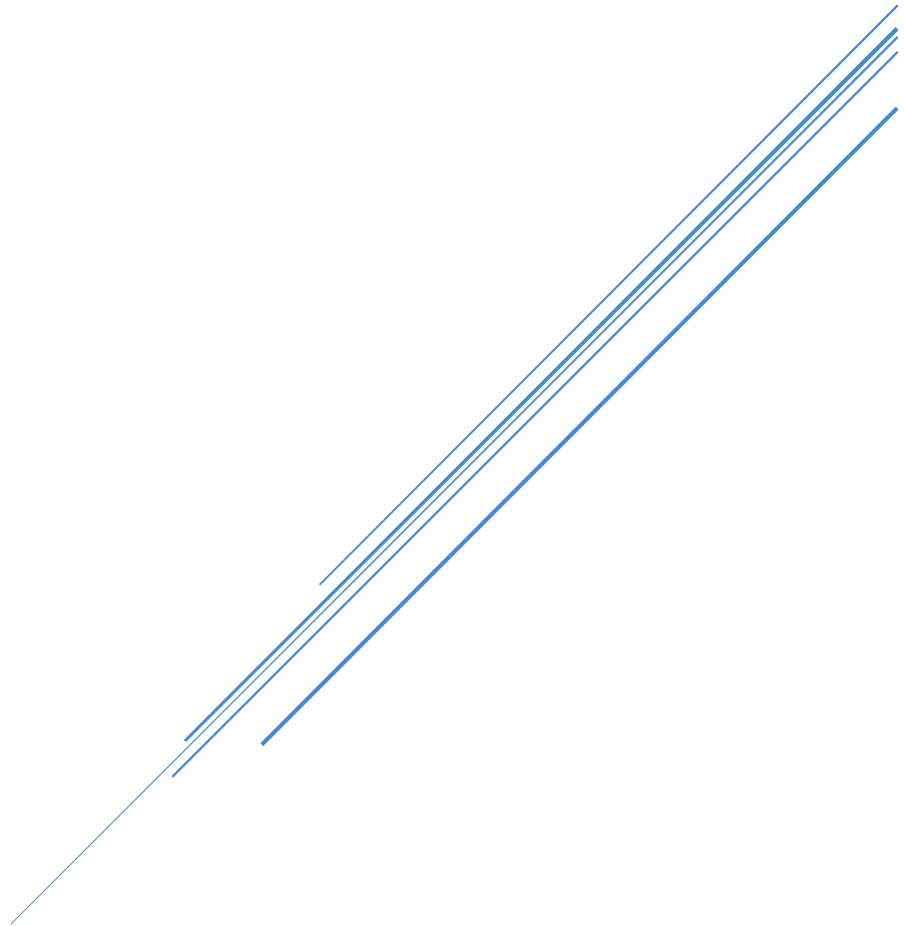


INTERVENTIONS TO REDUCE MEAT CONSUMPTION IN OECD
COUNTRIES: A SYSTEMATIC REVIEW TO UNDERSTAND DIFFERENCES IN
SUCCESS



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SYSTEMATIC REVIEW TO UNDERSTAND DIFFERENCES IN SUCCESS



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PREFACE

At a young age I was already concerned with pressing environmental problems, such as climate change. Fast forward a few years and my interest in environmental deterioration has grown insofar that I am enrolled in the master's degree in Environmental and Society Studies at the Radboud University in Nijmegen. It is especially the connection between food consumption and environmental impacts that intrigues me, as there is still much environmental progress to be made in changing consumers' food consumption patterns. At the same time, many people seem to be unaware of the urgency to change their dietary habits accordingly. Given my interest in this issue, it was a logical decision for me to choose a research topic for my master's thesis related to this issue.

I would like to express my appreciation to those who supported me or helped me complete my thesis.

I am very grateful for the guidance I received from Dr. Duncan Liefferink. He provided me with constructive feedback and new motivations in the many discussions we had during the process of writing this thesis. It was a great learning experience for me. I would also like to thank Dr. Mark Wiering, who guided and supported me during the preparatory stages of this thesis.

Besides, I am very grateful to The Netherlands Nutrition Centre for providing me the opportunity to execute my research and to learn in practice as part of an internship. I look back on an illuminating and pleasant period of six months in which I gathered many practical insights into sustainability and food consumption. I especially want to thank Corné van Dooren, who has helped me not only by offering me a position as an intern, but also by sharing relevant publications and by involving me in weekly meetings on food sustainability. Lastly, he provided me with fruitful feedback and new motivations during the numerous reflection meetings we have had.

Moreover, a big thank you to my sister Romy, who has proofread the concept version of this thesis, for her time and efforts. Finally, I am thankful to my parents, who have always supported me during my study period.

I hope that reading this thesis will be as much an enjoyable and informative experience to you as the process of writing has been for me.

Joeri Veul
The Hague – July 2018

SUMMARY

Meat consumption has grown rapidly worldwide since the 1950s, whereas meat consumption also has severe consequences for human health and animal well-being as well as for the environment and biodiversity. Therefore, a sharp reduction of people's meat consumption levels is inevitable. Several developed countries have acknowledged this and have taken measures accordingly, such as developing financial interventions to discourage the consumption of meat. Besides, interventions can be set up to stimulate the consumption of less harmful, alternative plant-based sources of protein. However, there happen to be great differences in the outcomes of the interventions. Moreover, the effectiveness of these interventions heavily depends on the socio-cultural and socio-demographic context in which they are applied and their target group.

The aim of this paper is to provide a deeper understanding and explanation of differences in the success of different intervention methods in reducing the meat consumption in OECD countries (countries belonging to the Organization of Economic Cooperation and Development). It does so by drawing from theoretical insights from sociological and psychosocial sciences. More specifically, Shove et al.'s (2012) Social Practice Theory and De Vries et al.'s (1988) Attitude-Social-influence-Efficacy model were used as the foundations for developing a conceptual model, which schematically illustrates the multiple behavioral determinants for reducing meat consumption. The model is a framework that enables seeking for patterns of association between outcomes of the interventions and the behavioral determinants on which the interventions focus.

A mixed-methods systematic review research design was used, for which a total of 43 evaluation articles, either qualitative or quantitative by nature, have been collected following the PRISMA data collection flow chart. The resulting 57 interventions were analyzed in a pre-composed Excel sheet (see appendix III), which helped identifying and giving structure to the key findings of the studies used and which also helped determining the reasons for variety in how successful the different interventions are.

The data analysis shows that there is no one-size-fits-all intervention method that reduces meat consumption to a great extent. Rather, it is necessary to focus on more than one behavioral determinant. The practice determinant appears to be a vital determinant for interventions to focus on due to its susceptibility for constant long-term behavior change. In Ghent, Belgium, for instance, the 'Thursday Veggieday' campaign has encouraged one fourth of the city's inhabitants not to eat meat several times a month and has resulted in 35 public schools adopting vegetarian lunches on Thursdays (Leenaert, 2012).

The most promising route to set intentions for reducing meat consumption is by focusing on the attitude and the self-efficacy determinant. That is, changing the individuals' thoughts about the consequences of reducing meat consumption on, for instance, health, the environment and food experience has great potential for making individuals intend to eat less meat. Self-efficacy on the other hand, is concerned with the extent to which the individual can deal with barriers overruling the intention to reduce meat consumption, such as meat products being on sale.

Certain tools, such as WhatsApp messages that remind the individual of the weekly recommended meat intake have proven to be helpful in reducing meat consumption in an experimental study of Carfora et al. (2017b). Additionally, interventions are more effective when they are tailored to gender and meat consumer segments. Lastly, intentions may sustain and lead to actual behavior change when interventions are combined with interference at the point-of-purchase of meat (substitute) products, such as making a vegetarian dish the default menu option.

Based upon these theory-based conclusions, practical recommendations are proposed and a plausible intervention strategy to reduce meat consumption in the Dutch context is formulated for The Netherlands Nutrition Centre.

Future research may explore the long-term effects caused by interventions to reduce meat consumption and could be focused on developing tailor-made intervention strategies for other countries as well.

TABLE OF CONTENT

1. Introduction	1
1.1. Problem statement	1
1.2. Research questions	2
1.3. Research aims and relevance	3
1.4. Study structure	4
2. Theoretical framework	5
2.1. The theory of planned behavior	5
2.2. The ASE-model	6
2.3. The Social practice Theory	7
2.4. Conceptual model & operationalization of concepts	9
2.5. Intervention methods	13
3. Methodology	15
3.1. Research philosophy	15
3.2. Research design: mixed methods systematic review	16
3.2.1. Mixed methods	16
3.2.2. Systematic review	17
3.3. Research methods	18
3.3.1. <i>Data collection: PRISMA Flow Chart</i>	18
3.4. Data analysis	20
4. Dutch context of meat consumption	22
4.1. Eating Meat as part of Dutch culture	22
4.2. Meat and masculinity	23
4.3. Meat consumption as a practice: Dutch historical background	23
4.4. Intra-national differences in meat consumption	25
4.4.1. <i>Socio-cultural differences</i>	25
4.4.2. <i>Socio-cultural differences</i>	25
4.5. Why (not) less meat?	26
5. Results	27
5.1. Raising awareness	28
5.1.1. <i>The meat paradox</i>	28
5.1.2. <i>Labelling</i>	30
5.2. Changing the choice architecture & point-of-purchase actions	33
5.2.1. <i>Portion sizes</i>	33
5.2.2. <i>Supply of meat substitutes</i>	34
5.2.3. <i>Nudging</i>	34
5.3. Financial measures	35
5.4. Other governmental regulations	38

5.5.	Tools.....	40
5.5.1.	<i>Framing of the issue</i>	40
5.5.2.	<i>Instruments for transferring information</i>	41
5.5.3.	<i>Terminology of plant-based products</i>	42
5.6.	Campaigns.....	43
5.6.1.	<i>Meat Free Monday</i>	43
5.6.2.	<i>Thursday Veggieday</i>	44
5.6.3.	<i>Nationale Week Zonder Vlees</i>	44
6.	Connecting interventions to behavioral determinants	46
6.1.	Personal characteristics	47
6.1.1.	<i>Nutritional and environmental knowledge</i>	47
6.1.2.	<i>Socio-demographic factors</i>	50
6.2.	Attitude	52
6.2.1.	<i>Expectations on food experience</i>	53
6.2.2.	<i>Expected food expenditures</i>	54
6.2.3.	<i>Expected consequences on animal well-being</i>	54
6.2.4.	<i>Expected environmental and health-related impacts</i>	55
6.3.	Social influence	55
6.4.	Self-efficacy.....	57
6.4.1.	<i>Belief of success in lowering meat consumption</i>	57
6.4.2.	<i>Belief of the ability to cope with barriers</i>	57
6.5.	Practice	58
6.6.	Barriers and abilities	60
6.6.1.	<i>Food supply</i>	60
6.6.2.	<i>Point-of-purchase presentation</i>	61
6.6.3.	<i>Prices of meat (substitutes)</i>	61
7.	Conclusions and Recommendations	63
7.1.	Conclusion.....	63
7.2.	Practical recommendations for the Netherlands Nutrition Centre	65
7.3.	Reflection on the proposed intervention strategy.....	68
7.4.	Theoretical and methodological implications of the findings.....	69
7.5.	Future research.....	71
	Bibliography	73
	Appendix I	81
	Appendix II	83
	Appendix III	84

LIST OF ABBREVIATIONS

ASE-model	Attitude-Social-Influence-Self-Efficacy-model
COV	Centrale Organisatie voor de Vleessector
CO₂	Carbon Dioxide
OECD	Organization of Economic Cooperation and Development
NGO	Non-Governmental Organization
NNC	Netherlands Nutrition Centre
PRISMA	Preferred Reporting Items for Systematic reviews and Meta-Analyses
SPT	Social Practice Theory
TPB	Theory of Planned Behavior
UK	United Kingdom
US	United States

1. INTRODUCTION

1.1. PROBLEM STATEMENT

The Health Council of the Netherlands (2015), a Dutch advisory body for government and parliament, recommends consuming less products derived from animals and more plant-based products. The average Dutch citizen eats 738 grams of meat a week – an amount that is associated with high chances of getting chronic diseases (Terluin et al., 2016; The Health Council of the Netherlands, 2015). Studies have proven that the intake of meat is strongly correlated with heart diseases, diabetes and certain forms of cancers (Zur & Klockner, 2014). The Netherlands Nutrition Centre (2018a), an independent organization that provides information about eating healthy, safe and sustainable, has translated the advice of The Health Council of the Netherlands into the practical recommendation to eat no more than 500 grams of meat a week.

A shift in diet that consists of eating less animal protein and more plant-based protein could not only be beneficial for the health of Dutch citizens, but would also entail a step forward in terms of sustainability¹, since meat-based diets contribute significantly to one's ecological footprint. The Food and Agriculture Organization of the United Nations (FAO, 2006) has reported that the livestock industry is even one of the biggest contributors to environmental problems.

Of all GHG emissions, more than 30 per cent originates from food systems (Goodland & Anhang, 2009). Roughly half of the food-related emissions is part of the livestock sector (Wellesley et al., 2015). Moreover, nitrous oxide and methane are the two main gases associated with livestock and contribute 298 and 25 times more to global warming than carbon dioxide (Solomon et al., 2007). Besides the environmental impacts of consuming meat in terms of GHG emissions, livestock also contributes severely to water depletion and pollution, loss of biodiversity, soil depletion and clearance of forests, since 30 per cent of all land surface is needed for making meat consumption possible (Steinfeld et al., 2006). When comparing different kinds of meat, red meat appears to have the most environmental impact. For instance, the GHG emission count is five times more than that of chicken and its production requires eleven times more water and 28 times more land (Carrington, 2014). At the same time, the Netherlands are the second biggest exporter of agricultural products and are therefore in a unique position to stimulate sustainability within the sector (Rijksoverheid, 2013).

It is predicted that the environmental impacts of meat consumption will keep rising in the coming decades: “consumption of meat and dairy produce is expected to rise by 76 per cent and 65 per cent respectively by the middle of the century, driven by a rising population and a shift in dietary preferences towards protein-rich foods” (Wellesley et al., 2015, p. 2). Developing regions of the world in particular, such as parts of Asia and Africa, are expected to see a drastic rise in the demand for more meat, driven by the expected growth of the middle class in these countries.

Besides environmental and public health aspects, the meat industry is often considered unethical with respect to how animals are treated. Rossi and Garner (2014, p. 480) refer to work ethic of the meat industry as aiming to achieve “the greatest production at the lowest cost and in the shortest amount of time”, which has serious

¹ “Sustainable diets are diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations. Sustainable diets are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair and affordable; nutritionally adequate, safe and healthy; while optimizing natural and human resources” (Burlingame, 2010, p. 83).

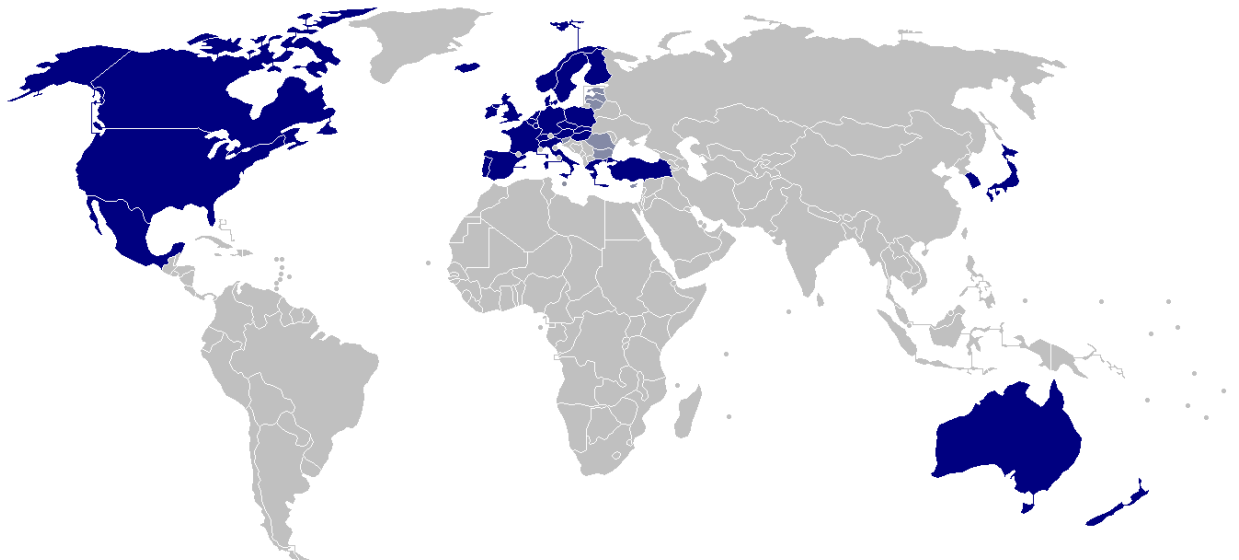
implications for the well-being of animals. A few topics of concern in this respect are unnatural growth of animals through overfeeding, use of antibiotics, health risks animal venture during long-distance transport and animals being detained to tiny living spaces.

1.2. RESEARCH QUESTIONS

Given the adverse impact of meat consumption on public health, environment and animal well-being, there is strong case to reduce meat consumption in the Netherlands. Trends have shown, however, that per capita consumption of meat has decreased by only 5.9 per cent between 2012 and 2016 within the Netherlands. Interestingly, in the surrounding countries Belgium and Luxemburg the meat consumption has declined more than twice as much as in the Netherlands (Expertise Voedingsmiddelenindustrie (EVMI), 2017). This difference suggests that the interventions to reduce meat consumption are an important topic within the environmental and social sciences. This study elaborates on this topic by answering three research questions:

1. What interventions have been established to reduce the consumption of meat in OECD countries?
2. Are these interventions successful in reducing the levels of meat consumption and what could be the explanation for these outcomes?
3. Which of these interventions might be the most suitable to reduce meat consumption in the Dutch context when applied by The Netherlands Nutrition Centre?

MAP 1: MAP SHOWING IN BLUE THE MEMBER COUNTRIES OF THE OECD GROUP



Source: OECD, 2018.

There are three reasons for specifically focusing on this selection of OECD countries when studying applied interventions in this research (see map 1 for an overview of the countries belonging to the OECD group). In the first place, making a selection was inevitable given the restricted time available for the research. In addition, the selected group of OECD countries are a formal demarcation of countries that are socio-economically and culturally comparable with the Netherlands. This is necessary for answering the third research question. Last, the OECD countries are all 'developed' countries, which is "where the bulk of research [on interventions to reduce meat consumption] is to be found" (Garnett et al., 2015, p. 74).

The research comprises a systematic review, which involves “identifying, synthesizing and assessing all available evidence, quantitative and/or qualitative, in order to generate a robust, empirically derived answer to a focused research question” (Mallet et al., 2012, p. 445). Data were compiled from two academic databases and were assessed in terms of usability by using the PRISMA model developed by Moher et al. (2009). Systematic reviews are “considered a key tool for evidence-informed policymaking”, as it is “the most reliable and comprehensive statement about what works” (Petrosino et al., mentioned in: Mallet et al., 2012, p. 445).

In answering the second question, theoretical understandings from two psychosocial theories were used to explain research findings and to categorize the interventions into behavioral determinants before answering the third question. The first theory used is De Vries and colleagues’ (1995) Attitude-Social-influence-Efficacy model (the ASE-model), which states that the intention of carrying out certain behavior is the most decisive factor in explaining behavior. Intention, on its part, is split into three behavioral determinants: attitude, social influence and self-efficacy. To supplement this theory - the Social Practice Theory (SPT) was used. This theory, initiated by Shove et al. (2012), provides an explanation for behavior by looking at socio-structural processes. It therefore contrasts with the ASE-model, which takes the individual as the unit of analysis. In chapter 2 these theories will be further explained.

1.3. RESEARCH AIMS AND RELEVANCE

By aiming to provide answers to the abovementioned research questions, this research project has two goals. The first goal is to contribute to existing academic literature about interventions aimed at reducing the consumption of meat. Given the adverse impacts of meat consumption on health, animal well-being and, most of all, environment, this topic requires adequate (academic) attention. Thus far, however, only little attention has been paid to this topic according to Stoll-Kleemann and Schmidt (2017), who propose that the “question of how to achieve this change in dietary behavior in the direction of reduced meat consumption [...] has yet to receive the attention it deserves” (p. 1262). De Boer and Aiking (2017) emphasize that there is also lack of research outside of academic circles in their comparable study of protein consumption in European countries. According to them “pro-environmental protein consumption is a new concept, which until now has little active support from policy-makers in government, industry, and even environmental NGOs” (p. 4). The present research will contribute to filling this gap of academic attention. Exceptional to this study is the fact that it comprises a review of literature from both health and sustainability study disciplines, which has been done only rarely until now (Garnett & Finch, 2016).

The second goal of this research project is to translate the results of this study into practical recommendations (i.e., crucial determinants to focus on and an elaborated plausible intervention strategy) for the NNC (Netherlands Nutrition Centre) to reduce meat consumption in the Netherlands. Thus far, a systematic review study into a broad range of intervention methods to reduce meat consumption in the Dutch context has not yet been completed (Nederlandse Omroep Stichting, 2017; Terluin et al., 2016). Although De Bakker and Dagevos (2010) discuss intervention methods in general, they do not position these in the context of the Netherlands. Besides, albeit research has been conducted into the underlying thoughts of Dutch consumers for purchasing of meat (e.g., Dagevos et al., 2012; De Bakker & Dagevos, 2012), as well as into interventions methods that municipalities and politicians could use to stimulate sustainable food consumption (e.g., Dagevos & Voordouw, 2013; Fontein et al., 2011), meat consumption reduction in the Netherlands remains rather unexplored outside of governmental bodies and individual consumers. This research project will contribute to filling the knowledge gap in terms of interventions for reducing meat consumption in the Netherlands.

1.4. STUDY STRUCTURE

This thesis is structured as follows. In chapter 2, theoretical insights relevant to this research will be discussed, resulting in a conceptual model and a summary table involving a classification of intervention methods aimed at reducing meat consumption. In chapter 3 the methodology, i.e., the practical execution of the research, will be described. Subsequently, chapter 4 will provide more detailed information about the current meat consumption in the Netherlands. What meaning do the Dutch attach to meat, and what policy-historical and cultural processes are at the root of this? This is accompanied by a discussion on intra-national socio-demographic and socio-cultural differences regarding meat consumption. It concludes with the motives of people in either adhering to carnivore practices or changing their meat consumption patterns. In chapter 5 literature about intervention methods for reducing meat consumption and the effects these have generated is explored in detail. Chapter 6 builds upon this chapter by relating the interventions to the behavioral determinants to which they respond. More specifically, this chapter addresses the question which behavioral determinants are the most susceptible for behavior change when it comes to interventions to reduce meat consumption, and addresses the reason for differences in success of these interventions. The final chapter comprises a concluding reflection on the different theoretical insights and findings of this research. Therefrom, a number of lessons are drawn and translated into recommendations for TNNC. This chapter also provides a discussion of the theoretical and methodological remarks and a foursome of suggestions for further research.

2. THEORETICAL FRAMEWORK

This chapter gives a deeper theoretical understanding of meat consumption behavior based on several scientific disciplines. First, section 2.1 and 2.2 provide an overview of two socio-psychological theories (the Theory of Planned Behavior and the Attitude-Social-influence-Self-Efficacy model or ASE model). After that, the sociological Social Practice Theory (SPT) is discussed in section 2.3. These models are the foundations for the conceptual model, which is presented in section 2.4. The follow-up section defines relevant theoretical and conceptual concepts and gives an in-depth elaboration on the conjunction of the SPT and ASE-model within the conceptual model. Finally, section 2.6 concludes this chapter by shedding light on the other part of the research' theoretical foundation, namely theories regarding intervention methods.

2.1. THE THEORY OF PLANNED BEHAVIOR

Food consumption behavior can be explained from several points of view. One of the first approaches providing a theoretical understanding on this topic is the neoclassical economic theory. This theory assumes that consumers are fully rational in their choices and strive for maximal utility when allocating money (Antonelli et al., 2014). Consumers are constrained by monetary budgets when making food decisions, and constantly evaluate options for food on their value. This approach, however, has received criticism during the second half of the twentieth century from both psychological and sociological stances in science. Most criticism had to do with the assumption in this theory that consumers act fully rational within the boundaries of the market. The line of thought within these newer stances is that food consumption decisions are not solely made in rational economic boxes. Other, more complex, psychosocial factors also determine consumption patterns. For instance, consumers could make decisions based upon the underlying thoughts of showing their attitude towards animal wellbeing or to express status or identity (Antonelli et al., 2014).

One of the most well-known psychosocial theories is the Theory of Planned Behavior (TPB) (Ajzen, 1985, 1991, 2015). Central to this theory is the idea that intention is the main antecedent of behavior, as it resembles the motivation to behave in a certain manner when there are opportunities to do so.

The TPB is frequently used in food consumption studies (Verain et al., 2015). This theory was, for instance, used by Fila and Smith (2006) in their study on healthy eating behavior among urban Native American youth. In their study, they found that a shortage of healthy foods in schools and fast-food restaurants is a great deterrent among Native American boys for not eating healthy. In this case the food environment is a barrier for eating healthy for native American boys who may in fact have the intention to do eat healthy.

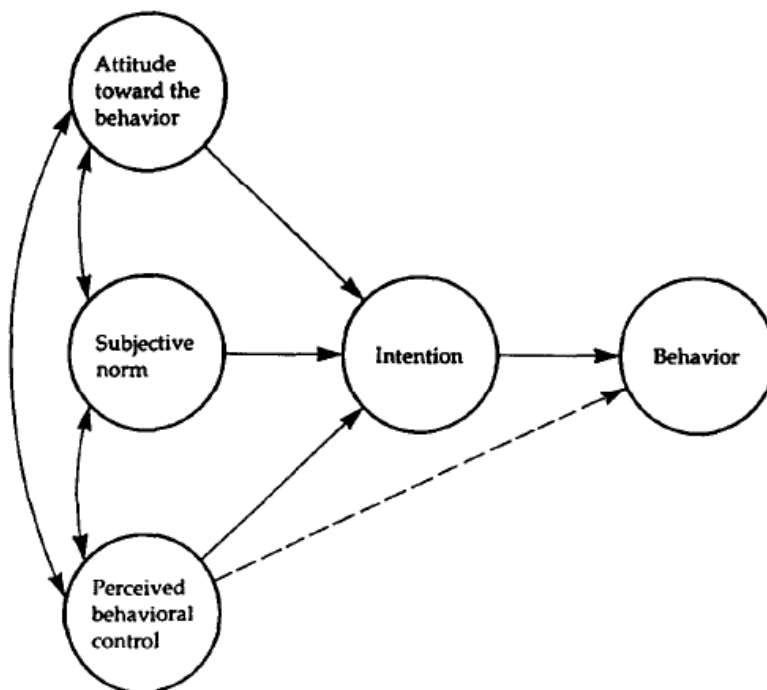
Intention, on its turn, is explained by three behavioral determinants according to the TPB:

- **Attitude towards behavior:** the individual's position towards the intended behavior and the expected evaluation of doing so. For instance, a person might decide to eat less meat because of its negative impacts on health (Terluin et al., 2016);
- **Subjective norm:** the direct and indirect social influences of influential people that carry a certain belief about the behavior in question. Lea and Worsley (2001), for instance, found that people willing to eat less meat have a harder time doing so when eating meat is perceived as normal in their immediate social environment;
- **Perceived behavioral control:** the perceived ability of the individual to perform the intended behavior and the ability to cope with barriers preventing this behavior. Specifically interesting in this regard are situations in which the person is confronted with the desire to step back from the intended behavior. For

example, a person might not succeed in eating less meat for a longer period, as he/she perceives having to ask for a vegetarian meal in a restaurant as a mental barrier (Ajzen, 1991; Lagarde, 2015).

A few years after introducing the original TPB, Ajzen (1991) expanded the model with two additions. First, a “feedback” arrow was added from behavior towards the behavioral determinants (p. 182), indicating a dynamic loop. Furthermore, background variables such as age, gender, intelligence, etc. were included as exogenous variables that influence the three behavioral determinants. Gender, to give an example for the Dutch context, is a main determining factor for the consumption of meat in the Netherlands: on average Dutch males eat 52 per cent more meat than females (2011). The TPB-model is portrayed in figure 1, although the feedback effect is not integrated in the model “for ease of presentation” (p. 181). Similarly, the background factors in the TPB are expected to affect intentions and behavior only *indirectly* via the behavioral determinants (Ajzen, 2015). Hence, for the sake of clarity these variables are not illustrated in the model.

FIGURE 1: THE CONCEPTUAL MODEL OF THE THEORY OF PLANNED BEHAVIOR



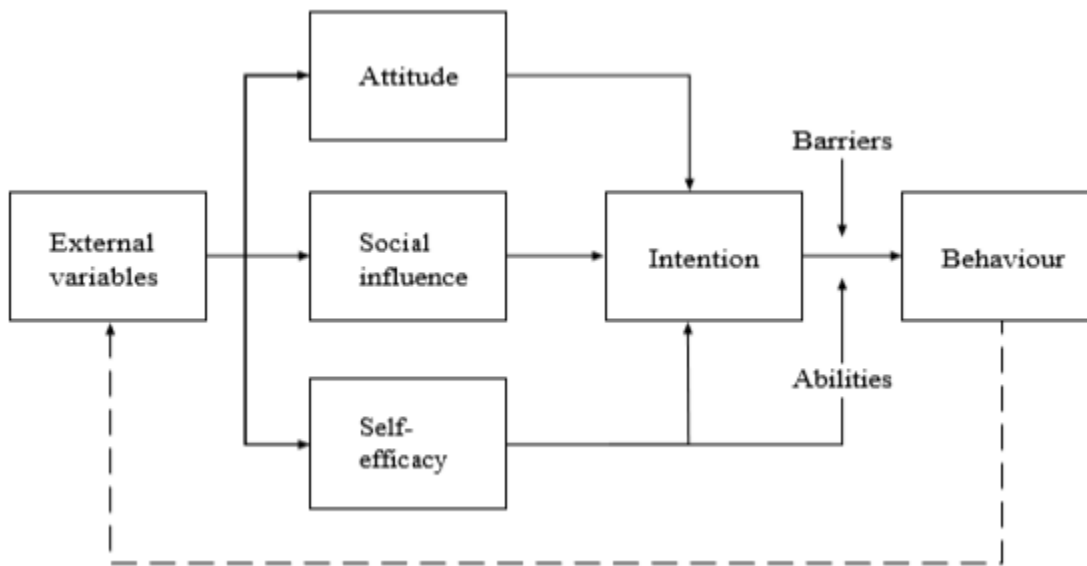
Source: Ajzen (1991).

2.2. THE ASE-MODEL

Around the same time that Ajzen developed his TPB model, De Vries and his colleagues (De Vries et al., 1995; 1998) built upon Ajzen’s work and introduced the ‘Attitude-Social-influence-Efficacy model’ (ASE-model). This model is frequently applied in studies that try to predict food consumption behavior, especially in Dutch speaking countries. The model differs from the TPB model in several respects. First, the ASE-model also considers social support and ‘modelling’ to play a role, whereas the TPB-model considers subjective norm to be of social influence on the intention to behave (De Vries et al., 1995, p. 239). Second, while the TPB model does not implicitly integrate variables that influence the correlation between intention and behavior in the model, the ASE-model integrates both barriers and abilities as influencing this relationship (see figure 2). The variable ‘barriers and abilities’ is partly determined by self-efficacy, since a person’s belief about his or her ability to perform certain behavior can either hamper or support that behavior. Third, the ASE-model makes use of a different and more extended

operationalization of the different behavior determinant variables (see section 2.2 for more information about the operationalization of the model) (De Vries & Mudde, 1998).

FIGURE 2: THE ASE-MODEL



Source: Brug et al. (1995), p. 286.

What makes the TPB and ASE-models helpful for this research, is that they split up the concept of behavior into several components. These determinants provide a convenient framework to categorize the interventions for reducing meat consumption. Furthermore, they are useful theoretical frameworks for understanding the underlying conscious processes that explain the performance of food consumption behavior (Carfora et al., 2017a).

However, when only focusing on individual oriented motivations to perform behavior it is not possible to catch all that is involved in behavior change interventions (Hargreaves, 2011, p. 95). There are more complex and indirect influences on food consumption besides cognitive individual aspects that act upon the unconsciousness state of an individual (Stern, 2000).

2.3. THE SOCIAL PRACTICE THEORY

A theory that offers a “broader and more holistic conceptualization” (Hargreaves, 2011, p. 81), is the Social Practice Theory (SPT), initiated by Shove et al. (2012). This theory builds upon understandings of Giddens’ (1984) structuration theory and Bourdieu’s (1990) concept of ‘habitus’ (Maller, 2012).

In contrast to the ASE-model and the TPB models, SPT does not take individuals as the unit of analysis. Rather, it focuses on social practices, situated between the agent on the micro level and the societal structures on macro levels. In other words, SPT does not take individuals’ thoughts and intentions as a basis for making certain choices, but is about people doing something they are used to do on a day to day basis. Practices, in this regard, are highly routinized by frequent repetition (Bacon & Krpan, 2018; Hargreaves, 2011).

Practices are especially apparent when it comes to food consumption: “Habit is one of the key challenges for eating behavioral change policy. Food procurement often is a routine activity, then food choices are strongly affected by habit” (Scalvedi et al., 2017, p. 1). This suggests that past behavior is an important predictor for food consumption. According to the SPT, it is not consumers’ motivation that must be changed to let society consume

less meat, but the social practice of eating meat every day of the week, or the social practice of having turkey as the main dish for Christmas dinner (Dagevos et al., 2012). Practice is not a synonym for behavior, but “is a driver of behavior in cases where volition and choice are evidently lacking” (Shove, 2010, p. 1276).

In order to better understand the applicability of the SPT in this research, it is crucial to know more details about the origins of the theory. Shove et al. (2012) states that “much of the literature [...] takes practices to be enduring entities reproduced through recurrent performance” (p. 8). According to Shove et al., this is a somewhat ambiguous and simplified manner of interpreting practices. Rather, the authors argue, is this line of thinking a combination of two interpretations of the concept. On the one hand, practices are entities made up by and making up the lives of people: they are constantly evolving and being reproduced. Put another way, ‘practice’ is a term to describe an accumulation of patterns of behavior over time. The underlying assumption behind this interpretation is that practices are culturally enrooted: they are embedded in time and space. As such, this interpretation of practices stems from the sociological sciences and is established at the collective level. Shove et al. refer to this as ‘practices-as-entities’. This is the stance adopted by most existing literature on practices.

On the other hand, another interpretation of practices focuses more on the individual level. Shove et al. (2012) emphasize that the significance of an individual in practices should not be overlooked either, as is often done in literature. This view on the individual level “is required if we are to develop a convincing account of change and order with practice at its heart” (Shove et al., 2012, p. 8). This ‘practices-as-performances’ interpretation, stemming from the socio-psychological sciences, takes the notion of practices in the absolute sense of the word. According to this perspective, practices are constellations of individual performances, carried out in everyday conduct. Crucial is its understanding that practices are open for change, as “the individual is continuously prompted to improvise or experiment. Routines, therefore, are never exactly the same and everyday practice adaptations always occur at some scale” (Kennedy et al., 2015, p. 162). Having laid out this dual interpretation of the concept ‘practices’, it is vital to know that the Social Practice Theory is established as an in-the-middle-road between both interpretations: Shove et al. do not inherently concur with one of either side, but argue that interpretations provide useful insights for explaining (changes within) practices.

According to Shove et al. (2012), behavior changes can be explained by shifts in meanings, competences and skills. These elements together make up social practices and consist of the following components (Shove et al., 2012, p. 14):

- **Materials:** the things and technologies we use for our practices;
- **Competences:** the skills, know-how and techniques needed to carry out practices;
- **Meanings:** the symbolic meanings given to the practice and how well the practice complements the ideas and culture in the wider society.

In order to clear up these theoretical concepts, it is useful to go into more detail about a practical application of this theory on the immense growth of worldwide meat consumption during the second half of the twentieth century. In 1961, annual per capita consumption of meat worldwide was 17 kilograms, whereas this currently is more than twice as much, at the level of 43 kilograms per capita (FAOSTAT, 2015; Pfeiler & Egloff, 2018). Taking the materials element of the SPT into account, one may assume that decreases in oil prices have led to cheaper livestock feed, while at the same time increases in wealth have made meat financially more accessible for bigger parts of the population (Harris, 2015). This shift to an ever-growing accessibility of meat has implications for the ‘meanings’ people attach to consuming meat: they may have hypothetically perceived meat as an everyday part of their meal(s) (Nierenberg, 2003). As a last important factor, Smith et al. (2013) have shown that a lack of time has

led to a shift from being able to prepare food at home towards making out-of-home purchases of ready-to-eat foods high in animal proteins.

The SPT is useful for this study because it is as an extension of the ASE-model in understanding behavior (change) by placing it in wider societal contexts. Nevertheless, all abovementioned theories, even when taken together, cannot fully explain why people tend to buy more meat than considered necessary at point-of-purchases as supermarkets. Studies have shown that marketing strategies used by companies, supermarkets or restaurants strongly affect the 'unconscious' consumer in his consumption process (Schapker, 1966) (see for instance: Bacon & Krpan, 2018; De Bakker & Dagevos, 2010; Hoek et al., 2017). Marketing strategies can either hinder intended food behavior or stimulate it by means of nudging² strategies (Thaler & Sustein, 2008). Typical examples of nudging in the field of food consumption are changing the default menu option to a more healthy or sustainable meal, manipulating the portion sizes or increasing the availability of fruit and vegetables in comparison with unhealthy snacks (Lorenz & Langen, 2018).

2.4. CONCEPTUAL MODEL & OPERATIONALIZATION OF CONCEPTS

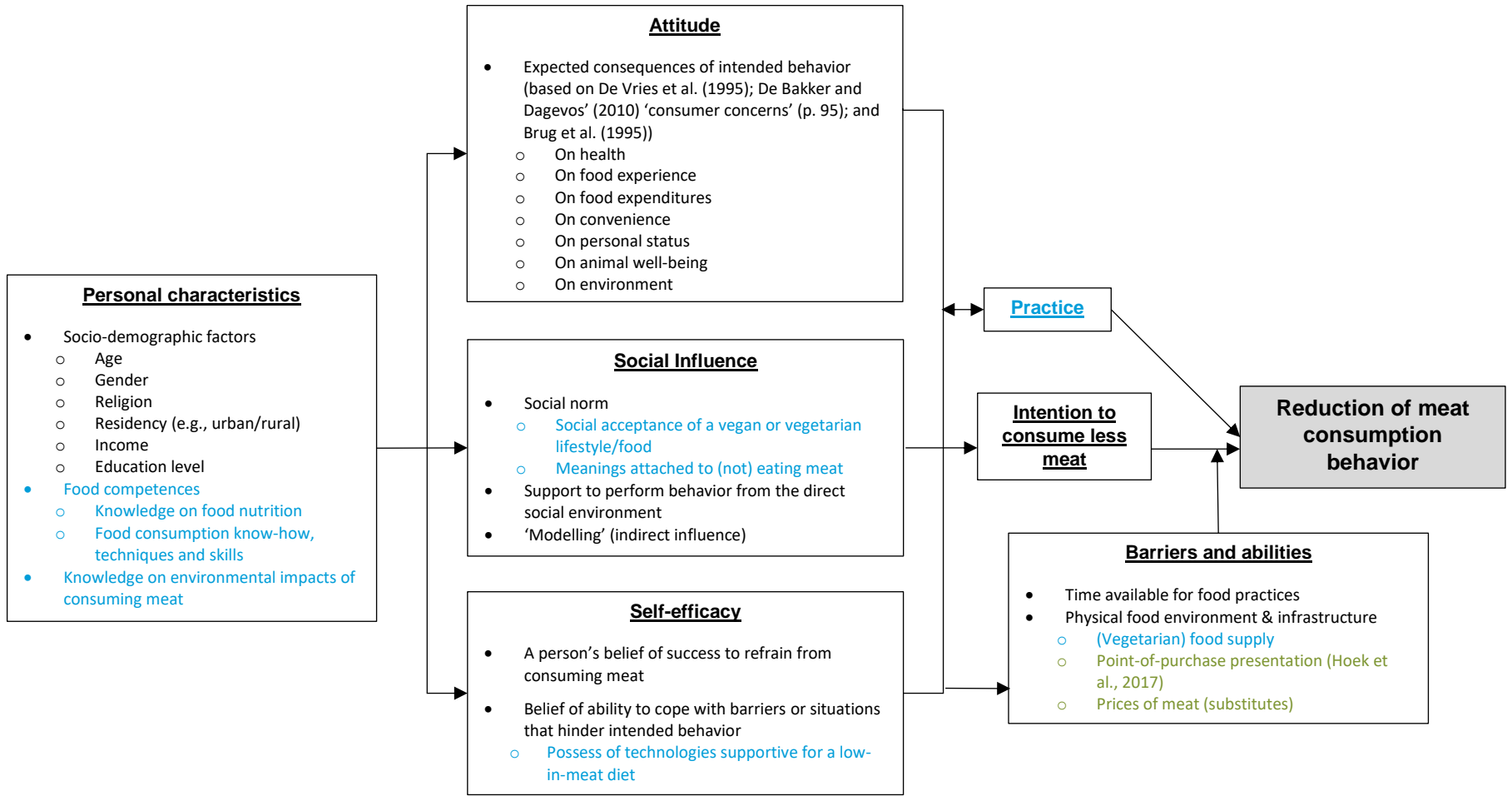
The ASE-model is rooted as a theoretical framework to predict behavior, often in combination with quantitative research methods. The operationalization of the variables is usually a division of the behavioral determinants into a range of dimensions based on the research subject. They are indicated by Likert scale survey questions, which gives the researcher the possibility to predict the extent to which a specific determinant affects behavior. However, the application of the ASE-model in this research will differ from this conventional manner by using it to explain behavior (in a qualitative sense). Renzi and Klobas (2008) have demonstrated that using the ASE model and the TPB model in qualitative studies is perfectly feasible.

However, this conversion has implications for practical applications of the ASE-model. In the conventional quantitative manner of using the model, it is seen as a theoretical tool to *predict* behavior. Hence, for reliability purposes, the operationalization of the variables precedes the phase of data collection. In contrast, this research uses the ASE-model in another way. It functions as an instrument to *explain* behavior, meaning that the model becomes relevant as soon as data are collected: the collected interventions to reduce meat consumption are categorized in terms of the behavioral determinants for answering the second and third research question. The model thus serves as a hook to hang the interventions on and makes it possible to find patterns in how successful various intervention methods are. For instance, it can be found that interventions focusing on the self-efficacy determinant are more successful in reducing meat consumption than interventions targeted at individuals' social influence on meat consumption. For this step in the research process, it is especially important to make an all-embracing conceptual model that captures all relevant behavioral determinants of consuming less meat. As mentioned above, using multiple theories simultaneously is instrumental for achieving this.

Based upon the above literature review a conceptual model has been developed. This model is shown in figure 3. An explanation of the choices made when developing this model will be provided in the next section. Where necessary, concepts will be defined.

² "A nudge is any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates." (Thaler & Sustein, 2008, p. 6)

FIGURE 3: CONCEPTUAL MODEL FOR UNDERSTANDING BEHAVIOR AIMED AT A REDUCTION IN MEAT CONSUMPTION – AUTHOR’S OWN COMPILATION



Source: Author, 2018. Based on: Brug et al. (1995, p. 286) and Shove et al. (2012, p. 29).

The base for the model is De Vries' (1988) ASE-model, to which insights from the SPT (represented by the blue parts of the model) have been added. In addition, since the influence of price of meat (substitutes) and marketing strategies (such as point-of-purchase presentations) are missing in the ASE model and SPT model, these have been included in the barriers and abilities variable (presented in green), as these strategies can have a significant impact on the relationship between intention and actual behavior.

