

Norges miljø- og
biovitenskapelige
universitet

Master's Thesis 2016 60 ECTS
Department of Chemistry, Biotechnology and Food Science

Social and Socio-Demographic Effects on Food Waste: The Case of Suboptimal Food

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Food Science (Food and health)

Acknowledgements

The study for this thesis was conducted during the period from August 2015 to May 2016 at the Norwegian University of Life Science, Department of Chemistry, Biotechnology and Food Science (IKBM). Supervisor of this thesis was Dr. Marije Oostindjer (PhD), while the main supervisor was Professor Bjørg Egelanddal (PhD). A special thanks to them for making it possible, and a special thanks to my supervisor for all the help and advice throughout this journey.

Furthermore, this journey could not have been accomplished without the important people in my life: my family and my friends. Their moral support, them believing in me, and helping me during difficulties, have encouraged and motivated me to complete this journey. I am especially grateful to my parents, Zohra Bibi and Mohammad Yaqub, for always being there, always believing in me, and for always remembering me in their prayers. I am nothing without you two. I would also like to express my gratitude to my husband, Qadeer A. Awan, for being my motivation, my inspiration, my best supporter, and for always pushing me to work harder at times I didn't think I could. Thank you!

Oslo, Norway,

May 2016

Siddiqua Yaqub

Sammendrag

I løpet av de siste årene, har det vært økt oppmerksomhet rettet mot matsvinn. FAO har estimert 1.3 milliarder tonn matsvinn årlig, hvorav forbrukerne er ett av de største bidragsyterne. Den negative belastningen matsvinn påfører miljøet, den manglende forståelsen bak handlingen og atferden rettet mot matsvinn, og den ujevne fordelingen av mat i verden, har bidratt til økt forskning innenfor dette feltet. Denne type forskning bidrar med å øke forståelsen bak årsakene til matsvinn, som videre kan bidra med å igangsette initiativ og konkrete handlinger for å redusere mengde matsvinn i husholdninger.

Ett av hensiktene i denne oppgaven var å vurdere påvirkningen av sosiale forhold og demografiske faktorer på matsvinn i husholdningen, samtidig som å studere årsakene bak matsvinn, og motivasjonene til å redusere matsvinn. Forbrukernes holdninger mot sub-optimale matprodukter ble også studert. Hvorvidt deres holdninger mot sub-optimale produkter ble endret basert på informasjon om den sosial normen, og hvor miljøbelastende matsvinn kan være, ble også studert.

Abstract

During the past few years, there has been increased awareness and attention towards food waste and food waste management worldwide. FAO estimates approximately 1.3 billions tonnes of food being wasted throughout the food supply chain annually, where food waste from households is one of the main contributors in developed countries. The environmental impact of food waste, the lack of understanding of food waste behaviour, and the unequal distribution of food globally, have led to extensive research in this field. Research conducted on this topic, contribute in increased understanding of reasons behind food waste and food waste behaviour, which furthermore contribute in initiating actions to reduce food waste in households.

The purpose of this thesis is to examine the influence of demographic factors and social context on estimated food waste in households. Additionally, the reasons behind food waste and the drivers to reduce food waste are also studied. Furthermore, by analysing consumers' perception towards suboptimal food, and the influence of different messages on these perceptions and food waste behaviour, also gives an insight in consumers' food waste behaviour.

Definitions

Food supply chain (FSC) = FSC is also referred to as the food system, and it involves the processes of foods journey from the agricultural production, such as harvesting, further through processing, distribution, packaging, marketing, to consumption and waste management (Yamshita 2008)

FAO = Food and Agriculture Organization of the United Nations

Waste and Resources Action Programme (WRAP) = organisation in UK conducting research on food waste in households: increasing understanding towards food waste behaviour. WRAP also conducts varying programs and initiatives at the consumers level to reduce the amount of food wasted.

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Introduction

Food waste and food loss

During the past few years, there have been an increased awareness and attention towards food waste and food waste management worldwide. Even though relative few studies have been able to give an concrete estimation of the total amount of food loss and food waste globally, FAO estimates approximately 1.3 billions tonnes of food being wasted throughout the food supply chain annually (Gustavsson et al. 2011). The agricultural stage of food, food manufactures, retail market, and the consumers, are all contributors to food waste production. The increased concern towards the environmental impact of food waste, the amount of food wasted annually, the unequal distribution of food worldwide, is concerning several fields, and thus, extensive research and studies are being conducted in this field.

Definitions

Varying definitions have been applied and suggested for food waste and food loss, where some literature separates these two terms, and others referring both terms as food waste. Highlighted in different literature, the term food loss is associated with decrease of edible food during the early stages of the food supply chain: post-harvest stage, the food production stage and during food processing (Parfitt et al. 2010). The term food waste is associated with decrease of edible food in the later stages of the food supply chain: at the retail market and at the consumer level (Parfitt et al. 2010). More specifically is food loss referred to spoilage of food before it reaches the consumers and the market level, mainly due to problems during harvesting-, processing-, producing-, transport-, and packaging of food. Food waste is referred as spoilage of food at the consumers level, predominantly due to the consumers' behaviour or surplus production of food (FAO 2015). However, in this thesis food loss and food waste will both be termed as food waste, and both of the terms can be used interchangeably.

Furthermore, when referring to food waste, some literature categorizes food waste according to how avoidable the waste was. According to a report presented by WRAP, waste can be categorised into the following:

- Avoidable waste
- Possibly avoidable waste
- Unavoidable waste

Avoidable waste is defined as “food and drink thrown away that was, at some point before disposal, edible (e.g. for instance slice of bread, apples)”, possibly avoidable is defined as “food and drink that some people eat and others do not, or that can be eaten when food is prepared in one way but not the other (e.g. potato skin), and unavoidable waste is defined as “waste arising from food and drink preparation that is not, and has not been, edible under normal circumstances” (Quested & Johnson 2009). The two former categories are referred to as edible food waste, and it is these two types that are referred as waste in this thesis. Another term utilized throughout this thesis, is ‘suboptimal food’. This term is defined as food that is wasted by the consumer, even though it is edible, consumers perceive the food as less desirable compared to similar food type (Aschemann-Witzel et al. 2015). The food is perceived as less desirable because it is either near or have passed their “best-before date”, or because the food product has an unusual appearance, smell, texture or taste (Aschemann-Witzel et al. 2015).

Food waste in developing- and developed countries

As mentioned above, food waste is a global concern due to its environmental impact. Throughout the food supply chain, the food system can adversely impact the society and the environment in varying manners: through pressurising natural resources e.g. water and land, and through development of contaminated agents e.g. greenhouse gasses and CO₂ (Garnett 2011; Lundqvist et al. 2008). Especially when food is being wasted later in the food supply chain, the usage of these resources is unnecessary.

Additionally, food waste is also a global concern due to the unequal distribution of food worldwide. Even though unequal food distribution exists between high-income countries and low-income countries, food waste occurs in both the developing- and developed world. Large amount of food is being wasted in both of the worlds, however, there is estimated higher amount of food waste in developed countries than in

developing countries *per capita*: in Europe and North America there is an estimation of 280-300 kg/year per capita being wasted, while in Sub-Saharan Africa and South-and Southeast Asia, there is an estimation of 120-170 kg/year per capita being wasted (Papargyropoulou et al. 2014).

In both low-income- and high-income countries, food waste can occur due to varying factors, including spoilage of food due to pests and mould, natural shrinkage, inadequate climate conditions, manufacture and processing complications, inappropriate storage of food, consumers food- behaviour and practice (Buzby & Hyman 2012). Furthermore, as mentioned earlier, food waste can occur at any stage during the food supply chain.

The different stages within food supply chain can roughly be divided into the early stages and the later stages. The early stages involve the harvesting-, production-, processing-, transporting- and storage of food, while the later stages of food supply involves the marketing-, consumption- and waste management of food. Loss of food have been observed both early and late in the food supply chain, and it is at this point the differences occurs between the developing- and developed countries.

In developing countries, food waste mainly occurs early in the food chain (Gustavsson et al. 2011). Within these countries, the main drivers to food waste seem to be associated with technical limitations within harvesting techniques, processing, transport, distribution, packaging, lack of knowledge regarding storage possibilities, and inappropriate market facilities (Godfray et al. 2010; Parfitt et al. 2010).

In contrast to the developing world, food waste in industrialized countries mainly occurs later in the food chain (Gustavsson et al. 2011). Food waste occurs in higher degree at stages associated with the retail, food service, the household and the consumers within developed countries (Godfray et al. 2010; Parfitt et al. 2010). One of the biggest contributors to food waste in developed countries is the consumer.

Food waste in the household

The contribution from households on food waste have been presented from different countries: in UK, of the total amount of 16 million tonnes of food being wasted annually, 8.3 million tonnes of food is from homes (Quested et al. 2011). Furthermore, in USA there is estimated 131 billions tonnes of food being lost during the food supply chain, where food loss by consumers comprise 91 billion tonnes (Buzby et al. 2014), and in Norway, out of 361 000 tonnes food wasted, 231 000 tonnes of food waste is from the consumers (ForMat 2013).

Food waste generated in households is not due to a single behaviour, but is rather a complex process involving consumers food- and kitchen practices, their behaviour and attitude on suboptimal food products, and factors associated with the retail marked e.g. price on the food product, how they are sold and their packaging (Quested et al. 2013; Quested et al. 2011). Additionally, lack of knowledge regarding food labelling e.g. “use by” dates and “best-before” dates, and regarding food storage among consumers, also contributes to food waste production in household.

Impact of the retail marked

The impact of the retail marked on household food waste is associated with how food products are being sold, their prices, their packaging and their labels (Aschemann-Witzel et al. 2016). In a study conducted on Swedish households, the respondents emphasized the influence of packaging: food wastage was due to packaging being too big, difficult to empty or was close to “best-before” date (Williams et al. 2012). Respondents from another study conducted in Finland, highlighted related arguments: in addition to other factors, food wastage was due to the size of the packages and their related prices (Koivupuro et al. 2012). The issue regarding prices on the food is associated with the size of the package: the retail marked promote larger packages to a reduced price. Even though smaller packages would be more suitable for some consumers, dependent on occasion and household size, these types of offers encourages consumers to purchase larger packages rather than smaller packages due to economics savings (Aschemann-Witzel et al. 2016). In similar manner, offers such as “buy-two-get-one-free” and reduced price on products with short “best-before” date also tempt consumers to purchase these kinds of food products, and as a consequence, the

likelihood of purchasing too much food increases, and furthermore increases the likelihood of food wastage in the household (Aschemann-Witzel et al. 2016; Lyndhurst 2007). As observed in different studies: purchasing too much food is one of the main drivers to food waste in the household, together with preparing too much food (Koivupuro et al. 2012; Lyndhurst 2007).

Impact of consumers' behaviour and practices in the household

Additionally, consumers' lack of knowledge and understanding regarding food labels e.g. "best-before"-date and "use by"-date, also impact the amount food wasted in the households (Aschemann-Witzel et al. 2016; Lyndhurst 2007). Highlighted by FSA, the "use-by" date is the date concerning the foods safety, and food products with passed "use-by" date should not be consumed. The "best-before" date is rather referred to the quality of the food products, and products with passed "best-before" date can be consumed based on consumers judgment and visual inspection (WRAP 2008). Consumers' misinterpretation on food labels, and their sensitivity on food hygiene, reveals their poorly understanding towards these aspects, and thus are more likely to discard food products unnecessarily (Koivupuro et al. 2012). This has also been reflected in a rapport on Norwegian consumers, where the majority emphasized passed "best-before" date as one of the main reason behind food waste in the household (Hanssen & Møller 2013).

Amount of food wasted in household is also impacted through consumers' kitchen practices and generally their food practices in the household e.g. planning shopping list, planning meals, and appropriate storage of food (Quested et al. 2013). Concerning the latter manner, inappropriate storage of food have been revealed as one of the main causes of food wastage in household due to lack of knowledge regarding correct storage of food (Aschemann-Witzel et al. 2016; Koivupuro et al. 2012; Lyndhurst 2007). Through incorrect storage conditions, food is more likely to develop bad taste and smell in a short time, and other losses in quality, which results in discarding the food. Furthermore, in addition to practices performed in the kitchen, the influence of demographic factors and social context also seems to impact the amount of food wasted in household.

Impact of social context and demographic factors

Amount of food wasted in household seems to be influenced by varying factors in the household e.g. household size and whether there are children in the household or not, and demographic factors, including age, gender, and educational level. One of two factors that correlate strongly with the production of food waste is household size: higher amount of food waste per capita is identified in smaller households compared to larger households (Koivupuro et al. 2012; Lyndhurst 2007; Quested & Johnson 2009). Possible explanations suggested to this difference, is for instance related to the purchase of larger packages than necessary by individuals from one-person households due to economics savings, as explained earlier in the thesis.

The other factor strongly correlated to generating food waste is age. Studies conducted in different parts of the world have observed younger age groups wasting more compared to older people, specially concerning those at the age of 65 or older (Quested et al. 2013; Secondi et al. 2015). As older people might have a different management of food in homes due to different life experience than the rest of the population, this might be a possible explanation (Quested et al. 2013). Additionally, of nine behaviours Quested et al. 2013 associated with lower food waste levels, the older people were more likely to perform seven of these behaviours.

Another factors influencing the amount of food waste in the household, is whether there are children in the household or not. Studies have observed a higher amount of food wasted in household with children compared to households without children (Parizeau et al. 2015). Furthermore, gender and education level also seem to impact the amount of food wasted, even though further research is needed regarding these two factors.

Impact of social norm

Together with recycling, reduction of food waste is perceived as a pro-environmental behaviour. The majority of the global population might be aware of the environmental impact of recycling, however, less people are aware of the environmental impact of food waste.

When an activity becomes a normative act in the society, the majority of the society is most likely to perform that particular act due to social influence and as it becomes a normal behaviour to do. As described in social psychology, individuals are more likely to perform a specific act when knowing that others actually *do* perform that activity (descriptive norm) than knowing that it is something that *should* be done (injunctive norm) (Thomas & Sharp 2013). This is the case of the pro-environmental activities including recycling and reduction of food waste. Particular concerning recycling, as this act has had an increased attention and awareness among consumers the past few years, more and more individuals are encouraged and pressurised to perform similar behaviour. In contrary to food waste, is recycling a visible act, and can result in a positive effect as it encourages other people to act in similar way (Thomas & Sharp 2013). However, food waste is a more private activity occurring within the household, and less visible to friends and neighbours. Due to this less visibility of the behaviour, the impact of social norm can be weaker on food waste, compared to other more visible behaviours e.g. recycling (Quested et al. 2013). Additionally, as there is relatively low awareness among consumers regarding the environmental impact of food waste, and amount food wasted in general, possibly explains why reducing food waste is not a normative act in the society at the moment.

As emphasized by Quested et al. 2013, one of the main ways to induce changes regarding food waste, is to influence the behaviours of the consumers (Quested et al. 2013). By increasing knowledge and understanding towards these aspects, and additionally increase the awareness among consumers, there is a possibility to reduce the amount of food waste. As to increase awareness among consumers, different organisations worldwide have approached this solution in varying ways.

Initiatives to reduce food waste

To be able to reduce the amount of food waste in households, there are some strategies that can be implemented. Based on several studies conducted, there seem to be lack of awareness among consumers regarding the amount of food they waste, and regarding the environmental impact of food waste (Graham-Rowe et al. 2014). Thus, one possible contributor to reduce food waste is by increasing consumers' awareness and knowledge

towards these aspects in different ways. This can be implemented through the government, through the retail market, through the educational system and also through advertisement (Godfray et al. 2010). In addition, increasing consumers understanding and knowledge towards food labelling and food storage, might also contribute in reducing the loss of food.

Several strategies and initiatives have been conducted worldwide to enable reduction of food waste in households. As extensive research has been conducted on British households the past few years, focus will be on actions and initiatives induced in the United Kingdom. In addition, different initiatives from organisations and the retail market have been initiated in Norway, and will also be presented.

The United Kingdom (UK)

In UK there is an organisation by the name of Waste and Resources Action Programme (WRAP), which is conducting research on food waste in household. The aim of their research project is to increase understanding towards food waste behaviour by increasing knowledge towards the reason behind food waste, types of food wasted, and drivers to reduce food waste. In addition to conducting a programme concerning waste prevention, WRAP is also building an understanding towards this aspect by doing research on the attitudes and behaviours related to food waste: both waste prevention and waste generation (Quested et al. 2013).

In 2007, WRAP launched the campaign *Love Food Hate Waste (LFHW)* together with multiple partners including supermarkets, and food and drink manufacturers. One of the main aims with the campaign was to increase the awareness among consumers regarding food waste, the benefit of preventing food waste, and provide guidance on how to reduce food waste in households (Quested et al. 2013). The campaign is conducted through different organisations and partners e.g. through media, through grocery retailers, and through local authorities. After the initiation of the campaign, it was observed a decrease in the amount of food wasted in UK: the amount of food waste fell by 1.1 million tonnes (Quested et al. 2013).

Norway

One of the leading organisations in Norway related to food waste, is Matvett AS. In a similar manner as WRAP, the main aims are to increase awareness among consumers regarding amount of food wasted in households, the environmental impact of food waste, the benefit of reducing food waste, and how to reduce food waste in households (Matvett 2016b). Matvett is achieving their goals through sharing information and guidelines on food labelling and correct storage conditions, on how to evaluate when to discard different food types and on the usage of leftovers.

“ForMat” is an on going project by Matvett AS, where the goal is to measure the amount of food wasted throughout the food supply chain in Norway. Additionally, the aim of the project is also to increase understanding of food waste behaviour among consumers to enable concrete actions on reducing food waste. To achieve these goals, ForMat is cooperating with the consumers through the usage of media, through cooperation with the retail marked, authorities, and different organisations (ForMat 2013).

Furthermore, different information bureaus in Norway are also contributing in increasing awareness among consumers regarding food waste. The Norwegian information bureau of eggs and meat (known as OEK) is the leading organ towards food information related these types of food, and is distributing several recipes and general food ideas through their marketing channel, MatPrat (MatPrat 2016). Recently, a new concept have been developed named “Gjenoppskrifter – med tanke på morgendagen”, rephrased into English: “Re-recipes – considering tomorrow”. The concept is about encouraging consumers to reduce food waste by reusing their leftovers. By doing so, MatPrat has developed several recipes and ideas to the consumers on how to reuse their leftovers on their website.

This type of action is an example of increasing awareness of food waste through commercial pressure, and how the awareness of food wastage can be enlarged at the consumers level. Consumers might not be aware of the amount food wasted in their own household, but when observing commercial and advertisements concerning leftover and food waste like this; it might evoke the attention towards food waste in their household.

Generally in Norway, and other industrialized countries, there is developed a guideline regarding standards towards the quality and shape of fruits and vegetables. Within Norway, these types of guidelines are developed by a private non-governmental organization named “Standard Norge”, who represents the trademarked Norwegian Standard (*Norsk Standard* 2015). The organisation is a standard-setting company towards several types of production, and not only towards the food industry. As the organisation ensures products of highest quality, several organisations and companies are members of the organisation. Nonetheless, it is important to emphasize that these standards are only guidelines, and not part of the country’s legislation. For instance, it is not prohibited to sell fruit and vegetables with unusual shape and size, as long as they are not damaged and there aren’t any sign of perishing.

Due to these types of guidelines developed, food products such as fruits and vegetables with an unusual appearance can be wasted even before they reach the retail market, which contributes to the total amount of food wasted. For example are carrots not suppose to have any branches, and they are recommended to meet a specific length and weight (Standard Norge 1999). When these standards are not met, the probability of these types of carrots being wasted is high. However, as an encouragement to the consumers, as well as contributing to reduce food waste, certain shops in Norway are marketing these kind of food products; food products that don’t fulfil the specific standards.

