also, in North America, industrialized Asia and Europe, over 45% of food waste and loss is caused by consumers, whereas in the rest of the world this percentage is lower than 35. Clearly, in richer countries more food is wasted, especially by consumers.

In the literature, much attention has been paid to health problems due to food overconsumption (e.g., Newton et al. 2017; Poorolajal et al. 2020; Wansink 2006) but relatively little is known about the consumer's choice of sustainable food. Our aim is to provide an overview of factors associated with both healthy and sustainable food consumption without the ambition to provide a complete literature overview. Despite some overlap, factors in consumer decision-making are likely to differ between healthy and sustainable consumption, which is explained in Sect. 2. Section 3 deals with models of consumer decision-making concerning healthy and sustainable food. Section 4 concludes.

2 Comparing Healthy, Organic, and Sustainable Food Choice

Healthy and sustainable food differ in the type of food, the factors influencing their consumption, and the impact on the environment and consumer health. With respect to type of food, healthy foods include poultry, both fresh and processed fish and seafood, fluid milk and cheese, both fresh and processed fruits and vegetables, nuts, and coffee and tea. Unhealthy foods include other types of meat than poultry, eggs, evaporated milk, butter, margarine, and other fats and oils, ice cream, and other frozen dairy products, wheat flour and rice, sugar and sweeteners (Luo and Huang 2012). Unhealthy food usually is more energy-dense than healthy food (Hagenaars et al. 2017).

Almost all healthy and unhealthy foods exist in both organic and nonorganic varieties. Organic has been defined as food produced without use of biocides or chemical fertilizers, without cutting animals' horns, nails, or bills, providing animals with more space to move around in (Bunte et al. 2010), and not genetically modified (USDA 2020), and is often indicated by a food label, e.g., USDA Organic in the US, or the EKO-label in the EU. Although organic food production seems to preserve environmental resources better than nonorganic production, hence producing more sustainable food, the yield per area and time often is less than in nonorganic production (Seufert et al. 2012), hence being less sustainable. The balance of these effects still requires more research. In addition to this, food may differ with respect to transportation distance, packaging, and required land use and resources. For example, beef normally requires 10 times as much energy input to produce 1 kcal of protein than chicken, and almost 6 times as much grain

feed to produce 1 kg of animal product (Pimentel and Pimentel 2003), although different ways of organic farming may require less energy or grain inputs (Broom 2019). Another type of sustainable food consumption is avoiding food waste, which may result from lack of meal planning, impulsive grocery shopping, inadequate food storage, cooking too much, and throwing away leftovers (Van Geffen et al. 2020a).

The impact on the environment does not seem to parallel the impact on human health. Some healthy products like fish and cheese may have adverse effects on the environment, whereas some unhealthy products such as wheat flour and rice may not affect the environment so much. Other products, such as beef, are considered both unhealthy and unsustainable types of food. For this reason, motives for healthy or sustainable food may differ also. Similarly, avoiding food waste by eating leftover food may contribute to sustainability but in some cases may be incompatible with healthy food consumption (Van Geffen et al. 2020b).

Either different factors, or the same factors in different ways, may explain healthy and sustainable food choices, partly because healthy food is known better due to information campaigns and public advice on healthy food consumption, and partly because the choices comprise different motives and objectives (see Table 1). The choice of healthy versus unhealthy food appears to be influenced relatively much by visceral factors and emotions, whereas the choice of sustainable versus unsustainable food is influenced more by cognitive considerations based on information than on nutritional factors.

2.1 Institutions

Institutions may provide the legal, economic, and social environment for food consumption. International institutions such as the World Health Organization, the UN Food and Agriculture Organization, International Food Policy Research Institute, the International Association for Food Protection, the European Union and local governments, food authorities such as the Food and Drugs Administration in the US and the European Food Safety Authority, consumer unions, and dietary advice bodies, each take their share in issuing laws, regulations and advice in order to arrange for food security, food safety, healthy food consumption, and environmental protection.

IFPRI provides information about optimal production systems at both global and local levels (e.g., Fanzo et al. 2020). WHO and FAO provide

Table 1 Factors in consumer decision-making on healthy and sustainable food and their typical focus

Factors	*Healthy food choice*	*Sustainable food choice*
Environmental factors		
Institutions	Food safety	Production quota
Price	Healthy more expensive	Sustainable more expensive
Type of information	Calories	Sustainability
Availability	Abundant	Limited range
Choice architecture		
Personal factors		
Visceral factors	Taste, nutritional value	
Time preference	Pleasure vs health	Resource depletion vs sustainable environment
Attitude		
Norms	Personal/social	Personal/social
Perceived behavioral control		
Values		
Habits		
Emotions	Stress, compulsive behavior	Regret, pride, guilt

information on microbiological and chemical hazards of food, food control systems, new food technologies such as genetic modification and nanotechnology (WHO 2020b). The EU and local governments issue laws and regulations to control and evaluate compliance with EU standards regarding food safety and quality, animal health, animal welfare, animal nutrition, and plant health. Local governments may also control the price mechanism, such as levying lower VAT on basic food items (e.g., all unprocessed food items in the UK) or higher VAT on unhealthy or non-environmentally friendly food (several countries, including the UK and France, are considering a so-called "fat tax"). Dietary guidelines are issued by local authorities, such as USDA (2015) and EU (n.d.).

Although laws, regulations, and advice provide the context for food consumption, by no means they fully determine what people eat. People's dietary decisions may further depend on prices, food availability, personal factors, and choice architecture, to be considered next.

2.2 Price

One of the main factors studied in economic decision-making is price. The own price of a good generally is assumed to have a negative effect on consumption quantity. The price of another good can have a positive effect on consumption if the other good is a substitute, a negative effect if the other good is a complement, or no effect at all. These effects usually are estimated by own-price and cross-price elasticities indicating by what percentage consumption changes by a percentage change in price. In particular, here we are interested in price elasticities with respect to healthy versus unhealthy food, and sustainable versus unsustainable food.

