

Taming Uncertainty

**Ralph Hertwig, Timothy J. Pleskac, Thorsten Pachur,
and The Center for Adaptive Rationality**

**The MIT Press
Cambridge, Massachusetts
London, England**

6 Toward Simple Eating Rules for the Land of Plenty

Mattea Dallacker, Jutta Mata, and Ralph Hertwig

Don't eat anything your great-grandmother wouldn't recognize as food.

—Michael Pollan, *Food Rules: An Eater's Manual*

6.1 The Taste of Uncertainty

People eat to live. Food provides the energy that human bodies need for everyday activities. It powers that most energy-hungry organ, the brain. But food is more than just functional. It can be a source of intense pleasure—or of grave harm. In the modern food environment, this harm can take the form of excessive calories, insufficient nutrients, or even ethical challenges. People who do not grow their own ingredients or prepare their own food are often unsure of exactly what they are eating and to what extent their food may have detrimental long-term consequences. Around the world, much food is now produced on an industrial scale, making it abundant and affordable. Yet although the availability and accessibility of food is, for many, no longer uncertain, a high degree of uncertainty remains in the modern food environment: the findings of nutrition research are sometimes weak or unreliable, the food industry not infrequently works with murky marketing strategies and vague health claims, and policy makers fail to sufficiently regulate the foods available to consumers.

What can policy makers and consumers do to reduce or manage these uncertainties and instead promote healthy food decisions? We focus here on individuals' decision-making competences—and on how simple, evidence-based heuristics can be used to boost them. The concise eating rules proposed by author and journalist Michael Pollan (2009) are one example of simple heuristics that aim to facilitate healthy decisions in the complex

modern food environment. Heuristic rules are mental tools that help people make smart, fast inferences and decisions when information, time, and computational power are limited (see chapter 1). They can also help people to engineer their environments in ways that foster good decisions in uncertain situations. In this chapter, we describe the heuristics people may use to engineer an important everyday choice domain: decisions on what to eat. We first identify different kinds of food-related uncertainties, and then describe how a repertoire of simple, evidence-based heuristics can help people master these highly uncertain food environments.

6.2 The Obesogenic and Complex Food Environment

Throughout most of human history, the biggest uncertainties about food were how to procure it, whether there would be enough of it, and whether eating it would result in illness or even death. Happily, the modern food environment has largely eliminated these ancestral uncertainties and risks. The products offered in supermarkets are rarely toxic or contaminated by dangerous pathogens. Most contemporary humans have enough food—eight in nine people have enough to eat (World Food Programme, 2016)—and that food is denser in calories, more readily available, and less expensive than during any other period of human evolution. German fables of *Schlaraffenland* tell of a land of plenty where the rivers flow with milk, raindrops are made of honey, and roasted birds fly into the mouths of the sedentary. Once a fantasy depicted by artists and novelists, the land of plenty has in a way become reality: for many people, there is more than enough of everything. And therein lies the rub. Obesity has become a global endemic that affects people of all ages and income groups and carries serious consequences for individual and global health (Finucane et al., 2011). Over 1.9 billion people worldwide are obese; obesity in adults has tripled globally in the last four decades (World Health Organization, 2018); and there has been a tenfold increase in obesity rates among children and adolescents (Abarca-Gómez et al., 2017). Obesity is a major risk factor for noncommunicable diseases such as cardiovascular diseases and diabetes. It is the cause of around 90%–95% of all cases of type 2 diabetes (American Diabetes Association, 2009); as obesity rates have grown, so has the worldwide prevalence of diabetes, which has quadrupled since 1980 (NCD Risk Factor Collaboration, 2016). Expanding waistlines shrink quality of life and

probably reduce longevity. In 2005, a study in the *New England Journal of Medicine* predicted that “life expectancy at birth and at older ages could level off or even decline within the first half of this century” in the United States (Olshansky et al., 2005). Recent preliminary data from the Centers for Disease Control and Prevention suggest that this tipping point may now have been reached (Ludwig, 2016).