The increased attention on suboptimal food products is most commonly occurring by reducing the prices of the food product. Suboptimal food products can be unusual in their shape and size e.g. fruit and vegetable, products near their “best-before” date, or minor production mistakes. Discount on suboptimal fruits and vegetables are illustrated by a grocery shop in Norway named “Bunnpris”. Recently, this shop introduced a new concept called “Snåle frukt og grønt” (weird-looking fruit and vegetables) as an encouragement to the consumers to waste less food by increasing the acceptance towards food that looks different in shape and size (Bunnpris 2016). At the same time as encouraging reduction of food waste, Bunnpris is also presenting how the taste of the fruit and vegetables stays the same despite varying shape and size.

Additionally, different food companies are also encouraging consumers to increase their acceptance on suboptimal food products. The dairy company, Tine, increases consumers' awareness and knowledge about "best-before" date and "use-by" date through their web-page, and thus encourage consumers to reduce food waste in household (Tine 2013).

Purpose of the thesis

As mentioned above, food waste at household level is a huge contributor to the total amount of food wasted in developed countries. Within the household, there are different factors influencing the amount of food wasted; consumers' food-related beliefs, attitude, behaviour, food practices within the kitchen, shopping routines, types of food purchased and their packaging, are all contributors to food wastage. As to increase understanding and knowledge towards food waste production at the consumer level, one of the main purposes of this study is to analyse the consumers' behaviour and attitude towards food waste and suboptimal food, and furthermore examine the impact of social context within the household on food waste production. Social contexts focused on during this thesis are household size, and household composition in the manner of children in the household. Effect of demographical factors has also been studied, including gender, age group and educational level.

The respondents' behaviour, attitudes and lifestyle towards food waste and suboptimal food is evaluated through different food waste related situations, including the choice between a suboptimal- and optimal food product, the likelihood of purchasing a suboptimal food product, the probability of wasting a suboptimal food product, main reason behind food waste and other similar situations.

Additionally, as a consumer, the retail market can also influence food waste in household through how food products are being sold, their prices and their packaging. Due to this possible influence, another purpose of this thesis is to analyse the impact of different social norm messages, and environmental- and financial messages displayed on suboptimal food products, and how these types of messages can influence food waste behaviour.

Research questions answering throughout this thesis are the following:

To what extent does social context and demographic factors affect consumer caused food waste?

- Do household size, household composition and demographic factors affect self-estimated food waste?
- What are the main reasons behind household food waste, and the main drivers to reduce household food waste?
- What factors influence the acceptance of suboptimal food products?
- Does social norm messages and environmental- and financial benefit messages influence food waste behaviours and the choice for suboptimal foods?

The three first questions were analysed in pilot study and research study 1, but mainly in research study 1. All of these questions were examined through online questionnaires. The latter two questions were analysed in research study 2, and also through an online questionnaire.

Pilot study: "Forskningsstorget"

Method

Data collection and Participants

The pilot study was conducted late summer at 18th and 19th of September in 2015 in Oslo, at "Universitetsplassen". Forskningsstorget is an annual event where people from all age groups have the opportunity to meet researchers and participate in research from varying fields. Different research groups present their project in varying manners depending on their aim.

The pilot study conducted at this event focused on consumers' food waste behaviour with regards to food with passed "best-before" date. Additionally, the purpose of the study was also to examine influence of social interactions within a household on food waste behaviours. Due this aim, the study was limited for only those who live together with another adult as a couple, and was together at the event.

Data was collected through a questionnaire, and during these two days, 56 individuals participated in the study.

Questionnaire

The questionnaire was constructed in cooperation with another student, based on questions from previous studies. Some questions regarding food waste behaviour and food related lifestyle, were obtained from the Food Waste Related Lifestyle measure (Aschemann-Witzel et al., in preparation), which was adapted from (Brunsø & Grunert 1995). The questionnaire is presented in the appendices section, appendix A.1.

The questionnaire was divided into three segments. The first segment of the questionnaire obtained demographic information from the respondents including age, gender, living situation, whether there are children in the household or not, and their responsibility level in the household: responsibility regarding food purchase and cooking in the household varying from full responsibility, shared responsibility and no

responsibility. All of these questions were close-ended questions with response alternatives associated with the related questions. Additionally in this section, each couple received a unique code (identity code) that they wrote down on their questionnaire. The purpose of the identity code was merely to link each couple with each other when analysing the data, while still maintaining anonymity.

The second segment of the questionnaire consisted of six statements regarding food waste behaviour and food related lifestyle. These statements were related to the respondents' habits regarding wasting food, purchasing food close to their expiration date, purchasing environmental friendly food, and the criterions to discard or consume food. The statements were measured through a 7-point response scale, from "completely disagree" (1) to "completely agree" (7).

The final section of the questionnaire consisted of questions related to food waste in the household, specifically concerning food products near their "best-before" date. This segment contained six questions, where each question was related to food waste in different manners. The first question was a CATA-type question (Check-all-that-apply) focusing on describing a milk product with an expiration date for that same day. The respondents were requested to describe the suboptimal milk with given attributes. The following two questions were also related to the same milk product, where the participants were asked about the probability of wasting the product and the amount of discount they would purchase it for. The final three questions obtained information concerning food waste behaviours within the household. These questions concerned the main reason behind food waste within the household, estimated amount of food waste in the household and importance of reducing food waste. The questions contained response alternatives related to the given question.

Data analysis

All data were gathered in Microsoft Excel, and data were analysed using the statistic software program "R" and "R-commander" (version 3.2.3 and version 2.2-3, respectively).

The study examined the effect of different explanatory variables on specific response variables by the usage of Multinomial Logit Model (MLM). Table 1 visualizes the different variables analysed. The data was mainly presented with p-values, and the significance levels were set at $p < 0.05$ to all of the data. Some data is presented as: means \pm standard deviation.

Table 1: Overview of the different response- and explanatory variables studied in the pilot study.

Response variable (Dependent variables)	Explanatory variables (Independent variables)
Estimation of food waste in the household	Age Gender
Main cause of food waste in the household	Living situation Children in the household
Likelihood of wasting suboptimal milk product	Responsibility in the household ¹
Importance of reducing food waste	

¹) Responsibility regarding cooking and purchase of food.

As the data was multinomial and MLM was utilized, testing the normality of the data was not necessary. The MLM identified the effect of age, gender, living situation, children in the household and responsibility level on each of the given response variables presented in Table 1. The model was:

$$\text{Response variable} = \text{age} + \text{gender} + \text{living situation} + \text{children in the household} + \text{responsibility level}.$$

Additionally, a paired t-test was also utilized to measure similarity in responses within each couple. The t-test was conducted in Microsoft Excel, and t-test was conducted on the following questions: amount discount necessary to purchase suboptimal milk, probability of wasting the suboptimal milk, estimated amount of food wasted, main reason behind food waste and the importance of not wasting food.

Results

Total number of 56 individuals participated in the pilot study. Based on the demographic distribution, 50% women and 50% men participated in the study. The demographic information regarding age revealed a lower percentage of younger participants (12.5%), while respondents from the age 31 to 50+ comprised 87.5%. The demographic distribution of the respondents is summarized in Table 2.

Table 2: Percentage distribution of the participants, based on their demographic information

		Percentage (%)
Gender	Female	50.0
	Male	50.0
Age group	18-30	12.5
	31-50	41.1
	50+	46.4
Living-situation	With spouse	91.1
	With roommate	0.0
	Other	8.9
Children in the household	Yes	71.4
	No	26.8
	Not specified	1.8
Responsibility in the household¹	I take full responsibility	26.8
	Shared responsibility	60.7
	Another person takes responsibility	12.5

¹⁾ Responsibility in the household regarding cooking and purchase of food.

No similarity in responses in the couples

Concerning the question “How much discount is necessary to purchase the suboptimal milk?”, no significant difference was observed between the responses within the couples ($p=0.48$; paired t-test). Similar results were observed for the questions “What is the probability of wasting the suboptimal milk?” ($p=0.63$; paired t-test), “Of the food purchased, give an estimated amount of food wasted?” ($p=0.36$; paired t-test), “What is the main reason behind food waste?” ($p=1.00$; paired t-test), and “How important is it for you to *not* waste food?” ($p=0.49$; paired t-test).

Estimation of food waste in the household is neither linked to living situation or the presence of children in the household

The majority of the respondents estimated an amount of 10% food wasted in their households (Figure 1).

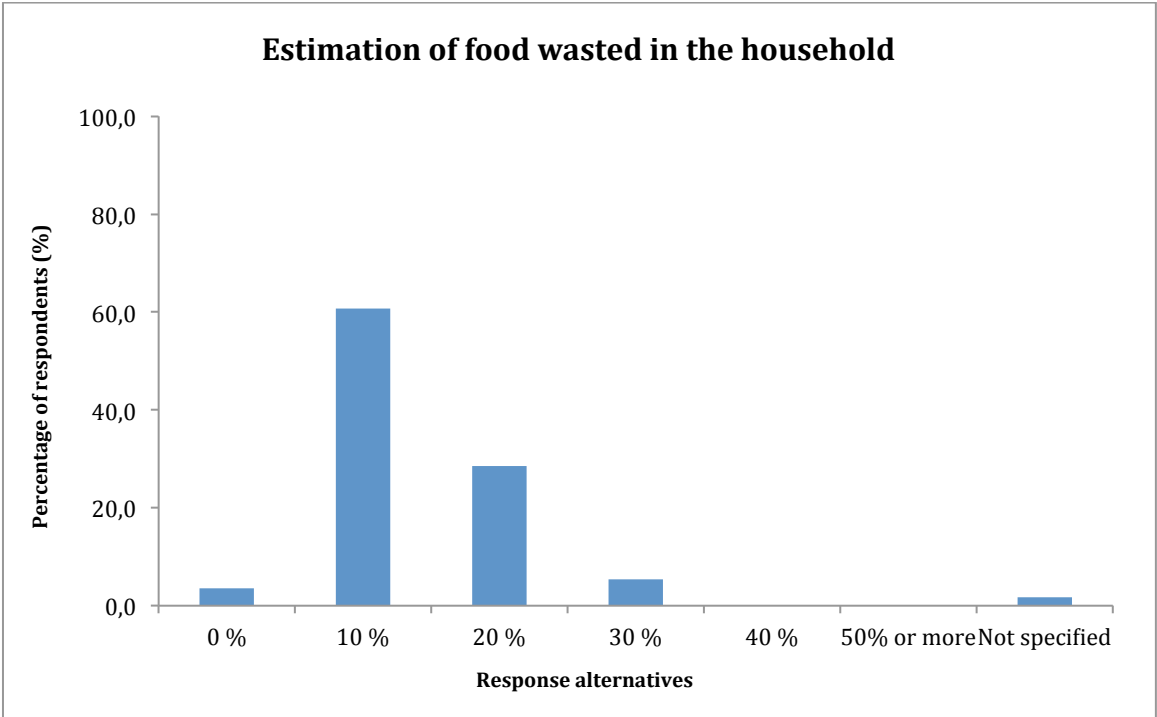


Figure 1: Responses to the question “Based on the amount food purchased, give an estimation of food wasted in your household”. The x-axis presents the response alternatives to the question, while the y-axis represents the percentage of responses given.

The estimation was also measured across given explanatory variables: gender, age groups, living situation (whether the respondents lived with their life partners or other type of living situation), between households with or without children, and between respondents with varying degree of responsibility.

There was no statistically effect of living situation on estimated food waste in the household ($p=0.34$; MLM), nor of having children in the household or not ($p=0.09$; MLM). There were also no effects of gender or age on estimated food waste in the household ($p=0.18$, $p=0.16$, respectively; MLM), nor responsibility level in the household ($p=0.38$; MLM).

Likelihood of wasting a suboptimal milk product is neither linked to living situation nor to presence of children in the household

On average, the respondents indicated higher than neutral level (3) of not wasting the suboptimal milk: they will most likely not waste the suboptimal milk (4.19 ± 0.94).

The effect of the mentioned explanatory variables on the likelihood of wasting the suboptimal milk with an expiration date the same day as when the study was conducted, was also examined. No significant effect of living situation ($p=0.55$; MLM), and households with or without children ($p=0.46$; MLM) was observed.

Gender, age, and responsibility level within the household, also did not influence the likelihood of wasting the suboptimal milk (all p -values >0.05 ; MLM).

When participants were requested to describe the suboptimal milk through given attributes, the majority described the milk with positive attributes. The percentage distribution is presented in Table 3.

Table 3: Percentage of respondents describing the suboptimal milk with the given attributes*

Attributes	Percentage of respondents (%)
Good taste	42.9
Bad taste	0.0
Is safe to consume	71.4
Is not safe to consume	1.8
Can be consumed as it is	41.1
Suitable for adults	35.7
Suitable for children	35.7
Suitable for guests	35.7
Will be discarded	0.0
Has to be used as soon as possible	44.6
Can be used for cooking	50.0

* Percentage of those who did not 'check' on the given attributes is not included.

Main reason behind food waste in the household is linked to presence of children in the household

The majority of the participants specified that purchasing too much food is the main reason behind food waste in their household. This is illustrated in Figure 2.

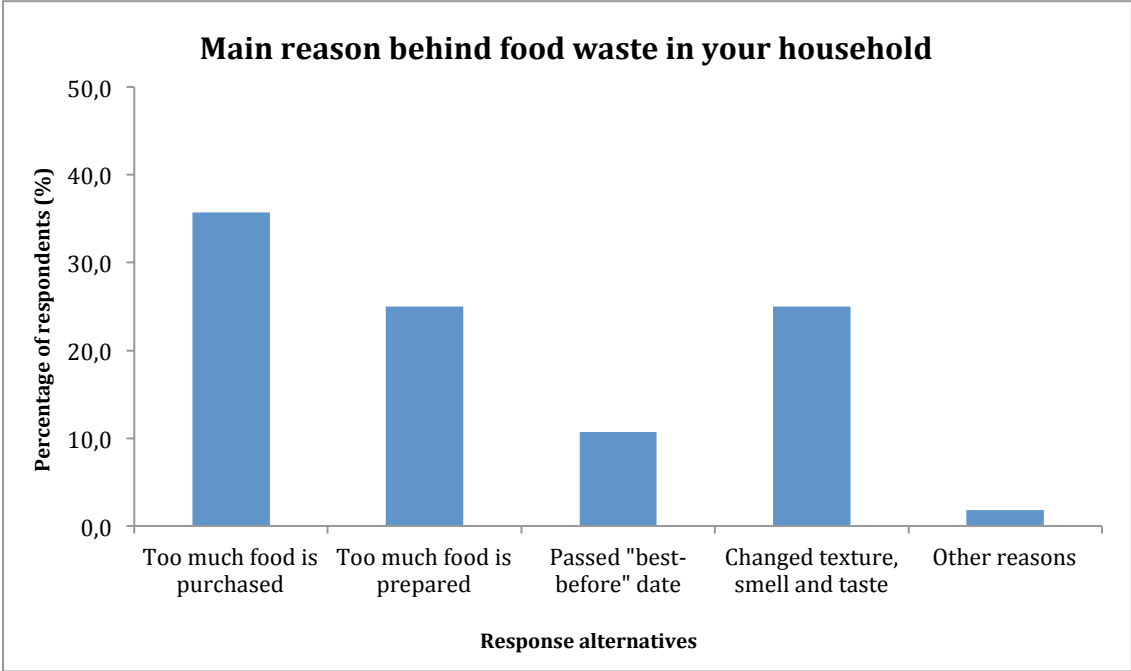


Figure 2: Responses from the question “What is the main reason behind food waste in your household?” The given response alternatives are presented in the x-axis, while the percentage of respondents is presented in the y-axis.

Having children in the household influenced the main reason behind food waste ($p=0.02$; MLM). This is illustrated in Figure 3. There is a higher probability for individuals with children in the households to waste food due to purchasing too much food and preparing too much food, compared to households without children. Similarly, there is a higher probability for respondents who do not have children in the household to waste food due to changed texture, smell or taste of the food, compared to households with children.

None of the other explanatory variables influenced the main reason for food waste (all p -values >0.05 ; MLM).

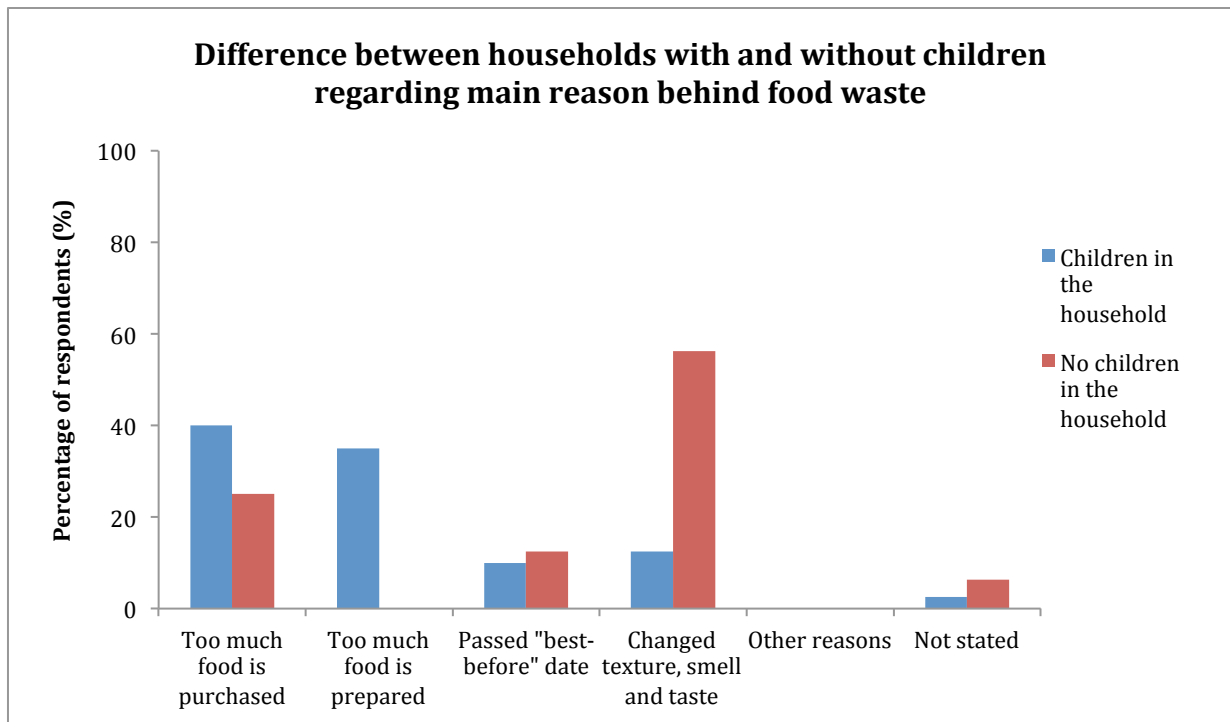


Figure 3: The differences between households with and without children regarding main reason behind food waste. The y-axis represents the percentage of respondents, while the x-axis represents the different response alternatives.

Importance of reducing food waste is weakly linked to the presence of children in the household

There was no significant effect of living situation on the importance of reducing food waste in the household ($p=0.24$; MLM), nor of gender, age and responsibility level (all p -values >0.05 ; MLM). However, a difference was observed between households with and without children ($p=0.05$; MLM). There is a higher probability for respondents with children in their households to believe that it is more important to reduce food waste than for respondents without children. The difference is presented in Figure 4.

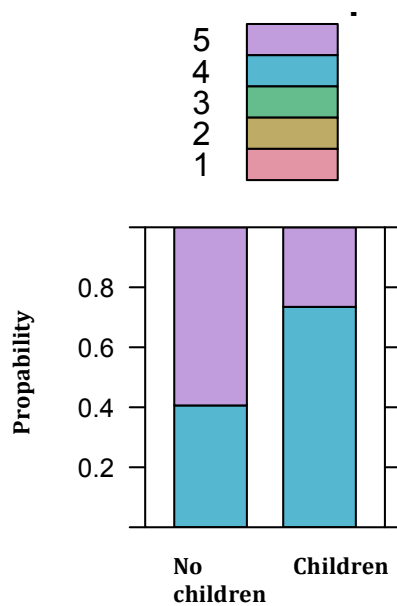


Figure 4: The difference between households with and without children regarding the question “How important is reducing food waste to you?” The y-axis represents the probability, while the x-axis represents households with and without children (0= No children in the household, 1= Children in the household). The colours above the effect plot represents the response alternatives: 1= Not important at all, 2= Not important, 3= Neutral, 4= Important, and 5= Very important.

