

DATE MARKS

- TOOLS TO CHANGE CONSUMER BEHAVIOUR

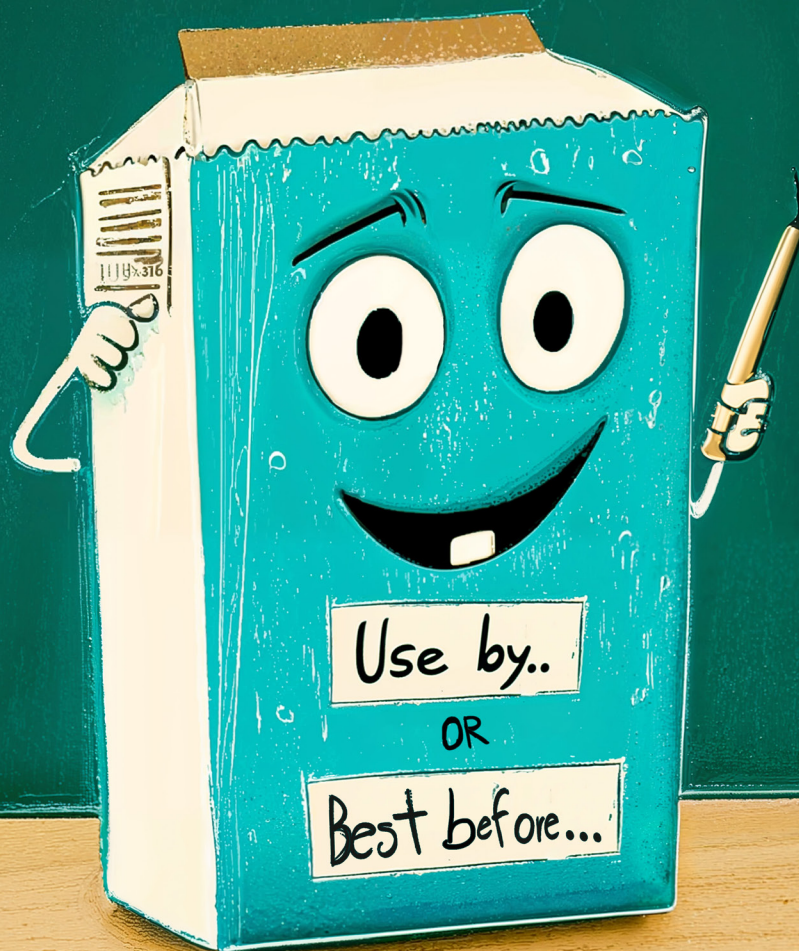
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Date marks

– tools to change consumer behaviour

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Preface

The terms "best before" and "use-by" on food labels convey messages that consumers are expected to interpret differently. In Denmark, most consumers are aware of the meanings of these date marks and generally follow the advice not to discard food solely because the "best before" date has passed. However, an earlier study has shown that some people still throw food out when "Best before" date has expired, and some also follow the advice to check the quality when SA date has expired resulting in a safety risk.

Based on this, the Danish Veterinary and Food Administration has requested the DCA - Danish Centre for Food and Agriculture at Aarhus University to explore existing literature focusing on tools that could change consumers' behaviour regarding the expired date marks and estimate the potential of the most promising tool.

The results of this study can inform the development of more specific actions or tools to guide consumers' interpretation and decision-making related to expired date marks in everyday life.

The project presented in this report was carried out by researchers from MAPP Centre at the Department of Management, Aarhus University.

1 Summary

Background and aim

From 2020-2021, AU has carried out two studies on consumers' understanding and handling of the "use by" and "best before" date marks (Hansen et al. 2021a, Hansen et al. 2021b). The studies showed that consumers are strongly influenced by their basic beliefs when deciding whether to discard a food product after expiry. Consumers' beliefs basically guide their choices, regardless of whether they understand the meaning of the two types of date marks. Therefore, the Danish Veterinary and Food Administration wants AU to carry out a new study, which will map tools that can be used to change consumers' beliefs and ultimately behaviour.

The expired date marks "best before" (BB) and "use-by" (UB) date marks should result in different actions by consumers, but many consumers do not make a difference between the two types of date marks. The aim of this report is to map the current literature to find tools that could help consumers differentiate between BB and UB date marks and lead accordingly to correct decisions. The feasibility and effectiveness of the most promising tool were explored in a small-scale intervention.

Mapping the literature on tools to influence date mark-related behaviours

The report consists of two parts. The first part is a literature review that maps existing literature to find and assess interventions and tools developed to address date marks, either directly or as part of efforts to reduce food waste or improve food safety. The literature review is based on both peer-reviewed literature, and grey literature and websites, on food waste and food safety. All searches focus on consumer behaviours and household practices. The literature review revealed only limited research on consumer behaviour related to date marks. All tools identified in the literature review is presented in the report. Some potential tools were identified from studies addressing food waste in general, but they need modification to fit the context of date marks, or new tools must be developed. The identified potential tools were educational courses, fridge charts, and reminders. Reminders were identified as the tool to test for effectiveness in the small-scale intervention.

Intervention with reminders

In a three-week intervention study, SMS reminders with a short, informative message were sent directly to participants preceded and followed by an online survey. The Reminder enhanced self-efficacy, reduced food waste, and improved understanding of date marks, especially for participants with low knowledge level in the beginning and those who received them once a week vs. every three days.

Conclusion

Expired date marks are recognised as one of the causes behind food waste but the literature on how to change behaviour and practices related to date marks is limited. Reminders were identified as potential tools to target the understanding of date marks, and our intervention suggests that they can provide statistically significant improvements in key areas, but the relatively small magnitude of these improvements suggests that the practical effects in everyday life may be limited.

2 Resumé

Baggrund og mål

AU har fra 2020-2022 lavet to undersøgelser af forbrugernes forståelse og håndtering af datomærkningerne "sidste anvendelsesdato" og "bedst før" (Hansen et al. 2021a, Hansen et al. 2021b). Undersøgelserne viste, at forbrugerne er meget påvirket af deres grundlæggende overbevisninger, når de skal beslutte, om de vil kassere en fødevarer efter udløb. Forbrugernes overbevisninger styrer som udgangspunkt deres valg, uanset om de forstår betydningen af de to datomærkninger. Derfor ønsker Fødevarestyrelsen, at AU laver en ny undersøgelse, som skal kortlægge værktøjer, som kan benyttes til at ændre forbrugernes overbevisninger og i sidste ende adfærd.

Datomærkerne "bedst før" (BB) og "sidste anvendelsesdato" (UB) har forskellige betydninger og opfordrer til forskellige håndteringer af madvarer. Dog skelner mange forbrugerne ikke mellem typen af datomærke, når de håndterer madvarer over dato. Formålet med denne rapport er at kortlægge den aktuelle litteratur for at identificere værktøjer, der kan hjælpe forbrugerne med at skelne mellem BB- og UB-datomærker samt handle i overensstemmelse med datomærkernes forskellige betydning. Værktøjet med bedst gennemførlighed og potentiale undersøges i en mindre intervention.

Litteratur Review af værktøjer til påvirkning af datomærkerelateret adfærd

Rapporten består af to dele. Den første del er en litteraturgennemgang, der kortlægger eksisterende litteratur for at identificere og vurdere interventioner samt værktøjer, der direkte eller indirekte er udviklet med henblik på at korrigere forkert forståelse og håndtering af datomærker. Litteraturgennemgangen fokuserer på forbrugeradfærd og husholdningspraksis og er baseret på peer-reviewed litteratur om madspild og fødevarer sikkerhed, grå litteratur og hjemmesider. Litteraturgennemgangen fandt kun i begrænset omfang forskning i forbrugeradfærd relateret til datomærker. Alle værktøjer identificeret i litteraturgennemgangen er præsenteret i rapporten. Nogle potentielle værktøjer blev identificeret i undersøgelser omhandlende madspild generelt. Disse værktøjer skal modificeres til datomærkernes kontekst, alternativt skal nye værktøjer udvikles. De identificerede værktøjer var *uddannelseskurser*, *køleskabsdiagrammer* og *påmindelser*. Værktøjet *Påmindelsertestes* for potentiale i en mindre intervention i anden del af denne rapport.

Intervention med Påmindelser

I en tre-ugers interventionsundersøgelse blev SMS-påmindelser bestående af en kort, informativ besked sendt direkte til deltagerne. Deltagerne fik før og efter de 3 uger med påmindelserne tilsendt en online-survey. Påmindelserne reducerede madspild, og forbedrede self-efficacy samt forståelsen af datomærker især for deltagere med lavt vidensniveau samt deltagerne, der modtog påmindelserne en gang om ugen kontra hver tredje dag.

Resultater

Forbrugerrespons på overskredne datomærker er en anerkendt årsag til madspild, men litteraturen om forandring af adfærd og praksis relateret til datomærker er begrænset. Påmindelser blev identificeret som et potentielt værktøj til at målrette datomærkerelateret adfærd. Denne intervention tyder på, at påmindelserne kan give statistisk signifikante forbedringer på nøgleområder. Størrelsen på disse forbedringer er dog relativ lille, hvilket tyder på, at de praktiske effekter i hverdagen kan være begrænsede.

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3 Background

The two date marks “best before” (BB) and “use-by” (UB) carry messages that consumers are expected to interpret in different ways. The BB messages should tell consumers that the product is likely to be edible and in good quality beyond the expiry date, whereas the UB should tell consumers to throw the food out after the date has expired. Previously the emphasis has been in raising awareness of food waste and educating consumers in the importance of not throwing food out just because the BB label has expired. In Denmark, the majority of consumers are aware of this, and they report to follow this advice but there are still around 20% who report to throw food out because the BB date has expired (Hansen et al., 2021a). However, the majority of respondents reported that they also check the quality when UB date has expired, which may result in a safety risk. This indicates that there might still be some confusion related to the interpretation and understanding of the two types of date marks.

However, when asked about the meaning of the two date marks, the majority of respondents in a Danish study answer correctly (84% on BB and 78% on UB mark), even though the knowledge did not translate into behavioural response (Hansen and Lähteenmäki 2021b). Throwing out food when BB date has expired can be linked to lack of ability to assess the eating quality (Glanz-Chanoz et al. 2016), whereas checking the quality when UB date has expired was reasoned by perceiving a low risk of any significant consequences beyond “a bit of upset in the stomach” (Hansen & Lähteenmäki, 2021b). This was enforced with a perception of “common sense” that helps assess the eating quality with one’s own senses and can be defined as a form of self-efficacy (Bandura, 1997).

According to the previous survey in Denmark, consumers use date marks when buying the product (56%), deciding whether to use a product when preparing food (50%), and when deciding whether to dispose the food (65%) (Hansen et al., 2021a). Date marks are only available on prepacked products and their relevance may be more important in products where assessing the product quality is perceived to be more difficult, such as animal-based products, which are also perceived as having higher safety risks than plant-based food products (Glanz-Chanoz et al. 2016; Hansen & Lähteenmäki, 2021b).

Date marks are estimated to contribute 10% to the food waste (European Commission, 2018) when people throw out expired food without checking the quality. As mentioned earlier, in Denmark date marks are most often used (65% of respondents, Hansen et al., 2021a) when making decisions about disposing products. One of the challenges is that only 56% of Danish people report to make a difference between the types of date marks (BB or UB). Thus, the date marks have several communication challenges in relation to aiding consumers to make the right decisions: first, people should check the type of date mark when deciding on whether to dispose the product or not; second, they should make a distinction between the two types of date marks; and third, then translate these into appropriate behaviours. Date marks should encourage consumers to check the quality of the product instead of directly disposing it when the BB date has expired, but they should make consumers to dispose the foods when UB date has expired.

Finding tools that would enable consumers to make better use of the date marks and then make the correct decisions about food products after the date mark has expired is important in reducing food waste without taking unnecessary risks in food safety. So far, there is a limited number of studies that have gone beyond exploring the knowledge and understanding of the two types of date marks and carried out interventions or explored tools that concentrate on helping consumers to translate the knowledge into correct actions with the date marks.