Zheng and Zhen (2008) found negative own-price elasticities for both unhealthy and healthy food in the US (−0.53 and −0.34 resp.) and Japan (−1.01 and −1.29 resp.), indicating that both types of goods were consumed less if price increased. However, cross-price elasticities were not significantly different from zero, indicating that unhealthy and healthy food were not substitutes of each other. Similar results were obtained in Luo and Huang (2012) for the US. However, Andreyeva et al. (2010) in their meta-study report positive consumption quantity changes of low-fat milk (cross-price elasticities ranging from 0.06 to 0.5) and skim milk (cross-price elasticities ranging from 0.01 to 0.29) with price increases of whole milk. Cornelsen et al. (2015) studied price elasticities of different types of food, including fruit and vegetables, meat, fish, dairy, cereals, fats and oils, and sweets, for countries with low, middle, and high incomes. They find generally negative own-price elasticities higher than −1, and varying cross-price elasticities across countries with different incomes. For both low-income and high-income countries cross-price elasticities between sweets and cereals (high caloric density), and other types of food, were positive in general, but less so for middle-income countries. This result suggests that in some countries unhealthy food is substituted for healthy food in case of an unhealthy food price increase but not in other countries. Although price may affect the consumption of healthy and unhealthy food, Powell and Shaloupka (2009) found little effect of price on overweight and obesity in their meta-analysis, although in some case the effects were larger for low socioeconomic status and overweight populations.

Regarding the consumption of organic and conventional food, organic fruit consumption in the US is still low and ranges between 2.8 and 12.1% (Lin et al. 2009). Negative own-price elasticities were found for organic

apples, bananas, and grapes, and for all conventional types of fruit. More positive cross-price elasticities were found between organic and conventional fruit than between conventional and organic fruits, suggesting that consumers are more likely to substitute organic fruits for conventional fruits with a price increase in organic fruits than vice versa with a price increase of organic fruits. Bakhtavoryan et al. (2019) find negative own-price elasticities for both organic and conventional flour in the US. In addition, they find a large positive cross-price elasticity between conventional and organic flour and a small negative cross-price elasticity between organic and conventional flour. This result is consistent with the findings of Lin et al. (2009).

2.3 Information

Consumer information about healthy and sustainable food centers around dietary guidelines and food labeling. Dietary guidelines may be issued by governments, NGOs, or private institutions. Guidelines may focus on limiting calorie intake, limiting consumption of nutrient-dense food, and increasing food intake variety (USDA 2015), which may be adapted to the local culture, production, and accessibility of food (FAO, n.d.; European Commission, n.d.). A relatively recent development is adding environmental aspects to the dietary guidelines in order to promote sustainable food intake, for example, by recommending eating local and seasonal foods (IOM 2014). The Health Council of the Netherlands (2011) recommended a less-animal based and more plant-based diet which serves to reduce both the risk of cardiovascular disease and environmental impact. Another recommendation is reduced energy intake for overweight people, aimed at reducing both the risk of diabetes, cardiovascular disease, and certain forms of cancer, and the demand for food, thus lowering production and ecological impact.

Food labeling usually takes the form of nutrient declarations on the food packaging. The EU has extensive regulation regarding the contents of the labeling (Purnhagen and Schebesta 2019), including, among other issues, the name of the food, the list of ingredients and their quantities, allergens, quantity, date, storage and use conditions, and nutrition declaration. The regulation is based on a philosophy of "permit but inform," which is supposedly easier to implement than regulating the contents of the food on the markets. However, although consumers usually can read

and understand the labels (Viola et al. 2016), the risk of information overload and bounded rationality of consumers may reduce the motivation to pay due attention to the labels.

In order to reduce the cognitive effort in reading and interpreting labels, "traffic-light labeling," indicating low (green), medium (yellow), and high (red) content of unhealthy ingredients (fat, salt, sugar) by colors, has been used (Sacks et al. 2011). Traffic-light labels can be observed at a glance, can easily be interpreted, and lead to 5–14% reductions of unhealthy ingredient intake on average (Emrich et al. 2017), predominantly by avoiding products containing red-marked ingredients. Traffic-light labels have been found equally effective in reducing calorie intake as numeric information in the case of workplace lunch orders (VanEpps et al. 2016).

Healthy food labeling has been supplemented with sustainable food labeling. A variety of sustainability labels exist, including labels for Fair Trade, Animal Welfare, Rainforest Alliance, Carbon Footprint, and the EU EKO-label. Results from a choice experiment shows that consumers tend to choose organic or green-labeled rice more often than rice without such label (Liu et al. 2017). However, field data on the effect of sustainable food labels is still lacking.

2.4 Availability

The recommended number of calories needed per day to keep a healthy weight equals 1600–2400 for women, and 2000–3000 for men (USDA 2015). As noticed above, to a large part of the world population this quantity is not available, for various reasons, including droughts, floods, plagues, wars, and inefficient agricultural techniques. A simple measure of food insecurity, based on self-reports, is the household food insecurity access scale (Swindale and Bilinsky 2006; Coates et al. 2007). This scale assesses feelings of uncertainty or anxiety about the food situation, perceived quantity and quality of food, reductions in food intake and their consequences, and feelings of shame over socially unacceptable means to obtain food, in the past few weeks (cf. Namayengo et al. 2018). In addition to calories, a number of different nutrients should be included in a healthy diet, which may be assessed by the household diet diversity score measuring the number of food groups consumed in the past 24 hours (Swindale and Bilinsky 2006). Insufficient nutrient intake may occur for a variety of reasons.

Even in a relatively rich country like the US the availability of healthy food in stores and supermarkets differs substantially across areas with subsequent impact on dietary pattern scores of the residents in those areas. Dietary patterns of unhealthy foods such as fat and processed meats are more prevalent and patterns of healthy food consumption such as whole grains and fruit are less prevalent in areas with relatively many black people, lower incomes and lower education, and among males rather than females (Franco et al. 2009). Walker et al. (2010) show that inner-city areas usually contain less supermarkets where healthy food is available and more small stores where healthy food is unavailable (so-called food deserts). At the same time, food deserts tend to be populated with people with lower income, and black people.

Even when healthy food is available in supermarkets, the price of healthy food may be much higher than the price of unhealthy food (69% higher on average in rural South Africa), leading to relatively high proportions of the household budget spent on food (Temple et al. 2011; Wong et al. 2011). A special kind of food availability is farmers' food reserve after harvest which has been found to be consumed in too large quantities at the expense of other kinds of food (Huang et al. 2020a). By selling more of their own produce, the farmers might have had means available to buy greater food variety than from their own produce.

2.5 Personal Factors

Several personal factors may influence people's food consumption decisions, including visceral factors, impulsivity, compulsivity, and time preference, as one cluster of interrelated motivations for eating behaviors.

2.5.1 Visceral Factors

Visceral factors include biological states of an organism, such as hunger, thirst, and craving, driving certain behaviors while diminishing cognitive control over decision-making with regard to such behaviors. Feelings of hunger may drive individuals to overeating (Loewenstein 1996), and "mouth-watering" may lead to quite specific food desires, such as fresh-baked bread or coffee. Several circumstances may influence visceral states, including proximity and vividness of sensory stimuli, and how recently the drive was satisfied (Loewenstein 1996). Visceral states may induce impulsivity by enhancing the focus on present wants and reducing attention to the future thus, for example, leading to short-sighted tradeoffs between

immediate and delayed food, binge eating and reduced attention for its consequences. Visceral states may also reduce altruistic behavior (Loewenstein 1996), eventually leading to decreased probability of consuming sustainable food to the extent that sustainable food consumption is driven by altruistic motivations toward future generations.

