CHAPTER 11

General discussion
The aim of this research project was to study the feasibility and effectiveness of environmental interventions targeted at portion size. First, two studies were conducted that assessed the feasibility of a number of interventions targeted at portion size. After that, the effects of portion size labeling, offering a larger variety of portion sizes, and a proportional pricing strategy were studied. This chapter summarizes the study results that are included in this thesis. Furthermore, the results of this research project will be put in a broader perspective, and future directions for both research and practice will be provided.

**MAIN FINDINGS**

**The development and feasibility of interventions targeted at portion size**

Part I of this thesis describes the development and feasibility of various interventions targeted at portion size. In Chapter 2 possibilities for interventions are identified and a framework for portion size interventions is presented. Within this framework, amongst others, four interventions are identified: offering a larger variety of small portion sizes, reducing portion sizes, pricing strategies (e.g. proportional pricing), and portion size labeling.

In Chapters 3 and 4 two studies are described in which the feasibility of various interventions targeted at portion size was assessed. The perspectives of consumers and of those working in the food service sector were taken into account. From both studies it can be concluded that offering a larger variety of portion sizes and portion size labeling were the most feasible interventions to implement. In settings such as worksite cafeterias, a proportional pricing strategy was considered to be feasible as well. The two studies also showed that attention should be paid to how interventions targeted at portion size are best communicated to consumers. This will be further discussed later in this chapter.

**The effectiveness of portion size labeling**

As outlined in Chapters 5, 6 and 7, the studies that were conducted to assess the impact of portion size labeling separately did not provide unambiguous conclusions. Combined, however, the studies suggested that a labeling format, in which a reference portion size (or
the number of portions per unit) is indicated, was the most effective format for helping consumers to select smaller sizes of high caloric snacks and drinks. It should, nevertheless, be mentioned that the effects of changing the preferences to smaller portions are expected, at most, to be modest.

**The effectiveness of a larger variety of portion sizes and proportional pricing**

Two studies were conducted to assess the impact of introducing a smaller portion in addition to the existing size and a proportional pricing strategy on (intended) choice and consumption behavior. The first study that is described in Chapter 8 showed that among overweight or obese visitors to fast-food restaurants, proportional pricing reduced the likelihood that they would select large soft drink sizes, and increased the likelihood that they would choose small-sized portions of chicken nugget. This study relied on the self-reported intended behavior of consumers who completed questionnaires.

Chapter 9 presents the results of an experimental field study. The results showed that after the introduction of small meals, a small group of worksite cafeteria visitors replaced their large meals with small meals, but that proportional pricing had no effect. Furthermore, the sales figures of fried snacks did not increase, suggesting that consumers did not compensate for their small meals by purchasing more snacks. On the other hand, based on consumer data, there were some indications of compensatory food intake: participants who chose a small meal in the worksite cafeteria reported, amongst other things, having larger meals than usual at home. Finally, the small meal attracted a relevant target group, as small meal purchases were positively related to being female and to BMI (the latter was borderline significant).

In addition to evaluating the effect of introducing smaller meals and proportional pricing in worksite cafeterias, a process evaluation was carried out (Chapter 10). The results showed that offering a small meal, in addition to the existing size meal, as well as proportional pricing were generally implemented as prescribed by the protocol. The interventions were also considered promising in terms of continued use.
Conclusions
From the studies that are included in this thesis, it can be concluded that portion size labeling, offering a larger variety of portion sizes, and proportional pricing are the most feasible interventions to implement. With respect to the effectiveness of these interventions, it can be concluded that the effects of portion size labeling on the (intended) consumption of soft drinks and popcorn are, at most, modest. However, a format indicating the number of portions per serving seems most promising. Lastly, the introduction of a smaller portion size for hot meals in worksite cafeterias in addition to the existing size appears to be a sustainable intervention that will help a reasonable and relevant proportion of guests to replace their large meal with a small meal. However, it should be mentioned that there is a risk of compensatory food intake among these people.

Strengths and limitations
The studies that are included in this thesis had some strengths and limitations that will be delineated in this paragraph.