3.1 Objectives

The overall objective of this report is to map the existing literature to find and assess those interventions and the tools that have been developed and tried, either on the date marks directly or as part of interventions on trying to reduce the food waste or improve food safety. In the second part, the most promising and feasible tool will be tried out in a small-scale intervention to explore its potential of enabling consumers to make better use of the date marks.

The tools can target the different steps that link date marks to behaviour. The change of behaviour requires first that consumer notice the date marks, second that they differentiate between the two types of date marks, and third they translate this knowledge into correct behaviour.

More specifically, we want to find and/or develop tools that result in better differentiation between the two types of date marks. The better differentiation should encourage correct decision making about disposing the food directly if the product carries an expired UB date mark, and assessing the food quality before making a decision about disposing if the product carries an expired BB date mark.

4 Mapping the existing interventions and tools: A literature review

4.1 Search strategy and findings

In the search of literature concerning tools that enable consumers to make use of the date marks in a purposed way, we have conducted three searches with different focus; one search on peer-reviewed articles focussed on food waste, one search on peer-reviewed articles focussed on food safety and one search on grey literature and websites related to date marks, tools and food waste. The searches were limited to articles/results from 2011 or later. The reason for this is that an EU regulation¹ updating the definition and use of the two types of date marks in EU countries was accepted this year, potentially making the topic of date marks more salient for EU countries. Additionally, we were only interested in articles/results focusing on consumers' behaviours and practices at the household level where disposal decisions are made. The search of articles is limited to English and Danish languages. Furthermore, we did not include interventions or experiments centred around the misunderstanding of date marks, as the (mis)understanding as such does not directly indicate behaviour. For all inclusion criteria see Table 1.

Table 1: *Inclusion criteria for literature review*

Subject inclusion criteria	
Date	From 2011 to now.
Subject intervention	Any intervention or kind of tool tested or proposed to help reducing food waste, which is in relation to date marks either as main or secondary focus of the study. Excluding any study focusing on the confusion related to date labels.
Setting	Questions about household behaviour
Language	English or Danish

We first did two searches for peer-reviewed articles, the first in relation to date marks/labels, food waste and interventions, and the second related to date marks/labels, food safety and interventions. We included a search focussing on "food safety" in our search as the date marks (the 'use by' date specifically) also serve a purpose of ensuring food safety². Therefore, the inclusion of this research field is a potential source of tools targeting consumer behaviour that is relevant in relation to date marks. However, we only included articles presenting new tools that were not discovered in the first search.

The searches concerning the peer-reviewed articles were done on Scopus and on Google Scholar. In each search we used multiple combinations of words like "*intervention*", "*experiment*", "*food*", "*date*", "*labels*", "marks" and "*food waste*" to ensure we got as many relevant hits as possible regardless of variations in choice of words in potential articles (for the exact search wording see Table 2). The articles

¹ Regulation - 1169/2011: <https://eur-lex.europa.eu/eli/reg/2011/1169/oj>

² Regulation 1169/2011: <https://eur-lex.europa.eu/eli/reg/2011/1169/oj>

were initially sorted by reading abstract, and if applicable, the entire article was read to determine whether the article was relevant in the context of tools targeting consumer behaviour relating the use of date marks.

4.1.1 Peer-reviewed articles

Following the search strategy described above, a total of 178 potential articles (some appearing in multiple searches) were identified on Scopus and Google Scholar. The initial screening based on abstracts identified 13 relevant research papers. In total the search focusing on food safety resulted in 107 articles on Scopus and Google Scholar. After screening, 19 articles were found to have a potential relevance with regard to discovering new tools.

Table 2: *Systematic search of published articles*

<i>Search wording</i>	<i>Hits</i>	<i>Relevant abstracts</i>	<i>Relevant articles</i>
Searches in the context of food waste			
1. search: intervention OR "experiment" AND "food date labels" AND "food waste" 2011-2025 (Scopus)	6	None	-
2. search: intervention AND "food waste" AND "date" 2011-2025 (Scopus)	34	8	2
3. search: experiment AND "food waste" AND "date" 2011-2025 (Scopus)	55	4	1
4. search: intervention "date marks" "food waste" 2015-2025 (google scholar)	30	None	-
5. search: experiment "date marks" "food waste" 2011-2025 (google scholar)	53	1	None
Searches in the context of food safety			
6. search: "date mark" OR "date label" AND "food safety" 2011-2025 (Scopus)	25	6	None
7. search: "date labels" "food safety" "consumer behaviour" "experiment" "tool" 2011-2025 (Google Scholar)	82	13	1

On reading the 13 papers found in the search on food waste, only three relevant papers concerning interventions on consumer behaviour and date marks were found. Furthermore, only two out of the three articles had the usage of date marks as the main focus in the study. The inclusion of "food safety" in the search of literature did introduce new articles with a slightly different focus than the previous search on food waste, but most of them did not introduce new tools or ways to intervene in behaviour and therefore are not included in the report. The search focusing on food safety only resulted in one article containing new tools not discovered earlier. See Table 3 for overview of the four discovered articles.

Table 3: *Relevant articles from the systematic search*

Authors	Woolley et al. 2022	Buttlar et al. 2021	Neubig et al. 2022	Blondin et al. 2022
Type of intervention	Technical tool	Information about date marks and environment	Information about health and safety of aged food	Relevant interventions not investigated
Description	Recipes and associated ingredients are suggested for users which consider their preferences, remaining food items already held at home, expiry dates and minimum pack sizes.	Information about the interpretation of date marks and the environmental consequences of food waste, to decrease their ambivalence towards expired food products. Results were inconclusive.	Investigating consumers' willingness to consume aging produce at home using information video about safety or healthfulness of aged Lettuce, and shows this information leads to a longer willingness to consume it.	Based on the MOA framework the authors develop 40 different interventions that target food waste related problems either linked to motivation, opportunity or ability.
Date marks as main focus	Yes	No	Yes	no
Experimental design	Applied to a simulated case study	Tested in online survey	Tested in online survey	Literature search and field trials
Results	Argued for potential	Found no effect	Found an effect	-

The three articles from the search focusing on food waste had the commonality that they used information as the intervention tool to induce change in the consumer behaviour. Two of them used information campaigns with an intent to educate consumers to make the decision process of whether or not something should be eaten easier (Buttlar et al. 2021; Neubig et al. 2022). The third article uses information indirectly as the article suggests using a technical tool that provides consumers with recipes for ingredients already available at home while taking account of expiry dates (Woolley et al. 2022). More precisely, “the platform is designed to optimise the utilisation of the remaining inventory, under the constraint of the expiry dates, and match purchase quantities to actual needs, thus reducing waste generated” (ibid.). The information in this case can thus be seen as adapted to the unique situation of the individual household as the content of the tool will vary by input of food products and their expiry dates, contrary to the other two articles where information is used at a general level. Additionally, the article by Woolley et al.(2022) did not test the effectiveness of the technical tool, but rather its potential usefulness. Concluding the article, they argue that there is a potential for reducing household food waste through better engagement with consumers but also admit that there are still many possibilities to further enhance the proposed tool.

Reviewing the results of the two other articles, Buttlar et al. (2021) demonstrated that expired best before date marks increased people's ambivalence towards food and made them more willing to waste it. However, the article's third experiment regarding two informational interventions (one informing about the interpretation of date marks and one informing about the environmental consequences of food

waste) aiming to prevent people from experiencing ambivalence did not work as intended. In conclusion, the effects on ambivalence were not significant and they did not find effects of the information intervention conditions on premeditated waste (a measurement of participants intended amount of waste) (Buttlar et al. 2021). The study by Neubig et al. (2022) showed on the contrary that a video providing information on either safety or healthfulness of an aged lettuce resulted in increased perception of safety and health, respectively. This resulted in prolonging the period that respondents were willing to consume the ageing lettuce. The article was assessed to be relevant as a potential tool to change date mark related behaviour as it investigates how to make consumers more willing to eat foods with perceived lower quality e.g. close to UB or beyond the BB expiration date (Neubig et al. 2022). Although the article focuses on aged produce (lettuce), the presented tool could potentially also increase consumers' willingness to eat food past the best before date.

When searching food safety targets, Blondin et al. (2022) discovered mainly articles targeting food waste in general. The paper applies the MOA framework (Motivation, Opportunity and Ability by van Geffen et al. 2016) to outline the "causes of the causes" of consumer food waste to gain a better understanding of drivers of food waste (Blondin et al., 2022). Based on the MOA framework, they present an overview of forty different intervention strategies with the potential to change consumer behaviour regarding food waste. In addition to the literature and presentation of the framework, the paper presents two field trials investigating interventions based on social norms (Blondin et al. 2022). Although most of the presented intervention strategies are either not relevant to our specific context or are already discovered by the earlier described articles, the paper presents some tools that can be relevant in the context of behaviour related to date marks. The intervention strategies that may be converted into interventions in the context of date marks are *Information in cost savings from Reducing food waste, Measurement and tracking of food waste, Goal setting and monitoring, Food waste reduction competitions* (Blondin et al. 2022).

4.1.2 Grey literature and websites

In the search on grey literature, we first used a Google search function with similar wording as in the earlier searches. More specifically, one search was made in English using the words "date marks" "tools" "food waste" limited to results 2011 or later, and one search was made in Danish using the words "værktøjer" "datomærker" "mad" with no year limit as the number of results was very limited. The sorting procedure and assessing of relevance of hits consisted of reading the headline and the associated text excerpt on the results. If assessed to be relevant, the website would be accessed and examined. Supplementary to searching on Google we also searched on specific websites that we expected to have relevant content regarding potential tools. These websites were think-tanks with a focus on food waste and official websites, such as pages targeting citizens by authorities (See the specific websites in Table 4). In addition, we also reviewed potentially relevant references linked to visited websites.

Table 4: Search of grey literature

<i>Grey literature on Google</i>		
Search documents	Hits	Relevant websites
1. search: date marks "tools" food waste 2011-2025	About 67.000.000 results (went through the first couple pages)	None
2. search: værktøjer datomærker mad no year limit on search	23	None
<i>Grey literature specific websites</i>		
Websites		Relevant websites
Danish Veterinary and Food Administration (Fødevarestyrelsen: https://foedevarestyrelsen.dk)		3
Taste for Life (Smag for livet: https://smagforlivet.dk)		3
Danish Consumer Council Think (Forbrugerrådet Tænk: : https://taenk.dk/)		4
Ministry of Environment and Food (Miljø- og Fødevareministeriet: https://www2.mst.dk)		1
One/Third Think-Tank (One/Third Tænketank: https://onethird.dk/)		None
Food Culture (Madkulturen: https://www.madkulturen.dk/)		None

The searches on grey literature on Google did not produce relevant hits to our context. Most hits relating to date marks were in the context of misunderstanding or not knowing the difference between the two types of date marks and therefore did not meet the search criteria of targeting behaviour change.

The second part of the grey literature search showed to be more successful as the websites of think-tanks and authorities had different versions of guides and other tools for reducing food waste. Some of these tools directly target the use of date marks, whereas other tools are linked to date marks in an indirect way. As an example, some tools seek to enhance consumers' self-efficacy by giving guidance on assessing the eating quality of food, which previously has been suggested to be a possible barrier among Danish consumers against using products beyond the best before expiry date (Hansen et al., 2021). The same applies to the guides relating to food storing, as consumers' knowledge on correct storing conditions contributes to the understanding of how to maintain the good food quality longer. However, it does not directly help assess whether a food is edible or not at expiry date.

The Danish food authority, Danish Veterinary and Food Administration (Fødevarestyrelsen), has three relevant pages on its website. One page is dedicated to explaining how to assess indicators of reduced eating quality of food and what is the difference between the two types of date marks (Danish Veterinary and Food Administration 2024^A). In addition, there is also a page that elaborates on how to deal with mould and a page on how to store food correctly, so that the shelf-life of a given food can be extended (Danish Veterinary and Food Administration 2024^{B,C}).

