



Consumers' understanding and user experiences regarding a time-temperature indicator (Keep-It®) in the HelloFresh meal box

An experimental pilot study

Gertrude G. Zeinstra & Sandra van der Haar



WAGENINGEN
UNIVERSITY & RESEARCH

Consumers' understanding and user experiences regarding a time-temperature indicator (Keep-It®) in the HelloFresh meal box

An experimental pilot study

Authors: Gertrude G. Zeinstra & Sandra van der Haar

Institute: Wageningen Food & Biobased Research

This research project has been carried out by Wageningen Food & Biobased Research commissioned by HelloFresh and Keep-it Technologies and funded by HelloFresh & the Dutch Ministry of Agriculture, Nature and Food Quality, in the context of Voucher arrangement Food Waste Free United (project number 6234162608).

Wageningen Food & Biobased Research
Wageningen, November 2020

Public

Report 2101

ISBN 978-94-6395-628-4

Version: final

Reviewer: Hilke Bos-Brouwers

Approved by: Annelies Dijk

Client: HelloFresh and Keep-it Technologies

Sponsor: HelloFresh & the Dutch Ministry of Agriculture, Nature and Food Quality

This report can be downloaded for free at <https://doi.org/10.18174/535846> or at www.wur.eu/wfbr (under publications).

© 2020 Wageningen Food & Biobased Research, institute within the legal entity Stichting Wageningen Research.

The client is entitled to disclose this report in full and make it available to third parties for review. Without prior written consent from Wageningen Food & Biobased Research, it is not permitted to:

- a. partially publish this report created by Wageningen Food & Biobased Research or partially disclose it in any other way;
- b. (let a third party) use this report created by Wageningen Food & Biobased Research or the name of the report or Wageningen Food & Biobased Research in whole or in part for the purposes of making claims, conducting legal procedures, for (negative) publicity, and for recruitment in a more general sense;
- c. use the name of Wageningen Food & Biobased Research in a different sense than as the author of this report.

PO box 17, 6700 AA Wageningen, The Netherlands, T + 31 (0)317 48 00 84, E info.wfbr@wur.nl, www.wur.eu/wfbr. Wageningen Food & Biobased Research is part of Wageningen University & Research.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system of any nature, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the publisher. The publisher does not accept any liability for inaccuracies in this report.

Contents

	Preface	4
	Summary	5
1	Introduction	8
	1.1 Background	8
	1.2 Objectives	9
2	Methods	11
	2.1 Participants	11
	2.2 Survey development & data collection	11
	2.3 Data analysis	12
3	Results	13
	3.1 Participant characteristics	13
	3.2 Expiry dates: attention and understanding	14
	3.3 Reported behaviour when the static date has passed	17
	3.4 Keep-it indicator (Test group only)	18
	3.5 Information in the box	19
	3.6 Salmon: Preparation date and reasons why	20
	3.7 Perceptions and expectations regarding the Keep-it indicator	21
	3.7.1 Comparison of the perceptions regarding the use by date and Keep-it® (Control group only)	24
	3.8 Reported behaviour when shelf life according to the static date and dynamic indicator are in conflict	25
	3.9 Potential of Keep-it® in food waste reduction	25
	3.10 Explorative analysis 1: Influence of reading the information flyer on respondents' perceptions and expectations	26
	3.11 Explorative analysis 2: Influence of seeing the indicator on respondents' perceptions and expectations	28
4	Main findings & discussion	30
	4.1 Main findings	30
	4.2 Strengths and limitations	33
5	Implications and recommendations	35
6	Conclusion	37
	Literature	38
	Annex 1 Approval ethical committee	40
	Annex 2 Test-group invitation flyer for participation in the survey	41
	Annex 3 Control-group invitation flyer for participation in the survey	42
	Annex 4 Final survey	43

Preface

About a third of all food produced is wasted, which leads to economic, societal and environmental losses. A large part is wasted at the consumer level. One of the factors contributing to food waste is the fact that consumers often do not know the difference between the meaning and use of “use by” and “best before” expiry dates. It would therefore be beneficial to find solutions that will help consumers in the correct use of expiry dates.

Time-temperature indicators (TTI) as developed by Keep-it Technologies, might offer such a solution for consumers. The Keep-it TTI shows the remaining shelf life in days of a fresh product as visual information on the package, which could make it easier for consumers to understand the remaining shelf life. In addition, another added value of such a dynamic indicator is that it displays the remaining shelf life more accurately, because this remaining shelf life is based on constant monitoring of the actual temperature over time. It can thereby help consumers in better planning their meals and it may avoid unnecessary food waste. The Keep-it indicator was launched the first time on the Norwegian market in 2013 and has since been applied on more than 80 million food items sold in food retail. Keep-it® is applied now to both use by and best before products such as fish, poultry, meat and ready-to-eat. Examples of customers are the food retail chain REMA 1000, food e-retailer kolonial.no and the University Hospitals of Oslo.

HelloFresh and Keep-it Technologies wanted to know if Dutch and Belgian HelloFresh customers understand the Keep-it® concept and whether the Keep-it indicator could help to reduce food waste or add value in any other way.

The research in this report has been designed, executed, analysed and reported by the Food, Health and Consumer Research group of Wageningen Food & Biobased Research, building upon existing research and experience. In this report the results of the study are described. We would like to thank Hilke Bos-Brouwers and Annelies Dijk for reviewing the report. Another mention of gratitude goes to the more than 1450 consumers who participated in this survey study. We appreciated the input of HelloFresh and Keep-it Technologies on the survey, and we are looking forward to possible future projects.

Gertrude Zeinstra (PhD) & Sandra van der Haar (MSc)
Food, Health & Consumer Research
Wageningen Food & Biobased Research

Summary

About a third of all food that is produced for human consumption is never eaten, and a large part of this is generated at the consumer level. Previous studies have shown that consumers do not always know how they need to handle different expiry dates on food products, and this lack of knowledge has been related to increased food waste. It would therefore be beneficial to find solutions that will help consumers in the correct use of expiry dates. Time-temperature indicators (TTI) as developed by Keep-it Technologies, might offer such a solution for consumers. HelloFresh provides their customers with boxes containing fresh ingredients and recipes for meals. Keep-it® may help HelloFresh in finding a solution to date-code previously frozen products in the meal box, that are now offered fresh.

The Keep-it TTI shows the remaining shelf life in days of a fresh product as visual information on the package, based on constant monitoring of the temperature of the product over time. Whereas the technology has been on the Norwegian market (retail and hospitals) since 2013, it has not yet been studied whether Dutch consumers understand, use and act upon a time-temperature indicator, to what extent the indicator affects consumers' perceptions on food safety and quality assurance, and whether the indicator could possibly lead to less food waste. Therefore, the central objective of this research project was to investigate consumers' user experiences of a time-temperature indicator (Keep-it®) in a Hello-Fresh box and to explore the potential impact of the indicator on food waste-related behaviour.

An experimental pilot-study was executed among HelloFresh users, who ordered salmon in week 34 (August) of 2020. Two groups were investigated. The test group received both the printed date and the Keep-it indicator on salmon in their Hello Fresh box (6000 HelloFresh boxes). This group also received an information flyer about the indicator (stating that the printed date is leading) and general date marking. The control group received information about general date marking, but there was no Keep-it indicator on the salmon in their box (20.000 HelloFresh boxes). Responses towards the Keep-it indicator, date marking experiences and self-reported (food waste) behavioural effects were investigated through an online survey in both groups. Respondents in the control group were shown an image of the Keep-it indicator in the survey before answering questions about this indicator. Survey data were analysed using t-tests, chi-square analyses and one-way ANOVAs.

The final sample consisted of 1485 respondents: 421 in the test group (Response rate: 7%) and 1064 in the control group (Response rate: 5%). The average age was 45 years, 76% was female, average household size was 2.7 persons and ~75% was higher educated. The results showed that about 90% of the respondents frequently pay attention to expiry dates. Respondents paid more attention to date marking on regular products than on HelloFresh products. About 50% of the respondents in both groups ($p=0.08$) knew the correct meaning of the use by date. The control group knew the meaning of the best before date somewhat better than the test group ($p<0.001$): 16% selected three out of three correct answers in the control group versus 8% in the test group.

In general, both groups were positive about the Keep-it indicator. The majority of respondents (60%-90%) agreed that the indicator is positive, reliable, useful, intuitive, value-adding and not confusing. The test group gave significantly higher scores for these aspects than the control group (all p -values <0.001). Exploratory analyses showed that test group participants who actually saw the indicator in their HelloFresh box gave higher scores for these aspects than test group participants who did not see the indicator and gave similar scores as the control group. To a lesser extent, this was also true for reading the information flyer about Keep-it® or not.

Respondents in both groups also expected that the indicator would be useful in several aspects. The majority of participants expected that Keep-it® will make it easier to see how long a fresh product can be used (control group: 86%; test group: 92%; $p<0.001$), will help to determine how long a fresh product can be safely eaten (control group: 84%; test group: 88%; $p=0.02$), will give more assurance that a fresh product is of good quality (control group: 78%; test group: 85%; $p<0.001$), indicates the shelf life of a fresh product more accurately than the date stamp (control group: 79%; test group:

83%; $p < 0.001$) and will show me if fresh products are not stored at the right temperature (control group: 79%; test group: 82%; $p = 0.03$). The test group gave significantly higher scores than the control group, which may be due to their actual experience with the indicator and the accompanying information flyer. Both groups expected that the indicator will help themselves and others to throw away less food, and will influence the planning of their meals (mean scores for all three items ~ 5.5 on 7-point scale; no significant differences between the two groups).

Most respondents (88%) in the test group had seen the indicator, and understood well what the indicator was stating. Test group participants who had seen the indicator understood the indicator better (6.2 ± 1.4 ; $N = 362$) than test group participants who did not see the indicator and judged a picture of the indicator (5.2 ± 1.9 ; $N = 59$; $p < 0.001$). Test group participants indicated that the information flyer helped to understand the Keep-it indicator (6.1 ± 1.3).

On average, the remaining shelf life of the salmon was five days when receiving the HelloFresh box and respondents ate the salmon on average two days after receiving the box. Most important reasons for preparing the salmon on that day were sticking to a pre-made planning based on the shelf life of products ($\sim 50\%$), always preparing fish dishes first (28%) and feeling like eating salmon (19-28%).

Respondents were asked what they would do with use by products that are beyond their expiry date. The results showed that this differed per product category. Whereas most consumers (78-84%) would inspect the expired food before deciding on consumption when it concerns dairy, most consumers (54-64%) would discard the expired food when it concerns fish. For meat, reported behaviours were in between with 55-64% indicating to inspect it and 35-44% reporting to discard expired meat. For expired non-perishable food products, 20-30% indicated to eat this without inspecting, whereas this answer was practically absent for the other product categories. For meat, fish, dairy and ready-to-eat meals, test group participants would relatively more often discard the expired food compared to the control group ($p \leq 0.002$).

When the static date has passed and Keep-it® would show two more days left, the number of people reporting to eat the product increased from 0-2% to approximately 20% for all four product groups (meat, fish, milk and ready-to-eat meals) and the number of people that reported to immediately discard it decreased. The number of people inspecting the food before deciding on consumption increased with 10-20% for meat, fish and ready-to-eat meals. For dairy/ milk, the number of people inspecting before consumption decreased, because more people indicated to eat it.

Strengths of the current study are the large sample size, the comprehensiveness of the survey and the fact that test group respondents received the Keep-it indicator in their regular HelloFresh box (real-life situation), which strengthens the ecological validity of the study. A limitation of the study is that there were small differences between the two groups concerning demographic characteristics (i.e. age, household size, country). Furthermore, results about behaviour were self-reported and the study was executed among HelloFresh users, who appeared to have a higher education level than the general Dutch/Flemish population. Finally, acceptance and experiences with the Keep-it indicator were studied with an accompanying printed date on the salmon and a message clearly stating that the date stamp is leading. How consumers perceive and experience the Keep-it indicator on its own - without an accompanying date stamp, has not been studied, and would be an interesting avenue for future research. These aspects should be taken into account when interpreting the results.

In conclusion, the results show that the consumer experiences regarding the Keep-it® time-temperature indicator in a Hello-Fresh box were positive. Overall, the concept was well understood, perceived as positive, reliable, useful, intuitive, value-adding, not confusing and positive expectations were attributed to the indicator. Actually seeing and experiencing the indicator led to a better understanding, a more positive perception and higher expectations. Therefore, when introducing this new technology, it is recommended to explain how the indicator works and give consumers the opportunity to actually see or experience the indicator. The results also show that consumers expected that Keep-it® offers them more clarity on how long a fresh product can be used and that it will help them and others to throw away less food. Additionally, in the situation where the static date has passed, but Keep-it® shows some days left, the responses indicated that consumers would inspect the

food more often and discard the food less often. This indicates a kind of trust in the indicator and shows the potential of a TTI in food waste reduction. However, in order to fully understand the effect of the Keep-it indicator on food waste reduction, it is recommended to investigate the experiences from a broader population during a prolonged period of time and to apply the indicator on a wider range of fresh products.

1 Introduction

The current report shows the results of an experimental pilot study. The research was commissioned by HelloFresh and Keep-it Technologies, executed independently by Wageningen Food & Biobased Research within the context of the project 'Voucher arrangement Food Waste Free United, and funded by HelloFresh and the Dutch Ministry of Agriculture, Nature and Food Quality (project number BO-43-002.02-005). The main goal of the Food Waste Free United foundation ("Samen Tegen Voedselverspilling") is to reduce food waste in The Netherlands by 50% by 2030 (SDG 12.3) together with Dutch companies, organizations, universities, government and consumers. In order to stimulate companies to valorise side streams and implement food waste reduction innovations in their processes and/or supply chain, the Ministry of Agriculture, Nature and Food Quality started a voucher scheme in 2018. This voucher scheme is related to action line 2 of Food Waste Free United: Together against food waste in the chain. The voucher scheme allows companies to receive tailor made advice from experts (WUR and possibly external parties) about food waste reduction innovations and side stream valorisation in an attractive, accessible way. The scheme will run until the end of 2022.