Several parts of the model demand further clarification. First, there is a reason why most variables are operationalized up until the dimension level instead of the more usual indicator level. As has been explained earlier in this section, the model will be used as a framework to categorize interventions in terms of the behavioral determinants to which it responds. If the dimensions had been subdivided into a range of indicators, the model would have become too complicated and would lead to only few records that make up one indicator – reducing the practical use of the model. For instance, the 'modelling' dimension, which De Vries et al. (1995) define as a practice in which a person "learns from the opinions and practices influential others hold about the intended behavior" (p. 239), could be divided into 'parents', 'siblings', 'friends', 'colleagues', 'film actors' and even 'famous soccer players'. Operationalizing the variables at this level would be too specific to make any meaningful statements about the evaluation of the intervention.

Second, several terms used in the model must be defined more specifically. 'Food experience' is understood as how people relive the taste, structure, and variety of food. Moreover, not to be confused with food competences, 'technologies supportive for a low-in-meat diet' comprise a wide range of tools. Two examples are a food processor or apps that enable the consumers making healthy and sustainable choices.

A critical reader might raise questions at two decisions made when composing this conceptual model. The first possible question is whether it is possible to adjust the ASE-model in the first place. However, Hargreaves (2011) has shown that this does not lead to any methodological problems: one of the benefits of the ASE-model is "its openness to the inclusion of additional variables" (p. 81). Furthermore, the model is suitable for divergent manners of how the behavioral determinants are operationalized - the deconstruction of variables into dimensions and/or indicators to make them measurable - since the model is applicable for a wide range of topics (Bryman, 2012). For example, a study into smoking behavior on Portuguese schools (Vitória et al., 2009) uses 'parents', 'siblings', 'peers' and 'teachers' as dimensions of the concept 'direct influence', whereas the range of dimensions is limited to only 'others who visit psychoeducation programs' in a study about Chinese participants of a chronic disease self-management program (Chan & Chan, 2011). Thus, being flexible in adding variables and deconstructing variables does not lead to any methodological problems.

On the other hand, this flexibility also has a side-effect that it could make the research less reliable, which means that relationships exist by coincidence and that it could also negatively affect the measurement validity (the degree to which the indicators reflect the concept) of the research, since the variables were not operationalized *ex ante* (Bryman, 2012). These issues were overcome by building upon existing studies that make use of the ASE-model as methodological examples for concept operationalization (e.g., Ajzen & Fishbein, 1980; Brug et al., 1995; De Vries et al., 1995; De Vries & Mudde, 1998). In addition, topic-specific operationalization is extended via literature on the topic of meat (substitutes) consumption (distinguishable by references in the model).

Besides, a critical reader might also question the methodological validity of merging the ASE and SPT models into one model. Both models make use of different aggregation levels, which may suggest them being incommensurable: the ASE-model starts from the individual level, whereas the SPT model focuses on the level between individuals and the wider society in general. By taking multiple steps, this study aims to resolve the problem of low methodological validity.

First, the competences and materials variable of the SPT will be interpreted on the aggregation level in conformity with the ASE-model, that of the individual. Doing so does not entail any trouble, since these variables on their own are not bound to any aggregation level *per se*. For instance, skills and know-how, just as available money, can be assigned to both the individual and wider society. The ‘meaning’ variable does not possess this elasticity. Nevertheless, due to partial overlap with the ‘social influence’ determinant of the ASE-model, it can appropriately be used as a dimension of the ‘social norm’ concept, which in itself is a dimension of the ‘social influence’ variable situated on a higher level of aggregation.

The second step was using the SPT as an internal complement to the operationalization of the ASE model. This was necessary because adhering to the original variables of the models would lead to a partial overlap. When using the SPT as an internal complement for the operationalization of the ASE-model, the ‘competences’ variable resembles the skills, know-how and techniques needed to carry out the behavior of reducing meat consumption. These are all part of an individual’s personal characteristics, one of the external variables within the ASE-model. ‘Materials’, as defined in the SPT (see section 2.1), equals parts of the ASE’s ‘barriers and abilities’ variable within the ASE-model, particularly the supply of (vegetarian) food. Besides, the materials dimension ‘possess of technologies supportive for a low-meat diet’ can be understood as tools that help consumers maintain their intention of consuming less meat, thereby better complementing the self-efficacy variable.

As a final step in elucidating the conceptual model, attention will be paid to the specific variables coming from the SPT that are integrated in the conceptual model (in blue):

- First, food competences are understood as the knowledge, know-how, techniques and skills an individual possesses in relation to reducing his/her meat consumption. As these are part of, but are also related to, an individual’s qualities, this variable belongs to the personal characteristics variable. Note that interventions can affect food competences, but socio-demographic factors are close to being static.
- Second, two parts of the SPT pertain to the social norm in the ASE-model for self-explanatory meanings: the meanings attached to eating meat and social acceptance of diets associated with reduced meat consumption.
- Third, the practice variable is the only variable of the SPT that is externally integrated into the ASE-model. However, it can be argued that practice is part of social norms, and should thus be related to the social influence variable. However, practice is in fact related to other variables as well rather than being merely related to social influences: section 2.4 made clear that practices are constituted at both the collective and the individual level (Shove et al., 2012), whereas the social influence determinant is only derived from the collective level. Furthermore, there is room to suggest that other factors than just social influence play a part in developing a practice. For instance, research by Lea and Worsley (2001) shows that meat consumption levels among Australian adolescents remain high because they are concerned about a lack of iron and protein when adopting a meat-reduced diet. Attitude (on health in particular) happens to be the overriding factor here. It implies that practice takes its place in the model on the right of attitudes, social influence and self-efficacy. It is independent of intentions, because the SPT does not propose that intentions affect behavior. Alternatively, the SPT contends that past behavior directly affects behavior itself.
- The last part of the SPT to be integrated in the ASE-model is the supply of meat and/or vegetarian meat substitutes, ranging from micro to national levels. Supply, just like price and product presentation, are part of the physical food environment and infrastructure. The physical food environment is understood as “the physical surroundings [...] of meat eating or avoidance, including specific food supply factors in the environment such as types of food, food sources, and availability of and access to foods” (Stoll-Kleemann & Schmidt, 2017, p. 1271). This, in turn, belongs to the barriers and abilities variable, because the physical

environment becomes relevant at the stage in which intentions have already been shaped, but are vulnerable for external alterations.

2.5. INTERVENTION METHODS

As has been mentioned earlier, the conceptual model is just one of two theoretical pillars of this research. Its purpose is to schematically decompose behavior into behavioral determinants in terms of which the interventions can be categorized. This section will go into more detail about the second theoretical pillar: intervention methods.

The second research question aims to explore the practical outcomes of intervention methods to reduce meat consumption. By subdividing the interventions into multiple intervention methods, common patterns of (lack of) success could be noticed more easily. Furthermore, this made it possible to also include systematic analyses studies on interventions, as these studies usually result in general statements on intervention *methods*. For instance, prior to delving into separate studies on carbon taxes or fruit vegetables, De Bakker and Dagevos (2010) summarize their general findings on the effectiveness of price interference in the first paragraph.

For these reasons, chapter 5 is set up to present the literature findings in accordance with this structure. The grouping of interventions into intervention methods is presented in table 1 and is established on earlier intervention classifications done by Garnett's (2014, p. 16) and Laestadius et al. (2013).

TABLE 1: CLASSIFICATION OF INTERVENTION METHODS – AUTHOR'S OWN COMPILATION

INTERVENTION METHOD	SHORT EXPLANATION	INTERVENTIONS (TO BE DISCUSSED IN CHAPTER 5) BELONGING TO THE INTERVENTION METHOD	EXAMPLE
<i>Raising awareness</i>	Sharing theoretical and practical knowledge with meat consumers about the impact of meat on, for instance, the environment, animal well-being and (public) health. At the same time, these intervention methods also focus on the possible benefits of a plant-based diet	Raising awareness on environmental and/or health consequences of meat consumption; tools helping to overcome the meat paradox; nutrition and/or environmental labels	Sharing flyers about the health consequences of consuming red meat
<i>Changing the choice architecture of meat (substitutes) & point-of-purchase actions</i>	Interventions carried out by the supply-side of meat products, often manifested at places where meat (substitute) products are sold. These interventions are often alterations in the number of choices or in the presentation of products	Reducing portion sizes; flavoring techniques; extending vegetarian/low-meat product range; changing the default menu-option; positioning vegetarian products on a more visible location	Reducing the default size of sausages that are on offer
<i>Campaigns</i>	One intervention or a set of interventions set up by an active and organized group to achieve reduced meat consumption levels	Campaigns that stimulate meat-consumers to not eat meat for one day a week/one week a year	Thursday Veggeday in Flemish Belgium

<i>Financial measures</i>	(Dis-)incentive for meat consumers to buy meat(-substitute) products by means of financial instruments	Carbon taxes; meat taxes; subsidizing meat products; subsidizing fruits and vegetables	Introducing a carbon tax on meat products
<i>Other governmental regulations</i>	Governmental regulations outside of the financial field	Statutory regulation of food advertisements; nutritional guidelines; nutritional school standards	Zoning restrictions of McDonald's restaurants near schools
<i>Tools</i>	The (technological) instruments available to meat consumers and/or policy-makers and meat-manufacturers to make it easier to switch and/or stick to following or maintaining a low or non-meat diet	Framing the issue of (excessive) meat consumption; instruments employed to transfer information; terminology; informative vs. narrative texts; psychological instruments	An app that helps consumers comparing nutritional values of meat substitutes

Source: Author, 2018.

The colors are on par with the Excel spreadsheets used to analyze the interventions (see appendix III for the Excel spreadsheet and chapter 3 for additional information). Point-of-purchase actions and changing the choice architecture have overlap to a considerable extent, which is why they were investigated simultaneously in this study. Additionally, several interventions can be categorized into more than one intervention method category. For instance, a campaign that makes use of an app that provides participants with vegetarian recipes, could belong to both the tools and campaigns categories. In these cases, an intervention was classified as belonging to more than one method.

3. METHODOLOGY

This chapter focuses on the methodology used in this study. It starts with a description of the research philosophy adopted in this study in section 3.1, followed by a section that explains the research design. Section 3.3 subsequently provides a detailed account of the PRISMA Flow Chart, an instrument used for gathering data in an explicit and exhaustive manner. The chapter ends with a comprehensive explanation of the process of analyzing the assessed literature (section 3.4).

3.1. RESEARCH PHILOSOPHY

Before diving deeper into the methodology of this study, it is important to clarify what research philosophy is adhered to, as it directs the inquirer in his/her choices of data collection, research methods and analysis of data (Guba & Lincoln, 1994). A research philosophy is defined as “an understanding of the nature of the world and how it should be studied” (Moses & Knutsen, 2012, p. 1). In qualitative research methods, the critical theory and constructivist paradigms are dominant. As will be explained, this study made use of a constructivist perspective on ontology and epistemology, whereas the perspective on methodology is only partially based upon constructionism and is supplemented by multiple insights from positivism.

Starting with the ontology, the dogma concerned with the question about the nature of reality, “I understand that reality is socially constructed”. Facts and realities are not given, but are continuously (re)constructed by social actors: they are relative to the context in which they are placed (Bryman, 2012; Guba & Lincoln, 1994). For instance, food cultures can be understood as social constructs. It is hard to determine what exactly constitutes a food culture, since food cultures are dynamic by nature. This idea of social constructs is strongly reflected in the theoretical framework, which implies that dietary behavior is not static but is susceptible to a range of behavioral and contextual variables.

Using a constructivist paradigm on ontology has implications for the epistemology, as these parts are intrinsically linked (Guba & Lincoln, 1994, p. 110). From the perspective of epistemology, the question arises which view is taken on the relationship between the inquirer and the units of analysis. The relevant units of analysis for this research are interventions aiming to reduce meat consumption. In this study, a subjectivist approach is adopted, in which the inquirer is assumed to strive toward deconstructing social phenomena in order to gain a better understanding of the world (Guba & Lincoln, 1994). The conceptual model resembles this decision, as it subdivides interventions into behavioral determinants to unravel patterns of how (un)successful these interventions are.

The final part of the research philosophy, the methodology, covers the question: “how can the inquirer go about finding out whatever he or she believes can be known” (Guba & Lincoln, 1994, p. 108). Here, a step will be made towards positivism. That is because the research design is cross-sectional which is a design more often associated with positivism than constructivism or critical theory (Bryman, 2012). A cross-sectional design implies that data are derived from multiple cases and are not longitudinal by nature. The research is cross-national, as multiple countries are in scope for this study. The main objective of using a cross-sectional design in this study is to look for “patterns of association” (Bryman, 2012, p. 58). For instance, one such pattern could be that interventions related to the attitude behavioral determinant have more effect in changing behavior than those interventions belonging to the social influence determinant.

This design has consequences for the research criteria of this study. First, it eliminated the possibility to make statements about the direction of relationships (internal validity). As Bryman (2012) notes on cross-sectional designs: “if the researcher discovers a relationship between two variables, he or she cannot be certain whether this denotes a causal relationship” (p. 59), because the research cannot be carried out in a controlled environment.

Second, systematic procedures were used for the data collection in order to obtain a high level of replication even when using a cross-sectional design (see section 3.2). Furthermore, ecological validity is usually considered weak when using this design, since quantitative methods often have trouble capturing ‘the natural habitat’ (Bryman, 2012, p. 61). However, the weak ecological validity was compensated in this study by following constructivist guidelines for interpreting the data. Using qualitative documentation methods made it possible to go in sufficient depth about the topic to precisely reflect ‘real life’. Finally, the external validity in this study – “the question of whether results can be generalized beyond the specific research context” (Bryman, 2012, p. 711) – can be considered weak, since the results are bound to their contexts and since only a limited sample size of interventions per country was used.

Research approach

In general, three methods of reasoning for doing research can be distinguished: inductive, deductive and abductive reasoning. A deductive research approach means that a pre-determined theory is leading for the inquirer when doing research. In this approach, an inquirer ultimately aims to find a confirmation (or not) of the theory in question by empirically testing in advance set-up hypotheses with collected research data (Trochim, 2006).

Inductive reasoning, on the other hand, is rather exploratory. In this approach, the research process is set up the other way around. The inquirer starts by doing observation work and subsequently, based upon these observations, detects patterns or consistencies in the observations, which ultimately leads to developing a theory or to coming up with a conclusion (Trochim, 2006).

Lastly, an abductive research approach – also known as inference to the best explanation - entails logical reasoning from observed data into tentative hypotheses. As opposed to deductive reasoning, the drawn conclusion is not necessarily *set* as such, but it is confined to only being a probable conclusion (Bryman, 2012).

The current research involved both inductive and deductive reasoning. The deductive research approach was used for developing the conceptual model, while inductive reasoning was used later in the research process when the interventions were collected and patterns between the success of interventions and the behavioral determinants to which they respond were sought. Based upon these patterns, in turn, general conclusions were drawn about the question which behavioral determinants are susceptible for achieving reduced meat consumption.

3.2. RESEARCH DESIGN: MIXED METHODS SYSTEMATIC REVIEW

3.2.1. MIXED METHODS

In this section, the “orientation to the conduct of social research” (Bryman, 2012, p. 715) of this study, i.e., the research strategy, and the research choices will be outlined. Besides, the design and main components of this research project will be discussed, as well as how they resulted into answers to the research questions.

The research strategy used is that of a mixed-methods systematic review. This type of desk research exclusively makes use of secondary data. Mixed-methods systematic reviews “can be defined as combining the findings of ‘qualitative’ and ‘quantitative’ studies within a single review to address the same overlapping or complementary review questions” (Harden, 2010, p. 7). A study that combines quantitative with qualitative findings in the same review enables researchers to “not only identify the effects of interventions, but also their appropriateness [...], similar to that of social validity” (Harden, 2010, p. 8). Besides, Harden proposes that integrating qualitative literature in a systematic review also facilitates the “critical analysis of interventions from the point of view of the

people the interventions are targeting. This design brings their experience to bear and draws on their different skills and expertise” (p. 8). Lastly, it “preserves the integrity of the findings of the different types of studies” (p. 8).

Thus, by applying both qualitative and quantitative methods and by using data from the two angles, this research benefited from the methodological advantages of both worlds. Qualitative data allowed for a deeper contextual understanding of (changing) meat consumption behavior (therefore enhancing the ecological validity of this research), while quantitative methods and data made this research project more reliable by adhering to standardized stages of collecting and interpreting data. The quantitative methods used resulted in a big array of data on interventions, thereby making it easier to make meaningful statements on the effectiveness of interventions in a more generic sense across cultures. Still, as explained in the previous section, cultural differences (although being small due to the contextual similarities between OECD countries) impeded obtaining a high level of external validity.

3.2.2. SYSTEMATIC REVIEW

Systematic reviews are a type of secondary research that enables assessing a wide range of conducted studies on a specific topic. Systematic reviews are characterized as being transparent, replicable and rigor (Mallet et al., 2012). Setting up a systematic review is therefore an appropriate method to find answers on the main questions within this research. This can be demonstrated by juxtaposing Kapoor’s (2016) definition of a systematic review (in green) with the main research questions in this study:

- The fact that systematic reviews “methodically and comprehensively identify studies focused on a specified topic...” corresponds with the first research question, which demands a thorough exploration of the range of interventions to reduce meat consumption in OECD countries based on a methodologically sound data collection process (which will be discussed in section 3.3.1).
- The second part of the definition of systematic reviews, focusing on the fact that they “appraise their methodology, summate the results, identify key findings and reasons for differences across studies, and cite limitations of current knowledge” is related to the second research question. This research question demanded examining and selecting relevant results, which were in turn summarized and deduced to key findings in the Excel spreadsheet (see appendix III). Furthermore, this research question was focused on finding plausible explanations for these findings by looking for patterns of (un)success among and across the behavior determinants to which the interventions respond. Related to this, adopting a cross-country-comparative approach was viable for this last part, as it offered the researcher enough studies to infer patterns, which would not have been possible if the research area had been limited to a single country.
- The part of the definition that systematic reviews “adhere to reproducible methods and recommended guidelines. The methods used to compile data are explicit and transparent, allowing the reader to gauge the quality of the review and the potential for bias” (Kapoor, 2016, p. 629) is not fundamentally linked to any research question in particular. However, it shows that the research design of a systematic review contributes to the methodological strength of this research, assuming that it was properly and accurately executed.

Another important feature of systematic reviews that made it a useful method for this study is that it “aims to draw inferences on common issues with different but allied empirical backgrounds” (Benedetto & Peter, 1997, p. 799). This is related to the demands of this study, as literature to reduce meat consumption has been gathered from environmental, health and economics backgrounds. Documentation was either country specific (see for instance De Bakker & Dagevos, 2010, who explored the applicability of a range of intervention methods within the Dutch context) or intervention specific (e.g., the study conducted by Bacon & Krpan, 2018, on changing restaurant

menus to make vegetarian dishes more attractive), although combinations were possible as well, just like meta-analyses of multiple interventions (e.g., Garnett et al., 2015).

A point of criticism on systematic reviews is that this method does not allow for a deeper understanding of “why particular interventions work in particular environments at particular times”, due to the large number of studies taken into account (Mallet et al., 2012, p. 453). As has been stated in the previous section, consolidating quantitative numerical data with qualitative understandings in a mixed methods approach helped to overcome this problem.

3.3. RESEARCH METHODS

3.3.1. DATA COLLECTION: PRISMA FLOW CHART

Most data assessed for this study were quantitative by nature, since most studies on interventions are experimental and are characterized by a pre- and post-intervention measure (so-called effect level evaluation studies). In cases in which quantitative methods were not available or if a more in-depth understanding of how the contextual environment is related to specific interventions was desired, qualitative methods could be used. For instance, the inquirers ask informants about triggers for an observed change. These types of process level evaluation studies often involve survey questions along the lines of: ‘if this... would you...’. To make the answers useful for a quantitative analysis, the inquirer may resort to Likert-scale questions.

The literature used in this study has been collected in a systematic way utilizing the PRISMA Flow Chart (Moher et al., 2009) (see figure 2). This reinforces the ability to reperform this research and also reduces the chance for subjectivity or biases in data collection to occur (Bartolucci & Hillegas, 2010). Importantly, this systematic way of collecting data delivers a thorough range of applied interventions to reduce meat consumption and it enhances internal validity, since the publications were collected according to strict criteria and since the (methodological) quality of the research was taken in consideration (Bryman, 2012).

The first step in the PRISMA Flow Chart was identifying possible literature by searching with predetermined keywords in the PubMed and Web of Science databases. The PubMed database consists of medical publications and was advantageous for this study as the interventions are partially concerned with public health. Besides, the Web of Science database covers a broader range of academic branches, and was used for finding literature from environmental and other fields.

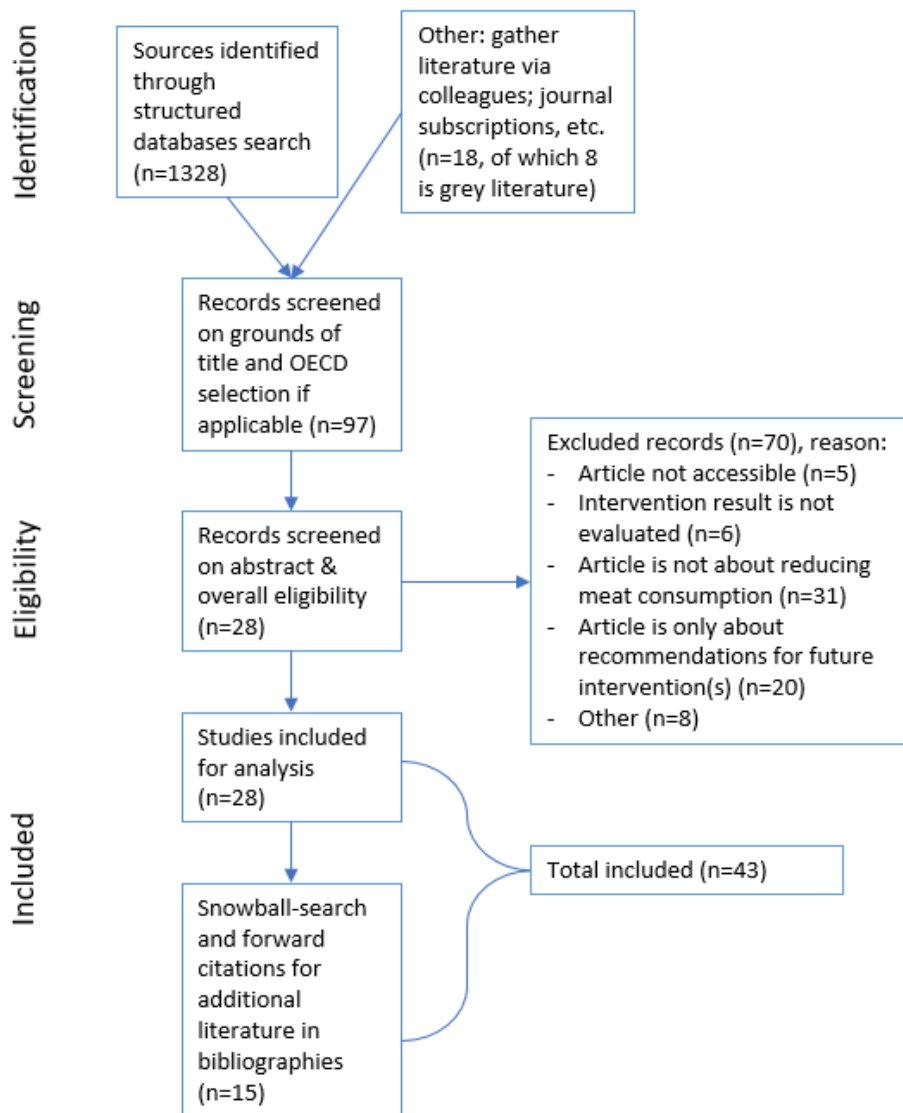
For both databases, a specific string of keywords was used. This string can be found in appendix I. The selected literature had to meet the following criteria to be selected:

- The title had to refer to the term ‘meat’ in some way. This could be directly as ‘meat’, but also more indirectly, for instance by referring to ‘sustainable food’ or ‘plant-based products’.
- Some kind of term related to the ‘intake of food’ had to be included in the title or in the article abstract. Again, synonyms or relatable words were accepted as well, ranging from the broad term ‘behavior’ to more specific terms such as ‘dietary habit’.
- The title or abstract had to give an indication that an intervention has been applied. Synonyms such as ‘incentive’, ‘measure’ and ‘strategy’ sufficed as well.
- The articles had to be published within the last ten years, since any older articles might not match current socio-economic and cultural contexts.

When searching in PubMed, 'MeSH terms' were applied. These are terms that PubMed uses to index articles. For example, all articles about meat, whether poultry or beef, received the MeSH term 'meat'. PubMed already covers terms in both singular and plural forms. Diverging spelling in US and UK English was kept in mind by composing the search strings manually. This first phase of the PRISMA Flow Chart resulted in a selection of 1004 articles from PubMed, and 537 articles from Web of Science.

All articles found were saved in EndNote. With this program 213 selected articles were deduplicated, since these articles were included in the sample twice. After that, the titles of all articles were manually screened. When doing so, topics such as food safety, animal treatment, efficiency of meat production, health effects of meat and storage and preparation of meat were excluded from the search. Countries outside the OECD were also excluded, resulting in a total of 97 records that met all criteria.

FIGURE 2: SCHEMATIC VISUALIZATION OF DATA COLLECTION BASED ON THE PRISMA MODEL



Source: Author, 2018. Based on: Moher, et al. (2009).

When all potentially useful literature was obtained, the selection of 97 records was narrowed down further. A critical selection criterion in this phase was that the abstract had to include a mention of (a scientifically substantiated entrance for) an intervention that attempts to reduce meat consumption or promote the consumption of alternative sources of protein. Manually reviewing the abstracts of these records made it possible to exclude all studies focused on consuming more meat and studies that were not focused on a (plausible) intervention method. Besides, records were also excluded if they only provided recommendations for future interventions, as these records did not contain any evaluation of an intervention. Articles that were not accessible or in which the intervention was not evaluated were also excluded from the selection. Due to these additional criteria, another 70 records dropped off in this eligibility phase, resulting in a database of 27 remaining articles of the total 1328 that had initially been selected.

Despite of these steps in the selection process, this systematic search still did not contain all literature that is desired for this study, as the keyword string did not comprise parts of the literature that were intervention specific. Intervention-specific studies possibly did not meet the criterion of the term ‘intervention’ being listed in the title or abstract. For instance, a journal article on Meat Free Mondays could be excluded from the systematic search as the name already implied an intervention. A snowball search in bibliographies and forward citations directs in finding these and other additional data. Besides, literature suggestions from colleagues and found via journal subscriptions were other entrances to relevant literature. Finally, grey literature that was not necessarily academic, such as policy documents or items published by national food centers, were gathered via news journals, websites of national food centers and via colleagues. Including grey literature was important for this systematic review to “limit bias due to publication lag and the publication of only positive results” (The University of Western Australia, 2018, p. 1).

3.4. DATA ANALYSIS

The data collection phase was followed by a data analysis to provide answers on the first part of the second research question: ‘Are the interventions applied in OECD countries successful in achieving reduced levels of meat consumption?’ In order to achieve consistency and replicability during this research phase, a systematic approach was desired. Highly relevant in this respect was the aforementioned Excel spreadsheet. This precomposed table was based upon Garnett’s (2014, p. 15) categorization of interventions and is enclosed in appendix III. A simplified version is presented in table 2. The goal of this table was to help identify key findings of the assessed studies, to summarize the results of these studies and to appraise the methodologies used. Most importantly, the table made it possible to compare the intervention outcomes in a structured and manageable way.

TABLE 2: EXCEL TEMPLATE FOR ANALYZING ARTICLES – AUTHOR’S OWN COMPILATION

	1. AUTHOR(S) (YEAR)	2. AUTHOR(S) (YEAR)
USED THEORY/THEORIES		
NATURE OF RESEARCH (QUANTITATIVE, QUALITATIVE, MIX)		
NUMBER OF ANALYSES		
SAMPLE GROUP		
SHORT EXPLANATION OF INTERVENTION		
INTERVENTION METHOD(S) (BASED ON GARNETT (2014) AND LAESTADIUS ET AL. (2013))		
YEAR OF INTERVENTION		

TARGET GROUP/POPULATION	
PLACE OF INTERVENTION	
VALUE FRAME (E.G., HEALTH OR ENVIRONMENT)	
EATING OCCASION	
AGENT OF CHANGE	
EVALUATION CRITERIA OF SUCCESS (PROCESS OR EFFECT LEVEL)	
BRIEF OUTCOME OF INTERVENTION	
PRACTICAL IMPLICATIONS/FUTURE RECOMMENDATIONS	
(POTENTIAL) EXPLANATION OF OUTCOME	
VARIABLE OF CONCEPTUAL MODEL	
MEAT GROUP	
NOTE/COMMENT	

Source: Author, 2018.

The last phase of the data analysis was to give practical recommendations to the TNNC based upon the key findings obtained in this study. This phase comprises three steps. First, behavioral determinants were identified based on their susceptibility for resulting in behavior change. They were suitable as trigger points for interventions to be focused on. During this process, the socio-economic, political and demographic Dutch context of meat consumption was taken into consideration. As a second step, a potential intervention campaign was drafted for the NNC. Lastly, two experts working in the fields of food consumption and sustainability gave feedback on the recommendations. Cross-checking the theory-based recommendations against practical-expertise was helpful for comprehending the relationship between the literature on interventions on the one hand and practice on the other hand. The two experts who gave feedback on the recommendations are:

- Corné van Dooren: Corné has a broad academic background. He has published numerous articles on optimizing nutritional quality and sustainability of dietary patterns. Besides, he has been working at the NNC as an expert in the field of sustainable foods since 2007. Early 2018, he received a post-graduate qualification at VU University. His qualities and tremendous expertise on the topic of sustainable food consumption makes Corné the right person to reflect on the proposed intervention strategy.
- Frederike Mensink: Working at the NNC as a specialist in behavior change for more than ten years, Frederike makes sure interventions are theoretically well-substantiated. She is involved in multiple projects at the organization. One of these projects focuses on developing intervention strategies to reduce meat consumption in the Netherlands. In addition, Frederike managed the Centre’s project for preventing obese and has written interesting articles on promoting healthy food consumption at schools (related to the ‘de Gezonde Schoolkantine’ project set up by the NNC). It therefore goes without saying that Frederike has excellent potential in reviewing the proposed intervention strategy.

4. DUTCH CONTEXT OF MEAT CONSUMPTION

Chapter 4 provides more detailed information about the current meat consumption in the Netherlands. First, section 4.1 addresses which processes, from a policy-historical and cultural perspective, underlie the fact that meat is a key element in Dutch dietary patterns. Examining and understanding the Dutch context of meat consumption is crucial for identifying plausible grasping points of interventions suited for the Dutch context (as will be discussed in chapter 7). The policy-historical and cultural context of meat consumption is not only key for how interventions work out in practice, but also should be determining for the outline and substance of intervention(s). After that, the intra-national socio-demographic and socio-cultural differences regarding meat consumption will be described in section 4.2. Finally, in section 4.3, the motives and barriers for people in reducing their meat consumption will be outlined.

4.1. EATING MEAT AS PART OF DUTCH CULTURE

Meat occupies a center stage on the plate of Dutch citizens and on restaurant menus. The Dutch reckon it to be essential for a complete nutritional meal besides vegetables (Caarels et al., 2018). The central role attached to meat in dietary patterns is common in the Western food culture in general: meat has the highest status in the Western food hierarchy (Holm & Mohl, 2000, p. 277). For instance, the description of restaurant menus and recipes often takes the following order: 'teriyaki beef with broccoli' or 'marinated chicken with sweet potato'. These descriptions are only rarely in opposite order, starting with the vegetables. Meat remains engraved in the Dutch culture, even though the Dutch have recently started questioning the normality of consuming meat (e.g., picture 1 shows a counter-movement to the unethical treatment of animals in the livestock sector), the number of vegans and vegetarians is increasing and the market for meat substitutes is expanding (Menkveld, 2018).

PICTURE 1: AN 'ANIMAL-FRIENDLY MEAT DOES NOT EXIST.' STICKER ON A TRASHCAN IN THE ROTTERDAM CITY CENTER



Source: Author, 2 June 2018. Location: Witte de Withstraat, Rotterdam, The Netherlands.

However, this does not mean that this virtuous image of meat is supported by all socio-economic and cultural groups in the Netherlands. The amount of meat consumed is greatly determined by various personal characteristics, such as age, gender and cultural background.

As will become apparent in this chapter, the current pattern of meat consumption is also heavily determined by path-dependent cultural developments in the Netherlands throughout its existence and before.

4.2. MEAT AND MASCULINITY

Various studies on food and psychology have shown that foods are culturally gendered. Meat products in the Dutch culture are a textbook example of this. Not only are the consumption levels of meat significantly (52 per cent) higher among men than women (Caarels et al., 2018; Van Rossum et al., 2011), but women also have more negative attitudes towards eating meat than their counterparts, and females are also more often vegetarian (Dagevos et al., 2012; Van Rossum et al., 2011). Schösler et al. (2015) state that these differences can be explained by the cultural intertwinement of eating meat with frames of masculinity, “which emphasize that ‘real men’ eat meat” (p.152). Vegetables and fruit, on the other side, are often considered ‘feminine food’ (De Bakker & Dagevos, 2010, pp. 59-60). Another link between gender and food consumption is that women in developed countries are in general more frequently responsible for dish choices than men (Wellesley et al., 2015). This also applies to the Dutch context, in which 57 per cent of all women are responsible for the dish choices (Caarels et al., 2018).

One must understand that this masculine character of meat cannot only be found in the Dutch context. Throughout much of Western world history, meat has become socially constructed as a symbol of power and strength, both features of masculinity (Ruby & Heine, 2011). The origin of this relationship can be traced back to long-lasting practices of hunting, which is a typical ‘male activity’ due to the need for strength and virility (Sobal, 2005). Marketing agencies in the Western world have responded to this link and made it more explicit over the course of the twentieth century. Advertisement slogans such as ‘For MEN only’ promoting Campbell’s beef soup, and the concluding sentence ‘Man loves meat and meat loves man’ in an advertisement from 1941 by the American Meat Institute in ‘Life magazine’ are primary examples of this (see illustrations 1 and 2 in appendix II). Even as of today, TV-commercials explicate the meat-masculinity link in promoting meat and meat-related food products. For instance, Remia, a Dutch brand for barbeque sauces, ran a TV-commercial with the famous actor Sylvester Stallone and Dutch TV-celebrity Jan Kooijman to promote their products. The commercial ends with the following sentence, which is clearly related to this gender bias: ‘Als je wilt eten als een tijger, eet dan niet als een konijn’ (translation: If you want to fight like a tiger, do not eat like a rabbit)³.

4.3. MEAT CONSUMPTION AS A PRACTICE: DUTCH HISTORICAL BACKGROUND

Meat consumption is nowadays intertwined with Dutch eating behavior. 61 per cent of the Dutch population consider themselves “real meat eaters” (Caarels et al., 2018, p. 5). Several path-dependent processes have contributed to making meat such an important pillar of the Dutch food culture, as explained by De Bakker and Dagevos (2010). The authors emphasize that these cultural, political and economic explanations cannot be interpreted separately, but that their influence is in conjunction (p. 59).

First, half of the Dutch citizens consider meat an important carrier of indispensable nutrients and believe that eating solely plant-based food will not lead to a sufficient intake of these nutrients (Caarels et al., 2018; De Bakker

³ Remia

& Dagevos, 2010). Nutrients that are often mentioned in this respect are proteins, irons and B1 and B12 vitamins (The Netherlands Nutrition Centre, 2018b). The idea of meat being a necessary element of one's diet was already noticeable in the nineteenth century, when the Dutch government deemed meat as fuel for citizens' productivity due to the strong presence of proteins in meat (De Bakker & Dagevos, 2010). This 'health message' framed the discourse on meat during the next century since it continuously appeared in advertisements and commercials (p. 56). One example of this is the following message: 'Verveling bestaat niet: met vlees. IJzer – vitamines – hoogwaardig eiwit' (translation: 'Boredom does not exist: with meat. Iron – vitamins – high-quality protein')⁴ in which the nutritional values of meat are emphasized.

Second, meat has become a way to express socio-economic status. Throughout most of Dutch history, meat was only affordable to higher-income groups, making it prestige food. During the nineteenth century elite classes used meat as a way to express status and to distinguish themselves from lower socio-economic strata, both within and outside of the Netherlands. This changed in the postwar period when the Netherlands experienced long term economic growth and the number of Dutch citizens belonging to the middle classes increased. At the same time, production processes of meat became more efficient, the refrigerator impeached the Dutch market and grand supermarket chains were on the rise. These developments made meat more affordable and widely accessible to a large part of the Dutch population. In Western countries in general, livestock had become the "chief source of protein in many Western countries" (Boer & Aiking, 2017, p. 4; De Bakker & Dagevos, 2010).

A final plausible cultural-historical explanation suggested by De Bakker and Dagevos (2010) for the high status of meat in the Dutch food culture is the presence of a traditional Northwest-European dinner format consisting of meat, potatoes and vegetables without much variety in terms of other menu compositions. This "holy trinity" (De Bakker & Dagevos, 2010, p. 87) has been ingrained in the Dutch culture since the second half of the twentieth century, and has led to the normalization of eating meat as an established repertoire. As of now, half of all meals the Dutch prepare at home are based on this trinity of meat, potatoes and vegetables (Nestlé, 2015). This habit of following the traditional Dutch dietary format could hinder reaching a broad societal reduction of meat consumption in the Netherlands.

The critical place of meat in Dutch diets could complicate making Dutch citizens accept a diet that is low in meat by making them switch to meat substitute products. In response to this, manufacturers of meat substitute products endeavor to replicate the meat products by making these substitutes taste similar to meat and by giving their products meat-like names, such as 'kipstuckjes' (translation: 'pieces of chicken'). However, meat substitute products are still not greatly favored by Dutch inhabitants. Two-thirds of the Dutch population consider meat substitute products less tasteful than meat (Dagevos et al., 2012), and seventeen per cent of the Dutch population would be willing to reduce their meat consumption if substitutes were better and less expensive (Caarels et al., 2018).

Current political stuations are also a major concern for achieving major dietary changes. Meat production historically has been considered "important for the Dutch economy" (Centrale Organisatie voor de Vleessector (COV), 2016, p. 7), partly because of the strong international position of the Dutch meat industry. Due to this strong link between meat production and economic growth, stakeholders have a big say in the Dutch meat industry and receive financial support from the Dutch government (i.e., subsidies). This lobby for meat production

⁴ Reclame Arsenaal

has been ingrained in the Dutch political context for food production and could hinder a nation-wide reduction of meat consumption (Lanjouw, 2016).

4.4. INTRA-NATIONAL DIFFERENCES IN MEAT CONSUMPTION

4.4.1. SOCIO-CULTURAL DIFFERENCES

Demographic characteristics are important determinants of the amount and type of meat consumed (see also section 4.1 on the role of gender in meat consumption). Stoll-Kleemann and Schmidt (2017) state that, apart from gender, age and socio-economic status are “the most influential socio-demographic factors” (p. 1268) affecting meat consumption. A recent study carried out by The Choice (Caarels et al., 2018) among a representative sample of Dutch citizens responsible for daily dish choices, gives more insight into the differences between Dutch socio-demographic groups in terms of their consumption of meat.

First, age is an important factor when it comes to meat consumption. That is, age is negatively correlated with meat consumption. People aged over 40, and especially people aged over 60, more often consume less meat than people under 40 years old and are also more willing to reduce their meat consumption (Caarels et al., 2018). A theoretical explanation for this could be that becoming older goes hand in hand with “heightened awareness of health and/or adaptation of dietary practices for the prevention or management of chronic disease” (Daniel et al., 2010, p. 580). On the other hand, Stoll-Kleemann and Schmidt (2017) show in their systematic review of studies done in numerous developed and developing countries that younger people more often shift to vegetarian or vegan diets than older people, being more open to changes in traditional diets. Besides, the reasons for choosing a meat-free diet differ between age groups. The environment and animal well-being are of more importance for young people, while 40-60-year-olds are especially driven by health concerns.

Another major determinant for meat consumption is income. In section 4.1, it has become apparent that an increasing welfare goes hand in hand with an increase in meat consumption. Nowadays, however, this relationship seems to be reversed in developed countries, such as the Netherlands. Groups with an above average income are the first adopters of a meat-reduced diet and more often show positive intentions to reduce their meat consumption than lower income groups (Caarels et al., 2018).

Related to income is education. Dutch high-educated inhabitants more often consume less meat and are also more often vegetarian than lower-educated inhabitants. For instance, half the group of all Dutch vegetarians have completed higher professional or university education (Caarels et al., 2018). Likewise, a Dutch city dweller is more likely to consume less meat than an inhabitant of a Dutch rural area.

4.4.2. SOCIO-CULTURAL DIFFERENCES

Next to socio-demographic characteristics, socio-cultural characteristics, such as religion and ethnicity, also affect meat consumption. The scope of the influence these factors have is too broad to discuss in this paper, but a study done by Schösler et al. (2015) on differences in attitudes towards meat consumption between ethnic groups of young adults in the Netherlands illustrates this influence in practice. Their study shows that Turkish-Dutch young adult men eat more meat per day (197 grams) than native Dutch young adult men (134 grams). Besides, 42 per cent of the native Dutch group is potentially willing to reduce their meat consumption, whereas only eight per cent of the Turkish-Dutch group is willing to do so. According to the authors, this could be explained by religion or different cultural norms and values. The findings suggest that parties active in stimulating the moderation of meat

consumption should take into account the ethnic diversity when it comes to meat consumption (Schösler et al., 2015).

4.5. WHY (NOT) LESS MEAT?

When Dutch citizens deliberately lower their meat consumption levels, animal well-being is their most important reason (20%) for doing so. Other important reasons are environmental concerns (14%) and more personal reasons, such as eating less meat being beneficial for health (11%), saving money (11%) and achieving variation in diet (10%). 43 per cent of the Dutch indicate having the intention to reduce their meat consumption in the near future (Caarels et al., 2018).

Regarding the barriers to reduce one's meat consumption, the report lists that 34 per cent of the Dutch would not want to miss the taste of meat, 30 per cent consider meat as part of their identity and 29 per cent of the Dutch claim to be used to eating meat. The qualitative focus-group sessions of the research indicate that Dutch consumers justify their meat consumption by stating that meat contains indispensable nutrients (Caarels et al., 2018).

These data show that there is a potential for lowering meat consumption in The Netherlands, but that the existing food culture is currently the major obstacle in realizing society-wide behavior change. It is listed in the report that the greatest "gain can be achieved among the group of consumers eating relatively large meat-portions but show willingness to reduce this". This applies to 22 per cent of all Dutch citizens eating meat (p. 9).

Several conclusions can be drawn based upon the findings for the differences in meat consumption levels and attitudes towards meat between different socio-demographic and cultural populations. Policy-makers should differentiate interventions according to population groups, particularly for differentiating for gender. In addition, the historical and political context must not be overlooked when initiating an intervention strategy.

5. RESULTS

In this chapter, the findings from the assessed literature will be discussed. A total of 43 academic articles, reports, books, news reports and web pages were collected. Several publications comprised more than one intervention, which means that in total 57 interventions have been assessed in this study.

There are many differences among the interventions, for instance in terms of the behavioral determinant to which the interventions respond, the scale of the interventions, and the group targeted to generate behavior change. Some interventions aim to influence specific target groups, such as children aged between six and twelve at primary schools in Ghent, while others aim for national outreach. The bulk of studies made use of convenience samples, e.g., students visiting university restaurants, while only a few made use of representative sampling. Besides, most studies have been conducted within Northwestern Europe or in the US. A slightly smaller group of interventions were conducted in China, Southern Europe or Australia, which shows that over-excessive meat consumption is a cross-cultural phenomenon. Furthermore, most of the studies are experimental by nature, while only few studies made use of real-life observations. Studies using real-life observations are mostly campaigns.