An important strength of this research project is that both consumers and point-of-purchase representatives were involved in the development of the interventions. Therefore, it is feasible to implement the interventions that were developed and evaluated. Furthermore, the effect evaluations of the interventions had solid study designs (i.e. Randomized Controlled Trials) and were conducted in realistic settings. This makes the results both valid and generalizable. Another strength is that in addition to intended behavior, actual choice and consumption behavior were included as outcome variables. Additionally, contrary to many other studies evaluating the effectiveness of nutritional interventions, in our worksite cafeteria study compensatory food consumption was taken into account. Finally, since the effect and process evaluations included sales data, consumer data, and observational data, the studies provided comprehensive results.

Evidently, the studies that are included in this thesis also had methodological limitations that are important to mention. The first issue is that the recruitment procedures of the participants might have led to a selection bias. One possibility is that these may have resulted in an over-representation of participants who were interested in issues that are
related to food. In line with this, the sample of some studies consisted predominantly of women. Second, although field studies are very beneficial to the generalizability of study findings, they also have their limitations. Most importantly, apart from the study that assessed the impact of portion size labeling on soft drink consumption, we could not measure actual consumption and had to rely on self-reported consumption behavior. A risk with self-reported data is that they might suffer from a social desirability bias and under-reporting [1]. This might for instance have been the case with the data with respect to compensatory food intake and BMI [1, 2].

REFLECTIONS AND SUGGESTIONS FOR FURTHER RESEARCH

The studies that we conducted in the area of environmental interventions targeted at portion size provided some important insights and issues to reflect upon. Based on these reflections, suggestions for further research will be given.

Communication to the consumers of interventions targeted at portion size

Designing an adequate communication strategy is an important aspect relating to the implementation of interventions targeted at portion size and there are some possibilities regarding such communication. A first option is to communicate the health aspects as the rationale behind these strategies. There are, however, two aspects that hamper this approach. First, some consumers consider interventions targeted at portion size (such as the reduction of portion sizes) as paternalistic. This topic will be further discussed later in this chapter. Second, for many, the connection between portion sizes and weight control is not that obvious. Often, people think that the type of food is important rather than how much of it is consumed. This is illustrated by our study among point-of-purchase representatives, but also by a survey study from the American Institute for Cancer Research. The results indicated that 78% of the respondents believed that eating certain types of foods and avoiding others is more important than the amount of food that is consumed [3].

Besides emphasizing health as the rationale behind interventions targeted at portion size, another option is to stress other aspects when communicating such interventions to
consumers. The idea behind this strategy is that, in general, companies are reluctant to reduce their prices along with reducing portion sizes. On the other hand, consumers want value for their money [4], and are therefore likely to distrust the motives of companies that reduce their portion sizes (most likely without lowering their prices). When choosing to communicate interventions targeted at portion size, it seems sensible for companies to emphasize other types of value such as quality or exclusivity. A successful example is the once popular French nouvelle cuisine that is, amongst other things, characterized by small portion sizes, high prices and perceived exclusivity. Another, more contemporary, example is the pricing of soft drinks in fast-food settings compared to cafes and restaurants. In fast-food restaurants, consumers pay approximately €0.42 per 100 milliliter for soft drinks that are served in disposable cups containing 300 to 500 milliliter. In regular cafes and restaurants, soft drinks are often sold in bottles containing 200 milliliter. The bottles might contribute to a more positively perceived taste, quality, and exclusivity. Accordingly, consumers are prepared to pay approximately €1.10 per 100 milliliter for a seemingly identical product (although it should be mentioned that post mix soft drinks that are served in fast-food restaurants are somewhat differently produced than soft drinks that are sold in bottles). It is needless to mention that this does not apply to all products and that there is a large group of consumers who equate value-for-money to quantity rather than to quality. Nevertheless, it would be worthwhile to assess the effects of selling (a sense of) quality and “premium-ness”, rather than translating value into large sizes. Social marketing aims to develop and deliver products that offer real value to the customer by using a combination of all the marketing components (i.e. product, price, place, and promotion). Social marketing could be helpful for the development of positioning strategies with respect to smaller portion sizes and the benefits that they provide [5].