Visceral states may increase the temporal discounting of food items that are tempting—defined as the visceral attraction to and enjoyment of a reward (Tsukuyama and Duckworth 2010). Different temporal discounting for different food items indicates specific time preference for items within a particular domain, different from time preference of items in different domains, i.e., domain specificity. Domain-specific time preferences have been shown in higher discount rates for beer than candy by beer lovers and higher discount rates for candy than beer by candy lovers (Tsukuyama and Duckworth 2010). Van Beek et al. (2013) adapted the Consideration of Future Consequences scale (CFC)—a verbal type of time orientation scale (Strathman et al. 1994; Petrocelli 2003)—separately for both eating and exercising behaviors, in accordance with the idea of domain specificity. They found that the CFC for eating predicted healthy eating behavior but not exercising, whereas the CFC for exercising predicted both healthy eating and exercising behavior, thus showing partial domain-specific time orientation.

2.5.2 Theory of Planned Behavior

To the extent that visceral drives are satisfied by consumption, they may also be related to attitudes toward specific food items. Although attitudes have been defined in different ways (Antonides 1989), the Theory of Planned Behavior (TPB) (Ajzen 2005; Fischbein and Ajzen 1975) has adopted a two-component specification, earlier developed by Rosenberg (1956). Attitude has been specified as a function of expectations that relevant object attributes contribute to certain outcomes, multiplied by evaluations of the relevant outcomes. For example, the expectation that vitamins (as food attributes) in a vegetable (the object) contribute to one's health (an outcome of food consumption), multiplied by how favorable one's health is evaluated, contributes to the attitude toward that vegetable. The expectation–evaluation products are then summed over all relevant attributes of the object to result in the total attitude toward the object. Attitudes are expected to be positively related to the intention to act with respect to the object, e.g., the intention to consume a vegetable. The ability of food consumption to satisfy visceral drives contributes to

the evaluation components of attitudes toward food items, although this mechanism is yet little understood. In addition, many other factors may shape expectations and evaluations, including product information and personal values.

Other concepts in the TPB include injunctive norms, considered below, and perceived behavioral control, reflecting one's perception of the ability or easiness to perform the behavior (Ajzen 2005). Social and personal norms are important factors driving both healthy and sustainable food consumption. Social norms comprise both descriptive norms—perceptions of the quantity and frequency of other people's behaviors—and injunctive norms—perceptions of what behaviors relevant other people find acceptable or desirable (Cialdini et al. 1990; Onwezen et al. 2013a). In general, descriptive norms appear to influence behavior more than injunctive norms (Melnyk et al. 2010). Personal norms reflect feelings of moral obligation to perform or refrain from specific actions (Schwartz 1977; Steg and De Groot 2010; Onwezen et al. 2013b).

Personal norms have been found to be positively related to consumption of fruit and vegetables (Wang and Worsley 2014; Onwezen et al. 2013b), indicating its impact on healthy food consumption. Also, personal norms have been positively related to the consumption of organic food (Koklic et al. 2019; Onwezen et al. 2013b), indicating its impact on sustainable consumption.

Injunctive social norms have been found to be positively related to intentions to consume dairy products, usually considered to be an organic type of consumption (Vermeir and Verbeke 2006). Onwezen et al. (2013a) showed that both descriptive and injunctive norms were positively related to both organic food and fairtrade food consumption, with descriptive norms having stronger effects than injunctive norms.

All three concepts of the TPB have been found to contribute positively to intentions to consume healthy or sustainable food (see, e.g., Aertsens et al. 2009; Onwezen et al. 2013b; Huang et al. 2020b; Dowd and Burke 2013).

2.5.3 Values

Values have been defined as desirable transsituational goals, serving as guiding principles in the life of a person (Schwartz 1994), and are considered as relatively stable and independent from different types of consumption. Schwartz's value system comprises ten different domains, which have

been culturally validated across the world (Schwartz 1994), including self-direction, stimulation, hedonism, achievement, power, security, conformity, tradition, benevolence, and universalism. Several values have been shown to be related to healthy or sustainable food consumption, either or not via the concept of attitude. Lee et al. (2014) show that values of self-direction, hedonism, security, and benevolence are related to the consumption of healthy drinks (e.g., yoghurt drinks, fruit and vegetable juices, and teas) because of their associations with choosing one's own goals, pleasure and enjoyment, not getting sick, and benefits to the family, respectively. Thøgersen and Olander (2002) show that people's reported importance of universalism—understanding, appreciation, tolerance, and protection for the welfare of all people and for nature—is positively related to their reported consumption of sustainable goods, including several food items. Aertsens et al. (2009) summarize evidence of relationships of all Schwarz's values (except achievement and tradition) with organic food consumption. Shin et al. (2017) show how biospheric values—defined as judgments of phenomena on the basis of costs or benefits to ecosystems or the biosphere (Stern and Dietz 1994; Stern et al. 1998)—influence consumer choice of paying more for an organic menu at a restaurant via pro-environmental attitudes.

2.5.4 Emotions

Another personal factor influencing eating behavior comprises emotions (Canetti et al. 2002). It has been found that feelings of boredom, depression, and fatigue are associated with higher food consumption, whereas fear, tension, and pain are associated with lower food intake (Mehrabian 1980). Macht (1999) found an increase in impulsive eating during anger, and an increase in hedonic eating during joy. Lyman (1982) found higher healthy food consumption during positive emotions and higher junk food consumption during negative emotions. With respect to organic food consumption, Verhoef (2005) found that fear tended to stimulate it, possibly because fear may be driven by uncertainty, and health risk (Aertsens et al. 2009). Onwezen et al. (2013a, 2013b) showed that anticipated pride and guilt were positively related to both organic and fairtrade food consumption. Van Geffen et al. (2020b) show that food waste is negatively related to feelings of guilt.

2.5.5 Habits

Since habitual behavior is less well-explained by the TPB (Bagozzi 1981), habits have been added to this model. In Verbeke and Vackier (2005), habit was positively related to eating fish; Huang et al. (2020b) found positive effects of habit on consumption of eggs, dairy, fish, and fruit; Russell et al. (2017) found a strong positive effect of habit on food waste behavior. Habits are difficult to change. Opportunities for change often occur with important life events, such as family composition changes, and house or job moves (Verplanken and Roy 2015).