For this research project, the main question of HelloFresh and Keep-it Technologies was to investigate consumers' understanding and user experiences regarding a time-temperature indicator (Keep-it®) in a Hello-Fresh box and the potential impact on food waste-related behaviour.

Whereas the Keep-it indicator is on the Norwegian market since 2013, this indicator is not yet on the Dutch or Belgian market. One of the reasons that TTI's are not yet applied on food products in The Netherlands, is that under the current regulation no.1169/2011 of the European Parliament, it is mandatory to mention the date of minimum durability (or 'use by' date) on a food product. This regulation also had to be taken into account when designing this experimental pilot study and therefore, the salmon packages with the TTI also showed the printed use by date. In addition, in the accompanying flyer, it was strongly emphasized that the printed date was leading. The execution of the pilot study was announced to the Dutch Food Authorities beforehand.

Participants of this study were recruited via the HelloFresh customer database of The Netherlands and Flanders. HelloFresh provides their customers with boxes containing fresh ingredients and recipes for meals. All the ingredients in the box are delivered at the right quantities for the number of persons in the household. HelloFresh's market share in meal boxes in The Netherlands is ~70% (Retail Intelligence Lab, 2016). HelloFresh customers have flexible subscriptions, meaning that for each week they have the possibility to pause, or adapt the (number of) meals. In order to be invited for the study, customers had to order a HelloFresh box with salmon in it. Our results are therefore applicable to Dutch and Flemish HelloFresh users, who had their first encounter with the Keep-it indicator. This report is initially written for HelloFresh and Keep-it Technologies and in addition for any other readers who are interested in consumer experiences of a time-temperature indicator as a new dynamic shelf-life indicator and a possible way to reduce food waste.

1.1 Background

About one third of all food produced globally is wasted (Gustavsson, Cederberg, Sonesson, Otterdijk, & Meybeck, 2011). This large amount of food waste leads to economic, social and environmental losses. A large part of wasted food is generated at the consumer household level (Gustavsson et al., 2011; Stenmarck et al., 2016). Although most consumers are reluctant to food waste (Rohm et al., 2017) and normally do not waste food intentionally (Van Geffen, Van Herpen, & Van Trijp, 2016) it is a challenging task to change consumers' food and waste behaviour (Aschemann-Witzel, de Hooge, Amani, Bech-Larsen, & Oostindjer, 2015; Farr-Wharton, Choi, & Foth, 2014).

Various studies point to the fact that consumers do not always know how to handle different expiry dates on food products. Many consumers do not know the difference between use-by (referring to food safety) and best before (referring to food quality) expiry dates, and this lack of knowledge has been related to more food waste (Aschemann-Witzel et al., 2015; Milne, 2012; Parfitt, Barthel, & MacNaughton, 2010). A recent study estimates that understanding of date labelling is a key influence on food waste behaviour and may explain about 20% of the difference in food waste behaviours of consumers (Toma, Font, & Thompson, 2020). These results suggest that the frequency of checking and understanding of date labels are main determinants of food waste behaviour, and this finding applied to the various geographical regions that were included in the study (Western, Eastern and Mediterranean Europe).

Meal boxes could be a promising way to reduce food waste, since the ingredients in the box are pre-portioned and precisely adjusted for the meals that need to be prepared. A Danish study shows that consumers value meal boxes, because they make meal planning easier, reduce grocery shopping frequency, contain more vegetables per meal and provide inspiration and variation due to new dishes and recipes (Hertz & Halkier, 2017). This study also points to the fact that meal boxes may create less food waste. A study among Swedish consumers indicates similar advantages of meal boxes. Meal boxes help in planning of the meals (less pressure on deciding what to eat), save time regarding shopping for food and simplify cooking while breaking out of routines by introducing new foods. Furthermore, meal boxes allow households to pursue a range of aspirations such as healthy eating, sustainable eating and practicing home-made family meals (Fuentes & Samsioe, 2020). The participants in this study considered meal boxes as effective reducers of food waste. Another study that compared the lifecycle environmental impact from five meal box meals and the same five grocery meals, concluded that meal boxes were generally more environmentally-friendly than grocery meals. This was mainly due to less food waste at the retailer and the consumer level and because of the direct supply to the consumer (Heard, Bandekar, Vassar, & Miller, 2019).

The business proposition of HelloFresh is to provide their customers with fresh and ready to eat ingredients to prepare at home. HelloFresh seeks a novel approach to date code previously frozen products, that are now offered fresh. Keep-it Technologies may offer a solution for HelloFresh's approach. The Keep-it indicator is a time-temperature indicator (TTI), showing the remaining shelf life of a fresh product based on constant monitoring of temperature over time. Such an indicator may help consumers in planning their meals and it may avoid unnecessary food waste. The Keep-it indicator was launched the first time on the Norwegian market in 2013 and has since then been applied on more than 80 million food items sold in food retail. Keep-it® is applied now to both use by and best before products such as fish, poultry, meat and ready-to-eat. Examples of customers are the food retail chain REMA 1000, food e-retailer kolonial.no and the University Hospitals of Oslo. A few consumer studies have been performed in Europe to investigate attitudes towards, and acceptance of, TTI technology. These studies show that consumers are interested in such technologies and find them in general useful (Pennanen et al., 2015; Pennanen et al., 2013; Sherlock & Labuza, 1992).

It has not yet been studied whether Dutch HelloFresh consumers understand, use and act upon a time-temperature indicator, to what extent the TTI affects consumers' perceptions on food safety and quality assurance, and whether the indicator leads to less food waste. Therefore, an experimental pilot study was designed to investigate these aspects.

1.2 Objectives

The central objective of this research project is to investigate consumers' user experiences of a time-temperature indicator (Keep-it®) in a Hello-Fresh box and to explore the potential impact of the indicator on food waste-related behaviour. In this study, consumers' understanding and interpretation of a dynamic shelf-life indication method and the impact on their perception of food safety and quality, are part of the consumers' user experiences.

Specific research questions for the project:

- Do HelloFresh users check expiry date marking on the products in the box?
- Do HelloFresh users notice the added information (in the flyer) on general data marking (control group) or on the time-temperature indicator (test group)?
- Do HelloFresh users understand the TTI or do they need the provided information?
- How do the two interventions (no TTI versus TTI in box) influence HelloFresh users' meal planning?
- How do the two interventions (no TTI versus TTI in box) influence HelloFresh users' food waste related behaviour?
- When did HelloFresh users consume the salmon and why?
- What will HelloFresh consumers do when static and dynamic dates are in conflict for various product categories (fish, meat, chicken) and why?
- How do static and dynamic date marking relate to consumer perceptions about ease of use, food quality, food safety, trust, freshness and product value?

2 Methods

The project consisted of an experimental pilot study among two adult consumer groups.

- 1) Test group: Consumers received the Keep-it indicator on salmon in their Hello Fresh box.
- 2) Control group: Consumers received salmon in their Hello Fresh box without the Keep-it indicator.

As mentioned in the introduction, the current regulations require that a static (printed) date has to be present on a food product. Therefore, both the printed date and a Keep-it indicator were on the salmon in the test group. Consumers in this group received an information leaflet, explaining that the conventional printed date is leading. Since providing information in itself is an intervention activity, which may change consumer thoughts and behaviour, a second group was needed to disentangle the effects of the dynamic indicator and information provision. Therefore, both groups received a flyer with information about general date marking (difference between use-by and best before) and only the test group received the Keep-it indicator with information about the indicator on the flyer.

Consumer responses towards the Keep-it indicator, date marking experiences and self-reported (food waste) behavioural effects were investigated through an online survey in both groups. The research protocol was approved by the Social Ethics Committee of Wageningen University (See Annex I).

2.1 Participants

Participants were recruited via HelloFresh customer database in The Netherlands and the Dutch-speaking part of Belgium. The test-group consisted of 6.000 consumers that ordered salmon for week 34 (August 13th 2020). About 20.000 other consumers that ordered salmon in that week, formed the control group. The HelloFresh box contained a flyer with information about general date marking (difference between use-by and best before dates) and the correct fridge temperature, as well as an invitation to participate in a consumer survey about consumers' perceptions on date marking and new ways for diminishing food waste. The invitation flyer for both groups can be found in Annex II and III. HelloFresh also e-mailed the invitation to participate in the survey. Free HelloFresh boxes were raffled among survey completers.

A total of 2079 HelloFresh consumers started the online survey. Of this group, 27 did not tick the box for giving permission to participate in the survey and therefore the survey was immediately closed, and 565 respondents were excluded due to incomplete questionnaires. One person was removed from the test group, since this person did not receive the Keep-it indicator. Another person was removed from the control group since this person was younger than 18 years old. The final sample consisted of 1485 respondents who completed the whole survey, of which 421 were in the test group (Response rate: 7%) and 1064 in the control group (Response rate: 5%).

2.2 Survey development & data collection

The survey was developed based on the research questions taking reference of the REFRESH-framework (Van Geffen et al., 2016), previous WFBR experiences regarding consumer perceptions and food waste behaviour, as well as previous surveys from Keep-it Technologies (CAWI Questionnaire, 2016; Rema consumer study, 2019; Shelf life survey, 2017). WFBR drafted the survey. The survey topics and questions were made as similar as possible for the two groups, in order to be able to compare the responses. The test group received some additional questions about actually seeing and understanding the Keep-it indicator in their HelloFresh box, whereas the control group received additional questions about their perceptions regarding the use by date. Since the control group did not receive the indicator in their HelloFresh box, they were shown an image of the Keep-it indicator in the survey and a short written explanation about how the indicator works before they answered several questions on perceptions and expectations regarding Keep-it®.

The topics and questions were discussed with HelloFresh and Keep-it Technologies during two discussion rounds. The survey was programmed by HelloFresh via QuestionPro and pre-tested among non-participants in a few rounds before finalizing it. The final survey can be found in Annex IV.

Data collection started in week 34 (August 13th 2020). HelloFresh users were invited to complete the 5-10 minute survey within a period of three weeks. Subsequently - in line with the General Data Protection Regulations - WFBR received the anonymous dataset of the two groups from HelloFresh for data analyses.

2.3 Data analysis

The participant characteristics are shown as averages plus Standard Deviations (=SD) or as percentages for categorical data. All results are shown for the two groups separately (test group versus control group).

For the question regarding the meaning of best-before and use-by date, the number of correct answers was calculated. Whereas only one answer was correct for the use by date, three answers were correct for the best-before date. Therefore, the number of participants that had one, two or three responses correct was calculated.

For the research question "when did HelloFresh users consume the salmon", respondents completed a table with the actual dates of receiving the box, the printed date on the salmon (static date), the shelf life according to the Keep-it indicator (dynamic) upon receipt of the box and upon preparation of the salmon, as well as the date when they used the salmon. By calculating the differences between various dates - resulting in a particular number of days -, remaining shelf life according to the static date and dynamic indicator was calculated and compared.

For questions that represented categorical data, frequencies of responses (and percentages) were calculated and are shown in a table or figure. Differences between the two groups were tested with a Chi-Square test.

For several questions, a 7-point answering scale was used ranging from 1= 'Not at all' to 7= 'totally' or from 1= 'completely disagree' to 7= 'completely agree' with 4='neutral'. For these questions, the mean scores and SD's were calculated. Differences between the two groups were tested with independent samples t-tests. In order to better understand the mean scores and potential differences between the groups, also the percentage of respondents agreeing/ scoring positive (score 5-6-7) or disagreeing/ scoring negative (score 1-2-3) on the statements were calculated. Similar calculations were done for the questions about attention for date marking, which were answered on a 5-point scale where 1='never'; 2='rarely'; 3='occasionally'; 4='often'; 5='always'.

Exploratory analyses were done to get an idea whether it was due to the information flyer or due to actually seeing the Keep-it indicator or due to the combination of these two which led to the found differences between the test group and control group regarding the evaluation and expectations regarding the Keep-it indicator. Therefore, the study group was split into three groups. First, the test group was split into two groups on the basis of whether they read the information flyer about the Keep-it indicator or not, and these two groups were compared to the control group. Secondly, the test-group was split in two groups on the basis of whether they had seen the actual Keep-it indicator in their HelloFresh box or not, and these two groups were compared to the control group. For both analyses, differences between the three groups in evaluation and expectation scores were tested via a one-way ANOVA with Bonferroni post-hoc tests.

In general, a p-value < 0.05 was regarded as statistically significant (2-sided). Due to the relatively large sample size, multiple testing and the relatively limited range of the scales (5 or 7 points), differences are highly likely to become significant. Therefore, p-values of <0.001 are given more value. The term 'significantly different' in the report is used to indicate a statistical significant difference.

3 Results

3.1 Participant characteristics

The final sample consisted of 1485 HelloFresh consumers. Their average age was 44.96 ± 13.7 year (range 18-82 year), 76% were female, 24% male and their average household size was 2.7 ± 1.2 persons (37% of the participants had children). Table 1 shows the participant characteristics per group.

Table 1 Participant characteristics of the HelloFresh consumers that participated in the experimental pilot study (means and SD or N and percentages).