In the same vein, the website for "Smag for Livet" (Taste for Life) has two pages which respectively, are a guide on using the date marks in practice and a guide to assess whether the food is still edible (Taste for Life 2024^A and Taste for Life 2024^B). The website Taste for Life has also a page containing a teaching course for children on the intermediate level in school. In the course the children are asked to work with

food waste and become familiar with different date marks, and to learn how to use their senses to examine and assess whether food is still edible (Taste for Life 2024^C).

The website for Forbrugerrådet Tænk (“The Consumer Council Think”) similarly, has a page regarding use of date marks in practice, a page on handling mould and a page on storage and food assessment (The Consumer Council Think 2024^{A,B,C}). The Consumer Council Think also has a page presenting the free app “For Resten” that has the intention to help consumers avoid food waste (The Consumer Council Think 2024^D). This app is interesting as it gives consumers’ the possibility to look up the most common foods and find out how to store them, assess their eating quality, and what else to pay attention to with any specific food.

On the website of the Ministry of Environment and Food, there is a report about food waste and consumer behaviour in which various forms of nudging interventions are proposed (Ministry of Environment and Food 2024). These interventions include visual instructions/guides and reminders on food assessment, guides on food usage after the foods have peaked in freshness, and a teaching module for primary school students to upgrade their knowledge of shelf-life, assessment of food quality, and ways to use food beyond its prime. See Table 5 for an overview of discovered tools from the search on grey literature and websites.

Table 5: Sourced tools from grey literature and websites

Type of tool	Number of cases
Guidance on the use of date marks (when and how)	2
Guidance on food assessment and/or handling of mould	5
Guidance on the food storing	2
Guidance on the usage of older foods	1
Teaching courses	2
Reminders	1
App	1

4.1.3 Conclusion on literature review

There are some potential tools available to influence consumer behaviour on the use of date marks in practice. However, in none of the cases the tool (proposed or already available) has been tested in order to find out whether it would be used in households as part of daily routines or as a learning tool, and whether it has an effect on behaviour in the context of date marks.

In total, we found three kinds of tools in the searches of peer-reviewed articles. One was a technical tool, one was an information campaign, and the third one was a framework of multiple interventions related to food waste. In the search on grey literature and website we discovered seven different types of tools, four of which are a form of guides that are linked to assessment of food quality. There are no

tools that related to encouraging the use of date marks at home but only information-based tools on making the difference between the two types of date marks.

4.2 Discussion of findings and potential tools

In this section the findings from the literature review will be discussed. Based on the findings from the literature review three potential tools are introduced and discussed in terms of feasibility and potential to be tested in practise in the second part of this report.

4.2.1 Discussion on findings from the literature review

Overall, the findings from the literature search did not show any tools specifically targeting consumers' date mark related practices, such as differentiating between the two types of date mark when making decisions about disposal of food or failing to follow the intended behaviour consisting of assessing foods that are past BB and throwing out food past UB.

Carrying out the literature review presented various challenges. The field was very fragmented making it difficult to get an overview of literature. Furthermore, most articles and websites on date marks did not have the behavioural aspect as the main focus. Most articles were focusing on reducing food waste having date marks as a minor or secondary focus, and if an article had the date marks as a main focus, it was often in relation to the confusion in understanding of the different types of marks. The literature review may have missed discovering some material, but the lack of material focusing, or even just touching upon the behavioural aspects of using date marks was consistent throughout all the different searches. This indicates that the published material is rather thin on trying to change the consumer behaviour and practices related to date marks.

The literature review did, however, find some tools with the intent to improve the use of the different date marks in practice (findings from the grey literature search). We also discovered tools, which can either be modified or act as an inspiration for our own development of tools. In any case, the potential tools still need to be tested, as the tools found in this literature search have limited or no evidence regarding their effectiveness.

Some tools were presented in both peer-reviewed articles and the grey literature. In both searches we saw propositions of a technical tool or an app; in one case not yet fully developed and in the other case finished and available for download. The content of the apps was almost identical and provided support to monitor specific foods related to when and how they decline in eating quality, and possible ways to use them in dishes depending on their stage of deterioration. Even though the primary goal of the two apps is to minimise food waste and not specifically target the behaviour related to date marks, the apps still have features relevant to date mark context. Specifically, the ability to access information with a mobile device just out of one's pocket about how to assess the eating quality of any specific food

gives the consumer easy and fast access to relevant information. This can potentially improve consumers' self-efficacy and make consumers more confident when assessing food quality, so they do not throw food out just because BB date has passed. Unfortunately, the app is no longer available³.

The educational aspect in the information campaign and guides can potentially be a way to minimise consumers' disgust sensitivity, which has been given as one reason contributing to why the Danish consumers throw out older, but edible food (Hartmann et al. 2018). Educating people about the safety and possible health impact of eating food that is no longer at its peak of freshness can potentially help consumers to tackle their disgust sensations. The information campaign and guides on food assessment and/or handling of mould can therefore be relevant to test for effectiveness in relation to the date marks behaviour as these guides can improve consumers' self-efficacy in assessing whether food is still healthy and safe to eat.

The search of grey literature discovered several types of guides with varying focuses, but there is no data available on whether or not they have an effect on the behaviour. The consumers may not know that these tools exist, they may not find them relevant or useful, or maybe the effort of finding and using them is too high. The apps as tools have potential to solve some of these challenges. One way to support the use of guides could be to hand out hard copies of selected guides to test if they induce changes in consumers' behaviour. This would be a more inexpensive attempt to change the behaviour than creating an app, but maybe not as permanent as paper guide can easily be damaged in a kitchen environment. Furthermore, various guides being available already may also indicate that the guides and knowledge on its own are simply not enough to change consumers' date mark related behaviour.

The other informational tool discovered in the search of published articles focused on information about the interpretation of date marks and the environmental consequences of food waste in order to decrease their ambivalence towards expired food products. An ambivalence that arises because people are conflicted between wanting to save the environment and avoiding lower quality or potentially unsafe food (Buttlar et al. 2021). The focus on "framing" the food waste in terms of environmental impact was also mentioned in a report on nudges discovered in the grey literature" (Ministry of Environment and Food 2024). Yet, the report did not propose any specific intervention in relation to it. Using framing nudges to focus on the negative effects resulting from failure to differentiate between the two types of date marks and translate that into correct decisions could be a tool to test. The framing could in this case be focusing on the environmental problems following an unnecessary high level of food waste when throwing out food past BB date without assessment. Another way of framing the problem could be focusing on the health-related risk when eating food past the UB date.

Reminders were another type of a potential nudge discovered in the literature search. A way of using reminders could be by email or text message where consumers at specific times receive a reminder to use the date marks correctly: if the date has expired, check the type of date mark and do the food

³ Forbrugerrådet Tænk, the owner of the available app announced in an email correspondence that the app was going to close on September 30, 2024.

quality assessment if BB has expired, but throw food out if UB has expired. This could perhaps be every day around dinner time or close to the weekend where people could be more likely to do food inventories or purchase large amounts of groceries preparing for the week ahead. This way of using reminders can potentially be a relatively cost-effective method to reach customers at home where the targeted behaviour on making decisions about disposing food takes place. Furthermore, this tool could also be combined with some of the other tools like guides. The weekly or daily message could be used beside a link to a more explicit guide on food quality assessment or handling of mould for those who would need it. By linking to a guide, the information will be easily accessible at the point of need. However, one challenge linked to using reminders in this way, is that we cannot make sure if people actually are opening and reading The Reminder.

The tool of teaching courses discovered in the grey literature differs from the other tools suggested. In teaching courses, participants can receive the actual stimuli of food that has deteriorated quality, and there is a possibility to have feedback on whether the knowledge is adopted. In addition, this tool has the potential to improve self-efficacy and even decrease disgust sensitivity. By implementing a teaching course in school, it would be possible to teach younger consumers skills on food quality assessment. Targeting the younger demographic group may reduce food waste in the future as young adults have been shown to be some of those who waste the most (Stancu et al. 2018). The education in food quality assessment and handling of food decay and mould could potentially also be effective in minimising the impact of disgust sensitivity if students are exposed to stimuli that is demonstrated to be of good quality. Moreover, it would probably be relatively easy to implement this as a part of the already existing course on food knowledge (in Danish madkundskab). One disadvantage regarding this tool is however, that the effect of these tools may only be fully felt over time when the school children reach adulthood and move to their own households.

4.2.2 Potential tools to change the behaviour related to the use of date marks

Based on the literature review, no tools fully developed or directly targeting the behaviour related to date marking have been discovered. Therefore, this section presents three different tools, which are modifications of discovered tools or tools that have been developed based on the findings from the literature review.

4.2.2.1 Reminder

The Reminder tool consists of a daily or weekly written text or e-mail messages sent to consumers. The objective is to remind consumers to use the date marks correctly: if the BB date has expired, check the type of date mark and do the food quality assessment, but throw food out if the UB date has expired. Furthermore, the written reminder can also include a link to a more explicit guide on food quality assessment or handling of mould for those consumers who wish more information. By linking to a guide, the information will then be easily accessible. The intention with this tool is to raise awareness about the difference between the two date marks and the correct use of them at home where the decisions about

disposal are made. In addition, The Reminder can also make the food assessment easier by providing the consumers with relevant information if needed.

4.2.2.2 Educational course

The second tool is an educational course, which is a modification of a tool discovered from the literature search on food waste. We propose a modified version focusing on three elements relevant to the use of date marks. The course will be focusing on the use of date marks to ensure that course participants know the difference and intentions behind the two date marks. The course will also focus on food quality assessment with the intent to improve their skills and thereby self-efficacy, and finally the course will focus on the process of food decay to potentially tackle disgust sensitivity as well. The tool can either be developed on school level as the original, however this will be delaying the full effect of the tool as it will take years before the school children become adult consumers starting an independent life. The tool can also be developed as course targeted adult consumers. So instead of being an actual part of a school subject, it could be transformed into webinar to support individual learning.

4.2.2.3 Fridge *chart/table*

Finally, inspired by the nudge focusing on the environmental cost of food waste and misbehaviour regarding the date marks a third tool is proposed. This nudge was not mentioned in discovered report in search of grey literature but is described in systematic review on nudges in relation to food waste. The nudge in question is informing consumers of the financial costs of not following the intended behaviour of the date marks (Barker et al. 2021). More specifically we suggest that consumers receive a form of chart/table on paper placed on the or near the fridge in addition to the basic information about the two date marks (e.g. the process tree or another form of guide on the right use of the two date marks). Every time consumers make a decision about whether to use a product or throw it out, they are asked to mark down whether the product has a date mark that has expired, whether that date mark it is best before (BB) or use-by (UB) and the decision they make: either throwing the food out or assessing the quality before making the decision. The aim of the chart is to make consumers more aware of the date marks and how they make decisions about the use or disposal.

The chart can give points for good decisions: e.g. assessing the quality when BB has expired; using the product if the quality is acceptable with BB; and throwing the food out when UB has expired. The idea of this is to gamify the tool and make it more engaging. The tool can cover assessment of leftovers and their quality to link it more tightly to food waste.

The chart can be further gamified by setting goals for points to be achieved over a period. In this way the fridge chart serves two purposes. One is that the game part of the chart potentially will motivate the consumers to practice the intended behaviour related to the date marks in order to receive most points. The other purpose is to make the consumer aware of their behaviour related to the date marks by marking down how much edible food is thrown out or how often they perform food assessment. A further motivating factor is that the visualisation of how much or little food is wasted is also an indication of the

money wasted or saved when it comes to the behaviour related to date marks. This can potentially also be a way to motivate consumers to waste less.

4.2.2.4 Comparison

Comparing these three tools the educational course and the fridge chart seem to require most effort from the consumers. In the educational course, the consumers are required to invest time and engage in a learning course with a relatively large information content. Additionally, the consumers are expected to have the ability to transform the knowledge from the course to a real-life situation at home in their everyday lives. In the case of the fridge chart, the consumers need to include additional elements and take artificial pauses to note down their every-day behaviours on the chart. In this aspect, The Reminder requires the least from the consumers, as they are only to receive and read the text message that may (or may not) affect them to adjust their decisions related to the date marks. The effectiveness of this tool therefore rests on the assumption that the consumers already are knowledgeable on the subject beforehand, as the text itself can include limited amount of information. If more information is needed, the text can include a link to additional information, but accessing it requires more effort from the consumers. This means that The Reminder, as an isolated text only provides knowledge on date marks but does not have the ability to guide the behaviour unlike the two other tools.