Table 4 (see appendix III) provides a structured comparison of the assessed interventions. Based upon the results shown in this table, several general appraisals of the intervention studies can be made. Half of the 43 records reportedly made use of a theoretical framework. This relatively low number can be explained by the strong presence of meta-analysis or systematic review studies and grey literature, such as news reports. 60 per cent of the records made use of quantitative methods. Only one record fully relied on qualitative data collection methods, and 39 per cent of all records involved a mixed methods approach. Three quarters of the 57 interventions were measured solely on the effect level. 18 per cent of the interventions were evaluated in terms of both their process and effect level. The remaining interventions were evaluated only on the process level only. Lastly, the main reason for which the intervention had been introduced is almost equally split between health and environmental values. 42 per cent of the interventions were based on health-considerations, whereas 47 per cent were based on considerations related to the environment. Nine of the interventions aspired to improve animal welfare in the livestock industry, while only one intervention did not refer to any value frame.

In order to answer the first two research questions, the 57 interventions will be discussed in this chapter in terms of their effectiveness in reducing meat consumption. The discussion format is in accordance with the intervention methods as outlined in table 1. Hence, chapter 5 consists of five different sections. The majority of all interventions (20 interventions) pertained to the choice architecture and point-of-purchase actions, with tools being the second most important focus (11 interventions) and campaigns and financial measures being the third and fourth most important focus (both 8 interventions). Least documented are raising awareness (6 interventions) and governmental actions other than financial interference (4 interventions). Again, some interventions could be divided into numerous intervention methods, and overlap between methods occurred. In each of the following sections, the findings in the studies related to the intervention method in question will be presented and an indication of the effectiveness of the intervention methods will be presented accordingly. As argued in chapter 3, this made presenting the findings more manageable and makes the findings easier to comprehend for readers. Chapter 6 derogates from this structure and will interpret the findings from the perspective of the behavioral determinants to which the interventions respond. This was desired to seek for a theoretical explanation for differences between interventions in how successful they are.

5.1. RAISING AWARENESS

In their paper on the governance of worldwide excessive meat consumption, Wellesley et al. (2015) emphasize the currently low public understanding of the relationship between livestock and climate change, both in developing and developed countries. They see great potential in awareness raising interventions to make people adopt a diet that is lower in meat than current average diets. Expanding awareness fulfills two important roles in making steps to achieve this shift.

First, education is an important intervention by itself. This is illustrated by De Boer et al. (2017), who found in their literature review that being aware of the environmental impacts of meat is positively related to consuming less meat. Likewise, Vainio et al. (2018), presented participants in their study with messages about the impacts of red meat consumption either on health or on the environment, and observed a positive correlation between reading messages about the impacts of red meat on health and/or on the environment and the intention to reduce the consumption of red meat. However, these optimistic results have not been found in all assessed studies on raising awareness. For instance, Campbell-Arvai et al. (2014) notice no differences in the intentions of students of a Midwestern US university (n=148) to buy vegetarian lunches between cases in which information on the environmental benefits of a vegetarian diet was presented as compared to cases in which this information was absent. Context-specific influences such as hunger, time and comfort appeared to override environmental concerns on the short term, even though the authors do not rule out the possibility that providing information alters long-term consumption behavior. Second, raising awareness can be a supportive measure for other intervention methods: it reinforces and fosters support for government action (Wellesley et al., 2015).

In practice, intervention methods focused on raising awareness are often campaigns, or they work with labelling. However, it should be noted here that labels are a rather practical tool for consumers to make sense of information more easily, and seem to be complementary to awareness raising. After all, general knowledge on environmental and health consequences of consuming meat is required for consumers to interpret labels on these topics. Furthermore, the way information is presented depends on the tools that are used. Given this overlap between intervention methods, more light will be shed on raising awareness in sections 5.4 and 5.5.

However, potentially there are difficulties when it comes to raising awareness. Challenges arise when trying to raise awareness about the adverse impacts of meat consumption. There is a plethora of information sources, of which a good portion is unreliable. In addition, commercial marketing of unhealthy foods hampers successful education on healthy foods. Besides, even within the wide range of information on healthy and sustainable diets, one can become entangled in finding the correct approach (Sarlio, 2018). To combat these complexities, Wellesley et al. (2015) argue that the message has to be simple: “Efforts must be made to develop meaningful, accessible and impactful messaging around the need for dietary change” (p. viii). Ideally, Sarlio (2018) argues, education of the aftermaths of eating meat should be targeted on all generations and should involve more than being solely informative. Rather, education should also address the practical skills that enriches consumers’ competences on where to buy and how to prepare vegetarian foods.

Based on the above findings, a middle-of-road stance on the effectiveness of raising awareness will be taken in this research: although awareness-raising is “crucial to ensuring the efficacy of the range of government policy interventions required” (Wellesley et al., 2015, p. vii), raising awareness alone is frequently mentioned as not being powerful enough in changing ones dietary habits (e.g., Graca et al., 2015; Sarlio, 2018; Sigle, 2016).

5.1.1. THE MEAT PARADOX

The ‘meat paradox’ is a clear illustration of why raising awareness on itself is not enough in reducing meat consumption levels. The paradox is the inconsistency that people have a negative attitude towards the impacts of

meat consumption on animal well-being, the environment and human health, but are reluctant to change their behavior accordingly. When explaining this phenomenon, most studies refer to the cognitive dissonance theory, which asserts that people tend to avoid information that is psychosocially uncomfortable to them.

Various interventions have tried to reduce meat consumption levels via overcoming the meat paradox by confronting meat eaters with their dissonance. The interventions show some effects on the position towards animal products, but actual consumption levels remain either unexplored or unaltered. There is one experiment conducted by Dowsett et al. (2018) among 460 Australian psychology students, in which a control group received nutritional information about lamb meat while the intervention group got confronted with uncomfortable information about animals characteristics and details about the meat production process. Pre- and after survey results reflect the presence of the masculinity – meat connection: having students face information that is uncomfortable to them makes the connection to animals significantly more apparent among women, but not among men. Despite of this greater connection, attitudes towards meat products remain unchanged for both sexes.

A cross-cultural study on this topic was conducted by Tian et al. (2016), who confronted 243 French and 277 Chinese meat eaters with the meat-animal connection by showing photos of cows in different stages of becoming a meat product. As hypothesized, “it seems that an animal image, as a symbol of meat's animal origin, makes participants less willing to consume meat in the future, but a text description of a recipe, as a symbol of meat's deliciousness, appears to promote meat consumption in the future” (p. 192). The effect of showing an animal image is less strong for the Chinese, which could be because slaughter is encountered more commonly in China than in France, where killing animals is rather industrialized. Despite this difference, the cognitive dissonance is apparent in both cultures, “and thus seems to generalize across cultures” (p. 194).

Another way of tackling the meat paradox might be to confront meat eaters with vegetarians by various means. Rothgerber (2014) investigated whether exposing people who eat meat to vegetarians alters meat-eaters’ thoughts about human-animal emotional similarity. He found that exposure to vegetarians via texts induces defensive mechanisms among meat eaters. Meat eaters, for instance, deny certain cognitive and emotional capacities of animals or underreport their actual meat consumption levels. The more arguments the vegetarians list for having a meat-free diet, the more meat eaters regard a vegetarian as feeling morally superior, further triggering discomfort, dissonance and defensiveness of the meat eaters. Remarkably, Rothgerber concludes that exposure to vegetarians might even promote greater meat consumption, as increasing dissonance evokes the search for justifications of consuming meat. Therefore, “the chief barrier to reducing meat consumption is not necessarily a lack of contact with vegetarians, but how to help omnivores work through their defensiveness” (p. 40).

The presence of the meat paradox also becomes apparent in a study by Gaspar et al. (2016), who examined the effects of presenting red meat consumers (a sample of 174 individuals from the UK, Belgium and Portugal) internet articles about the health risks of consuming red meat. Their perceived knowledge and attitudes were measured in a survey before, directly after and two weeks after exposure. As expected, communicating the risks enlarges consumers’ cognition of the risks, even those willing to avoid this information, and makes consumers have a less favorable attitude towards red meat. Gaspar and colleagues imply that, given these lasting effects of communicating red meat risks, the key focus should be to “engage consumers in the communication process before exposure [to the health risk information]. [...] This should be done in a way that prevents avoiders of self-selecting themselves out from it, while maintaining or increasing engagement for non-avoiders” (p. 545). These findings are in accordance with Vainio et al.’s (2018) study in which 1279 Finnish red meat consumers from 18-65 year old were presented with different frames of the issue of red meat consumption. The conclusion in this study is that exposing these red meat consumers to messages on environmental and health impacts of red meat alters

the behavioral intentions of ‘meat sceptics’, but not the intentions of the ‘meat believer group’ due to their cognitive dissonance.

5.1.2. LABELLING

Labelling is a way of certificating products so that their impacts are systematically made clear for consumers. When the nutritional values or carbon footprint of food products are stated on a product packaging, this might stimulate consumers to buy the more sustainable or healthy option. In the Netherlands, for instance, the ‘Beter Leven’ (living better) logo certifies meat products that meet certain animal welfare standards. Likewise, nutritional labels inform consumers about the nutritional values and dietary quality of a product and should guide consumers in choosing the healthier options available. An example of this is the traffic light labelling in the UK: products score red (high), orange (moderate) or green (low) in terms of how much fat, sugar, calories and salt they contain. Labels should be instrumental for consumers in choosing the ‘better’ option, but can also stimulate food manufacturers in creating healthier and more sustainable products to avoid an unfavorable image.

Nutrition labels

Thus far, not much research has been conducted when it comes to nutrition labels for meat products, which means that the impact of these labels on meat consumption levels has yet to be understood. However, Garnett et al. (2015) analyzed various major EU-funded and individual studies on nutrition labels for a range of food groups and found only weak impact of these labels on consumers making healthier food choices. The labels contribute to making people aware of the health impacts of food, but only a fraction of the population uses the labels thoroughly: namely only people who follow a healthy diet, higher socio-economic groups, middle-aged groups and individuals in need of special dietary requirements (Garnett & Finch, 2016). Aside from people not being aware of the reasons for these labels to exist, important barriers for individuals using the labels are a shortcoming of motivation and a lack of attention.

Environmental labels

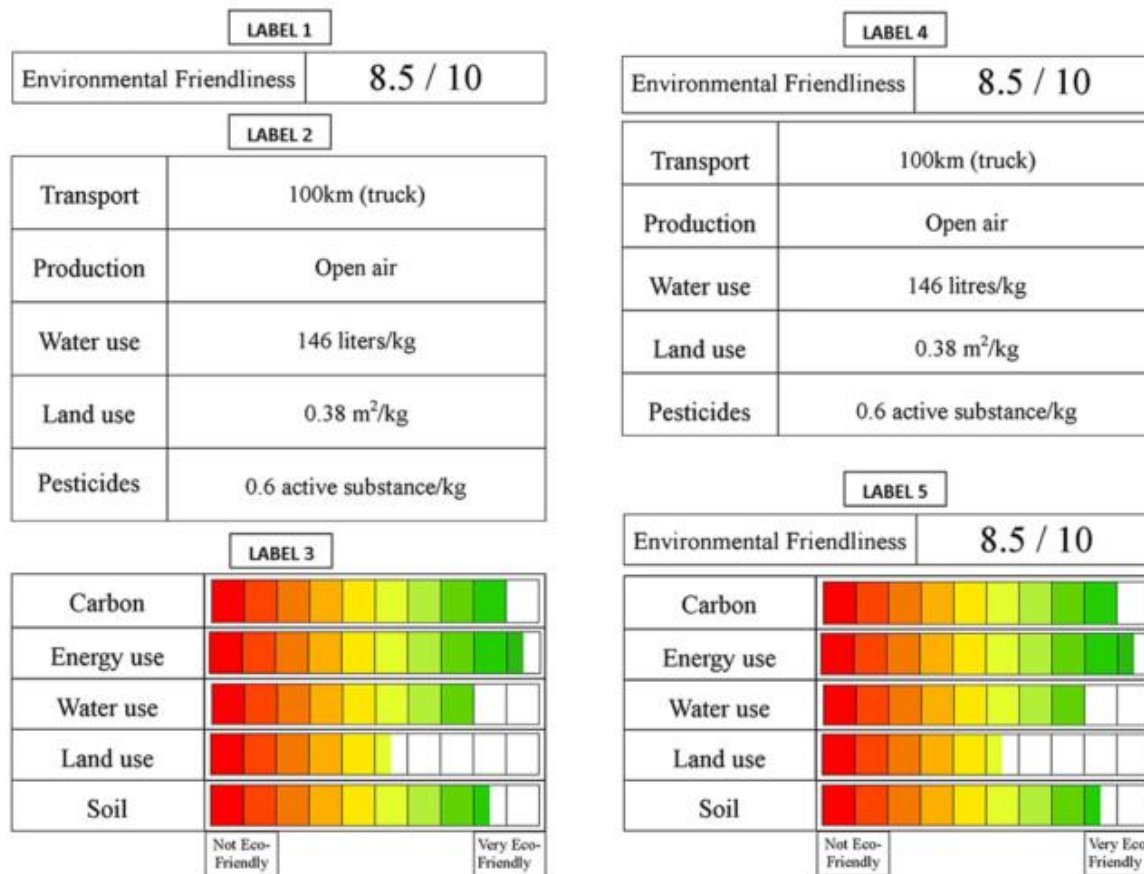
Labelling the environmental impacts of meat product has become a popular market-oriented tool in Western countries to empower consumers to make well-informed choices for more sustainable options. Its effects have been well-reported in a range of socio-cultural contexts.

In the Australian context, Hoek et al. (2017) explore the effectiveness of health/environmental logo’s on making Australian household grocery buyers shift to alternative healthy or sustainable food products. For this study, they used a quota sample of 944 respondents representative for Australian household grocery buyers. The effects of the health-environmental logos appeared to be predominantly limited and differ greatly between food categories and consumer groups. The success per food category seems to depend on the sensory similarity of the traditional and alternative variants. For instance, the authors found that making the grocery buyers shift from beef steak to kangaroo steak is more difficult than making them substitute brown rice for white rice. Product familiarity, price and taste are more important factors in shifting food choice than sustainability or health. A similar conclusion has been drawn based upon a Finnish study among 1010 consumers close to Finnish population averages (Hartikainen et al., 2014), since this study implies that the price and taste of food products are more important purchase criteria than carbon footprint.

Vlaeminck et al. (2014) provide deeper insight into different types of environmental labels to investigate which type is best suited to stimulate meat consumers to use environmental-friendly product variants. In an online survey completed by 230 Belgium respondents, the respondents had to assess five different types of labels on the

clarity of the label and on their willingness to buy the product on which the label appeared (see figure 3). The labels vary in the degree to which environmental impacts (based on life-cycle analyses) are aggregated. The second label portrays the raw information, while label 3 visualizes this same information by means of a traffic light. In label 1, the information is on an even more aggregate level by only rating the environmental friendliness on a 10-point scale. Labels 4 and 5 are combinations of multiple labels.

FIGURE 3: FIVE DIFFERENT TYPES OF ENVIRONMENTAL LABELS



Source: Vlaeminck et al. (2014, p. 182).

Among this sample group, visualizing the environmental impact at the attribute level combined with a general rank of 1/10 on environmental friendliness (label 5) is preferred (also being referred to by the authors as the label with the most accessible environmental information), and label 2 that portrays raw information solely is least favored. As a second step, differences in the effects of these labels on meat (substitute) products were reviewed in a framed field experiment with 150 participants in a Belgium supermarket. Here, "participants can choose between (1) an evidently inferior environmental option, i.e., steak (1.5/10), (2) a less inferior option, i.e., chicken (3.5/10), and (3) a superior alternative, i.e., the veggie burger (5/10)" (p. 187). The authors find that when the most accessible label is used, sales of both steak and chicken decrease by 25 and 19 per cent, whereas the sales of the veggie burger increase by 129 per cent, compared with when the standard food label is used. Based on these findings, the authors imply "that consumer attitudes translate into more corresponding eco-friendly behavior when the eco-friendliness information of the food products is more accessible" (p. 187), allowing for "public

authorities and companies to further explore and implement a new more complete, easy-to-interpret and standardized environmental label” (p. 188).

Within the range of environmental labels, carbon labels are most commonly used. These certify meat products based on the amount of CO₂ emitted while producing the products. Another Belgian study explored the potential of carbon labels alongside organic and animal welfare labels (Van Loo et al., 2014). This study indicates that carbon labels and organic labels on chicken breasts have less appeal for individuals responsible for food purchasing in the Flanders region of Belgium (sample of 359 persons) than labels focusing on animal welfare. In addition, consumers’ willingness-to-pay for chicken breasts is higher when animal welfare labels are certified nationally, compared to labels certified on the European level. Interestingly, the study shows that “high-income consumers are willing to pay a 50% higher price premium for sustainability labels on chicken breast compared to those in the low-income group” (p. 147).

A major criticism on carbon labels is concerned with the fact that they are not fully understood and well interpreted by consumers (Garnett et al., 2015). For instance, a European-wide study by Flash Eurobarometer (2013) demonstrates that 48% of European citizens consider the labels unclear. Besides, Hoogland et al. (2007) provide empirical evidence⁵ that “labels can only contribute to more sustainable food choices if the information helps to make sense of the issue immediately” (p. 55) in a more geographically delineated field experiment study that they conducted in a supermarket in Amsterdam. The authors therefore plea for extending the label information to make the labels more transparent. This could be done by either using more extensive product packaging labels or by incorporating additional external information given by (governmental) actors active in the food industry.

Samant and Seo (2016) demonstrate in their study among 110 Arkansas residents that sharing external information about environmental label claims offers the possibility to expand consumers’ trust in label claims on chicken meat and could lead consumers to perceive sustainability as being more important when purchasing chicken meat. This is especially the case when passive learning methods are employed (reading a flyer about label claims), as opposed to active learning where consumers discuss label claims. However, in later research Samant and other colleagues (2016) provide empirical evidence that greater understanding of label claims does not inevitably result in higher purchase intentions of more sustainable options (although the liking of and trust in products rise consequently), suggesting limited to no impact of label education on consumer behavior.

Because of the lack of understanding of carbon labels, Hyland et al. (2017) introduced an easily accessible traffic light carbon label system. Furthermore, carbon literacy must be raised to make carbon labels more effective: “sources of information must be trusted and attractive; the message relevant, clear and coherent; and the audience motivated and able to act” (p. 192). However, in non-meat product-groups the impact of a traffic light label appears to be only limited if not combined with other interventions. This conclusion has been drawn on the basis of an Australian real-life longitudinal study in which 37 food products were labelled according to the traffic light system (Vanclay et al., 2011). Sales of green products (low carbon) rose by only four per cent over a period of three months. When the carbon labels were combined with price interference (making these items the cheapest in their category), the results were, however, more outstanding: the sales of the low carbon products increased by twenty per cent in this scenario.

⁵ Since the results are more than ten years old, they should be interpreted with caution for the current context.

Besides the finding that carbon labels can be too complex for consumers to interpret them correctly, Hyland et al. (2017) mention three other issues as well. First, carbon labels do not cover the whole range of environmental externalities that meat products bring about, as the labels address only one of the many sustainability aspects. Second, food consumption behavior is influenced by habits and constraints over time, meaning that consumers might not notice “carbon labels amongst a large number of other labels that are frequently displayed on products” (p. 192). Finally, and in line with the results found earlier in the present research, Hyland et al. recommend “that health should remain the overarching principle for policies and actions” (p. 193) as it carries instant personal benefits to a consumer.

5.2. CHANGING THE CHOICE ARCHITECTURE & POINT-OF-PURCHASE ACTIONS

As has been discussed in chapter 2, the intention-behavior gap hampers the success of interventions to reduce meat consumption. It is therefore not surprising that many interventions focus on this gap. This accounts, for instance, for most of point-of-purchase actions, which are actions carried out at the places where the meat (substitute) products are sold. A similar intervention method in this vein comprises policy-makers, retail stores and restaurants adjusting the choice architecture for meat (substitutes). Interventions that focus on choice architecture method could be, for instance, to expand the vegetarian product range in a supermarket, to reduce the portion sizes of meat products and to use flavoring techniques.

5.2.1. PORTION SIZES

Cutting down portion sizes of meat products might assist consumers in an unobtrusive way in buying lower volumes of meat. Vandebroele and colleagues (2018) questioned whether decreasing the unit size of meat sausages by 33% (in line with the Belgium health guidelines) encourages consumers to buy smaller portions of meat. During a one-month real-life experiment, the traditional sausages with a unit size of 150 grams were still on offer, but a 125 grams portion was also introduced as an extra option. Insight in consumption behavior was gained by collecting the receipts of 161 consumers who bought any of these latter two products (excluding consumers who also bought the 150 grams option). A comparable Belgian retailer who had not applied an intervention served as a control measure. The findings in this study indeed provide evidence for the effectiveness of curbing portion sizes. More than half of all sausages sold were one of the two smaller options. Moreover, the total weight of meat sold decreased by eighteen per cent, while the number of sausages had remained stable in comparison with the pre-intervention period. Furthermore, thirteen per cent less meat had been sold in the intervention supermarket in comparison with the control supermarket. The authors therefore see potential for a win-win-situation, and state that “if these profit-affecting interventions could be combined with nudges to stimulate sales of healthier products, the total amount spent by consumers may be equaled or even enlarged” (p. 86).

In a representative sample of three large restaurant chains in medium-sized Dutch cities, Reinders et al. (2017) determine the effects of smaller portions of meat on the total amount of meat consumed by Dutch individuals. During a period of six weeks, meat portions were reduced by 12,5 per cent while the total dish volume was maintained by doubling the amount of vegetables. Because of the intervention, the average meat consumption decreased from 211.1 to 183.1 grams (-13,3%). Here as well, the retailers do not experience negative impacts on their image or revenue, as people’s satisfaction with the restaurants was unaffected. Moreover, these findings suggest that there are opportunities for restaurants to contribute to a “cultural normalization process of eating meat in moderation” (p. 112).

5.2.2. SUPPLY OF MEAT SUBSTITUTES

Flavoring techniques

An often-mentioned barrier for buying meat substitutes and/or vegetarian dishes is that they are not as tasteful as meat (e.g., Caarels et al., 2018; Garnett et al., 2015; Spencer & Guinard, 2018). In order to improve the appreciation of these products, food producers can adopt culinary and flavoring techniques. Spencer and Guinard (2018) explored the influence of 24 such techniques on the appeal of plant-based dishes among a sample of the Californian population. In short, it was found that an increasing variety of foods in colors, textures and flavors can increase sensory appeal and consumption of dishes low in or without meat and high in vegetables. However, they also found that some flavoring strategies only have effect on specific consumer segments⁶, suggesting that strategies should be catered to consumer preferences in order to enhance widespread appreciation of vegetarian foods.

Meatless and Meatlight products

When investigating this topic, it is also useful to get insight into the process of introducing a range of vegetarian products in a small-scale pilot in Zeeland, a southwestern province within the Netherlands. This process is reported by De Bakker and Dagevos (2010) and demonstrates the significance of consumers' experience and appreciation of vegetarian products on the final market introduction. In addition to traditional Meatless (fully vegetarian) products, the product range consists of 'Meatlight' products - hybrids that can be categorized as between meat and meat substitutes. This latter product group has been developed to reduce the barriers on making a step towards a less meat-based diet. The pilot shows that the success of the introduction of Meatless products is great within consumer segments that already eat vegetarian on a regular basis. Meatless products make up seven per cent of the meat substitute market in the tracked supermarkets. The Meatlight version also attracts non-vegetarian groups: "Meatlight has a six per cent share of the total sales volume of (low fat) ground beef. For the pork sausages and fresh hamburgers that is as much as 30 and 39 per cent" (p. 163). Albert Heijn, a major Dutch retailer, recognized the opportunity for this product group to fill a market gap and therefore has included the Meatlight products in its assortment as well. One of the initiators of a past range of hybrid meat products, Henk Schouten, is, however, rather skeptical about hybrid meat products as they could raise distrust among consumers: "they perceive it as a meat substitute that still contains meat" (De Bakker & Dagevos, 2010, p. 116).

5.2.3. NUDGING

A nudge helps to guide consumers (subconsciously) in making the 'better' food choice (more nutritious or less harmful choices for animals and/or the environment), while not removing the less inferior option (Thaler & Sustein, 2008). Many nudges within the food consumption sphere apply to the micro-environment, ranging from changing the default menu-option on offer in canteens to putting meat substitutes on more prominent places in supermarket shelves.

Both an online study among a sample of 853 adults representative for the UK population (Bacon & Krpan, 2018) and an experimental study in a midwestern US university restaurant (Campbell-Arvai et al., 2014) demonstrate

⁶ The sample groups were split into four cluster groups based on their hedonic overall liking scores of the 24 recipes presented. The recipes differed in the amount of meat and in the cuisine (either Asian, Latin-American or Mediterranean), using different cooking styles, ingredients and aroma strategies.

that changing the default meat-menu-option to a meat-free alternative results in significantly lower meat consumption. In the study conducted by Campbell-Arvai and colleagues, the portion of participants choosing meat-free menu options rose from nine to 73,2 per cent. The authors explain this finding by stating that a default option “provides a quick and convenient choice that requires minimal physical or mental effort” (p. 466). However, the same intervention had an unfavorable side-effect in Bacon and Krpan’s (2018) study. Since the vegetarian dish was the default menu option in their study, flexitarians unexpectedly showed less eagerness to choose the plant-based product. The authors clarify this by arguing that “the menu interventions may have made the concept of vegetarian eating more salient, thus signaling to frequent vegetarian eaters that they have already engaged in the morally superior food choice on numerous occasions and prompting them to select meat or fish instead” (p. 197).

These nudging experiments have frequently been conducted in university restaurants, for instance in a study conducted by Kurz (2017). He made a vegetarian dish more attractive by placing it higher on the menu list and by presenting it in a more visible location in the Swedish university restaurant for a period of seventeen weeks. The results were compared with a university restaurant close by, in which such an intervention had not been applied. The nudge resulted in a six per cent increase of the share of vegetarian lunches during the intervention period. The rise was partially persistent, as four per cent rise was found in an after-intervention-follow-up evaluation compared with the status quo situation. This suggests that when “customers learn about the vegetarian option, some then incorporate it permanently into their choice set” (p. 6).

Methodological questions may hinder the applicability of the above nudging studies to the real-world and in different contexts, due to the bulk of them being conducted in willingness-to-buy or university settings (Garnett et al., 2015). In addition, a possible ethical objection to the practice of nudging is that policy-makers should not ‘manipulate’ consumers in their choices, even if it happens in unconscious states (Hansen & Jespersen, 2013). In order to increase acceptability of the use of nudges, Kurz (2017) recommends policy-makers to be open and transparent to consumers when applying policies.

5.3. FINANCIAL MEASURES

Considering the modest cutback of meat consumption in parts of Europe over the last few years, it is evident that citizens and businesses are not (yet) capable of taking the lead in drastically steering the market away from animal-based proteins towards plant-based proteins (Vinnari & Vinnari, 2014). Wellesley et al. (2015) advocate that governments can be key actors in leading this protein transition. Governments do not only dispose of the power to enforce actors in taking the steps needed (e.g., setting limits to the GHG emissions of a livestock farm), but they also have the financial and managerial capacities to lead and initiate action. A recurring topic in public discussions about food consumption is price interference by governments, as price is perceived as the dominant factor (De Bakker & Dagevos, 2010). Price interference of meat products can be realized via taxes or subsidies.

Price interventions are related to the barriers and abilities variable of the conceptual model in figure 1, as they directly change the price of meat products but do not specifically target the intrinsic motivation for meat consumers reducing their meat consumption. In this section, an overview will be given of studies in which the effectiveness of financial interventions to shift food consumption for environmental and health reasons was investigated. Some of these interventions specifically focus on meat consumption, while others target a comparable food group or more than one food group.

Financial measures on food consumption in general

A wide range of studies on the effects of price interference have been conducted, of which most studies are experimental by nature. Although a clear-cut outcome remains absent, several conclusions can be drawn based

upon these studies. On the basis of their overview of studies on price interference for meat products between 2004 and 2009, De Bakker and Dagevos (2010) conclude that “the overall image of studies on price interventions is that of varying results. There are some effects, even though unambiguous and convincing scientific proof remains to be seen.” (p. 71). The authors add, referring to Waterlander et al. (2009), that positive financial measures prove to be more effective in stimulating healthy eating behavior than restricting financial measures. This has also been confirmed by a choice experiment study conducted by Hoek et al. (2017) among Australian household grocery buyers. In this study, consumers were offered regular food products (e.g., white rice and steak) with a price of maximum twenty per cent extra and more sustainable and healthy food products (e.g., brown rice and kangaroo meat) that were up to 30 per cent reduced in price. It turned out that the price reductions in both interventions have been most successful in getting Australian household grocery buyers consuming the healthier and environmental alternatives.

Garnett et al. (2015) assessed numerous systematic reviews of the experimental and real-life effects of introducing both taxes and subsidies in a range of food groups in developed countries between 2004 and 2015. The overall results were scattered. Some studies demonstrate that financial measures “would improve diets and potentially improve health outcomes although the range in magnitude of impact was not reported” (p. 35), while other studies suggest that one could be skeptical about taking financial measures to shift consumer choices, as these measures generate only minimal effects. The authors also found mounting evidence that combining both positive and negative price interference can be effective in reducing meat consumption, although taxation must be high to be of significant influence. Furthermore, they conclude that consumption practices are a complex process for which price is just one of the impactful variables, making price interference “not the be-all and end-all of policy interventions” (p. 78).

However, Garnett and colleagues raise two critical comments on the methodology of price experiment studies. First, price experiments hardly reflect the reality in which the consumer makes food choices, as these experiments are often conducted in controlled environments. Second, the different methodology and data sources used in these studies makes it difficult to compare the results.

Carbon and meat taxes

A popular instrument for governments to enhance sustainability in the food sector is integrating environmental externalities of meat consumption in product prices, for instance by means of carbon tax. Similarly, governments can tax meat products specifically. As of now, no country has legislated meat tax, although it reappears on political agendas (e.g., Denmark, Sweden and Germany) (Donnelly, 2017). Some findings in assessed studies on carbon taxes will be discussed below.

Edjabou and Smed (2013) conducted an experiment of carbon taxes among 2000 Danish households. Price interference was done either by taxing carbon emissions of food by 0.26 DKK or 0.76 DKK per kg, or by compensating the price increase by lowering the price of other foods. They found that a tax of 0.76 DKK per kg, leads to the largest reduction of CO₂ emissions (10.4 to 19.4 per cent). Especially the consumption of food products high in CO₂ emissions (such as beef products) was altered. However, the most cost-effective price intervention was introducing the higher tax combined with a compensation by lowering the prices of other products. In this case, carbon emissions were reduced by 2.3 to 8.8 per cent. However, providing compensations evidently has the unwanted side-effect of increasing individuals’ caloric intakes without decreasing the intake of saturated fats. Based on these findings, the authors conclude that “the results show a low-cost potential for using consumption taxes to promote climate friendly diets” (p. 84).

A comparable systematic review of carbon taxes in several Western countries by Hyland et al. (2017) suggests that carbon taxes are rather effective. For instance, Säll and Gren (2015) assert that introducing tax on meat and dairy consumption up to one third of the initial price in the Swedish context could lead to a decrease in the national GHG emissions of up to twelve per cent. In contempt of this promising outcome, Hyland et al. (2017) warns that meat taxes should not be applauded just yet as they are generally not welcomed by consumers. In order to increase the public acceptance of these taxes, Garnett et al. (2015) suggests using the revenues gained from taxes for the public good, like investing the taxes in health services.

Besides, Garnett et al. (2015) advocate that the modelling studies often do not address substitution effects of price interference in food choices. For instance, the modelling study conducted by Wirsenius et al. (2011) showed that even though a €60/ton CO₂ eq. tax would lead to a decrease in beef consumption in Europe by fifteen per cent, it would lead to respectively a seven and one per cent rise of the amount of poultry and pork sold. In that case, the overall CO₂ emission by food consumption would only decrease by one per cent. Therefore, cross-elasticity of meat-products makes taxing meat products a difficult process in which a range of other factors has to be taken into account (De Bakker & Dagevos, 2010). Likewise, Garnett et al. (2015) touch upon two other unwanted possible side effects of introducing meat taxes: 'meat-shoring' and 'welfare' effects. Meat-shoring involves a decrease in the consumption of non-meat products to compensate for the higher meat prices. A 'welfare' effect means that consumers shift to lower welfare meat while keeping their current consumption levels constant.

Although the theoretical results of the studies into financial measures are ambiguous, it is relevant to discuss the feasibility of these measures in practice. For instance, De Bakker and Dagevos (2010) point to administrative and political barriers of introducing meat tax, e.g., the difficulties arising when one tries to demarcate the concept of a 'meat product'. A chicken breast easily fits this category, but products that contain small amounts of animal parts (e.g., sweets containing gelatin) are more difficult to categorize when introducing meat tax. Another problem with taxing meat products, whether it is indirect carbon tax, or direct meat tax, is that it would crash onto political barricades. Not only would introducing national meat tax have repercussions for the international trade position of a country, but it can also lead to a 'leaky system effect': consumption levels of meat remain unchanged, as there will be more demand for imported meat to which the tax does not apply (Garnett, 2014, p. 17). Besides, Garnett et al. (2015) discuss two other barriers for introducing taxes on meat. First, taxes could put the financial burden of the heightened costs of meat products on producers instead of putting them on the consumers. Second, taxes are not meant to alter the intrinsic motivation of meat consumers to change their diet, leaving the possibility that once the tax is withdrawn consumers return to their old practices. Seen in another light, however, having introduced the tax could be a signal for consumers that the product is unhealthy, thereby indirectly raising public awareness.

Subsidized fruits and vegetables

Related to subsidizing healthier or environmental friendlier foods is providing them for free. In their systematic review of financial measures, Garnett et al. (2015) question whether providing free or subsidized fruits and vegetables at schools is successful in changing children's food behavior. Since a larger share of vegetables and fruit on a children's plate goes hand in hand with a lower meat intake (Reinders et al., 2017), these results are relevant for this research. The authors refer to a study by Evans et al. (2012) that involved 21 school programs on this topic, carried out in a range of Western countries⁷ affecting 26,000 school children in total. On average the programs led to an increase of 0.32 portions of fruit and vegetables combined, although the increase in vegetable intake is only

⁷ The USA, New Zealand and various European countries

minimal. Here again, the study reports that only changing the price does not lead to the desired effects. Combining the financial measure with strategies to motivate children in eating healthier increases effectiveness.

5.4. OTHER GOVERNMENTAL REGULATIONS

Governmental interventions to regulate meat consumption go beyond financial measures solely. Governments can deploy several instruments to change the composition of the food market. By means of land use zoning, land available for cattle breeding can be confined and/or agricultural land can be extended. Furthermore, governments can put a hold on the freedom of food producers when it comes to advertising, thereby reducing the demand for unhealthy foods in an indirect way.

Statutory food environment regulations

The number of studies on government interference in the physical retail environment of meat products is limited, although there is vast evidence of the connection between access to food and certain welfare diseases. For instance, retail environments in which healthy foods are absent or unaffordable and that are often rich in unhealthy foods are linked with the occurrence of obese (Garnett et al., 2015). Socio-economic class amplifies this effect, as these so-called 'food deserts' are often present in poor neighborhoods. Given these connections, the retail environment of meat products is a substantial sphere of influence for governmental agencies via urban planning, but further research is needed to assess its effectiveness in altering meat purchases.

Statutory regulations for food advertisements are not compounded to the physical environment only. The social climate is another relevant domain of influence for governments. In the Western world, governments actively determine which foods are advertised and in which ways. Generally, studies on statutory regulations of food advertisements indicate that statutory food advertisement regulations could be effective in altering food consumption, although aftereffects must be reckoned with. In the systematic review by Garnett and colleagues (2015) on food advertisement bans, they refer to a study on the consequences of a ban of advertising unhealthy food (e.g., food high in sugars, fats and/or salt) to children in households living in Quebec by Dhar and Baylis (2011). This is an interesting area to study, since the main language in this Canadian province region is French (just like the language used in commercials and advertisements there), whereas the province also has many English-speaking inhabitants. The latter group therefore served as a control group for the intervention. As hypothesized, the ban affected French-speaking households significantly more (by thirteen per cent) in their propensity to consume fast food than those households having English as their native language.

Galbraith-Emami and Lobstein (2013) and Chambers et al. (2015) have completed similar multiple-study assays and point out two common experienced issues. One issue is the difficulty to banish advertisements on more than one media outlet format, giving food producers the opportunity to interact with consumers via other mediums, such as social media. Furthermore, sufficient monitoring and enforcing of the ban only seldom follows up on the intervention. That is not to say that Chambers et al. want to abolish these bans altogether. Rather, "change may be long-term and cumulative and that while no single intervention can (at least in the short term) be expected to have a large impact, measures to reduce the volume of, and children's exposure to, advertising of these foods can be justified on precautionary grounds – and they can also help change social norms" (Garnett et al., 2015, p. 59).

Garnett et al. (2015) also emphasize that making generalizations of the influence of certain food advertising bans on food consumption behavior to other contexts is difficult, if not impossible, as the "present results do not show conclusively whether or not food advertising affects food-related behavior" [...] and the impact of food advertising "varies inconstantly within subgroups" (Garnett et al., 2015, p. 58).

Nutritional guidelines

Aside from these hard interventions, the softer governmental regulations prevail. Exemplary are recommendations to the national public to improve their diets, also known as nutritional guidelines. More than one third of all countries (especially high-income countries) use some kind of national guidelines at this moment: “short, science-based, practical and culturally appropriate messages that guide people on healthy eating and lifestyles” (Food and Agriculture Organization of the United Nations (FAO), 2016, p. 1). The dominating objective for these guidelines is public health, even though “assimilating sustainability into nutrition policies is gaining global momentum” (Hyland et al., 2017, p. 192). Generally, nutritional guidelines in relation to meat consumption recommend citizens to consume less (processed and/or red) meat and to substitute it by plant-based derived protein sources, whilst taking into consideration average national consumption patterns. China, for instance, aims to decrease its national level of meat consumption by half by 2030, doing so by recommending its inhabitants to consume between 40 and 75 grams of meat per person a day (Milman & Leavenworth, 2016).

Nutritional standards on schools

By using public procurement, governments can play a role in promoting healthy dietary habits on schools as well. Nutritional guidelines may be integrated as standards that school meals must meet, or voluntary schemes may be set up to encourage schools to improve their food supplies. The UK government, for instance, actively promotes healthy and sustainable foods on primary and high schools by a ‘Food for Life Partnership’: a partnership of governments, NGOs and schools in which schools can get awarded bronze, silver or gold depending on the health and environmental qualities of the meals they offer. Even though the scheme is fully voluntary, it has led to a range of successes. It is claimed in an evaluation report that on average pupils in one of the 3,600 Food for Life schools “are twice as likely to eat five a day [recommended UK standard of eating five portions of fruits and vegetables a day] [...] and eat around a third more fruit and vegetables than pupils in comparison schools” (Soil Association, 2016, p. 3). Furthermore, it was found in a qualitative study among fifteen participating schools (Orme et al., 2011) that pupils in these schools had more food knowledge and experience lunch breaks as more appealing than before the scheme was introduced.

A comparable program has also been set up in the Netherlands, ‘De Gezonde Schoolkantine’ (‘the healthy school canteen’). This program stimulates secondary education schools to offer food products that are in line with the NNC’s guidelines (‘De Schijf van Vijf’). A brigade of the NNC regularly visits schools and equips them with background information and advice. Effect level evaluation research among 95 participating schools in 2014 by iResearch (2014) reveals that three quarters of the schools made more positive than negative changes in their food assortment a year after the implementation, although this often meant that they had extended their existing supply (+21,3%) instead of significantly decreasing the amount of unhealthy foods (-1.4%). Therefore, based on this research, the brigade is recommended to proceed with the campaign but to also pay more long-term attention and to monitor the progress the schools make. Besides, this report emphasizes that extra attention is needed to counteract snack bar and supermarket visits during breaks, as the external food supply environment is often mentioned by the schools as the main barrier for creating a healthier food assortment in canteens (iResearch, 2014).

Although schools cannot alter their external food supply, they can restrict the supply of unhealthy or unsustainable foods internally. A systematic review by Mayne et al. (2015) of 37 experiments in real-life environments reveals that these active interventions (such as introducing nutritional standards on school meals or banning vending machines) yield more effects in shifting people to healthier products than passive interventions, such as providing nutritional information.

An example of an effective active intervention on food supply in schools is described by Lazor et al. (2010). In a middle-school group of 3,993 diverse students in Maryland, US, meat-based menu items were replaced by soy-based alternatives. The authors found positive results regarding the acceptability of the soy-based substitutes: “[s]tudents selected the 3 soy-based products from a crowded menu with similar frequency as the traditional products, and consumed the same amounts as the traditional items, when portion sizes were the same” (p. 204). Just like the reduced portion size interventions, this intervention offers the opportunity to encourage public health, while not negatively impacting the sales of restaurants.

All in all, despite the theoretical evidence of the unfavorable consequences of meat consumption on both health and the environment, governmental action to reduce the consumption of meat still does not occur often in policies on sustainability set up in OECD countries. The reason for that is what Wellesley et al. (2015) call the ‘Cycle of Inertia’ (p. 16): governments are inactive in regulating the shift towards more plant-based proteins, because the public is not generally aware of the urgency of this shift, thus reducing the priority of the issue on the political agenda. To break this cycle, Wellesley et al. (2015) plead for interventions that focus on raising awareness about the environmental and health-related issues and, more importantly, on the benefits that less animal-based protein intake has for the public good. Making the public conscious is a prerequisite for creating “the political space the full range of government interventions necessary to effect the scale of change required” (p. 16). De Bakker and Dagevos (2010) support this argument by stating that: “before discussing about the applicability of meat tax, consumers have to be aware of the production processes and environmental consequences of meat consumption.” (p. 79).

5.5. TOOLS

Raising awareness is about sharing correct and easy-to-interpret theoretical and practical knowledge on the impacts of meat on (public) health, the environment and animal well-being, but also the benefits of a plant-based diet (see section 5.1). Predominantly, it also matters how this knowledge is framed and transferred to its receivers. There is a great variety of tools that can be used to increase the attractiveness of meat substitutes, such as using flavoring strategies or linguistic instruments. Much literature on intervention methods assessed for this study focuses on these tools. These publications will be discussed in this paragraph.

5.5.1. FRAMING OF THE ISSUE

Actors active on raising awareness can adjust how the issue of meat consumption is framed. Generally, the issue is framed in environmental or human health terms. Vainio et al. (2018) conclude in their theoretical framework based on various communication studies conducted between 2011 and 2017 that placing health as the pinpoint of focus generally has a greater impact on persuading people to reduce their meat consumption than framing the issue in environmental contexts. Moreover, De Boer et al. (2016, p. 28) found in their cross-sectional study among Dutch and US consumers that framing red meat consumption as an environmental problem had no effect, not even for climate-change believers. Therefore, they envisage that trying to raise awareness on environmental impacts currently is “a bridge too far” (p. 28). Again, personal relevance seems to be the explaining factor here. Consumers only rarely buy food for climate mitigation reasons as this has no direct personal relevance to them, while health considerations are in fact personally relevant for them. Moreover, De Boer et al. argue that the complexities of the link between meat and climate change complicates communicating the issue successfully.