Characteristic	Test group (N=421)	Control group (N=1064)	p-value difference
Gender ^a			0.45
	<i>Female</i>	327 (77.7%)	802 (75.8%)
	<i>Male</i>	94 (22.3%)	256 (24.2%)
Education level ^b			0.04
	<i>High</i>	295 (77.2%)	727 (72.8%)
	<i>Middle</i>	77 (20.2%)	215 (21.5%)
	<i>Low</i>	10 (2.6%)	57 (5.7%)
Country			0.02
	<i>The Netherlands</i>	261 (62%)	726 (68.4%)
	<i>Belgium</i>	160 (38%)	336 (31.6%)
Age	43.4 ± 9.4	45.6 ± 14.9	0.001
Household size	3.6 ± 0.9	2.4 ± 1.0	<0.001
Number of children 0-12	0.9 ± 1.0	0.3 ± 0.8	<0.001
Number of children 13-18 years	0.4 ± 0.8	0.1 ± 0.5	<0.001
Households with children	285 (67.7%)	254 (24.8%)	<0.001
Food waste related statements ^c			
I try to throw away as little food as possible (Motivation)	6.3 ± 1.0	6.4 ± 1.0	0.80
I know what temperature my refrigerator should be (Ability)	5.5 ± 1.5	5.5 ± 1.6	0.56
I find it difficult to determine whether food products are still safe to eat (Ability)	3.4 ± 1.8	3.3 ± 1.8	0.49
By using HelloFresh I throw away less food now (Food waste behaviour)	5.7 ± 1.6	5.6 ± 1.7	0.33

^a N=6 omitted, since they chose the answer "other/ don't want to say"

^b N=104 omitted, since they chose the answer "other/ don't want to say"

^c Measured on 7-point Likert scales, ranging from 1=completely disagree to 7=completely agree

There were significant differences between the two groups regarding their socio-demographic background. The test group was slightly younger, had on average more children leading to a higher household size, contained relatively more participants with a higher education, and contained relatively more participants from Belgium. There were no differences between the groups concerning gender and the food waste related statements. The respondents gave a high score on their motivation to discard as little as possible (average scores over 6.3), whereas they gave a low score on the difficulty-statement (ability, average scores <3.4). A third of the respondents (30%) agreed that they find it difficult to determine whether food products are still safe to eat, and 57% disagreed, indicating that they judge this as not difficult. It took participants on average 11.2 ± 8.9 minutes to complete the survey.

3.2 Expiry dates: attention and understanding

Figure 1 shows that about 90% of the respondents indicated that they frequently pay attention to expiry dates on food products before using them, with 59.6% indicating 'always' and 33% indicating 'often' in the test group (sum is 93%) and 47.4% indicating 'always' and 39% indicating 'often' in the control group (sum is 86%). An additional 5-10% of the respondents indicated to occasionally pay attention to date marking of food products.

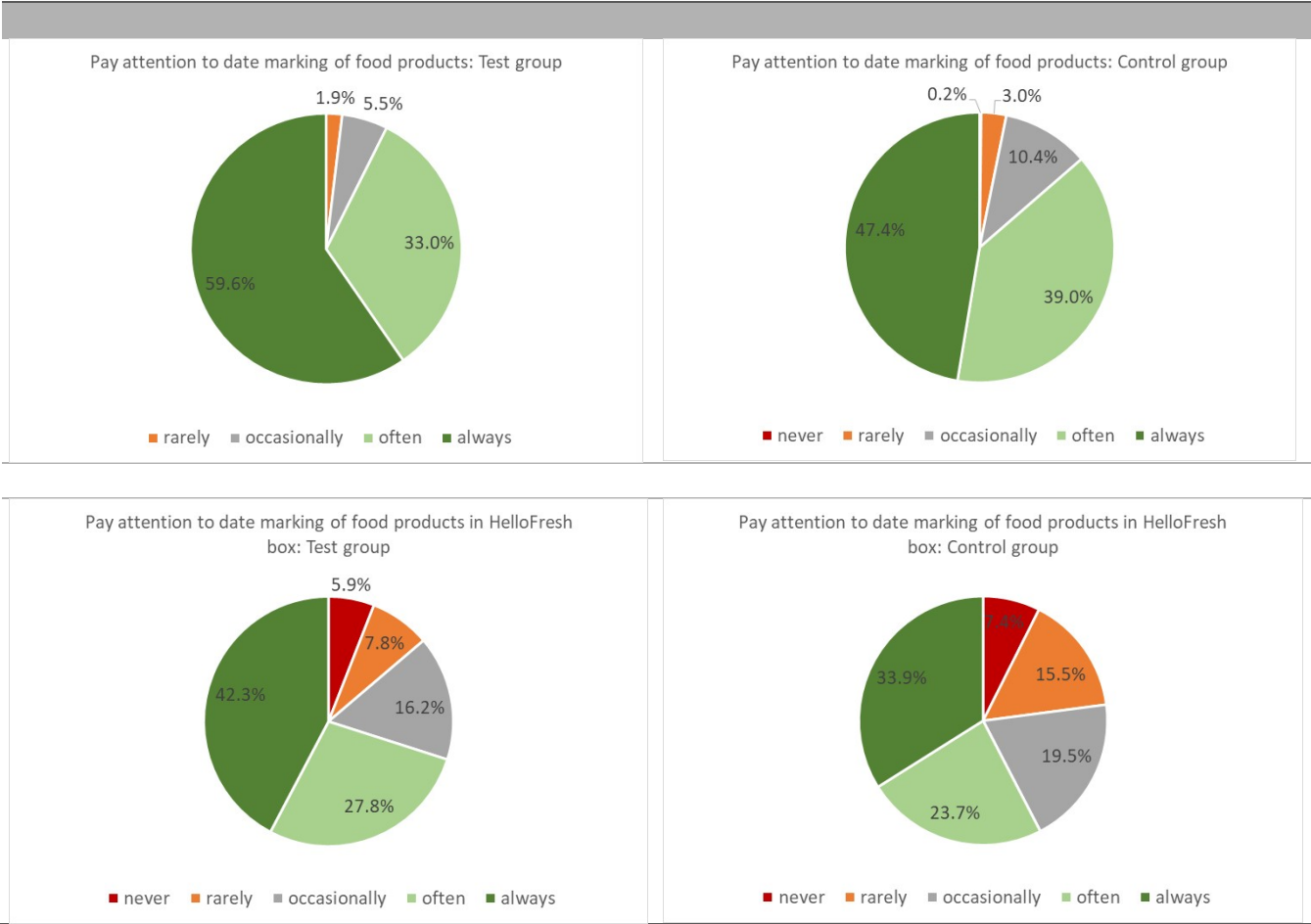


Figure 1 Percentage of respondents that is normally paying attention to date marking on food products (top figures) and on food products in the HelloFresh box (bottom figures) for the test group (left side) and control group (right side).

For the HelloFresh box in particular, the percentages were somewhat lower, with 42.3% paying always attention and 27.8% paying often attention in the test group (sum is 70%) and these percentages were 33.9% for 'always' and 23.7% for 'often' in the control group (sum is 58%). Another 16-20% indicated to occasionally pay attention to expiry dates of HelloFresh products.

Table 2 shows the average scores for the questions related to paying attention to, and consumers' understanding of, expiry dates. The results show that respondents generally pay more attention to date marking on regular products (4.4 ± 0.8) than to products in the HelloFresh box (3.7 ± 1.3 ; $p < 0.001$). In addition, the test group pays significantly more attention towards expiry dates for both general food products and food products in the HelloFresh box, although the differences are of small size.

Table 2 *Answers to the questions about paying attention to, and understanding of, expiry dates.*

	Test group (N=421)	Control group (N=1064)	p-value difference
Paying attention			
Normally pay attention to date marking of food products before using them ^a	4.5 ± 0.7	4.3 ± 0.8	<0.001
Normally pay attention to expiration dates of food products in HelloFresh box before using them ^a	3.9 ± 1.2	3.6 ± 1.3	<0.001
Understanding expiry dates			
Meaning of use by date (TGT) ^b			0.08
<i>Correct answer</i>	N=223 (53.0%)	N=510 (47.9%)	
<i>Incorrect answer</i>	N=198 (47.0%)	N=554 (52.1%)	
Meaning of best before date (THT) ^c			0.001
<i>1 of 3 correct answer</i>	N=250 (59.4%)	N=586 (55.1%)	
<i>2 of 3 correct answers</i>	N=80 (19.0%)	N=202 (19.0%)	
<i>3 of 3 correct answers</i>	N=35 (8.3%)	N=171 (16.1%)	
<i>Incorrect answer</i>	N=56 (13.3%)	N=105 (9.9%)	

^a Answer options on a 5-point scale ranging from never (=1) to always (=5)

^b Correct answer: only answer option "The product should not be eaten after this date due to food safety risks" was ticked, and no other answer options were ticked.

^c Three answer options were correct: "The product can be used after this date, but it is recommended to smell and view the product first"; "The producer cannot guarantee that the product will taste good"; and "The product can be used after this date, but it is recommended to taste it first". A correct answer was calculated as one, two or three of these correct answers without having ticked any other answer options.

Figure 2 shows that 55-60% of the respondents chose the answer "the product should not be eaten after this date due to food safety risks" when asked about the meaning of the use by date (TGT). Almost 30% chose the answer "after this date, the producer cannot guarantee that the product will taste good". About 24-29% marked the answer "the product can be used after this date, but it is recommended to smell and view the product first". Participants could choose multiple answers, whereas only one answer is correct for the use by date (i.e. "The product should not be eaten after this date due to food safety risks"). About 50% of the respondents gave this correct answer as only response with regards to the meaning of the use by date in both groups (see Table 2).

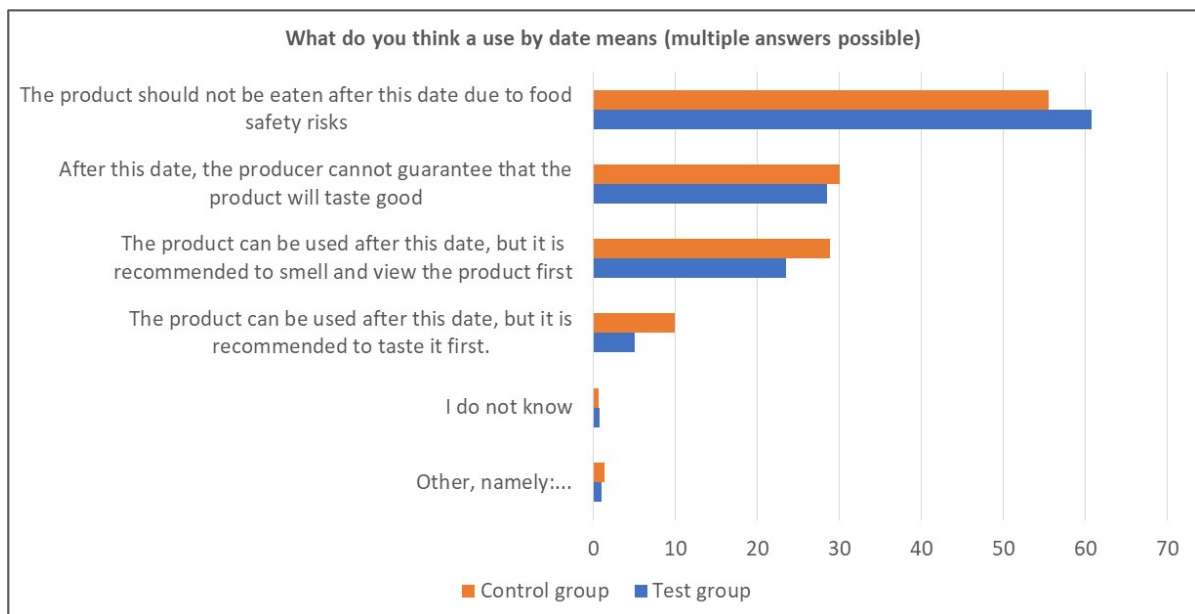


Figure 2 Percentage of respondents that chose each answer for the meaning of the use by date for the test group (N=421) and control group (N=1064).

Figure 3 shows that almost 70% of the respondents indicated that the best before date means that the product can be used after this date, but it is recommended to smell and view the product first. About 40-50% of the respondents chose the answer that the producer cannot guarantee that the product will taste good. A fifth to a quarter thought the product can be used after this date, but it is recommended to taste it first. About 10% thought the product cannot be eaten after the best before date due to food safety risks. Also for this question about the best before date (THT), participants could chose multiple answers and here, multiple answers can be correct. Approximately 90% of the respondents choose one, two or three correct answers from the three correct answers out of the six answer options, whereas only 8-16% choose the correct three answers. Relatively more participants in the control group chose the correct three answers ($p=0.001$; see Table 2).

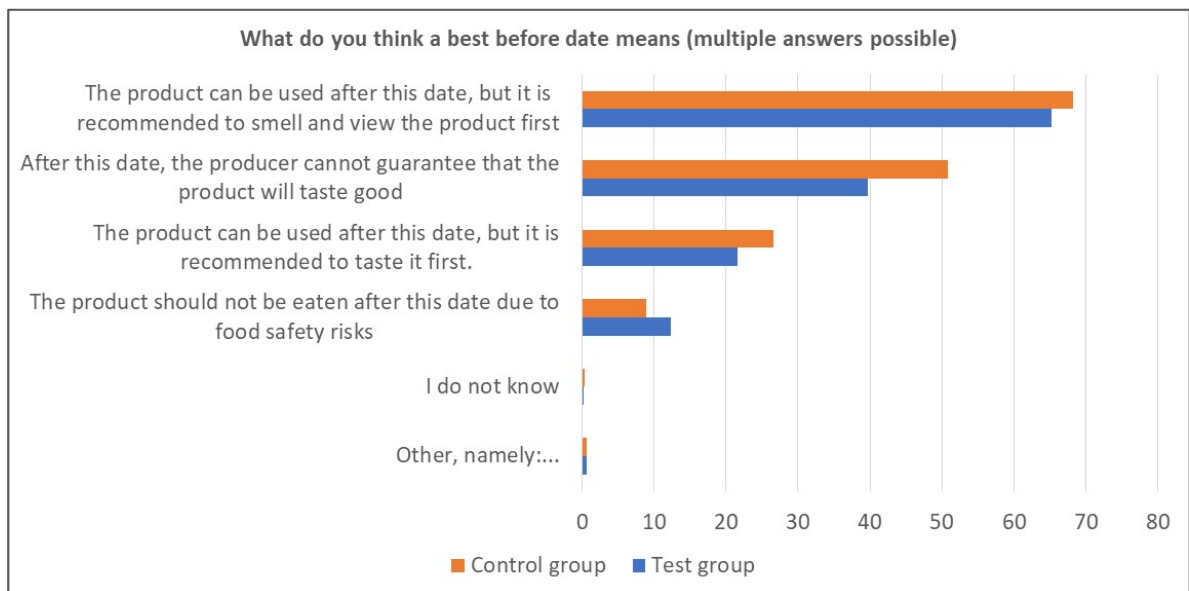


Figure 3 Percentage of respondents that chose each answer for the meaning of the best before for the test group (N=421) and control group (N=1064).