2.6 Choice Architecture

One way to influence people choices is to structure the choice environment in a particular way: "A choice architect has the responsibility for organizing the context in which people make decisions" (Thaler et al. 2013, p. 428). Typically, choices can be made using two different systems of thinking (Kahneman 2011). Type I thinking uses one's intuition and gut feelings, which is fast because deliberation is omitted. It is also often the default type of making choices. Type II thinking is deliberative, using reasoning and weighing positive and negative aspects of decision outcomes. It often comes into play if System I type of thinking shows failures. Since consumers typically do not want to take the effort or time to use System II, they usually resort to System I type of thinking. Most neoclassical economic models as well as the TPB (see above) are based on System II type of thinking since they assume the efficient use of information and deliberation (Antonides 2008). In order to simplify choice, choice architects tend to influence choices by playing on System I type of thinking which includes several choice heuristics, the use of defaults, asymmetry of positive and negative information, and subjective discounting of the future, among many other phenomena.

With regard to healthy and sustainable food choices, choice architecture has been suggested in public policy and marketing as a way of influencing people's choices (Antonides 2011; Sunstein 2014; Just 2011). Contrast effects—presenting a product in the presence of an inferior alternative—and compromise effects—presenting a product in between products with extreme attributes (e.g., very expensive and very cheap products)—are known to influence people's choices (Simonson 1999). A very powerful aspect of choice architecture is presenting a default choice alternative. Just and Price (2013) showed that offering fruits and

vegetables during elementary-school children's lunches led to 8% more consumption of these items. Van Dam and De Jonge (2015) showed that negative labeling of another food item led to higher preference for sustainable food than positive labeling of the sustainable food itself, thus pointing to the asymmetry in the effects of positive and negative information.

The increasing fraction of obesity in society shows that people eat too much unhealthy food, meanwhile disregarding the future consequences of such behavior, indicating high impatience for eating. One change in the choice environment that seems to help people to overcome such behavior is commitment to more healthy behavior. Coupe et al. (2019) show that a verbal or written commitment to stick to healthy behavior, witnessed by another person, on average results in more additional weight loss than in weight loss programs without such commitment, both in the short run and over longer time periods. The website Stickk.com serves as a tool to make such commitments for a variety of behaviors.

Thaler and Sunstein (2008) and Sunstein (2014) advise to simplify information for consumers in order to help them to make better choices. In this respect, labeling healthy or sustainable food should be quite effective in stimulating consumption of these types of food. Furthermore, warnings, reminders, eliciting implementation intentions (e.g., "do you plan to eat more sustainably?"), and informing people of the nature and consequences of their own past food choices (Sunstein 2014; Tomer 2018).

Some types of choice architecture work against making healthy choices. One such factor is distraction, shown in Shiv and Fedorikhin (1999). Consumers were offered a choice between a healthy fruit salad and unhealthy chocolate cake. Those who were distracted by having to repeat a 7-digit number more often chose the chocolate cake than those were not distracted by having to repeat a 2-digit number, who chose the fruit salad more often. The experiment shows that hampering System II type of choices may lead to unhealthy food choices. An interesting extension of this research is related to preparing a shopping list before buying groceries at the store. Contrary to intuition—suggesting that preparing a shopping list would result in less impulse buying—making a shopping list appears to result in more unhealthy food choices (Rottenstreich et al. 2007). The mechanism behind this finding is that a shopping list is a memory-based choice which tends to deplete one's cognitive capacity, thus hampering the operation of System II and leading to relatively many

choices of chocolate cake and cheesecake. In contrast, shopping in the store is stimulus-based requiring less cognitive resources, thus leading to less unhealthy food choices.

Although choices based on System I type of thinking may not be optimal, in a number of cases they seem to increase people's well-being more than choices based on System II type of thinking (see Antonides and Van Klaveren 2018).

An interesting question is what type of choice architecture is most effective in changing people's behavior with respect to healthy food choices. Cadario and Chandon (2020) aim at answering this question in their meta-analysis of field studies. They distinguish between cognitive effects, such as calorie counts or nutrient information, traffic-light labeling, and prominent placement of healthy options at eye level in the store or on the menu of a restaurant; affective effects, such as vivid descriptions of healthy food, and healthy eating appeals (e.g., "make a fresh choice"); and behaviorally oriented effects, such as default options for healthy food, and size enhancements (either increasing the amount of healthy food or reducing the amount of unhealthy food in the food options). The effect sizes (d) indicate that cognitive factors are the least effective ($d = 0.12$ on average); affective factors are moderately effective ($d = 0.24$ on average); and behavioral factors are most effective ($d = 0.39$ on average; $d = 0.59$ for size enhancements). A meta-analysis regarding choice architecture for sustainable food is still lacking, to the best of our knowledge.

3 A Comprehensive Model of Food Choice

Section 2 shows a relatively large number of factors influencing healthy and sustainable food choices. Very few attempts have been made to integrate these factors in a comprehensive model, although several models deal with such factors in a partial way, notably the economic theory of demand, and the TPB. Other models are Wądołowska et al. (2008) comprising food and package characteristics, advertising, price, and sociodemographic factors, and Shepherd et al. (2005) relating health and environmental attitudes to organic food choice. A few models combine economic, social, and psychological variables in explaining food choice, notably Shepherd (1999) and Tomer (2011, 2013).

Shepherd (1999) distinguishes between food-related, person-related, and economic and social factors. Physical and chemical properties of food

and nutrient content lead to both physiological effects (e.g., appetite) and perceptions of sensory attributes (e.g., taste). Price, availability, brand, and social and cultural variables, together with psychological factors (e.g., personality, mood, beliefs) and perceptions may lead to food attitudes. In turn, food attitudes, together with physiological and psychological factors may influence food choice and food intake.

Tomer (2013) distinguishes external factors, including technological changes, market factors, infrastructure related to both food and exercise, and advice from health practitioners, from internal factors, including social capital, health capital, personal capital, and biological factors in explaining diet and life pattern choices, and habits related to food and exercise. Tomer's social, health, and personal capital factors (2013) include a number of variables, such as genetic inheritance, emotional intelligence, self-control and time preference, lifestyle patterns, and choice architecture.