Today’s food decisions are made in an obesogenic environment where unhealthy food is available anywhere, anytime, and at relatively low costs. In the United States, the average share of per capita income spent on food fell from 17.5% in 1960 to 9.9% in 2013 (Barclay, 2015). Food is not only abundant, it is also perfectly designed to exploit our ancestral food preferences. The modern cultural food context has thus pushed back some of what Charles Darwin (1859) called the “hostile forces of nature,” only to replace them with the no less formidable forces of the food industry. Despite or possibly because of the extent to which modern consumer culture and food technologies have made foods reliably available, appealing, and safe, uncertainty in food choice has not become extinct. Instead, new uncertainties have entered the choice environment. Today’s uncertainties include health-related concerns (“Does this food contain a high level of sugar?”), uncertainty about the energy value of foodstuffs (“Will I gain weight if I eat this food?”), and questions around food’s chemical composition (“Are there pesticides in my food?”), as well as ethical concerns about issues such as animal welfare, fair trade, and ecological footprints. We now turn to three sources of uncertainty in the food choice environment: nutritional science, the food industry, and public policy.

6.3 Sources and Producers of Food-Related Uncertainty

6.3.1 Nutritional Science as a Producer of Uncertainty

Several methodological constraints make it challenging for the nutritional sciences to produce strong evidence for policy makers and the public. It is impossible to conduct double-blind studies that assess the long-term effects of foods. For one thing, because people see, taste, and smell their food, they cannot be blind to the foods they are eating (and the experimental condition in which this food is provided). For another, their food intake would need to be strictly controlled over many years, which is unrealistic. Other experimental approaches cannot be realized due to ethical considerations;

for instance, it would be unethical to compare a long-term high dose of sugar with a low sugar dosage in children. While it is common to rely on questionnaires to measure long-term food or nutrient intake, the majority of respondents give implausible reports. As a prime example, participants in the National Health and Nutrition Examination Survey reported too few calories to be able to maintain their body weight (Archer, Hand, & Blair, 2013). Furthermore, many of these studies are underpowered due to small sample sizes or have inadequate control groups (Ioannidis, 2013).

The effects of almost every imaginable nutrient on health outcomes have been reported in peer-reviewed articles—with almost every imaginable outcome. Results indicating, for example, that the risk of a major disease can be reduced or even halved by consuming a small amount of a single food or nutrient, such as five nuts a day, are rife in peer-reviewed journals (Schoenfeld & Ioannidis, 2013). It is highly unlikely that any single nutrient or food has more than a trivial effect on mortality. However, there is stronger evidence for the general health effects of certain food groups. Fruits and vegetables offer more health benefits than highly processed fatty and sugary foods (Slavin & Lloyd, 2012). More recent comparisons of dietary patterns (e.g., Mediterranean versus Western diets) are promising, but they often rely on risk populations or small samples, making it difficult to generalize findings to the public at large (Sofi, Macchi, Abbate, Gensini, & Casini, 2014).

Scientific research programs sponsored by the food industry are another source of uncertainty; the ensuing conflicts of interest render findings unreliable. For example, it is now known that the sugar industry systematically sponsored a decades-long research program to cast doubt on the negative consequences of sugar while endorsing fat as a key factor in coronary heart disease (Kearns, Schmidt, & Glantz, 2016). As we will show next, this is not the only way that the industry brings uncertainty into food choices.

6.3.2 Food Labeling as a Source of Ambiguity and Uncertainty

Understanding the ingredients of processed foods—and thus whether those foods are healthy or not—is another challenge in today's uncertain food environment. Take the example of ready-to-eat breakfast cereals. Cereals enjoy the reputation of being healthy, and wholegrain cereals without added sugars or other additives are indeed nutritious. But highly processed sugary cereals, which lack fiber and protein and cause blood sugar to spike, are more suitable as a sweet treat than as a balanced breakfast. In this kind of environment,

consumers cannot rely on either a categorical judgment (“cereal is healthy”) or reasonable intuitions about ingredients—many processed foods defy common sense.

Like any industry, the food industry’s objective is to sell its product at a profit. To achieve this end, many companies produce highly engineered processed foods that pleasure and delight the taste buds (Cross & Proctor, 2014). One symptom of this development is high sugar consumption. Added sugar was a rare pleasure prior to modern industrialism and marketing. In 1822, the American annual per capita intake was about 3 kg; by the end of the 20th century, it hovered around 50 kg (Cross & Proctor, 2014). This increase was made possible by turning foods—even products that do not appear particularly unhealthy—into sugar bombs. One of America’s favorite condiments, ketchup—a seemingly innocuous tomato-based sauce—can now contain as much as 6 g of added sugar per serving of approximately 30 g. Consumers’ intuitions about food have not kept up with these radical transformations of food products. We recently tested intuitive knowledge about the sugar content of common foods and beverages in a survey of 305 parents (Dallacker, Hertwig, & Mata, 2018c). To try this yourself, please visit interactive element 6.1 (at <https://taming-uncertainty.mpib-berlin.mpg.de/>). Parents tended to massively underestimate the sugar content of most foods and beverages, especially those that are perceived as healthy. For instance, over 90% of parents underestimated the sugar content of a 250 g container of fruit yogurt (which was actually 39 g), with the average estimate falling short by 21 g—the equivalent of seven sugar cubes. Children whose parents underestimated the amount of sugar in foods were at twice the risk of being overweight or obese.