Research study 1: Food waste in the household

Method

Data collection

The aim of this study was to examine the attitudes and behaviours towards suboptimal food products and food waste. In addition, the influence of social context in a household, and of different demographic factors on estimated food waste in a household was of interest. A questionnaire was developed in Norwegian, and was administered through a web-based program service (QuestBack). The online questionnaire was distributed through different social medias and through e-mails. Due to online distribution, participants from different geographic areas throughout Norway took part in the survey. The data collection initiated in the mid of December 2015, and ended in the mid of January 2016, over a four week period. This extended duration of the survey was due to the Christmas holidays in between.

Recruitment

The population of this study included 332 participants between the age group of 18 and 60+. Due to this wide age range, the study included students, fulltime employees, part time employees and also unemployed participants. Additionally, there were no requirements in order to participate besides age, and the sample consisted of participants living with their family, living alone, living with roommates, and those living with their spouses. However, due to the way respondents were recruited there is not an equal distribution, thus, the sample is not a representative sample. The distribution is presented in the results (Table 5).



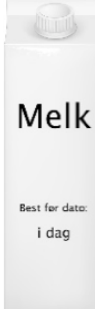



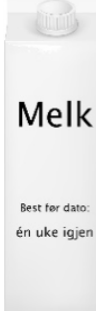

Questionnaire

The method utilized in this study was a questionnaire comprising mainly quantitative questions. The questionnaire included 51 questions related to food waste in the household. One of the aims throughout the questionnaire was to observe beliefs, attitudes and behaviour the participants had towards suboptimal fruits and vegetables,

and towards food-products close to their “best-before” date. Additionally, the influence of different demographic factors, household size, whether there were children in the household or not, and responsibility level on estimated food waste, were examined. To be able to compare result from previous studies, and to increase the validity of the results, questions were obtained and inspired from previous studies and literature (Quested et al. 2013). Additionally, questions regarding food waste behaviour and food related lifestyle were also used from the Food Waste Related Lifestyle measure (Aschemann-Witzel et al., in preparation), which was adapted from the Food Related Lifestyle measure (Brunso & Grunert 1995). Questions regarding the suboptimal food products were adapted from a survey done within the COSUS project (de Hooge et al., in preparation). However, some of the questions were adapted: response alternatives were reduced or edited, and questions were added to expand the interest area. The full survey is provided in the appendices, appendix A.2.

The questionnaire was divided into three different sections with distinctive aims. The first section of the questionnaire aimed to assess the participants’ perception on suboptimal food products in different situations. Four different types of food products were illustrated to the participants; apple, cucumber, milk and juice. The first question displayed both the optimal- and suboptimal version of the food products. In the subsequent questions, the suboptimal food product was presented. The fruit and vegetable were illustrated with visual imperfections, while the drinks were close to their expiration date. These are presented in Table 4. Per each food type, seven different questions were asked, including the choice between suboptimal- or optimal food product, QATA-type question describing the suboptimal product in different ways, likelihood of wasting the suboptimal food product, amount discount necessary to purchase the suboptimal product, two statements describing the suboptimal food products, and an open-ended question requesting respondents to clarify their choice. In that manner, it was possible to measure if the differences observed, were dependent on what food type was displayed. The questions were mainly close-ended questions with response alternatives, excluding some open-ended questions.

Table 4: Overview of the suboptimal and optimal food products displayed to the participants in the first section

	Apple	Cucumber	Milk	Juice
Suboptimal food			1) 	3) 
Optimal food			2) 	5) 

1), 3) The expiration date is the same day as the questionnaire was conducted.

2), 5) The expiration date is one week later

The second section contained a series of statements regarding attitudes and behaviour towards food waste in the household, and some statements regarding own behaviour compared to another person in the household. These statements were answered through a 7-point response scale, “strongly disagree” (1) to “strongly agree” (7).

In addition to these statements, the participants were also asked about general questions related to food waste in their household, such as estimated amount of food wasted in their household, their main reason behind food waste, and what motivates them most to reduce food waste based on statements provided. All questions were close-ended with given response alternatives.

The final section obtained demographic information from the participants, including gender, age, education, household composition, household size, children in the

household, job status and their responsibility in their household regarding cooking and purchase of food.

Data Analysis

To gather and analyse the data, Microsoft Excel and R-program, including R-commander, respectively, were utilized (R program version 3.2.3 and R-commander version 2.2-3). The data was mainly presented with p-values, with significance levels set at $p < 0.05$. Multinomial Logit Models (MLM) were applied when measuring significant effect of the explanatory variables due to the multinomial character of the response variables, while Spearman Rank order (two-sided) was applied when measuring correlations between response variables.

The explanatory variables examined in the study were mainly age, gender, educational level, responsibility level, household size, and whether there were children in the household or not. However, responsibility level was not prioritized. The main response variables examined, were the following:

- Estimated food waste in the household
- Probability of wasting suboptimal food product
- Choice between suboptimal- and optimal food product
- Main reason behind food waste
- Motivations to reduce food waste

MLM measured the effect of the given explanatory variables on the different response variables. The model was:

Response variable = age + gender + educational level + responsibility level + children in the household or not + household size

Results

A total number of 332 respondents participated in the study. The demographic distribution of the respondents included 80.1% women and 17.8% men, which illustrated limited gender diversity in this non-representative sample. In addition, the youngest age group, 18-30, dominated considerably (65.7%), and the oldest age group, 60+, comprised a minor portion (1.8%). A more detailed distribution of the respondents' demographic information is presented in Table 5.

Table 5: Percentage distribution of the participants based on their demographic information

		Percentage (%)
Gender	Female	80.1
	Male	17.8
	No gender stated	2.1
Age group	18-30	65.7
	31-40	13.6
	41-60	18.1
	60+	1.8
Education	Lower education	22.9
	Bachelor degree	31.3
	Master's degree	34.9
	PhD	7.2
	Other	2.7
Household composition	One-person household	7.5
	Two-person household	28.3
	More than two person in the household	63.6
Children in the household¹	Yes	47.9
	No	52.1
Responsibility in the household²	Full responsibility	23.2
	Shared responsibility	62.3
	No responsibility	14.5

¹ Children under the age of 18.

² Responsibility regarding cooking and purchase of food

The choice between suboptimal juice and optimal juice is linked to the presence of children in the household

Generally when the choice was between optimal or suboptimal food products, the choice of the respondents varied considerably dependent on what food product was presented. Figure 5 shows an overview over the participants' choices regarding what to serve during breakfast.

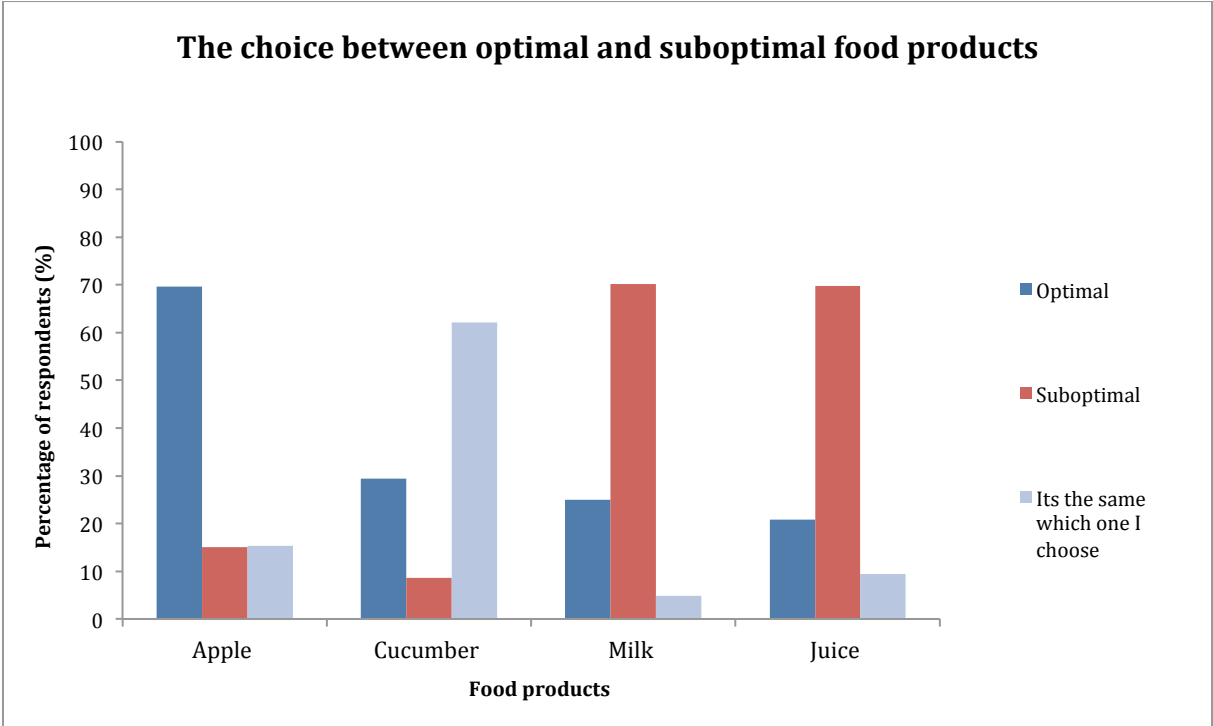


Figure 5: The participants' choices between the suboptimal and optimal food products. The y-axis represents the percentage of the respondents, while the x-axis represents the different food products.

As visualized in Figure 5, the responses varied considerably: regarding the apple, the majority would choose the optimal product. Regarding the cucumber, the majority specified that it does not matter which one they choose, and regarding the milk and the juice, the majority chose the suboptimal one.

Regardless of whether the respondents resided in a one-person household, two-person household or in a household with more than two individuals, no significant effect were observed on the choice between suboptimal- or optimal food products. This pattern was observed with all of the food products displayed (all p-values >0.05; MLM).

Regarding the presence of children in the household, there was no significant influence when apple, cucumber or milk was served (all values $p > 0.05$; MLM). However, an effect was observed when orange juice was displayed ($p = 0.015$; MLM): the probability of choosing the suboptimal juice is higher for respondents with no children in the household, compared to respondents with children in the household.

Additionally, no effect of educational level on the choice between suboptimal- and optimal apple/juice/milk was observed (all p -values > 0.05 ; MLM). However, effect of educational level on the choice for the suboptimal- or optimal cucumber was found ($p < 0.01$; MLM): those with higher educational level were more likely to specify that both cucumbers were acceptable to them.

Furthermore, when examining the explanations to their choices in the open-ended questions, the respondents specified the importance of serving the best product to others. Several of the respondents who chose the optimal apple or cucumber, highlighted that they would rather use the suboptimal product for self-usage, but when serving to others, they would like to serve the freshest product e.g. Participant 22 (P22): “The optimal apple looks more attractive”, P50: “The optimal apple looks more fresher”. This was specially highlighted when serving the apple and cucumber. Conversely, when question was related to milk or juice, the majority specified they rather choose the suboptimal. In this matter, many of the respondents highlighted the importance of utilizing the oldest product before spoilage as to avoid food waste e.g. P10: “You consume the oldest product first”, P87: “As long as there is no spoilage, both visually and sensory, the products with short “best-before” date is consumed first”.

Probability of wasting suboptimal food products

On average, the majority of the participants responded that they probably would not waste the suboptimal food product. The average of each of the food products is illustrated in Figure 6a.

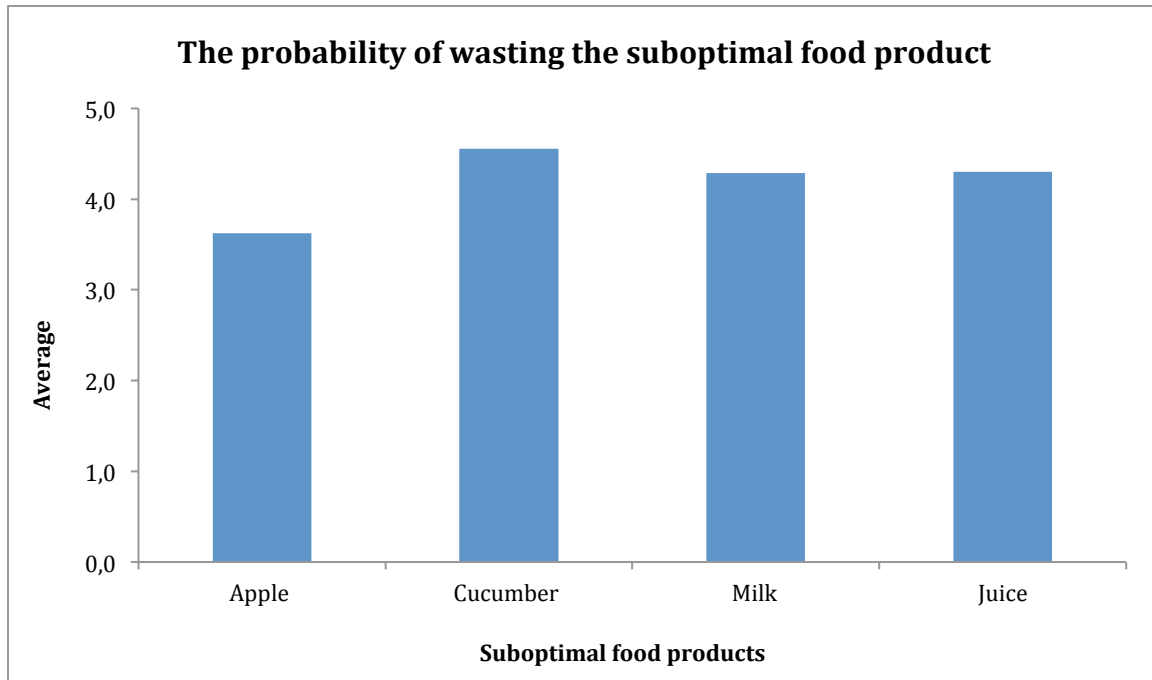


Figure 6a: Average of the probability of wasting each of the different food products presented in the x-axis. The y-axis represents the average of the following response alternatives: 1= Of course it will be wasted, 2= It will probably be wasted, 3= Neutral, 4= It will probably not be wasted, and 5= Of course it will not be wasted.

This observation was also negatively correlated to the following statements “the suboptimal food product does not have an attractive appearance” and “the suboptimal food product has an unpleasant taste, smell and texture” (all ρ -values $0 < -1$, all p-values < 0.05 ; Spearman Rank order). Those who most likely wouldn’t discard the suboptimal food products are more likely to disagree with both of the statements. The opposite was also observed: those who most likely would discard the suboptimal food are also more likely to agree with the statements. As similar correlations were observed regardless of what suboptimal food product was displayed, and with both of the statements, illustration of only one of the correlations will be presented in Figure 6b.

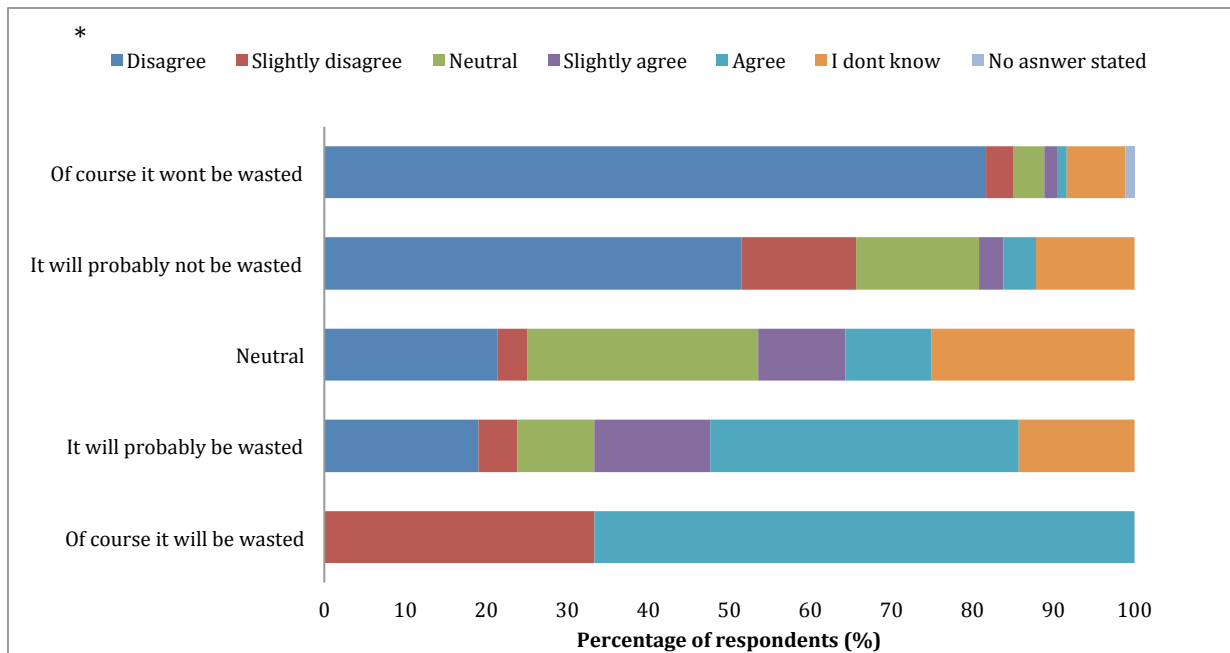


Figure 6b: Simplified* overview of the correlation between the likelihood of wasting suboptimal milk and the statement “This milk has an unpleasant taste, smell and texture”. The x-axis presents the percentage of respondents, while the y-axis represent the response alternatives associated to the question “what is the likelihood of wasting the suboptimal milk?”

* As to present the correlations in a more clearly matter, the response alternatives “strongly disagree” and “disagree” were combined to “disagree”, and similar adaptations were addressed on “strongly agree” and “agree” to “agree”. However, when measuring the strength of the correlations in R, no combinations of responses were used.

Regardless of which suboptimal food presented, there were no significant effects of household size (all values $p > 0.05$; MLM), nor of the presence of children in the household (all values $p > 0.05$; MLM). However, effect of age on likelihood of wasting apple was observed: older people were more likely to not waste the suboptimal apple compared to the younger age groups ($p = 0.03$; MLM).

Effects of gender, educational level and responsibility level varied according to what food product was displayed. Those with lower educational level were more likely to not waste the suboptimal cucumber ($p = 0.04$; MLM). Women were more likely to not waste the suboptimal cucumber compared to men ($p = 0.04$; MLM), and those with full responsibility were more likely to not waste the suboptimal milk compared to those with no responsibility in the household ($p = 0.03$; MLM).

Respondents described the different suboptimal food products with given attributes, and the percentage distribution of what the participants respondent, is presented in Table 6.

Table 6: Percentage of respondents describing the suboptimal foods with current attributes*

Attributes	Apple (%)	Cucumber (%)	Attributes	Milk (%)	Juice (%)
Good taste	28.3	68.7	Good taste	67.2	74.1
Bad taste	13.0	3.0	Bad taste	6.6	3.0
Sweet	33.4	8.1	Sweet	13.6	34.0
Bitter	4.8	2.4	Sour	5.1	11.7
Juicy	17.8	38.6	Clumpy liquid	6.0	1.5
“Bløt”	47.9	7.5	Pure liquid	31.9	28.9
Crunchy	7.5	50.6	Thick liquid	3.6	1.5
Crumbly (Smuldrete)	42.5	0.6	Thin liquid	20.5	14.8
Fresh	3.0	43.4	Fresh taste	25.9	29.5
Rotten	18.7	1.5	Rotten taste	8.7	7.5

*Percentage of those respondents who did not check for each of the attributes is not included.

Necessary discount on suboptimal milk and juice is linked to whether there are children in the household or not

How much discount was necessary for the respondents to purchase the suboptimal food product was not influenced by the size of the household, regardless of which suboptimal food product displayed (all values $p > 0.05$; MLM).