In their own experimental study among a quota sample of 1,279 Finnish red meat consumer adults, Vainio and colleagues (2018) “analyzed the effectiveness of message framing [on health, environment or both] and the refutation of misinformation in persuading respondents to reduce their consumption of red meat” (p. 217). They

state that combining the health and environment frames does not have more influence on altering consumers' intention to consume red meat than applying a single frame. They also found limited support that the way a message is formulated and framed determines the effectiveness of providing the message in changing behaviors. In a similar vein, Regan et al. (2014) conducted a comprehensive study among 8 European countries to investigate how individuals perceive the accuracy and credibility of information on conflicting messages on red meat consumption. They found that the perception of both accuracy and credibility of information increases when data is more recent, especially when information on the benefits of red meat overruled older risk information. Besides, Europeans seem to be skeptical about the credibility of sources, more so in the Netherlands and Germany than elsewhere. This suggests that European formal risk information strategies that are aligned to national cultures should be applied. More importantly, these information strategies are also insightful given the existing information contradictions.

Furthermore, Bertolotti and colleagues (2016) set up an experiment in which 156 Italian elderly volunteers between 60 and 95 years old faced fictional newspaper articles on meat consumption. The articles focused on either health or well-being and were written in a factual way (excessive meat consumption causes...) or in a pre-factual way (if you eat too much meat, then...). Focusing messages of meat consumption on well-being and framing the information pre-factually happens to be of greatest influence on impacting attitudes and on lowering intentions and real-life choices to consume meat among the sample of elderly. This is highly probable, because both present the elderly a *possibility* to improve their current condition, as contrary to the health focus and factual framing that both sketch changes in meat consumption as an *obligation*.

5.5.2. INSTRUMENTS FOR TRANSFERRING INFORMATION

Besides framing the issue of meat consumption in different terms, raising awareness can also involve how information is presented or which instrument is used to diffuse information. Given the widespread use of the text-messaging app 'WhatsApp', Carfora and colleagues (2017b) explored the potential of WhatsApp in reducing red meat consumption by sending daily reminders to consumers about not exceeding the weekly recommendation to eat 200 grams of red meat. The intervention was applied to half of 244 Italian undergraduate students. The other half served as a control group and both groups had to keep a daily food diary. The findings show the effectiveness of text-messaging in encouraging young adults to change their meat consumption habits: only 23,3 per cent of the intervention group transcended the 200 grams, as compared to 56,6 per cent in the control group that did not receive text messages.

Proceeding with university sample groups, Mental Contrasting with Implementation Intentions (MCII) appears to be a powerful tool to reduce meat consumption levels (Loy et al., 2016). This tool encourages individuals to imagine possible barriers for lowering their meat consumption and makes them think of manners to overcome those barriers (e.g., looking for vegetarian recipes when one cannot prepare vegetarian foods). Evaluations both one week [reduction of 108,5 to 63,2 grams of meat a day] and four weeks after the intervention [to 58,2 grams] show "that MCII participants who expressed a moderate or strong intention reduced their meat consumption more than participants in the control condition, whereas those who reported a weak intention did not" (p. 7). Thus, although MCII might not be as effective among all groups of meat consumers, it is a helpful tool to narrow down the gap between intention and behavior of individuals already willing to reduce their meat consumption.

A cross-European study was set up by Rutsaert et al. (2015) to gain knowledge about which presentation format for the risks and benefits of red meat stimulates online deliberation of receivers the most. Deliberation is understood as a measure of engagement with the presented information. Gaining insight on deliberation is insightful for policy-makers, since "successfully engaging consumers in a dialogue may provide opportunities for

better tailored and more effective communication about food-related risks and benefits” (p. 191). The authors found that YouTube videos and news articles generally spark deliberation the most, as the respondents posted twice as many comments via the former presentation formats compared to standard informative texts. This might be due to the fact that the “material is presented in a well-recognized and typical media format” (p. 197), thereby increasing its engagement and the perception of credibility.

In current neo-liberal societies celebrities become involved more often in conferring “reflexive modes of consumption as a form of political citizenship” (Doyle, 2016, p. 778) to wide audiences via mainstream media. This also applies to food practices such as eating (less) meat for ethical and/or environmental reasons. Doyle (2016), for instance, describes how US celebrities Alicia Silverstone and Ellen DeGeneres “help reframe a stigmatized identity and practice [of the vegan lifestyle] in a positive and accessible way” (p. 777). They do this by “performing a campaigning role” (p. 778) and “embodying it [the vegan lifestyle] through their own consumption habits” (p. 778). Celebrities are influential due to their large follower base, which turns them into opinion leaders. In her journalistic article, Deelder (n.d.) also acknowledges the instrumental value of celebrities in curbing meat consumption. Especially groups that are already aware of the impact of meat on the environment, health and animal wellbeing but that have not taken measures yet can be mobilized by various (social media) role models. This is in line with Wellesley et al.’s (2015) statement that “celebrities – be they chefs, actors, writers or musicians – often have influence on socio-economic groups that are otherwise difficult to reach. There are many successful experiences of celebrities working with NGOs, industry and the government to promote a variety of lifestyle messages including those around health, diet and the environment” (p. 48). In Holland, for example, Alpro Soya, a Belgian manufacturer of plant-based variations of dairy products, used both a Dutch TV-hostess and a chef for their advertising campaign, which led to greater sales of their products (De Bakker & Dagevos, 2010).

Finally, since narrative textual formats are more effective in health sciences in steering people in the right direction than informative texts, Houtenbrink (2017) examined whether this is also the case in the environmental domain, focusing on the issue of meat consumption. Narratives could be more engaging for readers, as they allow readers to identify with the storyteller (due to the first-person perspective in the story) and convey readers into the story (as the story is told in chronological order). A questionnaire filled out by 154 Dutch residents assigned to one of five text versions measured their attitudes towards reducing of meat consumption. Unlike hypothesized, the attitudes did not significantly differ between people who read an informative text and people who read a narrative text on why they should reduce meat consumption. It should, however, be considered that more than three-quarters of this (relatively small) sample were highly-educated, which makes generalizing the findings troublesome.

5.5.3. TERMINOLOGY OF PLANT-BASED PRODUCTS

The two studies below are about linguistic instruments that can be used in encouraging consumers to buy meat substitute products. First, Mattson conducted a survey among 1,163 American adults (as mentioned in: Watson, 2018), to assess which term is preferred for meat substitutes. It appears that 83 per cent of the American consumers prefer the term ‘100% plant-based’ above ‘vegan’, as the latter is associated with a restricting lifestyle and the former offers consumers a dietary choice that brings along positive change.

Second, Geipel et al. (2018) conducted an online experimental study among 161 German residents who had been living there at least one year. The participants received a description of artificial meat either in German or in English. Afterwards, their willingness to eat the product was inquired. 30.3 per cent of the consumers who had read the product in English reported being willing to eat artificial meat, against a notably smaller group of 18.3 per cent who reported doing so after having read the description of the product in German. By the same token,

willingness to not eat artificial meat also decreases when the product is presented in a foreign language: 25,8 per cent of people who read the English variant did not want to eat the product, compared to 40.2 per cent of the other group. The explanation the authors provide for artificial meat evoking disgust when presented in a native language is that “experiences and associated emotions are stored together with the linguistic context in which they occur, and are thus more easily accessed when the same language is used at retrieval” (p. 6).

5.6. CAMPAIGNS

The last, and arguably the most diverse form of interference in meat consumption is setting up campaigns. Campaigns are intended to encourage the larger public in limiting their meat consumption by means of (a combination of) several intervention methods that have been discussed in the above sections. Most outstanding and well-reported are the Thursday Veggieday in Ghent, Belgium, and Meat Free Monday in the US. The results for these campaigns are not as tangible as for most other interventions, as the results were not measured in experimental environments and the campaigns often last for multiple years. Despite of this, some evaluation results of the Thursday Veggieday and Meat Free Monday on the effect and the process level will be presented in this chapter.

5.6.1. MEAT FREE MONDAY

Meat Free Monday is a campaign that, as the name implicates, encourages people to not eat meat on Mondays. The campaign was launched by Paul McCartney and his siblings in 2009 and is based on raising awareness about the health (and recently also environmental) benefits of not eating meat one day of the week, although this campaign also alters the choice architecture of meat (substitutes) by having hundreds of schools/universities, companies and governmental parties participating (Garnett et al., 2015).

One of the companies participating is Sodexo, a US food service company. Sodexo assessed the impact of the campaign in 245 sites they serve via an online questionnaire⁸. Three quarters of the food providers who completed the questionnaire already participated in the campaign, and 65 per cent of them were willing to continue doing so in the future. Sales on Monday had remained stable for half of the providers, while another 30 per cent reported decreases in their overall sales. The sales of vegetables increased by 49 per cent among the participating providers, although more than half of the sites (56 per cent) experienced a change in meat purchases (Leidig, 2012).

The effects of the campaign on individuals have also been well-documented by Meatless Monday (2012). The sample for this study consisted of more than 1,000 US adults who were asked to fill out an online survey. Awareness of the campaign has risen from 26 per cent in 2010 to almost half of the US adult population (43 per cent) by 2012. 36 per cent of the sample admitted that the campaign made them cut back their consumption of meat. Of this group, 62 per cent said they have tried making the Meatless Monday a weekly habit. 40 per cent even go beyond the Meat Free Monday ideals by also eating vegetarian on other days of the week. It could also be an option to extend the campaign outside of the private sphere. That is, 42 per cent of the US adults who were aware of the campaign would like to see the campaign being adopted by restaurants. Even more of these US adults (54 per cent) would like to see the campaign being supported by supermarkets as well.

⁸ It should be mentioned that the response rate of this questionnaire is just fifteen per cent.

5.6.2. THURSDAY VEGGIEDAY

Based upon the success of the Meat Free Monday campaign in the US, the Thursday Veggieday has been initiated by the Ethical Vegetarian Alternative (EVA) in Ghent, Belgium. Instead of Monday, this campaign introduced Thursdays as the vegetarian day of the week. Another difference is that Thursday Veggieday started on environmental grounds, as opposed to Meat Free Mondays, which started as a public health campaign to reduce intake of saturated fats. From its start in May 2009, participation has been widespread among the Ghent population, and has even had influence outside of the city in later years. The campaign focuses on raising awareness of environmental impacts of meat (shared via local papers, TV-magazines, websites and posters), and is intended to actively support the Belgians in buying and preparing vegetarian foods. This is done by sharing recipe booklets (both for residents and catering staff) and vegetarian restaurant maps, as well as by giving vegetarian cooking lessons. Furthermore, the campaign involves a wide range of schools and company restaurants adopting the Thursday Veggieday principles. One principle, aside from not eating meat on Thursdays (and preferably on multiple days a week), is that the benefits of not eating meat are emphasized, instead of focusing on what participants are restricted to do.

Three questionnaires and polls completed by representative samples of the Ghent population show the impact of the campaign. Based on the number of participants and participating schools/canteens etc., Builddesk Benelux B.V. (2011) claims that the campaign has led to 576,2 tons of CO₂ reduction per year. Another poll filled out by respondents in 2011 (Leenaert, 2012) shows that 94 per cent of the pupils of the public schools choose the default vegetarian option on Thursdays. Awareness of the campaign is widespread in Ghent, reaching 70 per cent of the Ghent population of 60,000 inhabitants. One quarter of those inhabitants participates more than twice a month. Besides, twelve vegetarian restaurants can be found throughout the city, which is one of the highest numbers per capita in the Western world. According to Bernburg (2018), the impact of the campaign was also visible outside the borders of the city in the following years, as 28 per cent of the Belgians report being vegetarian as a result of the campaign in 2017 and 43 per cent have reduced their overall meat consumption due to the campaign. Bernburg recommends governments to intervene in the choice architecture besides merely raising awareness to increase the efficacy of the campaign.

A more in-depth study on the influence of the Thursday Veggieday campaign on primary schools in Ghent was carried out by De Keizer et al. (2012). They determined the acceptance of vegetarian lunches served on Thursday Veggie Day among children on two primary schools located in Ghent by comparing plate wastes on the vegetarian day to the non-vegetarian week days. The study findings indicate that the children “find the vegetarian lunches as acceptable as the conventional menus. [...] Certainly, there was no evidence that less of the vegetarian main course was being consumed than the conventional main course” (p. 3-4). The authors consider these results as hopeful, as the results implicate that preparing the vegetarian dish on other week days could be experienced as palatable, and above all, that it might lead to positive changes in the wider eating behavior of families. According to the authors, one of the major determinants of the success of the campaign on schools is that the children get lessons about the environmental impact one can have by (changing) one’s food pattern.

5.6.3. NATIONALE WEEK ZONDER VLEES

As of March 2018, a nation-wide campaign to reduce meat consumption has been introduced in the Netherlands: the ‘National Week Without Meat’ established by the foundation ‘Nationale Week Zonder Vlees’. The campaign has been set up mainly for environmental reasons, although the campaign also focuses on the possible health benefits of consuming less meat. The campaign is similar to the two campaigns discussed above, in the sense that its intention is to engage both private and public parties via awareness raising. This is done by spreading

background information about the campaign, as well as inspiration, i.e., meat-free recipes in magazines, interviews, and flyers and presentations at primary schools and highschools. However, contrary to the other two campaigns that devote themselves to one day of the week, this Dutch campaign introduces one meat-free week a year.

Literature evaluating the campaign is scarce, as the week of the campaign has ended only recently. A few days after the completion of the campaign, the creator of the foundation reported some results in a press release (Boerdam, 2018): 31,935 people have registered to participate in the National Week Without Meat. This number must be interpreted with caution, however, as it involves only those people who left their names and e-mail addresses on the website of the foundation and individuals also had the opportunity to register more than one participant. Furthermore, registering does not necessarily mean that individuals indeed act in accordance with the campaign (for the whole week) and it is possible that extra participants took part in the campaign who had not acquainted with or were not able to reach the page. All in all, based on this rough estimate, the foundation claims to have saved 389 tons of CO₂ being emitted.

One of the 53 companies supporting the campaign is Vivera, one of the leading Dutch producers of meat substitutes. Vivera claims having sold 500,000 extra products during the week of the campaign as compared to an ordinary week. The large Dutch supermarket chains Albert Heijn, Jumbo and Aldi also embraced the ideals of the campaign by putting vegetarian products up for sale. 139 schools took part in the National Week Without Meat, and at the same time catering companies expanded their assortments of vegetarian products in canteens, restaurants and gas stations. Boerdam has already sent out a press release stating that she will proceed with the campaign in 2019 and that she hopes to set up new collaborations with local and national governments to increase the range of Dutch participants in the campaign.

6. CONNECTING INTERVENTIONS TO BEHAVIORAL DETERMINANTS

The previous chapter addressed how effective 57 interventions have been, categorizing these interventions based on the intervention method they belong to. Chapter 3 has made clear that interventions concentrate on one or more behavioral determinants to aim for reducing the amount of meat consumption. In this chapter, an attempt will be made to find patterns between the effectiveness of the interventions and the behavioral determinants on which they focus. For the sake of clarification, table 3 provides an extensive overview of the relationship between the interventions and the behavioral determinants.

In order to answer the second part of the second research question ('what could be the explanation of the outcome of the intervention to reduce meat consumption?'), the interventions have been categorized based upon the behavioral determinants that they are targeting. The interface of the two theoretical pillars is that the interventions ultimately aim to bring about change in meat consumption behavior via one or more behavioral determinants. This table is based on Stoll-Kleemann and Schmidt (2017, p. 1272), who made a comparable table portraying the determinant-specific barriers to reduce meat consumption and the possible interventions that could overcome these barriers. Similar to this table, the connection between the behavioral determinants of the conceptual model in figure 1 and the interventions has been schematically set out in table 3. For instance, interventions on raising awareness of the human health impacts of meat consumption target the personal characteristics of individuals: these interventions aim to increase their nutritional knowledge, which is part of the food competences dimension.

TABLE 3: CONNECTION BETWEEN BEHAVIORAL DETERMINANTS AND INTERVENTIONS – AUTHOR'S OWN COMPILATION

BEHAVIORAL DETERMINANT	DIMENSION	INTERVENTION
<i>PERSONAL CHARACTERISTICS</i>	Food competences Environmental knowledge	<u>Related to both dimensions:</u> raising awareness; campaigns; labels; nutritional guidelines; nutritional school standards; framing the issue
<i>ATTITUDE</i>	Expected consequences on: - Health - Food experience - Food expenditures - Convenience - Personal status - Animal well-being - Environment	<u>Related to all dimensions:</u> framing of the issue Raising awareness; campaigns; labelling; nutritional guidelines Flavoring techniques; terminology - - - Raising awareness, campaigns; labelling; nutritional guidelines Raising awareness, campaigns; labelling; nutritional guidelines
<i>SOCIAL INFLUENCE</i>	Social norm Support from direct	Statutory regulation of food advertisements; nutritional guidelines; nutritional school standards; campaigns -

	environment	Instruments employed to transfer information (e.g., celebrities)
<i>SELF-EFFICACY</i>	Modelling	
	Belief of success	-
	Belief of ability to cope with barriers	Psychological instruments; tools helping to overcome the meat paradox; campaigns
<i>PRACTICE</i>		Statutory regulation of food advertisements; campaigns; nutritional guidelines; nutritional school standards; reducing portion sizes
<i>BARRIERS AND ABILITIES</i>	Time available	-
	Physical food environment & infrastructure	Reducing portion sizes; extending vegetarian/low-meat product range; labels; changing the default menu-option; placing vegetarian products on a more visible location; taxes and subsidies; nutritional standards on schools; campaigns

Source: Author, 2018.

6.1. PERSONAL CHARACTERISTICS

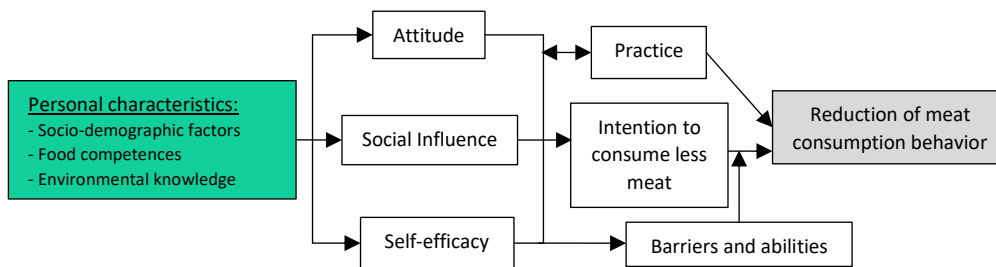
A returning pattern that can be found in the assessed literature is that differences in the effectiveness of interventions seem to be related to socio-demographic and cultural groups. There is no one-size-fits-all intervention method that affects all groups equally. Wellesley et al., for instance, emphasize the importance of socio-demographic factors on current meat consumption patterns and also on intervention effects in his country-by-country analysis: “income, age, gender – have a significant impact on the likelihood of regularly eating meat, and on desired future meat eating habits” (Wellesley et al., 2015, p. 7). Policy-makers who set up these interventions should reckon with the distinct qualities and demands of different groups.

Similarly, when setting up an intervention, inter-personal differences in gradation and approval of nutritional and environmental knowledge should be considered. Meat sceptics are more susceptible for adopting this knowledge than meat-believers and meat sceptics also require more targeted information and tools to transfer information, since cognitive dissonance can be observed in the latter group (Doyle, 2016; Vainio et al., 2018). Similarly, the frequency of meat consumption is a determining factor in how interventions work out in practice, reflecting the need for tailor-made interventions specific for flexitarians and frequent meat eaters (Bacon & Krpan, 2018; De Bakker & Dagevos, 2010; Loy et al., 2016).

6.1.1. NUTRITIONAL AND ENVIRONMENTAL KNOWLEDGE

The route from implementation of interventions targeting individuals’ food competences and environmental knowledge to eventually realizing behavior change is a lengthy one. This can also be seen in the conceptual model of figure 5.

FIGURE 5: PERSONAL CHARACTERISTICS IN THE CONCEPTUAL MODEL



Source: Author, 2018.

These interventions unfold on the left-hand side of the model, whereas behavioral shifts are made on the far right, with several other behavioral determinants being positioned in-between. Ideally, improving one’s food competences (e.g., one’s knowledge of food nutrition or the skills needed to prepare vegetarian foods) and environmental knowledge should lead to a more negative attitude towards meat products. Attitude change on its part should eventually lead to lower intentions to purchase meat and/or to new food practices. Although this route entails multiple steps, it has been travelled prosperously in other product groups harmful to health. Take cigarettes as an example. The decrease of the percentage of smokers in Western countries over the last decades was induced by a population-wide recognition of the harmful effects of smoking after influential scientific publications and information campaigns on the topic. Eventually, smoking turned from a common practice into a rather deviant behavior (Proctor, 2004).

This route is at least partially observable for meat consumption. Intervention methods focusing on increasing knowledge and awareness adequately succeed in altering people’s attitudes and intentions to consume less meat, a process that seems to be cross-cultural within the OECD context according to the findings of this research. Still, a negative attitude towards meat products because of the environmental or social impact it brings does not inevitably lead to significant short-term reductions in meat consumption levels. Most experimental studies on providing information only measure the intention to reduce one’s own meat consumption and those studies on labelling do not report on any significant differences in meat consumption levels. These findings are in line with Garnett et al. (2015), who found that “a higher level of knowledge among current buyers of healthy and sustainable food products indicates correlation but not necessarily causation: i.e., providing education will not necessarily shift other consumers towards healthier and more sustainable foods” (as mentioned in Hoek et al., 2017, p. 104).

The findings emphasize that other behavioral determinants might override the relationship between negative attitudes and actual consumption levels. Practices such as having meat as an everyday part of dinner, barriers like being hungry and a lack of time, and attaching greater value to price and taste than health and environment may have greater bearing on short-term food choices than increased knowledge of the impacts of meat consumption. Exemplary of this is the limited effect of passive interventions on schools (e.g., learning pupils about food nutrition and teaching them preparation skills) due to the presence of unhealthy food environments.

Other than these external behavioral determinants harming the effectiveness of knowledge-increasing intervention methods, it also plays a role that these methods are associated with an internally rooted intricacy when applied in practice. That is, shared information is often not well-understood by consumers to be effective for two reasons. First, awareness of the link between meat consumption and climate change is already low in Western countries, and the link is too complex to comprehend (Wellesley et al., 2015). Second, there are many unreliable

and sometimes contrasting sources of information, hampering the clarity and accessibility of correct information messages. Some of them even stem from the commercial sector and show a competing image of meat products. In this light, the message should be credible, transparent, accessible and easy-to-interpret in order for it to be conveyed successfully to the public (Wellesley et al., 2015). This applies not only to product labels and to the content of information campaigns, but also to how and by which party information is transferred to consumers who eat meat.

In addition to this, food advertisement restrictions by governmental parties could restrict the stream of data that promote meat products. Recently, the Dutch initiative “Onsje Minder” organized a petition to appeal for a nationwide ban on meat commercials. The initiators of the campaign speak of a ‘meatogene environment’, i.e., an environment in which meat products are steadily available and meat consumption is heavily promoted and normalized. The petition has been signed 16,000 times⁹ already, which is almost half of the goal of 40,000 signatures. These kinds of advertisement bans may lead to a transformation of social norms on meat consumption. Still, putting the idea into practice may yield political and social uproar, making this interference a kind of option of last resort.

The fact that these interventions have had only limited effects on the short-term does not mean that they should be disregarded altogether. The route from the initial implementation to behavior change is long, and results might come forth years after implementation. It takes long for habits to be changed, especially given the fact that meat-centered paradigms prevail (Dagevos & Voordouw, 2013). However, this does not only apply to reducing meat consumption. For instance, societal-wide shifts in smoking behavior did not happen overnight, but has been a decades-long process as well, just like the increase in meat consumption between 1960 and 2010.

Furthermore, following Wellesley et al.’s (2015) theory on the cycle of inertia, higher public awareness could result in the political space needed for governmental parties to intervene in meat consumption practices. Consumers may, for instance, justify point-of-purchase interventions such as price alterations. Thus, raising awareness, is a worthwhile intervention method to approve other interventions in the first place. However, using multiple interventions at a time is not only a legislative opportunity, but also a prerequisite for raising awareness methods to be effective: “while information campaigns have been shown to increase knowledge and intentions to perform a behavior, behavior change is typically seen only when that information is accompanied by additional efforts” (Campbell-Arvai et al., 2014, p. 455). Point-of-purchase considerations such as price and taste might have more sway on consumer behavior, which is why raising awareness alone is not enough for achieving behavior change. Two frequently mentioned methods that work complementary are financial interventions (as illustrated by Hyland et al., 2017; Reinders et al., 2017) and alterations in the food environment (as illustrated by Bernburg, 2018; De Bakker & Dagevos, 2010; Mayne et al., 2015; Orme et al., 2011).

In short, focusing on individuals’ food competences and environmental knowledge can arguably change attitudes, but does not necessarily imply lower consumption levels in the short term. Practices and barriers are overruling behavioral determinants in this regard. Combining sharing of knowledge with other intervention methods that engage on these determinants could improve the effectiveness of campaigns, labelling and nutritional or environmental guidelines that aim to increase knowledge on the impacts of meat consumption. Nonetheless, behavior change could happen after considerable time, but more research into its long-term influence is needed.

⁹ Updated on 2 July 2018

6.1.2. SOCIO-DEMOGRAPHIC FACTORS

Age, gender, income and education are socio-demographic factors of substantial leverage for meat consumption (Wellesley et al., 2015). These factors can be potential points of engagement to align intervention methods with consumer-segments. Other socio-demographic factors, such as religion and traditional food culture have not been major topics of interest in the assessed studies, although they are of direct influence on meat consumption (as exemplified in section 4.2.3). Similarly, residential situation is another socio-demographic determinant when it comes to meat consumption behavior. For instance, at least in the Netherlands and in Belgium, living in more urbanized areas is related to lower meat consumption levels and greater willingness to reduce it (Caarels et al., 2018; Vlaams Infocentrum Land- en Tuinbouw, 2018). Effectual differences of interventions on residential situation remain unnoticed in the analysis of this research, and follow-up research is needed to explore the relationship between the two factors.

Age

In Wellesley et al.'s (2015) large scale study on meat consumption patterns in 12 OECD countries, the authors conclude that age has a significant influence on meat consumption levels in all assessed countries, except for Germany. Generally, younger generations tend to have higher levels of meat intake than older generations (p. 20). It is safe to assume that interventions become more successful when they are tailored to specific age groups. For example, social media could offer a platform for information campaigns for young people, whereas it makes sense to use other media platforms for older groups. Likewise, influential opinion leaders for the youth may be less triggering to deploy for the elderly. Lastly, Stoll-Kleemann and Schmidt (2017) ought to frame the need for lower meat consumption levels on health considerations to be promising for men and older people, but not so much for women and younger people. In short, generational differences should be taken into account when considering tools to transfer information on meat consumption impacts.

Gender

Arguably, the most decisive personal characteristic for meat consumption and for the effectiveness of interventions is gender. This is also clearly illustrated by the findings of this study. Affection for animals among Australian psychology students is greater among women than among men, and when exposing the students to the meat-animal connection, attachment to meat products decreases among females but increases among men, implicating that “the key to lowering meat consumption in males is not through connection to the animal” (Dowsett et al., 2018, p. 287). Besides, Californian men have a greater belief that their daily meat consumption is important and that red meat is relatively healthy than Californian women, which implies that raising awareness is particularly important for men (Spencer & Guinard, 2018). This can also be seen from the fact that Dutch men eat on average 10,5 times meat per week, while women do so 8,2 times per week. Furthermore, while three quarters of Dutch men regard themselves as “real meat eaters”, only half of Dutch women consider themselves to be “real meat eaters”. Lastly, 44 per cent of Dutch women show willingness to consume less meat, while only one quarter of Dutch men show this willingness (Caarels et al., 2018). These gender-related differences cannot only be observed in the Netherlands: Wellesley et al. (2015) have in fact found these effects in several Western countries. Moreover, they found that women are more frequently first-movers to low-meat diets than men.

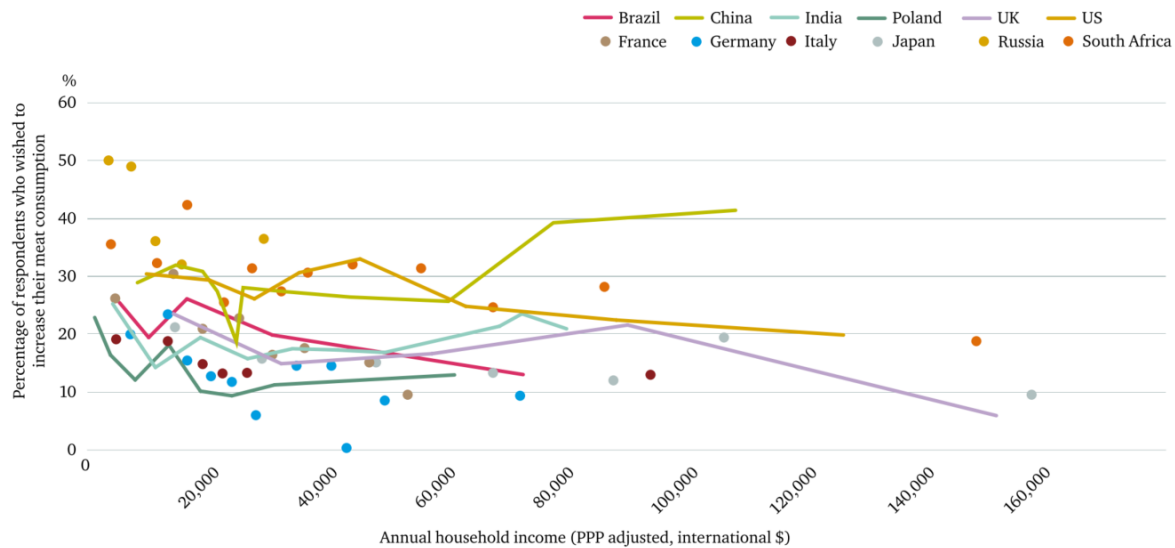
Given these differences, it seems logical for policy-makers to consider men as the main target group to fixate interventions on. However, the correlation between gender and meat consumption is in fact more complex, involving other factors as well. Wellesley et al. (2015) found that women play important roles “in preparing and providing food for the family in most countries around the world”, suggesting that it could be advantageous to focus policy strategies on women as well. For men, “action to ‘de-masculinize’ meat consumption is likely to be

important” (p. 21), implying that interventions to reduce meat consumption among men may make use of the attitude route. Based upon these findings, it can be concluded that interventions should take into account the differences in behavior and perception between males and females.

Income and education level

Before outlining the differences between different income and education level groups in terms of effectiveness of interventions, some trends regarding meat consumption and income and education level on the macro and national levels should be discussed. On the macro level, one’s income level is positively related to one’s level of meat consumption, since rises in national income generally lead to an increase in the intake of meat products. It “has become a cultural imperative throughout much of the world, having become a sign of affluence and modernity and a ‘right’ of consumer choice” (Carolan, 2011, p. unknown). Exceptional cases are Japan and India, where religion (Hindu populations in India) or the perseverance of traditional food culture (a relatively low-meat diet in Japan) suggest that the correlation between an increase of the national income and meat consumption is not straightforward (Wellesley et al., 2015, p. 21). The trend of higher meat intake to go hand in hand with a rise of the national income is observable only up to certain welfare and education levels. In that case, plateaus or greater willingness of lower meat consumption might commence due to synergies between income and education: with the desire to lower one’s meat consumption to be “driven in large part by higher levels of education and awareness of the health and environmental costs of overconsumption” (p. 18). This process can be observed in Western-European countries, South-Africa, the US and Japan (see figure 4).

FIGURE 4: GLOBAL MODEL FOR DESIRE TO INCREASE ONE’S MEAT CONSUMPTION



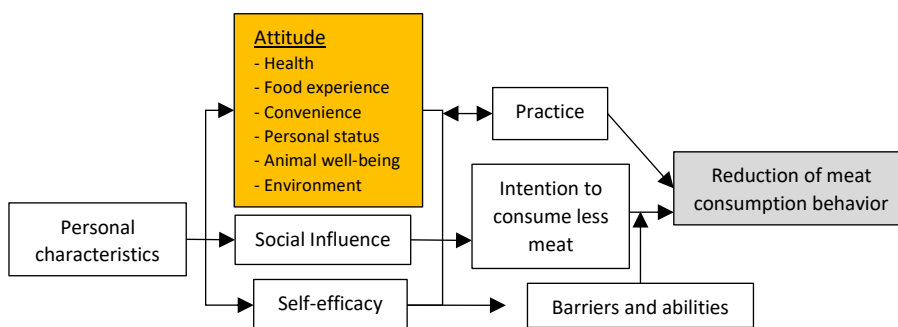
consumption work out. Nutrition labels are, for instance, often used by groups with an above-average income and with a higher education level (Garnett & Finch, 2016). The same groups also show the greatest willingness to pay for sustainable products in a Chinese willingness-to-pay study (Shuai et al., 2014). In addition, De Bakker and Dagevos (2010) and Garnett and Finch (2016) found that price is a major determinant for how much meat one consumes within groups who have little money to spend, but not so much for higher income groups. This not only raises ethical questions concerning the application of regressive taxes¹⁰, but also implies that prosperous countries are to some extent insensitive to price interventions (De Bakker & Dagevos, 2010). Hence, price interventions may not be a top of mind intervention method for policy-makers to reduce meat consumption in OECD countries, although its effect as a complementary intervention method should not be disregarded.

In conclusion and in accordance with previous research (Apostolidis & McLeay, 2016; Silva & Manzano Fischer, 2017), this research implies that one cannot make any claims about “the average” meat consumer, as the effectiveness of interventions depends on the personal characteristics of individuals. In future interventions, individual and cultural differences should be considered and should be tailored to consumer segments, instead of being targeted on the society as a whole.

6.2. ATTITUDE

The artificial dividing line between interventions acting upon the personal characteristics behavioral determinant and the attitude determinant is difficult to identify. For this research, it is assumed that the attitude cluster consists of all intervention methods that *directly* affect people’s expectations of the consequences of behavior change. By contrast, interventions belong to the personal characteristics cluster when they *indirectly* affect attitudes by increasing knowledge about the health or environmental impacts of meat consumption. A considerable difference between the two is that using communication tools is common in the attitude cluster of interventions, while the other cluster mainly focuses on sharing knowledge in general, irrespective of how that knowledge is framed or which instruments are used to transfer the knowledge.

FIGURE 6: ATTITUDE IN THE CONCEPTUAL MODEL



Source: Author, 2018.

The discussion below outlines the main findings in this study categorized according to the six dimensions of attitude (as portrayed in figure 6). As no results were found on expectations regarding convenience and personal

¹⁰ However, Thow et al. (2010), as noted in Garnett et al. (2015), see possibility in overcoming socio-economic differences raised by meat taxes by making use of both taxes and subsidies in tandem.

status, these dimensions have been omitted, endorsing that further research should be devoted to the correlation between these dimensions and people's meat consumption behavior.

When looking at the overall picture for attitude, the findings in this study provide a valuable indication that interventions targeting attitudes are more effective when they are focusing on food experience and health, as opposed to interventions that have impact on animal well-being and environmental impact. In addition, attitude is strongly interrelated with an individual's personal characteristics and culture. Therefore, it can be surmised that applying a one-size-fits-all intervention on attitudes will not be the most effective.

6.2.1. EXPECTATIONS ON FOOD EXPERIENCE

Derived from their overview studies on interventions to reduce meat consumption, Garnett et al. (2015, p. 34), Hoek et al. (2017) and Wellesley et al. (2015, p. 10) assert that taste, price and routinized behavior affect food choices of individuals in Western countries to a larger extent than less tangible considerations such as health, animal well-being and environmental impact. Since taste is of critical importance, policy-makers may benefit from adopting interventions that magnify the food experience of plant-based foods in attaining meat consumers towards diets lower in meat. This is all the more so when keeping in mind that meat substitutes are experienced as inferior to meat in terms of texture and taste (Wellesley et al., 2015).

Considering this finding, one would expect lower consumption levels for plant-based dishes. Remarkably, however, both De Keizer et al. (2012) and Lazor et al. (2010) report no difference in consumption frequencies and volumes when the default menu option containing meat is substituted for a plant-based alternative in their studies conducted at schools. This may implicate that attitude is important if consumers can choose between meat and meat substitutes, whereas when this freedom of choice is bounded, the amplitude of the attitude determinant on meat consumption behavior becomes less important. However, further research conducted outside of school contexts and in other cultural contexts is needed to substantiate this statement.

Another route to intervene in expectations on food experience is increasing the appeal of dishes low in meat by using culinary and flavoring techniques. Similarly, hybrid food products that contain both meat and meat substitutes could be an initial-step to a low-meat diet, as one does not have to give up considerably on food texture, taste and colors in this case, meaning that the food experiences of these hybrid products resemble the experience of eating meat products. Hoek et al.'s (2017) study underlines the significance of attitudes on food experience, as it shows that shifting to more sustainable food products becomes less difficult for consumers when product similarity is high. Another supportive measure to successfully ameliorate the expected food experience of meat substitutes is marketing these products in foreign languages. In Germany, this ultimately led to more favourable attitudes and intentions of buying meat substitute products. It could lead to more credibility for other non-English speaking countries as well to use English terminology for branding meat substitutes, given the non-emotional relationship that inhabitants of these countries have with the English language.

Different cultures and consumer segments require different strategies to generate changes in attitudes. Again, this demonstrates the mediating role of demographic and socio-cultural characteristics in the relationship between attitude towards food experience and consumption behavior. Hence, a major question policy-makers face is whether the path to low-meat diets is best travelled via promoting conventional meat substitute products, or via encouraging vegetarian dishes (e.g., recipes stemming from the Indian cuisine) (de Boer et al., 2017). The answer to this question is that different routes apply to different consumer segments, as "focusing on the benefits of the meat-free dish may be easier among consumers who are already familiar with the quality of plant-based dishes or who want to become more familiar with ethnically-inspired meat-free dishes" (p. 43). To wrap up, the diversity of

food cultures and individual preferences would create niche-interventions that are so far-fetched that it raises doubts about the feasibility of targeting on food experiences to change attitudes, and ultimately meat consumption behavior.

6.2.2. EXPECTED FOOD EXPENDITURES

None of the interventions assessed in this literature study focused on the *expected* consequences of expenditures on a low-meat diet. That is not surprising, since price interference on *direct* consumption has already been widely explored (see section 6.6). The difference between these two is that interventions focusing on expected food expenditures aim to affect the attitude determinant, whereas interventions focusing on price interference directly thrive for behavior change at the point-of-purchase. An example of an intervention on expected food expenditures would be showing meat consumers a price comparison of a vegetarian diet and a diet that involves meat. The current general expectation is that plant-based alternatives are more costly than meat products (Wellesley et al., 2015), which means that consumers' intentions to reduce their meat consumptions might increase when the costs of a vegetarian diet happen to be lower than or similar to the costs of a traditional diet.

6.2.3. EXPECTED CONSEQUENCES ON ANIMAL WELL-BEING

Framing the issue of meat consumption in terms of animal well-being does not seem to be a promising driver of dietary change. In most of the assessed interventions relating to this meat eaters are confronted with the connection between animal and meat product to bring about aversion of meat products in consumers. The generally small effects of these methods can be explained by the cognitive dissonance theory (Tian et al., 2016): attitudes to meat products might be altered, but not to such an extent that in practice this leads to shifts. Meat consumption and cognitive dissonance are "rationalized" (p. 280) by meat consumers, meaning that consumers simply attach more value to other attitudinal dimensions, such as convenience or taste, than to animal well-being.

Still, these methods differ in terms of how effective they are, with differences existing both depending on the link between the animal and the instruments used to share the meat product and depending on cultural differences. When this connection is presented in visual form instead of in an informative text, effectiveness might be higher, as Dowsett (2018) has found in the Australian context. Furthermore, cultures in which the meat product-animal connection is faded because slaughter has been far removed from personal lives (e.g., in most Western-European countries) could be more sensitive to change than countries in which slaughter is a more common-encountered phenomenon (Tian et al., 2016).

However, these are only minor differences which do not give policy-makers considerable opportunity to achieve behavioral change via the animal well-being route. On top of that, interventions focused on animal well-being might even work out counterproductive, as has been made clear in Rothgerber's (2014) experimental study in which omnivores were faced with texts about individuals who had become vegetarian on grounds of animal ethics. The author concludes that tension between omnivores and vegetarians has to be avoided, as exposure to vegetarians raises omnivores' defensive mechanisms to reinforce their status quo (e.g., "but aren't plants alive too?" (p. 39)). Within-group similarities such as adhering to the same diet are more important factors for meat consumption levels than exposure to contrasting groups (Rothgerber, 2014), suggesting that the social influence determinant is a more efficient aspect for interventions to focus on than attitudes towards animal well-being. After all, if policy-makers employ interventions that raise awareness for ethical animal situations in the livestock sector, the cognitive dissonance that consumers experience should not be overlooked, and information should be adjusted to meat-believers and meat sceptics.

6.2.4. EXPECTED ENVIRONMENTAL AND HEALTH-RELATED IMPACTS

Consumers are in general not aware of the link between climate change and meat consumption (Wellesley et al., 2015). Even though information campaigns may fortify public awareness, it is doubtful whether behavior change can be triggered by the environmental dimension of the attitude determinant. Not only is the link highly complex to be assimilated in interventions (e.g., in environmental labels and information campaigns), but “the received wisdom is [also] that public interest in the [environmental] issue is too low for dietary change to occur” (Wellesley et al., 2015, p. 21). When it comes to interventions to reduce meat consumption, environmental concerns that affect the common interest play a secondary role in food decisions, whereas the findings of this research unambiguously show that the expectations of more personal health consequences play a more important role (Hoek et al., 2017; Hyland et al., 2017; Wellesley et al., 2015). The importance of framing the issue of excessive meat consumption in terms of personal relevance is also reflected in Bertolotti et al.’s (2016) finding that focusing on the improvements individuals can make has greater potential for shifting behavior of Italian elderly than framing it as an obligation. Consistent with Wellesley et al. (2015), this research implies that interventions may be more successful if the meat consumption reduction scenario is framed in terms of the health benefits, as opposed to framing it in terms of the adverse environmental consequences of excessive meat consumption. Based on these grounds, it is safe to agree with De Boer et al. (2016) that “this carbon footprint approach currently is a bridge too far” (p. 28).

However, health considerations should not be a go-to reference in all interventions. As has been mentioned before, anticipating on health concerns has greater effects for some consumer groups. As could be noted from the effectiveness of nutritional labels, consumer segments involving consumers who are young, belong to lower socio-economic groups and follow unhealthy diets are insensitive for using these labels (Garnett & Finch, 2016). Additional attention for interventions on raising awareness is prerequisite to enhance mutability of this group’s attitude towards health.

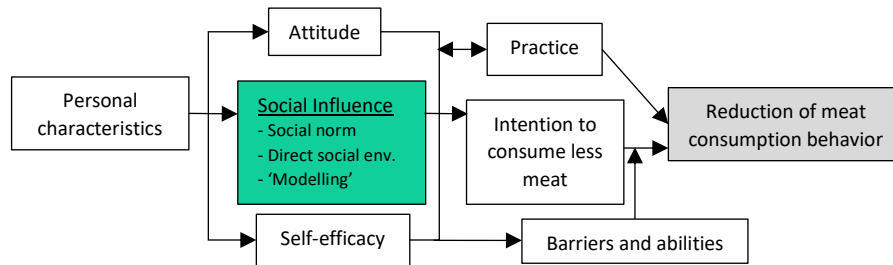
All in all, expected health consequences are a more amenable dimension of attitudes than expected consequences on the environment and animal well-being. But, as has been specified in the previous section, change in attitude and intention does not necessarily lead to lower consumption levels, as considerations at the point-of-purchase (such as price) and practice seem to be greater determinants of meat consumption behavior (De Boer et al., 2016; Hoek et al., 2017). Thus, it can be concluded that focusing on attitudes is important in increasing consumers’ willingness to change their behavior, but solely anticipating on attitude is not sufficiently persuasive for achieving societal wide substantial change.