A last option would be not communicating portion size reductions at all. This could be achieved by a gradual and implicit or “stealth” reduction in portion sizes. Akin to portion sizes that have not increased overnight, reductions in portion sizes could also be carried out steadily over time. According to the consumers who participated in our study, pizzas and candy bars would be suitable products for covert portion size reductions of 15 to 30 percent. Another example is single candy bars, available at different point-of-choice settings, that
weighed 60 grams in 1999, then reduced to 54 grams in 2001 and then to 51 grams in 2008 [6], a 15% decrease in less than 10 years. To our knowledge, this has not been explicitly communicated, nor were the prices reduced. Since this has not led to a boycott of the manufacturer of this candy bar, in some cases not communicating portion size reductions seems to be an option. Another advantage of stealth portion size reduction is that cognitions triggering compensatory food intake are less likely to occur. On the other hand, as the point-of-purchase representatives mentioned, there is a risk of a loss of credibility that many companies are unwilling to take. A last stealth intervention strategy that is worth investigating, is a combination of portion size reduction and a decrease in energy density [7]. Further research is needed to define which products are suitable for stealth portion size reductions, and to what extent portion size reductions (possibly accompanied by a decrease in energy density) can take place without a loss of credibility or compensation behavior.

**Making consumers more susceptible to environmental interventions**

It seems that, when healthier options are being made available without removing the unhealthy ones (which was the case in the interventions that were studied in this thesis, and is currently the most realistic scenario), additional efforts are necessary to stimulate people into choosing the healthy options. For a number of reasons, however, this is difficult to achieve.

It is estimated that people make, on average, more than two hundred food decisions daily [8]. This, combined with the fact that our environment is awash with all kinds of information and other stimuli, results in people having few cognitive resources available for nutritional choices. Consumer behavior is, therefore, often strongly habitual. As a result, subtle environmental changes such as portion size labels, the introduction of small portions, or pricing strategies might go unnoticed.

Habits can be described as a mental construct that is characterized by automaticity, difficulty in controlling and mental efficiency [9]. Since habits are strongly linked to environmental cues, interventions that aim to change habitual behavior need to disrupt environmental cues [10]. One way to achieve this could be the use of “Disrupt-Then-Reframe” (DTR) techniques. Disruption might counter arguing and increase people’s
susceptibility to the reframing or rewording of the message. When DTR techniques are used, a request or advertisement is preceded with a disruptive or confusing message [11]. An example of a subtle disruption that has proven to be effective is the showing of the price of a product in pennies instead of dollars [12]. The DTR technique has been shown to increase sales of various products [11]. When applying the DTR technique to environmental interventions targeted at portion size, an option could be to explicitly mention the price per unit in cents instead of Euros. Another, less subtle, suggestion would be to accompany the introduction of healthy options in, for instance, a worksite cafeteria with changes in its interior (e.g. another location of the hot meal counter in the cafeteria). It is also possible to focus interventions on people whose performance context has recently changed (e.g. moving to a new house or starting a new job). Research has shown that these situations are suitable for disrupting existing habits and for providing new information and opportunities to create new habits [10]. A suggestion is that new employees could receive reduction vouchers for small meals and other healthy options in their worksite cafeteria.

Another reason why it is difficult stimulating people into choosing healthy options is that, currently, large portion sizes are considered to be normal. It would therefore be helpful if norms with respect to acceptable portion sizes changed and that super-sizing were to be considered a display of bad taste and decadency. In the field of social psychology, studies are available demonstrating that social norms can successfully be invoked by using descriptive norms (i.e. the action that is most commonly performed in a given situation). By invoking new social norms, changes in behavior can be accomplished [13]. One suggestion is to mention to a consumer that the customer before him or her selected the smallest available size.

All in all, strategies that might be helpful in changing consumption habits by disrupting unhealthy habitual behavior or invoking different social norms should be studied.

**How target group characteristics and contextual factors are related to the impact of interventions targeted at portion size**

As already mentioned in the introduction to this thesis, there are individual differences in the degree to which people are susceptible to environmental interventions targeted at
portion size [14]. Also, contextual factors play a role in the effectiveness of interventions targeted at portion size. First, some remarks about individual factors will be made. Subsequently, contextual factors with respect to the impact of portion size interventions will be described.