However, the presence of children in the household had an effect on the necessary discount, but only for the milk and juice. There is a higher probability for those who have children in the household to not buy the suboptimal milk at all, compared to those who do not have children in the household ($p = 0.03$; MLM). In addition, those with

children in the household seem to be more willing to purchase suboptimal milk for a higher discount. The effects are illustrated in Figure 7.

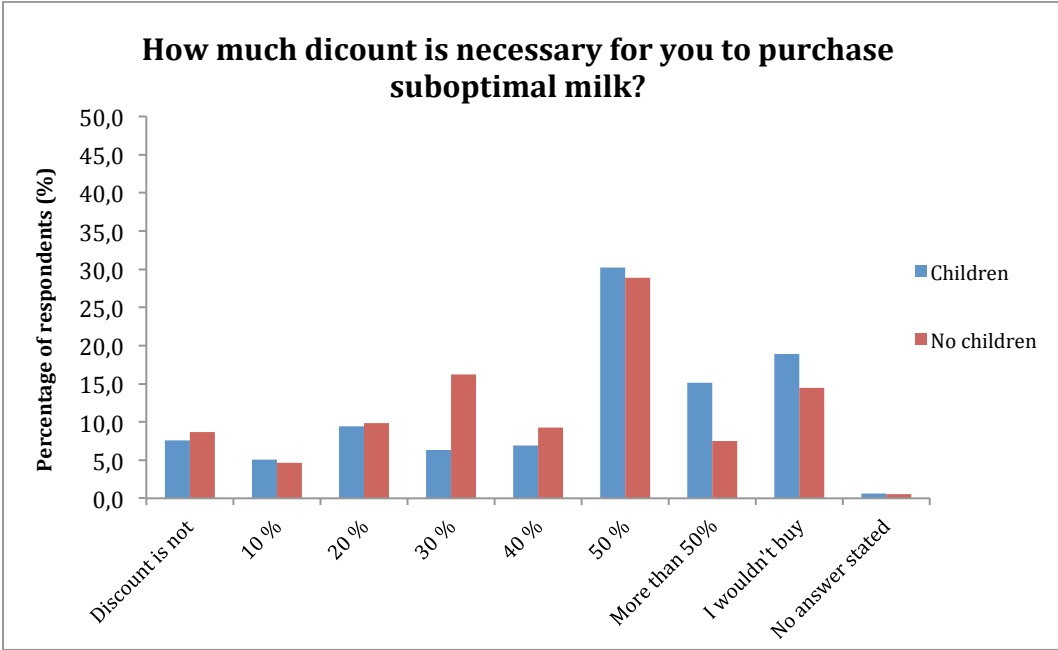


Figure 7: The differences between household with and without children regarding the question “There is need for milk in your household. There is discount on milk with an expiration date the same day you go to the shop. How much discount is necessary for you to purchase the suboptimal milk?” The x-axis represents the response alternatives, while the y-axis represents the percentage of respondents.

Approximately similar results were observed with the suboptimal juice ($p=0.04$; MLM). There was a higher probability for those with children in the household to purchase suboptimal juice for a higher discount compared to those with no children.

Estimated food waste in the household is not linked to household size or children in the household

The majority of the respondents estimated that around 10% of the food purchased is wasted in their household. This is presented in Figure 8.

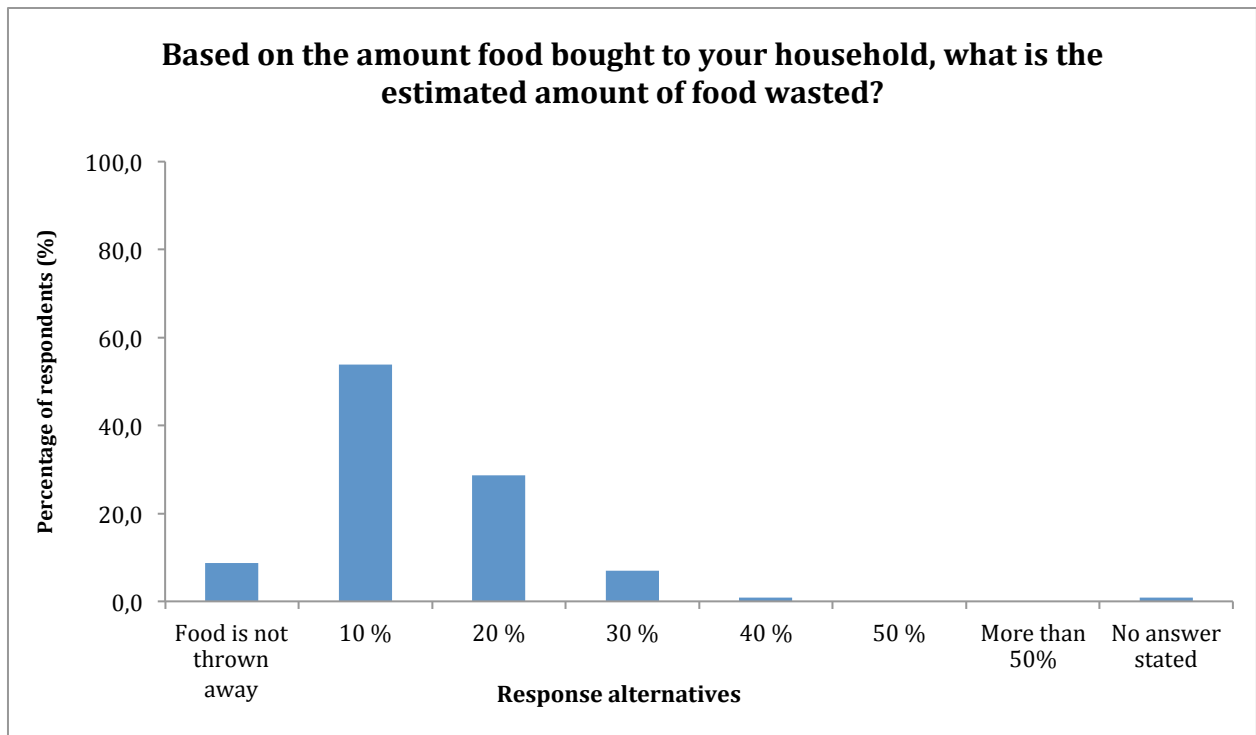


Figure 8: Overview of the responses from the participants to the question “Based on the amount food bought to your household, what is the estimated amount of food wasted?” The response alternatives to the question are presented in the x-axis, while the y-axis presents the percentage of respondents.

Effect of household size on estimated amount food wasted in household was also measured. This is graphically illustrated in Figure 9. Whether respondents live in a one-person household, two-person household or in a household with more than two individuals, the majority estimate 10% food wasted. There were no significant effects of household size on estimation of food waste ($p=0.59$; MLM).

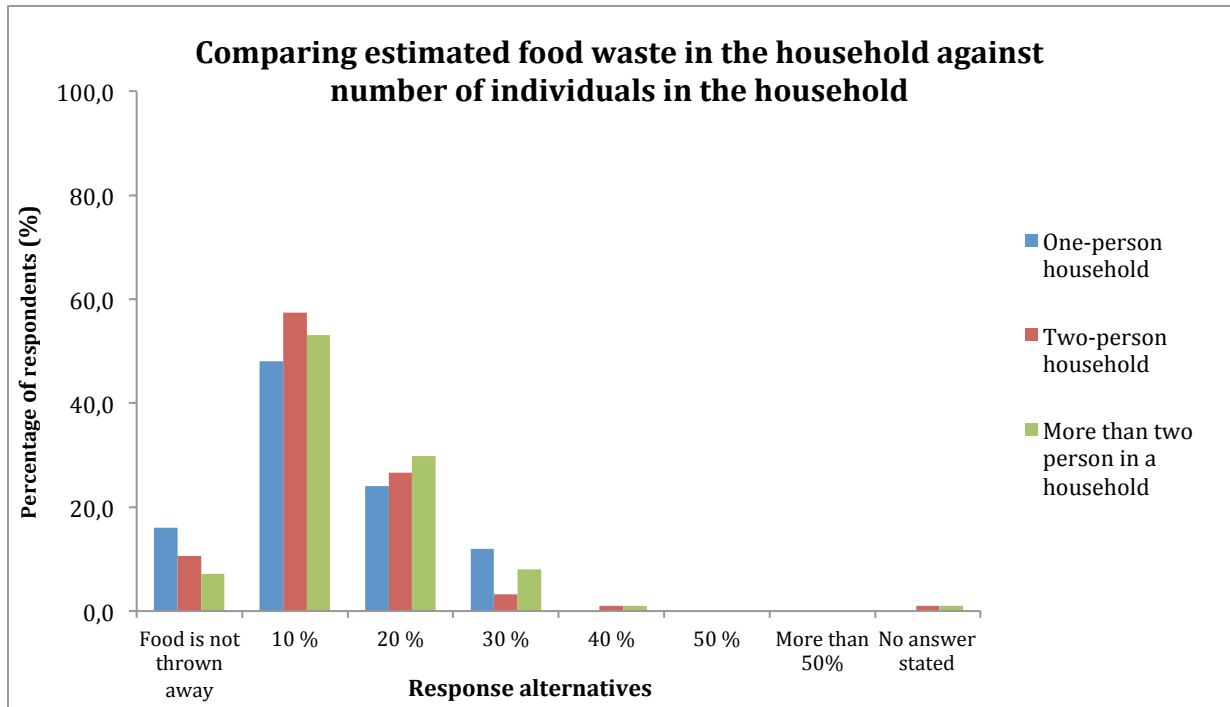


Figure 9: Grouped bar chart illustrating the differences between varying household compositions regarding estimation of food waste based on food purchased. The x-axis represents the response alternatives, while the y-axis represents the percentage.

There was also no significant effect of presence of children in the household on estimation of food waste ($p=0.33$; MLM), nor of gender, of age groups, of educational level or between respondents with varying degree of responsibility (all p -values >0.05 ; MLM).

Main reason behind food waste in the household is linked to gender

The majority of the participant specified changed texture, smell and taste as the main reason behind food waste within their household. This is illustrated in Figure 10.

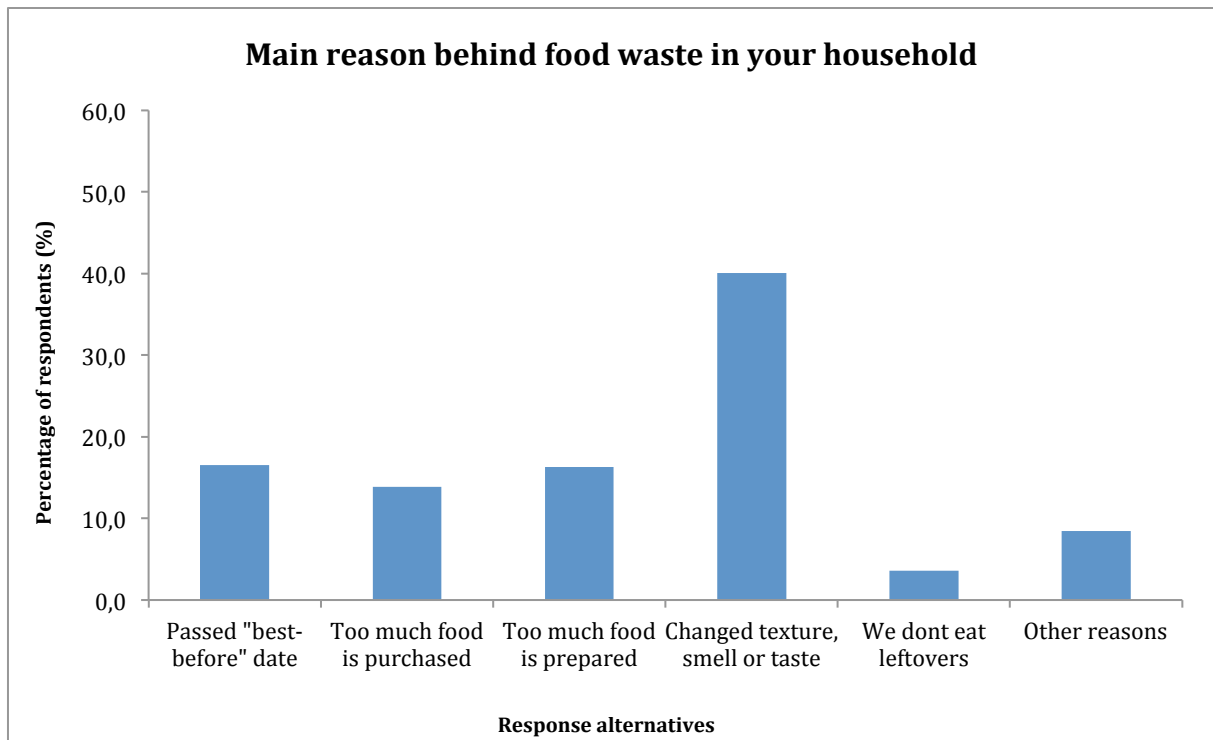


Figure 10: Response to the question “What is the main reason behind food waste in your household?” Given response alternatives are presented in the x-axis, while the percentage of the respondents are in the y-axis.

There was no significant effect of household size on main reason behind food waste in the household ($p=0.16$; MLM). Similar results were observed between households with and without children in the household, educational level and age (all p -values >0.05 ; MLM). However, significant effect of gender was observed ($p=0.04$; MLM): there is a higher probability for female respondents to waste food due to changed texture, smell or taste, compared to male respondents. Otherwise, there seem to be minor differences within each option between men and women regarding the main reason behind food waste. This is illustrated in Figure 11.

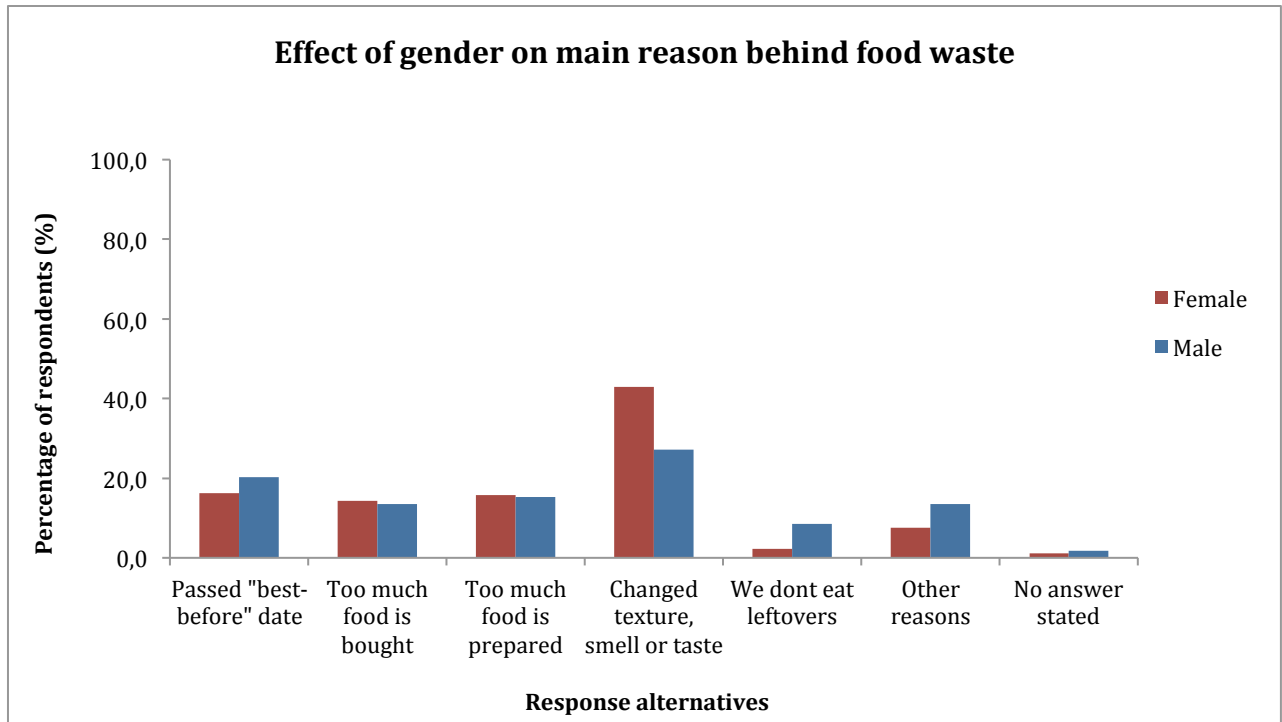


Figure 11: Differences within gender regarding the main reason behind food waste graphically illustrated. The x-axis represents the response alternatives presented to the respondents, while the y-axis represents the percentage (%).

Motivations for reducing food waste

Respondents were asked to specify their most encouraging factor to reduce food waste based on given response alternatives, and the majority specified guilt as the most motivating factor. The results are graphically illustrated in Figure 12.

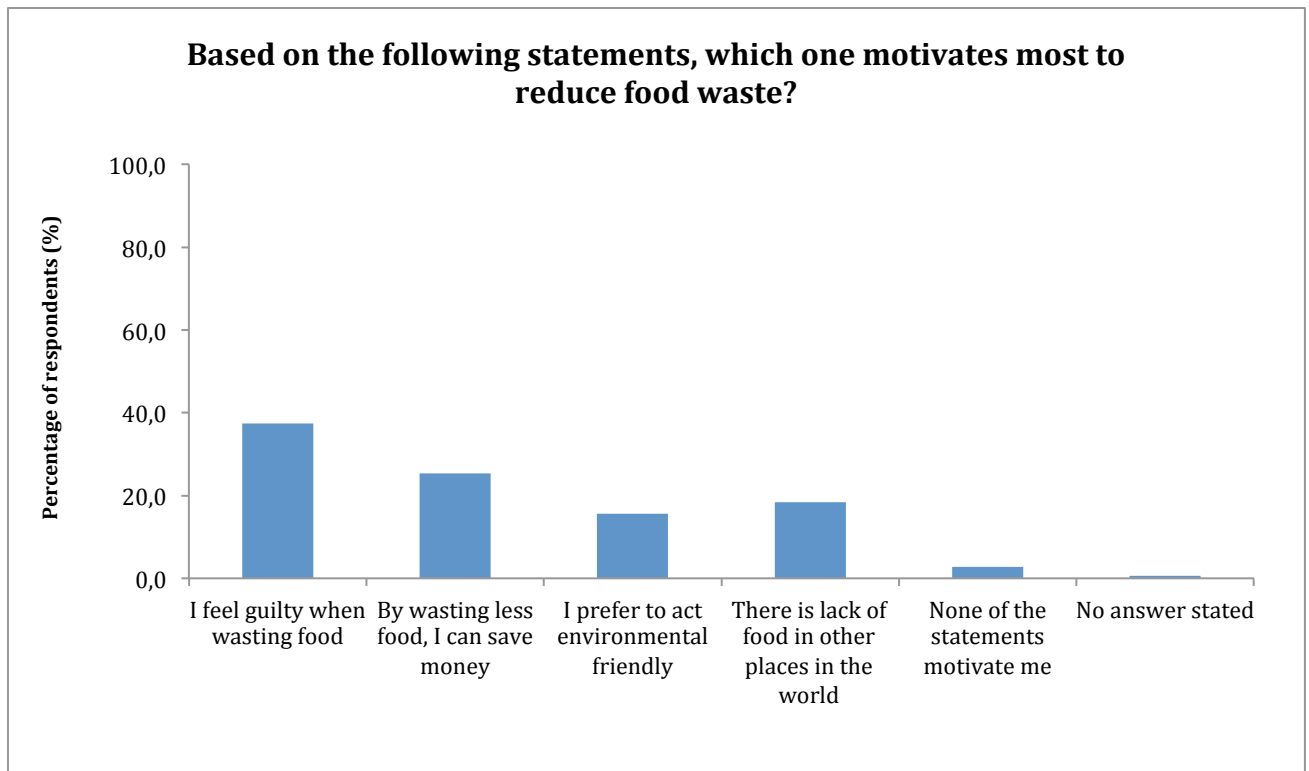


Figure 12: Response to the question “Based on the following statements, which one motivates most to reduce food waste?” The y-axis represents the percentage of the respondents, while the x-axis represents the given response alternatives.