The resources and effort required to run the different tools follow a similar pattern. The educational course, if implemented as a physical matter, requires teachers and rooms to hold the courses, which means that only a limited number of consumers can take part. Even, if the educational course was to be converted to an online webinar, it will still require producing the whole course and making it accessible online on a platform. This is scalable, however still requires a lot of resources to implement and advertise the course. The fridge chart requires less resources to run and scale up to make it available for consumers. The chart and information can either be sent online to the recipients, however, this will require that they have the possibility and will to print out the materials themselves. The target consumers could receive the material already printed out by post. This would minimise consumers' workload but end up being costly due to person and material expenses required in mailing the materials. The Reminder can be set up to run automatically but can potentially be costly in terms of all the emails or text messages that are to be sent. This makes this tool easily scalable, but potentially expensive.

As the effectiveness of the three tools is not known the decision of which tool will be tested is based on the scalability of the tool and on the level of consumer engagement and effort needed. The assumption is that the less effort the tool requires from the consumers, the higher are the chances that consumers will use it. Therefore, the tool *Reminder* will be tested, as it requires least effort from consumers and is the easiest tool to scale up when compared with the two other tools.

4.3 Summary

Taken together, the literature review revealed that there is little literature on consumers' behaviour related to date marks. Some potential tools were discovered; however, they were not directly targeting date marks but instead food waste in general. The tools found having potential in promoting desired behaviours when making decisions on products with expired date marks need to be modified to fit the purpose or alternatively develop new tools. From the three tools that were regarded as most potential, The Reminder will be tested for effectiveness, because of its scalability and the low level of required consumer effort.

5 Testing of The Reminder

In this part of the report the perception and effectiveness of The Reminder is tested with a three-week intervention study consisting of text reminders sent during the intervention and two questionnaires, one sent pre- and one sent post-intervention. The data collection took place in November 2024 in Denmark. The Research Ethics Committee, Aarhus BSS approved the study (BSS-2024-171-S2).

The objective of testing The Reminder is to investigate the use of text-messages, assess how The Reminder was received, and determine whether it increased knowledge, self-efficacy, and changed reported behaviour related to date marks and food waste.

5.1 Method

Our interest in The Reminder was to investigate their potential effect on date mark related behaviour in people's homes. For this reason, we wanted to conduct an intervention reaching people at the place where decisions about disposing food are made.

5.1.1 The intervention

The intervention tool is a SMS reminder that consists of a short message with a link sent directly to the participating consumers. Specifically, the text message contains a very short definition on the meaning of the UB mark and of the BB mark, and a link to the website of Danish Veterinary and Food Administration for a more detailed explanation of the two date marks. See picture 1 for the specific content.

We chose two frequencies as we were interested in whether the frequency has an influence on the perception and effectiveness of The Reminder. The sample was therefore randomly divided into two groups: one group received The Reminder in a frequency of every three days (group Third day), and the second group received The Reminder once a week on Fridays (group Friday). The higher frequency of reminders can potentially strengthen the effect as the consumers are receiving the message more often. Every *third day* also divided The Reminders more evenly to different weekdays than receiving them once a week. On the other hand, a higher frequency can potentially also be perceived as irritating by the consumer, whereby they might choose to ignore and not to read the texts. We chose Friday as the weekly target day because we assumed that the weekend is a time when many families have more time to

Picture 1 – SMS text

DATOMÆRKNINGER - Har du styr på dem?

Husk at tjekke typen af datomærkning på dine madvarer inden, du spiser eller smider ud.

Smid maden ud, hvis "Sidste anvendelsesdato" er overskredet, så risikerer du ikke uforudsete gener.

Tjek altid madens kvalitet, hvis "Bedst før" er overskredet. Ser, dufter og smager maden fint, så fejler fødevaren intet og kan sagtens spises.

Hvis du er i tvivl om en fødevarer med "Bedst før" kan spises, så se fødevarestyrelsens vejledning her:
www.foedevarestyrelsen.dk/kost-og-foedevarer/alt-om-mad/madspild-i-hjemmet/vurder-madens-holdbarhed

Image produced for this report with the purpose of illustrating the SMS reminder.

do food inventory (going through what food is left and what foods are past their date marks) and buy larger amounts of groceries preparing for the coming weekend and week. Thus, we assumed that sending The Reminder at this time makes it especially relevant/current and potentially more impactful.

The intervention lasted three weeks, preceded and followed by an online survey (Table 6).

Table 6: *Overview of study process*

Study	
Participants recruited by data agency	
Receiving survey one	
Placed randomly in one of two groups	
Group 1: SMS frequency every three days	Group 2: SMS frequency every Friday day
Receiving survey two	

5.1.2 Survey description

We used the market research agency Norstat for recruiting of participants and sending text messages. The inclusion criteria were that consumers must be over the age of 18 and fully or partially responsible for food provisioning in their households. The reason for this is that we were only interested in adult consumers who make decisions about foods with date marks on.

In the first survey the participants were asked about socio-demographic background, self-efficacy, knowledge about date marks and their self-reported household level of food waste. The second survey asked about the participants' impression of The Reminder in addition to repeating the questions related knowledge about date marks and their self-reported household level of food waste to assess if these have changed.

Questions concerning self-efficacy, knowledge about date marks and food waste were adopted from published studies. More specifically, the questions capturing the concept of self-efficacy and subjective food waste used in this survey are used in report "Consumer behaviour towards food waste in families with children" (Laasholdt et al. 2021). The questions on the participants' knowledge on date marks were adopted from Glanz-Chanos et al. (2016). The questions were modified to focus only on "best before" and "use-by" date marks. Five true or false statements about these date marks were included, which could be answered as "right," "wrong," or "don't know." The knowledge score was calculated as a sum of correct answers ranging from 0 to 5 indicating how well each participant knows the meaning of the two date marks.

The participants' level of self-efficacy is based on the mean of three items regarding their ability to assess food quality, edibility, and if it is safe to eat. In both pre- and post-survey, a factor analysis (one factor solution with factor loadings higher than 0.8 on all items) confirmed that the three questions are

measuring the same concept. Thus, the summary variables were created for “self-efficacy” measuring and named as “pre self-efficacy before and “post self-efficacy” after receiving The Reminder.

To measure the participants' perception and attitude towards the SMS reminder the participants were asked to what degree they agreed with eight evaluative statements related to The Reminder. The statements were introduced to capture enjoyment, helpfulness, potential for helping others, and usefulness of The Reminder. Furthermore, the participants were asked how they liked the frequency of receiving The Reminder, if they had become more aware of the two date marks after receiving The Reminder, and whether they used the link provided for further information, and in that case, found it useful. See appendix 1 for the survey and questions.

5.1.3 Data description

Overall, 240 people completed the first survey, ending up with a total sample of 130 people who completed the second survey. There were 65 people in each of the two groups, that are either got the texts send every third day (group *third day*) or every Friday (group *Friday*) over the three weeks period. The distribution of the sample demographics is similar between the groups (Table 7). Comparing the two samples on the different background variables there were no major differences between them.

Table 7: Overview of sample demographics

	Group 1: <i>Third day</i> (n= 65)	Group 2: <i>Friday</i> (n=65)	Total (n= 130)
Gender	46% males, 52% female, 2% other	54% males, 46% female	50% males, 49% female, 1% other
Age groups	43% 18-34, 29% 35-54, 28% 55+	37% 18-34, 29% 35-54, 34% 55+	40% 18-34, 29% 35-54, 31% 55+
Education level¹	69% shorter, 31% longer	74% shorter, 26% longer	72% shorter, 28% longer
City	26% Storkøbenhavn, 31% Aarhus, Odense, Aalborg, 15% bigger city (population over 15,000), 28% smaller city (population under 15,000 or countryside)	17% Storkøbenhavn, 22% Aarhus, Odense, Aalborg, 18% bigger city (population over 15,000), 43% smaller city (population under 15,000 or countryside)	22% Storkøbenhavn, 26% Aarhus, Odense, Aalborg, 17% bigger city (population over 15,000), 43% smaller city (population under 15,000 or countryside)
Region	25% Capital, 14 Sjælland, 23% Southern Jutland, 26% Central Jutland, 12% North Jutland	22% Capital, 12 Sjælland, 29% Southern Jutland, 22% Central Jutland, 15% North Jutland	23% Capital, 13 Sjælland, 26% Southern Jutland, 24% Central Jutland, 14% North Jutland
Living constellation	31% alone, 42% partner, 15% partner and children, 12% Alone with child/children or in a shared house or with parents	26% alone, 49% partner, 15% partner and children, 11% Alone with child/children or in a shared house or with parents	28% alone, 45% partner, 15% partner and children, 12% Alone with child/children or in a shared house or with parents
Household size	31% one person, 43% two persons, 11% three persons, 9% four persons, 6% five persons	26% one person, 52% two persons, 6% three persons, 14% four persons, 2% five persons	28% one person, 48% two persons, 8% three persons, 12% four persons, 4% five persons
Responsible for household's food	60 % fully, 40% partially	60 % fully, 40% partially	60 % fully, 40% partially

Note: 1: Education level measures *lower educations* as *Primary school, Secondary education, Vocational education and Short-term higher education*, and *higher education* as *Medium-term higher education and Long-term higher education*.

Generally, the participants answered that they have a relatively high awareness on food waste being a problem in all three items used (Table 8). The two groups had similar means and there are no statistically significant differences between the two groups.

Table 8: *Food waste awareness in the pre-test*

	Full sample: Mean (SD)	Group <i>third day</i> : Mean (SD)	Group <i>Friday</i> : Mean (SD)
We are aware that our food waste is a problem for the environment	5.3 (1.49)	5.2 (1.62)	5.3 (1.37)
At home we are aware of how much food we throw away	5.6 (1.43)	5.5 (1.54)	5.7 (1.32)
At home we are aware of how much money we spend on food each week	5.1 (1.61)	5.0 (1.71)	5.2 (1.51)

Note: Measured on a scale from 1 to 7, 1 being "Strongly disagree" and 7 being "Strongly agree".

5.2 Results

This section will first present the results on the participants' perception of the SMS reminders and the frequency of receiving them. Secondly, The Reminder's effect on subjective level of food waste, self-efficacy, and self-reported and objective understanding of the two types of date marks is presented.

5.2.1 Participant perception of the SMS reminders

The perception of SMS reminders was measured with eight items (Table 9). The messages that were perceived as easy to understand scored the highest (5.5 out of 7), but overall, the mean of perception was neutral. Usefulness, perceived benefit and working as reminders all had means around the middle of the scale suggesting that reminders did not receive high enthusiasm but not high negative response either. The two groups with messages once (*Friday*) or every third day (*Third day*) did not differ statistically significantly from each other except in two items. The negatively worded item "I did not get anything out of the SMS reminders" was rated higher in the group *Third day*. The same group also rated the usefulness of reminders lower when making decisions. The item measuring level of annoyance is not significant, but it approaches a level of significance. This supports the indication that receiving texts too frequently may be counterproductive.