6.3. SOCIAL INFLUENCE

Only few interventions via the PRISMA literature search seek to respond to the social influence behavioral determinant. Most prominently present on this determinant are campaigns. Campaign makers may use influential persons to promote their ideals of the campaign and to gather participants. It also happens that the initiator of the campaign is an opinion leader him- or herself, like singer-songwriter Paul McCartney who started the Meat Free Monday campaign with his siblings.

The findings on this determinant give room to suggest that social influence is a plausible determinant to focus on in order for interventions to be effective. However, tangible results of interventions on social influence are difficult to deduct, as the effects of these interventions have not been researched in isolation from other interventions used in campaigns (e.g., raising awareness).

FIGURE 7: SOCIAL INFLUENCE IN THE CONCEPTUAL MODEL



Source: Author, 2018.

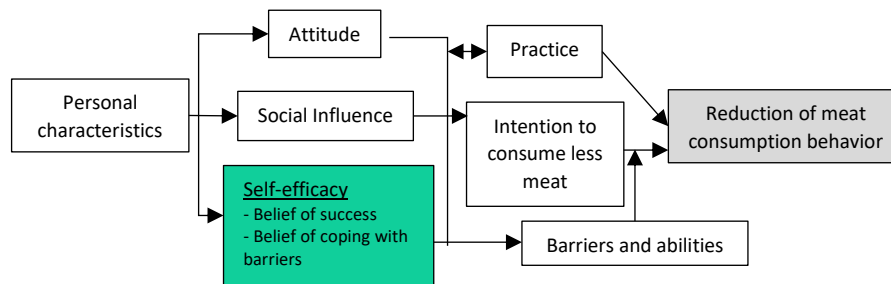
The direct social environment dimension of the social influence determinant (see figure 7) has a two-sided influence on meat consumption behavior. First, the direct social environment may facilitate adoption of a low-meat or vegetarian diet. For instance, 95 per cent of the vegetarians (19 vegetarians living in the New York state, US) interviewed by Jabs et al. (1998) admit that they are surrounded by a group that explicitly supports their dietary lifestyle. Moreover, Worsley and Skrzypiec (1998) found in a stratified sample of more than 2,000 senior secondary school students in South-Australia that female vegetarians are “more likely to describe themselves as vegetarians if their mothers or sisters were vegetarian” (p. 159). Second, Worsley et al Skrzypiec also show that a social desirability bias may negatively influence one’s intentions to purchase less meat. For one-fifth of all non-vegetarian females and 16 per cent of non-vegetarian males in their sample, pressure by others (peers, parents and/or meat eaters in the household) are the main reason for them not to become vegetarians. In the opposite direction, change within the family sphere could happen as well: De Keizer (2012) hypothesizes that providing primary-school children vegetarian lunches on Thursdays could socially influence other family members to pursue the principles of Thursday Veggieday.

In addition, ‘modelling’, a type of indirect social influence to consume less meat, has empirically proven to be successful in the Dutch context: celebrities promoting plant-based variations of dairy products have led to higher sales (although hard numbers are absent). Deelder (n.d.) stresses, however, that opinion leaders such as celebrities might persuade especially those already aware of the impacts of meat and willing to reduce their meat consumption, but not so much the meat believer group and people unaware of the impacts of eating meat. Alternatively, a modelling role can be adopted by food experts, famous chefs and/or ordinary persons or households to raise identification of the campaign among consumers (Caarels et al., 2018), although statistics on practical implications have not been reported in this analysis.

In summary, social influence could be a suitable approach for interventions to reduce meat consumption, but further analysis and experiences in practice are needed.

6.4. SELF-EFFICACY

FIGURE 8: SELF-EFFICACY IN THE CONCEPTUAL MODEL



Source: Author, 2018.

Self-efficacy has two dimensions, as can be noticed in figure 8. The first dimension is an individual's perception of whether he/she has the competence to lower his or her meat consumption and to maintain this lower level over time. The second dimension is how an individual perceives to deal with barriers withholding him/her from the intention to reduce his or her meat consumption. The strength of targeting the self-efficacy behavioral determinant is that it offers the possibility to avoid being trapped by the intention-behavior gap, a common problem that characterizes the above discussed determinants.

6.4.1. BELIEF OF SUCCESS IN LOWERING MEAT CONSUMPTION

Interventions that try to influence how individuals perceive their success in reaching and maintaining lower consumption levels of meat is an underexplored topic, making it impossible to make any pronouncements on this dimension of self-efficacy. An interesting future research subject would be to explore the effectiveness of an intervention that targets individuals' intrinsic willpower to lower their meat consumption, like an app that praises users when they succeed to not exceed the recommended weekly intake of meat. Another option, comparable with quit-smoking-apps, is motivating meat consumers by sharing with them the health benefits that they have attained by reducing his/her meat intake.

6.4.2. BELIEF OF THE ABILITY TO COPE WITH BARRIERS

The second dimension of self-efficacy relates to how an individual perceives of his ability to come to grips with the intention-behavior gap. Technologies supportive for a low-in-meat diet can be helpful in equipping an individual with the competences needed to do so. In this respect, two interventions of the tools type belong to this dimension. First, it is possible to send out text messages with daily reminders not to exceed the weekly recommendations of red meat consumption to meat consumers. Second, an MCII tool can be used that enables meat consumers to actively figure out barriers that set back their intentions of reducing meat intake and matching solutions to overcome this. Both interventions have been highly effective: the MCII tool has led to a decrease by half of the meat consumption levels for the intervention group, and the text-messaging tool has led to a decrease by half in the number of people exceeding their weekly red meat consumption recommendations compared with the pre-intervention period. These findings showcase the gain that can be achieved by targeting the self-efficacy determinant. Still, the findings must be interpreted with certain caution, as the MCII tool affects consumer groups differently: consumption shifts are greater among consumers already showing more willingness to reduce their meat intake, and both experiments have been carried out among a specific group consisting of young highly-educated sample groups.

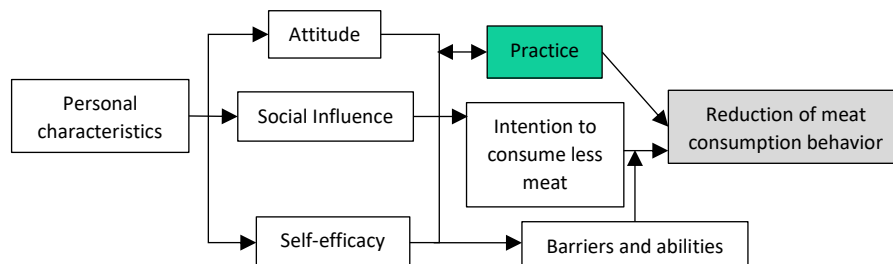
6.5. PRACTICE

Before the susceptibility of the practice determinant for behavior change will be discussed, it is useful to refer to the Social Practice Theory of Shove et al. (2012). As has been discussed in chapter 2 already, two interpretations of the concept of practices are possible, both being associated with different behavioral determinants. The practices-as-entities interpretation, which assumes that practices develop by continual reoccurrence of cultural dependent behavior, would implicate that practices are ingrained in culture. Culture on its part, is shaped and reinforced by a wide range of determinants over time. An example is the Northwestern-European tradition of dinners consisting of meat, vegetables and potatoes, which has come-into-being by various socio-economic and cultural processes during the last two centuries (De Bakker & Dagevos, 2010). The argument based on this interpretation is that practices may be altered indirectly via the route of the attitude, social influence or self-efficacy determinants.

The practices-as-performances interpretation derogates from this argument and states that practices are an external given: they are independent from other behavioral determinants, as practice is in this regard merely a concept to describe plain recurrence of behavior on a day-to-day basis without questioning its origin. Or, to put it differently, practice is a collective term for behavior patterns that a large number of individuals follow. An example of interference in these practices is changing the default-option on menus, as a way to break through a habitual pattern.

More details about the methodological and theoretical ramifications of this distinction will be given in section 7.3. For now, it is important to keep in mind that interventions acting upon the practice determinant can refer to either of the two interpretations of the concept.

FIGURE 9: PRACTICE IN THE CONCEPTUAL MODEL



Source: Author, 2018.

Meat has a customary position in traditional Western diets (Holm & Mohl, 2000). The practice of regularly eating meat originates from long-lasting cultural beliefs. As dietary patterns are deeply rooted in culture, have become routinized and are connected to multiple behavioral determinants at the same time (see figure 9), behavioral change through the practice determinant requires a decent time frame (Hoogland et al., 2005). Nevertheless, practices have more leverage in determining food choices than sustainability and health (De Boer et al., 2016; Hoek et al., 2017), making the practice determinant attainable to incentivize behavioral change. More than one of the assessed interventions are meant to touch upon the practice determinant as a route of changing behavior, via one of the two abovementioned routes. These methods are nutritional guidelines, limiting (meat) portion size, interventions in the physical food environment and campaigns.

Practices-as-performance

Overall, campaigns, interventions in the physical food environment and limiting portion size have all led to a significantly lower level of meat consumption. A conceivable explanation for these hopeful results is that all these interventions consisted of introducing a new practice: Thursday VeggieDay makes it a common practice to not eat

meat on Thursdays in Ghent, interventions in the physical food environment (when also restricting unhealthy food supplies) make healthier variants more prominently visible and reducing portion sizes of meat normalizes eating smaller amounts of meat in restaurants or canteens.

It thus seems possible to circumvent (some) barriers that pertain when focusing on the intention determinant by directly anticipating on the practice determinant. This can be clarified with an example. When using the intention route to change in behavior, a lack of time and limits to cognitive capacity could still result in suboptimal food choices (e.g., the food container being decisive for food portions) (Campbell-Arvai et al., 2014, p. 455). However, this is not the case for the practice route, as in that case someone is not individually responsible for choosing the option involving less meat. Instead, this choice has already been made for him/her. At that point larger meat portions have become the exception and this has paved way for the 'new practice' of smaller meat portion sizes.

Practices-as-entities

When change of practice is stimulated via the route of other determinants, behavior change may happen after considerable time. That is not surprising, as interventions pertaining to this interpretation of practices generally aim for long-time behavior change, which makes this kind of interference highly demanding for individuals. Nutritional guidelines are one type of intervention belonging to the practices-as-entities interpretation, as these guidelines are meant to initiate change of practice the long way around by an attempt to embed the nutritional guidelines in the (national) food culture. This method starts with raising awareness - possibly combined with other interventions at other determinants - and ultimately tries to achieve long-term behavior change. Examples of this are the Chinese government setting the target to have national meat consumption levels cut by half by 2030, as well as the Dutch 'Wheel of Five' recommending not to eat more than 500 grams of meat per week.

However, the actual utility of nutritional guidelines in achieving behavior change remains to be seen, as the analysis of this research did not include real-life evaluations on actual meat consumption levels. Of course, the success of nutritional guidelines is highly dependent on their content and the way the guidelines are communicated to the wider public (Luo, 2016). Even though tangible results of guidelines are missing, the literature study in this research allows for several theoretical recommendations to be made.

Integrating environmental considerations into dietary guidelines would be a "win-win" situation, according to the Food and Agriculture Organization of the United Nations (2016, p. 1), as both health and environmental issues can be tackled in this way. Van Dooren (2018) provides empirical evidence that adhering to recommended nutritional guidelines often goes hand in hand with lower levels of greenhouse gas emissions and usage of land and water than current average Western diets. Based on these data, it would seem logical to suggest that reconciliation of healthy and sustainable principles into guidelines is not highly complex. However, Hyland et al. (2017) argue that assimilating environmental considerations in dietary guidelines is not as straightforward. Problems arise when it comes to food products that score high on environmental impacts, while at the same time containing vital nutrients (e.g., iron and vitamin B12 in red meat). Consequently, the authors plead for food politicians to not focus on just one food group, but to incorporate a total diet in their guidelines.

Lorenz and Langen (2018) point out the opportunity to conjoin interventions in the physical food environment with nutritional guidelines. Nutritional guidelines only grasp certain food behavior aspects, but tend to overlook the complexity of the influence on the surrounding physical and social food environment. The opportunity becomes even bigger when taking into account the findings in chapter 5 that there is a close connection between the built environment and dietary patterns and that new practices of eating out-of-house are heavily on the rise. Examples of conjoining in practice would be to not only educate children about the benefits of eating more fruit and vegetables, but also to employ "government initiatives that restrict access to competitive, less healthy food items at school", or offering fruit and vegetables for free. Again, using multiple interventions simultaneously seems inevitable for achieving desired results. In fact, Fischer and Garnett (2016) emphasize that nutritional guidelines

should be connected to food policies, such as nutritional school standards and advertising restrictions.

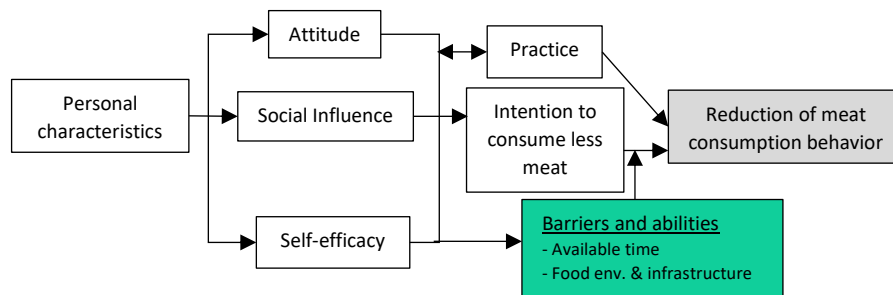
6.6. BARRIERS AND ABILITIES

It has become evident in the previous sections of chapter 6 that targeting the intention to reduce meat consumption does not automatically lead to the desired behavior change. The barriers and abilities determinant, sometimes in cooperation with the practice determinant, may have overruling power to influence behavior. Given the strength of the barriers and abilities determinant, interventions may be tuned to respond to this determinant to enhance effectiveness. Policy-makers can reduce barriers or increase people's abilities to overcome the intention-behavior gap. A wide array of interventions in this respect is at hand, ranging from price interference to nudges such as locating meat-free products on more prominent places in canteen (menus).

In the literature assessment, no interventions relating to time available on food practices have been found. This is not surprising, as available time is an external factor that cannot be intervened upon. Still, this dimension is influential on at least the relationship between nutritional or environmental knowledge and consumption (as can be seen in section 6.1), as a lack of time may impede the proper understanding of product labels. On the other hand, a lack of time can also be an important factor to *not* eat meat, as meat often requires longer preparation time than plant-based protein sources such as legumes or most meat substitutes.

This section comprises a discussion of the possibilities that the barriers and abilities determinant offers as a grasping point for interventions to reduce meat consumption.

FIGURE 10: BARRIERS AND ABILITIES IN THE CONCEPTUAL MODEL



Source: Author, 2018.

6.6.1. FOOD SUPPLY

Interventions having to do with the supply of meat and/or meat substitutes are very diverse. One of these interventions is extending the supply of meat substitutes. Although the number of assessed interventions on this topic is limited, some conclusions can be drawn from the introduction of Meatlight and Meatless products on the small-scale market in Zeeland, the Netherlands: the majority of consumers purchasing Meatless products are already vegetarian, most likely because they already show interest in the vegetarian product group. It can, thus, be inferred that extending the supply of meat substitutes would not mean successfully reaching the target group consisting of meat consumers. It might require additional motivations via other behavioral determinants to make this group shift to meat substitutes. Making meat substitutes more appealing to non-vegetarians via the social influence determinant may offer chances, although other interventions related to increasing people's knowledge on and attitudes to environmental issues or food nutrition may be suitable as well. The Meatlight products, on the other hand, have also been bought quite often by non-vegetarian consumers. This is probably related to the fact

that these products are more comparable with the food experience of meat than the Meatfree products, as mentioned in section 6.2.1.

Another way of intervening in the food supply to reduce meat consumption is by regulating what is on offer in restaurants and canteens. Based on evaluations of school canteen regulations of unhealthy foods, it is safe to assume that these types of regulations are only of great success when they are holistic. This means that solely *extending* the food supply with meat substitutes is not sufficient for achieving behavior change. Curbing the supply and attractiveness of meat should be taken into account as well. These additional interventions restrict the range of choices available to consumers, and thus require less physical and mental effort on the side of the consumer to opt for a vegetarian option.

6.6.2. POINT-OF-PURCHASE PRESENTATION

Compared to most of the other interventions, point-of-purchase actions are relatively small-scale, settling on the micro-level. A large number of interventions are related to this dimension of the barriers and abilities variable.

Huge differences can be observed between interventions focusing on the point-of-purchase presentation of meat (substitute) products in terms of how successful they are. Some methods have great potential to lower overall meat consumption. Nudging, for instance, is a useful tool for restaurants and canteens to make meat consumers choose for available low-meat or meat-free options. Presumably, nudging can lead to equally positive results in supermarkets using strategic product placement. Still, the problem remains that nudges does not target intentional behavior. Consumers may purchase meat substitutes once, but might return to old habits of buying meat if a meat substitute product does not meet their desires (i.e., when they have negative attitudes to the food experience of meat substitutes). Therefore, nudging should function as a supportive method to sustain intended behavior, in which motivation of behavioral change is a prerequisite.

Labelling on the other hand, as illustrated in section 6.1, is not very effective in making people consume less meat. Again, the extra efforts on the side of the consumer can be the explanatory factor for these differences. A lack of intention to choose the 'better' option or additional barriers such as lack of time and higher prices of meat substitutes can be decisive in consumers' final purchases. Therefore, it is logical to concur with Garnett et al.'s (2015) observation about point-of-purchase actions that several determinants have to be triggered in order to make labelling more effective: "the research finds that multiple-component interventions tend to be effective especially when some price incentive (in the form of coupons, differential pricing and so forth) is included in the mix and combined with some educational and awareness raising approaches." (p. 80).

6.6.3. PRICES OF MEAT (SUBSTITUTES)

At first sight there seems to be potential for reducing barriers to consume less meat by regulating the prices of meat or meat substitutes. After all, Wellesley et al. (2015) found that personal concerns such as health and price are greater stimuli for consumption patterns than concerns that apply to the general public (e.g., the environmental consequences of eating meat). De Bakker and Dagevos, although being skeptical about the use of financial measures to reduce meat consumption, also mention price being referred to as an "overpowering factor" in public discussions on food consumption (p. 12).

Our findings, however, implicate that solely focusing on price will not result in any major achievements. Aside from the problems regarding the practical, political and ethical feasibility of meat or environmental taxes, food choices are not made based on price only. Price is just one of many factors influencing food consumption, since food consumption is a culturally entwined process. Practices may make price interferences worthless, as being used to

eating meat on a day-to-day basis can foster consumers' willingness to pay the higher prices or can make them shift to less expensive meat types (Garnett, 2014). Thus, just as the other interventions targeting on the barriers and abilities determinant, large-scale reduction of meat consumption can only occur when more than one behavioral determinant is triggered, with at least one of the determinants preceding the intention determinant.

Thus, by and large, the assessed studies indeed show an auspicious route for reducing meat consumption via the barriers and abilities determinant. Extending the supply of meat substitutes, reducing meat portions and price interference have all yielded some effects, some more than others. Their high effectiveness can be explained by several factors. First, the barriers and abilities determinant is positioned closest to behavior and thus seems to be a more direct valuable determinant to interfere in than the determinants preceding intentions (see figure 10). Second, the barriers and abilities (as well as the practice) determinant is the determinant in which unconscious decisions are made. The unconscious state is of paramount importance for food choices, as food choices are generally unplanned and are predominantly made at the point-of-purchase (Velema et al., 2018). In addition, these interventions are not highly demanding for consumers, as the trigger of change is located at actors within the food supply chain.

However, the success of interventions aiming to narrow down the intention-behavior gap does not need to be applauded yet. Solely targeting the barriers and abilities determinant has a major inevitable flaw. That is, the interventions have some effects, but do not change individuals' mindset when it comes to *why* they should change their behavior. Put differently, the intention determinant is not set in motion. For this reason, long-term behavior change cannot be safeguarded when consumers become used to higher prices of meat, or when interventions are discontinued. All in all, these interventions should be combined with additional interventions that unfold before the intention determinant, because that would enhance consumers' intrinsic motivations to reduce meat consumption. In that sense, the barriers and abilities determinant can be instrumental as a reinforcing and supportive factor for interventions to help individuals sustain their intentions, but should not be considered a sufficient point-of-leverage itself.

7. CONCLUSIONS AND RECOMMENDATIONS

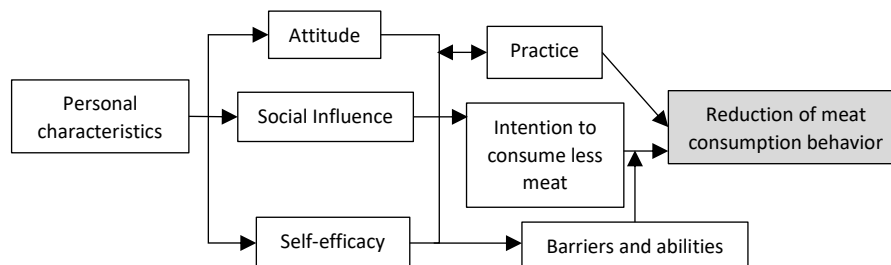
7.1. CONCLUSION

Humanity has positioned itself in a predicament with its excessive meat consumption over the last decades. The urgency to do something about it is high due to the continuously severe social and environmental costs. Governments, businesses, NGOs and individuals should thrive for a lower average meat intake and should act decisively. The interventions assessed in this research are valuable tools in realizing lower levels of meat consumption, with some interventions being more effective than others.

Chapter 5 has provided an answer to the first research question ‘What interventions that aim to reduce the consumption of meat exist in OECD countries?’ In order to get a complete picture of the range of interventions, a structured PRISMA search method has been used, during which in total 57 highly diverse interventions have been assessed. Subsequently, the effectiveness of these interventions has been reflected upon in chapter 6. Using a mix of quantitative studies, qualitative studies and systematic reviews allowed for going in considerable depth on the theoretical and practical applicability and the feasibility of interventions. This chapter also outlined patterns of association between the effectiveness of intervention methods and the behavioral determinants they act upon. The theoretical assessment clearly shows that the effectiveness of interventions differs vastly between different socio-demographic, cultural and economic groups. Gender in particular is a key intervening factor in how effective interventions are.

Another main conclusion is that interventions are more effective when the message of reducing meat consumption is framed in terms of individual health benefits. Compared to interventions conveying the message that a low-meat diet can bring about health benefits, only a limited number of effective interventions has been found that address the issue in terms of environmental matters. This is reconfirmation of Hyland’s (2017) finding that personal interest is a compelling trigger for food consumption behavior.

FIGURE 11: THE CONCEPTUAL MODEL



Source: Author, 2018.

When looking at the conceptual model (see figure 11), several more far-reaching conclusions can be drawn. First, interventions aimed at the practice determinant are by and large highly effective, as they do not require meat consumers to voluntarily change their behavior. Changing default-options or portion size reductions, for example, anticipate on the unconscious state of consumers and are valuable tools to nudge consumers to lower their meat consumption levels. Furthermore, interventions on practices can be distinguished from other interventions as they involve day-to-day (or weekly) repetitions, making practice an essential determinant for constant and long-term reduction of meat consumption levels.

However, some interventions related to the practice determinant may have biased the promising appeal of the practice determinant for realizing change, since some of them are not merely confined to the practice determinant in the model. An example of this is the Veggie Thursday campaign, which does not only involve a weekly meat free day, but also focuses on raising awareness and point-of-purchase interventions. The success of these campaigns may very well be explained by the influence the campaign has on other determinants, or by the combination of the interventions. Another reason why the dignity of the practice determinant must not discourage change via other determinants is that solely changing people's practices does not seize upon the intentions of individuals to realize the need for behavior change. When people's mindsets are attuned to consuming less meat, the acceptance and understanding of interventions on practices or barriers and abilities could increase, which might lead to long-term behavior change.

Thus, in disregard of the premise of the last research question that asks for *one* intervention to be used in the Dutch case, this research demonstrates that there is no one magical intervention method that drastically reduces people's meat consumption to a desired level. Policy-makers would benefit from having a joint set of interventions at force at the same time, responding to multiple behavioral determinants of the developed conceptual model.

Raising awareness, which is of influence on food competences and environmental knowledge, complements (but does not substitute) other intervention methods: it creates political space for interventions and has considerable effect on converting attitudes towards expected consequences on health and environment. However, long-term effectiveness on ultimate behavior requires more scientific attention.

Additionally, the evidence reviewed in this literature study shows that significant impact can be achieved by acting upon the self-efficacy and attitude determinant. The self-efficacy determinant is meaningful in helping individuals overcome the strong presence of the intention-behavior gap. Most interventions in this regard are psychological tools (e.g., the Mental Contrasting with Implementation Intentions tool) and have achieved overt intervention successes by reducing people's willingness to consume (red) meat by half in varying contexts. Interventions related to the attitude determinant, on their part, engender favorable effects on setting the desired intention, especially when they focus on the dimensions of expectations on food experience and health. What makes these tools (such as linguistic instruments to reduce disgust of meat substitutes) particularly useful is their relatively low-cost implementation in relation to the significant amplitude of their effects.

The above-mentioned consumer-demanding interventions should be accompanied by supply-side-interventions for the sake of making consumers become and remain willing to reduce their meat consumption. Most of these interventions are point-of-purchase interventions affecting the barriers and abilities determinant. However, the observable effects of these intervention methods differ. Financial measures, for instance, show limited impact and low public acceptability, while the assessed literature overwhelmingly proves that nudges are an adequate way to steer people to lower levels of meat consumption. Nudges appear to be particularly effective in the context of schools, arguably because the lunch option on offer is a default, as opposed to canteens or restaurants where consumers may have more choice options. Still, the plethora of these point-of-purchase interventions should function as stimulus to live up to set intentions on top of other interventions, as point-of-purchase interventions are generally unwanted by the public.

One concluding remark is appropriate here. In this study, it was attempted to diminish result interpretation biases caused by intra-national differences, by confining the research area to OECD countries. Still, caution is needed when translating the results of interventions to other contexts, as the effectiveness of these interventions is also shaped by country-specific contexts to at least some extent (Garnett et al., 2015, p. 6). Meat and dairy taxes, for instance, have great potential to reduce meat consumption in Sweden (Säll & Gren, 2015), while Danish

households would show only minimal change if a carbon tax would be introduced (Edjabou & Smed, 2013). An explanation for this difference could be distinct methodological decisions, but the influence of (path-dependent) contexts should always be taken into account when explaining the divergent intervention results, even considered the commonness of OECD countries. For this reason, in order for the findings in this study to be meaningful for the Dutch context, they will be re-interpreted in accordance with the Dutch (historical) context of meat consumption in the next section.

7.2. PRACTICAL RECOMMENDATIONS FOR THE NETHERLANDS NUTRITION CENTRE

In this final chapter, heads will be turned to the last research question: ‘Which of these interventions might be the most suitable to reduce meat consumption in the Dutch context when applied by the NNC?’ Based on the above conclusions, a practical recommendation for a future intervention strategy by the NNC will be given that could lead to nation-wide adherence to the NNC’s recommendation of eating a maximum of 500 grams of meat per week.

As of today, the majority of Dutch consumers (57 per cent) do not show willingness to consume less meat in the future (Caarels et al., 2018). Important reasons for this, even more for Dutch men than for Dutch women, are the fact that people identify themselves with meat and that they attach great value to the taste and nutrients of meat. Women show greater willingness to reduce meat consumption, are more often first-movers to low-meat diets than men (Wellesley et al., 2015) and are more often responsible for daily dish selections (Caarels et al., 2018). An optimal intervention strategy would be a combination of different strategies and has to be comprehensive and tailored to various socio-demographic groups. Gender, in particular, should be the guiding principle for drafting an intervention strategy. Other leading demographic and socio-cultural factors the NNC could take into account are the frequency of meat consumption, the identification with meat products and the age of people consuming meat.

Part 1: running a campaign

The proposed general scheme for the intervention strategy is a campaign, because launching a campaign creates a framework on which other intervention methods can be built as well. Besides, a campaign makes it possible to affect daily practices, on both the entity and performance side. The NNC could declare one or more days of the week as meat-free days, similar to Veggie Thursday and Meat Free Monday. The rationale behind this is threefold. First, meat-free days offer consumers an action perspective: a structure in which food consumption can be planned in advance. Second, meat-free days offer the 43 per cent of Dutch consumers already willing to reduce their meat consumption the opportunity to put their intentions into practice for at least one day of the week. That will have greater leverage on making eating low- or no-meat dishes a practice than a meat free week, due to the more frequent recurrence of the desired behavior. And third, this approach could make the campaign more widespread, as one or more meat-free days can easily be adopted by restaurants, canteens and schools as well. Participating in the campaign would in fact make a compelling case for them, since that will contribute positively to their image (as part of a business strategy of caring about public health, environmental and animal well-being issues), while they will also be likely not to experience a loss of sales (De Keyzer et al., 2012; Lazor et al., 2010).

Part 2: tools to raise awareness of the campaign

A pitchy, easy-to-remember and clear campaign title would contribute to the convincing powers of the campaign (Leenaert, 2012; Wellesley et al., 2015). The name could, for instance, imply the health benefits of a low-meat diet. An example would be ‘Donderdag Gezonder-Zonder dag’ (translation: ‘Thursday Healthier-Without Day’). Media channels that may be sought for bringing the campaign to attention throughout the Netherlands are (digital) flyers, posters at bus stops, television advertisements and YouTube videos. Moving images via television and YouTube could generate deliberation, while flyers and bus-bench advertisements spread the ideals of the campaign among

the overall public, aside from the fact that these materials are suitable for communicating the (visual) linkage between meat and its impacts on health and on the environment (Rutsaert et al., 2015; Wellesley et al., 2015).

Part 3: Intervention strategy for men

After giving a general outline of the campaign, a next step is to elaborate on what the campaign should look like. This is the point where gender differentiation comes in. The majority of Dutch consumers who state that eating meat is part of their identity are men (Caarels et al., 2018), conceivably because of the entrenchment of the meat-masculinity link in Dutch culture. Focusing on the attitudes of men towards low-meat diets and meat substitutes offers opportunities to counteract on this rationale. The expected consequences of reducing meat consumption on health seems to be the most appropriate dimension for change within the attitude determinant, because these consequences are personally relevant for consumers. It would be fruitful for the NNC to develop a genuine strategy established on contentions of the health benefits a low-meat-diet engenders, such as lower body mass weight, reduced chances of developing cancer and/or a better cardiovascular system. It would be worthwhile to frame these messages in terms of the Wheel of Five, one of the benchmarks of the NNC, considering the fact that frequent Dutch meat eaters willing to reduce their meat intake already attach great value to this tool (Caarels et al., 2018, p. 9). Even though spreading information on the impacts of meat consumption could generate only minimal effects on the short-term, circulating this information can be a strategic imperative for other interventions to be accepted by the wider public.

Another intervention recommended to be applied, also helpful in languishing the meat-masculinity link, is deploying vegetarian opinion leaders who symbolize masculinity as ambassadors for the campaign. Typical personifications in this case of modelling would be famous Dutch vegetarian male athletes or body builders. Since a younger age goes hand in hand with higher personal identification with meat (Caarels et al., 2018, p. 7), young adolescents are a relevant target group for this intervention. The pool of ambassadors to choose could, thus, be narrowed down to influential persons for young (male) meat consumers. The ambassador could adopt the following roles:

- carrying the message that a low-meat diet is beneficial in terms of health;
- making the (male) meat consumer aware that a low-meat diet is not presupposed to be low in protein or iron;
- marketing vegetarian products.

Part 4: Intervention strategy for women

As has been mentioned before, Dutch women already show greater intentions to reduce their meat consumption than men, are more often responsible for selecting daily food dishes and mention taste of meat as the number one reason to not reduce their meat consumption (Caarels et al., 2018). These gender-specific characteristics allow for setting up an intervention strategy tailored to women. The first two facts point out that an intervention at the point-of-purchase could be valuable, as food choices are made at the point-of-purchase and desired intentions have already been broadly set at this point. Combining this point-of-purchase intervention with interventions focused on attitudes on taste, could be used for targeting the group that does not have the intention to reduce meat consumption yet. A promising intervention would be to re-enact the 'Vaker Vega!' campaign, which was led by the NNC in 2017. This was a one-week campaign, in which a food truck visited prominent locations in six Dutch cities allowing people to taste vegetarian stews in order to show "how easy and delicious a low or no-meat, plant-based dish can be" (Van Dooren, 2017, p. 1). However, in this case it is recommended to slightly adjust this campaign, by making the truck stop at point-of-purchase locations, so that passersby are encouraged to instantly translate product-linking into purchases.

Part 5: Developing an app

After implementing the recommendations above, the intervention campaign should have set intentions to reduce meat consumption, both among men and women. Nonetheless, it cannot be guaranteed that intentions actually lead to (long-term) behavioral change. In this sense, the self-efficacy determinant offers a relevant point of application to tackle this. That is, the NNC could develop an app (or expand any of their existing apps) that builds upon the campaign, but also features extra tools to help persevere behavioral change. For instance, the app could include:

- information on how to store and prepare certain vegetarian foods, vegetarian recipes (just like the successful Veggie Thursday campaign presented similar information on the NNC website) and short facts on nutritional values of vegetarian dishes. The short facts can be represented in the following format: ‘Did you know that soy beans contain more grams of protein per portion than chicken meat?’¹¹ An advantage is that this information can be easily adopted from the website of the NNC. This information corresponds with a user’s food competences;
- an interactive map of vegetarian or vegan restaurants;
- a feature to let individuals keep track of daily or weekly meat consumption levels, or set certain goals that they would like to achieve. Additionally, ‘reward points’ or compliments can be given to stimulate perseverance. This would transform participation in the campaign into a challenge the individual might want to accomplish – making participation more playful and perhaps easier to maintain. The ‘Eetmeter-app’ of the NNC¹² may function as a useful template, which also makes it possible to offset app development costs.

Part 6: Point-of-purchase interventions

In order to use the abovementioned interventions to their fullest potential, it is essential to establish extra interference at places where meat (-substitute) products are sold. The NNC does not have the power to force manufacturers and retailers of meat products to reduce the portion sizes on offer or to change product prices. Still, the NNC could *encourage* manufacturers and retailers to do so. For instance, they may suggest to meat manufacturers to adapt the portion sizes of their products in accordance with the Wheel of Five recommendations, and meat retailers could be supported to endorse the meat-free day(s) in the week by offering meat substitutes on sale on one or more specific days of the week.

An additional recommendation is to convey the ideals of the campaign to Dutch schools. In contrast to schools in Belgium and the US, where schools offer lunch meals prepared for children, it is more common in the Netherlands for children to bring their own prepared lunches. This means that, although changing the default option to a vegetarian option in schools can be auspicious, this does not seem possible to do on a large scale in the Dutch context. Nevertheless, it is still possible to lower pupils’ meat intake on schools by using the program of De Gezonde Schoolkantine. It would be useful to incorporate in the program the ideal of not eating meat once or multiple times a workweek. Just like the brigade of De Gezonde Schoolkantine stimulates schools to restrict (the alluringness of) unhealthy food supply and nudges healthy foods, so too would it be an option to make eating less meat or at least have vegetarian options available a topic of attention. The great commensurability of both

¹¹ Based on the assumption of the NNC that 100 grams of chicken meat is tantamount to 135 grams of legumes.

¹²The ‘Eetmeter-app’ is a food diary tool with which individuals can keep track of their nutritional intake. This app compares their intake with the recommendations of the Wheel of Five.

programs (as a low meat diet generally entails to be healthier than conventional meat diets) would make this intervention easy to implement.

Finally, the NNC would take advantage of monitoring and evaluating the effects of the proposed intervention campaign when put in practice. Regular process and effect level evaluations may subsequently point out plausible needs for adjustments. It must be noted, however, that implementing this intervention strategy would require more investments – both in time and in money - within the sustainability department of the NNC.

7.3. REFLECTION ON THE PROPOSED INTERVENTION STRATEGY

This research project has added value for policy-makers in OECD countries who are active in the field of pro-environmental protein consumption. More specifically, this research has contributed to the existing literature on the topic of meat consumption reduction by providing new and practical insights into the effectiveness of implemented interventions that address meat consumption. In addition, it has led to the development of practical recommendations for The Netherlands Food Nutrition Centre to reduce meat consumption in the Netherlands. This section offers a reflection on the practical usefulness of these recommendations by Corné van Dooren and Frederike Mensink, who are both engaged in composing a strategy to reduce meat consumption commissioned by the NNC.

Corné van Dooren

“The recommendations made in this report are in line with the goal of the study, formulated by the NNC. The quantity and quality of the interventions found in literature was beyond my expectations as an expert. The interventions were excellently summarized in Excel sheets by Joeri. The focus on OECD countries was a good decision, because of the commonness in cultures, although we should be careful to copy interventions from neighbouring countries without doing pretesting for the Netherlands. The conceptual model is very useful for future interventions in practice. There are still knowledge gaps to conclude on the ultimate solutions to reduce the consumption of meat, but the suggestions given are useful for the short-term interventions planned by us [the NNC]. Therefore, there should be a continuous evaluation of upcoming interventions to get more insight in the consumer behaviours in this field. The mix of suggested interventions sounds reasonable and applicable in the context of the Netherlands, especially the continuation of the ‘Vaker Vega’ campaign including recipes, the use of masculine role models and implementation of a national meat-free day.”

Frederike Mensink

“Using multiple strategies for behavior change is the most effective, which is a plus in Joeri’s proposal for an overall strategy to decrease meat consumption.

Social influence is positioned as a determinant that is less important than personal factors, such as knowledge and self-efficacy, whereas insights in behavior change show that the social environment should be a priority in intervention development when it is a factor that influences a certain behavior. Especially when it comes to meat consumption, women play an important role as they are often responsible in the households for doing grocery shopping and are responsible for meal preparation. Women therefore play a crucial role in lowering meat consumption amongst men.

Aside from giving people ideas for specific actions they can execute when communicating about a meatless day, this recommendation also helps to communicate a social norm that not eating meat every day is normal and thus might help changing social norms about meat consumption. This is also important given the fact that our physical

environment, which makes it very easy to consume meat everywhere and in large portions, communicates a norm that (a lot of) meat consumption is normal.

Making providers of food more aware of the role they play in meat consumption and motivating them to change their range of meat products is necessary to change the food environment and to stimulate consumers to alter their food choices and lower their meat consumption.”

7.4. THEORETICAL AND METHODOLOGICAL IMPLICATIONS OF THE FINDINGS

This section will look back on the strengths and flaws of the theoretical and methodological foundations of this research. First, the strengths and flaws of the data collection and analysis will be discussed. After that, the next section will focus on the strengths and flaws of developing the conceptual model. Finally, the strengths and flaws of the process of refining the conceptual model will be addressed.

Data collection and analysis

The methodology of this research is bolstered by following a standard procedure of both collecting data (via the PRISMA systematic data-search method) and analyzing data (by means of an *ex ante* defined Excel sheet), as this adds to the reliability of the research and diminishes chances of bias caused by the inquirer interpreting data subjectively (Harden, 2010; Kaptchuk, 2003).

Another factor that improves the methodological strength of this research is the fact that both quantitative and qualitative evaluation literature have been included in this study. This makes it possible to take advantage of the reliability of numerical data, and at the same time enabled the inquirer to understand and interpret the findings in their political-economic and socio-cultural contexts (Harden, 2010).

Notwithstanding these methodological strengths, this research is not an all-encompassing study on all intervention methods applied in OECD countries. That would be inconceivable given the narrow time frame of six months and the limited methodological instruments at hand to acquire literature by following the snowball procedure. As a consequence, relatively few studies per country have been assessed, which is a commonly encountered problem with studies taking in an inductive research approach (Bryman, 2012). In a worst-case scenario, observed trends between implemented interventions and their effectiveness in different national contexts are not significant enough to be meaningful. However, the likelihood thereof is rather remote, given the socio-cultural and economic commonness of the countries belonging to the OECD. Future research would benefit from using more extended database search strings and/or more comprehensive snowball searches.

Developing the conceptual model

The established theoretical framework of this study revealed that socio-cultural, psychosocial and financial processes underpin food consumption behavior, proving the need for more than one theoretical approach to explain current meat consumption patterns. The developed conceptual model follows up on this statement by integrating the sociological SPT, the psychosocial ASE-model and theoretical insights from the science of economics. This multi-disciplinary model strengthens the theoretical firmness of this study.

Another key strength of this research from a theoretical point of view is its dual theoretical framework, consisting of intervention methods and behavioral determinants. The added value of this framework is its ability to identify which determinants are conducive routes for interference, making the conceptual model a viable tool for policy-makers addressing meat consumption.

Refinement of the conceptual model

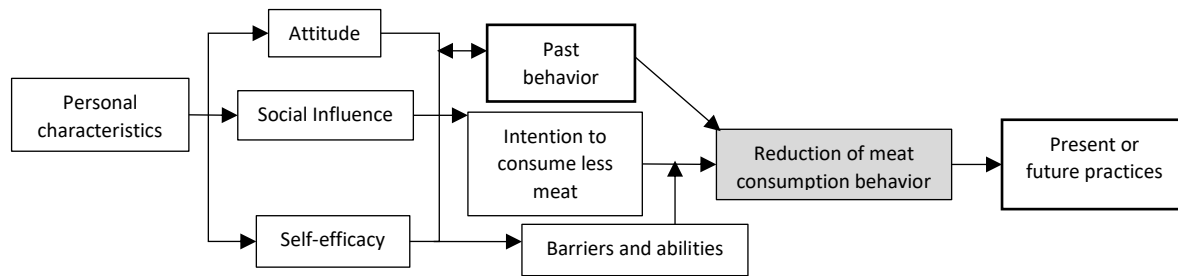
Section 2.3 demonstrated how the SPT complements the ASE-model in explaining meat consumption behavior. After that, section 2.4 built on this by conceptually aggregating the SPT into the ASE-model. However, some structural complications during the aggregation process were encountered in chapter 6, in which a connection was made between the interventions and the behavioral determinants. It turned out that interventions clearly pertain to either the entity or performance interpretations of practices, and not so much to both sides of the line. Two inherent differences between the two interpretations make it a complex matter to use both in one variable of the ASE-model:

1. The interventions on the practices-as-entities side unfold themselves in the collective field, whereas the practices-as-performance interventions refer to the behavior of individuals. Having argued that the separation line between the two interpretations is clearer than previously assumed, this inherent scope difference makes it complex to merge the two interpretations;
2. The interventions related to the practices-as-entities side aim to bring about change of practice via the indirect route of other determinants, while the interventions on practices-as-performances directly target on the practice determinant (changing routinized behavior mostly by intervening at the point-of-purchase). This difference demands for a refinement in such a way that the two interpretations have a different place in the conceptual model.

Another conceptual problem is that the position of the practice determinant in the model might not be applicable anymore, since its position does not correspond with two findings in this research. As of now, the practice determinant is connected to the determinants affecting intentions (i.e., attitude, social influence and self-efficacy) and to the behavior variable. First, this model cannot endorse our finding that practices may be altered by interventions related to the barriers and abilities determinant. This research has shown, for instance, that reducing portion sizes of meat in restaurants might normalize eating less meat, potentially leading to a new practice. It suggests a connection between practices and barriers and abilities, which is absent as of yet.