One important aspect of food regulation and, at least in theory, an important way to inform consumers and reduce their lack of knowledge and uncertainty is food labeling. But how effective is it? Clearly, simply providing access to a list of ingredients is not effective. Many consumers have problems understanding and interpreting food labels (Grunert, Wills, & Fernandez-Celemin, 2010). This is not surprising. The serving sizes displayed on packages vary by brand and product, and ingredient names are often far from transparent. Even the most diligent consumer could easily overlook several of the 50 names for sugar that are used on food labels (Shulman & Lustig, 2013).

It has been estimated that improved food labeling could decrease health costs in the United States by \$4.2 billion over 20 years (Hawkes, 2004).

Ongoing efforts are therefore being made to help consumers understand what they are eating. In the United States, for example, food labels now state the amount of added sugars. But nutrition labels compete for attention with many other health claims, such as “reduced cholesterol,” “100% natural,” “antioxidant plus,” or “immune support.” These claims are often independent of a product’s nutritional value, instead advertising other (alleged) health benefits of the product. Even if consumers do not actually understand them, such claims make the product seem more attractive or healthy (van Trijp, 2009). The information structure of today’s food packages also makes it difficult to think about the ingredients and healthfulness of a product: the amount of nutrition information displayed is high; the daily guided amount of nutrients is often presented in reference to arbitrary, nonstandardized portion sizes; and no criteria are provided to allow consumers to evaluate whether a product is comparably high or low in nutrients such as sugar relative to similar products. The food industry has a record of fighting efforts to develop transparent food-labeling systems. Although its attempt to prevent the Nutrition Labeling and Education Act of 1990 failed, its lobbying met with more success in 2010, when the European Parliament voted down an attempt to introduce a traffic-light system to food labeling.

6.3.3 Policy Makers and Regulators as Producers of Uncertainty

The challenges of producing reliable evidence in the nutritional sciences have implications for policy makers, regulators, and agencies that issue nutritional recommendations. Littered with constantly changing evidence that is often weak and even conflicting, nutritional recommendations for the general public vary over time and across countries. The German food pyramid, for example, recommended foods high in carbohydrates as the basis of daily nutrition until 2005. It now suggests a diet dominated by fruit and vegetables. Within a period of just two decades, the United States Department of Agriculture (USDA) presented no fewer than three recommendations for healthy nutrition: two pyramids and, most recently, MyPlate (United States Department of Agriculture, 2015; see figure 6.1).

The most striking difference between the two pyramids was the switch from grains as the main component to an equal distribution of grains, fruits, and vegetables. The later version no longer included sweets but added a reference to physical activity. The third approach, MyPlate, divides a plate

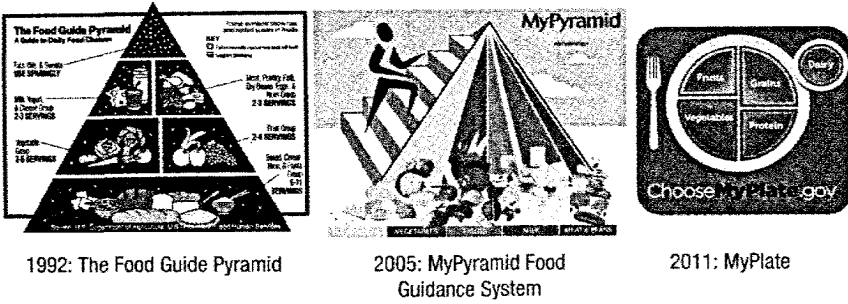


Figure 6.1

History of USDA food pyramids illustrating changes in American dietary guidelines within two decades.

in four sections of varying sizes: one each for vegetables, fruits, grains, and proteins, plus a portion of dairy. This most recent concept is itself likely to be replaced eventually as well. MyPlate has already faced criticism for not offering a complete picture: it omits some basic dietary advice such as distinguishing between potatoes and other vegetables (Harvard School of Public Health, 2018), and fails to represent the specific nutrition needs of large and growing groups such as vegetarians and vegans.