Table 9: *Evaluation of The Reminder by group*

	Full sample: Mean (SD)	Group <i>third day</i> : Mean (SD)	Group <i>Friday</i> : Mean (SD)
I found the SMS reminders annoying.	3.9 (1.79)	4.2 (1.73) ^{a○}	3.6 (1.82) ^{b○}
I learned something from the SMS reminders.	3.9 (1.81)	4.0 (1.87)	3.8 (1.76)
I found the SMS reminders to help me remember to check the date mark type.	3.8 (1.76)	3.6 (1.79)	4.0 (1.74)
I found the SMS reminders to be good at reminding me of date marks.	4.4 (1.62)	4.3 (1.64)	4.4 (1.61)
I didn't get anything out of the SMS reminders.	3.8 (1.92)	4.2 (1.85) ^a	3.5 (1.95) ^b
I think others would benefit from the SMS reminders.	4.7 (1.59)	4.6 (1.61)	4.7 (1.59)
I found the SMS reminders useful when making decisions related to date marks.	3.7 (1.73)	3.5 (1.80) ^a	4.1 (1.61) ^b
I found the SMS reminders easy to understand.	5.5(1.33)	5.6 (1.21)	5.5 (1.45)

Note: Measured on a scale from 1 to 7, 1 being “Strongly disagree” and 7 being “Strongly agree”. Different letters “a” and “b” indicate there is a statistically significant difference in means between groups. Based on two-sample t-tests Significant ($p < 0.05$). ^o indicate $p=0.085$ and approaching level of significance.

The perception of reminders was consistent across age groups, except on the item of annoyance levels (Table 10). Younger age groups rated “I found the SMS reminders annoying” higher, whereas the 55+ group expressed a lower level of annoyance. Comparisons of group means showed that the difference between the 55+ age group and the 18-34 and 35-54 age groups was statistically significant.

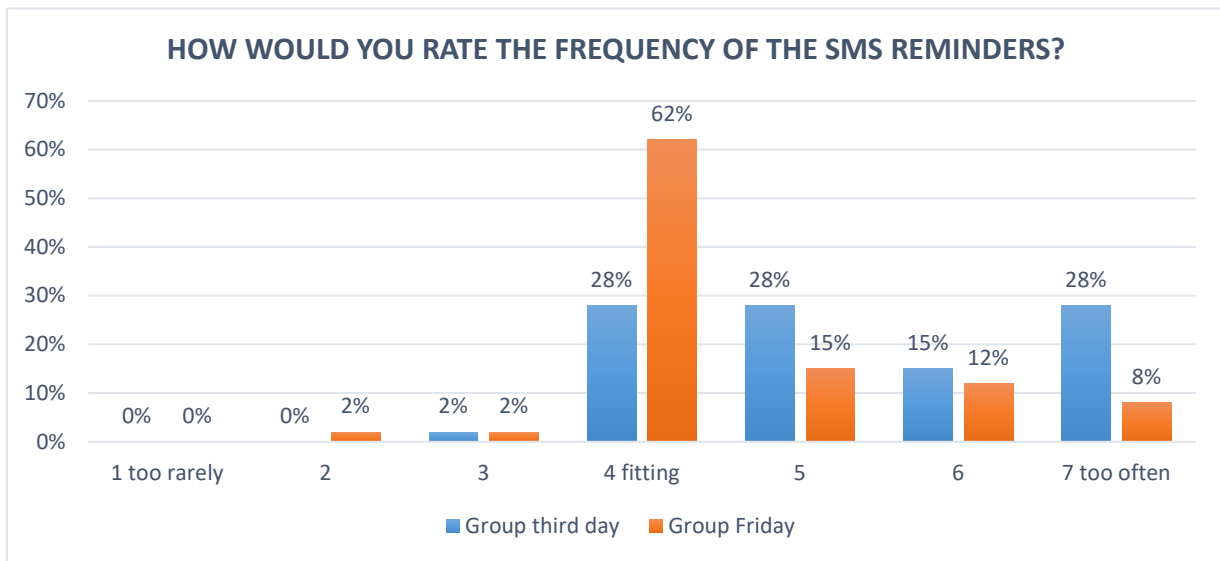
Table 10: *Evaluation of The Reminder by age groups*

	18-34: Mean (SD)	35-54: Mean (SD)	55+: Mean (SD)
I found the SMS reminders annoying.	4.2 ^a (1.70)	4.4 ^a (1.75)	3.0 ^b (1.64)
I learned something from the SMS reminders.	3.9 (1.81)	3.6 (1.69)	4.3 (1.90)
I found the SMS reminders to help me remember to check the date mark type.	3.6 (1.60)	3.6 (1.75)	4.2 (1.95)
I found the SMS reminders to be good at reminding me of date marks.	4.3 (1.33)	4.1 (1.90)	4.7 (1.65)
I didn't get anything out of the SMS reminders.	3.7 (1.52)	4.1 (2.13)	3.8 (2.19)
I think others would benefit from the SMS reminders.	4.4 (1.62)	4.6 (1.67)	4.5 (1.41)
I found the SMS reminders useful when making decisions related to date marks.	3.7 (1.63)	3.6 (1.76)	4.1 (1.81)
I found the SMS reminders easy to understand.	5.7 (1.19)	5.3 (1.23)	5.4 (1.58)

Note: Measured on a scale from 1 to 7, 1 being “Strongly disagree” and 7 being “Strongly agree”. Based on ANOVA test $F(2, 127)=7.87$; $p<0.001$. Different letters “a” and “b” indicate there is a statistically significant difference in means between groups.

When the participants were asked to rate the frequency of receiving The Reminder neither of the groups rated it to be too rarely (Figure 1). In the group *Third day* 28% rated the frequency as “fitting”, but the majority rated it to be too often to some degree. In comparison the majority of group *Friday* rated their frequency to be “fitting”. The rest of the group *Friday* generally also rated the frequency as too often to some degree. The difference between the two groups was statistically significant. The result indicates that once a week is the highest frequency to apply in this kind of interventions.

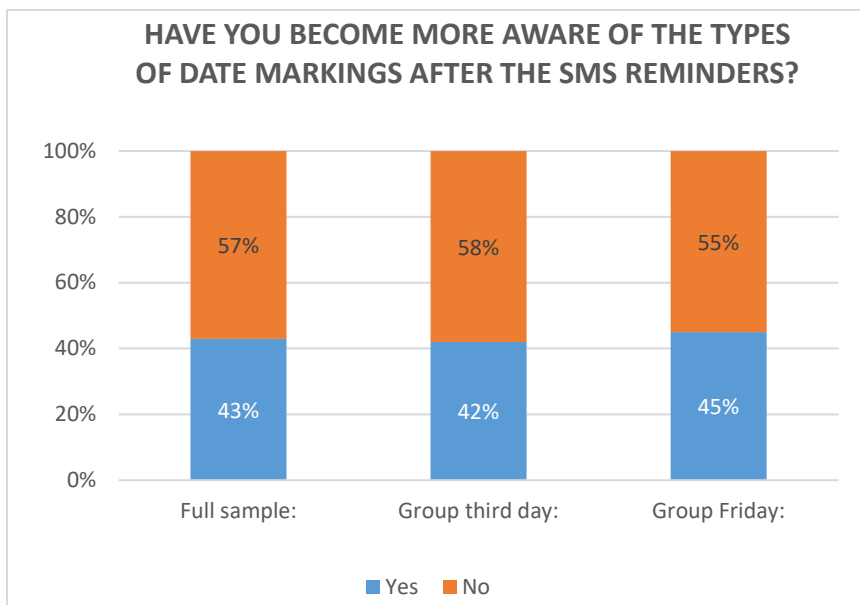
Figure 1: Evaluation of frequency of receiving The Reminder



Note: Measured on a scale from 1 to 7, 1 being "Too rarely", 4 being "Fitting" and 7 being "Too often". Based on paired t-test $p < 0.001$: Group *third day*: mean=5.4, SD=1.21; Group *Friday* mean=4.6, SD=1.04.

Overall, 43% responded 'yes,' indicating increased awareness of the date marks after receiving The Reminder (Figure 2). There was no statistically significant difference between the two groups in becoming more aware of the date marks after The Reminder.

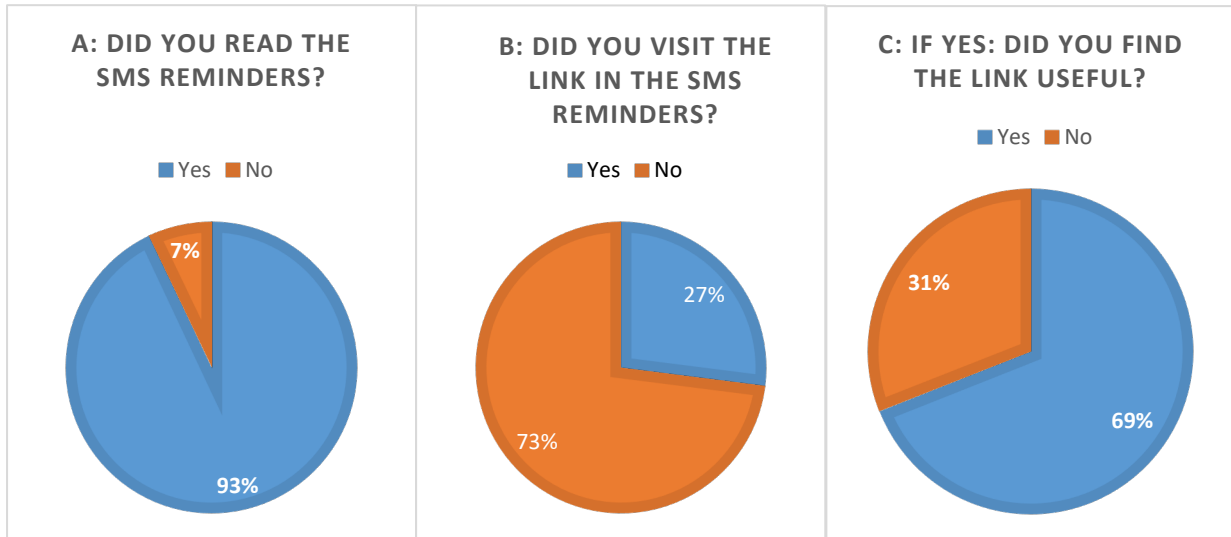
Figure 2: Evaluation of self-reported awareness of date marks of The Reminder



As the perception of The Reminder was very similar in the *Friday* group and *Third day* group, the further findings will be reported over the whole group unless the groups differed statistically significantly in their responses. Almost all participants (93%) read the text of The Reminder. Out of these, 27% visited the link

included in The Reminder. In total, 35 participants visited the link, and of those, 69% found the link useful. (Figure 3).

Figure 3: *The use of The Reminder*



Note: Diagram A: N=130. Diagram B: N=121. Diagram C: N=35.

The oldest age group read The Reminder most frequently and were also the ones who most often visited the link for additional information (Table 11). In contrast, the youngest age group did this the least. However, the majority of those respondents who visited the link also found the link useful.

Table 11: *The percentage reported to use of The Reminder by age group*

	18-34	35-54	55+
Read the SMS reminders (N=130)	48 (92%)	34 (89%)	39 (98%)
Visited the link in the SMS reminders (N=121)	7 (15%) *	10 (29%) *	16 (40%) *
If yes to the above: finding the link useful (N=35)	6 (75%)	8 (73%)	10 (63%)

Note: Measured on a scale from 1 to 2: 1 being "Yes", 2 being "No". *Pearson chi-square statistic: 7.6941, p-value of 0.021; p<0.05.

5.5.5 Self-reported and objective understanding of the date marks

The self-reported understanding of date marks is high with the mean around 6 on a 7-point scale (Table 12). The Reminder increased the self-reported understanding slightly; the difference was statistically significant for the use-by date mark on the full sample. The difference was also statistically significant in case of group *Friday* and is approaching a level of significance in group *Third day*.

Table 12: Self-reported understanding of date marks

	Full sample: Pre	Full sample: Post	Group <i>third day</i> . Pre	Group <i>third day</i> . Post	Group <i>Fri</i> - <i>day</i> . Pre	Group <i>Fri</i> - <i>day</i> . Post
Best Before: Mean (SD)	5.9 (1.25)	6.2 (1.05)	6.0 (1.32)	6.2 (1.20)	5.9 (1.19)	6.1 (0.88)
Use-by date: Mean (SD)	6.0** (1.23)	6.3** (0.95)	6.0 ^o (1.38)	6.4 ^o (1.04)	6.0* (1.07)	6.3* (0.85)

Note: Answers on the question: *Please indicate to what extent you understand the meaning of the following information on food labels.* Measured on a scale from 1 to 7, 1 being “Not at all” and 7 being “Very well”. Based on Paired t-test; *t=-2.38693; p=0.02. ** t=-2.9232; p=0.004. ^o t= -1.9061; p=0.06.