Effect of different factors on the motivation was measured: there was no significant effect of household size on the most motivating factor to reduce food waste ($p=0.75$; MLM), nor of presence of children in the household ($p=0.77$; MLM). Effects of age and educational level was also not observed (p -values >0.05 ; MLM).

Conversely, significant effects of gender, and of responsibility level were observed ($p=0.003$, $p=0.01$, respectively; MLM). There is a higher probability for men to reduce food waste due to economics savings, while women have a higher probability to reduce food waste due to guilt. Effect of educational level is illustrated in Figure 13.

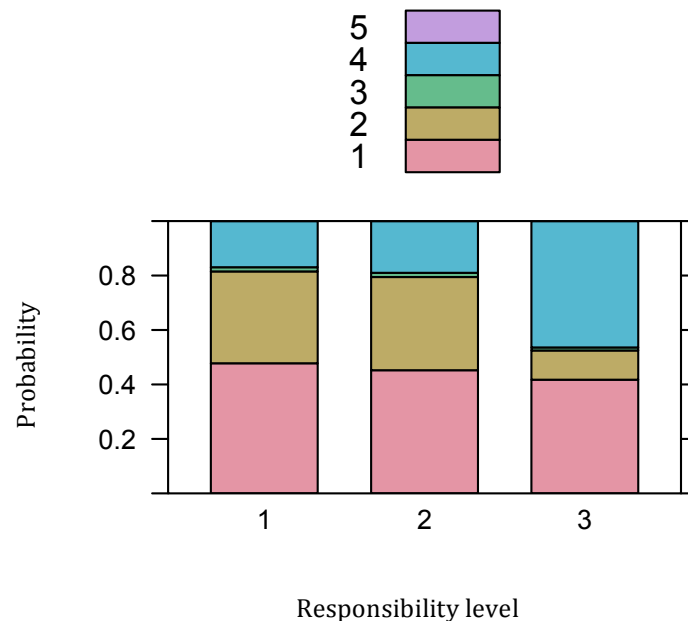


Figure 13: Effect plot illustrating correlation between the explanatory variable, responsibilities in the household, and the response variable “Based on the given statements, what is the most motivating statement to reduce food waste?” The numbers related to the colourful blocks above the plot, represents the different options given to the respondents; 1= I feel guilty when wasting food, 2= By reducing food waste, I’m able to save money, 3= I choose to be environmentally friendly, 4= Other places in the world there is food deficiency, and 5= None of the given statements. The y-axis represents the probability, and x-axis represents the degree of responsibility in the household of the respondents: 1= Full responsibility, 2= Partly responsible, and 3= No responsibility.

Based on the effect plot in Figure 13, there is a higher probability of those individuals who have no responsibility in the household, to reduce food waste due the thought of others in the world are suffering from food deficiency, compared to those respondents who share the responsibility or take the full responsibility in the household. Additionally, there is a higher probability for those respondents who share the responsibility or have the full responsibility to reduce food waste due to economics savings.

Research study 2: Influence of social-norm, environmental and financial benefit messages on food waste behaviour

Method

Data collection and Experimental design

Main purpose of this research study was to examine the influence of social-norm-, and environmental- and financial messages on food waste behaviour and on the perception of suboptimal food products. Labels consisting these messages were presented on packages containing suboptimal food: odd-shaped carrots and brown-spotted apple. Some of the labels had neutral messages, while others had a specific message regarding the environment/financial or a social-norm message. The different types of messages presented to the participants are illustrated in Table 7, and the different packages presented to the participants, is illustrated in Figure 14 and Figure 15.

Table 7: An overview of the different messages displayed to the participants.

		Message	Neutral message
Social norm message	English	“70% of our customers help reduce unnecessary food waste by choosing our visually imperfect apple/odd-shaped carrots. Well done!”	“We offer visually imperfect apple/odd-shaped carrots as a step to help reduce unnecessary food waste. Enjoy!”
	Norwegian	“70% av våre kunder bidrar med å redusere matsvinn ved å velge våre epler/gulrøtter med små imperfeksjoner. Godt jobbet!”	“Vil tilbyr epler/gulrøtter med små imperfeksjoner/annerledes form som et steg nærmere for å redusere matsvinn. Nyt det!”
Environmental and financial benefit message	English	“Waste less food! Good for the wallet and the environment”	“Waste less food!”
	Norwegian	“Kast mindre mat! Bra for lommebok og miljø”	“Kast mindre mat!”



Figure 14: One of the packages (containing apples) displayed to the participants with a neutral environmental message, and a neutral social message.

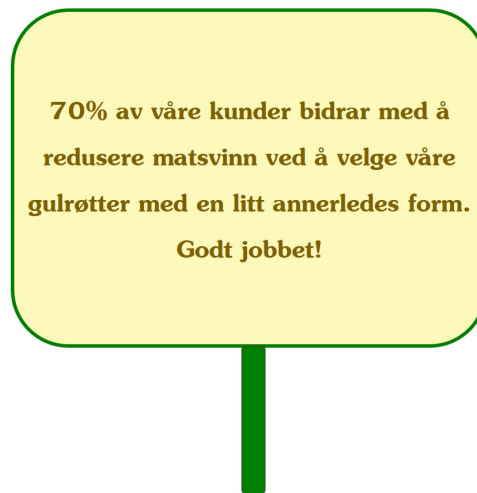


Figure 15: One of the packages (containing carrots) displayed to the participants with a social norm message and an environmental- and financial encouragement message.

The participants were divided into four different groups. Each group was presented with both apples and carrots, but with different social-norm and environmental/financial messages on the packages. But within each group, the same type of labels were presented. As to be able to measure possible correlation between the influence of the messages and food waste behaviour, the participants answered a subsequent questionnaire. The messages displayed to each group, are presented in Table 8.

Table 8: Overview over the different messages presented to different groups

Group nr.	Food type	Social norm message	Environmental and financial benefit message
1	Apple/ Carrot	Yes	Yes
2	Apple/ Carrot	Yes	Neutral
3	Apple/ Carrot	Neutral	Yes
4	Apple/ Carrot	Neutral	Neutral

The study was conducted in March 2016 as an online questionnaire in Norwegian. The survey was distributed by a marketing company, Faktum. The questions were developed in association with representatives from the Norwegian company Nofima and with help from Matvett for the labels, and the questions were inspired and obtained from previous validated surveys (Brunsø & Grunert 1995; Greenwood et al. 2008; Hoolohan et al. 2013). Some questions were also added to expand the interest area, and in addition, some questions were edited regarding their response alternatives and the way the questions were framed to match the Norwegian sample.

Participants

509 participants contributed to the study. There were certain terms that had to be met in order to participate: the participants had to live with another adult, and they also had to be the person in the household with at least shared responsibility regarding purchase of food and/or cooking in the household (those without any responsibility were excluded).

Questionnaire

As there were certain requirements that had to be met in order to participate, the questionnaire initiated with two control questions asking about the responsibility in the household. If the participants had full responsibility or shared responsibility concerning purchase of food and cooking in the household, the respondents could continue to the remaining questionnaire. If they didn't have any responsibility, the questionnaire ended after these two questions.

The subsequent questionnaire was divided in different sections, and consisted of varying questions regarding food waste within the household, environment related questions, attitudes towards suboptimal food and general demographic questions. The first segment of the questionnaire contained questions directly linked to the suboptimal food products, where four different questions were asked for each package. Questions in this section were related to the products attractiveness, amount it would be purchased for, expected taste and willingness to purchase the product. Question about attractiveness was measured through a slider scales, from "not attractive at all" (0) to

“very attractive” (100). Similar slider scale measured expected taste: from “very bad taste” (0) to “very good taste” (100). Question about willingness to purchase the product was measured with a percentage slider scale from “would absolutely not purchase the product” (0) to “I would absolutely purchase the product” (100%), and the question regarding amount it would be purchased for, contained a slider scale from “5 kr” to “35 kr”. The purpose of this segment was to observe the influence of the messages on the participants’ attitudes towards these suboptimal food products.

The second segment of the questionnaire was related to the participants’ personal behaviour towards food and their general food sustainable behaviour. Through this information, potential relation between these kinds of behaviours and food waste was possible to evaluate. The third section included several statements regarding food waste behaviour and general lifestyle behaviour. These were answered through a 7-point response scale, from strongly disagree (1) to strongly agree (7).

The questionnaire also obtained information regarding personal behaviour in different situations, however, as these questions weren’t relevant for this study, they are not included when analysing the data.

The questionnaire also included questions measuring the influence of behaviour and attitudes of others in the household on the respondents’ food waste behaviour. These questions were also measured through a 7-point response scale: from strongly disagree (1) to strongly agree (7). Additionally, to obtain a more detailed information on estimated food waste than in the previous studies, a percentage slider scale was presented.

The final segment of the questionnaire obtained demographic information from the respondents, including gender, age groups, household size, household composition regarding children in the household, educational level and work status.

Data analysis

Microsoft Excel and statistics software program, “R” and R-commander (version 3.2.3 and version 2.2-3, respectively), were utilized when examining the data. Excel was mainly applied when assembling the responses to a file and for developing bar charts. The R-program was utilized when operating on the statistical segment, it was applied to measure correlations between different variables studied, and the effect of the specific variables. The data was mainly presented with p-values, and the significance levels were set at $p < 0.05$.

In this study, Generalized Linear Model (GLZ) was utilized to analyse the effect of the two factors: the social norm message, and the environmental- and financial benefit message, on specific response variables. The GLZ assessed the influence of the messages separately, and in interaction between the two types of messages. The responses variables measured in this context were attractiveness of the product, expected taste, likelihood of purchasing and amount discount necessary to purchase. The model was:

Response variable = social norm message + environmental/financial message + social-norm message*environmental/financial message

Due to the non-normal distribution of the data, it was used a Poisson distribution.

Additionally, Multinomial Logit Model was utilized to examine the influence of specific explanatory variables on estimated food waste in the household. The model used was:

Estimated food waste = age + gender + educational level + household size + household composition (regarding children in the household)

Furthermore, Spearman Rank order correlation test (two-sided) was utilized to analyse correlations.

Results

A total of 509 individuals participated in the survey. The survey was mainly limited for those who lived with another adult, and for those who has the full responsibility or shared responsibility within the household regarding cooking and purchasing food. The demographic distribution of the participants is illustrated in Table 9.

Table 9: Percentage distribution of the participants based on their demographic information

		Percentage (%)
Gender	Female	49.1
	Male	50.9
Age group	18-30	29.9
	31-40	19.6
	41-50	25.7
	51-60	19.6
	60+	5.1
Education	Lower education ¹	51.1
	Bachelor degree	26.7
	Master's degree	14.5
	PhD	1.6
	Other	6.1
Household composition	One-person household*	17.9
	Two-person household	40.7
	More than two individuals in the household	41.5
Children in the household²	Yes	31.6
	No	68.4
Responsibility in the household³	Full responsibility	55.8
	Shared responsibility	44.2
	No responsibility	0

¹) Lower education is referred to primary school and high school, ²) Children under the age of 18,

³) Responsibility regarding cooking in the household and purchase of food.

* This study was mainly restricted to participants who lived with another adult, but due to errors, participants from one-person household also participated, and are therefor included.

Influence of social norm message on the likelihood of purchasing suboptimal carrots

The mean values for each of the response variables associated with each food type, within each of the four groups, are presented in Table 10.

Table 10: Mean values to each of the response variables associated to the specific food type, within each group.

Response variables	Food type	Group 1 SN+EF*	Group 2 SN+NEF	Group 3 NSN+EF	Group 4 NSN+NEF
The degree of attractiveness (0-100 ¹)	Apple	50.8	54.6	50.6	52.5
	Carrot	34.6	34.9	39.5	41.1
Expected taste (0-100 ²)	Apple	55.7	60.5	56.6	58.2
	Carrot	38.7	41.2	45.0	48.1
Likelihood of purchasing the food type (0-100% ³)	Apple	50.2	49.5	49.6	52.3
	Carrot	36.9	34.3	39.8	43.5
Amount it would be purchased for (5-35kr)	Apple	16.8	17.2	16.2	16.6
	Carrot	12.3	11.7	12.4	12.8

¹) 0=Not attractive at all, 100=Very attractive ²) 0=Very bad taste, 100=Very good taste

³) 0%= Would absolutely not purchase the product, 100%= Would absolutely purchase the product

*SN= Social Norm message, NSN= Neutral social norm message, EF= Environmental/financial message, and NEF= Neutral environmental/financial message

There are differences in the rating of apples' –and carrots' attractiveness between the types of social norm message displayed ($p=0.02$, $p<0.01$, respectively; GLZ), where the apples were mainly rated more attractive when social norm message was displayed. Concerning the carrots, opposite pattern was observed: attractiveness rating was higher

when neutral social norm message was displayed. Differences were also observed between types of environmental –and financial message displayed regarding the attractiveness of apples and carrots (both p -values=0.04; GLZ): apples seemed to be more attractive when neutral message about environment/finance were presented. Concerning the carrots, there is no clear observation of the direction of the effect. Additionally, there was no statistically significant interaction between the effects of social norm message and environmental- and financial message, on the rating of attractiveness (both p -values >0.05; GLZ).

Differences were also observed in the rating of expected taste of apples and carrots between the types of social norm message displayed ($p=0.02$, $p<0.01$, respectively; GLZ), where there seem to be better taste rating about apples when social norm message was displayed. Opposite effect is observed concerning carrots: taste expectations seem to be higher when neutral social norm message is displayed. Regarding the types of environmental-and financial messages displayed on carrots: difference regarding expected taste of carrots was observed ($p<0.01$; GLZ): ratings were mainly higher when neutral environmental/financial message is displayed. However, significant difference between types of environmental-and financial messages regarding expected taste of apples was not observed ($p=0.09$; GLZ). In addition, there was significant interaction between the effects of the different types of messages on the rating of expected taste concerning the apple ($p=0.02$; GLZ), but not regarding the carrot ($p=0.89$; GLZ).

Likelihood of purchasing suboptimal apples and carrots was affected by the type of social norm message displayed, and by the type of environmental- and financial benefit message displayed (all values $p<0.01$; GLZ): where likelihood of purchasing apples mainly seems to increase when neutral social norm message was displayed. However, concerning the environmental message, it was no clear pattern. Regarding the carrots, the likelihood of purchasing decreases when social norm message was displayed, but there was no clear effect when environmental message is displayed. Additionally, there was a significant interaction between the effect of social norm message and environmental-and financial messages on the likelihood of purchasing apples and carrots ($p=0.007$, $p<0.01$, respectively; GLZ).

How much the respondents would purchase the suboptimal apples for, was not influenced by the type of social norm message displayed, and nor by the type of environmental-and financial benefit message displayed (both values $p > 0.05$; GLZ). However, how much carrots would be purchased for, was affected by the type of social norm message displayed ($p = 0.02$; GLZ), but not by the type of environmental- and financial message displayed ($p > 0.05$; GLZ). The amount carrots would be purchased for a lower price when social norm message is displayed. There was also no significant interaction between the effects of types of social norm message and types of environmental-financial message displayed on the amount apple or carrots would be purchased for (both p -values > 0.05 ; GLZ).

Furthermore, even though significant interaction was observed in some of the cases, testing with post-hoc Tukey did not reveal any significant differences between the four groups. Additionally, due to difficulties in R-commander, one-way ANOVA post-hoc testing was utilized, instead of two-way ANOVA (2 x 2 ANOVA), and the post-hoc testing was conducted through an online program (Vasavada 2014).

Estimation of food waste in household is linked to gender and age

The majority of the respondents estimated a value of 1-15% food wasted in their household. The distribution is illustrated in Figure 16.

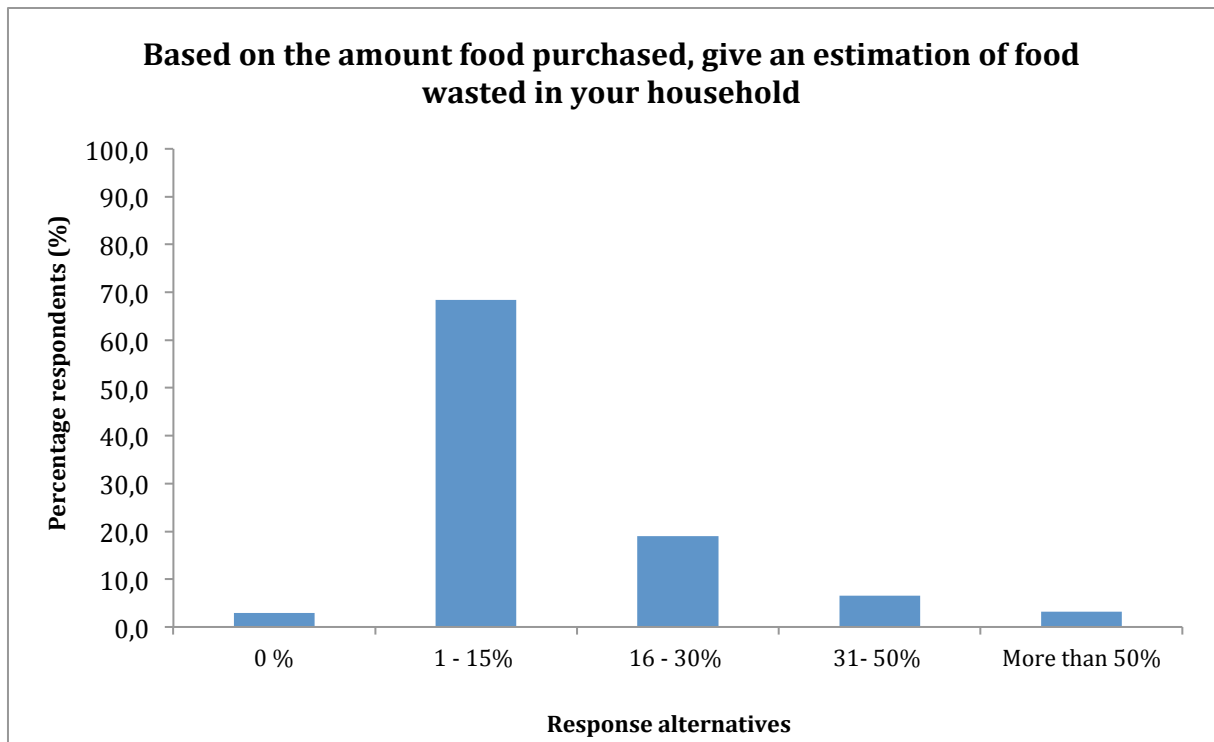


Figure 16: Overview of the responses from the participants to the question “Based on the amount food bought to your household, what is the estimated value of food wasted”. The response alternatives to the question are presented in the x-axis, while the y-axis presents the percentage of the respondents.

There were no differences in estimated food waste between different household sizes ($p=0.36$; MLM), nor between households with and without children ($p=0.86$; MLM). Regarding educational level, a trend was observed ($p=0.07$; MLM). Nonetheless, gender did impact estimated food waste, as did age ($p=0.01$, $p<0.01$, respectively; MLM). The difference between men and women is presented in Figure 17. Regarding age groups, there is a higher probability for the elderly participants to estimate a lower percentage of food wasted, compared to the younger ones. This is illustrated in Figure 18.