3.3 Reported behaviour when the static date has passed

Figure 4 shows what HelloFresh consumers reported to do when the static date of four different product categories has passed. The figure shows that there are differences between the product categories. Whereas most consumers (78-84%) would inspect the expired food before consumption when it concerns dairy, most consumers (54-64%) indicated to discard expired food without inspecting it when it concerns fish. Reported behaviours for meat were in between these two product categories, with 55-64% indicating to inspect it and 35-44% reporting to discard the expired meat. When it concerns non-perishable products, 20-30% of the respondents indicated to eat the expired product without inspecting, whereas this answer was practically absent for the other food categories. For ready-to-eat meals, about 12% of the consumers indicated that they do not know what they will do; this answer was hardly given for the other product categories.

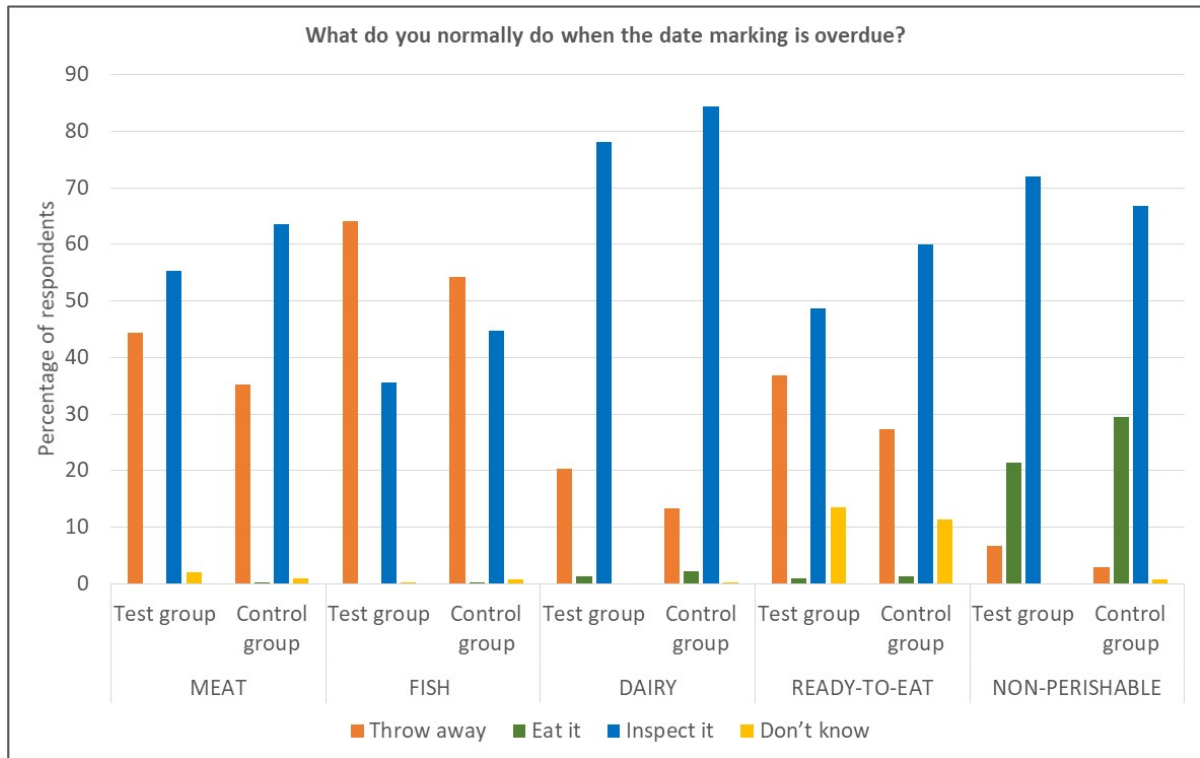


Figure 4 Percentage of respondents that chose each answer regarding what they normally do when the static date has passed for the product categories 'meat', 'fish', 'dairy', 'ready-to-eat meals' and 'non-perishable products', separately for the test group (N=421) and control group (N=1065).

The four answering categories are: Throw away = I throw the product away without inspecting if the product is still edible; Eat it = I'll eat it without inspecting if the product is still edible; Inspect it = I inspect it and decide on look, smell and/or taste whether the product is still edible; Don't know = I don't know.

For all five product groups, there was a significant difference between the test group and control group in the pattern of answers. Due to the small number of observations for some answer options, only the answer options with >5 observations were included in this Chi-Square analyses.

- For meat (options included in the analysis: 'throw away' and 'inspect it'), the test group answered relatively more frequent that they will throw expired meat away, whereas the control group answered relatively more frequent that they will inspect the expired meat before deciding to eat or not to eat it (p=0.001).
- For fish, a similar pattern was found (options included in the analysis: 'throw away' and 'inspect it'). The test group answered relatively more frequent that they will discard expired fish, whereas

the control group answered relatively more frequent that they will inspect the expired fish before deciding to eat or not to eat it ($p=0.001$)

- For dairy (options included in the analysis: 'throw away', 'eat it' and 'inspect it'), relatively more participants in the test group would throw the expired dairy away, whereas relatively more participants in the control group would inspect the expired dairy before deciding on consumption ($p=0.002$).
- Also for ready-to-eat meals (all four answer options included), the test group indicated relatively more often to discard the expired food, whereas the control group indicated relatively more often to inspect the expired ready-to-eat meal before deciding on consumption ($p=0.001$).
- For non-perishable products, the test group indicated relatively more frequently that they will inspect the expired product before consuming, whereas the control group indicated relatively more often that they will eat it without inspecting the food ($p<0.001$).

3.4 Keep-it indicator (Test group only)

Most consumers (86%) in the test group had seen the Keep-it indicator, mostly on the package (84.3%), whereas for 1.7% of the respondents, the indicator was not on the package anymore. A group of 14% had not seen the Keep-it indicator.

Figure 5 shows how well the participants understood the Keep-it® indicator for the respondents that had seen the indicator ($N=362$; 86%). The majority of them (88%) agreed that they understood what the Keep-it indicator is stating (with 65.7% understanding this completely=score 7). Only 6.4% disagreed (score 1, 2 or 3), indicating that they did not understand what the Keep-it indicator is stating, and 5% of the respondents answered neutral (score 4).

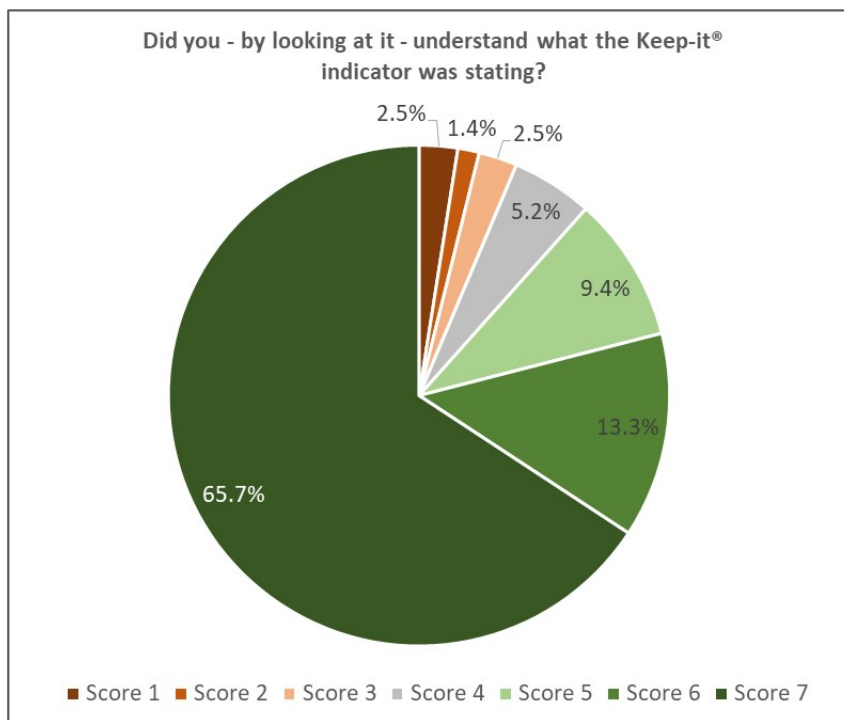


Figure 5 Test group respondents' understanding of what the Keep-it indicator is stating on a 7-point scale, where 1=not at all, 4=neutral and 7=totally. This question was answered by the respondents who had seen the Keep-it indicator in their HelloFresh box ($N=362$).

The participants who had not seen the indicator ($N=59$; 14%), judged a picture of the Keep-it indicator. Also in this part of the test group, the majority (71.2%) agreed that they understood from the image what the Keep-it indicator is stating (with 33.9% understanding this completely=score 7).

Almost 20% disagreed, indicating that they did not understand what the Keep-it indicator is stating based on the image, with 10.2% of the respondents responding neutral to this question (score 4).

Test group participants who really saw the Keep-it indicator in their HelloFresh box, understood the indicator better (6.2 ± 1.4 ; $N=362$) than the test group participants who had not seen the indicator in their box and based their understanding on an image (5.2 ± 1.9 ; $N=59$; $p<0.001$).

3.5 Information in the box

Figure 6 reveals that more than three quarters of the respondents read the flyer about Keep-it® (77% in test group) and about two thirds read the flyer about use by and best before date marking (66% in control group). Most of them read the flyer completely (56.5% in test group; 41.3% in control group). About 12-18% of the respondents did not see the flyer in the box at all, whereas another 11-16% did not read the flyer. When the answer patterns are compared between the test group and control group, there is a significant difference: $p<0.001$. Relatively more participants in the test group read the flyer totally, whereas relatively more participants in the control group read the flyer partially, did not read the flyer or did not see the flyer.

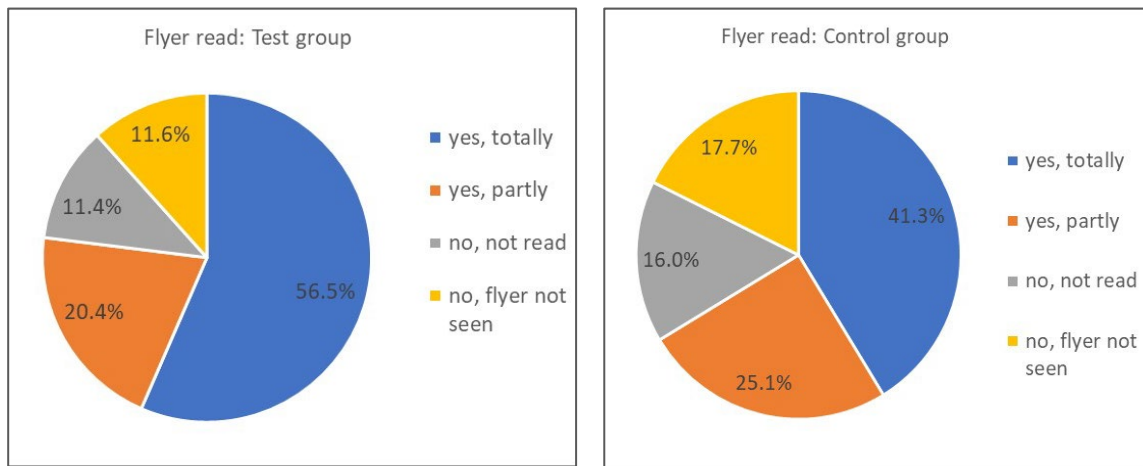


Figure 6 Percentage of respondents that read the information flyer in the HelloFresh box for the test group (left; $N=421$) and the control group (right; $N=1064$).

Table 3 shows that both groups thought the information in the flyer was clear and informative with average scores close to or above six on a 7-point scale. The test group was somewhat more positive regarding these aspects than the control group. The test group indicated that the information on the flyer helped to understand the Keep-it indicator, with an average score of 6.1 for this question (88% agreed on the statement).

Table 3 Participant responses regarding the evaluation of the information flyer in their HelloFresh box and lowering their fridge, for participants who had read the flyer totally or partly.

	Test group (N=324)	Control group (N=706)	p-value difference
Information in flyer clear ^a	6.4 ± 0.9	6.1 ± 1.0	<0.001
Information in flyer informative	6.3 ± 0.9	5.8 ± 1.0	<0.001
Did information help to understand Keep-it®	6.1 ± 1.3		
Have you lowered the temperature of your refrigerator after reading the flyer?			<0.001
	Yes N=17 (5.2%)	N=76 (10.8%)	

	Test group (N=324)	Control group (N=706)	p-value difference
No, I don't think a lower temperature is needed	N=71 (21.9%)	N=74 (10.5%)	
No, I already had my fridge temperature low	N=236 (72.8%)	N=556 (78.8%)	

^a N lower due to non-obligatory question: Test group N=322; Control group N=695

Most respondents did not lower the temperature of their fridge after reading the flyer; the large majority indicated that their fridge temperature was already low (~ 75%; see Table 3). In the test group, relatively more participants indicated that they think a lower temperature is not needed (22% versus 11% in the control group), whereas relatively more participants in the control group lowered their fridge temperature (11%) compared to 5% in the test group ($p < 0.001$).