It is likely that people differ with respect to the impact of labeling on choice and consumption behavior. People who are not particularly motivated to eat healthily might, for instance, be more difficult to reach with labeling than the general population. This is in line with influential behavioral theories such as the Health Action Process Approach (HAPA). HAPA suggests a distinction between pre-intentional motivation processes that lead to a behavioral intention, and post-intentional volition processes that lead to actual health behavior [15]. As a result, labeling might appeal to people who are in the post-intentional phase and already diet conscious. In contrast, labels might go unnoticed to those people in the pre-intentional phase who are perhaps most in need of adequate information. For intervention strategies aiming to affect health behavior, this could imply that they have to match the process characteristics of their target group. Accordingly, labeling might be a suitable intervention for consumers in the volitional phase, but less suitable for consumers in the motivational phase [16].

A second issue is that people vary with respect to factors that might be related to food intake such as BMI and (in some cases related to this) dietary restraint or impulsiveness [17, 18]. Rolls and colleagues have conducted a large series of studies on the impact of portion size on consumption [19-22] but did not find any differences with respect to BMI or dietary restraint. Although the impact of portion size on consumption seems robust and independent of factors such as BMI or dietary restraint, this might be different with respect to the impact of portion size interventions on behavior. This implies that it is possible that people who are overweight (or dietary restraint) are more responsive to interventions targeted at portion size than people who are not. Indeed, our studies into the impact of proportional pricing and the introduction of smaller portion sizes indicated 1) that overweight people were more susceptible to proportional pricing; and 2) that BMI (borderline significantly) predicted the self-reported purchase frequency of small meals. In addition, a recent study showed that giving participants four 100-calorie packages of
crackers compared to one 400-calorie package reduced their caloric intake. This was especially true for participants who were overweight [23]. According to the authors, an explanation might be that obese people are more likely to rely on external cues (such as finishing a package) to stop eating than people with a healthy weight. This explanation is in line with findings from a classic series of studies from Schachter [24]. Since overweight people are most likely to profit from interventions targeted at portion size, these findings are promising.

Contextual factors are also relevant when developing and evaluating the impact of environmental interventions targeted at portion size. People might be less health conscious in leisure outing settings than for instance in worksite cafeterias. Also, in a supermarket the impact of interventions could be hampered by the fact that many choices have to be made in a limited amount of time. This could have implications for designing appropriate and effective labeling formats or portion size portfolios.

All in all, certain contexts might be more suitable for interventions targeted at portion size, and people who are concerned about their weight might be more responsive to such interventions (especially in the case of labeling). It is therefore suggested that labeling formats be tailored to the specific setting, product or target group.

**Teaching consumers how to deal with a “super-sized” food environment**

Consumption behavior can be considered as a set of different behaviors and choices that together form a “contextualized process” [25]. When this is applied to the topic of this thesis, it means that the impact of portion size on consumption depends on the context. In the supermarket for instance, value-for-money and practical considerations are likely to be relevant variables that need to be taken into account. People are consequently susceptible to purchasing large portion sizes, value packs, and bundles of products with the intention of storing them. In the home environment, however, other factors (e.g. the availability, accessibility, diversity, and visibility of foods) come into play that might lead to passive over-consumption [26].

As mentioned in Chapter 2, people tend to overeat palatable, high energy-dense foods, without deliberate intention [27]. Additionally, research has indicated that when in a
non-aroused “cold state” (e.g. in the supermarket when not hungry) people generally overestimate their self-regulation capacities and have difficulty forecasting that they are more likely to make unhealthy choices when they are in a hot state such as at home. This is called the “cold-to-hot intrapersonal empathy gap” [28]. Related to this is the issue that people can run out of self-regulation resources with respect to healthy eating and become “ego-depleted” [29]. This might particularly lead to overeating in the anonymous home environment. As mentioned in chapter 3, the intention to stockpile products seems very sensible and realistic in the supermarket. When at home, however, purchasing larger quantities increases consumption [30].

Another issue is that many people experience portion distortion (i.e. perceiving it to be appropriate to consume larger quantities on a single occasion) [31, 32], and people are generally not aware that this is the case (Poelman et al., unpublished data). Informing people about reference portion sizes and making them aware of the fact that their portion sizes are likely to be too large are advised.