Second, the practice determinant in the conventional model *precedes* behavior to fit the rationale of the SPT that current behavior is shaped by routinized activities (i.e., past behavior). However, this position of the determinant falls short in supporting another key rationale of the SPT, i.e., that practices are the outcome of the continuous repetition of behavior. Such a statement implies that the determinant is a relevant *subsequent* to the behavior variable. Hence, refining the model by separating the practice determinant into two variables in different places in the model would be a logical step. One part of practices – that of routinized activities in the past, labeled ‘past behavior’ here – would hold the place of the traditional practice determinant. The second part of practices corresponds with the rationale that practices are the result of the repetition of behavior, here termed ‘present or future practices’ to distinguish them from ‘past behavior’. This part comes after the behavior variable, thereby resulting in the refined proposed conceptual model as shown in figure 11.

FIGURE 11: REFINED VERSION OF THE CONCEPTUAL MODEL FOR UNDERSTANDING BEHAVIOR AIMED AT A REDUCTION IN MEAT CONSUMPTION



Source: Author, 2018.

This refined model is slightly more complicated than the conventional model, since multiple time dimensions are included. The inquirer believes that it is conceptually possible to use more than one time dimension in the qualitative version of the ASE-model, because in the end the ASE-model is not restricted to one dimension *per se*. For instance, if an individual has had an unpleasant experience with eating a vegetarian burger and hence does not want to order a vegetarian option in a restaurant, multiple time dimensions play a role. That is the case because the individual's attitude to vegetarian products which has its origin in the past subsequently has a major impact on the intention at present to not chose the vegetarian option.

7.5. FUTURE RESEARCH

This study pinpoints additional fields of interest for future research to develop an even more in depth and broader understanding of interventions to reduce meat consumption:

- The interventions assessed in this research have predominantly been evaluated on the short-term at one or two moments in time. In some cases, however, changes in behavior require an adequate timeframe for the effects to be noticeable. For instance, interventions aimed at raising awareness of the impacts of meat consumption may be effective only after several years, and thus should be evaluated accordingly. A brief structural remark is that measurement of long-term change or stability is complicated. Not only is it infeasible to conduct evaluations of the long-term effects in experimental environments - as interventions are all jumbled up and external influences cannot be eliminated – but such long-term evaluations would also require far-reaching study populations. Nonetheless, it would be beneficial if future research can better point out the influence that raising awareness has on food consumption practices and long-term behavior.
- One of the most prominent findings in this research is that the effectiveness of interventions is highly dependent on the context in which they are executed, since socio-cultural, demographic and regional differences demand for tailored strategies. The current recommendations are limited to OECD countries, but it would be valuable to pursue the quest for context-specific tailored strategies in other countries as well. Of special interest are developing countries, given the fact that the topic of meat consumption reduction remains underexplored in these countries while at the same time consumption levels are rapidly rising.
- In this research, the topic of addressing meat consumption has been explored from a consumer-oriented policy approach on the level of individuals. As “public-policy interest in meat reduction, as well as support for policy measures to reduce meat consumption, are currently scarce in European countries – not to mention other parts of the world” (Dagevos & Voordouw, 2013, p. 66), it would be interesting to investigate relevant governmental strategies to address meat consumption at the national level. This becomes

especially interesting given the fact that national governments aim for lowering greenhouse gas emissions in light of the Paris agreement on climate change. Furthermore, the role of national governments is deemed important, as they can create an environment that enables behavioral change via, inter alia, enforcement and financial measures. This research is a useful start for investigating financial interventions, but research on zoning and enforcement interventions would be welcomed.

- There is a solid establishment of motivation and ambitious ideas stemming from civilians and industry parties to tackle excessive meat consumption. Documentaries such as 'Cowspiracy', 'Forks over Knives' and 'Earthlings' may have contributed to accelerate this movement over the last few years. These documentaries confront the audience with impacts of the livestock sector on human health, the planet and animal well-being, and emphasize the power consumers have in controlling this process when making their daily food choices. These documentaries do not meet the definition of an 'intervention' as such and were therefore not considered in the literature assessment. However, it would be interesting to investigate the impact these and other documentaries about the livestock sector have on current meat consumption levels.

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APPENDIX I

PUBMED DATABASE SEARCH

Part 1: Meat

"Meat"[Majr] OR animal product*[ti] OR animal-based diet[ti] OR animal-based product*[ti] OR Meat[ti] OR meats[ti] OR plant-based diet[ti] OR plant-based product*[ti] OR sustainable food[ti] OR vegetarian[ti] OR vegan[ti]

Part 2: Food intake

"Feeding Behavior/psychology"[Mesh] OR "Eating/psychology"[Mesh] OR Behavior[tiab] OR Behaviour[tiab] OR Feeding Pattern*[tiab] OR Food Habit*[tiab] OR Eating Habit*[tiab] OR Dietary Habit*[tiab] OR Diet Habit*[tiab] OR Consumption[tiab]

Part 3: Intervention

"methods" [Subheading] OR Incentive[tiab] OR Incentives[tiab] OR Initiative[tiab] OR Initiatives[tiab] OR Intervention[tiab] OR interventions[tiab] OR Measure[tiab] OR Measures[tiab] OR Strategy[tiab] OR Strategies[tiab] OR Tactic[tiab] or Tactics[tiab]

Part 4: filter from 2008 to 2018

Query:

((("Meat"[Majr] OR animal product*[ti] OR animal-based diet[ti] OR animal-based product*[ti] OR Meat[ti] OR meats[ti] OR plant-based diet[ti] OR plant-based product*[ti] OR sustainable food[ti] OR vegetarian[ti] OR vegan[ti])) AND ("Feeding Behavior/psychology"[Mesh] OR "Eating/psychology"[Mesh] OR Behavior[tiab] OR Behaviour[tiab] OR Feeding Pattern*[tiab] OR Food Habit*[tiab] OR Eating Habit*[tiab] OR Dietary Habit*[tiab] OR Diet Habit*[tiab] OR Consumption[tiab])) AND ("methods" [Subheading] OR Incentive[tiab] OR Incentives[tiab] OR Initiative[tiab] OR Initiatives[tiab] OR Intervention[tiab] OR interventions[tiab] OR Measure[tiab] OR Measures[tiab] OR Strategy[tiab] OR Strategies[tiab] OR Tactic[tiab] or Tactics[tiab])) Filters: published in the last 10 years

WEB OF SCIENCE DATABASE SEARCH

Part 1: Meat

"animal product*" OR "animal-based diet" OR "animal-based product*" OR Meat OR meats OR "plant-based diet" OR "plant-based product*" OR "sustainable food" OR vegetarian OR vegan

Part 2: Food intake

Behavior OR Behaviour OR "Feeding Pattern*" OR "Food Habit*" OR "Eating Habit*" OR "Dietary Habit*" OR "Diet Habit*" OR Consumption

Part 3: Intervention

Incentive OR Incentives OR Initiative OR Initiatives OR Intervention OR interventions OR Measure OR Measures OR Strategy OR Strategies OR Tactic or Tactics

Part 4: filter from 2008 to 2018

Query

Set	Results	
		<input type="button" value="Save History / Create Alert"/> <input type="button" value="Open Saved History"/>
# 16	537	#14 AND #5 AND #4 Refined by: PUBLICATION YEARS: (2012 OR 2013 OR 2014 OR 2008 OR 2015 OR 2009 OR 2016 OR 2010 OR 2017 OR 2011 OR 2018) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 15	774	#14 AND #5 AND #4 <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 14	40,765	TI=("animal product*" OR "animal-based diet" OR "animal-based product*" OR Meat OR meats OR "plant-based diet" OR "plant-based product*" OR "sustainable food" OR vegetarian OR vegan OR "climate friendly diet") <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 13	1	#2 NOT #12 <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 12	3	#2 AND #8 <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 11	607	#8 NOT #10 <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 10	167	#9 AND #7 AND #5 <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 9	681,632	TI=(Behavior OR Behaviour OR "Feeding Pattern*" OR "Food Habit*" OR "Eating Habit*" OR "Dietary Habit*" OR "Diet Habit*" OR Consumption) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 8	774	#7 AND #5 AND #4 <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 7	40,764	TI=("animal product*" OR "animal-based diet" OR "animal-based product*" OR Meat OR meats OR "plant-based diet" OR "plant-based product*" OR "sustainable food" OR vegetarian OR vegan) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 6	4,396	#5 AND #4 AND #3 <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 5	5,383,311	TOPIC: (Incentive OR Incentives OR Initiative OR Initiatives OR Intervention OR interventions OR Measure OR Measures OR Strategy OR Strategies OR Tactic or Tactics) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 4	3,047,650	TOPIC: (Behavior OR Behaviour OR "Feeding Pattern*" OR "Food Habit*" OR "Eating Habit*" OR "Dietary Habit*" OR "Diet Habit*" OR Consumption) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>
# 3	104,444	TOPIC: ("animal product*" OR "animal-based diet" OR "animal-based product*" OR Meat OR meats OR "plant-based diet" OR "plant-based product*" OR "sustainable food" OR vegetarian OR vegan) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI, ESCI Timespan=All years</i>

APPENDIX III

	8. Bertolotti et al. (2016)	12. Carfora et al. (2017)	13. Carfora et al. (2017)
Used theory/theories	Framing theories	Theory of Planned Behavior	Theory of Planned Behavior
Nature of research	Quantitative	Quantitative	Quantitative
Number of analyses	single study	single study	single study
Sample group	59 inhabitants of socio-recreational centres for elderly in Milan	124 Italian undergraduate students	244 Italian undergraduate students
Short explanation of intervention	The manner of how messages to reduce meat consumption are framed and communicated most effectively to elderly is questioned. Several groups have to read fictional newspaper articles on excessive meat consumption, wherein the paper focuses on either health or well-being, and the message is framed in factual (this behavior causes...) or prefactual (if you behave this way, then...) way.	Participants filled in a questionnaire on their processed meat consumption, besides a daily food diary for a week. Participants got split in two. The intervention group received daily WhatsApp messages for seven days that reminded them to not exceed the recommended processed meat consumption (50g a day), while it also reminded them to self-monitor their consumption of processed meat. The control group did not receive these messages. The SMS "application could promote the management of a specific food consumption, helping the identification of discrepancies between current and recommended levels of consumption".	Participants were split into a control and a intervention group. Both groups had to complete a daily food intake diary, but the intervention group received daily SMS messages (for seven consecutive days) that reminded them of the Italian national recommendation to eat 200 grams of red meat a week at most.
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	raising awareness; tools	tools; raising awareness	tools; raising awareness
Year of intervention	Unknown	2016	2015
Target group/population	Elderly that excessively consume meat	Young adults that consume processed meat	Young adults that consume red meat
Place of intervention (e.g. supermarket or canteen)	Irrelevant	Irrelevant	Irrelevant
Value frame (e.g. health, environment or animal wellbeing)	Health	Health and partially environment	Health and partially environment
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingcentrum or Rijksoverheid)	Inquirers	Inquirers	Inquirers
Evaluation criteria of success	Effect-level	Effect-level	Effect-level
Brief outcome of intervention(s)	"Results indicate that older adults' attitudes, intentions, and choices regarding meat consumption can be influenced by both types of appeal (health and well-being), depending on their framing. We found that messages focusing on the effects of food on well-being are more convincing when framed prefactorially ("if ... then") than factually, whereas messages focusing on the effects of meat consumption on health are more convincing when framed factually than prefactorially."	"The intervention group significantly reduced their weekly PMC compared to the control group. [...] Thus, a simple messaging intervention could be an efficient strategy to encourage young adults to change their processed meat eating habits, increasing intentions and reducing the sequential consumption. Furthermore, [...] anticipated regret significantly increased after the intervention in the messaging group. [...] Although both groups were required to self-monitor their food intake a simple message encouraging self-monitoring of PMC plus reminder of potential anticipated regret about eating PMC was sufficient to increase anticipated regret and intention, and consequentially to reduce self-reported PMC. Thus, these findings support the efficacy of a text messaging intervention that combines the reminder to engage in self-monitoring, writing a daily food diary, with the elicitation of anticipated regret simultaneously."	"A brief SMS intervention was effective in changing RMC. [...] Following initiation of the intervention, 56.6% of the participants in the control group ate above the recommended value of red meat consumption compared with 23.3% of participants in the message condition group."
Practical implications/future recommendations	"Our research shows that messages about the effects of nutrition with the elderly can effectively focus on the pursuit of well-being. Our results indicate that the content and the framing of persuasive messages should be taken in consideration jointly when designing communication campaigns. Messages focusing on the consequences of nutrition on health and on well-being can both be effective, provided that they are formulated in a way that is consistent with the different concerns evoked in recipients. Considering the growing social and economic costs of healthcare, effective communication aimed at improving the quality of nutrition can be seen as a starting point to provide a powerful and relatively inexpensive tool to improve the health and well-being of the ageing population."	"Future studies could try to differentiate it, using different way for eliciting anticipated regret such as a diverse message framework (for example, see Bertolotti et al., 2016). This may be particularly important in longer term studies where participants may be expected to habituate to the same message."	"Future research could test the effects of messages through different communication channels, such as the Internet (Caso, 2015); or using different message content, such as affective (which provide information on the emotional consequence of healthy eating) versus instrumental messages (which provide information about the physical aftermath of healthy eating; e.g. Morris et al., 2015); or emphasising health rather than wellbeing (e.g. Bertolotti et al., 2016)."
(Potential) explanation of outcome	"Why focus on well-being?": "According to a growing body of research on active or successful ageing, many people continue to attribute great value to the pursuit of a good quality of life throughout the later stages of life. [...] The data of our pilot study confirmed that when elderly individuals read a message about the potential risks deriving from excessive meat consumption, they were more likely to think about dietary change as a duty, or something they were obliged to do, showing a safety regulatory concern. Conversely, when they read a message about the effects on well-being, they were more likely to think about dietary change as a way to foster self-improvement aspirations, showing a prevalent growth regulatory concern." "Why framing prefactorially?": "suggesting that a recourse to prefactual (i.e. "if ... then") statements can increase the effectiveness of this kind of communication. [...] Our results indicate that the conditionality and intentionality (Bagozzi et al., 2004; Stadler et al., 2009, 2010) implied by a prefactual statement is consistent with a growth/well-being regulatory concern, which is associated with the desire to actively improve one's present condition. Conversely, the prefactual frame is less consistent with the safety/health concern, which is associated with the desire to avoid and prevent undesirable outcomes."	"This strategy helps young adults to control any discrepancies between their current behaviours and intentions and on targeting anticipated regret - confirming that it could drive intention and behaviour change"	"The findings that a messaging intervention increases healthy-eating identity and decreases meat-eating identity is coherent with the literature, where the nutritional and related health outcomes of food appeared as more relevant for meat consumption if meat identification decreases"
Variable of conceptual model (max. 3)	Attitude	Barriers and abilities	Barriers and abilities
Meat group	Combination	Processed-meat	Red meat
Note/comment	-	-	-

	24. Geipel et al. (2018)	28. Vainio et al. (2018) - chapter 1.2	29. Regan et al. (2014)
Used theory/theories	The underlying theory for this study is that by describing products that arouse negative feelings in a foreign language, this disgust can be languished.	Framing theories	Theories about communicating conflicting information
Nature of research	Quantitative	Mixed	Quantitative
Number of analyses	single study	meta-analysis	single study
Sample group	4 experiments: 161 German participants; 212 Italian students; 141 German social media volunteers; 201 Dutch students	Several sample groups	6439 citizens between 18 and 75 years old of eight European countries
Short explanation of intervention	Experiment 1: An online survey in which participants received a description of artificial meat, either in their native or English language, and were questioned whether they would consume the product. Experiment 2: A questionnaire that asks: "would you be willing to drink certified-safe recycled water?". The control group received an Italian description of recycled water, while the intervention group received the English version. Experiment 3 had the same format, but was about eating a mealworm cookie. In the fourth experiment students were asked for their thirstiness for water. They were given a glass of water, which was told was recycled water either in Dutch or English.	Several studies that focus on the manner of how environmental- and health-related messages that focus on reducing meat consumption are framed. Focus can be on health, environment or both.	This study wonders how consumers react to conflicting messages about the benefits and risks that are associated with red meat intake. The influence of a third-party communicator (e.g. website/paper) on sharing this information is also assessed. Participants were divided alongside two axes: messages that are confirmatory vs. conflicting messages and low trust vs. high trust third-party communicators. Respondents filled-in Likert scales to express the extent to which they believed the information was "accurate, believable and credible".
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	tools	tools; raising awareness	tools; raising awareness
Year of intervention	Unknown	Studies are done between 2011 and 2017	2012
Target group/population	Native speakers of several countries	Non vegetarian/vegan consumers	food consumers from eight European countries
Place of intervention (e.g. supermarket or canteen)	Places where recycled water, artificial meat, and insect-based foods are on offer	Irrelevant	Irrelevant
Value frame (e.g. health, environment or animal wellbeing)	Environment	Health and environment	Health
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Inquirers	Inquirers	Inquirers
Evaluation criteria of success	Effect-level	Effect-level	Effect-level
Brief outcome of intervention(s)	"The present research shows that describing aversive but sustainable products in a foreign language increases intended and actual consumption by attenuating the disgust these products trigger in the native language. These findings underscore the interconnectedness between language, thought and behaviour. A verbal description that signals avoidance in the native language indicates a lesser threat in a foreign language. Our results confirm and extend those of previous studies showing that foreign language can modify judgment and choice. They add that it can influence intention as well as behaviour, and, importantly, attenuate barriers to sustainability."	"A public health focus is potentially a more effective tool for strengthening climate mitigation support than the traditional environmental focus (Myers et al., 2012; Nisbet, 2009). [...] Perhaps for the same reason framing red meat consumption as a climate issue has been found to be more challenging than framing it as a health issue. For example, framing red meat consumption as a climate issue was ineffective even among those Dutch consumers who were concerned by climate change (de Boer et al., 2016). Similarly, a German study found that reading newspaper articles focusing on animal welfare or health effects of meat had stronger effects on intentions to reduce meat consumption than the article focusing on the climate effects (Cords, Nitzko, & Spiller, 2014). [...] Framing has also been found to affect attitudes about meat consumption depending on individuals' values (Graham & Abrahams, 2017). Thus different people may find different frames appealing, and it has been suggested that multiple frames may lead to a wider acceptance than a single frame (de Boer et al., 2013). It has also been suggested that the avoidance of certain words may be an effective strategy among some groups, such as "climate change" among the climate sceptics".	"New information emphasising the benefits of red meat and perceived to contradict older risk messages led to judgments that the original risk message was less credible. New information communicated by a more trusted third-party was perceived as more credible no matter whether the information it provided was in line with, or contradicted the original information. These effects were not subject to cultural variation." [Explanation of the above statement follows below]: "We found that credibility in an original risk message on red meat was lowered when followed by a newer conflicting message that emphasised the benefits of red meat." [...] credibility in the new message was lower when a low-trust third party disseminated the message compared to a highly-trusted third-party" [...] we observed a number of noteworthy main effects at the level of culture: those participants from a culture scoring moderate in UA (Germany and the Netherlands) had less credibility in the presented information, while those participants from a culture scoring high in UA (Spain and Italy) tended to have more trust in the official communicator. This indicates that culture has an important role to play in how different Europeans may appraise risk information at amore general level."
Practical implications/future recommendations	"The present intervention is actionable because most people live in multilingual societies where foreign language use is commonplace. For less proficient foreign language users or monolinguals, the intervention could instead target product labelling."	None	"Principles of effective risk communication stress that where true scientific uncertainty exists about a risk, this should be actively acknowledged and communicated to the public in a manner that empathises with their confusion" [...] "This is a particularly relevant point for official communicators to consider in the online information age where official messages, remarks, and quotes can be easily sourced and referenced by third-party communicators. By monitoring online media, particularly social media which can be synonymous with anonymity, and thus, reduced trust (Rutsaert et al., 2013), official bodies can become aware of where and how their information is being further disseminated and used." [...] The experimental factors' impacts on credibility in the messages were not subject to cultural variation. At one level, this provides support for risk communication strategies operated by trans-European organisations such as the European Food Safety Authority (EFSA) or DG Sanco (Houghton et al., 2006), who can anticipate that EU consumers may respond to conflicting risk and benefit messages on a rather uniform basis. However, other research has cautioned the adoption of pan-EU risk communication policies, given that cross-cultural variations likely play some role in how consumers will appraise management and communication efforts, and thus, local institutions may be better positioned to communicate in a way that acknowledges values in local cultures" [...] It is evident that conflicting information perceived by consumers to exist in the food and nutrition communication domain has the potential to cause appraisals which could be detrimental for the goals of official communicators. For example, heuristics (such as the temporal order
(Potential) explanation of outcome	What drives the reduced emotionality of a foreign language? According to the emotional contexts of learning hypothesis, a language gains emotionality by virtue of being learned and used in emotional contexts. A foreign language lacks emotionality because it is used in non-emotional contexts such as classrooms. The assumption is that experiences and associated emotions are stored together with the linguistic context in which they occur, and are thus more easily accessed when the same language is used at retrieval".	"Many individuals are more familiar with health issues and find them more personally relevant than environmental issues."	"It can be considered that judgements of the conflicting information may have been driven by a heuristic that the most recent information is the most accurate information. This has been referred to as a temporal order effect, whereby individuals place more weight on more recently provided information." [...] "A possible explanation is a gate-keeping effect whereby the third-party communicators were perceived to have been active in developing, selecting, or interpreting the official message".
Variable of conceptual model (max. 3)	Attitude	Attitude; personal characteristics	Personal characteristics
Meat group	Artificial and/or insect-based meat	Combination	Red meat
Note/comment	There is chosen for the variable of attitude, since the intervention of changing the language in which the product is described aims to transform the emotional attitudes towards the product that is disgusted, which falls under the dimension of food experience.	-	-

	36. Loy et al. (2016)	38. Rutsaert et al. (2013)	47. Houtenbrink, Y. (2017)
Used theory/theories	MCI	The heuristic-systematic and risk information seeking and processing (RISP) models on deliberation	Theories on narratives
Nature of research	Quantitative	Mixed	Mixed
Number of analyses	single study	single study	single study
Sample group	60 non-vegetarian students of a German university	55 frequent red meat-eaters from Belgium, 50 from Portugal and 45 from the UK	154 Dutch participants who registered via social media
Short explanation of intervention	The self-regulation strategy of mental contrasting with implementation intentions (MCI) was applied to an intervention group. That means that respondents from this group had to imagine a behavior that they desire, the possible barriers for that behavior and the manners to overcome such a barrier (e.g. "If I want to prepare a vegetarian meal, but do not know how to prepare it, I will look up for vegetarian recipes"). The other group did not make use of this strategy. Both groups, however, received information on the environmental consequences of meat consumption. A food diary during the research and a questionnaire regarding the intentions of eating meat before and (1 week and 4 weeks) after the intervention were completed.	Participants were presented information (ranging from definition of red meat to the benefits and risks but also nutritional values) about red meat consumption. The VIZZATA program was used to perceive how respondents deliberate on this information that is presented online. Deliberation was measured "as the participants' engagement (comments left, time spent on deliberation activity and questions asked) with the study material presented to them". Information was presented in form of YouTube videos, news articles and other media forms. After the information got shown, the respondents were for instance asked to name up to three risks and benefits of eating red meat to measure the effectiveness of various information contents and instruments. This study should give "insight in how consumers engage in online deliberation when provided with information about the risks and benefits of red meat".	This experiment aims to measure the effectiveness of identification ('identifying oneself with the person in the story') and transportation ('get drawn into a story') of narratives on the attitude of participants to consuming less meat. Hypothesized is that identification will be higher when the story is told in the 'I-perspective' as opposed to the 'he/she-perspective'. Furthermore, telling the story in chronological order shall in theory increase the transportation of the story to the receiver. When the story starts with a conclusion, it is hypothesized that transportation will be less. The participants got split over 4 groups (either I or he/she and either chronological or non-chronological) and one control group. The participants all read a version of a story told by Rutger Bregman (de Correspondent) that got adjusted according to which group it focuses on. Lastly, the participants had to fill in questions (Likert scales answers) on their attitude towards reduction of meat consumption - both before and after the experiment.
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	tools	tools; raising awareness	tools; raising awareness
Year of intervention	Unknown	2012	2017
Target group/population	Meat consumers	Frequent red meat consumers (more than once a week)	Dutch meat consumers
Place of intervention (e.g. supermarket or canteen)	Irrelevant	Irrelevant	Irrelevant
Value frame (e.g. health, environment or animal wellbeing)	Environment	Health and environment	Environment
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Inquirers	Inquirers	Inquirer
Evaluation criteria of success	Effect-level and process-level	Effect-level	Effect-level
Brief outcome of intervention(s)	"We observed that the self-regulation intervention strategy of MCI translated participants' intentions to reduce meat intake into actual behavior change. Participants' intentions of reducing their meat consumption in the MCI condition were more predictive of their actual reduction than those in the information only control condition. This result supports our hypothesis that MCI narrows the intention-behavior gap. Participants supported with MCI reduced their meat consumption in correspondence with their prior intentions already in the 1st week after the intervention and sustained the intention-consistent consumption level 4 weeks later." [...] In addition, our study shows that the responsiveness to the strength of the goal intentions reported for the II technique (i.e., only strong goal intentions benefit from making if-then plans; Sheeran et al., 2005) is also valid for MCI as a combined intervention. As our study comprised participants whose strength of intention was moderate to strong (i.e., 61.7% of participants reported a strength of intention > 4.00 on our scale ranging from 1 to 7) as well as participants whose strength of intention was rather weak (i.e., 38.3% < 4.00), we were able to identify whether a minimum strength of intention was necessary for MCI to reduce meat intake more than information only control instructions. We observed that MCI participants who expressed a moderate or strong intention reduced their meat consumption more than participants in the control condition, whereas those who reported a weak intention did not." [...] "MCI empowered individuals with moderate and strong intentions to reduce their meat consumption to translate their intention into behavior."	"The results indicate that deliberative activity can be assessed as an individual and behavioral measure that—at least, for the case of red meat—varies among individuals and associates with the level of education and having a responsibility as a parent. 1. The higher educated people are, the more able they are to engage with complex communications, such as information presenting both the risks and benefits of red meat. 2. The presence of children in the household led to leaving more comments. 3. The findings also suggest that, besides content, the presentation format of information influences deliberative activity. The content testers including a news article and YouTube video, resulted in twice as much comments compared to standard verbal content testers. 4. Despite a positive correlation between personal relevance (or perceived importance of red meat in the diet) and deliberation, this construct had no significant impact in the structural equations model (H1 not supported), which suggests that people may engage in deliberative activity irrespective of their level of personal involvement with the issue at hand. 5. If people feel knowledgeable about the risks and benefits of red meat, they may either refrain from further deliberation or they may still enjoy engaging with additional stimulus material by asking questions, leaving comments or clicking glossary terms, e.g. out of curiosity or to confirm their own knowledge."	"[Translated from Dutch] "It can be concluded that narratives are not a more effective method on steering consumers towards the direction of eating less meat than informative texts." Furthermore, identification and transportation of narratives do not individually influence the attitude towards meat eaters. This is in contrast to the health-sciences, where narratives are more effective in steering people towards the right direction (of behaving healthy). Lastly, narratives do only significantly contribute to a more open attitude towards being a vegetarian, but not to not eating meat one day of the week."
Practical implications/future recommendations	"the present study suggests that people who engage in the self-regulation strategy of MCI change their behavior in the service of solving societal problems. Regarding the challenge to consume more sustainably, MCI helped individuals who were motivated to reduce their meat intake to realize an actual behavior change. We thus showed that MCI aligns behavior change to individuals' respective intentions and narrows the intention-behavior gap."	1. "The implication is that food communicators should tailor their messages so as to reach those groups of consumers who are less able to navigate around the complex aspects of food-related risks and benefit. [...] information recall can serve as a useful cognitive construct against which to locate the deliberation measure." [...] In general: Although the integration of social media in public or private communication strategies might worry some food policy makers and communicators, engaging consumers into a dialogue, whether online or offline, can lead to better informed and more critically thinking consumers."	"[Translated from Dutch] "The most important implication of this research is [...] that both narratives and informative texts could be used to influence meat consumption. [...] Narratives appear to be especially effective in convincing people in becoming vegetarian [but not really in convincing them to not eat meat one day in the week]."
(Potential) explanation of outcome	None	1. "This may be the result of being better 'equipped' and more skilled to deliberate around the complexity of an issue, and/or of being more familiar with such situations as a result of more frequent exposure to complex information. 2. This suggests parents may attend more to the complex aspects of food, which is possibly driven by their protective role and concern about providing adequate nutrition and wholesome food to their children. 3. This may be due to content, but also to the higher level of experimental realism as the article and video content testers were visibly copied from an original and professional source. Material presented in a well-recognized and typical media format such as a news page or YouTube video may seem more credible, may be more engaging, and may stimulate more active deliberation from participants."	"[translated from Dutch] "A possible explanation for the fact that narratives are more effective in influencing behavior in the health communication domain as compared to the environment domain, is that the subject of meat consumption could potentially call up more resistance at the receivers. Besides, within the health communication domain the consequences often directly influence the receiver itself [as is not the case with environmental consequences]. [...] Another possible explanation for not finding the expected results with regard to influencing attitude is that people could regard it as too big of a thing to give up on eating meat. One can expect that meat consumption behavior has become an habit. Habits are difficult to change. Besides, people could use a strategy of blocking the information that they do not want to receive [cognitive dissonance theory]".
Variable of conceptual model (max. 3)	Self-efficacy; personal characteristics	Personal characteristics	Personal characteristics; attitude
Meat group	Combination	Red meat	Combination
Note/comment	-	-	A lot of the participants (83,8%) are well-educated, which will have consequences for interpretation of results.

	56. Watson (2018)	57. Doyle (2016)	14. Dowsett et al. (2018)
Used theory/theories	None	None	Psychological theories on the meat paradox
Nature of research	Quantitative	Qualitative	Mixed
Number of analyses	single study	single study	single study
Sample group	Not reported, although the sample is representative for the American consumer population, as findings are generalizable to the national level.	None	460 participants constituting of Australian undergraduate psychology students and (some of) their social connections
Short explanation of intervention	Not reported, although the research outcomes resembles a quantitative methodology and a broad representative sample of the American consumer population.	Vegan celebrities as role models making "the ethical practice of veganism more accessible"	"How people relate to, and resolve, the issue of loving animals and eating meat is a contradiction which has been termed the 'meat paradox'." Participants were split into two groups who were asked to fill in a survey before and after the intervention about their attachment to meat and attitude towards animals. One group (meat condition group) received nutritional information about lamb meat, while the second group (meat-animal) got assigned information about "animals' intelligence and personality, and details about the meat production process, to induce cognitive dissonance and the negative affective state associated with it. [...]"
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	tools	tools; raising awareness	raising awareness
Year of intervention	Unknown	2016	Unknown
Target group/population	American consumer population	Those meat consumers watching mainstream media	Meat-eaters
Place of intervention (e.g. supermarket or canteen)	Irrelevant	Irrelevant	Irrelevant
Value frame (e.g. health, environment or animal wellbeing)	Irrelevant	Ethics/animal wellbeing and environment	Animal well-being and partially health
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingcentrum or Rijksoverheid)	Inquirers	Vegan celebrities	Inquirers
Evaluation criteria of success	Process-level	Process-level	Effect-level
Brief outcome of intervention(s)	[Translated from Dutch]: "83 percent of the American consumers prefer hearing '100% plant-based' as compared to 'vegan', as the latter sounds too restricting and negative."	"veganism is figured as a diet and lifestyle that foregrounds an ethics of care, compassion, kindness and emotion – about and for humans, animals and environment – consistent with ethical veganism. Yet these ethics are reworked through the commodity logic of celebrity culture to make it more marketable and thus consumable as a set of ideas and gendered lifestyle practices, where the individual choice is to be a healthy, happy and kind self." [...] "Celebrities play key roles in the cultural politics of food and ethical consumption, helping articulate and define the types of (ethical) lifestyles that we should live. Celebrities who educate about (their) veganism contribute toward, and capitalize upon, two specific areas of "expertise" and concern: an increasing celebrity involvement in food campaigning (dominated by celebrity chefs) that draws attention to unethical and unsustainable food practices (such as battery egg production); and the mainstreaming of diverse forms of ethical consumption, such as fair trade, local produce, consumer boycotts and environmentally "friendly" products" [...] "The tensions between ethical veganism as an intervention at the point of consumption within the production of exploitative human/animal/environmental relations (Plumwood, 2002), and the focus upon an individualized lifestyle politics through which celebrities maintain their	"In this research we found no significant difference in participants' attitudes towards animals as a result of the experimental manipulations." [...] "The experimental manipulation was found to have a large effect, and although negative affect significantly increased in the meat-animal condition, attachment to meat and attitudes towards animals did not significantly differ between the two conditions. [...] This study revealed two interaction effects. Firstly, meat attachment differed according to gender, decreasing in females and increasing in males when exposed to the meat-animal condition; secondly, while male affect did not vary between conditions, female affect increased significantly in the meat-animal condition. When considering post-affect independently, participants exposed to the meat-animal connection experienced significantly increased negative affect. [...] This study found that women experienced significantly greater negative affect both before and after the experiment." [...] "In the current study, the experimental manipulation was found not to have a significant effect on meat attachment, indicating that attitudes towards meat may be more entrenched than the transient nature of affect [...] - our relationship with food consumption incorporates deep-rooted habits and behaviours."
Practical implications/future recommendations	[Translated from Dutch] "By performing another communication strategy, food can be considered as more tasteful by the consumer" [...] "It is recommended for brands and producers of plant-based meat substitutes to brand their products as 'plant-based', instead of focusing the communication on the concept on 'vegan'." [...] "By changing this concept, producers can sell more of the products, as this change infers 'better for you', instead of 'better voor the world'."	None	"For those who wish to promote reduction of meat consumption and associated values such as increased attention to animal welfare, they also highlight the importance of gender: informing people of the consequences of their actions may increase dissonance in females and lead to behaviour change; however the key to lowering meat consumption in males is not through connection to the animal."
(Potential) explanation of outcome	[Translated from Dutch] "[American] consumers associate veganism with a restrictive lifestyle, in which the focus is on animal well-being or the environment, with a strong engagement. This relationship gives a negative value to non-vegans: it is about <u>not</u> doing something - it is a altruistic lifestyle. 100% plant-based does not share this connotation: plant-based products are experienced as healthier and more tasteful - therefore creating a more positive vibe with the concept. This concept is about making food choices, <u>not</u> restricting them".	None	"Explanation for this difference [in gender] in pre-affect is perhaps due to making mention of meat in research recruitment materials, as reference to red meat has been shown to trigger discomfort in females. [...] Rothgerber (2013) found that women use dissociation more than men to resolve the meat paradox, and it seems logical to argue that they would experience more negative affect when they are unable to disconnect the meat from the animal."
Variable of conceptual model (max. 3)	Attitude; barriers and abilities	Social influence; Attitude	Personal characteristics; attitude; self-efficacy
Meat group	Combination	Combination	Lamb
Note/comment	-	-	-

	23. Gaspar et al. (2016)	37. Rotherber (2014)	42. Tian et al. (2016a)
Used theory/theories	Cognitive dissonance theory	Dissonance theory; theory of moral disengagement; techniques of neutralization	Psychological theories on cognitive dissonance
Nature of research	Quantitative	Quantitative	Quantitative
Number of analyses	single study	single study	single study
Sample group	A quota sample of 174 red meat consumers from the UK, Belgium and Portugal	Several sample groups	520 participants (243 French and 277 Chinese) meat-eating participants
Short explanation of intervention	According to the cognitive dissonance theory, people tend to avoid information that is psychosocially uncomfortable for them. This may problematize a successful communication of information. "To address this, we presented information on red meat risks to red meat consumers [via seven internet pages that had to be read]. To explore information exposure effects, attitudes toward red meat and perceived knowledge of red meat risks were measured before, immediately after, and two weeks after exposure."	5 experiments were completed. 1. Minimal exposure to a vegetarian (showing a brief text about a vegetarian person) and its effect "on the specific dissonance-reducing strategy of denying animal mind". Respondents had to fill in their thoughts about human-animal emotional similarity. 2. "Participants were presented with information about a strict vegetarian or about an imposter (someone claiming to be vegetarian who yet ate meat and fish regularly). [...] Because vegetarian imposters are less likely to endorse the vegetarian message, they are less likely to make meat eaters feel defensive about their behavior and less likely to activate dissonance in them." 3. "The context was manipulated so that it clearly contained two authentic vegetarians: the first one described as freely choosing to become a vegetarian and the second described as being forced to adopt vegetarianism because of food allergies [...]; their behavior may not reflect their dispositions or beliefs." 4. "Study 4 kept the dietary description of the vegetarian targets constant but manipulated how consistently they promoted animal welfare outside of diet, thus indirectly varying how easy it would be to attack the vegetarian. It was hypothesized that an inconsistent vegetarian would be easier to attack and that such attacks would enable meat eaters to avoid processing their own potentially dissonant state." 5. Threat caused by vegetarians was made salient for some participants who were asked to anticipate moral reproach from vegetarians. Following judgments about how vegetarians would evaluate them personally and as a group, those in the treatment condition reported on their emotional state and then made judgments of human-animal emotional similarity (see study	Study 1 (meat production): participants filled in a questionnaire via social media. They were separated over 4 different groups who all received a form of dissonance manipulation. 1st group: shown a photo of a cow with text that the cow will be sent to the abattoir the day after. 2nd group: less stronger connection between meat and the animal by stating the cow will be sent to another pasture tomorrow. 3rd group: got to see a diagram of a cow that resembles the names of beef of varying body parts. The control group had no experimental manipulation. Secondly, the respondents completed a questionnaire that questioned their willingness of eating meat and the mind perception of cows.
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	raising awareness	tools; raising awareness	tools; raising awareness
Year of intervention	Unknown	Unknown	Unknown
Target group/population	Red meat consumers in various countries	Meat-eaters exposed to vegetarians	French and Chinese populations
Place of intervention (e.g. supermarket or canteen)	Places where red meat is consumed	Irrelevant	Irrelevant
Value frame (e.g. health, environment or animal wellbeing)	Health and environment	Animal well-being	Animal well-being
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksvoedseloverheid)	Inquirers	Inquirers	Inquirers
Evaluation criteria of success	Effect-level	Effect-level	Effect-level
Brief outcome of intervention(s)	"Faced with exposure to the information that otherwise would be avoided, the participant's information avoidance related to a decrease in the systematic processing of information. Despite this latter result, when we differentiated between individuals that were low and high in information avoidance, we observed that both groups decreased their attitudes toward red meat and increased their perceived knowledge of red meat risks, a change that was not predicted for avoiders. In addition, such changes were maintained in the two-week follow-up period." [...] "Information avoidance was negatively related to systematic processing of information. Nonetheless, individuals that were high in avoidance of red meat risks changed their attitudes and perceived knowledge following exposure, similarly to individuals that were low in avoidance. This result was unexpected and is quite challenging." [...] "In this case, high avoiders of red meat risks information would deliberately aim to suppress the thoughts about the red meat risks information they were provided. Ironically, the use of this strategy may automatically increase the accessibility of red meat risks information and, therefore, relate to a less favorable attitude toward red meat and to an increase in the perceived knowledge of red meat risks."	"Across the five studies, meat eaters attempted to handle reminders that they consumed animals with a variety of mechanisms ranging from denying animals the capacity for pain, to denying their emotional and cognitive states, to endorsing pro-meat justifications, to reducing perceived choice in eating meat, and to the more apologetic underreporting of how much meat they consume. These effects were initiated by relatively minor manipulations including simply stating that an individual followed a vegetarian diet. Moreover, vegetarians did not advocate for their diet or do anything to overtly criticize omnivores. While perceived moral superiority in vegetarians by meat eaters is correlated with negative evaluations (Minson & Monin, 2012), it is difficult to imagine the vegetarian targets presented here as seeming to be morally superior." [...] "Studies 2-4 demonstrate that meat eaters will attend to characteristics of vegetarians that may mitigate the threat. So, while vegetarians are generally threatening, they are not all equal in their likelihood of triggering dissonance. Whenever possible, meat eaters may focus on derogating vegetarians to minimize dissonance, thus eliminating the need to endorse one of the other dissonance reducing strategies."	This study "provides support for the hypothesis that omnivores would reduce their willingness to eat meat in order to resolve cognitive dissonance due to experience of the meat paradox. Participants in the abattoir condition reported less willingness to eat beef than those in the meat condition. It seems that the suffering of animals in the slaughtering process emphasized by the abattoir condition reduced participants' willingness to eat beef. This confirms that associating meat to a live animal that will be slaughtered (as opposed to a diagram of the body of a food animal with specific names for cuts of meat) can influence people's desire to eat meat in the future."
Practical implications/future recommendations	"Risk communications may change the evaluation of the risk object." [...] "It was clear that avoidance motivations refrained individuals from seeking risk information. Nevertheless, when individuals were exposed to the information they tend to avoid, there were similar changes to individuals who scored low in avoidance of red meat risks information, that is, information exposure had the same effects for the two groups. Hence, the challenge for practitioners in this regard may not be so much providing different information content to avoiders and non-avoiders but rather engage consumers in the communication process before exposure, based on different engagement strategies tailored for avoiders and non-avoiders. This should be done in a way that prevents avoiders of self-selecting themselves out from it, while maintaining or increasing engagement for non-avoiders. In addition, it is also necessary to design strategies to keep individuals with lower levels of education engaged in the communication processes, as we found that these individuals dropped out more than individuals with higher levels of education." [Concluding mark]: "Researchers and practitioners need to develop effective strategies to increase consumer engagement. Afterward, changes in the individual's cognitions appear to be likely, particularly when individuals are exposed to and stimulated to attend to risk information."	"the present findings suggest that such exposure to vegetarians may only harden pro-meat sentiment though defensiveness and the justifications it produces. The chief barrier to reducing meat consumption is not necessarily a lack of contact with vegetarians, but how to help omnivores work through their defensiveness." [...] Indeed, the present findings may suggest that the negative meat campaign may be backfiring by ultimately increasing dissonance, which is alleviated by justifications that only promote greater meat consumption. This conclusion should be considered carefully though because it is unclear whether exposure to pro-vegetarian arguments produces the same, more, or less dissonance than exposure to vegetarians."	None
(Potential) explanation of outcome	"Cognitive dissonance theory appears to be an adequate and fruitful approach for understanding risk information avoidance and considering tailoring risk communication to the individual's cognitions and affect." [...]	"The present results provide empirical verification for Adams's (2001) claims that vegetarians produce a host of negative reactions within meat eaters because they activate the inner conflict surrounding meat consumption. [...] Discomfort is brought on by what vegetarians represent: a reminder of eating meat, the associated guilt accompanying this reminder, and threat to strategies designed to help omnivores feel better about consuming meat."	"However, manipulating presentations of the link between meat and animals in order to lead participants to deliberately pay attention to the meat production process may be a little contrived, as slaughter of food animals is conducted "out of sight, out of mind" for most people in modern life. It may also have been the case that showing the different cuts of beef in the meat condition activated participants' willingness to eat beef, prompting questions about whether pictorial or verbal presentations of a dish may enhance the perceived deliciousness of a dish. Such presentations of dishes are quite common in restaurants and shops"
Variable of conceptual model (max. 3)	Personal characteristics; attitude; self-efficacy	Self-efficacy	Attitude; barriers and abilities
Meat group	Red meat	Combination	Beef
Note/comment	-	-	"The current research suggests that cognitive dissonance in response to the meat paradox is observed among both French and Chinese participants, and thus seems to generalize across cultures."