3.6 Salmon: Preparation date and reasons why

Table 4 shows the results with regard to the remaining shelf life according to the printed date and the Keep-it indicator upon receipt and upon consumption of the salmon, as was calculated from the table with dates in the survey. As expected, not all participants could complete all dates in this table, resulting in a lower N.

Table 4 Remaining shelf life according to the printed date and the Keep-it indicator upon receipt and upon consumption of the salmon in the HelloFresh box.

	Test group	Control group
Number of days to use the salmon upon receipt box (Difference between date received and printed date)	4.8 ± 1.1 (N=175)	4.9 ± 1.1 (N=393)
Number of days left on Keep-it indicator on salmon upon receipt box	4.4 ± 1.0 (N=231)	n.a.
Difference between Keep-it indicator and printed date upon receipt		
<i>Keep-it® indicated longer shelf life</i>	11.1%	n.a.
<i>Keep-it® shelf life = printed shelf life</i>	44.5%	
<i>Printed shelf life longer shelf life</i>	44.4%	
Number of days left for salmon upon consumption (Difference between consumption date and printed date)	3.2 ± 1.4 (N=175)	3.2 ± 1.6 (N=382)
Number of days left on Keep-it indicator on salmon upon consumption	3.1 ± 1.4 (N=239)	n.a.
Difference between Keep-it indicator and printed date upon consumption		
<i>Keep-it® indicated longer shelf life</i>	24.0%	n.a.
<i>Keep-it® shelf life = printed shelf life</i>	29.3%	
<i>Printed shelf life longer shelf life</i>	46.7%	

n.a. = not applicable

When HelloFresh consumers received the HelloFresh box in their home, the shelf life indicated on the date stamp of the salmon was almost five days in both groups. According to the Keep-it indicator, shelf life was somewhat lower, with an average of 4.4 days ($p < 0.001$). In approximately 45% of the cases, the printed use by date and the Keep-it indicator showed the same shelf life, and similarly often, the printed shelf life showed more days than the Keep-it indicator. For 11% of the participants, the Keep-it indicator gave a longer shelf life for the salmon. In case of a difference, this was most often one or two days.

On average, consumers ate the salmon two days after receiving the HelloFresh box, since the remaining shelf life upon consumption was about three days for both groups. The Keep-it indicator showed a similar shelf life with 3.1 days ($p=0.24$). Keep-it® and the use by date indicated a similar shelf life upon consumption for 29% of the participants. For almost half of the respondents (46.7%), the use by date indicated a longer shelf life than Keep-it®, whereas for a quarter of the respondents Keep-it® showed a longer shelf life than the use by date (mostly a difference of one or two days).

Participants were asked why they chose to prepare the salmon on the particular day that they ate it. Figure 7 shows the results. It appeared that this question was non-obligatory; therefore not all participants gave an answer, resulting in lower N for both groups. Respondents could choose multiple answers, but the majority (~75%) selected one answer, whereas about 20% chose two answers. The most frequently chosen reason in both groups was that participants made a menu planning based on the shelf life of the products in the HelloFresh box and they stuck to this planning. This option was chosen by almost half of the respondents (46% in test group; 49% in control group). Subsequently, "I always prepare fish dishes in the HelloFresh box first" and "We felt like eating salmon" were the second most important reasons for eating salmon that day, selected by 28% and 19-28% of the respondents. Preparation time was for 12% a reason for consuming the salmon. About 6% of the test group participants indicated that the Keep-it indicator was a reason to prepare the salmon that day, whereas the printed date indication was the reason for 3% (test group) to 6% (control group) of the participants. Choosing the salmon because the recipe card indicated they had to prepare this dish within 3 days was a frequent response in the category 'otherwise'.

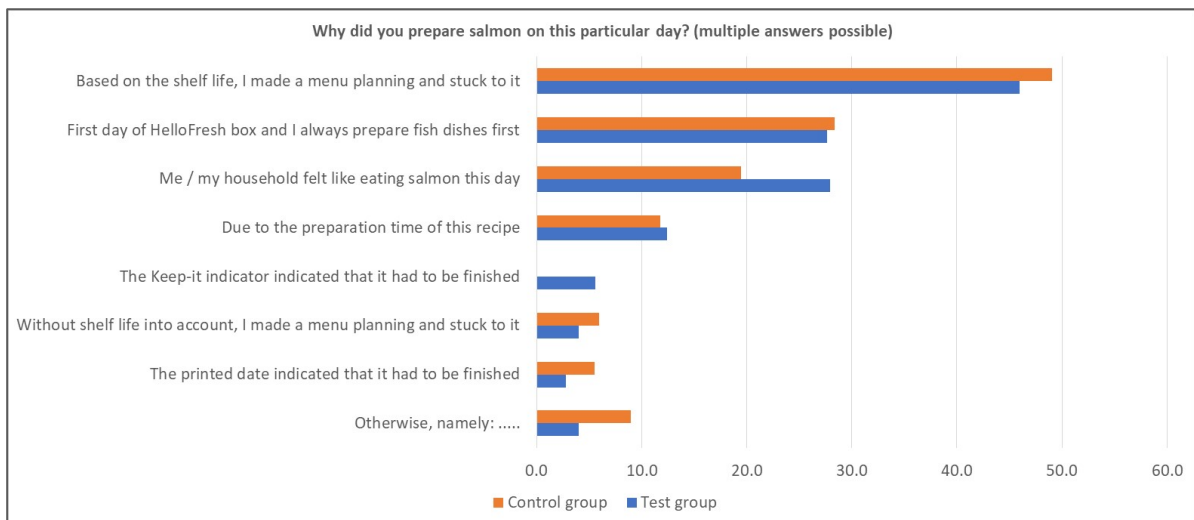


Figure 7 Participants' reasons in percentages why they prepared salmon on that particular day for the test group (N=322) and the control group (N=705).

3.7 Perceptions and expectations regarding the Keep-it indicator

Figure 8 shows that both groups were overall positive about the Keep-it indicator, with average scores between a five ('slightly agree') and six ('agree') on how positive, reliable, useful, intuitive and value-adding the Keep-it indicator is. In the test group, 72% to 90% agreed on these statements (<10% disagreed), indicating a positive attitude towards the indicator. In the control group - that saw a picture and a short explanation of the Keep-it indicator in the survey - these percentages were lower, ranging from 57% to 75% (with 8-16% disagreeing), indicating that these respondents were somewhat less positive about the indicator. The mean score for confusing was between two (disagree) and three (slightly disagree), suggesting that - on average - the respondents in both groups judged the indicator as not confusing. Figure 9 shows that 58% in the control group and 82% in the test group disagreed on finding Keep-it® confusing, implying that they find the indicator not confusing. Still, about 10% in the test group and 20% in the control group agreed with this statement, indicating that these respondents judged the indicator as confusing. Similarly, 10% (test group) to 16% (control

group) disagreed on the intuitiveness of the indicator, implying that these participants experience the Keep-it indicator as not intuitive.

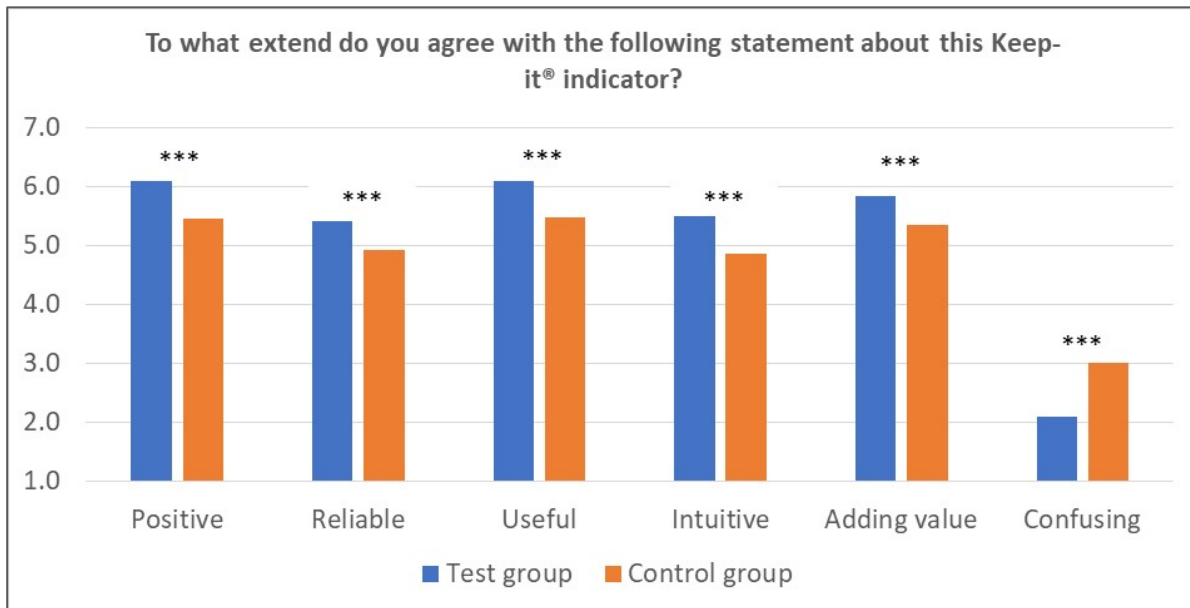


Figure 8 Mean scores for the evaluation statements about the Keep-it indicator on a 7-point scale for the test group (N=421) and control group (N=1064); *** = Significantly different with $p < 0.001$.

The statistical test confirmed that the test group significantly more positive was about the Keep-it indicator than the control group. The test group gave a significant higher score for how positive, reliable, useful, intuitive and adding value the indicator was compared to the control group, whereas the score for confusing was significantly lower than in the control group (all p-values < 0.001).

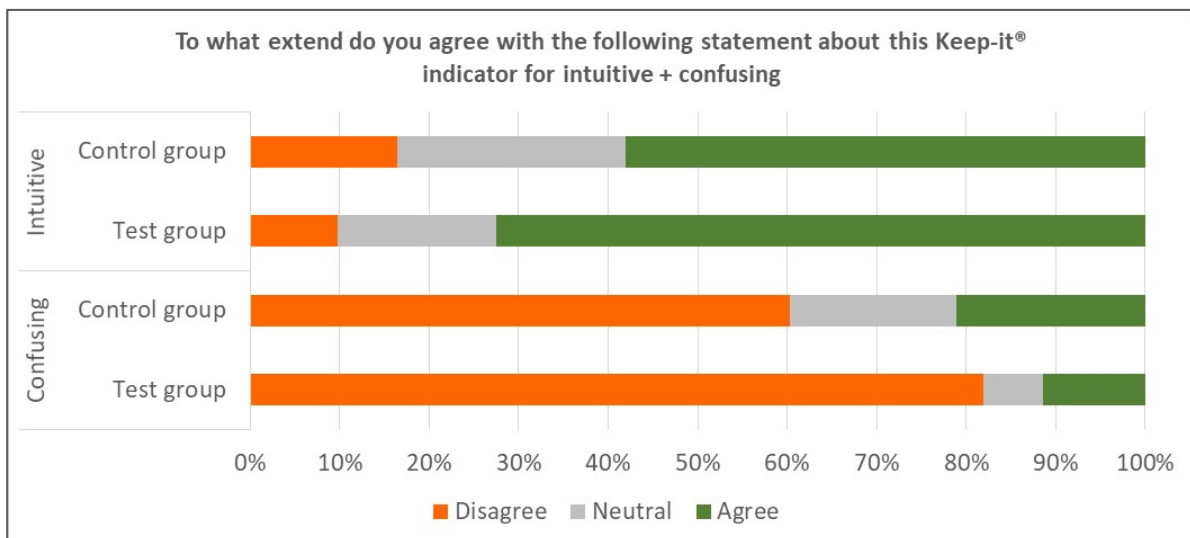


Figure 9 Percentage of respondents agreeing (scores 5-7), disagreeing (scores 1-3) or responding neutral (score 4) to the questions whether the Keep-it indicator is intuitive or confusing, for the test group (N=421) and the control group (N=1064).

When looking at the expectations about the Keep-it indicator (Figure 10), both groups scored between five (slightly agree) and six (agree) on all statements. This indicates that respondents expect - on average - that the Keep-it indicator will be helpful in several aspects, and will influence their meal planning. In the test group, between 76% and 92% of the respondents agreed on the statements, and between 3 and 16% of the respondents disagreed on the expectation statements. For the control group, these percentages were in a similar range with 76-86% of the respondents agreeing on the statements, and 6-12% of the respondents disagreeing with the statements. The highest scores (>5.8) were given for the statement "makes it easier to see how long a fresh product can be used", whereas the relatively lowest (~5.5) scores were given for the statements "influences the planning of my meals", "encourages me to pay more attention to the correct way of storing food", and "helps me to throw away less food".

For some aspects, there were significant differences between the two groups. The test group was significantly more positive in that the Keep-it indicator will give more assurance that the fresh product is of good quality and that the Keep-it indicator will make it easier to see how long a fresh product can be used ($p < 0.001$). The test group was also more positive than the control group ($p = 0.001$) regarding the statement that the Keep-it indicator more accurately indicates the shelf life of a fresh product than the date stamp. Test group participants also gave a slightly higher score for the statements: "will help me determine how long I can safely eat a fresh product" ($p = 0.02$) and "will show me if fresh products are not stored at the right temperature" ($p = 0.03$).