Although the groups were assigned randomly the two groups had a difference in the mean scores of right answers regarding the objective knowledge on the meaning of UB date mark before receiving The Reminder (Table 13). The intervention did not have a statistically significant impact on objective knowledge scores on best before date mark, but in group *Friday* the use-by mark score improved resulting to the level of group *Third day*. This improvement was statistically significant.

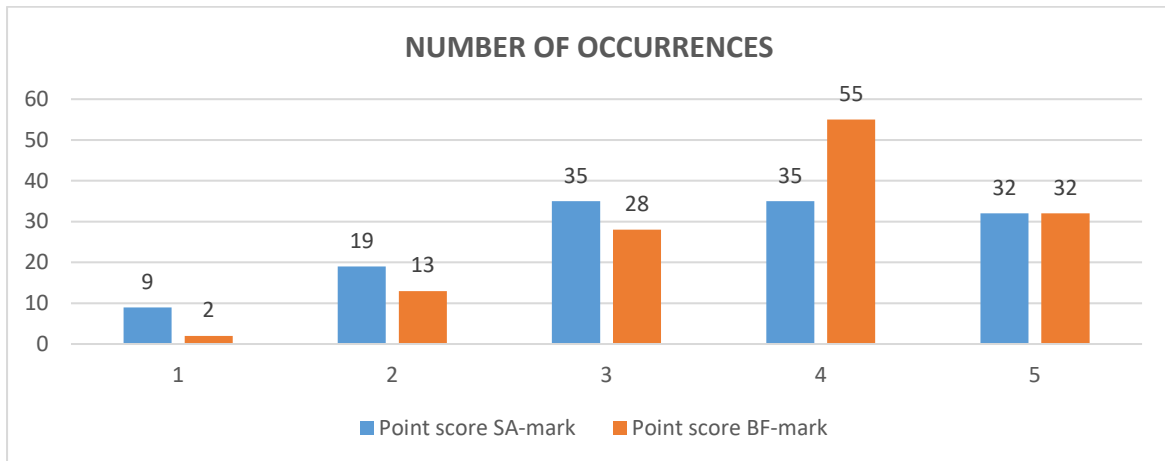
Table 13: Tested understanding of date marks

	BB Mean (SD)		UB Mean (SD)	
	Pre	Post	Pre	Post
Full sample	3.8 (0.98)	3.7 (1.04)	3.5 (1.21)	3.6 (1.32)
Group <i>third day</i>	3.9 (0.90)	3.7 (0.97)	3.7 (1.06)	3.7 (1.27)
Group <i>Friday</i>	3.7 (1.06)	3.6 (1.11)	3.3* (1.31)	3.6* (1.37)

Note: Participants’ total score of right answers relating the meaning of BB and UB is measured on a scale from 0 to 5 right answers. *Paired t-test; t=-2.1244; p=0.04 Significant (p < 0.05).

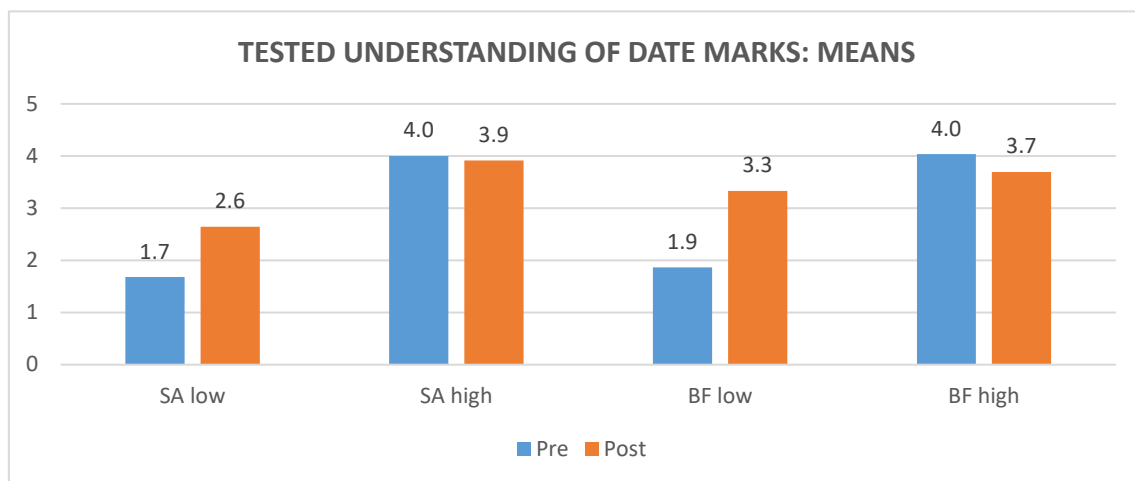
In total 28 participants had a score of 2 or lower when answering questions about the meaning of the UB mark, and 15 participants had a score of 2 or lower when answering questions about BB mark (Figure 4). The majority of participants had a score of 4 points or more indicating a relatively high level of understanding, especially in the BB date mark.

Figure 4: Distribution of total point score on the two date marks



When comparing the differences in means of the understanding of date marks before and after receiving The Reminder, participants with a low initial understanding showed an increase in both types of date marks (Figure 5). The Reminder seems to benefit those whose objective knowledge was low initially.

Figure 5: Change in means compared by groups of low and high levels of understanding

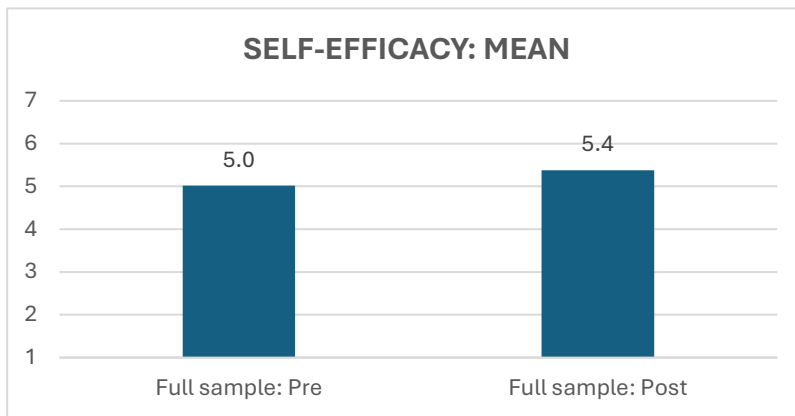


Note: UB low: N=19, UB high: N=111. BB low: N=13, BB high: N=117.

5.2.3 Effect on self-efficacy

The self-reported level of self-efficacy in assessing food quality was relatively high as the mean before receiving The Reminder was 5.0 and after 5.4 on the scale of 1-7 (Figure 6). The improvement was statistically significant, and there were no statistically significant differences between the two groups. This indicates that respondents felt more confident in their decisions related to assessing food quality, and how to deal with them after receiving The Reminder.

Figure 6: Self-efficacy

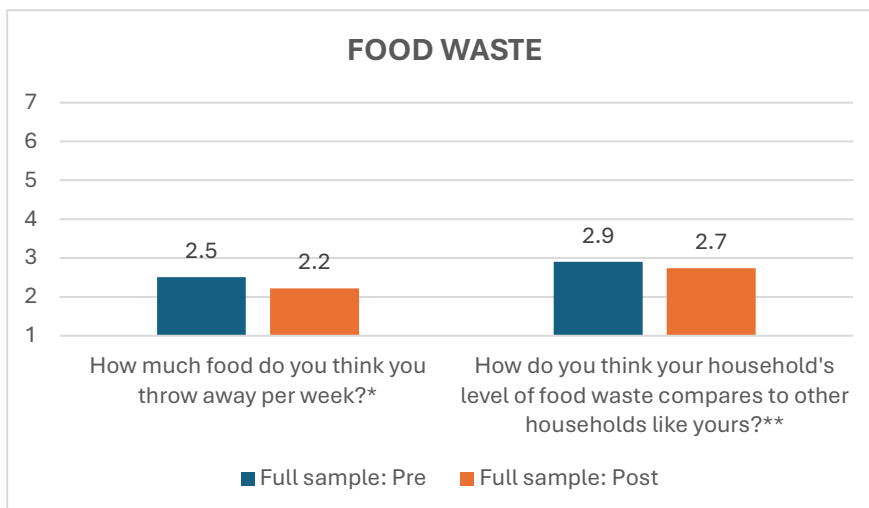


Note: Full sample. Measured on a scale from 1 to 7. Paired t-test; $t=-3.6583$; $p=0.0004$ Significant ($p < 0.01$). SD pre=1.38; SD post=1.35.

5.2.4 Effect on self-reported food waste

The participants report relatively low levels of weekly food waste, and they also report wasting less than another family with similar characteristics. The means were around 2.5-3.0 on a scale of 1-7 before receiving The Reminder. In the case of the weekly food waste The Reminder resulted in a small but statistically significant improvement as the mean lowered to 2.2 (Figure 7). This indicates that The Reminder may help in reducing the food waste. However, we need to keep in mind that the self-report findings may underestimate the true food waste.

Figure 7: Self-reported level of food waste



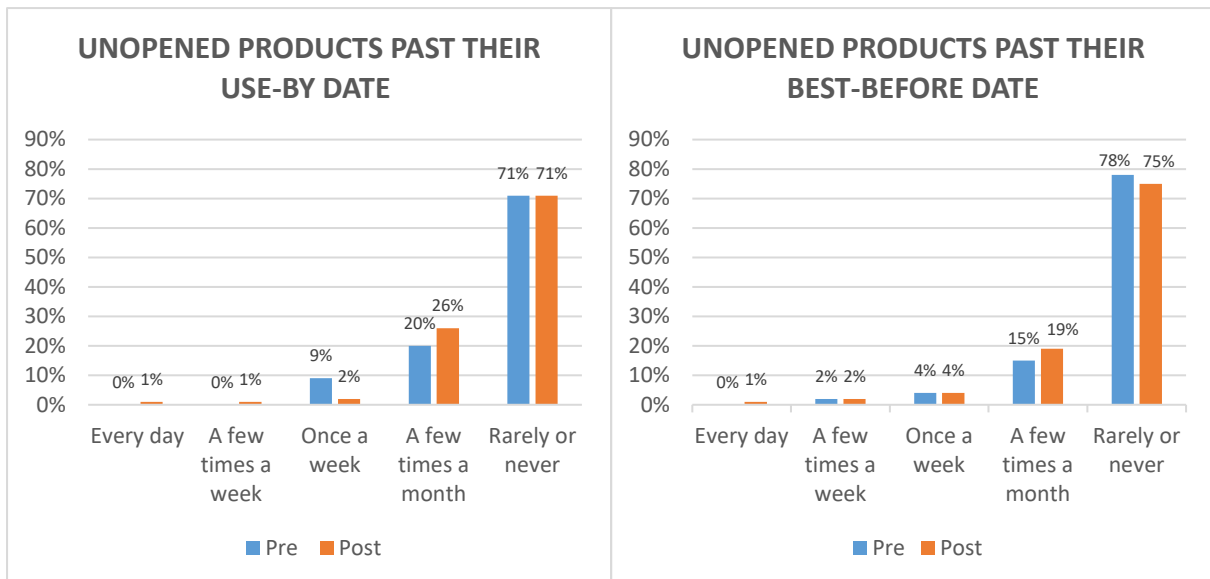
Note: *Measured on a scale from 1=very little or nothing to 7=a lot, Paired t-test; $t=3.3604$; $p=0.001$ Significant ($p < 0.01$), SD pre=1.40; SD post=1.23. ** Measured on a scale from 1=a lot less to 4=the same to 7= a lot more, , Paired t-test was insignificant, SD pre=1.33; SD post=1.25.