	43. Tian et al. (2016b)	27. Vainio et al. (2018) - whole article	2. Bacon & Krpan (2018)
Used theory/theories	Psychological theories on cognitive dissonance	Framing theories and cognitive dissonance theories	Practice and nudging theories
Nature of research	Quantitative	Quantitative	Quantitative
Number of analyses	single study	single study	single study
Sample group	520 (243 French and 277 Chinese) meat-eating participants	A quota sample of 1279 that is representative of the 18-65 years old internet users living in Finland	853 U.K. resident adults whose first language is English
Short explanation of intervention	Study 2 (meat consumption): This study is the same as the first study (see Tian et al., 2016a), except for the fact that this one particularly focuses on the consumption process itself. So here recipes in which the main ingredient was beef were shown to all four groups. The intervention, however, is that the first group received a photo of a cow. The second got to see a photo of the dish, while the third group got shown a recipe by itself and the last group received no additional information.	Participants were split into a group that either had to read a message on the impact of red meat (and plant-based alternatives) consumption on health or environment, or the control group who did not receive such a message. Intentions and beliefs about red meat consumption were also measured during the online questionnaire.	Participants of an online survey were randomly given one of four restaurant menu options and were asked to choose a main dish. Variable between these four options is the way the dishes are presented on the card (nudging). Study aim is to "examine whether the effectiveness of different restaurant menus in nudging pro-environmental food choice depends on the frequency at which people ate vegetarian dishes in the past" (p. 192).
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	tools; point of purchase actions	tools; raising awareness	point of purchase actions
Year of intervention	Unknown	2016	Unknown
Target group/population	French and Chinese populations	Finnish internet-users between 18 and 65 years old	People who are neither vegetarian nor vegan
Place of intervention (e.g. supermarket or canteen)	Irrelevant	Places where red meat is consumed	Restaurants
Value frame (e.g. health, environment or animal wellbeing)	Animal well-being	Environment and health	environment
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Eating out in restaurants
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Inquirers	Inquirers	Inquirers
Evaluation criteria of success	Effect-level	Process- and effect-level	Effect-level
Brief outcome of intervention(s)	1. "Study 2 provides support for the hypothesis that a recipe with an animal image would reduce omnivores' willingness to eat beef, but [2] a recipe without such an image would increase their willingness to eat beef. That is, participants in the recipe with animal image condition reported less willingness to eat beef than those in the recipe alone condition reported more willingness to eat beef than those in the control condition where no recipe was shown." 3. The differences between French and Chinese participants on the mind perception of cows in the meat production stage may reflect a cultural difference. That is, French participants were more strongly affected than the Chinese by being made aware of the meat paradox in the meat production stage."	"We found that reading any message was positively associated with intentions to change behaviours when the effect of prior beliefs about red meat-based diets was taken into account. At least in this narrow experimental setting, we therefore conclude that information had the desired effect on behavioural intentions, but also that individuals' prior beliefs played a key role in determining responses to persuasive messages. Beliefs moderated the effect of reading a message on behavioural intentions as expected: reading any message changed behavioural intentions among "meat-sceptics" but not among "meat believers". Beliefs were also found to influence intentions to change behaviours directly: beliefs that red meat-based diets were healthy, climate-friendly and necessary were negatively associated with intentions to increase consumption of plant-based products. [...] We did not find evidence that refutational strategies were more effective than non-refutational strategies at modifying consumers' behavioural intentions. [...] Our study also found limited support that the way a message is framed matters. [...] We did not find any evidence that applying a combination of health and climate frames was more effective than the single-frame messages in modifying intentions." [...] "It appears that ambivalent attitudes and beliefs are more likely to be changeable"	"Overall, the findings showed that, whereas certain menus can have a positive impact on pro-environmental food choice, they can also backfire and decrease the likelihood of this choice, depending on how frequently people ate vegetarian meals in the past" (p. 197). For instance, "the vegetarian menu did not have an effect on the extent to which the infrequent vegetarian eaters selected a vegetarian dish, but it had a negative impact on frequent vegetarian eaters and made them less likely to choose vegetarian" (p. 197).
Practical implications/future recommendations	1. "Our results demonstrate the power of animal concepts or images in activating people's awareness of the meat-animal link and thus influencing their thoughts and behavioral intentions." [...] "Only conditions that present relatively salient reminders of the meat's animal origin, such as images of live animals evoking the slaughter, have the strength to overcome the thoughts of deliciousness of meat."	"Consumers who are regular red meat eaters and infrequent consumers of vegetables are often those who also have strong positive beliefs about meat eating. In this group, communication through messages is not likely to be an effective strategy because people tend to avoid situations where they have to face a cognitive dissonance. However, messages were effective in modifying behavioural intentions within the group of meat-sceptics, probably by confirming beliefs that were already held. [...] Targeted communication based on a careful understanding of target groups' prior beliefs is needed" [...] We therefore suggest that the developers of information campaigns do not simply aim at filling the "information deficit" but rather identify novel strategies helping consumers to make sense and process contradictions and uncertainties in information about healthy and climate-friendly diets in an effective way as part of their daily lives."	"Our experiment therefore points out that any contextual interventions aimed at nudging pro-environmental behavior need to be carefully examined in relation to people's past eating choices to avoid undesirable behavioral effects, and suggests that achieving sustainable eating may require more personalized interventions." (p. 198).
(Potential) explanation of outcome	1. "It seems that an animal image, as a symbol of meat's animal origin, makes participants less willing to consume meat in the future, but a text description of a recipe, as a symbol of meat's deliciousness, appears to promote meat consumption in the future." 2. "In addition, the lack of significant differences between the experimental conditions and control condition may be due to that participants, when presented with a recipe, associated the meat shown in the form of food with appetite and/or culturally familiar and concrete meat-eating practices. This might, to some extent, have strengthened participants' imagination of enjoying the delicious meat, and thereby reduced the attention paid to the animal origin of meat." 3. "French people, compared with Americans, focused more on the experience of pleasure in the process of eating and spent much more time on eating, which implies that eating has a social communication function in their culture. Based on this finding, we may surmise that eating behavior among French people may be more related to their self-concept, and so the suffering of animals in the slaughterhouse may threaten the self-concept of French participants in Study 1. This could motivate them to deal with the cognitive dissonance arising from the meat paradox by reducing mind attribution to cows. [...] Another possible explanation for this is the difference in feelings of familiarity with respect to killing food animals between these two cultures. In China, especially in rural areas, people have more opportunity to witness the killing process. So, Chinese people	None	"The menu interventions may have made the concept of vegetarian eating more salient, thus signaling to frequent vegetarian eaters that they have already engaged in the morally superior food choice on numerous occasions and prompting them to select meat or fish instead." (p. 197).
Variable of conceptual model (max. 3)	Attitude; barriers and abilities	Attitude	Barriers and abilities
Meat group	Beef	Red meat	Combination
Note/comment	"The current research suggests that cognitive dissonance in response to the meat paradox is observed among both French and Chinese participants, and thus seems to generalize across cultures."	-	-

	9. Campbell-Arvai et al. (2014) - intervention 1	10. Campbell-Arvai et al. (2014) - intervention 2	11. Campbell-Arvai et al. (2014) - intervention 3
Used theory/theories	Nudging theories	Nudging theories	Nudging theories
Nature of research	Quantitative	Quantitative	Quantitative
Number of analyses	single study	single study	single study
Sample group	316 undergraduate students of a midwestern US university	316 undergraduate students of a midwestern US university	316 undergraduate students of an midwestern US university
Short explanation of intervention	A menu choice experiment wherein students can select their preferred menu. Variable in the options is the presentation of the meat-free items. The study objective is to measure the effectiveness of nudges in guiding students towards vegetarian menu options.	A menu choice experiment wherein students can select their preferred menu. Variable in the options is the presence/absence of information about the environmental impacts of meat consumption. The study objective is to measure the effectiveness of nudges in guiding students towards vegetarian menu options.	A menu choice experiment wherein students can select their preferred menu. Variable in the options is the attractiveness of the meat-free options. The study objective is to measure the effectiveness of nudges in guiding students towards vegetarian menu options.
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	point of purchase actions	raising awareness	point of purchase actions
Year of intervention	Unknown	Unknown	Unknown
Target group/population	Meat-eating visitors of canteens	Meat-eating visitors of canteens	Meat-eating visitors of canteens
Place of intervention (e.g. supermarket or canteen)	Canteens	Canteens	Canteens
Value frame (e.g. health, environment or animal wellbeing)	Environment	Environment	Environment
Eating occasion (e.g. on the go meal or dinner)	Meals eaten in canteens	Meals eaten in canteens	Meals eaten in canteens
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Inquirers	Inquirers	Inquirers
Evaluation criteria of success	Process-level	Process-level	Process-level
Brief outcome of intervention(s)	"Overall, those individuals who were assigned a default menu—both with information and without—were more likely to choose a meat-free menu item than those who did not receive a default menu."	"The provision of information on the menus, albeit in simplified but realistic terms (for what is typically encountered on a menu), did not have a significant influence on an individual's choice of a meat-free menu option."	"Our research also shows that—as might be expected—the attractiveness of menu items (in a default position or otherwise) has a significant influence on food choice; with unappealing menu options being selected less frequently than appealing ones. However, it is important to point out that there was no statistically significant interaction between the presence of a default and the attractiveness of menu options. Thus, the efficacy of a default-based menu configuration in terms of motivating meat-free meal choices seemed to trump the attractiveness of those menu options."
Practical implications/future recommendations	None	None	None
(Potential) explanation of outcome	"Johnson and Goldstein (2003) and Pichert and Katsikopoulos (2008), for example, suggest that defaults work because they represent an implied endorsement from those presenting the options, and for this reason alone may be viewed more favorably than the nondefault options." [...] "Another possible explanation is that participants may stick with a default option because of loss aversion and status quo bias (Kahneman et al., 1991). Given the timing of our study, participants were likely hungry and under time pressure; as a result, the default options presented to them—the absence of any point of comparison as to the "goodness" or "badness" of the options— may simply have provided a quick and convenient choice in that it required minimal physical or mental effort on participants' part."	"Although this kind of information may be helpful in motivating behavior change over a longer time scale, that is, through increasing awareness of the environmental consequences of a particular action, or identifying a new way to minimize one's environmental impact (Stern, Dietz, Kalof, & Guagnano, 1995), particularly for those individuals who hold envirocentric values (Stern & Dietz, 1994), it appears to be less effective at motivating behavior change at the scale of individual, real-time choices. As other studies have also shown, what we learn about options in terms of their links to environmental sustainability can be overridden by the immediate characteristics of the context in which decisions are made. In other words, it is common for immediate or visceral factors to dominate decisions, especially when time pressure and distractions further conspire to prevent more effortful deliberation and consideration of information"	None
Variable of conceptual model (max. 3)	Barriers and abilities	Attitude	Barriers and abilities
Meat group	Combination	Combination	Combination
Note/comment	-	-	-

	19. Garnett et al. (2015) - Chapter 7: changing the choice architecture	48. Kurz, V. (2017)	41. Spencer & Guinard (2018)
Used theory/theories	None	Nudging theories	None
Nature of research	Mixed	Quantitative	Quantitative
Number of analyses	meta-analysis	single study	single study
Sample group	Several sample groups	Consumers at restaurants of the University of Gothenburg	a representative sample of the California consumer population, consisting of 141 participants
Short explanation of intervention	"Interventions that: "... involve altering the properties or placement of objects or stimuli within micro-environments with the intention of changing health-related behaviour. Such interventions are implemented within the same micro-environment as that in which the target behaviour is performed, typically require minimal conscious engagement, can in principle influence the behaviour of many people simultaneously, and are not targeted or tailored to specific individuals." "changing the choice supply; governmental regulations"	A field experiment in two university restaurants. In one restaurant the vegetarian menu option got more salient by adding it higher on the list of menu options and making the vegetarian dish more visible [nudging] [during a period of 13 weeks]. In the other restaurant that serves as a control, no intervention got done. The results were measured before the intervention, during the intervention and after the intervention got done [reversal where the menu order was the same as before the intervention].	This study has investigated whether changes in the flavours of dishes (meat proportion, flavor strategy and cuisine (e.g. Asian)) can be used as a means to make plant-based dishes more appealing. 24 mixed dish samples were judged by the sample group using Likert scales.
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	Varying	2015-2016	Unknown
Year of intervention	Varying	Consumers at canteens/restaurants	American consumer population
Target group/population	Varying	canteens/restaurants	Irrelevant
Place of intervention (e.g. supermarket or canteen)	Places where choice architecture is of importance for the food consumption process	Environment	Health and environment
Value frame (e.g. health, environment or animal wellbeing)	Health	Environment	Health and environment
Eating occasion (e.g. on the go meal or dinner)	Meals consumed out of the house	Lunch	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Companies and/or inquirers	Inquirer	Inquirers
Evaluation criteria of success	Effect-level	Process and effect-level	Effect-level
Brief outcome of intervention(s)	"Repackaging food into smaller portion sizes, using smaller plates, positioning healthier foods near the front of the refrigerator etc. can potentially reduce consumption and promote healthier choices". [...] "It found some evidence that health labelling at point of purchase, changes in the perceived assortment and variety of foods on offer, and payment option manipulation were all associated with healthier food choices although the impact on total calories consumed or overall nutrient impacts were not assessed. Changing the plate or cutlery size had an inconclusive effect on consumption volume." [...] "A systematic review of 'natural experiments', including those focusing on school meal standards, vending machine bans and so forth generally found more active interventions to be more effective than passive ones. For example school food policies or standards that changed the food environment generally led to improvements in purchasing or self-reported diet, while simply providing nutritional information for the most part had little effect".	"Results show that the nudge increased the share of vegetarian lunches sold by around 6 percentage points [during the intervention period] [...] which constitutes an increase of around 40 percent of the sales share of the vegetarian dish compared with the baseline period. The change in behavior is partly persistent, as the share of vegetarian lunches sold remained 4 percentage points higher than during the baseline period after the original setup was reinstated. The changes in consumption reduced GHG emissions from food sales around 5 percent." [...] "It seems as if customers learn about the vegetarian option, and some then incorporate it permanently into their choice set."	1. "Regarding the meat level, the LM/high-vegetable samples were rated higher in every hedonic category than the high-meat/low-vegetable (HM) samples (Figure 1). 2. With respect to the flavor strategy, the results support the hypothesis that there were consumer preference segments that preferred different flavor strategies. Figure 2 shows that the trimodal combo flavor strategy had the highest mean hedonic ratings overall, which again follows the concept that increasing variety increases consumer enjoyment." 3. "It seems that aromatic ingredients alone, with little to no taste or trigeminal ingredients, may not be as effective as a stand-alone sensory strategy. The recipes could be intensified with greater amounts of the aromatic ingredients, but it seems that without much stimulation on the tongue (as with taste-focused or trigeminal-focused ingredients), the sensory appeal would not be as high."
Practical implications/future recommendations	None	"When considering nudging as a tool for changing consumption patterns, one should keep in mind possible ethical objections against nudging. Recent years have seen a lively and controversial debate on policy-making based on behavioral insights. Many feel that transparency is important for the use of nudging to be acceptable (see, for example, Hansen and Jespersen, 2013). Restaurants and policy-makers who want to use nudges to reduce the climate impact of food consumption should try to do so as transparently as possible."	"With the right flavor strategy, the sensory appeal of a high-vegetable dish can be just as high as, if not higher than, that of a meat-central dish. However, there is not one ideal flavor strategy for all consumers. Also, based on the consumer beliefs that daily meat consumption is important and that red meat is relatively healthy, there seems to be a lack of consumer awareness of the health and environmental benefits to reducing meat consumption and increasing plant-based food consumption. This concept is especially important to communicate to males, as it was found in this study that daily meat consumption was more important to males." [...] "Vegetable- and plant-heavy dishes with high sensory appeal are a promising strategy with which to implement this shift. Specifically, of the flavor strategies tested (taste, aroma, trigeminal, and trimodal combo), after the trimodal combo strategy, the trigeminal strategy was found to be the most promising flavor modality to use to implement this shift, considering the higher salt content of the taste strategy. However, no flavor modality alone can measure up to the full complexity and balance of modalities in the trimodal combo strategy. A trimodal combo flavor strategy, perhaps with a spicier version and a less spicy version, would be the most successful in the implementation of the Flexitarian FlipTM in mixed dishes, because some consumers prefer spicy dishes and some do not. We conclude that mixed dishes full of variety, incorporating worldly flavors and ingredients adopted from cultures outside the United States, and with sensory characteristics that cater to consumer preferences, are a promising strategy with which to carry out the Flexitarian FlipTM in American consumers."
(Potential) explanation of outcome	None	None	1. "the variety of colors and textures introduced by the vegetables may have positively influenced overall acceptability ratings of the samples (Figure 1). It has been shown that increasing the variety of food, including vegetables, increases the enjoyment and consumption of the food. Because the LM samples had a higher amount of the vegetable mix, and thus more apparent variety in the dish, especially in colors, textures, and flavors, this could have been more appealing to the consumers than the HM samples, which had a larger amount of meat, which was only one ingredient". 2. "This is not surprising, because although the trimodal combo strategy had reduced (by 1/3) amounts of all of the ingredients, it had the largest variety of ingredients and it combined the 3 components of flavor: taste, aroma, and chemical sense (trigeminal), and there may have been synergistic effects among the flavor elements"
Variable of conceptual model (max. 3)	Barriers and abilities	Barriers and abilities	Attitude; barriers and abilities
Meat group	Non-meat	Combination	Combination
Note/comment	"However the study [the first part of the outcome] conclusions emphasised the poor quality of many of the studies reviewed, noted that many were in laboratory rather than real life settings and that different methodological approaches also made comparison difficult"	"[The experiment restaurant] is frequented by a highly educated, rather young population. Younger people might be more open to trying new types of food, and the nudge used here may have a smaller effect in a setting with an older population. On the other hand, data from the Swedish National Food Agency (2012) show that meat consumption is as high amongst people 18–30 years old as it is in the rest of the adult population, and that there are no differences in meat consumption with regard to educational level."	There is chosen for barriers and abilities, as this intervention can play in on the choice infrastructure of meat/meat substitutes.

	44. Vandenbroele et al. (2018)	50. Reinders et al., 2017 (as read in Dagevos & Reinders, 2018)	6. Bakker & Dagevos (2010) - chapter 7: Eiwittransitie begint in Zeeland
Used theory/theories	None	Unknown	None
Nature of research	Quantitative	Mixed	Mixed
Number of analyses	single study	single study	single study
Sample group	sample of consumers who bought the target product (n=161)	consumers at three (major chain) restaurants in medium-sized cities in The Netherlands	Consumers of several Agrimarkt supermarkets in the province of Zeeland, the Netherlands
Short explanation of intervention	This study is a field experiment in which the size of meat sausages (default = 150 grams) that are on offer at a Belgium retailer is reduced to 100 gram (according to the Belgium nutritional guidelines) and 125 gram (in-between size). Furthermore, the default size of 150 gram still will be on offer. The experiment lasted for one month. In addition, a comparable Belgium retailer where no intervention is introduced serves as a control group. Underlying thought of this intervention is that "interventions in the food environment, rather than education, seem promising and because consumers tend to believe that it is easier to regulate their consumption at the moment of purchase, rather than consumption it is necessary to evaluate the effectiveness of interventions at the point of purchase." A reduction in the portion size should reduce the volume of meat consumed.	Three restaurants in medium-sized Dutch cities of a large restaurant chain were chosen as intervention places where portions of meat on main dishes were reduced with 12.5 percent, while doubling the amount of vegetables. Both a intervention and control period were present in this study. Observations and questionnaires gave insights in the results of this intervention.	A local-scale pilot of bringing plant-based protein products on the market. Implementation is chain-wide and ranges from production of meat-free (Meatless) and hybride foods (Meatlight) to the promotion of the products and their recycling.
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	point of purchase actions	tools	changing the choice supply
Year of intervention	Unknown	2015	2009
Target group/population	Consumers of meat sausages	Dutch people who eat meat at restaurants	Zeeland inhabitants
Place of intervention (e.g. supermarket or canteen)	Supermarket	Restaurants	Supermarkets
Value frame (e.g. health, environment or animal wellbeing)	Environment	Unknown	Environment and health
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Inquirers/Belgium supermarket retailer	Inquirers	Project group 'Economische Impuls Zeeland' in combination with Meatless, Agrimarkt and Van Pelt Vleesgroep.
Evaluation criteria of success	Effect-level	Effect-level	Effect-level
Brief outcome of intervention(s)	"A growing body of literature supports this "nudging" option. Consumers can more easily regulate their food intake at the point of purchase rather than at the moment of consumption. [...] "Comparing the default choice architecture versus additional portions, while assuming an equal number of units sold regardless of the setting, we note that 13% less meat (in kg) would have been sold, due to the purchases of smaller portions." [...] "a majority of consumers (63%) bought a smaller portion than they normally would have. [...] The total weight sold of the meat product decreased with 18% compared to the preceding month. Thus, 18% less meat (in grammes) were sold, while the number of sausages sold remained stable" (retrieved from: tenudge.eu/project/little-less-meat-little-green-action-nudging-towards-sustainable-healthy-portion-sizes-supermarket/). "This study has shown that making smaller portions available at the point of purchase may be an effective means to curb portion size effects".	"Meat consumption was significantly lower during the intervention period (M=183.1 grams) than during the control period (M=211.1 grams). In addition, total vegetable consumption (including side dishes) was significantly higher during the intervention period (M=178.0 grams) than during the control period (M=137.0 grams). Furthermore, although participants evaluated the amount of meat lower in the intervention period compared to the control period, satisfaction with the restaurant did not differ during the intervention and control periods [...] These results suggest that portion size could significantly affect meat consumption, while leaving satisfaction largely unaffected".	[translated from Dutch]: "From the sales figures of Agrimarkt by the end of November 2009 we observe the sales of new, hybride meat products being a big success: Meatlight has a 6% share of the total sales volume of (low fat) ground beef. For the pork sausages and fresh hamburgers that is as much as 30% en 39%. These numbers are spectacular for an introduction of new meat variants in the meat sector. Meatless has a market share of 7% in meat substitutes. The research shows that consumers who buy meat substitutes, (also) buy Meatless and Meatlight during the research period. The 'regular' meat buyer has only been reached very lightly with these products. Especially the idea that meat substitutes are less tasteful and less natural discourages them to buy meat substitutes. [...] "The research also shows out that one fifth of the consumers considered buying Meatlight, of which 25 to 30% really did so. 5 to 10% of the consumers considered Meatless, of which 10 to 15% actually bought it. [...] "In general we can conclude that Meatlight is a success and possibly filled in a gap in the market. Meanwhile, the marketing of fully plant-based Meatlessproducts has been less successful" [...] "Hybride meat products will be offered at the Albert Heijn supermarkets. Also for the fully meatfree variants is interest in the form as a fresh products (not
Practical implications/future recommendations	Sidenote: "For retailers, interventions aimed at curbing portion size effects may decrease profits, which could leave them reluctant to participate in such initiatives. However, we find strong demand for smaller portions; slightly more than half of the units sold in this experiment were smaller portions. Consumers' growing attention to health and environmental issues suggests that such demand probably will only increase in the future. Participating in initiatives that stimulate consumers to make healthier choices also could enhance stores' corporate image. [...] Incorporating the current study's behavioral insights in retail store management strategies offers a valuable alternative to both voluntary guidelines and enforced regulations. [...] if these profit-affecting interventions could be combined with nudges to stimulate sales of healthier products, the total amount spent by consumers may be equalled or even enlarged." [...] "However, implementing a point-of-purchase intervention requires a thorough preparation. Retailers do not only need to order the intervention materials, they also have to think in advance about relevant benchmarks and measures to evaluate the effectiveness".	"The findings of this study imply that modifications of portion sizes of meat in restaurants could offer opportunities to effectively limiting meat consumption. By the same token, by serving more vegetables and less meat in their restaurants, restaurant owners could play an important role in promoting meat-reduced meal options, and thereby contribute to a consumption cultural normalisation process of eating meat in moderation".	[Translated from Dutch]: "To reach the meat-loving consumer with these products, their doubts about the health and taste of these meat variants should be removed"
(Potential) explanation of outcome	None	None	"Another important lesson we can learn from this research among customers of the Agrimarkt is that it once again confirms the strong image of meat as compared to the weak image of meat substitutes. Meat is being seen as healthier, tasteful, easier, lower in fat, cheaper and better."
Variable of conceptual model (max. 3)	Barriers and abilities	Practice; barriers and abilities	Barriers and abilities
Meat group	Combination	Combination	Combination
Note/comment	-	-	-

	35. Lazor et al. (2010)	21. Garnett et al. (2015) - Chapter 7: Nutrition labelling	26. Hoek et al. (2017) - (environmental and/or health) logo
Used theory/theories	None	None	Previous research done on this topic
Nature of research	Quantitative	Mixed	Quantitative
Number of analyses	single study	meta-analysis	single study
Sample group	3993 students from five test schools from Montgomery County in southern Maryland, US.	Several sample groups	A quota sample that is a representation of Australian household grocery buyers
Short explanation of intervention	Inquirers compared the weight of leftovers of four popular meat-based menu items on five middle schools in Maryland, US to the weight of leftovers of soy alternatives menu items. Aim is to understand whether soy-based alternatives could successfully be introduced in these schools.	Nutrition labels should help consumers in choosing the more healthy food options available. The research done here consist of a systematic review of several studies done in this field.	The research has the form of choice experiments (e.g. "would purchase 10 chances in 100") in which participants could choose between a 'regular' food product and a more sustainable and healthy option. In this case white rice as compared to brown rice; kangaroo steak as compared to beef steak and fresh tomatoes as compared to tinned tomatoes. Interventions was done in form of logos (environmental and/or health logo).
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	changing the choice supply	tools	point of purchase actions
Year of intervention	Unknown	irrelevant	2014
Target group/population	Adolescents in a large urban area with culturally diverse populations	Consumers	Australian household grocery buyers
Place of intervention (e.g. supermarket or canteen)	Cantines	Supermarkets and other places where food is sold	Supermarkets
Value frame (e.g. health, environment or animal wellbeing)	Health	Health	Health and environment
Eating occasion (e.g. on the go meal or dinner)	Lunch	Irrelevant	Meals prepared at home
Agent of change (e.g. Voedingscentrum or Rijkssoeverheid)	Inquirers	Governments, companies and NGOs	Inquirers
Evaluation criteria of success	Effect-level	Effect- and process-level	Effect-level
Brief outcome of intervention(s)	"Overall, the findings indicate that middle school students in a very large, highly diverse school district in Montgomery County, Maryland, readily accepted the hybrid patty, soy-based chicken nuggets, and soy-based pasta. [...] Students selected the 3 soy-based product (ie, burgers, nuggets, and pasta) from a crowded menu with similar frequency as the traditional products, and consumed the same amounts as the traditional items, when portion sizes were the same. If the portion size of a soy-based product was larger than the traditional food item, students did not finish the larger portion. [...] Most students, however, consumed the entire product regardless of the food type."	health labels: "nutrition and other consumer facing labels certainly help build consumer awareness, people find them acceptable, and some people also make use of them; but the evidence suggests that they are not always fully understood and their impact is only weakly positive." [...] "A systematic review of labelling on pre-packaged foods in seven countries found that nutrition labels are an important source of information for consumers and are associated with healthier diets. It notes that the causal nature of this association is likely bidirectional: nutrition labels may promote healthier eating, whereas individuals with healthier diets are more likely to seek out nutritional labels in the first place. It concludes that there is sufficient evidence from a range of study designs to indicate that providing nutritional information has a positive impact on diet. However it also finds that the use of nutrition labels varies considerably across population subgroups. Use is particularly high among individuals with health conditions and special dietary requirements and notably lower among children, adolescents and older adults, and people in lower socio-economic groups." [...] "A major EU funded study (FLABEL) found that nutrition labels are well understood, but lack of motivation and attention are significant barriers to people using and acting positively to the information" [...]. environmental	"However, what can be achieved with point-of-purchase actions is highly dependent on the type of products. It is clear that overall the greatest shift in choices were achieved in the rice experiment with the relatively similar products white and brown rice. Therefore, a crucial product factor that needs to be considered is the level of product similarity between the standard and healthy & sustainable alternative. This is consistent with other research as, after all, a product with a high level of similarity is more easily recognized and accepted as a product alternative, with the potential of a higher level of substitution." [...] We found that the key consumer factors that explained product choices related to past product experience and product liking of the healthy and sustainable option. Surprisingly, general food attitudes, as measured by attribute determination (Van Dam & Van Trijp, 2013), showed that the importance attached to sensory/hedonic food choice factors (e.g. taste) were the main differences between the consumer segments, as opposed to their health or environment orientation."
Practical implications/future recommendations	"Soy-based products can help meet USDA requirements for fat, saturated fat, and cholesterol, while providing more vegetarian choices and variety to attract higher meal participation from diverse student bodies in urban school districts. Overall, this study indicates that the NSLP can look to soyfoods for adding variety and healthier choices on the menu without negative impacts on sales or consumption." [...] As the challenge grows for school FSDs to deliver optimal nutrition, meet USDA requirements, and sell sufficient volume of foods to be cost effective, a range of new vegetarian entrees, vegan options, whole grains, fresh fruits and vegetables, and soy products can help school districts be successful. The plate waste study design reported in this article offers an approach for schools to follow when selecting lower fat, lower calorie versions of popular foods as well as new healthy options."	None	"If the choice for an alternative product does not involve a loss of highly valued product-specific benefits (i.e. flavour preference, convenience), the balance can be tipped to the healthy and sustainable alternative by price measures, and to a lesser degree health and environment logos and labels. The closer the substitutes are, the easier it is to tip the scale under influence of these measures. Most importantly, if consumers are familiar with a healthy and sustainable product and like it, it will be easier to tip the scale." [Implications]: (1) It may be desirable from a health and sustainability impact point of view to aim for big behavioural shifts in food choice and consumption (e.g. kangaroo instead of beef), however there seems to be a higher potential to shift consumers to closer healthy and sustainable food alternatives (e.g. brown instead of white rice) under influence of point-of-purchase actions. (2) There is no one-size-fits-all solution. The effect of actions visible at point-of-purchase, such as pricing measures, health and environment logos and labels, seem to be dependent on the interaction between consumer characteristics and the product category. Consumers' familiarity and product liking of the healthy and sustainable alternative largely determines whether they will respond positively to such actions. In addition, consumer attitudes towards the sensory
(Potential) explanation of outcome	None	"In all it appears that measures to raise awareness through media campaigns and information provision can play a part in influencing consumption. However the long term sustained effects are unclear. Note too that a systematic EU wide review of both 'hard' and 'soft' approaches to promoting healthy eating found the former to be more effective than the latter, and noted that while information campaigns raise awareness, the message does not necessarily translate into action".	None
Variable of conceptual model (max. 3)	Barriers and abilities	Barriers and abilities	Barriers and abilities
Meat group	Non-meat	Combination	Combination
Note/comment	-	-	-

Used theory/theories	39. Samant et al. (2016) Theories on 'credence qualities' ("reflecting the credibility of the seller towards the buyer", such as label information on food-product-packaging)	40. Samant & Seo. (2016) Theories on 'credence qualities' ("reflecting the credibility of the seller towards the buyer", such as label information on food-product-packaging)	22. Garnett et al. (2015) - Chapter 7: Carbon labelling None
Nature of research	Quantitative	Quantitative	Mixed
Number of analyses	single study	single study	meta-analysis
Sample group	110 Northwest Arkansas residents (US)	48 Northwest Arkansas residents (of which half demonstrate better recall of food label knowledge, and the other half who had never been involved in any food label education activity)	Several sample groups
Short explanation of intervention	"Participants were randomly distributed into 1 of 3 educational-intervention groups: (1) active learning (discussing label claims with other participants), (2) passive learning (reading a flyer about label claims), and (3) passive learning with an authoritative effect (attending a professor's lecture on label claims). Participants were asked to fill out a survey regarding their understanding and attitude toward 10 sustainability and process-related labels commonly displayed on chicken meat products at 3 different times: before, immediately after, and 2 weeks after educational intervention. [Its goal is to] determine the effect of varying educational approaches to label claims on consumers' understanding and attitude toward such claims".	"An eye-tracking is an objective methodology that has been used to analyze consumers' purchase behavior in terms of their visual attention to labels. The aim of this study was to determine the effect of label education [on sustainability and processment of food] on consumers' purchase behavior, measured with respect to their visual attention to label claims on chicken products. 29 participants with prior food label education were chosen to represent the High Label Understanding (HLU) group. Additionally, 29 new participants without any kind of prior label education were selected as a Control (CNTL) group. Each participant viewed packaging images of chicken meat products using the eye-tracker and answered additional subjective questions relating to their potential purchase behavior (purchase intent, trust in product, and overall liking)".	Carbon labels have the aim of guiding the consumer towards food products that are environmental friendly. The research done here consist of a systematic review of several studies done in this field.
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	tools; point of purchase actions; raising awareness	tools; point of purchase actions	tools
Year of intervention	Unknown	Unknown	Irrelevant
Target group/population	Consumers of chicken-meat products	Consumers of chicken-meat products	Consumers
Place of intervention (e.g. supermarket or canteen)	Supermarket	Supermarket	Supermarkets and other places where food is sold
Value frame (e.g. health, environment or animal wellbeing)	Unknown	Environment, animal well-being and working conditions	Environment
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Inquirers	Inquirers	Governments, companies and NGOs
Evaluation criteria of success	Effect-level	Effect-level	Effect- and process-level
Brief outcome of intervention(s)	"Our findings demonstrated that educational intervention regarding label claims not only increased participants' trust in label claims, but also led to their considering label claims to be more important when they made chicken product purchases. However, the effect of educational intervention on participants' attitudes toward label claims varied by type of educational approach. Passive learning (i.e., reading a flyer about label claims) helped participants build positive trust in label claims, while active learning (i.e., discussing label claims with other participants) showed a potential for decreasing their trust in label claims. Similarly, passive learning led participants to consider label claims to be more important, while active learning tended to drive them to consider label claims as slightly less important when purchasing chicken products, compared to before educational intervention. [...] Our findings demonstrate that, following educational intervention, participants came to consider "environmental sustainability" of chicken products to be more important when making purchasing decisions of chicken product."	"A high level of label-claim understanding can result in a longer visual fixation on the label claims found on chicken meat products than that associated with only a normal or average level of label understanding. [...] The present study provides empirical evidence that the association between visual attention and positive purchase intent becomes pronounced when consumers correctly understand the significance or meaning of label claims. [...] Consumers have been found to demonstrate higher potential for buying products they trust and like. A greater degree of label understanding resulted in higher trust in the chicken meat product, as well as higher liking of the product (Fig. 6). Thus, the HLU group was expected to show higher purchase intent than the CNTL group. [...] However, the HLU group results did not significantly differ from those of the CNTL group with respect to self-reported purchase intent. [...] It might be argued that since purchase intent between HLU and CNTL groups was not significantly different, providing label education has no impact on consumers' purchase behavior. However, it must be noted that purchase behavior includes not only purchase intent, but also consumer attitudes of making a decision on the purchasing. In other words, liking and trust in products are also considered as purchase behavior. In this sense, it is worth noting that label education increased participants' trust and liking toward the chicken meat products even though it did not seem to directly influence participants' purchase intent. These results shed light on the positive impacts of label education with respect to consumers' perception and attitude toward food products with label claims."	"A European survey by Grunert et al. finds that sustainability labels currently do not play a major role in consumers' food choices. A study of 3000 UK households reported that while 65% of households felt that ethical food production methods were an important issue, only 29% actively sought these products, and an even smaller 4.7% actually bought Fairtrade products – another instance of the attitude-behaviour gap" [...] Consumer understanding of the scheme was limited since people found it difficult to make sense of numerical values. The study concludes that there is more scope for using carbon reduction labels to indicate a programme of on-going emissions reductions, than in expecting consumers to incentivise emissions reductions by actively choosing the lower carbon variant of two or more products. [...] "Another UK study based on a survey of 428 UK supermarket shoppers reveals that while consumer demand is strong for carbon labels (72% in favour), most people (89% find it difficult to understand and interpret the labels, mainly because of poor communication and the proliferation of different labels." [...] "A Finnish study which explored, through focus groups and an online survey of 1000 respondents, how consumers perceive the communication of carbon footprints for food products also found substantial confusion. While the term 'product carbon footprint' is familiar to many, only 7% of respondents linked 'product carbon footprint' spontaneously to GHGs associated with the product; an additional 5% of the respondents linked it to climate change. Attitudes towards carbon labels are positive, with 90% stating that a carbon footprint would have at least a little impact on their buying decision, but the information became meaningful only when many other purchasing criteria (such as price and taste) were satisfied. 86% preferred carbon labels that allow comparisons of carbon footprints to be made among food products (either within or across food categories), but on the whole it was concluded that given current levels of awareness, carbon labels have a low appeal." [...] "As regards the impacts on purchasing decisions, in an Australian study, 37 food products were labelled with high, medium or low carbon footprints, the labels displayed over 8 weeks, and sales recorded over a three month period including pre- and
Practical implications/future recommendations	"providing educational intervention" in and of itself is sufficiently effective in improving consumers' understanding of the label claims commonly found on chicken meat products. [...] From the findings of this study, food manufacturers, marketers, and policy-makers in government and industry should not underestimate the efficiency of educational intervention on improving consumers' understanding and attitude toward label claims because of the following aspects. Firstly, increased label-understanding can minimize consumers' wrong inference as well as misinterpretation with respect to the meaning of label claims, which may lead consumers to make more informed choices. [...] a well-understood label-claim may lead to consumers' favorable and positive attitude toward food products with the label, resulting in their increased purchase intention. [...] Secondly, increased label-understanding may lessen the influence of negative comments and wrong information on consumers' attitudes toward label claims. [...] Thirdly, it is worth noting that in all three approaches an increased awareness of label claims was retained for at least two weeks after the educational intervention, meaning that the effect of educational intervention on consumers' label understanding is not temporary. [...] Finally, the present study demonstrates that flyers regarding label information (i.e., passive learning) may have a significant effect as good as the more costly alternatives. Thus, food manufacturers should positively consider providing label information through visual and/or auditory carriers to their potential customers. For example, food manufacturers may easily and quickly deliver information about the label claims found on their products through social network sites to their potential customers. In this way, repeated exposure to information about label claims may increase consumers' understanding of the claims."	"Educational intervention, especially when learners more completely understand information regarding sustainability and quality-related label claims, can be effective in attracting their attention with respect to the claims displayed on chicken meat products when they are purchased."	The study on 428 UK supermarket shoppers mentioned in the outcomes: "concludes that a strong policy steer leading to a targeted, coherent and possibly mandatory carbon labelling policy is needed."
(Potential) explanation of outcome	"What created this difference that happened in spite of passive and active learning not significantly differing with respect to the participants' label understanding? Fig. 3 shows that participants' attitudes to label claims are more associated with their subjective understanding than objective understanding. In other words, as consumers are more confident in their own understanding of label claims, they become more trusting of label claims. In this sense, it should be noted that, in contrast to passive learning, active learning allows participants to be more exposed to other participants' comments on label claims, including even negative comments and wrong information. Furthermore, compared to passive learning, active learning has been found to make participants more intrinsically motivated to learn (Benware & Deci, 1984; Haidet et al., 2004). Thus, through group discussion, a participant's label understanding can be affected by other participants' incorrect or confusing information (Wong, 2008) about the label claims, resulting in a decrease in self-confidence with respect to label understanding. [...] However [...], as a participant developed a stronger knowledge of label claims, he/she would be less affected by other participants' comments during group discussion". [...] These results [that participants considered the active-learning approach to be less thorough and efficient with respect to their making informed choices about chicken meat products compared to passive learning with/without an authoritative effect] might result from the fact that passive learning with/without an authoritative effect increased participants' positive attitude toward label claims, while active learning showed either no effect or a negative effect on their attitude."	"the higher fixation time and fixation count of the high label-education group suggest that prior label education increased participants' interest in the label claims. It therefore seems possible that familiarity with the claims and the resulting higher level of understanding might be responsible for motivating participants to look at the label claims for a longer time while making purchase decisions. [...] There are two plausible explanations for this lack of significant group difference with respect to purchase intent. First, [...] It is possible that participants in the control group overestimated their purchase intent because of social desirability bias. [...] Second, it is possible that, apart from label education, other components such as brand and price might have played a role in modulating consumers' purchase intent toward sustainability and process-related products."	"In all then, while carbon labelling appears to be received positively by consumers, understanding is low and other considerations – including price and ability to pay – are critical influences on the purchasing decision that people ultimately make." [...] "In all it appears that measures to raise awareness through media campaigns and information provision can play a part in influencing consumption. However the long term sustained effects are unclear. Note too that a systematic EU wide review of both 'hard' and 'soft' approaches to promoting healthy eating found the former to be more effective than the latter", and noted that while information campaigns raise awareness the message does not necessarily translate into action"
Variable of conceptual model (max. 3)	Personal characteristics; attitude; barriers and abilities	Barriers and abilities	Barriers and abilities
Meat group	Poultry	Poultry	Combination
Note/comment	-	"However, the present results of the subjective ratings, i.e., the label understanding-induced purchase intent, trust, and overall liking for chicken meat products, should be interpreted with caution because the number of participants was not large enough for providing conclusive evidence"	-