Many other attempts to offer definitive nutrition guidelines are likewise blighted by weak evidence. For example, the Austrian food pyramid suggests limiting egg consumption to three eggs per week. Yet two recent meta-analyses found no evidence that a higher consumption of eggs (up to seven per week) is related to a higher risk of cardiovascular diseases (Rong et al., 2013). On a grander scale, the European Prospective Investigation into Cancer and Nutrition study of almost half a million Europeans over 8.7 years showed that an increased fruit and vegetable intake, as suggested by most nutrition guidelines, decreased the incidence of cancer by such a small magnitude that the results must be interpreted with caution (Buchner et al., 2010). Other large-scale studies have likewise found that increased fruit and vegetable consumption has only very small effects on the reduction of cancer, heart disease, and other chronic diseases, particularly in women (Hung et al., 2004; Joshipura et al., 2001). However, studies considering more components of healthy eating (e.g., Harvard University’s Alternative Healthy Eating Index) have found that more healthy eating is linked to a higher overall decreased risk of developing these diseases (Akbaraly et al., 2011).

A further difficulty for consumers is in deciding which of the countless guidelines to actually follow. In Europe alone, more than two dozen organizations have issued their own recommendations for healthy nutrition. These stand alongside those offered by the World Health Organization, the USDA, and many other public authorities. To date there is no single independent agency that provides solely evidence-based recommendations for healthy nutrition to the general public. The modern food environment is uncertain beyond the classic dimensions of probabilities and outcomes—there is no clear, normative, evidence-based benchmark for the nutritional content of individual food items. It is no surprise that consumers are inundated by a media avalanche of conflicting claims about what to eat and what to avoid.

6.4 How to Help People Dealing with a Complex Food Environment

The unfolding obesity epidemic is contributing to plummeting health levels and skyrocketing health costs (Biener, Cawley, & Meyerhoefer, 2017), prompting scientists, public health organizations, and policy makers to develop and implement measures to prevent and treat obesity. Policy makers can draw from an expanding toolbox of interventions, including more traditional measures such as bans or restrictions on advertisements for junk food aimed at children or on unhealthy food options (e.g., snack vending machines on school campuses), fiscal measures (e.g., a sugar tax), and measures informed by recent behavioral science evidence. This last-mentioned class of intervention can be divided into two approaches: *nudges* and *boosts*.

6.4.1 Nudging: Steering Good Decisions

Governments and organizations around the globe, such as the World Bank (2015), the European Commission (Lourenso, Ciriolo, Almeida, & Troussard, 2016), and the Organisation for Economic Co-operation and Development (2017) have begun to appreciate the role behavioral science evidence can play in designing effective and efficient public policies to address a wide range of public health and societal problems. This development is the lasting achievement of the nudge approach, presented prominently in Thaler and Sunstein (2008). Nudges are nonregulatory, nonmonetary interventions that steer people in a direction that is deemed good for them

while preserving their freedom of choice (Alemanno & Sibony, 2015; Halpern, 2015). The idea at the core of nudging is that cognitive and motivational deficiencies (e.g., loss aversion, inertia, present bias) that normally lead individuals to make choices detrimental to their health, wealth, and happiness can be used to steer, or nudge, individuals to behave in ways that are consistent with their goals or preferences—and thus produce better outcomes (Rebonato, 2012; Thaler & Sunstein, 2008). Take, for illustration, default rules as a paradigmatic nudge. Default rules establish what will automatically happen if a person does nothing—and “nothing is what many people will do” (Sunstein, 2015, p. 9). Betting on this inertia, a policy maker can put a default in place that brings people closer to a desired behavioral outcome. For example, organ donation rates are much higher in countries where all adults are organ donors by default (Beshears, Choi, Laibson, & Madrian, 2010).

Nudge policies have also become popular in the attempt to help people make healthier food choices (e.g., Hollands et al., 2013). These nudge interventions include changing the placement of food, thereby making options easier or harder to reach (Thorndike, Bright, Dimond, Fishman, & Levy, 2017); altering the properties of food options (e.g., changing the size of plates, bowls, glasses, or the product itself); and raising awareness through nonpersonalized information (e.g., providing information about the nutritional content of food). Due to the relative lack of evidence and also definitional and conceptual issues (Hollands et al., 2013), it is still difficult to fully evaluate the efficacy of different types of nudging interventions and their short- and long-term effects on a healthy diet.