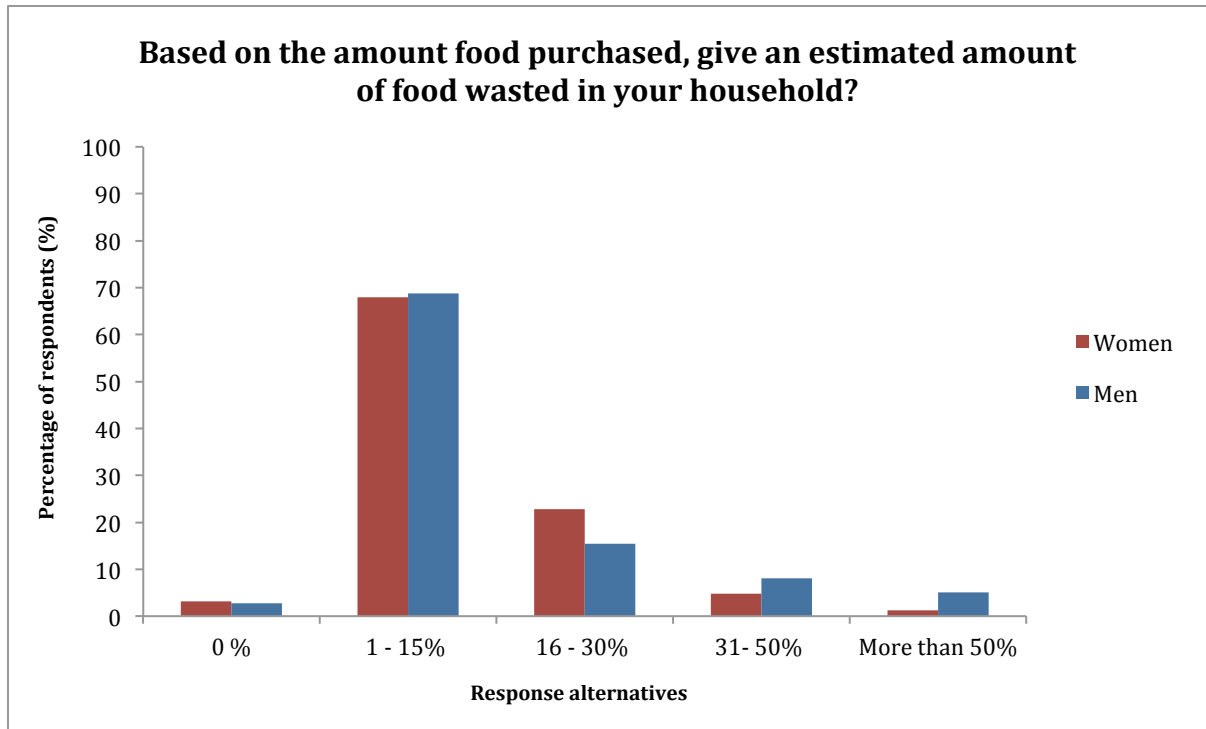


Figure 17: Graph illustrating the difference between women and men regarding the question “Based on the amount food purchased in your household, give an estimated amount food wasted”. The x-axis represents the response alternatives, while the y-axis represents the percentage of respondents.

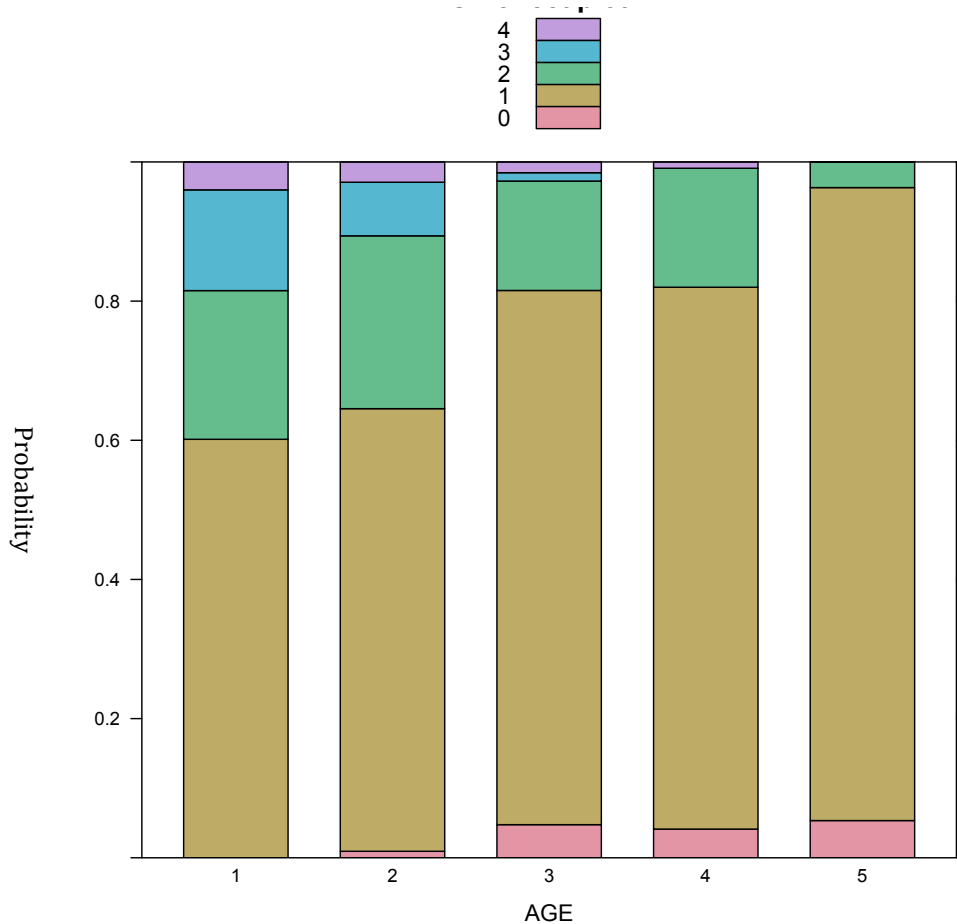


Figure 18: Effect plot illustrating difference between age groups regarding the question “Based on the amount food purchased in your household, give an estimation of food wasted in your household”. The y-axis represents the probability, while the x-axis represents the different age groups: 1=18-30, 2= 31-40, 3= 41-50, 4= 51-60, and 5= 60+. The colourful box above the plot represents the response alternatives associated to the question: 0=0%, 1= 1-15%, 2= 16-30%, 3= 31-50%, and 4= More than 50%.

Correlation between estimated food waste in the household and response to the statement “I hate wasting food”

A negative correlation was observed between estimated food waste in the household and the response to the statement “I hate wasting food”: those who agree with the statement, are more likely to estimate lower percentage of food wasted in their household ($\rho = -0.34, p < 0.01$; Spearman Rank Order).

Correlation between estimated food waste and response to the statement “as long there are people suffering from hunger in the world, food should not be wasted”

A negative correlation was observed between the above-mentioned statement and estimated food waste in the household: respondents’ who agree with the statement, are also those who most likely would estimate lower percentage of food waste ($\rho = -0.25$, $p < 0.01$; Spearman Rank Order). The graphically illustration of the correlation is presented in Figure 19.

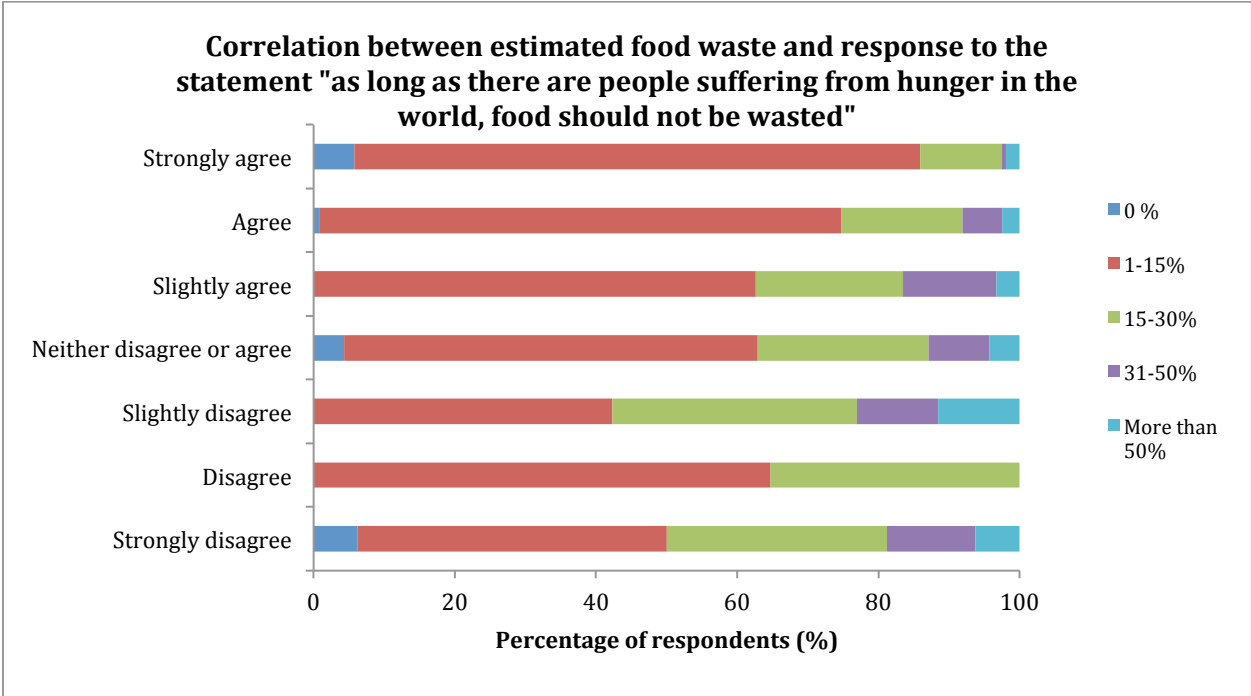


Figure 19: Graphically presentation of the correlation between estimated food waste and response to the above-mentioned statement. The y-axis represents the response alternatives, while the x-axis represents the percentage of respondents.

Correlation between estimated food waste in the household and how often dinner is eaten together

A negative correlation was observed between estimated food waste in the household and how often dinner is eaten together: those who eat dinner more often together, estimate a lower percentage of food waste, with the exception of respondents that eat

together rarely ($\rho = -0.13, p = 0.003$; Spearman ranks order). This is illustrated in Figure 20.

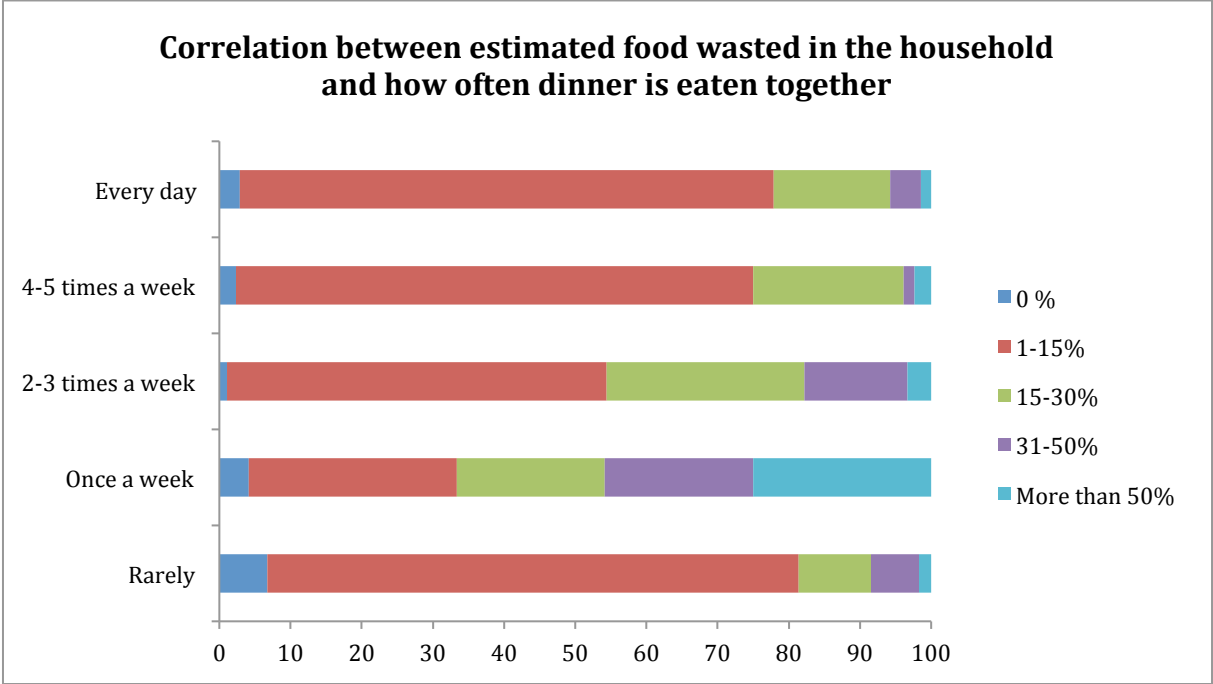


Figure 20: The graph gives a simplified representation of the correlation between estimated food wasted in the household and how often dinner is eaten together during the week. The y-axis represents the response alternatives regarding how often dinner is eaten together, while the colours represents the response alternatives regarding estimation of food waste.

Correlation between estimated food waste in the household and influence of household-members’ behaviour towards food waste

A negative correlation was measured between estimated food waste and response to the following statement “as my household member is concerned about reducing food waste in the household, I also increase my attention towards reducing food waste”: those who indicated to be more influenced by their household member, are also more likely to estimate lower percentage of food wasted in their household ($\rho = -0.17, p < 0.01$; Spearman rank order). The correlation is visualized in Figure 21.

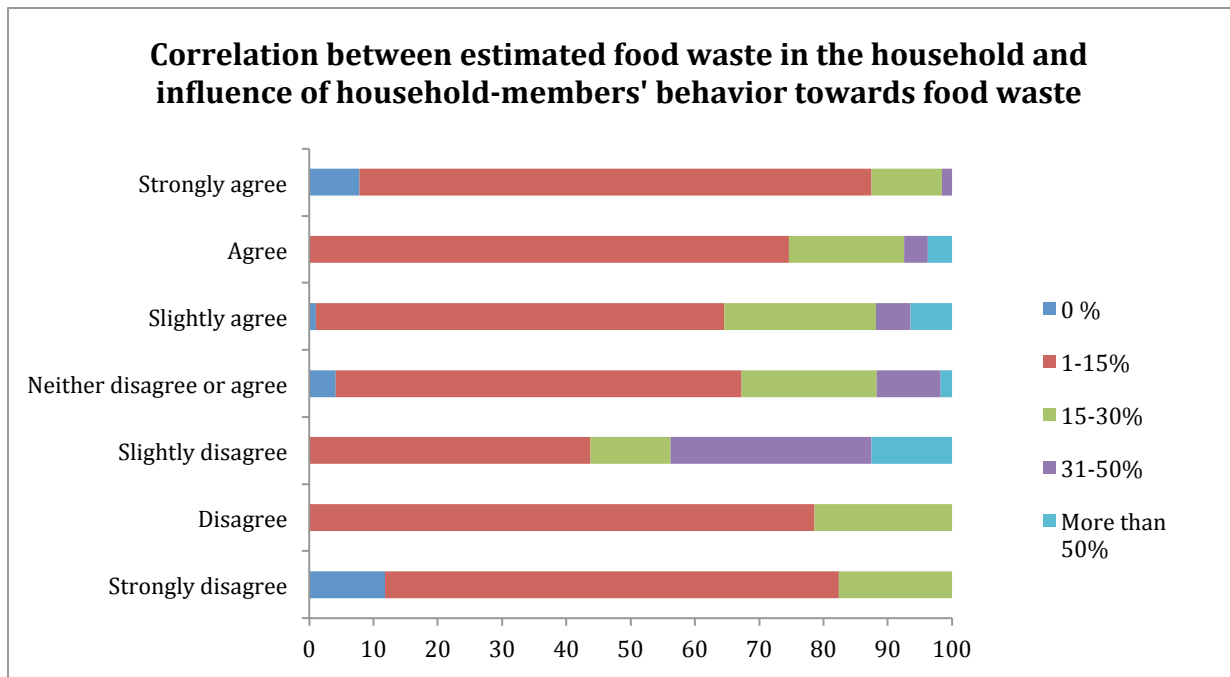


Figure 21: The graph gives a simplified representation of the correlation between estimated food wasted in the household and the influence of household-members' behaviour towards food waste. The y-axis represents the degree of agreement towards the statement, while the colours represents the response alternatives regarding estimation of food waste. The x-axis represents the percentage of respondents.

Correlation between estimated food waste and the influence of food waste behaviours from others in the household

There was a negative correlation between estimated food waste and the statement "others in my household are attentive about reducing food waste" ($p < 0.01$; Spearman Rank order): those who have thoughtful household-members are more likely to estimate lower percentage of food waste ($\rho = -0.31$; Spearman Rank order). The relationship is illustrated in Figure 22.

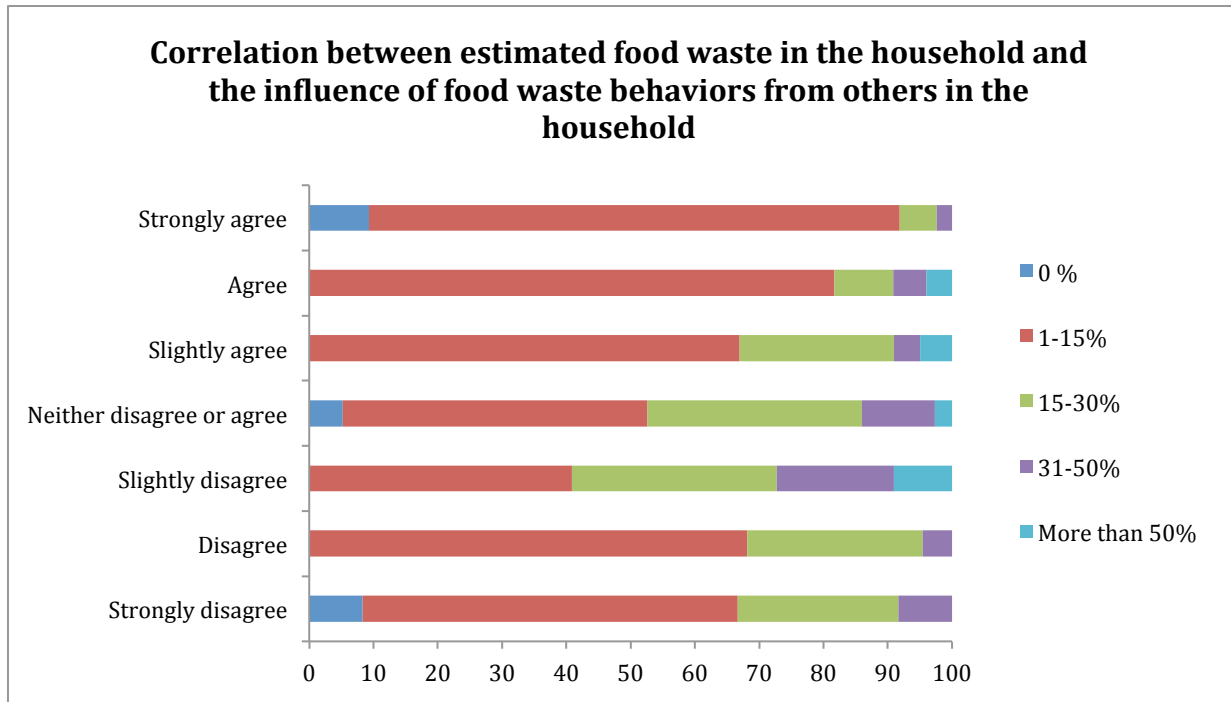


Figure 22: The graph gives a simplified representation of the correlation between estimated food wasted in the household and the influence of food waste behaviours from others in the household. The y-axis represents the degree of agreement towards the statement, while the colours represents the response alternatives regarding estimation of food waste. The x-axis represents the percentage of respondents.

Discussion

One of the main aims during the study was to understand the food waste behaviours, and assess the affect of different factors, both demographic factors and social factors, on the estimated amount of food waste in the household. Additionally, as to increase understanding on food waste behaviour, examining consumers acceptance of suboptimal food products in different situations, was also examined.

Estimated food waste in the household

To be able to get an insight of estimated food waste in households, the participants where asked to give an estimation of food wasted in their household based on given response alternatives. As presented in the results, the majority gave an estimation of approximately 10% food waste. This estimation was observed across all of the studies conducted for this thesis, and are confirmed by similar findings in a former study on American consumers: 56% of the participants estimated 10% food waste in their household (Neff et al. 2015). In contrast, a study conducted on Italian youth, the majority estimated 20-30% food waste in their household (Principato et al. 2015).