Majority of participants reported that they throw out unopened products past their use-by date or best-before date rarely or never (Figure 8). Less than 10% reported to throw these foods out once a week or more often. Across all types of food waste, the most frequently reported disposal frequencies were “a

few times a month” or “rarely or never.”, including opened products with expired date marks and products without a date mark. The most often discarded food was leftovers that around half of the respondents reported to throw out at least once a week (see Appendix 2 for the full table of frequencies of self-reported food waste across categories).

These patterns suggest that participants tend to rarely or never throw out unopened products past their use-by or best-before dates, while leftovers and opened products are more frequently thrown out. In none of these cases the difference before and after receiving The Reminder was statistically significant.

Figure 8: Self-reported level of food waste: How often do you throw away the following?



Note: Full sample. Measured on a scale of *Every day*, *A few times a week*, *Once a week*, *A few times a month*, *Rarely or never*.

5.2.5 Summary of findings

The participants generally perceived The Reminder as neutral: they were easy to understand, but more useful to others than to oneself. The youngest groups reported the highest levels of annoyance, while the oldest reported the lowest. The frequency of weekly reminders was regarded as more fitting than more frequent reminders. The Reminder was read but less than a third visited the linked material.

The Reminder had some minor impact on self-efficacy, self-reported food waste and self-reported knowledge on use-by date mark. Although statistically significant, these changes were relatively small. In terms of the objective knowledge score the intervention did only have a statistically significant impact on objective knowledge scores in group Friday for the use-by mark. For those with low knowledge level in the beginning, The Reminder text messages improved their knowledge level. However, when looking at self-reported food waste across categories, the practices related to decisions on product disposal were not affected by reminders (see Appendix 2 for the full table of frequencies of self-reported food waste across categories).

5.3 Discussion and conclusion

The intervention demonstrated that reminders are read and also produce some statistically significant improvements in self-efficacy, self-reported food waste reduction, and self-reported understanding of the “use-by” date mark, although these changes are moderate at the best. A statistically significant impact on objective knowledge scores was found only in the Friday group for the use-by mark.

Despite a difference between age groups in terms of level of annoyance of The Reminder, there was no significant difference in usage or effects, indicating that The Reminder is a relevant tool across various age groups. However, the improvements observed were relatively small, which suggests that their impact or practical effects on daily activities are minor. One of the main intentions of this tool was to change behaviour related to date marks. However, when examining participants' self-reported behaviour in relation to throwing out different types of food waste, we found no change between before and after The Reminder. This raises questions about the overall effectiveness of this otherwise feasible tool.

Frequency of SMS Reminders

One potential improvement for the tool is adjusting the frequency of SMS reminders. The study revealed that the majority of participants who received reminders every third day found this frequency too high. This is further supported by the effectiveness results, where significant changes were observed more frequently in the group with less frequent reminders. Several participants from the *Third day* group also contacted the data agency managing the messages and expressed confusion about the high frequency and the repetitive content of the SMS texts. To address this, it could be beneficial to include more varied information on date marks or other relevant topics. Additionally, reducing the frequency to less than once a week could be tested for effectiveness. Although the majority of participants who received reminders every Friday found this frequency appropriate, a substantial portion still considered it too frequent.

Engagement with the Link

Another area for improvement is increasing the number of participants who read the provided link. In our study, only 27% of participants read the link, with the majority being from the oldest age group. However, 69% of those who read the link found it useful. Increasing engagement with the link could potentially enhance the overall effectiveness of The Reminder. Linking text messages with other links giving additional information could also be used to engage the participants more effectively and avoid the confusion of receiving the same information repeatedly.

Baseline Knowledge and Sample Size

The high baseline levels of understanding of date marks left limited room for improvement, thereby challenging the relevance of a tool of this nature. However, the data suggests that participants with a lower understanding of date marks show a clear improvement on knowledge about date marks after receiving The Reminder. This indicates that the tool could have a greater impact if targeted towards

individuals with lower baseline understanding. The same would apply on targeting people who have more frequent disposal of products that have expired date marks.

Another challenge faced by this study is the limited number of participants, which constrains its analytical power. Additionally, the small sample size precludes the possibility of conducting reliable statistical analyses to confirm the hypothesis that reminders will be helpful to those with lower baseline understanding of date marks. If this assumption regarding baseline level of understanding is correct, a further challenge would be identifying individuals with low understanding or high food waste. Previous studies among Danes suggest that both subjective and objective knowledge levels are generally high (Hansen et al., 2021a).

Potential tools identified and studied

The literature review revealed a lack of research on consumer behaviour related to date marks and thus, highlighting the need for either modifying existing tools or developing new ones. Among the potential tools identified were reminders, which were studied in the second part of the report. While this study showed significant improvements in key areas, the relatively small magnitude of these improvements suggests that the practical effects in everyday life may be limited. Adjusting the frequency and content of reminders, as well as targeting individuals with low baseline knowledge could enhance the effectiveness of the tool.

Implications and Future Research

The findings of this study have several implications for future research and practical applications. Future studies could explore different frequencies and content variations of reminders to identify the most effective strategies for different groups and thus develop more impactful interventions and tools for improving self-efficacy and understanding of date marks. Additionally, targeted tools aimed at individuals with low baseline knowledge could be developed to test whether it maximises the impact of such interventions. Further research is also needed to explore the long-term effects of these reminders on behaviour change and to identify other factors that may influence their effectiveness.

There is also a need to find better ways to study consumers' decision-making at the point of disposal decisions at home. Reminders used in our intervention are sent at a certain time point, but they may not be in mind when having a food package in hand making the decision. Future research should explore how the date mark information in the package can help make the appropriate decision about using or disposing of the product. Furthermore, the impact of date mark on total food waste in Denmark would benefit from further research.

6 Referencer

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1.2 Links

Danish Consumer Council Think ^A: <https://taenk.dk/forbrugerliv/mad-og-indkoeb/madspild-saadan-undgaar-du-smide-mad-ud> (15/8 2024)

Danish Consumer Council Think ^B: <https://taenk.dk/kemi/foedevare-og-koekken/mug-paa-din-mad-hvad-goer-du> (15/8 2024)

Danish Consumer Council Think ^C: <https://taenk.dk/forbrugerliv/mad-og-indkoeb/holdbarhed-opbevar-din-mad-saa-den-holder-laengere> (15/8 2024)

Danish Consumer Council Think ^D: <https://taenk.dk/forbrugerliv/mad-og-indkoeb/app-undgaa-madspild-med-resten-appen> (15/8 2024)

Danish Veterinary and Food Administration ^A: <https://foedevarestyrelsen.dk/kost-og-foedevare/alt-om-mad/madspild-i-hjemmet/vurder-madens-holdbarhed> (15/8 2024)

Danish Veterinary and Food Administration ^B: <https://foedevarestyrelsen.dk/kost-og-foedevare/alt-om-mad/kemi-i-maden/mad-med-uoensket-kemi/mug-paa-mad> (15/8 2024)

Danish Veterinary and Food Administration ^C: <https://foedevarestyrelsen.dk/kost-og-foedevare/alt-om-mad/madspild-i-hjemmet/opbevar-maden-korrekt> (15/8 2024)

Ministry of Environment and Food: <https://www2.mst.dk/udgiv/publikationer/2016/04/978-87-93435-53-7.pdf> (15/8 2024)

Smag For Livet ^A: <https://www.smagforlivet.dk/materialer/guide-til-undg%C3%A5-madspild-f%C3%A5-overblik-over-datostemplerne-p%C3%A5-madvarerne> (15/8 2024)

Smag For Livet ^B: <https://www.smagforlivet.dk/materialer/undg%C3%A5-madspild-s%C3%A5dan-vurderer-du-om-din-mad-er-frisk-eller-gammel> (15/8 2024)

Taste for Life ^C: <https://smagforlivet.dk/undervisning/folkeskolen/madkundskab/smag-overskudsmad-og-et-hemmeligt-v%C3%A5ben> (15/8 2024)

Appendix 1

1.3 Preliminary Questionnaire

<i>Intro</i>		
	Sociodemografiske spørgsmål	
Q0-1	Hvad er dit køn?	Single 1. Mand 2. Kvinde 3. Andet/ønsker ikke oplyse
Q0-2	Hvornår er du født?	Numerisk Screenout if under 18 ____ vælg år
Q0-3	Hvad er din højest gennemførte uddannelse?	Single 1. Folkeskole 2. Ungdomsuddannelse (STX, HHX, HTX, HF) 3. Erhvervsuddannelse 4. Kort videregående uddannelse (2-3 år) 5. Mellem-lang videregående uddannelse (3-4 år) 6. Lang videregående uddannelse (5 år eller mere) 7. Forskeruddannelse (Ph.d.) 98. Andet
Q0-4	Hvilken region bor du i?	Single 1. Region Nordjylland 2. Region Midtjylland 3. Region Syddanmark 4. Region Sjælland 5. Region Hovedstaden

		6. Jeg bor i udlandet – Screen outs 7. Ved ikke – Screen outs
Q0-5	Hvor bor du?	Single 1. Storkøbenhavn 2. Aarhus, Odense, Aalborg 3. Større by (over 15.000 indbyggere) 4. Mindre by (under 15.000 indbyggere) eller på landet
Q0-6	Hvordan bor du?	Single 1. Alene 2. Med partner 3. Med partner og barn/børn 4. Alene med barn/børn 5. I bofælleskab 6. Hos forældre
Q0-7	Hvor mange personer bor i din husstand inkl. dig selv? <i>(hvis antallet af personer i husstanden varierer, notér venligst antallet af der regelmæssigt bor i husstanden).</i>	Open ended Indtast: (value between 2 and 50 or alone)
Q0-8	Står du helt eller delvist for husstandens madindkøb og madlavning? <i>Eks. At handle ind, tilberede mad, holde styr på madens holdbarhed, rydde op i madbeholdning</i>	Single 1. Ja, det er primært mig, som står for de opgaver 2. Ja, vi deles om opgaverne 3. Nej, jeg deltager sjældent eller aldrig i de opgaver - Screenout
Subjektiv madspild		
Q1-1	Angiv venligst, hvor uenig eller enig, du er i følgende udsagn:	Insert carousel Randomize 1-3 Single Scale • 1 Meget uenig • 2 • 3 • 4 • 5 • 6 • 7 Meget enig
	Vi er bevidste om at vores madspild udgør et problem for miljøet	
	Hjemme hos os er vi opmærksomme på, hvor meget mad, vi smider ud	
	Hjemme hos os er vi bevidste om, hvor mange penge vi ugentlig bruger på mad, der ender med at blive smidt ud	
Q1-2	Hvor meget mad synes du, at du smider ud om ugen?	Single

		<p>Scale</p> <ul style="list-style-type: none"> • 1. Meget lidt/ingen-ting • 2. • 3. • 4. • 5. • 6. <p>7. Rigtigt meget</p>
Q1-3	Hvordan tror du, at din husstands niveau af madspild er sammenlignet med andre husstande som jeres (husstande med lignende/samme karakteristika som jeres)?	Single
	Vores niveau af madspild er ...	<p>Scale</p> <ul style="list-style-type: none"> • 1 Meget mindre • 2 • 3 • 4 Cirka det samme • 5 • 6 • 7 Meget større
Q1-4	Hvor ofte smider du følgende ud?	Single
	Madrester (tidligere tilberedte retter)	<p>Answers</p> <ul style="list-style-type: none"> • 1. Hver dag • 2. Et par gange om ugen • 3. Én gang om ugen • 4. Et par gange om måneden • 5. Sjældnere eller aldrig
	Uåbnede produkter, som er over sidste anvendelsesdato	
	Åbnede produkter, som er over sidste anvendelsesdato	
	Uåbnede produkter, som er over bedst før-dato	
	Åbnede produkter, som er over bedst før-dato	
	Produkter uden dato	
Q1-5	Angiv venligst, hvor svært du generelt har ved at:	Insert carousel
	Afgøre med dine sanser, om en fødevarer stadig er spiselig	Randomize 1-3
	Afgøre sikkerheden af en fødevarer	Single
	Afgøre kvaliteten af en fødevarer med dine sanser	<p>Answers</p> <ul style="list-style-type: none"> • 1. Meget let • 2. • 3. • 4. • 5. • 6. • 7. Rigtigt Svært
Viden om datomærkninger		
Q2-1	Angiv venligst i hvilken grad, at du forstår betydningen af følgende informationer på fødevarer:	Insert carousel
	Bedst Før	Single