Finally, a recent study has indicated that people’s meal sizes are often planned in advance, and that satiation often plays a secondary role in determining the amount of food that is consumed. The authors therefore stress the importance of pre-meal planning and suggest that, for successful weight control, the planned amount to be eaten should be an accurate reflection of the individual’s energetic needs [33].

Based on the above, we suggest that interventions targeted at portion size should have a multiple focus. First, interventions should focus on the food environment, as is the case with the studies that are described in this thesis. Second, interventions should train people to deal with a “super-sized” food environment by teaching them about portion distortion, self-regulation, and pre-meal planning.

**PRACTICE RECOMMENDATIONS**

Based on the results of this research project, some implications for practice and policy will be summarized. Firstly, the qualitative studies among consumers and point-of-purchase representatives raised issues about individual, corporate and governmental responsibilities
with respect to healthy eating. This will be further discussed in the next paragraph, and the term “paternalization paradox” will be introduced. Secondly, information provision and therefore portion size labeling, seem to be widely endorsed interventions. As demonstrated by the studies that we conducted, however, the effectiveness of portion size labeling on individual behavior is limited. It seems nonetheless that, although information provision has its limits, a minimal amount should and can be done. A third issue that will be discussed is that the effectiveness of the environmental interventions that we evaluated could probably be enhanced without overly paternalizing consumers. The approach for this has been coined “libertarian paternalism” [34], and will be further outlined.

The “Paternalization Paradox”

Over time, portion sizes have gradually and “stealthily” increased, and thereby contributed to the prevalence of overweight and obesity. This thesis has increased the knowledge that may lead to effective interventions to reduce the intake of high caloric foods and drinks by studying environmental interventions targeted at portion size. An important strength of this research project was that the interventions that were studied were judged by stakeholders to be feasible to implement. Yet, they probably have only modest effects on behavior.

In all probability, a gradual decrease in portion sizes and an elimination of the largest portion sizes of high caloric snacks and drinks would be more effective in reducing food intake than the ones that were evaluated in this thesis. As discussed in Chapter 4, such reductions and eliminations seem risky for food companies and therefore not logical steps to take. Therefore, formal legislation seems necessary which leads to the question of the role of the government on this issue.

As shown in the focus group study conducted among consumers, some participants very strongly felt that governmental initiatives with respect to portion sizes are paternalistic. This corresponds to a vivid and wide-ranging debate about this issue [35, 36]. Apparently, people have negative attitudes towards perceived restrictions on their freedom of choice, especially if the government is involved. This is interesting to observe since it is, and always has been, a given fact that consumers are confronted with an assortment of food and available choices, offered and created by an external party. Thaler and Sunstein describe this
as follows: “Just as no building lacks an architecture, so no choice lacks a context” [34]. This implies that it is impossible to eliminate contextual factors that affect behavior.

Certainly, people should be held accountable for their own behavior. It is, however, questionable whether the food environment as it is currently designed, sufficiently facilitates consumers in making healthy choices. Producers claim that consumers influence the assortment, because demand creates the offerings and it is in the interest of the producers to respond to consumer demands. This seems (at least partly) true: the industry offers choices and consumers are free to choose that which and how much they eat. As illustrated by the interviews with the point-of-purchase representatives, however, this claim disregards the fact that, essentially, the interest of the food industry is to sell as much food as possible and thereby to increase its profits. So, in many cases, their goals conflict with the interests of public health, often resulting in an unhealthy food environment. When applying this to portion sizes, the choice is often between large and extra large. Moreover, the industry actively creates a demand for large sizes, and, over time, larger sizes have been added to the portfolio while smaller sizes have been removed [6, 37]. This means that, as is the case with any given assortment, consumers’ individual freedoms have been limited. The surprising and paradoxical observation that consumers do not seem to consider restrictions to their freedom stemming from commercial parties (as opposed to governmental interventions) as paternalistic, can be described as the “paternalization paradox”.

Resulting from the paternalization paradox, governments seem unwilling to demand portion size reductions and the elimination of the largest portion sizes. Afraid of being accused of paternalism, governments prefer to stress the importance of people’s individual responsibility and information provision [38].