However, even though related findings have been observed, the methodology utilized in all of the mentioned studies was a self-estimated percentage scale. As this kind of measurement is a subjective measure, the possibility to give an underestimation is quite likely to happen, as consumers often are not aware of their own food waste contributions (Neff et al. 2015; Quested et al. 2011). Based on assumptions, social acceptance can also be a possible explanation to underestimation, as individuals often wants to present them self as a good consumer. And as highlighted by a study by Thomas & Sharp (2013), imitation is likely to happen when knowing others are performing similar act. However, a more precise and objective method of estimating waste is by actually measuring waste streams (food wastage recordings). This allows to obtain information about types and quantities of food wasted (Quested et al. 2011).

Household size and household composition

Furthermore, an effect of household size on estimated food waste was not observed in this study: there were no difference in estimation of food waste whether the respondents resided in a one-person household, two-person household or in a household with more than two individuals. These findings are in contrast to other related studies.

A study conducted by Parizeau et al. (2015) on households in Canada, showed a negative correlation between the size of the household and the amount food wasted per person (*per capita*): larger households tended to waste less *per capita* compared to smaller households. Similar findings were observed in a research conducted by WRAP in United Kingdom: less food waste production was observed in larger household sizes compared to one-person households *per capita* (Quested & Johnson 2009). Another way to look at it: the total amount of food wasted in a household seemed to be higher in a household with more occupants compared to households with fewer occupants (Koivupuro et al. 2012; Quested & Johnson 2009; Wenlock et al. 1980). Amount food wasted in these above-mentioned studies and research were obtained through recordings of the waste and through food diaries.

The tendency of larger household sizes to waste food less per capita can be associated with different factors, including the size of food packages available in shopping stores, and food recipes utilized for cooking. As food mainly is available in larger quantities in grocery stores, food waste in a one-person household is more likely to occur in a higher amount per capita, compared to a larger household (Quested et al. 2013). Additionally, in certain circumstances, packages with a larger content are being sold to a lower price (per kg) compared to smaller packages. Due these differences in prices, individuals from one-person household have emphasized that due to economics savings, they would choose the larger packages rather than the smaller packages, and thus, food waste is more likely to occur (Aschemann-Witzel et al. 2016). Relatedly, Secondi et al. (2015) also observed that the availability of smaller packages, might contribute in reducing food waste. Similar observations have been made in a study conducted on Finnish households: a larger amount of food is wasted in households that believe larger packages was a reason for wasting food most of the time (Koivupuro et al. 2012).

Likewise, as most recipes are targeting larger groups (often 4 individuals or more), this also can be a contributing factor towards higher amount of food waste per capita in a one-person household (Quested et al. 2013).

Concerning the difference between a household with children and a household without children regarding self-estimation of food waste, no effect was observed in our study. These findings are, however, not supported by other findings. Former studies have reported higher total amount of food wastage in a household with children, compared to households without children (Parizeau et al. 2015; Quested & Johnson 2009).

That being said, it is important to be cautious when comparing different studies. Due to different methodologies utilized, different usage of measurement units, differences in sample size and approach of the study, comparisons between varying studies can be challenging (Koivupuro et al. 2012). One of the limitations associated to the studies conducted in this thesis, is the quantification regarding amount of food wasted. When the respondents were asked to estimate amount food wasted in their household, it was not specified to estimate it based on food wasted during a day, during a week, during a year, in total or per capita, but rather on the amount of food purchased. Additionally, as mentioned above, the respondents gave a self-estimation based on a percentage scale, which only gives an insight of amount food wasted. In contrary, the studies mentioned above measured the wastage in different ways, either by actually recording the wastage (by categorizing it and weighing it) or through food waste diaries. By the usage of these kinds of methodologies, a more accurate amount of food waste is presented.

Age and gender

The effect of age on estimated food waste was also analysed across all three studies conducted. Even though the pilot study and research study 1 did not observe any differences between the age groups, differences were observed in research study 2. According to these results, older respondents estimated lower amount of food wasted in their households compared to the younger respondents. Similar findings have been observed in previous studies: WRAP observed younger people wasting higher amount of food compared to older people, specifically elderly from the age 65+ (Quested et al.

2013). In addition, a study conducted on some EU-countries, also confirm these findings: the older the people are, the more likely are they to waste less food (Secondi et al. 2015).

Even though an effect of age was not observed on the direct estimation of food waste in research study 1, the tendency of elderly to waste less was reflected in a different manner. When asking the respondents to specify the likelihood of wasting a suboptimal apple, an effect of age was observed: older respondents were less likely to waste the apple compared to the younger age groups. Related observations were also observed regarding wasting juice at the best-before date.

As emphasized by Quested et al. (2013), the habit of the elderly to waste less food can be explained through their food practices in their household. In a study conducted by WRAP, of nine behaviours associated with reducing food waste, seven of these were performed by elderly (Quested et al. 2013). These behaviours included planning meals in advance, making a shopping list, using up leftovers, and using date-labels on food. Additionally, other possible explanations to the difference between the elderly and the younger age groups can be related to the influence of different circumstances as they grew up, and more experience regarding food.

However, in research study 1 and 2, the age group 60+ comprised only a minor part of the total participants: 1.8% and 5.1%, respectively. In addition to limiting the diversity of the sample, the sample becomes less representative for the actual population. Furthermore, as it was an online questionnaire, there may be less elderly people willing to participate. Due to these limitations, even though significant effects have been observed, further research is necessary before concrete correlations can be drawn.

Furthermore, influence of gender on estimated food waste in the household was also examined, and the results varied considerably across the studies. Even though there was no effect of gender in pilot study and the research study 1, an effect was present in research study 2, where women seemed to waste less compared to men, which is supported by similar study conducted on EU-countries: women seems to waste less than men (Secondi et al. 2015). As highlighted by Secondi et al. 2015, women seemed to be

more concern towards food waste than men. In contrast, another study observed opposite results: women tend to waste more (Buzby & Guthrie 2002).

However, even though a significant effect of gender was not observed when respondents gave a self-estimation of food wasted in their household, an effect of gender regarding wasting cucumber was observed. In similar manner as the mentioned findings, women were less likely to waste a cucumber with odd-shape, compared to men. As mentioned above, the limited diversity can be a possible explanation to the results, as women dominated considerable in research study 1. Additionally, based on the given results from our study, and the limited research regarding the difference between men and women, it is difficult to establish the reason behind it.

In addition to the other demographic factors, the effect of educational level was also examined. As presented in the results, no effect of educational level on estimated food waste was illustrated in our study. These findings are related to another study: no effect of educational level on amount food wasted was observed in Finnish households (Koivupuro et al. 2012). However, a study conducted on some EU countries, reported an effect of educational level: those who finished education in an early age (age of 15 or under) are more likely to waste less than those who finished education later (Secondi et al. 2015). As suggested by Secondi et al. (2015), an interpretation can be that respondents with higher education are more likely to have higher income, and thus are less concern regarding wasting food. Additionally, individuals with low educational level might also estimate food waste less correctly as it was a subjective measurement (Secondi et al. 2015). However, as limited studies have analysed this factor, further research is needed.

Correlations between estimated food waste and different social context

In addition to assess the influence of demographic factors, correlations between estimated food waste and varying social context were examined to give insight into other possible factors that influence self-estimated food waste.

Correlation between estimated food waste and how often dinner is eaten together during a week, was negatively correlated: less food seemed to be wasted in households where dinner is eaten often together. Related findings have been observed in an extensive research conducted by WRAP: even though a weak factor, it was demonstrated lower food waste among those who eat a main meal together once a day, compared to those who eat main meal only twice a week or less (Lyndhurst 2007). When dinner is often eaten together, meals are more likely planned, there is less likely to prepare too much food, which furthermore reduces the likelihood of leftovers. As these behaviours are considered as contributors to reduce food waste in the household, these kinds of habits can be possible explanations towards the observed correlation (Quested et al. 2013).

In a similar way, those respondents who agreed to the statement: “as my household member is concerned about reducing food waste, I also increase my attention towards it”, estimated to waste less food in the household compared to those who disagreed. Related correlation was observed regarding the statement “Others in my household are attentive about reducing food waste”: those agreeing to this statement, also self-estimated lower food waste.

As lower amount of food is estimated by those individuals who have others in their household concerned about food waste, there is an indication of social influence and imitation. Suggested by the social learning account, individuals might imitate others behaviour when they either admire the person performing the behaviour, are rewarded for performing the same behaviour or if they see more than one person performing that particular behaviour (Greenhalgh et al. 2009). Similar observations were obtained from a study conducted on British households: some respondents emphasized that their food waste behaviour are results from imitation of important people in their lives e.g. parents (Graham-Rowe et al. 2014). However, even though all of these observations indicate possible impact of food practices and habits performed by others on estimated food waste, these observations are results from subjective measurements. Suggestions for obtaining more objective measurements can be experiments with visual inspection and control groups as to decrease the likelihood of overestimating or underestimating own behaviour.

Suboptimal food products

Food waste behaviour can also be reflected through the consumers' perception on suboptimal food products, and their acceptance about them. In this study, this was examined in different ways, including requesting the respondents to specify the likelihood of wasting suboptimal food products, and the choice between optimal and suboptimal food products.

Concerning the milk and the juice, in both the pilot study and research study 1, the majority specified that they wouldn't waste the suboptimal food products. These observations can be understood through their description on the food products: the participants described the food products with positive attributes including safe to consume, has a good taste, it is fresh, and other positive attributes. Based on these observations, it is clear that the majority of the participants seem to be acceptable and less sensitive regarding food safety and food labels guidance. Additionally, in research study 1, those respondents who most likely wouldn't waste the suboptimal food products, are also those who most likely perceive them as attractive even though "best-before" date has passed, which also contributes in the understanding about their choices. However, based on the open-ended questions, it was clearly that their decision of discarding the suboptimal product was also depended on tasting and smelling it before consuming or wasting it. This has also been observed in previous findings, where visual and sensory inspection of a suboptimal food product, influence the decisions of discarding it or consuming it (Kosa et al. 2007; Lyndhurst 2007).

In contrast, based on the open-answer questions, those respondents who would most likely discard the suboptimal milk and juice, some of these individuals seemed to have concerns about the freshness of the product. Others highlighted extra concern about dairy products and the expiration date, and would therefore discard the milk/juice when the expiration date has passed regardless of tasting or smelling it. These findings are similar to earlier research, where consumers have indicated their sensitivity towards food products passed their "best-before" date, and to food products close to this date, and would discard these kinds of food products, even though they are edible (Lyndhurst 2007; WRAP 2008). Sensitivity on guidance on labelling and food safety, have also been

observed in Finnish households: one of the reasons behind food waste was due to food products with passed “best-before” date or are close to the date (Koivupuro et al. 2012).

Possible explanation on these observations can be the lack of knowledge and awareness regarding the difference between “best-before” date and “use-by” date, and high sensitivity on food hygiene and thus, food labels (Kosa et al. 2007). As mentioned in the introduction, “use-by” date is related to the food products safety, and should not be consumed when this date has passed, while the “best-before” date is related to the food products quality, and can be consumed when the date is passed but after sensory and visual inspection (WRAP 2008). Consumers have revealed their poorly understanding towards these dates, and therefore discard food product unnecessarily (WRAP 2008).

A possible initiative towards this aspect is to increase the consumers’ knowledge, understanding and awareness about these types of dates where different educational system and retail system can contribute. As mentioned in the introduction, dairy companies such as Tine have shared an article on the difference between “best-before” date and “use-by” date as to contribute in reducing food waste at the consumer level (Tine 2013). Additionally, through their website, Matvett is sharing varying guidelines and tips regarding food safety and suboptimal food products e.g. how to identify if eggs are edible or should be discarded, and how to prepare couple days old bread to make it fresh, respectively (Matvett 2016a).

Relatedly, when respondents chose between suboptimal or optimal food products, the choices varied considerably depending on what food product was displayed. When milk and juice were presented, the majority would choose the suboptimal product. However, when an apple with brown spot was presented, the majority would rather choose the optimal apple one. Similar, when a curved cucumber was presented, the majority specified that both products were fine for consumption.

Concerning the choice of apple, these observations can be explained through the consumers’ preference of fresh products. As highlighted in their open-ended questions, the majority of the respondents emphasized the importance of fresh product, and thus, chose the optimal apple rather the suboptimal one. Similar findings have also been

observed in previous findings, where the freshness of the product is important to the consumers (Koivupuro et al. 2012). In addition, as the apple had visual imperfection, the likelihood of the participants choosing the suboptimal one might decrease, as previous studies have observed consumers discarding food products that are visual unpleasant (Koivupuro et al. 2012; Lyndhurst 2007). The choice can also be a result from a previous experience from a low quality food product. As highlighted in a previous study, if a consumer from a previous occasion obtained foodborne-illness by consuming a suboptimal food product, that person will gain direct knowledge regarding the quality of the product (Caswell & Mojduszka 1996). The likelihood of choosing a low quality food product another occasion, is thus relatively low. This is also related to consumers concern about food hygiene in previous studies, which can also contribute in the explanation towards the choice (Lyndhurst 2007).

In contrast, suboptimal juice and milk were chosen rather than the optimal ones, and these observations can be explained through their answers in the open-ended questions. Some of the respondents highlighted the importance of eating those food products that should be eaten first, and would therefore choose the suboptimal one. Others also highlighted that even though the “best-before” date was passed, didn’t necessarily mean it should be wasted. They emphasized the importance of visual inspection of the food product before making a decision. This has also been observed in a previous research: 2/3 of the participants reported that visual inspection and senses were the main factor when deciding to consume or discard a suboptimal food product (Kosa et al. 2007). Furthermore, other possible factors contributing on the choice can be related to how long the food products have been in the refrigerator.

How messages can change consumers’ perception on suboptimal food products

Additionally to examine consumers’ relation to suboptimal food products, effect of different messages on these food waste behaviour was also examined.

Even though the results indicated significant effect of the different messages displayed, the impact seemed to be minor based on the measured mean values. As emphasized in the results, expected observation was only observed regarding attractiveness of apple and expected taste of apple as the respondents rated the apple more attractive when

social norm message was displayed. These observations reflect what was highlighted in the study by Greenhalg et al. (2009): individuals are more likely to imitate others when knowing that there are more than one performing the same behaviour. These observations indicate possible influence of the normative act performed by the others in the society. As emphasized in a study by Thomas & Sharp (2013), when consumers know that an act is actually being performed by others, they are more likely to perform the similar act. Thus, when respondents read about an act that the majority of the society is performing, a possibility of being influenced is likely. Related observations have also been presented in previous study on college students where the impact of food waste messages was measured on amount food wasted. The study observed less food waste after exposing the students with messages regarding food waste (Whitehair et al. 2013).

However, due to errors occurring when using the statistical program, elaborating the interaction effects was difficult, even though a substitute program was utilized. Therefore, as controversy results also were observed, impact of the messages seems to be minor, and needs further research before conclusions are taken. Thus, to further examine the impact of social norm messages and messages about the environmental impact and person finance, further research can be done by the usage of different methodologies, more advanced statistical programs, and by using a more representative and larger sample.

In addition to examine different food waste behaviour and the consumers acceptance on suboptimal food products, evaluating the reason behind food waste and the motivations to reduce food waste, contributes in increasing the understanding behind food waste behaviour.

Main reason behind food waste

Food waste is a complex process caused by a combination of different, related factors (Quested et al. 2013). Even though there are several individual factors contributing to food waste, it is the combination of different factors that causes food waste. Factors, including consumers' behaviour, attitudes, beliefs, kitchen practices, food practices and

generally their lifestyle, are all contributors to food waste in the household. By increasing knowledge and understanding towards the main reasons behind food waste in the household, further actions and initiatives can be addressed to reduce, or perhaps prevent amount food wasted in households.

Based on the results presented, the responses between the studies varied considerably. The majority of the respondents from the pilot study specified purchasing too much food being the main reason to food waste, while the majority from research study 1 specified that changed texture, smell and taste were the main drivers for food waste in their household. Preparing too much food was also one of the top reasons behind food waste.

The difference between the two studies can be due to dominance of different age groups in each of the two studies. Within the pilot study, the age group 31-50+ dominated (comprising 80% of the participants), while in research study 1, age group 18-30, dominated (comprising 66% of the participants). Additionally, as the lifestyle of these two age groups most likely are varying, this also may contribute in the explanation towards the difference. In addition, in pilot study, there were also less people participating decreasing the likelihood of representing the population.

Comparing our results with previous findings, similarities are observed. Related to our results, research conducted by WRAP on British households highlighted too much food being purchased as one of the top reasons behind food waste was too much food being purchased (Lyndhurst 2007). Even though our study did not provide further information from the respondents regarding why too much food is being purchased, the extensive research by WRAP identified factors such as “buy-two-get-one-free” offers, and reduced price on products due to their near expiration date, tempting the consumers to purchase more (Lyndhurst 2007). Due to these offers are contributing in food waste in household, certain grocery shops in Norway have decided to reduce these types of offers, “buy 3 get 2 free” (Rema 2016).

Furthermore, preparing too much food, changed appearances (including smell, texture and taste), and products close to their expiration date, have also been highlighted as

main reasons behind food waste in different studies (Koivupuro et al. 2012; Parizeau et al. 2015; Silvennoinen et al. 2014). However, it is also important to emphasize that reasons behind food waste can be varying regarding of what types of food is being wasted. For instance: vegetables and fruit are often discarded due to spoilage, while milk is more likely to be discarded due to either passed expiration date or spoilage (Silvennoinen et al. 2014).

Arguably, as our study only utilized questionnaires with specific response alternatives, the respondents' opportunity to elaborate their reason behind food waste in further details was restricted. In addition, it also restricts the respondents to specify other reasons behind food waste in their household. An alternative methodology that could have been utilized, would be a food waste diary (Koivupuro et al. 2012). Even though the usage of food waste diary is a more time-consuming and a resource demanding methodology, food diaries enlarges the insight of food waste behaviour by providing more detailed information.

Motivations to reduce food waste

As to be able to design effective initiatives towards food waste reduction within households, it is essential to also increase knowledge about the consumers' motivators to minimise household food waste. Thus, in research study 1, participants were asked to specify motivations to reduce food waste based on given response alternatives.

Based on our findings, the majority of the respondents reported guilt as the main motivator to reduce food waste, followed up by economics savings. These findings are supported by previous studies conducted on American consumers and British consumers: economics savings and the feeling of guilt or doing the right "thing", were the main motives to reduce food waste (Graham-Rowe et al. 2014; Neff et al. 2015; Quested et al. 2013). As presented by Graham-Rowe et al. (2014), the respondents associated food waste with waste of money, and thus, tried to minimise the amount of food waste. Research conducted by WRAP suggested that economics savings being the highest motivator could be associated with the consumers' motivation to spend money elsewhere in the household (Quested et al. 2013). However, in our study, when

presenting labels about financial benefit of purchasing suboptimal food products, there was no large impact on the likelihood of purchasing observed.

Dependent on the gender, and on the degree of responsibility in the household, motivations to reduce food waste varied. Those individuals who stated that they have shared responsibility or full responsibility in the household, had a higher probability of specifying economics saving as the most encouraging factor to reduce food waste, compared to those respondents who didn't have any responsibility in the household. These findings are reasonable, as those who have the responsibility for purchasing food know the expense of the food and the effort behind purchasing the food, and would therefore more likely, discard food more thoughtful. Those respondents with no responsibility specified that the thought of others suffering from food deficiency was the most motivating factor.

In addition, echoing the findings from Neff et al. (2015) and Graham-Rowe et al. (2014), respondents in the current study specified environmental concern as one of the least motivating factor towards minimising household food waste. Arguably, as there seem to be low awareness of the negative impact of food waste on the environment, the current findings are not a surprise. However, even though it hasn't been analysed in this study, those respondents who are aware of the environmental impact of food waste, could be wasting less. For further research, this could be an interesting aspect to examine. Furthermore, as mentioned earlier, to be able to increase consumers' awareness to the environmental impact of food waste, actions through education, retail marked and other similar influential systems have to increase.