To structure the determinants of food choice behavior considered in Sect. 2, we employ a well-known distinction from attitude theory in social psychology between cognitive, affective, and behavioral components (Rosenberg and Hovland 1960), which was also applied in Cadario and Chandon (2020) and combine this distinction with the external/internal distinction from Tomer (2013) in explaining healthy and sustainable food choices. Then, we impute our variables from Sect. 2 into the relevant categories that emerge from this combination. Table 2 summarizes the model,

Table 2 Structure of food choice determinants

Factors	*External factors*	*Internal factors*
Cognitive	Prices Information Labeling	Norms Values Perceived behavioral control
Affective	Vivid descriptions and appeals	Visceral factors Attitude Emotions Time preference
Behavioral	Institutions Availability Default options Size enhancements	Habits
Behavior	Healthy food choice Sustainable food choice	

showing the categorization of factors into external and internal factors, and cognitive, affective and behavioral factors, affecting both healthy and sustainable behavior.

We noticed that healthy and sustainable food need not be the same, although it is possible that they are the same for some types of food. In general, "there is no unambiguous evidence that organic foods are healthier than conventionally produced foods" (Shepherd et al. 2005, p. 352). However, health benefits appear to be prominent in the consumer's perception of organic food (Shepherd et al. 2005) especially for those who are strongly or moderately environmentally conscious, but not for the so-called pro-self—who find price, healthiness, and taste relatively important (Verain et al. 2016). Hence, the determinants that directly influence healthy food choice may also indirectly contribute to sustainable food choice.

4 Discussion and Conclusions

We have provided a broad but non-exhaustive overview of factors involved in healthy and sustainable food choice and categorized them in a sort of comprehensive model. However, since most research takes into account only a few factors to explain a certain type of food behavior, an overview of all relevant factors in relation to multiple food choices is still lacking. Yet, such a meta-analysis seems highly useful, as Cadario and Chandon (2020) have shown in the area of choice architecture regarding healthy food decision-making. Policy makers and practitioners may benefit from such effort by selecting the most promising factors and by developing interventions aimed at changing them to bring about desired changes in healthy and sustainable consumption. Increasing healthy and sustainable food availability and changing the default of unhealthy/unsustainable into healthy sustainable food may directly impact on behavior, which might be the most effective type of intervention. Also, changing habits, possibly at the time of a life event, may directly affect behavior. An overview of different policy instruments aimed at health aspects, organic food, emissions, and food waste is provided in Reisch et al. (2013), including reducing meat, increasing the share of organic and vegetarian food in public cafeterias, and increasing the range of regional food in retail markets, among others. Furthermore, segmentation of the population in terms of light, medium, and heavy users of healthy and sustainable food,

and characteristics of these segments may be useful in order to aim interventions at segments effectively (Verain et al. 2016, 2017). Aertsens et al. (2009) suggest that light and medium user segments have the highest potential of market growth.

Often, the influence of several factors on food behavior is studied, enabling to gauge the size of their effects separately. What is still lacking are studies of factor combinations, e.g., cognitive, affective, or behavioral factors in combination, or internal and external factors in combination. The interaction of factors may be even more powerful than the sum of individual factors (cf. Tomer 2018; Wilkes et al. 2016). Governments and NGOs could develop interventions aimed at several factors together and experiment with different combinations, aimed at segments or parts of the population rather than population wide. Furthermore, monitoring changes in factors, and changes in impact on healthy and sustainable behavior is essential for making progress in the development of interventions (Steg and Vlek 2009).

An implication of the relatively low cross-price elasticities reported in Sect. 2 is that substitution effects have only small effects on both healthy and sustainable food consumption. Government interventions could be aimed more at showing people healthy and sustainable alternatives to unhealthy and unsustainable consumption, rather than focusing on one type of food at a time.

A systematic study of multiple food consumption behaviors is preferred to studies of single food consumption behavior. The latter type of studies tends to neglect alternative choice options, associated with substitution effects. For example, making healthy or sustainable food choices with respect to one type of food may lead to negative spillovers to consumption of other, unhealthy or unsustainable, types of food (cf. Thøgersen 1999), due to moral licensing, i.e., feeling free to act immorally after an initial moral act (Adriaanse and Prinsen 2017). Spillover behaviors and moral licensing have implications for the portfolio of food choices rather than for behavior regarding a single food item.

A problem with the definition of what is healthy and sustainable food remains, despite several definitions provided by governmental bodies and NGOs. Also, such definitions tend to change over time (e.g., milk was considered healthy for a long time which now has been reconsidered because of its relatively high fraction of saturated fat content). Furthermore, the ecological footprint of organic food is often unknown, which

makes it difficult for consumers to decide what to buy. In addition, health and sustainability aspects may be incompatible in certain types of food.

Although we have provided a broad overview of factors influencing healthy and sustainable food behaviors, the most promising factors for policy making are those which directly impact on behavior. These factors comprise laws and regulations provided by institutions, the availability of healthy and sustainable food, the strategic use of default options and size enhancements, and habit changes.

References

Adriaanse, M., & Prinsen, S. (2017). Justification as antecedent and consequence of self-control failure. In D. De Ridder, M. Adriaanse, & K. Fujita (Eds.), *The Routledge international handbook of self-control in health and well-being* (pp. 206–218). New York: Routledge.

Aertsens, J., Verbeke, W., Mondelaers, K., & Van Huylenbroeck, G. (2009). Personal determinants of organic food consumption: A review. *British Food Journal, 111*(10), 1140–1167.

Ajzen, I. (2005). *Attitudes, personality, and behavior*. Berkshire, UK: McGraw-Hill.

Andreyeva, T., Long, M. W., & Brownell, K. D. (2010). The impact of food prices on consumption: A systematic review of research on the price elasticity of demand for food. *American Journal of Public Health, 100*(2), 216–222.

Antonides, G. (1989). An attempt at integration of economic and psychological theories in consumption problems. *Journal of Economic Psychology, 10*, 77–99.

Antonides, G. (2008). Comparing models of consumer behavior. In A. Lewis (Ed.), *The Cambridge handbook of psychology and economic behavior* (Chapter 10, pp. 227–252). Cambridge, UK: Cambridge University Press.

Antonides, G. (2011). Behavioral economics applied. Suggestions for policy making. In P. Martin, F. Cheung, M. Kyrios, L. Littlefield, M. Knowles, J.-M. Prieto, & J.B. Overmier (Eds.), *The IAAP handbook of applied psychology* (pp. 500–524). Chichester, UK: Wiley-Blackwell.

Antonides, G., & Van Klaveren, C. (2018). Consumers and households: Materialism, nonmaterialism and subjective well-being. In A. Lewis (Ed.), *The Cambridge handbook of psychology and economic behavior* (Chapter 11, pp. 340–364). Cambridge, UK: Cambridge University Press.

Bagozzi, R. P. (1981). Attitudes, intentions, and behavior: A test of some key hypotheses. *Journal of Personality and Social Psychology, 41*, 607–627.