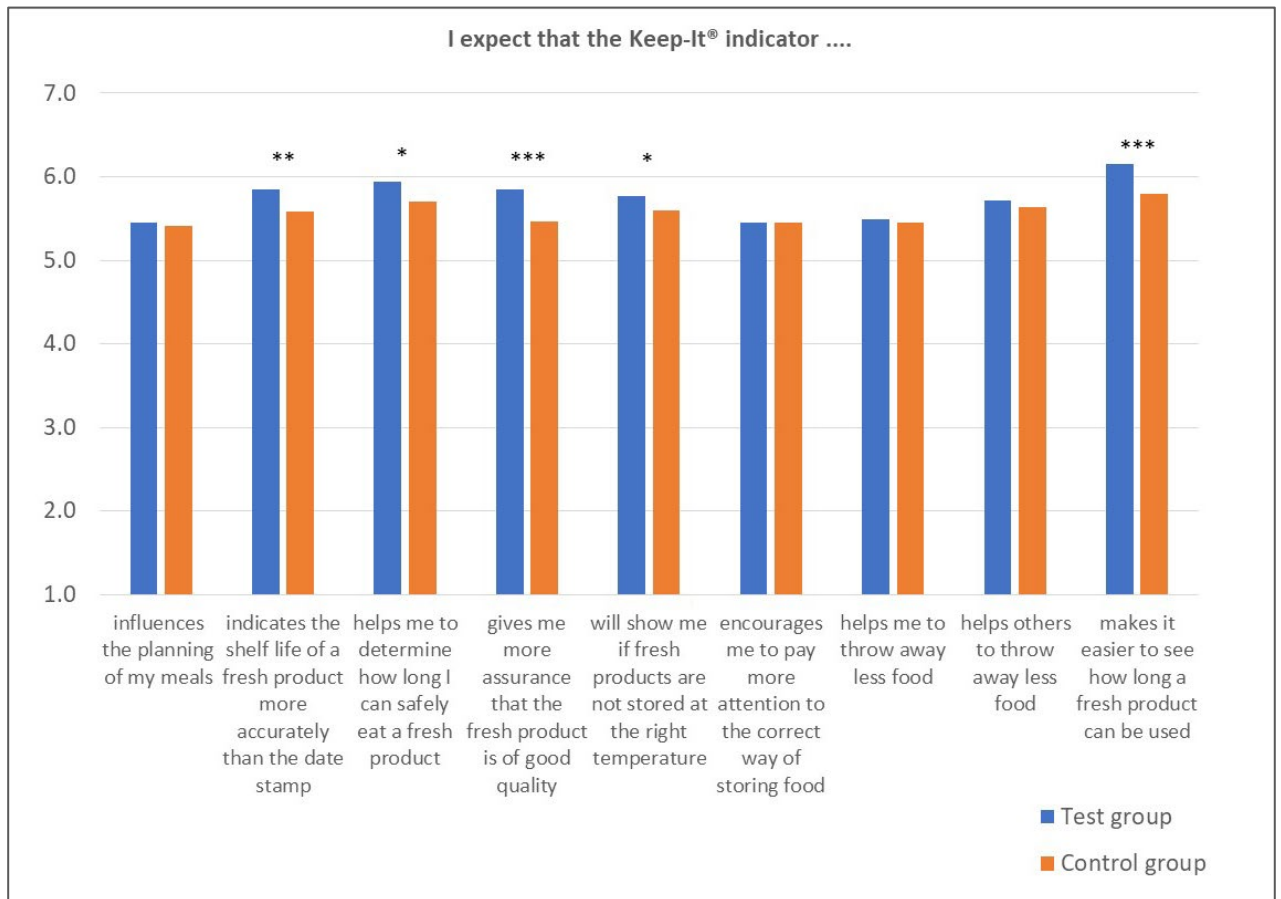


Figure 10 Mean scores for the participants' expectations about the Keep-it indicator regarding various aspects on a 7-point scale, separately for the test group (N=421) and control group (N=1064); *** = Significantly different with $p < 0.001$; ** with $p < 0.01$; * with $p < 0.05$.

3.7.1 Comparison of the perceptions regarding the use by date and Keep-it® (Control group only)

In order to get insight into how the regular and familiar use by date marking is perceived, control group participants were asked to indicate how positive, reliable, useful, intuitive, value-adding and confusing the use by date is for them. Subsequently, in the survey they were shown an image of the Keep-it indicator and a short written explanation about how the indicator works and scored the same six items for the Keep-it indicator. Figure 12 shows the average scores for these six items for the use by date and the Keep-it indicator. In general, respondents were somewhat more positive about the use by date. They judged the use by date as significantly more positive, reliable, useful and adding value than the Keep-it indicator, whereas they judged the use by date as less confusing (all $p < 0.001$). Three quarters of the control group participants (75%) agreed that the Keep-it indicator would be positive compared to 60% for the use by date. The 'agreeing' percentages for adding value were 72% for Keep-it® compared to 80% for the use by date. Approximately 60% of the participants indicated that they would judge the Keep-it indicator as reliable (58%), useful (58%) and not confusing (60%), whereas these percentages were 80% (reliable), 91% (useful) and 74% (not confusing) for the use by date. About 21% indicated that the Keep-it indicator would be confusing, while this percentage was 16% for the use by date.

There was no difference between Keep-it® and the use by date concerning how intuitive it was ($p = 0.73$); for both the use by date and Keep-it®, about 60% of the respondents agreed that they are intuitive. Whereas 16% of the control group respondents indicated that a Keep-it indicator would not be intuitive, this percentage was 18% for the use by date.

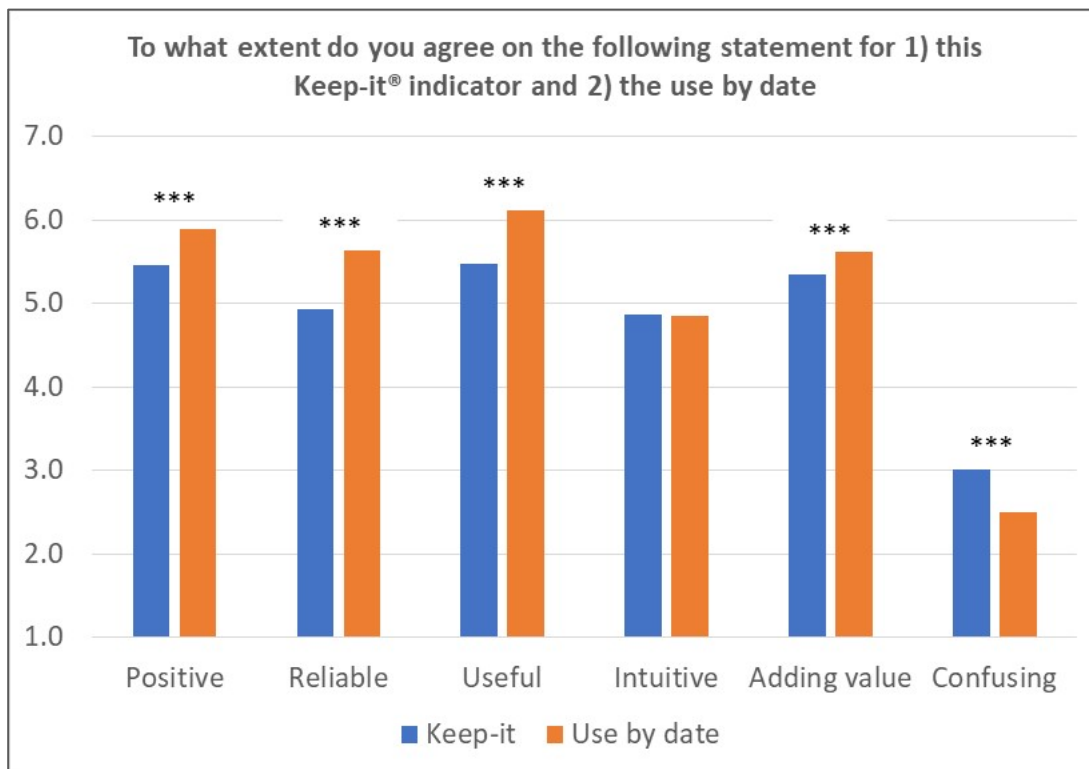


Figure 11 Mean scores for the evaluation statements about the Keep-it indicator and the use by date on a 7-point scale for the control group only (N=1064); *** = Significantly different with $p < 0.001$.

3.8 Reported behaviour when shelf life according to the static date and dynamic indicator are in conflict

For meat, fish, milk and ready-to-eat meals, respondents were asked what they would do if the use by date has passed, but the Keep-it indicator shows two more days. The results are shown in Figure 11. The most prominent answer in both groups for all four product categories (60-70%), was that before making a choice, they would check and smell whether the product is still good to eat. About 20% of the respondents would eat it within the next two days. Between 5-16% of the respondents would throw the food away immediately. The answer "I throw the product away immediately" seemed a bit more prominent for fish, whereas "I don't know" was relatively more frequently chosen for ready-to-eat meals.

For meat and fish, there were slight differences between the two groups. The test group would relatively more frequently eat the meat within the next two days, whereas the control would relatively more often check and smell before deciding on consumption of the meat ($p=0.03$). For fish, again the test group would relatively more often eat it within the next two days, whereas the control group would relatively more often throw it away immediately or check and smell for deciding on consuming it or not ($p=0.006$). The patterns of answers were not significantly different between the two groups for milk ($p=0.06$) or ready-to-eat meals ($p=0.43$).

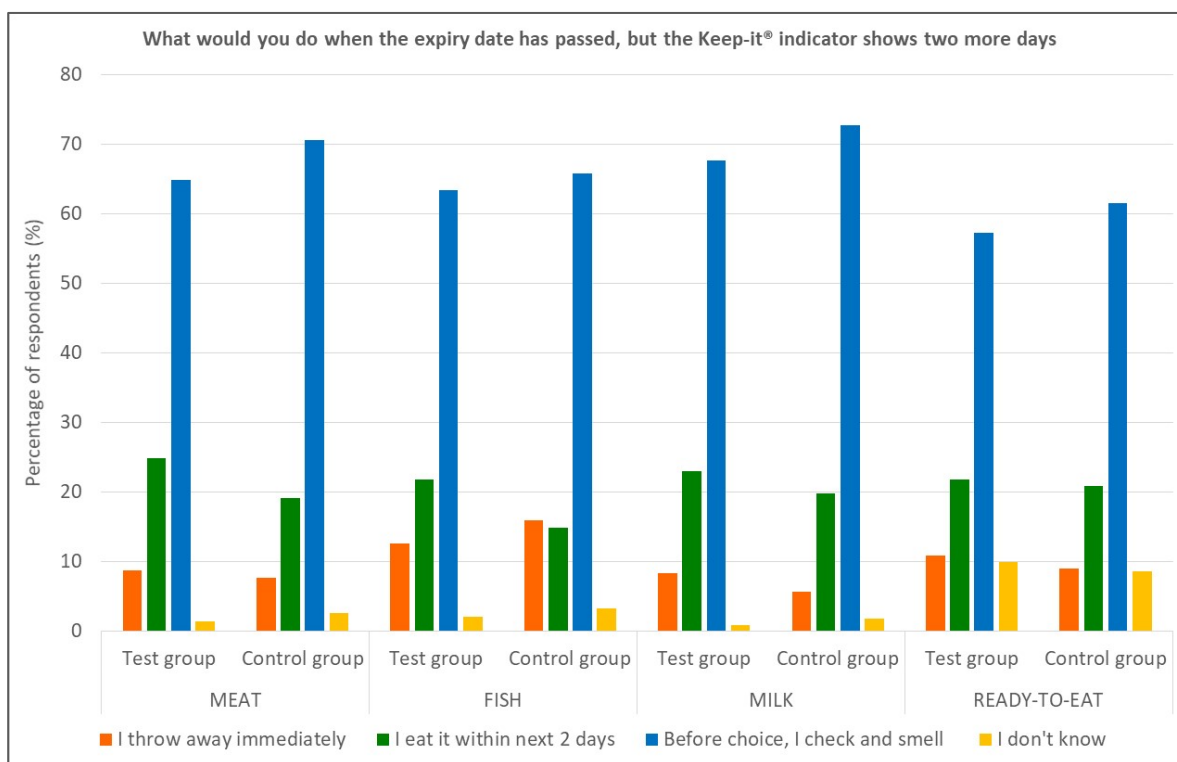


Figure 12 Reported behaviour regarding the situation where the use by date has passed, but the Keep-it indicator showed two more days, per product group, separately for the test group (N=421) and control group (N=1064).

3.9 Potential of Keep-it® in food waste reduction

Via two questions, it was asked what respondents would do when the date stamp has passed. The first one concerned what they normally do in the current situation (without Keep-it®). In the second question, they were asked about the hypothetical situation that the date stamp has passed, but Keep-it® shows two more days left. Table 5 shows the results over the two groups.

When the Keep-it indicator is added and shows a longer shelf life (+ 2 days) than the static date, this increased the number of people that reported to eat the product from 0-2% to approximately 20% for all four product groups and decreased the number of people that reported to throw the food away immediately. The number of people reporting to inspect the food before deciding on consumption increased with 10-20% for meat, fish and ready-to-eat meals. For dairy/ milk, the number of people reporting to inspect the food before consumption decreased, as more people indicated to eat it.

Table 5 Comparison of reported behaviour when the date stamp has passed: normal situation without Keep-it® versus Keep-it® showing two days left, over the two groups.