	Sidste anvendelsesdato	Scale <ul style="list-style-type: none"> • 1. Slet ikke • 2 • 3 • 4 • 5 • 6 • 7. I meget høj grad
Q2-2	Hvad tror du 'Bedst før' betyder?	Insert carousel Randomize 1-5 Single Answers <ul style="list-style-type: none"> • 1. Sandt • 2. Falsk <ul style="list-style-type: none"> • 99 Ved ikke
	Kvaliteten af fødevaren er i orden til og med denne dato	
	Fødevare skal være anvendt senest denne dato	
	Selvom fødevaren har været åben, kan fødevaren altid spises indtil denne dato	
	Fødevaren kan spises efter den angivne dato, såfremt den lugter normalt og ser fin ud	
	Fødevaren kan efter overskridelse af denne dato udgøre en sundhedsrisiko	
Q2-3	Hvad tror du 'Sidste anvendelsesdato' betyder?	Insert carousel Randomize 1-5 Single Answers <ul style="list-style-type: none"> • 1. Sandt • 2. Falsk <ul style="list-style-type: none"> • 99 Ved ikke
	Kvaliteten af fødevaren er i orden til og med denne dato	
	Fødevare skal være anvendt senest denne dato	
	Selvom fødevaren har været åben, kan fødevaren altid spises indtil denne dato	
	Fødevaren kan spises efter den angivne dato, såfremt den lugter normalt og ser fin ud	
	Fødevaren kan efter overskridelse af denne dato udgøre en sundhedsrisiko	

1.3.1 Post Questionnaire

Intro		
Q0-1	Har du modtaget nogle SMS-påmindelser i løbet af de sidste tre uger?	Single Answers <ul style="list-style-type: none"> 1. Ja 2. Nej Screenout
Q0-2	Læste du SMS-påmindelserne?	Single Answers <ul style="list-style-type: none"> • Ja • Nej
Vurdering af SMS-påmindelsen		
Q1-1	Hvordan vil du vurdere SMS-påmindelserne? Angiv venligst, hvor uenig eller enig, du er i følgende udsagn:	Insert carousel Randomize 1-8 Single Scale <ul style="list-style-type: none"> • 1 Meget uenig • 2 • 3 • 4 • 5 • 6
	Jeg synes SMS-påmindelserne var irriterende.	
	Jeg har lært noget af SMS-påmindelserne.	
	Jeg synes, at SMS-påmindelserne hjalp mig med at huske at tjekke typen af datomærke.	
	Jeg synes, at SMS-påmindelserne var gode til at påminde mig om datomærkninger.	
	Jeg fik ikke noget ud af SMS-påmindelserne.	
	Jeg tror, at andre ville have gavn af SMS-påmindelserne.	
	Jeg fandt SMS-påmindelserne brugbare, når jeg skulle træffe beslutninger relateret datomærkninger.	

	Jeg fandt SMS-påmindelserne lette at forstå.	<ul style="list-style-type: none"> • 7 Meget enig
Q1-3	Hvordan vil du vurdere frekvensen af SMS-påmindelserne? (hvor ofte du modtog dem)	<p>Single</p> <p>Scale</p> <ul style="list-style-type: none"> • 1 For sjældent • 2 • 3 • 4 Passende • 5 • 6 • 7 For ofte
Q1-4	Er du blevet mere opmærksom på typerne af datomærkninger efter SMS-påmindelserne?	<p>Single</p> <p>Answers</p> <ul style="list-style-type: none"> • Ja • Nej
Q1-5	Besøgte du linket i SMS-påmindelserne?	<p>Single</p> <p>Answers</p> <ul style="list-style-type: none"> • Ja • Nej
Q1-6	Fandt du linket brugbart?	<p>Answers</p> <ul style="list-style-type: none"> • Ja • Nej
Subjektiv madspild		
Q2-1	Hvor meget mad synes du, at du har smidt ud om ugen i løbet af de sidste tre uger?	<p>Single</p> <p>Scale</p> <ul style="list-style-type: none"> • 1. Meget lidt/ingenting • 2. • 3. • 4. • 5. • 6. • 7. Rigtigt meget
Q2-2	Hvordan tror du, at din husstands niveau af madspild er sammenlignet med andre husstande som jeres (husstande med lignende/samme karakteristika som jeres)?	<p>Single</p> <p>Scale</p> <ul style="list-style-type: none"> • 1 Meget mindre • 2 • 3 • 4 Cirka det samme • 5 • 6 • 7 Meget større
	Vores niveau af madspild er ...	
Q2-3	Hvor ofte smider du følgende ud?	<p>Insert carousel</p> <p>Single</p> <p>Answers</p> <ul style="list-style-type: none"> • 1. Hver dag
	Madrester (tidligere tilberedte retter)	
	Uåbnede produkter, som er over sidste anvendelsesdato	
	Åbnede produkter, som er over sidste anvendelsesdato	
	Uåbnede produkter, som er over bedst før-dato	

	<p>Åbnede produkter, som er over bedst før-dato</p> <p>Produkter uden dato</p>	<ul style="list-style-type: none"> • 2. Et par gange om ugen • 3. Én gang om ugen • 4. Et par gange om måneden • 5. Sjældnere eller aldrig
Q2-4	Vil du vurdere, at du smider mindre mad ud efter at have modtaget SMS-påmindelserne i 3 uger?	<p>Single</p> <p>Answers</p> <ul style="list-style-type: none"> • 1. Ja • 2. Nej • 99. Ved ikke
Q2-5	<p>Angiv venligst, hvor svært du generelt har ved at:</p> <p>Afgøre med dine sanser, om en fødevarer stadig er spiselig</p> <p>Afgøre sikkerheden af en fødevarer</p> <p>Afgøre kvaliteten af en fødevarer med dine sanser</p>	<p>Insert carousel Randomize 1-3 Single Answers</p> <ul style="list-style-type: none"> • 1. Meget svært • 2. • 3. • 4. • 5. • 6. • 7. Rigtigt let
Viden om datomærkninger		
Q3-1	<p>Angiv venligst i hvilken grad, at du forstår betydningen af følgende informationer på fødevarer:</p> <p>Bedst Før</p> <p>Sidste anvendelsesdato</p>	<p>Single</p> <p>Scale</p> <ul style="list-style-type: none"> • 1. Slet ikke • 2 • 3 • 4 • 5 • 6 • 7. I meget høj grad
Q3-2	<p>Hvad tror du 'Bedst før' betyder?</p> <p>Kvaliteten af fødevarer er i orden til og med denne dato</p> <p>Fødevarer skal være anvendt senest denne dato</p> <p>Selvom fødevarer har været åben, kan fødevarer altid spises indtil denne dato</p> <p>Fødevarer kan spises efter den angivne dato, såfremt den lugter normalt og ser fin ud</p> <p>Fødevarer kan efter overskridelse af denne dato udgøre en sundhedsrisiko</p>	<p>Insert carousel Randomize 1-5</p> <p>Answers</p> <ul style="list-style-type: none"> • 1. Sandt • 2. Falsk • 99. Ved ikke

Q3-3	Hvad tror du 'Sidste anvendelsesdato' betyder?	Insert carousel Randomize 1-5 Answers <ul style="list-style-type: none"> • 1. Sandt • 2. Falsk • 99. Ved ikke
	Kvaliteten af fødevaren er i orden til og med denne dato	
	Fødevare skal være anvendt senest denne dato	
	Selvom fødevaren har været åben, kan fødevaren altid spises indtil denne dato	
	Fødevaren kan spises efter den angivne dato, såfremt den lugter normalt og ser fin ud	
	Fødevaren kan efter overskridelse af denne dato udgøre en sundhedsrisiko	

Appendix 2

1.4 Frequencies of self-reported level of food waste: How often do you throw away the following?

<i>Frequency</i>	<i>Count pre</i>	<i>Count post</i>
Leftovers		
Every day	4 (3%)	4 (3%)
A few times a week	14 (11%)	13 (10%)
Once a week	30 (23%)	21 (16%)
A few times a month	47 (36%)	46 (35%)
Rarely or never	35 (27%)	46 (35%)
Unopened products past their use-by date		
Every day	0	1 (1%)
A few times a week	0	1 (1%)
Once a week	12 (9%)	2 (2%)
A few times a month	26 (20%)	34 (26%)
Rarely or never	92 (71%)	92 (71%)
Opened products past their use-by date		
Every day	1 (1%)	2 (2%)
A few times a week	5 (4%)	4 (3%)
Once a week	15 (12%)	22 (17%)
A few times a month	68 (52%)	62 (48%)
Rarely or never	41 (32%)	40 (31%)
Unopened products past their best-before date		
Every day	0	1 (1%)
A few times a week	3 (2%)	2 (2%)
Once a week	5 (4%)	5 (4%)
A few times a month	20 (15%)	25 (19%)
Rarely or never	102 (78%)	97 (75%)
Opened products past their best-before date		
Every day	1 (1%)	1 (1%)
A few times a week	3 (2%)	1 (1%)
Once a week	11 (8%)	21 (16%)
A few times a month	58 (45%)	57 (44%)
Rarely or never	57 (44%)	50 (38%)
Products without a date		
Every day	2 (2%)	0
A few times a week	0	1 (1%)
Once a week	4 (3%)	7 (5%)
A few times a month	25 (19%)	21 (16%)
Rarely or never	99 (76%)	101 (78%)

Note: Full sample. Measured on a scale of *Every day*, *A few times a week*, *Once a week*, *A few times a month*, *Rarely or never*.

About DCA

DCA - Danish Centre for Food and Agriculture is the entrance to research in food and agriculture at Aarhus University (AU).

The Centre comprises AU departments with food and agricultural science activities. These are primarily Department of Agroecology, Department of Animal Science, Department of Food Science, Centre for Quantitative Genetics and Genomics, and parts of Department of Engineering.

DCA has a Centre Unit, which supports and coordinates DCA activities in relation to research based policy support, industrial and sector collaboration, international collaboration, and communication.

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Research results are published in international scientific journals, and they are available at the university publication database (pure.au.dk).

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SUMMARY

Consumers responses to expired date marks are a recognised cause of food waste. This study maps tools that can potentially change consumers' beliefs and behaviours regarding the "Best Before" and "Use By" date marks. The report consists of two parts. The first part maps existing literature to identify and evaluate interventions and tools to correct misunderstandings and handling of date marks. The literature on changing behaviour and practices related to date marks was limited, but among the mapped tools from the first part were educational courses, refrigerator diagrams, and SMS reminders. In the second part, a three-week experimental study of SMS reminders showed that the reminders reduced self-reported food waste and improved understanding of date marks, especially for participants with low knowledge levels about date marks. However, the size of these improvements is relatively small, indicating that the practical effects in everyday life may be limited.

Forbrugerrespons på overskredne datomærker er en anerkendt årsag til madspild. I denne undersøgelse kortlægges værktøjer, der potentielt kan ændre forbrugernes overbevisninger og adfærd i forbindelse med datomærkerne "Bedst før" og "sidste anvendelsesdato". Rapporten består af to dele. Første del kortlægger eksisterende litteratur for at identificere og vurdere interventioner og værktøjer til at korrigere forkert forståelse og håndtering af datomærkerne. Litteraturen om forandring af adfærd og praksis relateret til datomærker var begrænset, men blandt de kortlagte værktøjer fra den første del var uddannelseskurser, køleskabsdiagrammer og SMS-påmindelser. I anden del viste en tre-ugers eksperimentel undersøgelse af SMS-påmindelser, at påmindelserne reducerede selvrapporteret madspild og forbedrede forståelsen af datomærker, især for deltagere med lavt vidensniveau om datomærker. Størrelsen på disse forbedringer er dog relativt lille, hvilket tyder på, at de praktiske effekter i hverdagen kan være begrænsede.