6.4.2 Boosting: Empowering Good Decisions

Across his writings, the founding father and third president of the United States, Thomas Jefferson, repeatedly emphasized that liberty and a functioning democracy depend on an informed and educated electorate (e.g., Jefferson to George Washington, in Jefferson & Johnston, 1903). Similarly, a functioning population of eaters requires information and education. Although people do not always make good decisions—as the domain of food choices readily illustrates—decision making is not as egregiously irrational as the nudge approach may suggest. Based on a short conceptual history of psychological theorizing and evidence on how people reason and make decisions, Hertwig

and Grüne-Yanoff (2017; see also Grüne-Yanoff & Hertwig, 2016) have argued that the nudge approach's portrayal of the human decision maker as systematically imperfect is not the only legitimate model of people's decision-making behavior. Evidence from behavioral science supports other, less disquieting, conceptions of human decision-making competences. We therefore believe that there is a compelling alternative to nudging: Hertwig and Grüne-Yanoff (2017) have referred to it as boosting. The objective of boosts is to improve people's decisional and motivational competence, thus enabling them to make their own choices. Boosts are interventions that foster people's existing competences or instill new ones, thus making it easier for them to exercise their own agency (see Hertwig & Grüne-Yanoff's taxonomy of boosts).

Our objective is not to champion one policy approach over the other. Both boosts and nudges have important target domains (Hertwig, 2017). We believe, however, that it is vital to acknowledge and examine different views and findings if behavioral science insights into how people make decisions are to inform public policy—particularly as these different approaches may suggest different types of policy interventions. Applied to the domain of nutritional health, boosts—unlike nudges—do not reduce people to “somewhat mindless, passive decision makers” (Thaler & Sunstein, 2008, p. 73), whose decisions are steered by the way a choice architect places foods. Rather, the objective of boosts is to promote healthy food choices by building relevant competences. As we will show, this can be achieved by interventions such as helping parents develop the skills they need to make family meals more conducive to their children's good health. In addition, children, teenagers, and adults can be provided with simple, actionable heuristics that help them make healthy food choices in commercially designed food environments that aim to hijack their senses and cravings. Boosts offer behaviors that last longer and are more generalizable across a wider range of conditions, including conditions that are much harder to reach by nudges (e.g., the family dinner table; Dallacker, Hertwig, & Mata, 2018b). Furthermore, people can take advantage of their boosted capacities whether the choice architecture supports or thwarts the choices they desire to make. Next, we describe the first steps toward a boost that helps people make healthy dietary choices. Its starting point is where the foundation of people's food preferences is laid: at the family dinner table.

6.5 Boosting Parents' Competence as Choice Architects of the Family Meal

Obesity is a complex phenomenon. There is no silver bullet solution that will end the obesity epidemic. Most weight-loss interventions are not effective over the long term (Jeffery et al., 2000; Wing & Phelan, 2005); in fact, the chance of an overweight man reaching a normal weight within a year is just 1:210 (Fildes et al., 2015). Thus, the most compelling treatment of overweight and obesity is to prevent them from occurring in the first place. Instead of searching for a single factor that can stop obesity, the focus must instead be on effective entry points for *preventing* obesity. Prevention measures starting in childhood promise to be a particularly powerful lever for fighting obesity because food preferences are established early in life. Childhood is a sensitive period for the formation of healthy eating habits. Furthermore, adults make their daily food choices in an obesogenic environment plagued with uncertainty, but children, especially in their younger years, are often not directly exposed to this environment. Instead, parents are usually the nutritional gatekeepers who design their children's food choice architecture: two-thirds of a child's daily calories stem from food prepared at home (Poti & Popkin, 2011) and most of the 10,000 or so meals children have experienced by the age of 10 were in a family context. Consequently, the family environment can be seen as "the cradle of eating behavior": it is the most critical learning environment, and the main source of influence on young people's eating behavior (Pinard et al., 2012).