Bakhtavoryan, R., Poghosyan, A., Lopez, J. A., & Ogunc, A. (2019). An empirical analysis of household demand for organic and conventional flour in the

United States: Evidence from the 2014 Nielsen Homescan Data. *Journal of Agribusiness, 37*(2), 97–115.

Broom, D. M. (2019). Land and water usage in beef production systems. *Animals, 9*, 286.

Bunte, F. H. J., Van Galen, M. A., Kuiper, W. E., & Tacken, G. (2010). Limits to growth in organic sales. *De Economist, 158*(4), 387–410.

Cadario, R., & Chandon, P. (2020). Which healthy eating nudges work best? A meta-analysis of field experiments. *Marketing Science, 39*(3), 465–486.

Canetti, L., Bachar, E., & Berry, E. M. (2002). Food and emotion. *Behavioural Processes, 60*, 157–164.

Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology, 58*(6), 1015–1026.

Coates, J., Swindale, A., & Bilinsky, P. (2007). *Household food insecurity access scale (HFIAS) for measurement of food access: Indicator guide*. Washington, DC: Food and Nutrition Technical Assistance Project, Academy for Educational Development.

Cornelsen, L., Green, R., Turner, R., Dangour, A. D., Shankar, B., Mazzocchi, M., & Smith, R. D. (2015). What happens to patterns of food consumption when food prices change? Evidence from a systematic review and meta-analysis of food price elasticities globally. *Health Economics, 24*, 1548–1559.

Coupe, N., Peters, S., Rhodes, S., & Cotterill, S. (2019). The effect of commitment-making on weight loss and behaviour change in adults with obesity/overweight; a systematic review. *BMC Public Health, 19*, 816.

Dowd, K., & Burke, K. J. (2013). The influence of ethical values and food choice motivations on intentions to purchase sustainably sourced foods. *Appetite, 69*, 137–144.

Emrich, T. E., Qi, Y., Lou, W. Y., & L'Abbe, M. R. (2017). Traffic-light labels could reduce population intakes of calories, total fat, saturated fat, and sodium. *PLoS ONE 12(2)*, e0171188.

European Commission. (n.d.). European dietary guidelines. Available at: https://ec.europa.eu/jrc/en/health-knowledge-gateway/promotion-prevention/nutrition/food-based-dietary-guidelines.

Fanzo, J., Covic, N., Dobermann, A., Henson, S., Herrero, M., Pingali, P., & Staal, S. (2020). A research vision for food systems in the 2020s: Defying the status quo. *Global Food Security, 26*, 100397.

FAO. (2011). *Global food losses and food waste—Extent, causes and prevention*. Rome.

FAO. (n.d.). FAO dietary guidelines. Accessed at http://www.fao.org/nutrition/education/food-dietary-guidelines, 16 October 2020.

Fischbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior*. Reading, MA: Addison-Wesley.

Franco, M., Diez-Roux, A. V., Nettleton, J. A., Brancati, F., Caballero, B., Glass, T., & Moore, L. V. (2009). Availability of healthy foods and dietary patterns: The multi-ethnic study of atherosclerosis. *American Journal of Clinical Nutrition, 89*, 897–904.

Gerber, P. J., Steinfeld, H., Henderson, B., Mottet, A., Opio, C., Dijkman, J., Falcucci, A., & Tempio, G. (2013). *Tackling climate change through livestock—A global assessment of emissions and mitigation opportunities*. Food and Agriculture Organization of the United Nations (FAO), Rome.

Hagenaars, L. L., Jeurissen, P. P. T., & Klazinga, N. S. (2017). The taxation of unhealthy energy-dense foods (EDFs) and sugar-sweetened beverages (SSBs): An overview of patterns observed in the policy content and policy context of 13 case studies. *Health Policy, 212*(8), 887–889.

Hales, C. M., Carroll, M. D., Fryar, C. D., & Ogden, C. L. (2020). *Prevalence of obesity and severe obesity among adults: United States, 2017–2018*. NCHS Data Brief, no 360. Hyattsville, MD: National Center for Health Statistics.

Health Council of the Netherlands. (2011). *Guidelines for a healthy diet: The ecological perspective*. The Hague.

Hirvonen, K., Bai, Y., Headey, D., & Masters, W. A. (2020). Affordability of the EAT–*Lancet* reference diet: A global analysis. *The Lancet, 8*(1), E59–E66.

HLPE (2011). *Price volatility and food security*. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome.

Huang, J., Antonides, G., & Nie, F. (2020a). Is mental accounting of farm produce associated with more consumption of own-produced food? *Journal of Behavioral and Experimental Economics, 88*, 101594.

Huang, Y., Antonides, G., & Nie, F. (2020b). Social-psychological factors in food consumption of rural residents: The role of perceived need and habit within the theory of planned behavior. *Nutrients, 12*, 1203.

IOM (Institute of Medicine). (2014). Options and approaches to enable sustainable food choices. In *Sustainable diets: Food for healthy people and a healthy planet: Workshop summary* (Chapter 5). Washington, DC: The National Academies Press.

Just, D., & Price, J. (2013). Using incentives to encourage healthy eating in children. *Journal of Human Resources, 48*(4), 872–885.

Just, D. R. (2011). Behavioral economics and the food consumer. In J. L. Lusk, J. Roosen, & J. F. Shogren (Eds.), *The Oxford handbook of the economics of food consumption and policy* (pp. 99–118). Oxford, UK: Oxford University Press.

Kahneman, D. (2011). *Thinking fast and slow*. New York: Farrar, Straus and Giroux.

Koklic, M. J., Golob, U., Podnar, K., & Zabkar, V. (2019). The interplay of past consumption attitudes and personal norms in organic food buying. *Appetite, 137*, 27–34.

Lee, P. Y., Lusk, K., Mirosa, M., & Oey, I. (2014). The role of personal values in Chinese consumers' food consumption decisions. A case of healthy drinks. *Appetite, 73*, 95–104.

Lin, B.-H., Yen, S. T., Huang, C. L., & Smith, T. A. (2009). U.S. demand for organic and conventional fresh fruits: The roles of income and price. *Sustainability, 1*, 464–478.

Liu, Q., Yan, Z., & Zhou, J. (2017). Consumer choices and motives for eco-labeled products in China: An empirical analysis based on the choice experiment. *Sustainability, 9*(3), 331.

Loewenstein, G. (1996). Out of control: Visceral influences on behavior. *Organizational Behavior and Human Decision Processes, 65*(3), 272–292.

Luo, H. L., & Huang, C. L. (2012). *Journal of Agribusiness, 30*(1), 69–85.

Lyman, B. (1982). The nutritional values and food group characteristics of food preferred during various emotions. *Journal of Psychology, 112*, 121–127.