	Throw away	Eat it	Inspect it	Don't know
Meat normal situation	35-44%	0-0.3%	55-64%	1-2%
Meat: Keep-it® 2 days left	8-9%	19-25%	65-71%	1-3%
Fish normal situation	54-64%	0-0.3%	36-46%	0.2-0.7%
Fish Keep-it® 2 days left	13-16%	15-22%	63-66%	2-3%
Dairy normal situation	13-20%	1-2%	78-84%	0-0.1%
Milk Keep-it® 2 days left	6-8%	20-23%	68-73%	1-2%
RTE meals normal situation ^a	27-37%	1%	49-60%	11-14%
RTE meals Keep-it® 2 days left ^a	9-11%	21-22%	57-62%	9-10%

^a RTE= Ready-to-eat

3.10 Explorative analysis 1: Influence of reading the information flyer on respondents' perceptions and expectations

Based on whether participants read the information flyer about the Keep-it indicator or not, two groups were made of the test group (test-group-read versus test-group-not-read) and these groups were compared to the control group that did not receive an information flyer about Keep-it®. The results are shown in Figure 13. For all aspects, there was a significant difference between the three groups ($p < 0.001$). Post-hoc tests revealed three different patterns. For the three aspects reliable, intuitive and confusing, the test-group-read participants were more positive than the test-group-not-read participants as well as the control group (all $p < 0.005$). The scores of the control group and the test-group-not-read were not significantly different ($p > 0.16$).

The second pattern appeared for the two aspects positive and useful. Here, both segments of the test group gave a significant higher score than the control group (all $p < 0.003$; except the difference between control group and test-group-not-read for useful: $p = 0.04$), with no difference between whether the Keep-it® information flyer was read or not ($p > 0.16$). Thirdly, for the aspect adding value, the test-group-read participants gave a significantly higher score than the control group ($p < 0.001$); the test-group-not-read participants scored not significantly different compared to the test-group-read ($p = 0.08$) as well as the control group ($p = 0.63$).

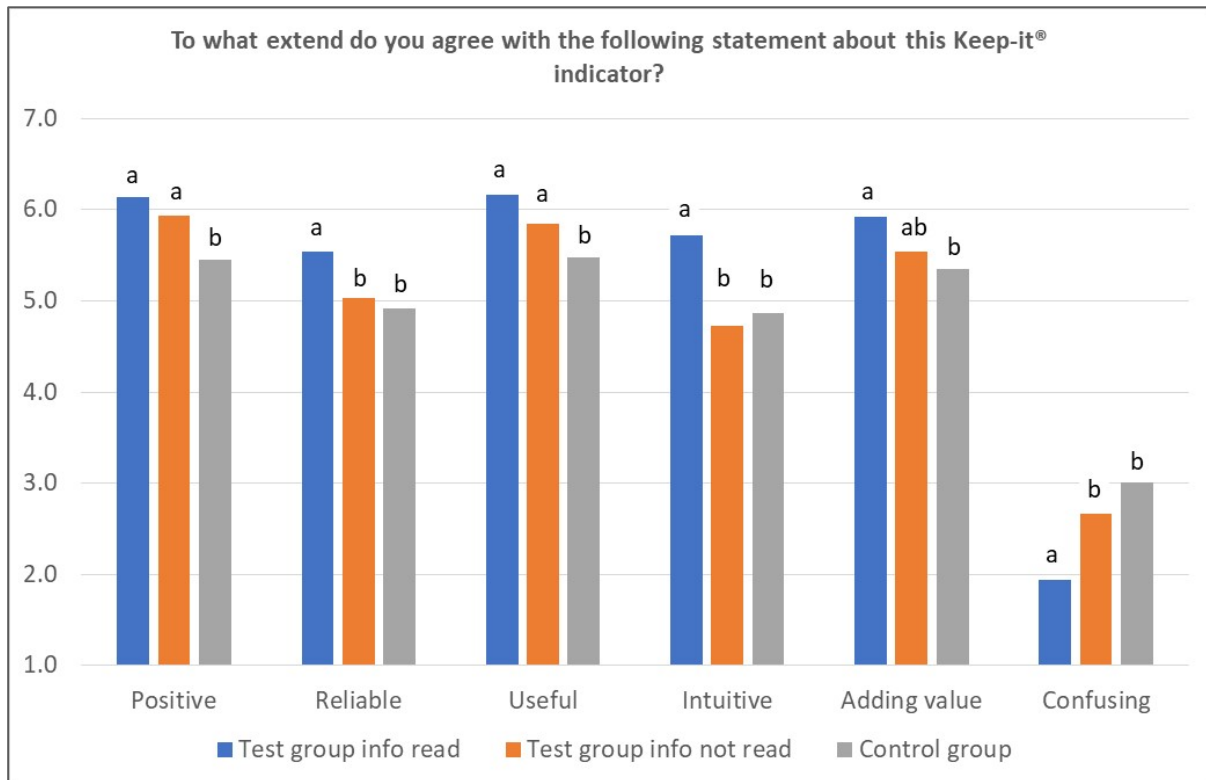


Figure 13 Average scores for the evaluation statements regarding the Keep-it® indicator for three groups: test group participants who read the information flyer about Keep-it® (N=324), test group participants who did not read the information flyer about Keep-it® (N=97), and the control group who did not receive an information flyer about Keep-it® (N=1064); different superscript letters indicate significant differences.

Figure 14 shows the average scores of the three groups for the expectations regarding the Keep-it indicator. Expectations are generally positive/ confirmative for all three groups with mean scores above five (~slightly agree). There were no significant differences for the expectations regarding meal planning ($p=0.71$), Keep-it® will show that fresh products are not stored at the correct temperature ($p=0.06$) and whether Keep-it® will help me ($p=0.08$) or others ($p=0.11$) to throw away less food. For the statements 'Keep-it® indicates the shelf life of a fresh product more accurately than the date stamp' and 'Keep-it® gives me more assurance that the fresh product is of good quality', the test-group-read participants gave higher scores (all $p<0.01$) than both the test-group-not-read and the control group, with the latter two groups not being significantly different ($p=1.0$).

For the statements 'helps me to determine how long I can safely eat a fresh product' and 'makes it easier to see how long a fresh product can be used', the test-group-read gave significantly higher scores than the control group ($p<0.001$), with the test-group-not-read giving scores in between, being not significantly different from the other two groups (all $p>0.17$). For the statement 'encourages me to pay more attention to the correct way of storing food', the test-group-not-read gave a significantly lower score than the test-group-read ($p=0.005$) and the control group ($p=0.02$), with the means of the latter two not different ($p=0.53$).

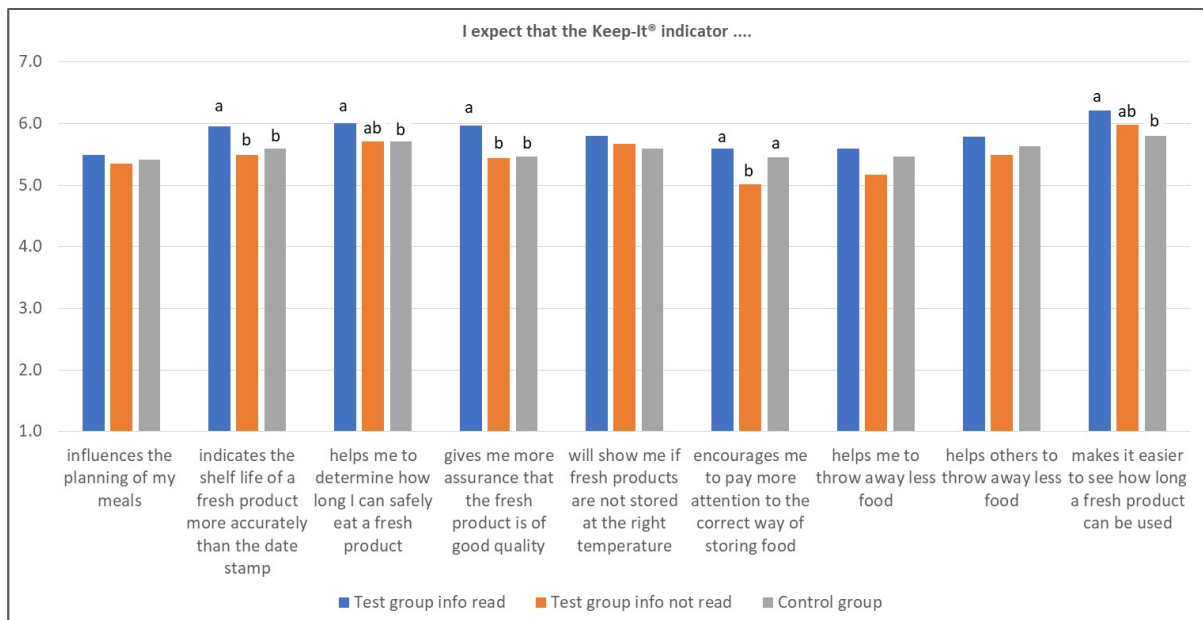


Figure 14 Average scores for the various expectations about the Keep-it indicator for three groups: test group participants who read the information flyer about Keep-it® (N=324), test group participants who did not read the information flyer about Keep-it® (N=97), and the control group who did not receive an information flyer about Keep-it® (N=1064); different superscript letters indicate significant differences.

3.11 Explorative analysis 2: Influence of seeing the indicator on respondents' perceptions and expectations

Based on the response whether participants saw the Keep-it indicator in their HelloFresh or not, two groups were made of the test group (test-group-KI-seen versus test-group-KI-not-seen) and these groups were compared to the control group. Figure 15 shows the results and reveals a similar pattern for all six aspects. For all aspects, there was a significant difference between the three groups ($p < 0.001$). Post-hoc tests indicated that the test-group-KI-seen participants judged the Keep-it indicator more positive on all aspects compared to the test-group-KI-not-seen participants as well as the control group, but the mean scores of these latter two groups did not differ ($p > 0.67$).

Figure 16 shows the average scores for the expectation statements about Keep-it® for the same three groups. There were no significant differences between the three groups for 'influences meal planning' ($p = 0.39$) and 'encourages me to pay more attention to the correct storing of food' ($p = 0.11$). For the four statements 'indicates the shelf life of a fresh product more accurately than the date stamp', 'helps me to determine how long I can safely eat a fresh product', 'gives me more assurance that the fresh product is of good quality' and 'will show me if fresh products are not stored at the right temperature', a similar pattern was found. There was a significant difference between the three groups (all $p < 0.02$), the test-group-KI-seen participants gave significantly higher scores for these statements compared to the control group, with the test-group-KI-not-seen not significantly different from the two other groups (although borderline significant with the test-group-KI-seen participants for three of the four statements). For the two food waste statements, the score of the test-group-KI-not-seen was significantly lower than the test-group-KI-seen (all $p < 0.02$). The control group was not different from both test group segments for the statement 'helps me to throw away less food' ($p = 0.09$), but the control group was significantly different from the test-group-KI-not-seen in case of 'helps others to throw away less food' ($p = 0.02$). Finally, for the statement 'makes it easier to see how long a fresh product can be used', the score of the test-group-KI-seen was significantly higher than both the test-group-KI-no-seen ($p = 0.03$) and the control group ($p < 0.001$).

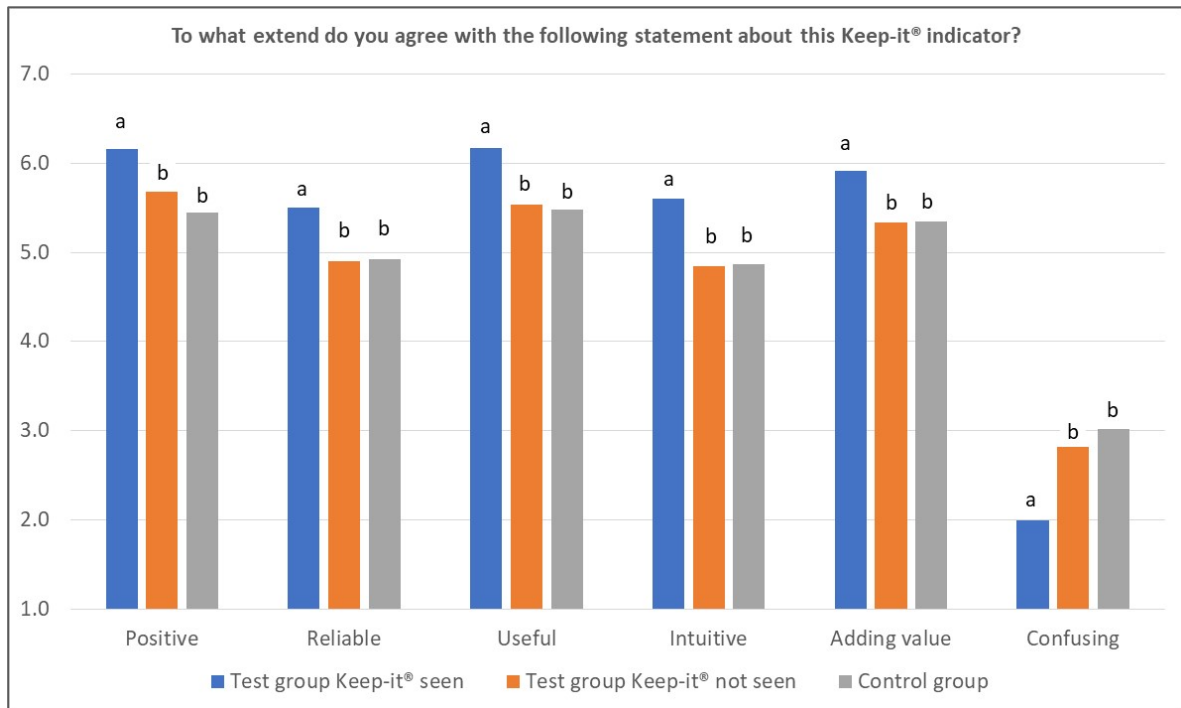


Figure 15 Average scores for the evaluation statements regarding the Keep-it indicator for three groups: test group participants who saw the indicator (N=362), test group participants who did not see the indicator (N=59), and control group who did not receive the indicator at all (N=1064).