In a recent meta-analysis, we found that family meals are a key entry point for influencing nutritional health. The results showed that frequent family meals are significantly associated with a lower risk of being overweight, as well as with better diet quality in children (Dallacker et al., 2018b). Sharing food is prevalent across cultures and history, with communal meals serving as an important medium for sharing knowledge, expressing fellowship, and forming eating habits (Salali et al., 2016). However, in the wake of technological, economic, and social changes such as television, digital technologies, eating on the go, and dual-earner families, the family meal as a social institution is in flux (Breaugh, 2008; S. E. Chen, Moeser, & Nayga, 2015). Modern eating culture is increasingly marked by "grazing" or the snackification of meals. Eating happens anywhere and anytime,

often throughout the day (Nielsen & Popkin, 2002) and even while performing another task (“secondary eating”; Zick & Stevens, 2011). Parents, as their children’s nutritional gatekeepers, therefore face new challenges when designing the architecture of family mealtimes. How can parents be empowered in their roles as choice architects? Specifically, are there simple *building blocks* that parents can use to construct a healthy family meal environment?

Various aspects of family meals and their relation to children’s average dietary quality and risk for obesity have been investigated. We conducted a meta-analysis in which we identified, categorized, and systematically reviewed these studies (Dallacker, Hertwig, & Mata, 2018a). Our aim was to identify environmental, behavioral, and social attributes of family meals with the potential to positively influence children’s eating behavior. In other words, the goal was to determine evidence-based building blocks of healthy family meals. In our meta-analysis, we summarized over 40 studies, 50 effect sizes, and 40,000 participants and identified six frequently investigated building blocks of family meals that are related to better diet quality and lower body weight in children (see figure 6.2). Let us emphasize that the effect sizes obtained are relatively small; however, this is commonly the case in observational studies (as analyzed in Dallacker et al., 2018b) that preserve the causal texture of natural environments.

The first building block is to *turn off the television* during meals. Watching television while eating is distracting. Experimental studies have shown that people eating in front of the television are less able to monitor their food intake and require more salt and fat to be satisfied than people who are not watching television while eating (Bellisle & Slama, 2004; Blass, Kirkorian, Pempek, Price, & Koleini, 2006). Another potent way in which television can thwart healthy eating is through food advertising. It is estimated that children view around 20,000 to 40,000 commercials each year and that 50% of those commercials promote unhealthy food products (Story & French, 2004). Children’s exposure to television food advertising has been shown to influence snack choices and dietary behavior (Gorn & Goldberg, 1982; Harris, Brownell, & Bargh, 2009).

The second and perhaps most intuitive building block is to *serve healthy foods during family meals*. The repeated experience of eating and being exposed to healthy foods has been found to make children more likely to accept and enjoy them (Birch, 1989). Serving homemade, unprocessed foods can help

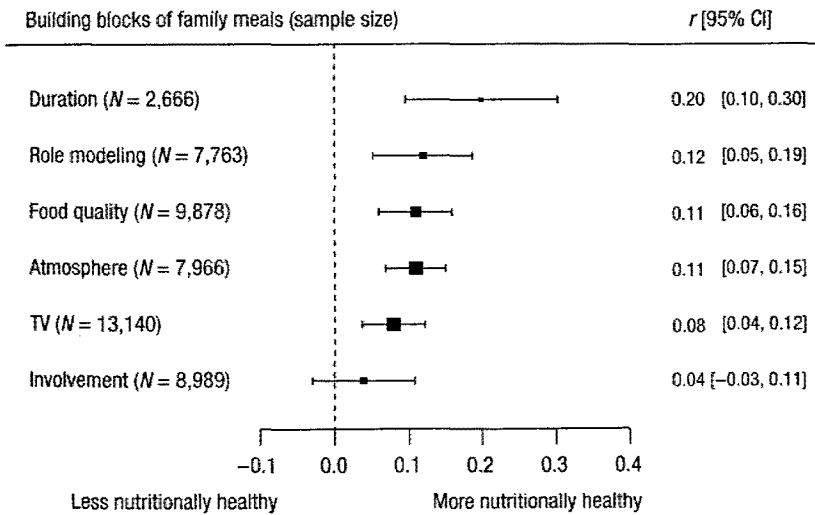


Figure 6.2

The pooled effect size r for each of the six building blocks of healthy family meals identified (adapted from Dallacker et al., 2018a). Each of the building blocks rests on data from a substantial number of studies and participants (see sample size in parentheses).

children accept and enjoy healthier foods and, consequently, improve their nutritional health.