	33. Hyland et al. (2017) - carbon labelling	46. Van Loo et al. (2014)	49. Vlaeminck et al. (2014)
Used theory/theories	None	None	Attitude/behavior gap theories
Nature of research	Mixed	Mixed	Quantitative
Number of analyses	meta-analysis	single study	single study
Sample group	Several sample groups	359 main persons in the household responsible for food purchasing in the Flanders (Dutch speaking) region of Belgium.	150 consumers at a big Belgium grocery retailer
Short explanation of intervention	"A carbon label serves as important indicator of a systems impact on the global environment by identifying where emissions can be reduced in the food system."	participants took part in a choice experiment in which four sustainability claims are put to the test for chicken breasts. The claims were free range claims, organic labels, a EU animal welfare label and carbon footprint label. The choice experiment measured the willingness-to-pay of consumers in a simulation of the real consumer world.	In a real life supermarket, new environmental labels are introduced that have to be easy to interpret for consumers. These labels are derived from an online survey out of which a least-effective, most-effective and the standard control label got chosen. Environmental impact is measured on a scale of 1 to 10. "Participants can choose between (1) an evidently inferior environmental option, i.e. steak (1.5/10), (2) a less inferior option, i.e. chicken (3.5/10), and (3) a superior alternative, i.e. the veggie burger (5/10). "
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	point of purchase actions	point of purchase actions	point of purchase actions; tools
Year of intervention	Studies range from 2009 to 2014	2012	2013
Target group/population	Meat consumers	Main persons in the household responsible for food purchasing in the Flanders (Dutch speaking) region of Belgium	Consumers of meat at supermarkets
Place of intervention (e.g. supermarket or canteen)	Supermarkets	supermarkets	Supermarkets
Value frame (e.g. health, environment or animal wellbeing)	Environment	Environment and slightly animal well-being	Environment
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Governmental parties and inquirers	Inquirers	Inquirer
Evaluation criteria of success	Effect-level and process-level	Effect-level	Effect-level
Brief outcome of intervention(s)	"Carbon labelling has developed as a meaningful market-oriented tool to motivate greenhouse gas emission reductions (Liu, Wang,&Su, 2016). Rööös, Sundberg, Tidåker, Strid, and Hansson (2013) encourage the implementation of carbon labelling for meat products but emphasised that such a label can generate conflicts with other environmental externalities as it assesses only one aspect of sustainability."	"Our study illustrates that consumers like to be informed about the sustainability issues related to their food choices. Consumers are willing to pay the highest price premium for free range chicken breast (i.e., free range-total freedom, traditional free range, and free range), followed by chicken breast with an EU animal welfare label, carbon footprint labels (30% and 20% CO2-reduction), and organic logos (the Belgian Biogarantie and EU organic logos). High income consumers are willing to pay a 50% higher price premium for sustainability labels on chicken breast compared to those in the low income group. Overall, our study suggests that the free range claims are liked by more than 9 out of every 10 consumers who also place the highest value on them in terms of WTP. These are followed by an animal welfare label, carbon footprint label and, lastly, organic logos. While labels for both certified organic production and carbon footprint are of importance to consumers, these are valued less than a label on animal welfare certification at the EU level. The Belgian organic food label performs better in terms of consumer liking than the EU organic food label, although this may be due to lower recognition of the new EU organic logo and poorer knowledge of its meaning." [...] "Our study also shows that a vast majority of consumers (87%) would welcome the introduction of an EU level animal welfare label. The carbon footprint labels and the organic labels are less appealing to consumers, who have lower willingness to pay for these labels. Belgian consumers prefer the national Belgian organic food logo, certified by a private organization, to the newly-introduced EU organic food logo."	"We find that consumers choose less steak and chicken in favor of veggie burgers when effective environmental information is provided. The combined finding of choosing less steak and less chicken may indicate a trickle-down effect of steak buyers substituting steak for chicken and chicken buyers substituting chicken for veggie burgers." [...] "We show that consumer attitudes translate into more corresponding eco-friendly behavior when the eco-friendliness information of the food products is more accessible. We find that the best environmental information label preselected in an online survey increases the overall eco-friendliness of our subjects' food consumption in the experimental market by about 5.3%. [...] "This finding is in line with Vanclay et al. (2011) who found in a supermarket experiment that sales increased 4% for products with a 'green light' carbon label." [as noted in Kurz, 2017: p. 33] In a test of an environmental label in an experimental supermarket by Vlaeminck et al. (2014), the share of meat products dropped by around 20 percent in their most effective treatment."
Practical implications/future recommendations	"Governments, manufacturers, and marketers therefore need to raise consumers' carbon literacy to encourage more informed choices related to carbon labelling (Sharp&Wheeler, 2013). For targets related to climate change to be attained and responded to, sources of information must be trusted and attractive; the message relevant, clear and coherent; and the audience motivated and able to act (Fielding, Hornsey,&Swim, 2014). [...] "It is important therefore that a carbon labelling scheme is carefully introduced to avoid confusion. Hence, Rööös et al. (2014) recommends that products are placed in one of three groups according to a red/yellow/green 'traffic light' system."	It makes sense – at least temporarily – to still supplement the mandatory EU organic logo with the voluntary national one. Adding a free range claim to organic meat products seems to be an attractive option. All three labels together, however, might result in information overload in which case the national organic logo is the most logical to be dropped. Although the carbon footprint label does not yet exist on the Belgian market, the large share of consumers who express positive preferences for one suggests that, if made available in the future, it may become successful, especially if targeted at those consumers who attach a high importance to ecological footprints when making food choices. Our study also suggests that new harmonized labeling, incorporating information about environmental impacts would be appreciated by consumers.	"This finding can serve as evidence that consumers may be prepared to reduce their meat consumption (or switch to lower environmental impact meat categories) if they are informed at the point of sale through efficient environmental information." [...] "Our experimental finding that the multi-criteria label with a standardized score as used in this paper significantly promotes eco-friendly food consumption can serve as a piece of scientific evidence for public authorities and companies to further explore and implement a new more complete, easy-to-interpret and standardized environmental information label."
(Potential) explanation of outcome	"Carbon labelling of food products can influence consumer purchase decisions but consumers are likely to know little about the actual carbon footprints of meat or its substitutes." "Consumers are increasingly aware of the environmental impact of the food they consume (Briggeman&Lusk, 2011). Nevertheless, sales of products with environmentally positive attributes (i.e. organic foods) are low for various reasons: perceived high price, strong habits governing food purchases, perceived low availability, lack of marketing and information, lack of trust in the labelling system, and low perceived customer effectiveness (Rööös et al., 2013). These obstacles also apply to products that display a carbon label and in many cases are heightened as they may not bring any personal benefit to the consumer." [...] "Consumers shop quickly and habitually, and consequently may not notice carbon labels amongst a large number of other labels that are frequently displayed on products (Sorensen, 2009). [...] However, human behaviour is complex and altering consumer practices towards more environmentally tendencies presents many challenges. It is recommended that health should remain the overarching principle for policies and actions".	None	None
Variable of conceptual model (max. 3)	Barriers and abilities; attitudes	Barriers and abilities	Barriers and abilities
Meat group	Combination	Poultry	Combination
Note/comment	-	-	-

	51. Hoogland et al. (2007)	1. BuildDesk Benelux B.V. (2011)	7. Bernburg (2018)
Used theory/theories	Varying theories on determinants of food consumption	None	None
Nature of research	Mixed	Mixed	Quantitative
Number of analyses	single study	single study	single study
Sample group	371 customers of a Dutch supermarket in Amsterdam	Inhabitants of Ghent and its commuters	Belgians
Short explanation of intervention	"We tested how consumers recognize, understand and value on-package information about food production methods that may contribute to a more sustainable agriculture. Nine copy tests were formed, each containing one out of three products and one out of three panels of information. The products were (1) fillet of chicken, (2) semi-skimmed milk and (3) fillet of salmon. The panels of information were (a) a certified organic logo and details about the animal welfare standards of organic products, (b) just the logo, or (c) a statement in which the product was attributed to the world market." A questionnaire [with Likert scales] measured the subset of three copy tests. "Each participant filled in the questionnaire about three different products. The product was combined with one of three information panels."	(see Leenaert, 2012) <u>Donderdag Veggie</u> dag: a campaign initialised by EVA (Ethical Vegetarian Alternative) that encourages the "big public" (p. 29) in not eating meat on thursdays for health and environmental purposes. Measures to reach this goal are communication campaigns (shared via TV-commercials, city magazines, websites and posters throughout the city) and events. The city of Ghent's identity is a recurring part in the campaign.	(See Leenaert, 2012). <u>Donderdag Veggie</u> dag: a campaign initialised by EVA (Ethical Vegetarian Alternative) that encourages the "big public" (p. 29) in not eating meat on thursdays for health and environmental purposes. Measures for this goal are communication campaigns (shared via TV-commercials, city magazines, websites and posters throughout the city) and events. Ghent's own characteristics are a recurring part in the campaign.
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	point of purchase actions	campaigns; raising awareness	campaigns; raising awareness
Year of intervention	2004	2009, although the campaign recurs every year	2009-2017
Target group/population	European consumers ("The Netherlands, where our experiment was located, can stand as a good example of the European situation")	Inhabitants of Ghent and its commuters	Inhabitants of Ghent and its commuters
Place of intervention (e.g. supermarket or canteen)	Supermarket	Schools, governmental agencies, catering industries and the 'everyday places that inhabitants visit' of the city of Ghent	Schools, governmental agencies, catering industries and the 'everyday places that inhabitants visit' of the city of Ghent
Value frame (e.g. health, environment or animal wellbeing)	Environment	health; environment; animal-well being and taste	health; environment; animal-well being and taste
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Thursdays in general	Thursdays in general
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Inquirers	EVA (Ethical Vegetarian Alternative) vzw and governmental parties	EVA (Ethical Vegetarian Alternative) vzw and governmental parties
Evaluation criteria of success	Effect-level	Effect-level and process-level	Effect-level
Brief outcome of intervention(s)	1. "It appeared that the logo [b] did not play the role of a well-understood shopping aid, as consumers tended to underestimate its distinctive value. In contrast, detailed on-package information about animal welfare standards [a] led to overgeneralizations based on associations between animal welfare, environmental issues, safety and expected prices. As a result, consumers tended to overestimate the premium price of the corresponding products." 2. "we found that the panel with logo and details enabled consumers to choose more in agreement with their personal values than the other conditions. That is, those who endorsed universalistic values had a higher intention to buy the explicitly animal friendly product and those who particularly endorsed safety had a lower intention to buy it."	An estimated reduction of 575,6 tons CO2 per year, based on the amount of participants of the campaign and the amount of vegetarian meals that have been served on schools, restaurants, etc. Approximately 47,3% of the respondents who filled in a questionnaire is willing to change their food consumption behavior because of the campaign.	[translated from Dutch]: "Of all people participated with Thursday Veggie day at least once: - has 43% reduced their overall meat consumption by starting with Thursday Veggie day - did 40% start with not-eating-meat on other days than Thursday because of Thursday Veggie day - is 28% vegetarian because of Thursday Veggie day
Practical implications/future recommendations	1. "More transparency in matters of food can be advantageous to consumers individually and to society at large, as it affects price-value trade-offs." 2. "More transparency of production standards can also be advantageous to society at large. "For policy-makers in government and industry who want to use on-package information as an instrument to foster a more sustainable food system for society [...]: one important lesson is that an information panel will not uniformly elicit changes in beliefs and purchase intentions among consumers with divergent value priorities, especially if there are also interfering beliefs about higher prices." [...] "The latter [label] can only contribute to more sustainable food choices if the information helps them to make sense of the issue immediately. This puts high demands on the presentation of the information, for example, by carefully designing front and back package labels, and on more general forms of transparency that can support the role of on-package information as a proper shopping aid, such as information campaigns organized by government, business or civil society".	None	None
(Potential) explanation of outcome	1. "This type of behaviour can occur because current food production standards are not transparent and consumers are not well informed about conventional and organic farming. One of the crucial points may be that consumers seriously underestimate how much effort producers make to meet the organic production standards, including the animal welfare standards that are considered valuable by many people. It is difficult for producers to communicate the nature of their production standards and the rationale for a premium price in the context of a supermarket that sells both conventional and organic products." 2. "The explanation may be that those consumers who are very concerned with their personal health and safety—i.e., value priorities that belong to the "conservation" part of Schwartz' value circle—do not completely trust organic production standards, which may be relative new to them."	None	None
Variable of conceptual model (max. 3)	Barriers and abilities	Practice; barriers and abilities; personal characteristics	Practice; barriers and abilities; personal characteristics
Meat group	Combination	Combination	Combination
Note/comment	Experiment got done in 2004, which might raise problems generalizing these results to the current state of affairs.	"The effects of the campaign Donderdag Veggie dag are researched on the campaign's components due to a lack of resources. The total effect has not been scientifically studied yet."	-

	30. Leenaert (2012)	52. de Keyser et al. (2012)	20. Garnett et al. (2015) - Chapter 7: Meatless Monday
Used theory/theories	None	None	None
Nature of research	Mixed	Quantitative	Quantitative
Number of analyses	single study	single study	single study
Sample group	The city of Ghent in Belgium	Primary-school children aged between 6 and 12 years from two primary schools located in Ghent	a sample of US citizens
Short explanation of intervention	"Much like the Meat free Monday campaign [...], <u>Thursday Veggie Day campaign</u> encourages people to have one vegetarian day a week. [...] On May 13 2009, the kick-off event was held and was meant to gather as much publicity for the campaign as possible. About six hundred people came to the square to take the Thursday Veggie Day Pledge, committing themselves to having at least one vegetarian day each week. As a stimulating reward, they got a goodie bag with products, a recipe booklet, an apron, etc. They could taste vegetarian products, follow on stage cooking courses, get more information, and even play veggie games." 1000 street maps with vegetarian (option) restaurants and background info regarding the campaign got distributed via local a paper. "At the same time, EVA had developed 'Veggie for Chefs' brochures, in which we explain to restaurant and catering staff why and how to put vegetarian dishes on the menu, and which provided a lot of recipe suggestions. About a thousand of these guides were sent to restaurants in the city, announcing that they could also qualify for free vegetarian cooking lessons. On October 1, the campaign was rolled out in 35 city schools. EVA and staff from the different city departments sat together with Deliva, the central catering business providing the school lunches to discuss what was probably the biggest order of vegetarian dishes ever in the country." [...] "Some of the principles underlying the Veggie day campaign are: - emphasis is on the alternatives and its benefits, not on the lack of meat - feasible: one day without meat/fish is something that any of us should be able to do. - challenging and fun. - empowering; the consumers can do something about the environment and their	1242 main course plate wastes of menus with meat and 472 plate wastes of meat-free menus on the 'Thursday Veggie Day' got observed to determine the acceptability to children of vegetarian lunches served on the Thursday Veggie Day.	<u>Meat Free Monday</u> : "this campaign encourages people to avoid eating meat on Mondays on grounds of health and the environment. This is another example of an intervention that straddles the typological divide presented in this report; it is an 'awareness raising' initiative [...], but it also changes the 'context of consumption' – the subject here – here since hundreds of food service companies, health care providers, schools, businesses and university campuses, have signed up. These signatories promote vegetarian options on Mondays to their customers; meat is generally still on offer, but vegetarian dishes predominate."
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	campaigns; raising awareness	changing the choice supply; raising awareness	campaigns; raising awareness
Year of intervention	Poll is from March 2011, although the campaign occurs annually since 2009	2009	initiated in 2003 and returning annually
Target group/population	Inhabitants of Ghent and its commuters	Primary-school children aged between 6 and 12 years	People who are neither vegetarian, nor vegan
Place of intervention (e.g. supermarket or canteen)	Schools, governmental agencies, catering industries and the 'everyday places that inhabitants visit' of the city of Ghent	Primary-school canteens	Mostly supermarkets and canteens
Value frame (e.g. health, environment or animal wellbeing)	health; environment; animal-well being and hunger	Health	Health and environment
Eating occasion (e.g. on the go meal or dinner)	Thursdays in general	Lunch	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	EVA (Ethical Vegetarian Alternative) vzw and governmental parties	EVA and inquirers	Companies and/or inquirers
Evaluation criteria of success	Effect-level and process-level	Effect-level	Process-level
Brief outcome of intervention(s)	"At the public schools, about 94% chooses the (default) vegetarian dish on Thursdays, even though a meat option is available. The poll of March 2011 shows that awareness of the campaign in Ghent is 70%. About 25% or 60.000 people participate at least a several times a month."	"Overall, the findings of the study indicate that the children from the examined primary schools in Ghent find the vegetarian lunches as acceptable as the conventional menus. This suggests that vegetarian meals may be acceptable as part of the usual menu cycle on other weekdays. Certainly, there was no evidence that less of the vegetarian main course was being consumed than the conventional main course, nor was there any evidence of compensatory additional consumption of the soup or dessert courses when a vegetarian main course was offered. In fact, when vegetarian main courses were offered, significantly less soup and dessert were consumed".	"In 2012 Meatless Monday commissioned an online survey of US citizens' meat consumption trends and assessed the role of Meatless Mondays. Of those surveyed, 59% said they had cut back on meat in the past year, and 41% were trying to do so. About 30% said they had not cut back and did not intend to. 43 percent of respondents were aware of Meatless Mondays, and of those 36% said the initiative had influenced their decision to cut back or consider doing so." [...] "Sodexo, a large US food service company involved in Meatless Mondays since 2011 surveyed its participating sites in 2012. Of the 245 respondent who took part in the survey (a 15% response rate), 74% offered meatless Monday meal options, 64% said they would continue to offer this option, and 24% responded they might continue. 76% felt it was easy or very easy to promote this option. As to purchasing behaviour, 56% saw no change and 30% saw a decrease in meat purchases. Forty nine percent reported an increase in vegetable sales, with 46% seeing no change; 5% saw a decrease in vegetable sales (Leidig 2012)".
Practical implications/future recommendations	"We believe that government can play an active role in regulation, subsidizing, taxing products that are bad for our health and for the environment, and raising awareness around these problems as well as the alternatives." [...] "One principle which may make it easier for governments to play a role in raising awareness around meat consumption is choice architecture. Choice architecture (synonyms are choice editing and nudging) is about trying to influence decisions (for instance in consumer behaviour) by the way choices are presented. [...] For governments, however, choice architecture may offer an interesting and elegant way out between the extremes of extreme permissiveness on the one hand and enforcement and limiting free choice on the other."	"It [a weekly vegetarian school lunch] may influence childhood eating behaviour over the rest of the week, and it may also influence the wider family eating behaviour if the child finds the vegetarian school lunch palatable. On the other hand, the potential of only environmental changes to improve dietary behaviour should not be overestimated. As reviewed by Van Cauwenbergh et al., strong evidence of positive effects on fruit and vegetable intakes was found in children only for multicomponent interventions combining education and environmental changes. Therefore, EVA has published 'Thursday Veggie Day' educative tools for teachers, a step-by-step plan for implementation in schools and promotional material (http://www.donderdagveggiedag.be)."	None
(Potential) explanation of outcome	"Communication is extremely important. When Ghent's councillor of education Rudy Snoeck announced that city schools would participate in the campaign, the city's major local newspaper wrote on its cover page that Ghent wanted to force pupils to eat vegetarian, even though we clearly communicated that there would be no question of any enforcement. People, it seems, are very protective of their right to eat meat, however much they want, whenever they want. EVA obviously feels that the partnership with the local government has been very important and fruitful. In terms of city marketing, the campaign was a huge success, with pictures of Ghent's wonderful historical centre appearing on websites and in newspapers all over the globe."	None	None
Variable of conceptual model (max. 3)	Practice; barriers and abilities; personal characteristics	Practice; barriers and abilities; personal characteristics	Practice; barriers and abilities; personal characteristics
Meat group	Combination	Combination	Combination
Note/comment			"Other factors (e.g. changes in food prices due to the economic downturn) also need to be considered as possible contributory factors."

	54. Leidig (2012)	55. Boerdam (2018)	53. VeeteeltVlees (2012)
Used theory/theories	None	None	None
Nature of research	Mixed	Mixed	Mixed
Number of analyses	single study	single study	single study
Sample group	245 food service sites that implemented Meatless Monday ideals	Participants of the Dutch national week without meat	Unknown
Short explanation of intervention	"In 2003, the national non-profit Meatless Monday campaign was established as a public health initiative to help reduce consumption of saturated fat". [...] Sodexo [a food service company, which serves more than 9.3 million meals a day] first launched Meatless Monday in January 2011." [...] Then a year after its implementation "surveys were distributed internally and electronically via email to the general managers in all of Sodexo's U.S. food service accounts".	Nationale Week Zonder Vlees: This campaign tries to get as many participants (companies and individuals) to not eat meat during one week in March. These were gathered by raising awareness by spreading information and inspiration via media (ranging from magazines to TV-interviews and flyers, but also sharing presentations for primary and high schools. The goal of the campaign is to raise awareness in The Netherlands about the positive impact that meat consumption reduction can bring, but also to show how easy making this shift can be.	This campaign is not to reduce meat consumption, but rather to emphasize the presence of meat in a well balanced diet. In that sense this campaign is a countervoice against campaigns as Thursday VeggieDay that aim to reduce meat consumption. The campaign is based around the introduction of the term 'flexivoor' and is about sharing an advertisement of fish and beef on a plate combined with a few lettuce leaves. Underneath the photo one can read the nutritional values of meat, the variance meat can offer for meals and it comforts consumers about the ethically interaction with animals for food production.
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	campaigns; changing the choice architecture	campaigns	raising awareness
Year of intervention	2011	2018	2012
Target group/population	Sodexo food service accounts following Meatless Monday	Dutch inhabitants and companies	The Flemish consumer
Place of intervention (e.g. supermarket or canteen)	Health care and corporate canteens	Irrelevant	Irrelevant
Value frame (e.g. health, environment or animal well-being)	Environment and health	Environment and health	Health, environment and animal well-being
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Sodexo	Stichting Nationale Week Zonder Vlees	VLAM and inquirers
Evaluation criteria of success	Effect-level	Effect-level	Effect-level
Brief outcome of intervention(s)	"almost 75 percent offered Meatless Monday in their units, increasing vegetarian options and encouraging healthier food choices." [...] "65 percent of the participating providers said they would continue to promote Meatless Monday." [...] "The majority of sites found neither a decrease nor increase in sales, and one account found that customers were willing to pay as much for meatless options as for those containing meat proteins. This suggests that the Meatless Monday promotion, on average, maintains sales and may increase customer satisfaction." [...] "Of the participants who promoted the Meatless Monday campaign, 77 percent considered the promotion to be "easy" or "very easy" to implement. In other words, the majority of clients who adopted Meatless Monday found it feasible to execute." [...] "51 percent of the providers, saw no change in retail sales on Monday; 19 percent reported an increase in sales, while 30 percent experienced a decrease in overall sales. Several of the participants were not sure of their sales records". [...] Meat and vegetable purchasing both shifted in desired directions during the program period. While 56 percent of food providers reported no change in meat purchasing, 30 percent decreased their purchase of meat products, of which 20 percent saw a decrease of 6 percent or more. This decrease in purchasing might decrease their costs, and can also have significant environmental impacts. Vegetable purchasing increased at 49 percent of food providers surveyed, with more than one third reporting an increase of 6 percent or more; 46 percent reported no change in vegetable purchasing".	32.000 registered participants; 500.000 more containers of plant-based substitutes by Vivera were sold compared to a 'normal week';	"The campaign significantly has had a positive effect on the imago of meat, according to VLAM. 43 percent of the Flemish inhabitants indicate to pay attention to the presence of a quality label, as opposed to 29 percent before the campaign."
Practical implications/future recommendations	None	[translated from Dutch]: "In March 2019 we will proceed with this campaign. I look forward to further relations with national and local governments. I hope, just as the municipality of Amsterdam did this year, more municipalities will connect to our ideals. Furthermore, I would like the national Dutch government commits itself to spreading our message. For instance, it would be great when ministers would lead by example and choose for a meat-free-week."	None
(Potential) explanation of outcome	None	None	None
Variable of conceptual model (max. 3)	Barriers and abilities	Personal characteristics; barriers and abilities; practice	Personal characteristics
Meat group	Combination	Combination	Combination
Note/comment	-	"Registered participants" are Facebook users who have liked a page saying he/she will participate in the Dutch National Meat free week. However, this source might not be reliable, but can give an indication of the number of people willing to participate.	Note that this intervention is done and reported by 'pro-meat' institutions. Furthermore, this intervention got nominated for Belgian 'green wash campaign' of the year 2012. Lastly, one might ask why the evaluation is on quality labels, as these are not present in the poster.

	3. Bakker & Dagevos (2010) - chapter 3: price policies in general	4. Bakker & Dagevos (2010) - chapter 3: Biological products price experiment by Bunte et al. (2007)	15. Garnett et al. (2015) - Chapter 7: price interventions
Used theory/theories	Rational choice theories	Rational choice theories	None
Nature of research	Mixed	Quantitative	Mixed
Number of analyses	meta-analysis	single study	meta-analysis
Sample group	Several sample groups	Populations living nearby one of the ten supermarkets in the Netherlands where eight biological product groups were strongly reduced in price	Several sample groups
Short explanation of intervention	Trying to steer the consumer towards a reduction in its consumption of meat by means of taxing or subsidizing price interference in meat (alternative) products. The research does not stop short at interventions targeted on the consumption of meat, but also encloses interventions that have been done to stimulate health in a broader sense and those that foster the consumption of biological food products.	Subsidizing eight biological product groups in supermarkets by + 15 percent to achieve a consumption increase of biological products of 5 percent	"Taxes on SSBs saturated fat, and/or subsidies on fruits and vegetables"
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014) (max. 3)	Fiscal measure	fiscal measure	fiscal measure
Year of intervention	Studies that are included are in between 2004 and 2009	2006	Ranging from 2004 to 2015
Target group/population	Varying, but generally food consumers in prosperous countries	The Dutch consumer	People who eat unhealthy regularly
Place of intervention (e.g. supermarket or canteen)	Places where meat (substitutes) are being sold	Supermarkets	Irrelevant
Value frame (e.g. health, environment or animal wellbeing)	Primarily environment	Primarily environment	Health
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	National governments	National government in combination with supermarkets	Inquirers or governments
Evaluation criteria of success	Effect-level	Effect-level	Varying
Brief outcome of intervention(s)	[translated from Dutch]: "Both taxing and subsidizing price interventions are of less influence on food choices of prosperous consumers". [...] and "Especially consumers with lower incomes, according to De Mul et al., 2009, take in a positive position towards price interventions that make healthy foods more affordable. For consumers with less money to spend, price plays a big role in ones food choices". [...] and "The overall image of studies on price interventions is that of varying results. There are some effects, even though unambiguous and convincing scientific proof remains to be seen. [...] Furthermore, the effects of price interventions are hard to measure, as a plethora of other variables are at play regarding food choices: education, income and education, but also meat (substitute) supply, point of purchase presentations, comfort, labels and brand names".	[translated from Dutch]: "The study concluded that the effects varied. With five product groups (milk, mushrooms, potatoes, pork and rice) we observed a top line regarding the effect of price interventions. By further reducing the price of these products, consumers bought slightly more, but not as much that the revenue (price x volume) kept increasing. Price interventions on eggs, ground beef and muesli), on the other hand, seemed to be effective even by further price reductions. The researchers conclude that substantial price reductions can help in greater consumption of biological products, but that this instrument is not enough for realising a 5% increase."	"Several systematic reviews of both simulated and experimental food-pricing studies in developed countries concluded that these measures would improve diets and potentially improve health outcomes although the range in magnitude of impact was not reported. Another systematic review, by Thow et al. comes to similar conclusions. However, the authors draw attention to the high proportion of modelling studies among those reviewed, and their limitations. Models are based on assumptions, subject to data limitations and tend not to consider shifts in consumption within or across food categories - the 'substitution effect'. They also note wide variations in data sources and analytical methods, making comparisons across studies difficult [...] A systematic review of empirical evidence for combinations of subsidies and taxes concludes that the net effects were small and does not recommend the use of fiscal instruments. It also speculates that a single nutrient tax might have unhelpful consequences – for example a fat tax may lead manufacturers to substitute sugar for fat. [...] However the study also noted that price changes could exacerbate social inequalities and warned that financial incentives potentially undermine intrinsic motivation to adopt healthier eating patterns, risking a return to unhealthier behaviours once incentives are withdrawn. [...] Finally, Cornelsen et al. warn against overemphasising the potential role of fiscal instruments in health policy. They note too, the insufficient understanding of how taxes affect costs and decisionmaking further up the supply chain – for example the increased cost to producers may or may not be passed onto consumers, or may be shared across foods, including those
Practical implications/future recommendations	[translated from Dutch]: "Experts state that especially positive price interventions can be effective in stimulating healthy eating behavior (Waterlander et al., 2009). [...] "Our thought is that before discussing about the applicability of meat tax, consumers have to be aware of the production processes and environmental consequences of meat consumption. [...] Fiscal measures should not be used as a means to steer consumer behavior, but should also and especially be connected to ethical (and economic) justice. This is even more the case when placing it in the framework of societal and political awareness that is needed for a protein-shift."	None	"The systematic review by Thow et al. discussed above reported on a range of studies which found differing impacts on low-income consumers. Some find that taxes disproportionately affect low income groups who do not reduce their consumption habits, and for whom the impacts on overall household budgets are disproportionately large, while others find these taxes to be only slightly regressive. Thow et al. argue that a combination of taxes and subsidies could reduce regressive effects. [...] Some studies also point out that government revenues gained from taxes could be used for public health measures or other services, which could increase their public acceptability. [...] Their [Cornelsen et al.] conclusion is not that fiscal measures should be avoided but that the empirical evidence base is poor and that these instruments constitute just one of a range of needed approaches to alter the context in which people consume."
(Potential) explanation of outcome	[translated from Dutch]: "As an explanation one can point to the weak price elasticity of agricultural products (Berkhout, 2007; Berkhout en Roza, 2007; Boer et al., 2006). For instance, a price increase of 10% leads to a decrease in demand of just 0,1-1,5%. In other words, in more prosperous countries is the food demand up to a certain height insensitive for price changes." [...] "The sidenote has to be made that research to price interventions is liable for methodological problems, as the research very often is not carried out in a controlled environment. Furthermore, there are administrative and practical barriers to price interference in food products. Price taxes could juridically seen only be introduced in domestic areas (which would put burdens on the Dutch international economic position), as placing a consumer levy on foreign countries is not legally allowed in the European Union. Price interference would also be exposed to practical problems as defining the borders of what a meat product constitutes of".	"The explaining factor could be that the latter three products all had large price differences with non-biological products, while this difference was smaller with the other five product groups".	"Taxes may also reinforce efforts to educate consumers; being aware that a product has been taxed because it is unhealthy may discourage purchases."
Variable of conceptual model (max. 3)	Barriers and abilities	Barriers and abilities	Barriers and abilities
Meat group	Combination	Combination	Combination
Note/comment	-	The study got carried out in 2006, which might trouble interpreting the results for the current context.	-

	25. Hoek et al. (2017) - Price	45. Edjabou & Smed (2013)	17. Garnett et al. (2015) - Chapter 7: free or subsidized school fruit and vegetables
Used theory/theories	Previous research done on this topic	Rational choice theories	None
Nature of research	Quantitative	Quantitative	Quantitative
Number of analyses	single study	meta-analysis	meta-analysis
Sample group	A quota sample that is a representation of Australian household grocery buyers	a representative sample of 2000 Danish households	Several sample groups
Short explanation of intervention	The research has the form of choice experiments (e.g. "would purchase 10 chances in 100") in which participants could choose between a 'regular' food product and a more sustainable and healthy option. In this case white rice as compared to brown rice; kangaroo steak as compared to beef steak and fresh tomatoes as compared to tinned tomatoes. Interventions were done in form of price change (for standard products ranging from standard price to 20 percent higher, for alternatives ranging from market price to 30 percent lower).	Four conditions of price interventions are tested on various food products in the Danish context to get insight on the price elasticity of these products. 1a: tax all food products on their carbon emissions by 0.26 DKK per kg. 1b: tax all food products on their carbon emissions by 0.76 DKK per kg. 2a: compensate the tax with other products, but maintain the price of 0.26 DKK per kg. 2b: compensate the tax with other products, but maintain the price of 0.76 DKK per kg.	"A number of countries have sought to improve the health of children by providing free or subsidised school fruit and sometimes vegetables to children at primary level". A systematic review and meta-analysis of school programmes assessed the impacts of 27 programmes, involving over 26,000 children in the US, New Zealand and various European countries. Twenty one were eventually used in meta-analyses.
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	fiscal measure	fiscal measure	changing the choice supply; point-of-purchase actions; fiscal measures
Year of intervention	2014	2006-2008	Varying
Target group/population	Australian household grocery buyers	Danish consumers	School children
Place of intervention (e.g. supermarket or canteen)	Supermarkets	Irrelevant	Schools
Value frame (e.g. health, environment or animal wellbeing)	Health and environment	Environment and slightly health	Health
Eating occasion (e.g. on the go meal or dinner)	Meals prepared at home	Irrelevant	Meals consumed in schools
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Inquirers	Danish government and inquirers	Schools, governments or NGOs
Evaluation criteria of success	Effect-level	Effect-level and process-level	Effect-level
Brief outcome of intervention(s)	"Generally show that price, particularly a decreased price (subsidy) for the healthy and sustainable food products, had the biggest effect [of all interventions done in this study, see next two columns] on shifting consumer choices. The responsiveness of consumers to the investigated measures was largely influenced by product familiarity and liking of the healthy and sustainable alternative." [...] We found that the key consumer factors that explained product choices related to past product experience and product liking of the healthy and sustainable option. Surprisingly, general food attitudes, as measured by attribute determinance, showed that the importance attached to sensory/hedonic food choice factors (e.g. taste) were the main differences between the consumer segments, as opposed to their health or environment orientation." [...] "Consumers' subjective knowledge about healthy and environmentally friendly foods was generally higher among the consumers that chose the healthy and sustainable alternatives. However, this was not a key determinant for consumer responsiveness. Garnett et al. (2015) outline that a higher level of knowledge among current buyers of healthy and sustainable food products indicates correlation but not necessarily causation: i.e. providing education will not necessarily shift other consumers towards healthier and more sustainable	"Generally, the results show a low cost potential for using consumption taxes to promote climate friendly diets." Table D1: The price elasticity of beef is in Denmark -1.184, that of 'other meat' is -1.007. Fish and pork are respectively -0.794 en -1.178. Poultry has the biggest elasticity with -1.438. If there is looked at the cross elasticity, other results are measurable. Beef - pork has the strongest cross elasticity with 0.521. That means, when the price of beef rises with 10 percent, 5.21% more pork will be sold. The most effective system in Denmark would be a carbon tax on all food (situation 1) (here, the prices of other foods are left unchanged, as opposite to situation 2). In this efficient situation, the integrated price of CO2 emissions is 0.76 DKK per kg (situation 1b (% increase of 32.4 on beef) and 2b (% increase of 25.3) (instead of 0.26DKK - situation 1a (% increase of 11.1) and 2a (% increase of 8.5)). Especially beef is sensible for carbon taxes (explanation is the very high emissions of CO2 that are related to the production of beef meat). The influence of 2b is in-between -6 en -32 (differs per research), while the influence of 1a is limited to -6 en -16.	"The schemes on average led to an increase in fruit and vegetables— by 0.25 portions if fruit juice was excluded and by 0.32 portions including juice. These were mainly increases in fruit but not vegetable consumption. It also found that multiple interventions (i.e. provision of fruit and vegetables as well as efforts to motivate children to change their eating behaviours) were more effective than single-component programs that simply provided the produce. However, teachers who rated programs for ease of use rated distribution-only programs easier to implement than multicomponent programs. The study's overall conclusion is that school-based interventions moderately improve fruit, but have minimal impact on vegetable intakes. [...] It is worth noting however, that negative substitution or compensatory behaviours may sometimes arise following an intervention. [...] It is also important to note that trial interventions in school canteens and so forth may rely on goodwill by the vendor, caterer, or school authorities in accepting revenue losses during the trial period. They may not be willing to accept permanent losses at larger scale, raising questions about the feasibility of scaling up interventions without enforcement or compensatory mechanisms."
Practical implications/future recommendations	"If the choice for an alternative product does not involve a loss of highly valued product-specific benefits (i.e. flavour preference, convenience), the balance can be tipped to the healthy and sustainable alternative by price measures, and to a lesser degree health and environment logos and labels. The closer the substitutes are, the easier it is to tip the scale under influence of these measures. Most importantly, if consumers are familiar with a healthy and sustainable product and like it, it will be easier to tip the scale."	None	None
(Potential) explanation of outcome	None	None	None
Variable of conceptual model (max. 3)	Barriers and abilities	Barriers and abilities	Barriers and abilities
Meat group	Combination	Combination	Non-meat
Note/comment	-	-	-

	5. Bakker & Dagevos (2010) - chapter 3: Fattax	32. Hyland et al. (2017) - carbon taxes	16. Garnett et al. (2015) - Chapter 7: nutritional standards for school meals
Used theory/theories	Rational choice theories	Rational choice theories	None
Nature of research	Quantitative	Mixed	Mixed
Number of analyses	meta-analysis	meta-analysis	meta-analysis
Sample group	Several sample groups	Several sample groups	Several sample groups
Short explanation of intervention	Taxing food products high in fat as a fiscal means to counter obesity	Carbon taxes (Pigovian tax): "The negative environmental externalities associated with meat consumption could be mitigated in theory by means of a Pigovian tax. A Pigovian tax involves an increase in prices which corresponds to the marginal damage costs; therefore, meat products would carry their related social costs."	"The UK government has also introduced nutritional standards for school meals. [...] The Food for life Partnership (FFLP) is a UK voluntary award scheme for schools led by the UK's organic charity, the Soil Association. It seeks to improve both the nutritional and environmental quality of school meals. Participating schools can work towards bronze, silver or gold catering mark awards; bronze targets are largely health oriented but silver and bronze standards incorporate ethical, animal welfare and environmental criteria." [think of 'Gezonde Schoolkantine']
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	fiscal measure	fiscal measure	governmental regulations; campaigns
Year of intervention	Studies that are included are inbetween 2004 and 2007	Studies range from 2007 to 2015	Varying
Target group/population	People buying food products that are high in fats	Meat consumers	School children
Place of intervention (e.g. supermarket or canteen)	Places where food is sold that is high in fat	Supermarkets	Schools
Value frame (e.g. health, environment or animal wellbeing)	Health	Environment	Health
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Meals consumed in schools
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	National government	Governmental parties and inquirers	Schools, governments or NGOs
Evaluation criteria of success	Effect-level	Effect-level and process-level	Effect-level
Brief outcome of intervention(s)	[translated from Dutch]: "When only the food products highest in fat are taxed, the health effects are nil"	"Carbon taxes offer many advantages and can be an effective means of mitigation. For instance, Säll and Gren (2015) found that a tax on meat and dairy consumption could reduce GHGE by 12% in Sweden. However, it has been shown that consumers respond unfavourably to such taxation measures (Vanhonacker, Van Loo, Gellynck, & Verbeke, 2013)."	"A pre- and post-implementation evaluation found improvements in the nutritional profile of the meals and also found them to be more nutritious than packed lunches. [...] Outcome of FFLP: "One qualitative impact evaluation of the FFLP focusing on 15 of the participating 3600 schools concluded that, for the schools reviewed the FFLP had helped schools transform their food culture (i.e. school meal times were made more attractive and children were more knowledgeable of and engaged in food issues); take up of school meals in participating schools increased as did fruit and vegetable consumption; educational attainment improved while parental engagement in the scheme was strong; and the schools' interaction with the local community increased" [...] However the study did not quantify children's uptake of schools meals in the two periods. One shortfall of these studies is that they do not measure impacts on actual health outcomes, such as the incidence of obesity."
Practical implications/future recommendations	[translated from Dutch]: "Oliver Mytton et al. (2007) observe that only when a broader range of unhealthy foods are taxed, effects will occur."	None	None
(Potential) explanation of outcome	[translated from Dutch]: "By only taxing the foods highest in fat, health effects are nil because of substitution-effects. Food choices are strongly interdependent, therefore. Because margins between prices of food producers and final supermarket prices are high in developed countries, an increase in the producer prices does not lead to the desired effect - this price only determines a small part of the final price the consumer has to pay".	None	None
Variable of conceptual model (max. 3)	Barriers and abilities	Barriers and abilities	Barriers and abilities
Meat group	Combination	Combination	Non-meat
Note/comment	-	For snowball-search: Wirsenius, S., Hedenus, F., & Mohlin, K. (2010). Greenhouse gas taxes on animal food products: Rationale, tax scheme and climate mitigation effects. Climatic Change, 108(1-2), 159-184.	-

	18. Garnett et al. (2015) - Chapter 7: advertising and marketing	31. Lorenz & Langen (2018) - (lack of) European policies on sustainable food consumption	34. Hyland et al. (2017) - nutritional guidelines
Used theory/theories	None	The ecological systems theory and personal behavioral determinant theories	None
Nature of research	Mixed	Mixed	Mixed
Number of analyses	meta-analysis	meta-analysis	meta-analysis
Sample group	Several sample groups	Several sample groups	Several sample groups
Short explanation of intervention	Combatting the amount and nature of food advertising and marketing that promote "high-salt, -sugar and -fat products"	European policies on sustainable consumption in its general sense.	"Policy makers must ensure that dietary guidelines go beyond concern for current generations and encompass the nutritional and environmental needs of future consumers (Clonan et al., 2014). Thus, the concept of assimilating sustainability into nutrition policies is gaining global momentum."
Intervention measure(s) (based on Garnett (2014) and Laestadius (2014)) (max. 3)	governmental regulations	governmental regulations	raising awareness; governmental regulations
Year of intervention	Varying	Unknown	Studies range from 2012 to 2016
Target group/population	Receivers of food marketing/advertisements	European food consumers	The national citizen'
Place of intervention (e.g. supermarket or canteen)	Irrelevant	Out-of-home food sector	Irrelevant
Value frame (e.g. health, environment or animal wellbeing)	Health	Environment	Environment
Eating occasion (e.g. on the go meal or dinner)	Irrelevant	Irrelevant	Irrelevant
Agent of change (e.g. Voedingscentrum or Rijksoverheid)	Governments or NGOs	Governmental parties on the European level	NGOs and governments
Evaluation criteria of success	Effect-level	Process-level	Effect-level and process-level
Brief outcome of intervention(s)	"As regards the influence of food advertising to adults, one review noted the poor quality of available evidence and found that at present results do not show conclusively whether or not food advertising affects food-related behaviour, attitudes or beliefs in adults. It suggests, though, that the impact varies inconsistently within subgroups, including gender, weight and existing food psychology." [...] "Dhar and Baylis (2011) study the effect of a ban on advertising of unhealthy food to children in the Canadian province of Quebec. The authors examined whether spending on fast food is lower in groups affected by the ban than in those that are not. Given Quebec's media market and demographic composition, the ban disproportionately affected French- rather than English-speaking households and did not affect similar households in Ontario or childless households in either province. The authors found that French-speaking households with children in Quebec were significantly less likely to purchase fast food than equivalent French speaking households in Ontario or English speaking households in Quebec. They estimated that the ban significantly decreased the propensity to consume fast food by 13% for the affected households and that if anything this was an underestimate." [...] "A systematic review of 47 studies by Chambers et al. came to a similar	"A major criticism with respect to European policies in the broad field of sustainable food consumption currently is the presumed lack of a general framework. More precisely, what has been stated being relevant to enhance the sustainability of food consumption is a more integrated application of available instruments to change consumption behaviours toward higher levels of sustainability"	"A resistance remains to the amalgamation of a sustainability dimension into nutritional guidelines despite an increasing amount of dietary recommendations being conscious of the environment. Trevena, Kaldor, and Downs (2015) found that the interpretation of sustainability can shift throughout the policy process when implementing measures to address the issue. Thus, variances in how actors from civil and corporate societies frame its meaning and solution may result in a lack of shared vision to advance the concept. Assimilating climate considerations into national dietary guidelines is problematic due to the complexities of simultaneously achieving dietary guidelines and reducing GHGE associated with food consumption. Red meat is frequently targeted to reduce carbon emissions, yet it is the sole dietary source of certain essential nutrients; thus, eliminating it from diet could present health challenges" [...] Indeed, many studies have shown the difficulties of concurrently adhering to dietary recommendations and reducing dietary emissions (Hendrie et al., 2016; Masset, Soller et al., 2014; Masset, Vieux et al., 2014; Vieux et al., 2012)."
Practical implications/future recommendations	"Restrictions do need to keep pace with technological and market change. Lee et al. (2013) examined the effect of TV food advertising restrictions on food companies' marketing approaches in South Korea, a year after their enforcement. It found that the while the restrictions to an extent encouraged companies to reformulate their energy dense, nutrient poor products to make them more healthy, companies also employed strategies to bypass the regulations by changing marketing channels from TV to other channels (e.g. internet marketing) or by reducing product serving sizes so as to fit within nutritional content specifications. The need to consider the role of non 'traditional' marketing channels such as television is evident."	Out-of-home food consumption is rising in Europe. This sector "should be considered as a relevant setting in which interventions with the aim to facilitate and enable sustainable food behaviours of individuals seem promising"	"Therefore, any food policy instruments developed for health and sustainability reasons should be holistic in nature rather than concentrating on one food group. It is also imperative that nutritional guidelines emphasise that overconsumption of food is inextricably linked to higher dietary emissions; which is one aspect of the sustainable diet discourse that has gathered little attention and yet would have significant implications in not only tackling sustainability but also addressing the increasing global obesity epidemic"
(Potential) explanation of outcome	None	"The currently observable variety of unrelated instruments, focusing only on specific aspects of food settings and food-related behaviours of consumers, may result from inadequate understandings of complex individual food systems and dietary patterns that 'are not only a reflection of what people eat (...) [but which] reflect complex social behaviours' (FAO, 2016b, p. 81)" [...] "These complex systems demand an integrated view on the interactions between the provision and the consumption of food as well as between social, economic and environmental aspects of food in consumers' everyday life"	"variances in how actors from civil and corporate societies frame its meaning and solution may result in a lack of shared vision to advance the concept [of sustainability]. Assimilating climate considerations into national dietary guidelines is problematic due to the complexities of simultaneously achieving dietary guidelines and reducing GHGE associated with food consumption. Red meat is frequently targeted to reduce carbon emissions, yet it is the sole dietary source of certain essential nutrients; thus, eliminating it from diet could present health challenges" [...] However, human behaviour is complex and altering consumer practices towards more environmentally tendencies presents many challenges. It is recommended that health should remain the overarching principle for policies and actions"
Variable of conceptual model (max. 3)	Barriers and abilities	Barriers and abilities	Personal characteristics
Meat group	Non-meat	Combination	Combination
Note/comment	-	There is chosen for the variable of barriers and abilities, as the policies in question in all probability focus on the food environment.	-