**Regulation with respect to standard sizes and labeling**

Labeling generally seems to be a widely endorsed intervention in the battle against obesity. However, this approach seems to be founded on overly high expectations with respect to the impact of labeling. Following from our and others’ study findings [39-41], we cannot affirm that portion size labeling has a convincing impact on consumer behavior. It is therefore concluded that transparent and correct information should lie at the basis of a
healthy food environment, but is far from sufficient to improve consumers’ eating patterns. This means that high quality information provision with respect to portion sizes is a minimal and crucial aspect of a healthy nutrition environment. Unfortunately, current portion size labeling is not sufficiently understandable and transparent.

The labeling of soft drinks provides a clear example of inconsistent information that is provided with respect to portion sizes. On the Coca-Cola website and the Coca-Cola bottles (that can be closed and reopened) the calories are displayed per 250 milliliter glass [42]. This means that a reference portion size of 250 milliliters is suggested. On the cans (that contain 330 milliliters and cannot be closed after opening), however, a reference portion size of 330 milliliters is implied. Hence, even within companies the information about reference portion size is contradictory and therefore confusing to the consumers.

Apart from the observation that portion size labeling of soft drinks is inconsistent within one company, it is often also contradictory to reference portion sizes as recommended by the Netherlands Nutrition Center3 that recommends units of 150 milliliters [43]. A recent study has found that consumers are more willing to believe (and consequently consume more when confronted with) a label that depicts a medium sized item as a smaller item than as a larger item. Thus, a small sized item that is mislabeled as “large” (or “medium”) is less likely to be believed than a large sized item that is mislabeled as “small” (or “medium”). Consumers are not aware of this phenomenon that has been described as the “asymmetric size label effect” [44]. This means that due to the asymmetric size label effect, consumers could be more likely to believe the portion size information from the soft drink manufacturer (that suggests reference portion sizes of 250 milliliters) than from the Netherlands Nutrition Center (that suggests reference portion sizes of 150 milliliters).

In addition to the credibility problems that are a likely consequence of the mismatch between portion size information from the Netherlands Nutrition Center and portion size information provided by food companies, current portion size recommendations can also lead to an underestimation of the number of calories that a portion contains. For instance,

3 An institution, financed by the Dutch government, which provides information and education about healthful nutrition.
consumers might believe that their portion of soft drink (i.e. 250 milliliters) only consists of 55 calories, as stated on the website, instead of the actual 92 ((250 milliliters /150 milliliters) x 55 calories).

All in all, communication with respect to (reference) portions sizes is currently ambiguous and therefore often not helping consumers in making informed choices. Another problem is that the information provided is often not in line with nutritional guidelines. We therefore advocate regulations that enforce clear and realistic norms with respect to reference portion sizes and their communication and labeling.

**Libertarian paternalism**

The results of the studies in this thesis illustrate that there is a tension between (most probably) effective interventions that are considered paternalistic, and interventions that are not considered paternalistic but generally have a limited impact on consumption behavior.

An alternative approach to this dilemma seems to be “libertarian paternalism”. Libertarian paternalists try to steer people’s behavior in welfare-promoting directions without blocking choices or eliminating freedom of choice [34]. Libertarian paternalism is based on the assumption that people’s choices and preferences are strongly influenced by contextual factors. One example of a contextual factor is that people do not tend to depart from the status quo situation. This means that default settings strongly steer people’s choices even when better alternatives are available [45]. Therefore, choice architects can design the choice environment and thereby “nudge” people to make behavioral choices that are in the best interests of their personal wellbeing and the public good [46]. According to libertarian paternalists, people should always be given the freedom to make their own perhaps unhealthy choices. However, unhealthy options should cease to be so heavily marketed or set as the default.

The principles of libertarian paternalism seem to be feasible and useful in shaping a more “portion-friendly” choice environment. Most importantly, this means that portion sizes that are in line with nutritional guidelines, should become the default option. This would mean that “healthy” portion sizes are the most visible and explicitly labeled and marketed.
Furthermore, portion sizes as recommended by the Netherlands Nutrition Center should be the most attractively priced, and the sizes given unless otherwise requested.

Traditionally the question asked in fast-food restaurants when ordering an item is: “Would you like that in small, medium, large or super-size?” Following the principles of libertarian paternalism, this question should become superfluous as the customer automatically receives the smallest item. This approach could increase the effectiveness of environmental interventions targeted at portion size while retaining freedom of choice.
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