The third building block is for parents to *model healthy eating*. Children are more likely to try a novel food if an adult eats it (Adessi, Galloway, Visalberghi, & Birch, 2005). Parents who are aware that their behavior sets an example can promote the consumption of healthy food during family meals by eating it themselves. They can also model positive behavior in applying the fourth building block, which is to *create a positive mealtime atmosphere*. Stressful mealtime situations such as arguments across the dinner table can increase a dysfunctional form of eating known as emotional eating, which is the attempt to regulate negative emotions by consuming foods that are high in energy and fat. It is therefore also a risk factor for overweight (Singh, 2014). Furthermore, the context or atmosphere in which new food is presented is important for a child's food preferences. Children are more likely to like foods presented in a positive context (Aldridge, Dovey, & Halford, 2009).

The fifth building block we identified is to *involve children in meal preparation*. Participating in the preparation process is not significantly associated

with better nutritional health in general (see figure 6.2). However, our analysis revealed a significant association with better diet quality ($r = .08$, 95% CI [.04, .11]). People like objects they created themselves (Norton, Mochon, & Ariely, 2012). This “IKEA effect” could explain why children who help to prepare vegetables are more likely to eat them, leading to better overall diet quality. At the same time, there is evidence that children with a high body mass index (BMI) show more interest in food and food preparation (L. Hill, Casswell, Maskill, Jones, & Wyllie, 1998). A higher interest in food and greater involvement in food preparation could be related to higher food intake in general, which could in turn explain why the involvement of children in meal preparation is associated with better diet quality, but not with a lower BMI.

The final—perhaps counterintuitive—building block is to *spend more time on meals*. Spending more time at the family table is actually beneficial for children’s nutritional health. One potential explanation of this finding is that people who take more time at the table eat at a slower rate, allowing a sense of satiety to kick in before they have finished (Andrade, Kresge, Teixeira, Baptista, & Melanson, 2012; Berkowitz et al., 2010). Paradoxically, they consume fewer calories even though the meal takes longer. It is also possible that longer mealtimes result in longer periods of satiety between meals, meaning that fewer unhealthy snacks are consumed throughout the day.

In short, informed by the meta-analytical findings on the building blocks of family meals summarized in figure 6.2, one can abstract three simple rules, or heuristics, for how parents can engineer the architecture of the family meal: turn the television off, strive for a positive mealtime atmosphere, and spend more time at the table together. Another two rules inform parents’ own behavior: model the desired behavior and involve children in the preparation of the food you want them to eat. The final rule pertains to the food content itself: offer healthy foods at the family table. Clearly, more experimental tests are needed before causality can be claimed between the rules and desirable health outcomes, but the results of the first few experimental studies are promising. For instance, a recent study by Fiese, Jones, and Jarick (2015) investigated family mealtime dynamics within a randomized control setting. One group of families experienced the distracting noise of a vacuum cleaner during the family meal; another group of families were able to eat in peace. Noise and distraction increased both unhealthy eating

in children and negative communication patterns in adults. To the extent that these findings can be generalized to the sound of a television set, they explain why both television and a negative atmosphere create a fertile ground for the development of unhealthy eating patterns in children.

Equipping parents with the six simple rules we identified is likely to turn them into competent choice architects of a key social institution within the family, thus enabling them to create a family meal environment that is conducive to healthy food choices. The rules are concrete, relatively intuitive, and actionable; and once practiced, they may become natural routines. The anticipated effects of each individual rule are small (see the results presented in figure 6.2). Yet their combined effect is likely to be larger (although the combination is certainly not additive). Some readers may object that this particular social institution is at best quaint, and at worst almost obsolete. In light of sociocultural changes such as the rising number of dual-earner families, organizing family meals is increasingly challenging. But a family meal does not have to be a traditional dinner with the whole family coming together to sit around a nicely laid table. Our results suggest enormous flexibility in when, how often, and with whom family meals can take place. For instance, family meals seem to be beneficial independent of whether the family shares dinner or breakfast. It also makes no difference to nutritional health whether the whole family eats together or merely some family members take part (Dallacker et al., 2018b). Crucially, the relationship between the frequency of family meals per se and nutritional health is weaker than the relationships between specific mealtime *building blocks* and children's nutritional health (Dallacker et al., 2018a).