However, as the current study mainly consisted of close-ended questions with given response alternatives, this limits the respondents' opportunity to give their own view and opinion towards the issue. Even though such methodologies do give an insight into consumers' behaviour, attitudes and lifestyle towards food waste, addressing more advanced methodologies as interviews and food waste diaries increases the understanding towards household food waste. When that said, the usage of questionnaire does have several advantages. By utilizing a questionnaire the possibility to reach out to more people in short time is enlarged compared to using interviews and

food waste diaries. Questionnaires are also less time consuming, and therefore an effective approach to collect useful insights in a short time.

As for future implementation, to induce changes regarding food waste in households, both the educational system and the retail market can make a change at the consumer level. As mentioned during the thesis, the work and actions of different organisations e.g. Matvett and WRAP, and different grocery shops e.g. Bunnpris, Rema 1000, are already contributing in increasing awareness about food waste in different ways. Encouraging and advising the consumers on how to reduce waste through different practices in the household, including kitchen- and food practices, can contribute in slowly induce changes.

Conclusion

In conclusion, there was typically no effect of household size, gender, educational level and household composition (regarding children in the household) on the estimated food waste in the household in the studies in this thesis. However, differences between age groups were observed in some food waste related behaviours.

The reasons behind food waste were mainly due to purchasing too much food, changed texture, smell or taste on the food products, and due to preparing too much food. As to be able to reduce food waste in the household, it was highlighted that economics savings and feeling of guilt were the main motivators to reduce food waste. Furthermore, consumers' perception on suboptimal food products seemed to be varying dependent on what food type was displayed. Consumers' acceptance of suboptimal food products seemed to be influenced by varying factors: knowledge and understanding of food labels (e.g. "best-before" date), visual and sensory inspection, and the freshness of the product. All these factors tend to influence the likelihood of wasting suboptimal food products and the choice between suboptimal and optimal food products. Additionally, their perception on suboptimal food products regarding its attractiveness, the amount it would purchased for, seemed to marginally influenced by social norm-, environmental-, and financial messages.

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Appendices

Appendix A.1 – Questionnaire conducted at “Forskningstorget”

Deltager kode: _____

- Kjønn: Alder: Bostilstand: Barn? I din husstand, hvem har ansvaret for å handle og for å lage mat?
- Mann 18-30 Med partner Yes Jeg tar hovedansvaret
 Kvinne 31-50 Med romkamerat No Vi deler ansvaret
 50+ Annet: _____ Annen person i husstanden tar hovedansvaret

Til hvert utsagn, gi en indikasjon på hvorvidt du er enig/uenig:	1 Helt uenig	2 Ganske uenig	3 Uenig til en viss grad	4 Hverken uenig eller enig	5 Til en viss grad enig	6 Ganske enig	7 Helt enig
1) Ofte handler jeg inn varer som er nærmer seg sin utløpsdato (“best-før” dato)							
2) Det er viktig for meg å velge miljøvennlig mat							
3) Å kaste mat er noe jeg misliker sterkt							
4) Jeg vil heller kaste mat enn å innta det, dersom det er usikkert om hvorvidt det er spiselig eller ei							
5) Jeg avgjør om mat er spiselig ved å smake, lukte og se på utseende, selv dersom den har passert sin utløpsdato							
6) Jeg kan kjøpe matvarer nær sin utløpsdato, dersom jeg vet jeg skal benytte meg av det snarest							

Kan du gi en beskrivelse av den avbildede melken? Kryss av for alternativene som passer:



- God smak Dårlig smak Usikker på smaken
 Kan trygt drikkes Ikke trygt å drikke Kan drikkes slik den er
 Egnet for voksne Egnet for barn Egnet for gjester
 Kastes i avfallet Må tas i bruk raskest mulig Kan tas i bruk for matlaging

Du ser melkekartongen i matvarebutikken:

Hvor mye rabatt må gis for at du skal kjøpe den? Kryss av for det mest passende alternativet:

- Rabatt er ikke nødvendig 10% 30% 50% 70% Jeg ville ikke ha kjøpt produktet

Hvis melken var tilgjengelig i din husstand:

Hva er sannsynligheten for at du ville kastet den? Sett ring rundt det mest passende alternativet:

Selvfølgelig blir den kastet	Mest sannsynlig blir den kastet	Hverken eller	Mest sannsynlig blir den ikke kastet	Selvfølgelig blir den ikke kastet
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Av all type mat du handler inn, hvor mye blir kastet? (Gi en omtrentlig estimering)

- 0% 10% 20% 30% 40% 50% eller mer

Hva er hovedårsaken til matsvinn i din husstand?

- For mye handles inn Passert “best-før dato”
 Forberedt for mye mat Endret utseende eller tekstur Annen årsak: _____

Hvor viktig er det for deg å ikke kaste mat?

- Har ingen betydning Ikke viktig Hverken eller Viktig Veldig viktig

Appendix A.2 – Questionnaire related to the study “Food waste in the household”

Spørsmål	Svar alternativer
<p>Q1^{A)}: Det skal serveres snacks i form av frukt i din husstand, og epler er blant disse. Følgende epler er tilgjengelige, eple 1 og eple 2. I din husstand, hvilket av disse to eplene har større sannsynlighet for å bli tatt i bruk?</p>	<p>Eple 1 (Optimale) Eple 2 (Sub-optimale) Det er det samme hvilket eple som blir valgt Ingen av disse Jeg vet ikke</p>
<p>Q2: Vennligst begrunn ditt valg</p>	
<p>Q3: Du har følgende eple^{C)} foran deg. Hvilke beskrivelser tenker du er de mest passende for eplet? Kryss av på så mange alternativer som er ønskelig.</p>	<p>God smak Dårlig smak Søt Bitter Saftig Bløt Knasende Smuldrete Fersk Råtten usikker på smaken</p>
<p>Q4: Dette eplet har ikke et fristende utseende.</p> <p>Q5: Dette eplet har en ubehagelig smak, lukt eller tekstur.</p>	<p>Sterkt uenig Uenig Litt uenig Verken uenig eller enig Litt enig Enig Sterkt enig</p>
<p>Q6: Følgende eplet er tilgjengelig i din husstand. Hva er sannsynligheten for at dette eplet blir kastet?</p>	<p>Selvfølgelig blir den kastet Mest sannsynlig blir den kastet Nøytral Mest sannsynlig blir den ikke kastet Selvfølgelig blir den ikke kastet</p>
<p>Q7: Det er behov for epler i din husstand. I butikken er det rabatt på epler med litt uvanlig utseende. Hvor mye rabatt er nødvendig for at slike epler blir kjøpt for din husstand?</p>	<p>Rabatt er ikke nødvendig 10% 20% 30% 40% 50% Mer enn 50% Jeg ville ikke ha kjøpt produktet</p>

Spørsmål	Svaralternativer
<p>Q15^{B)}: Frokost skal spises i din husstand, og melk er blant drikkene som blir servert. Valget ligger mellom melk 1 og melk 2. I din husstand, hvilket av disse to har større sannsynlighet for å bli valgt?</p>	<p>Melk 1 (Optimale) Melk 2 (Sub-optimale) Det er det samme hvilket melk som blir valgt. Ingen av disse. Jeg vet ikke.</p>
<p>Q16: Vennligst begrunn ditt valg.</p>	
<p>Q17: Du har følgende melk^{D)} foran deg. Hvilke beskrivelser tenker du er de mest passende for melken? Kryss av på så mange alternativer som er ønskelig.</p>	<p>God smak Dårlig smak Søt Sur Klumpete væske Ren væske Tyntflytende væske Tyktflytende væske Fersk smak Gammel smak Usikker på smaken</p>
<p>Q18: Denne melken har ikke et fristende utseende.</p> <p>Q19: Denne melken har en ubehagelig smak, lukt eller tekstur.</p>	<p>Sterkt uenig Uenig Litt uenig Verken uenig eller enig Litt enig Enig Sterkt enig</p>
<p>Q20: Følgende melk er tilgjengelig i din husstand. Hva er sannsynligheten for at denne melken blir kastet?</p>	<p>Selvfølgelig blir den kastet Mest sannsynlig blir den kastet Nøytral Mest sannsynlig blir den ikke kastet Selvfølgelig blir den ikke kastet</p>
<p>Q21: Det er behov for melk i din husstand. I butikken er det rabatt på melk med kort utløpsdato. Hvor mye rabatt er nødvendig for at melken blir kjøpt for din husstand?</p>	<p>Rabatt er ikke nødvendig 10% 20% 30% 40% 50% Mer enn 50% Jeg ville ikke ha kjøpt produktet</p>

A) Spørsmål Q1-Q7 ble også stilt for agurk. B) Spørsmål Q15-Q21 ble også stilt for juice. C) Eplet/agurken som blir fremstilt i Q3-7 er den sub-optimale. D) Melken/juice som blir fremstilt i Q17-21 er den sub-optimale.

Spørsmål	Svar alternativer
<p>Q22: Nedenfor er en rekke utsagn listet opp. Hvor enig/uenig er du i utsagnene.</p>	<p>Sammenlignet med en i samme husstand, er jeg mer fleksibel/åpen mot utløpsdato.</p> <p>Sammenlignet med en i samme husstand, er jeg flinkere til å kaste mindre mat.</p> <p>I min husstand kastes det ofte mye mat</p> <p>Sterkt uenig Uenig Litt uenig Verken uenig eller enig Litt enig Enig Sterkt enig</p>
<p>Q23: Ut i fra hvor mye mat som blir kjøpt inn, omtrent hvor mye mat blir kastet? Gi en omtrentlig estimering.</p>	<p>Mat blir ikke kastet 10% 20% 30% 40% 50% Mer enn 50%</p>
<p>Q24: I din husstand, hva er hoved årsaken til matsvinn?</p>	<p>Passert utløpsdato. For mye handles inn. For mye mat forberedes. Endret tekstur eller smak. Vi spiser ikke rester. Andre årsaker</p>
<p>Q25: Nedenfor er en rekke utsagn listet opp. Hvilke motivere deg mest til å minimisere matsvinn?</p>	<p>Jeg får skyldfølelse når jeg kaster mat.</p> <p>Ved å kaste mindre mat, er det en mulighet for å spare penger.</p> <p>Jeg ønsker å være miljøvennlig.</p> <p>Andre steder i verden er det mangel på mat.</p> <p>Ingen av utsagnene.</p>
<p>Q26* : Ville du forberedt noe med denne poteten? Hvorfor, hvorfor ikke?</p>	
<p>Q27* : Hva antar du noen andre i husstanden ville gjort med poteten?</p>	

Spørsmål	Svar alternativer
Q28: Nedenfor er en rekke utsagn listet opp. Hvor enig/uenig er du i utsagnene?	<p>Jeg sammenligner utløpsdato på matproduktene når jeg er ute og handler.</p> <p>Jeg misliker sterkt å kaste mat i søppelen.</p> <p>Jeg foretrekker å kjøpe økologiske matvarer (mat med minimalt bruk av tilsetningsstoffer).</p> <p>Jeg forsikrer meg at maten jeg inntar er sunn.</p>
Q29: Kjønn	Kvinne Mann
Q30: Alder	18-30 31-40 41-50 51-60 60+
Q31: Velg høyeste utdanningsnivå	Videregående Bachelor Master Doktorgrad Annet
Q32: Yrkesstatus. Her er det mulighet for å krysse av på flere alternativer.	Arbeidsledig Student Heltidsansatt Deltidsansatt
Q33: Bo-tilstand	Med romkamerat Med samboer Med ektefelle Annet
Q34: Hvor mange er dere totalt i din husholdning, inkl. deg selv?	1 2 3 4 Flere enn 4
Q35: Hvilke aldersgrupper er det i din husstand? For hver aldersgruppe, velg antall individer i den gruppen	Yngre enn 10 år 10-17 18-30 31-60 60+
Q36** : I din husstand, hvem har ansvaret for å handle inn mat, og lage mat?	Jeg tar hovedansvaret Delt ansvar Annen person tar ansvaret

*Disse spørsmålene ble ikke inkludert under analysen av data. **I utgangspunktet er dette to separate spørsmål

Appendix A.3 – Questionnaire related to the study “Influence of social-norm, environmental- and financial messages on food waste behaviour”

Spørsmål	Svaralternativer
<p>Q1: I din husholdning, hvem har hovedansvaret for å handle inn mat?</p>	<p>Jeg tar hovedansvaret. Delt ansvar. Annen person i husholdningen tar hovedansvaret.</p>
<p>Q2: I din husholdning, hvem har hovedansvaret for å lage mat?</p>	<p>Jeg tar hovedansvaret. Delt ansvar. Annen person i husholdningen tar hovedansvaret.</p>
<p>Q3^{A)}: På skala fra 1-100, hvor attraktivt finner du dette produktet? Hvor 1 indikerer "ikke attraktivt i det hele tatt", og 100 indikerer svært attraktivt.</p>	<p>1= ikke attraktivt i det hele tatt ... 100= svært attraktivt</p>
<p>Q4: På skala fra 1-100, hvor stor smaksforventning har du til dette produktet? Hvor 1 indikerer "svært dårlig", og 100 indikerer "svært god".</p>	<p>1= svært dårlig ... 100= svært god</p>
<p>Q5: På skala fra 1 - 100%, hva er sannsynligheten for at du ville kjøpt dette produktet? Hvor 1% indikerer "jeg ville absolutt ikke ha kjøpt produktet", og 100% indikerer "jeg ville absolutt ha kjøpt produktet".</p>	<p>1= jeg ville absolutt ikke ha kjøpt produktet ... 100 = jeg ville absolutt ha kjøpt produktet</p>
<p>Q6: På skala fra 1-35 kr, hvor mye er du villig til å betale for dette produktet?</p>	

^{A)}Q3-Q6: Samme spørsmål ble stilt for både epler og gulrøtter

Spørsmål	Svaralternativer
Q7*: I løpet av en dag, hvor mange ganger inntar du frukt?	0 ganger i løpet av en dag 1 gang i løpet av dagen 2 ganger i løpet av dagen 3 ganger i løpet av dagen 4 ganger i løpet av dagen 5 ganger i løpet av dagen Flere enn 5 ganger i løpet av dagen
Q8*: I løpet av en dag, hvor mange ganger inntar du grønnsaker?	0 ganger i løpet av en dag 1 gang i løpet av dagen 2 ganger i løpet av dagen 3 ganger i løpet av dagen 4 ganger i løpet av dagen 5 ganger i løpet av dagen Flere enn 5 ganger i løpet av dagen
Q9*: Når dette er tilgjengelig, pleier jeg å kjøpe organiske matprodukter, organiske egg og organiske meieriprodukter.	Aldri Sjeldent Av og til Ofte Alltid Jeg vet ikke
Q10*: Er jeg den siste personen til å forlate et rom, forsikrer jeg meg at jeg slår av lyset etter meg. Q11*: Jeg resirkulerer alltid papir og papiresker. Q12*: Blir jeg tilbudt plastikk pose i butikken, velger jeg å takke nei.	Aldri Sjeldent Av og til Ofte Alltid Jeg vet ikke
Q13*: Hva legger du i ordet "miljøvennlig mat"? Gi en kort beskrivelse av ordet.	

*Disse spørsmålene er ikke inkludert i analysen da disse ikke er relevante til min problemstilling

Spørsmål	Svaralternativer
<p>Q14: Hvor uenig/enig er du i følgende utsagn?</p>	<p>Jeg foretrekker å kjøpe naturlige produkter: produkter uten tilsetningsstoffer.</p> <p>Jeg foretrekker miljøvennlig mat.</p> <p>Jeg spiser alltid opp maten min for å unngå å kaste mat når jeg er hjemme.</p> <p>Jeg tenker alltid på matsikkerhet når jeg handler inn mat.</p> <p>Jeg hater å måtte kaste mat i søppelen.</p> <p>Å forberede et måltid til noen er en måte å vise takknemlighet og omsorg på.</p> <p>Jeg foretrekker organiske matprodukter.</p> <p>Så lenge det er mennesker i verden som ikke får nok mat, bør ikke mat kastes.</p> <p>Å gå ut på lunsj eller middag er en del av mine spisevaner.</p> <p>Over et måltid kan man ha en hyggelig samtale.</p> <p>Jeg og mine venner kan ofte forberede en enkel og uformell middag sammen.</p>

Spørsmål	Svaralternativer
<p>Q14: Hvor uenig/enig er du i følgende utsagn?</p>	<p>For å forsikre meg at jeg inntar kun sunne måltider, kontrollerer jeg hva jeg spiser.</p> <p>Når jeg har gjester, ønsker jeg å tilby mye mat.</p> <p>Ved middag er det viktigste tiden sammen med hverandre.</p> <p>Spiser jeg ute, vil jeg alltid spise opp maten min for å unngå å kaste mat.</p> <p>Jeg oppbevarer og spiser rester fra mat jeg har laget mat.</p>
<p>Q15*: Jeg unngår å utføre handlinger som kan resultere i at andre unngår meg eller avviser meg.</p> <p>Q16*: Jeg har behov for å vite at jeg har personer jeg kan vende til ved vanskelige tider</p> <p>Q17*: Jeg vil bli akseptert av andre personer.</p> <p>Q18*: Det plager meg sterkt hvis jeg ikke blir inkludert i andres planer.</p>	<p>Sterkt uenig</p> <p>Uenig</p> <p>Litt uenig</p> <p>Verken uenig eller enig</p> <p>Litt enig</p> <p>Enig</p> <p>Sterkt enig</p> <p>Ikke i det hele tatt</p> <p>Litt</p> <p>Til en viss grad</p> <p>Ofte</p> <p>Hele tiden</p>

*Disse spørsmålene er ikke inkludert i analysen da de ikke er relevant for min problemstilling

Spørsmål	Svaralternativer
<p>Q19: Ettersom min ektefelle/samboer er opptatt å redusere mengde matsvinn, prøver jeg også opprettholde dette.</p> <p>Q20: Ettersom min ektefelle/samboer er engasjert i kildesortering, blir jeg også opptatt av å kildesortere.</p> <p>Q22: I min husstand er det enkelte som bevisst er aktive på å redusere matsvinn.</p> <p>Q23: I min husstand er de eldre mer bevisst aktive med å redusere matsvinn i forhold til de yngre i husstanden.</p> <p>Q24: Jeg er mer opptatt av å redusere matsvinn i husholdningen enn min ektefelle/samboer.</p>	<p>Sterkt uenig Uenig Litt uenig Verken uenig eller enig Litt enig Enig Sterkt enig</p>
<p>Q25: Basert på hvor mye matvarer som handles inn i din husholdningen, gi en omtrentlig estimering (i prosent) av hvor mye mat som kastes:</p>	<p>Prosentkala fra 1-100%</p>
<p>Q26: I løpet av en uke, hvor ofte sitter dere sammen og spiser middag i din husstand?</p>	<p>Sjeldent 1 gang i uken 2-3 ganger i uken 4-5 ganger i uken Hver dag</p>

Spørsmål	Svaralternativer
Q27: Kjønn	Kvinne Mann
Q28: Alder	18-30 31-40 41-50 51-60 61+
Q29: Velg høyeste utdanningsnivå	Grunnskole Videregående Bachelor Master Doktorgrad Annet
Q30: Yrkesstatus. Her er det mulig å krysse av på flere muligheter.	Arbeidsledig Student Deltidsansatt Heltidsansatt Annet
Q31: I tillegg til deg selv, hvem andre bor i din husholdning? Her er det mulig å krysse av på flere muligheter.	Kjæreste/samboer Ektefelle Mor Far Søsken Barn Venn (romkamerat) Annet
Q32: Hvor mange er dere totalt i din husholdning, inkludert deg selv?	1 2 3 4 Flere enn 4
Q33: Hvilke aldersgrupper er det i din husholdning? For hver aldersgruppe, vennligst velg antall individer i den gruppen.	Yngre enn 10 år 11-17 år 18-30 år 31-50 år 51-60 år 61+ år



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