MacEwan, J. P., Alston, J. M., & Okrent, A. M. (2014). The consequences of obesity for the external costs of public health insurance in the United States. *Applied Economic Perspectives and Policy, 36*(4), 696–716.

Macht, M. (1999). Characteristics of eating in anger, fear, sadness and joy. *Appetite, 33*, 129–139.

Mehrabian, A. (1980). *Basic dimensions for a general psychological theory*. Cambridge: Oelschlager, Gunn & Hain.

Melnyk, V., Van Herpen, E., & Van Trijp, H. (2010). The influence of social norms in consumer decision making: A meta-analysis. *Advances in Consumer Research, 37*, 463–464.

Moomaw, W., Griffin, T., Kurczak, K., & Lomax, J. (2012). *The critical role of global food consumption patterns in achieving sustainable food systems and food for all*. UNEP Discussion Paper, United Nations Environment Programme, Division of Technology, Industry and Economics, Paris, France.

Namayengo, F. M., Antonides, G., & Cecchi, F. (2018). Microcredit and food security: Evidence from rural households in Uganda. *Journal of African Economies, 27*(4), 457–482.

Newton S., Braithwaite D., & Akinyemiju T.F. (2017). Socio-economic status over the life course and obesity: Systematic review and meta-analysis. *PLoS ONE 12*(5), e0177151.

Onwezen, M., Bartels, J., & Antonides, G. (2013a). The self-regulating function of anticipated pride and guilt in sustainable and healthy consumption. *European Journal of Social Psychology, 44*, 53–68.

Onwezen, M., Bartels, J., & Antonides, G. (2013b). The Norm Activation Model: An exploration of the functions of anticipated pride and guilt in environmental behavior. *Journal of Economic Psychology, 39*, 141–153.

Petrocelli, J. V. (2003). Factor validation of the consideration of future consequences scale: Evidence for a short version. *The Journal of Social Psychology, 143*, 405–413.

Pimentel, D., & Pimentel, M. (2003). Sustainability of meat-based and plant-based diets and the environment. *American Journal of Clinical Nutrition, 78*, 660S-663S.

Poorolajal, J., Sahraei, F., Mohamdadi, Y., Doosti-Irani, A., & Moradi, L. (2020). Behavioral factors influencing childhood obesity: A systematic review and meta-analysis. *Obesity Research & Clinical Practice, 14*, 109–118.

Powell, L. M., & Shaloupka, F. J. (2009). Food prices and obesity: Evidence and policy implications for taxes and subsidies. *The Millbank Quarterly, 87*(1), 229–257.

Purnhagen, K. P., & Schebesta, H. (2019). *Food labeling for consumers EU law, regulation and policy options*. Policy Department for Citizens' Rights and Constitutional Affairs Directorate General for Internal Policies of the Union PE 608.871.

Reisch, L., Eberle, U., & Lorek, S. (2013). Sustainable food consumption: An overview of contemporary issues and policies. *Sustainability: Science Practice and Policy, 9*(2), 7–25.

Rosenberg, M. J. (1956). Cognitive structure and attitudinal affect. *Journal of Abnormal and Social Psychology, 53*, 367–372.

Rosenberg, M. J., & Hovland, C. I. (1960). Cognitive, affective, and behavioral components of attitudes. In M. J. Rosenberg, C. I. Hovland, W. J. McGuire, R. P. Abelson, & J. W. Brehm (Eds.), *Attitude organization and change: An analysis of consistency among attitude components* (pp. 1–14). New Haven: Yale University Press.

Rottenstreich, Y., Sood, S., & Brenner, L. (2007). Feeling and thinking in memory-based versus stimulus-based choices. *Journal of Consumer Research, 33*, 461–469.

Russell, S. V., Young, C. W., Unsworth, K. L., & Robinson, C. (2017). Bringing habits and emotions into food waste behavior. *Resources, Conservation & Recycling, 125*, 107–114.

Sacks, G., Tikellis, K., Millar, L., & Swinburn, B. (2011). Impact of 'traffic-light' nutrition information on online food purchases in Australia. *Australia and New Zealand Journal of Public Health, 35*(2), 122–126.

Schwartz, S. H. (1977). Normative influence on altruism. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 221–279). New York: Academic Press.

Schwartz, S. H. (1992). Universals in the content and structure of values. Theoretical advances and empirical tests in 20 countries. *Advances in Experimental Social Psychology, 25*, 1–65.

Schwartz, S. H. (1994). Are there universal aspects in the structure and content of human values? *Journal of Social Issues, 50*(4), 19–45.

Searchinger, T., Waite, R., Hanson, C., & Ranganathan, J. (2019). *Creating a sustainable food future*. World Resources Institute report. Washington, DC, USA.

Seufert, V., Ramankutty, N., & Foley, J. A. (2012). Comparing the yields of organic and conventional agriculture. *Nature, 485*, 229–232.

Shepherd, R. (1999). Social determinants of food choice. *Proceedings of the Nutrition Society, 58*, 807–812.

Shepherd, R., Magnusson, M., & Sjödén, P.-O. (2005). Determinants of consumer behavior related to organic foods. *AMBIO: A Journal of the Human Environment, 34*(4), 352–359.

Shin, Y. H., Moon, H., Jung, S. E., & Severt, K. (2017). The effect of environmental values and attitudes on consumer willingness to pay more for organic menus: A value-attitude-behavior approach. *Journal of Hospitality and Tourism Management, 33*, 113–121.

Shiv, B., & Fedorikhin, A. (1999). Heart and mind in conflict: The interplay of affect and cognition in consumer decision making. *Journal of Consumer Research, 26*, 278–292.

Simonson, I. (1999). The effect of product assortment on buyer preferences. *Journal of Retailing, 75*(3), 347–370.

Steg, L., & De Groot, J. (2010). Explaining prosocial intentions: Testing causal relationships in the norm activation model. *British Journal of Social Psychology, 49*, 725–743.

Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behavior: An integrative review and research agenda. *Journal of Environmental Psychology, 29*, 309–317.

Stenmarck, Å, Jensen, C., Quested, T., Moates, G. Buksti, M., Cseh, B., Juul, S., Parry, A., Politano, A., Redlingshofer, B., Scherhaufer, S., Silvennoinen, K., Soethoudt, J.M., Zübert, C., Östergren, K. (2016). *Estimates of European food waste levels*. IVL Swedish Environmental Research Institute.

Stern, P. C., & Dietz, T. (1994). The value basis of environmental concern. *Journal of Social Issues, 50*(3), 65–84.

Stern, P. C., Dietz, T., & Guagnano, G. A. (1998). A brief inventory of values. *Educational and Psychological Measurement, 58*(6), 984–1001.