The building blocks of healthy family meals that we identified suggest another fruitful area of future research: the architecture of mealtimes in kindergartens and schools. The mealtime architectures of such institutional contexts are particularly important for children whose families are less likely to come together at the dinner table, such as families from lower socioeconomic backgrounds, families with dual-earner parents, or families with busy schedules. The results of a few initial studies suggest that the building blocks we identified may also have positive effects in institutionalized settings such as schools. For example, one study found that when teachers ate fruits and vegetables during school lunches, it was more likely that children would eat these foods as well (Hendy & Raudenbush, 2000).

6.6 Beyond Simple Heuristic Rules for the Family Meal Architecture

Family meal rules are just one example of simple evidence-based eating rules. As children get older, their parents' roles as nutritional gatekeepers fade, leaving children to interact more directly with the modern obesogenic food environment and its many sources of food-related uncertainty. This means that both children and adults need the competencies to deal with this peculiar environment. In our view, one dimension of this competence is a toolbox of simple heuristics for selecting food in an obesogenic environment in which a revolution in food technology has produced a colossal shift in human consumption and sensual experience (Cross & Proctor, 2014), with ever more deliciously manufactured sugar-filled, high-fat foods and sugary beverages unleashing new and intense pleasures—and health problems.

Simple heuristics can offer a first line of defense against attempts to hijack deeply entrenched biological desires that evolved in a world of scarcity and are now miscalibrated in today's land of plenty. In his book *Food Rules: An Eater's Manual*, Pollan (2009) outlined a set of 64 simple, memorable rules for eating healthily, such as *sweeten and salt your food yourself*. Indeed, many people eat more sugar than they realize, and approximately 16% of children's total energy intake is from added sugar (Ervin, Kit, Carroll, & Ogden, 2012). Most of this added sugar is not added by the eater; rather, it is found in processed foods such as sodas or cereals, which contain more sugar than one would usually add oneself. For example, an average frozen pizza contains 18 g of sugar, the equivalent of six sugar cubes. When baking from scratch, one would be hard-pressed to find a recipe that recommends adding six sugar cubes to the pizza dough, sauce, or toppings. The same principle applies to fruit yogurt, lemonade, pasta sauce, and many other mass-manufactured foods. Thus, a person consistently employing the simple rule of *sweeten and salt your food yourself* is likely to significantly reduce the amount of sugar and salt they consume. Another of Pollan's rules that could help people reduce their sugar intake is *don't eat breakfast cereals that change the color of your milk*. Cereals that discolor milk are highly processed and sugary, and thus likely to be full of refined carbohydrates.

Although Pollan's rules are intuitive, they are not yet evidence based. Research is needed to test and quantify their effects on people's nutritional health. If the evidence supports their intuitive logic then they can be added

to a toolbox of simple heuristics, joining the evidence-based rules for designing the family meal environment. The toolbox would endow children, teenagers, and adults with the competence to make healthy and autonomous food choices even when facing a barrage of advertising, branding, sponsored social media, and highly engineered, easily accessible pleasures.

6.7 Nutritional Health and the Uncertainties of the Modern Obesogenic Environment: Final Remarks

What a paradoxical world we live in! In large parts of the Western globalized world, the ancestral sources of uncertainty around food no longer exist. Food is always available (there are exceptions—e.g., food insecurity in rich countries such as the United States; Mata, Dallacker, & Hertwig, 2017; Nettle, Andrews, & Bateson, 2017) and relatively safe. However, this seemingly blissful consumer environment—the land of plenty—coincides with an obesity epidemic which is now a major threat to public health. New sources of food-related uncertainties have emerged, such as sponsored research geared more toward obfuscation than discovery, frequently changing recommendations, and highly processed foods with contents that defy normal expectations.

We believe in the need for a proactive policy that prevents obesity in childhood, alongside programs that address existing obesity. There is no silver bullet for prevention; such a policy will have to include a wide range of measures. Some interventions would be regulatory, such as banning vending machines at schools, taxing high-sugar foods, and eliminating advertisements for unhealthy foods that target children (Grigsby-Toussaint, Moise, & Geiger, 2011). But any policy mix must also include measures that take control of commercially constructed choice architectures in public spaces and institutions (e.g., school cafeterias) and redesign those environments with the well-being of children in mind (Downs, Loewenstein, & Wisdom, 2009). Last but not least, healthy food choices necessitate competences. We have proposed simple food choice rules and rules for designing protective family meal environments that can boost parents' competences. Leaving people without those competences risks leaving them defenseless in the many food environments in which there is no benevolent choice architect to curb the temptations of the land of plenty.