Strathman, A., Gleicher, F., Boninger, D. S., & Edwards, C. S. (1994). The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of Personality and Social Psychology, 66*, 742–752.

Sunstein, C. R. (2014). Nudging: A very short guide. *Journal of Consumer Policy, 37*, 583–588.

Swindale, A., & Bilinsky, P. (2006). Development of a n universally applicable household food insecurity measurement tool: Process, current status, and outstanding issues. *Journal of Nutrition, 136*(5), 1449S-1452S.

Temple, N. J., Stryn, N. P., Fourie, J., & De Villiers, A. (2011). Price and availability of healthy food: A study in rural South Africa. *Nutrition, 27*(1), 55–58.

Thaler, R. H., & Sunstein, C. R. (2008). *Nudge: Improving decisions about health, wealth and happiness*. Yale: Yale University Press.

Thaler, R. H., Sunstein, C. R., & Balz, J. P. (2013). Choice architecture. In E. Shafir (Ed.), *The behavioral foundations of public policy* (Chapter 25, pp. 428–439). Princeton: Princeton University Press.

Thøgersen, J. (1999). Spillover processes in the development of a sustainable consumption pattern. *Journal of Economic Psychology, 20*(1), 53–81.

Thøgersen, J., & Olander, F. (2002). Human values and the emergence of a sustainable consumption pattern: A panel study. *Journal of Economic Psychology, 23*, 605–630.

Tomer, J. F. (2011). What causes obesity? And why has it grown so much? *Challenge, 54*(4), 22–49.

Tomer, J. F. (2013). Stemming the tide of obesity: What needs to happen. *Journal of Socio-Economics, 42*, 88–98.

Tomer, J. F. (2018). Realizing nudging's potential: Improving well-being and reducing socio-economic dysfunction. *Real-World Economics Review, 86*, 66–82.

Tsukuyama, E., & Duckworth, A. L. (2010). Domain-specific temporal discounting and temptation. *Judgment and Decision Making, 5*(2), 72–82.

USDA. (n.d.). Organic regulations. Accessed at https://www.ams.usda.gov/rules-regulations/organic, 16 October 2020.

USDA. (2015). 2015–2020 Dietary Guidelines for Americans. 8th Edition. U.S. Department of Health and Human Services and U.S. Department of Agriculture. Available at http://health.gov/dietaryguidelines/2015/guidelines/.

Van Beek, J., Antonides, G., & Handgraaf, M. J. J. (2013). Eat now, exercise later: The relation between consideration of immediate and future consequences and healthy behavior. *Personality and Individual Differences, 54*(6), 785–791.

Van Dam, Y. K., & De Jonge, J. (2015). The positive side of negative labeling. *Journal of Consumer Policy, 38*, 19–38.

VanEpps, E. M., Downs, J. S., & Loewenstein, G. (2016). Calorie label formats: Using numeric and traffic light calorie labels to reduce lunch calories. *Journal of Public Policy & Marketing, 35*(1), 26–36.

Van Geffen, L., Van Herpen, E., & Van Trijp, H. (2020a). Household food waste—How to avoid it? An integrative review. In E. Närvänen, N. Mesiranta, M. Mattila, & A. Heikkinen (Eds.), *Food waste management* (pp. 27–55). Cham: Palgrave Macmillan.

Van Geffen, L., Van Herpen, E., Sijtseman, S., & Van Trijp, H. (2020b). Food waste as the consequence of competing motivations, lack of opportunities, and insufficient abilities. *Resources, Conservation & Recycling, 5*, 100026.

Verain, M. C. D., Sijtsema, S. J., & Antonides, G. (2016). Consumer segmentation based on food-category attribute importance: The relation with healthiness and sustainability perceptions. *Food Quality and Preference, 48*, 99–106.

Verain, M., Sijtsema, S., Dagevos, H., & Antonides, G. (2017). Attribute segmentation and communication effects on healthy and sustainable consumer diet intentions. *Sustainability, 9*(5), 743.

Verbeke, W., & Vackier, I. (2005). Individual determinants of fish consumption: Application of the theory of planned behavior. *Appetite, 44*, 67–82.

Verhoef, P. C. (2005). Explaining purchases of organic meat by Dutch consumers. *European Review of Agricultural Economics, 32*, 245–267.

Vermeir, I., & Verbeke, W. (2006). Sustainable food consumption: Exploring the consumer "attitude–behavior intention" gap. *Journal of Agricultural and Environmental Ethics, 19*(2), 169–194.

Verplanken, B., & Roy, D. (2015). Consumer habits and sustainable consumption. In L. Reisch & J. Thøgersen (Eds.), *Handbook of research on sustainable consumption* (pp. 243–253). Edward Elgar Publishing Ltd, Cheltenham, UK: Elgar Original Reference.

Viola, G. C. V., Bianchi, F., Croce, E., & Ceretti, E. (2016). Are food labels effective as a means of health prevention? *Journal of Public Health Research, 5*(768), 139–142.

Wądołowska, L., Babicz-Zielińska, E., & Czarnocińska, W. (2008). Food choice models and their relation with food preferences and eating frequency in the Polish population: POFPRES study. *Food Policy, 33*, 122–134.

Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healthy food in the United Sttes: A review of food deserts literature. *Health & Place, 16*, 876–884.

Wang, W. C., & Worsley, A. (2014). Healthy eating norms and food consumption. *European Journal of Clinical Nutrition, 68*, 592–601.

Wansink, B. (2006). *Mindless eating: Why we eat more than we think*. Bantam Dell.

Wilkes, A., Kiff, L., Wollenberg, E., & White, J. (2016). *Shifting food consumption to mitigate climate change is critical to fulfilling the Paris Agreement, but how? CCAFS Info Note*. Copenhagen: CGIAR Research program on Climate Change, Agriculture and Food Security.

WHO. (2020a). Factsheet on obesity and overweight. Accessed at https://www.who.int/en/news-room/fact-sheets/detail/obesity-and-overweight, 16 October 2020.

WHO. (2020b). Factsheet on food safety. Accessed at https://www.who.int/news-room/fact-sheets/detail/food-safety, 16 October 2020.

Wong, K. C., Coveney, J., Ward, P., Muller, R., Carter, P., Verity, F., & Tsourtos, G. (2011). Availability, affordability and quality of a healthy food basket in Adelaide, South Australia. *Nutrition & Dietetics, 68*, 8–14.

World Resources Institute. (2019). *Creating a sustainable food future*. Washington, DC, United States.

Zheng, X., & Zhen, C. (2008). Healthy food, unhealthy food and obesity. *Economics Letters, 100*, 300–303.