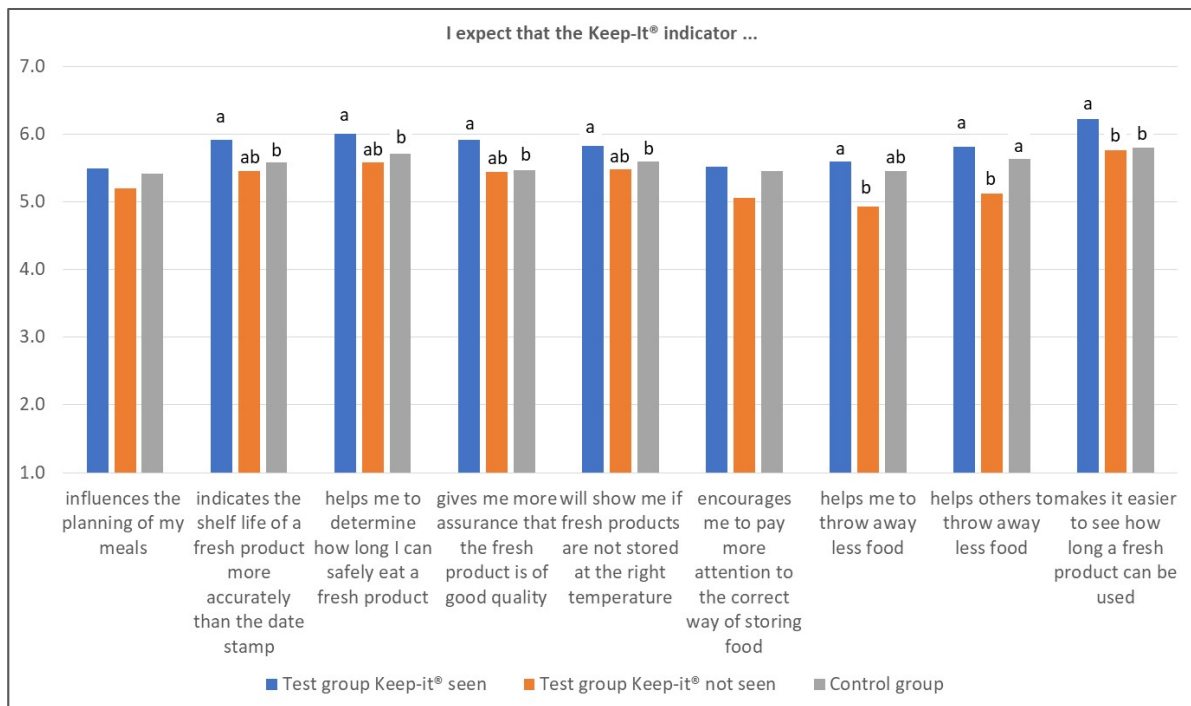


Figure 16 Average scores for the various expectations about the Keep-it indicator for three groups: test group participants who saw the indicator (N=362), test group participants who did not see the indicator (N=59), and control group who did not receive the indicator at all (N=1064); different superscript letters indicate significant differences.

4 Main findings & discussion

The main aim of this study was to investigate consumers' user experiences of a time-temperature indicator (Keep-it®) in a Hello-Fresh box and to explore the potential impact of the indicator on food waste-related behaviour. This chapter summarizes and compares the main results of the experimental pilot study and gives the strengths and limitations of the study.

4.1 Main findings

In this paragraph, the main findings will be summarized and discussed per research question.

Do HelloFresh users check expiry date marking on the products in the box?

The results show that HelloFresh users generally pay significantly more attention to date marking on regular products than to products in the HelloFresh box. About 90% of the respondents indicated to pay attention often or always to expiry dates when buying food products, whereas this was between 58% (control group) and 70% (test group) for products in the HelloFresh box. This finding suggests that HelloFresh box products are less often checked on their expiry dates, which may be due to a kind of trust. HelloFresh users probably expect that the products in the box are safe to eat for the ordered period and they may also follow the planning suggestions on the recipe cards, which – for example – advises to eat dishes with perishable products (such as fish) within three days. For both situations, the test group gave higher scores than the control group. This implies that the test group participants pay more attention to expiry dates than the control group, but the absolute differences were relatively small (0.2-0.3 on 5-point scale).

A logical next question is whether HelloFresh users understand the two different types of date marking (use by and best before). The results showed that about 50% of the HelloFresh users know exactly what the use by date means (TGT), whereas 50% gave an incorrect answer. For the best before date (THT), 8-16% had all three answers correct, 19% had two answers correct and 55-60% had one out of three answers correct, whereas about 10% gave a wrong answer. Taking into account that we used a strict criterium for both questions, the results point to the fact that quite a large group of HelloFresh consumers do not understand exactly what the use by and best before dates mean. Previous studies on this topic also indicated that consumers have difficulties in understanding the difference between the use by and best before date (Aschemann-Witzel et al., 2015; Milne, 2012; Parfitt et al., 2010), and this misunderstanding can lead to more food waste.

Do HelloFresh users notice the added information (in the flyer) about the general data marking (control group) or on the time-temperature indicator (test group)?

The majority of respondents saw the information flyer, with 12% (test group) to 18% (control group) indicating that they had not seen the information flyer. Test group participants significantly more often read the flyer completely (57% versus 41%), whereas the control group more often read the flyer partially (25% versus 20%), did not read the flyer (16% versus 11%) or had not seen the flyer (18% versus 12%). Test group participants gave significantly higher scores for the clearness and informativeness of the information flyer, which may explain why more participants in this group read the flyer completely.

Do HelloFresh users understand the Keep-it indicator or do they need the provided information?

The Keep-it indicator was pretty well understood in the test group, and actually seeing the indicator led to a significant better understanding than judging a picture of the indicator (a difference of one point on 7-point scale). Within the test group participants that had actually seen the Keep-it indicator, 88% understood what it states, with 66% understanding this completely (score 7). A small group of 6% did not understand the indicator. Within the test group participants that had not seen the Keep-it indicator, 71% understood what it states based on a picture, with 34% understanding this completely (score 7) and 20% not understanding the Keep-it indicator.

When asked whether the information flyer helped to understand the Keep-it indicator, 88% of the test group participants agreed to this statement. With an average score of 6.1 (on a 7-point scale), we can conclude that the information was helpful during this first experience with the indicator. It is not possible to conclude whether the test group participants needed the information, because all test group participants received both the indicator as well as the information flyer.

These findings align with the direct evaluation of the Keep-it indicator. The test group participants perceived the indicator as more intuitive and less confusing than the control group that did not receive the indicator, nor the information flyer about Keep-it® in their box. Between 10-20% of the participants judged the indicator as not intuitive or as confusing, with higher percentages in the control group.

When did HelloFresh users consume the salmon or the fish and why?

On average, consumers in both groups ate the salmon two days after receiving the box, with the salmon having a remaining shelf life of three days. Upon receipt in the test group, Keep-it® and the printed date gave the same shelf life in 45% of the cases. Shelf life according to Keep-it® was shorter in 44% of the cases and longer in 11% of the cases. Upon consumption, Keep-it® and the printed date gave the same shelf life in 29% of the cases. Shelf life according to Keep-it® was shorter in 47% of the cases and longer in 24% of the cases. So, it seems that with progression of the days, shelf life according to Keep-it® started to go over the printed shelf life, which may be due to storing at an average temperature lower than used to estimate date stamp shelf life. It is important to realize that the number of participants for this question was much lower, due to incomplete responses.

The top three of reasons why participants prepared and ate the salmon on that particular day, was pretty similar in both groups. The most important reason was that consumers made a planning based on the shelf life of products and stuck to that planning, which was chosen by almost 50% of the respondents. The second reason was that participants always prepare fish dishes as first HelloFresh dish (28%), and we felt like eating salmon the third reason (19-28%).

How do the two interventions (no TTI versus TTI in box) influence HelloFresh users' meal planning?

Most respondents (75%) in both groups expected that the Keep-it indicator will influence their meal planning, and only 11% disagreed on this statement. However, based on the salmon preparation behaviour, there was no difference between the two groups in when they consumed the salmon, suggesting that – on group level - the presence of the Keep-it indicator in the test group did not lead to a later or earlier salmon consumption compared to the control group. This difference between expectations and actual preparation behaviour may be due to the fact that expectations about behaviour do often not align with actual behaviour, the so called intention-behaviour gap (Bhattacharjee & Sanford, 2009; Faries, 2016). On the other hand, the indicator was placed on one particular product (salmon), which is strongly advised to eat within three days. Meal planning behaviour may be different when the indicator is placed on various other fresh products.

What will HelloFresh consumers do when static and dynamic dates are in conflict for various product categories and why?

Participants were asked what they would do when the static date stamp has passed, but the Keep-it indicator gives two more days. The general pattern for all four product categories was that most consumers in both groups (60-70%) answered they would check and smell before deciding on eating it or not and about 20% of the respondents would eat the product within the next two days. Between 5-16% of the respondents would throw the product away immediately, which is in line with the Rema customer study (2019) among Norwegian consumers, where 10% said to throw it away. The test group would slightly more often eat the product within the two next days compared to the control group for meat and fish, whereas there were no differences between the two groups for milk and ready-to-eat products.

When these results were compared to the regular situation when the printed date has passed (without Keep-it® present), the results points to the potential that Keep-it® may have in reducing food waste. On condition that Keep-it® shows a longer shelf life than the printed date and both the static and dynamic date marking are used, the number of HelloFresh users that reported to eat the product increased from 0-2% to approximately 20% for all four product groups and the number of people that would throw it away immediately decreased. The number of people inspecting the food before deciding on consumption seemed to increase with 10-20% for meat, fish and ready-to-eat meals. This increase was not observed for dairy/ milk, since more people indicated to eat it and as a result, the number of people inspecting the milk before consumption decreased. Discarding less at the expense of more frequent consumption and inspection of the food, is beneficial with regard to food waste reduction.

Still, some care is needed in drawing strong conclusion, since these answers are self-reported (actual behaviour not measured) and the answers are based on the hypothetical situation that Keep-it® shows a 2-day longer shelf life than the printed date.

How do the two interventions (no TTI versus TTI in box) influence HelloFresh users' food waste related behaviour?

Multiple questions in the survey provide an answer to this research question. First of all, the majority of HelloFresh respondents expected that Keep-it® will help them (76%) and others (>80%) to throw away less food, with 6-12% not agreeing on this expectation. There were no differences between the two groups for these two food waste reduction statements. Also, the actual behaviour regarding salmon use (meal planning) did not differ between the groups. Additionally, in the hypothetical situation where the printed date has expired and Keep-it® shows two more days, more consumers in both groups would eat the product and less participants would throw it away, compared to the situation where only a passed printed date is shown. This shows the potential of the Keep-it indicator in reducing food waste. In this hypothetical situation, the test group participants were more likely to eat the product within the two next days compared to the control group for meat and fish, whereas the control group was more likely to check and smell (meat and fish) or throw it away (fish). This means that for fish, it seems likely that the test group would have less food waste than the control group, but for meat, this reasoning is not possible, since we do not know to what decision the group comes when checking and smelling (eat or not eat). So, overall these findings point towards the potential of Keep-it® in food waste reduction, especially when the food is stored at the correct temperature leading to a longer shelf life on the Keep-it indicator compared to the printed date stamp. Since there were barely differences between the two groups, there is little evidence that actually experiencing the Keep-it indicator in the test group resulted in having or expecting more food waste reduction than in the control group.

The positive expectations about Keep-it® regarding food waste reduction are in line with a consumer survey carried out in 2015 in four European countries: France, Greece, Germany and Finland. This study also showed that participants believed the use of a TTI could reduce food waste (average scores between 3.7-4.2 on a 5-point scale), because the evaluation of the usability of the products after the expiration date would be easier. It must be stated that the participants in that study were only offered a description of the TTI and they did not see the indicator in real-life (Pennanen et al., 2015) as was done in our study. The percentages in our study were higher than a study amongst Norwegian consumers, where 58% agreed that they throw away less food at home and 42% agreed that the Keep-it indicator has helped reducing food waste in their household (Rema consumer study, 2019).

How do static and dynamic date marking relate to consumer perceptions about ease of use, food quality, food safety, trust, freshness and product value?

Respondents in both groups were positive about the Keep-it indicator regarding how positive, reliable, useful, intuitive and adding value the indicator is, and the indicator was seen as not confusing. The test group was significantly more positive about Keep-it® regarding these six aspects, which suggests that actual experience with the Keep-it indicator leads to a more positive perception about the indicator. This assumption is confirmed by the exploratory analyses, where the test group participants who actually saw the indicator or who read the information flyer about the indicator, were more positive than both the control group and the test group participants who did not see Keep-it® or did not read the flyer. The fact that the latter two subgroups gave similar scores suggest that it is the actual experience with the indicator that encourages an even more positive perception.

This reasoning fits with the results in the control group, which showed that respondents judged the use by date (static date marking) as somewhat more positive, reliable, useful, adding value and less confusing than the Keep-it indicator, except for intuitiveness which they judged similar. It seems likely that the control group - who did not receive the Keep-it indicator - had a more positive perception of the use by date, because it is a familiar date marking method for them and they have long-lasting experience with it. The fact that intuitiveness did not differ for both date marking methods and had the relatively lowest score of all six aspects with 4.85 on a 7-points scale (between neutral and slightly agree) fits with our findings that understanding of the use by date is suboptimal.

The finding that respondents in both groups evaluated the Keep-it indicator positively, is in contrast with previous studies that showed that consumers are often hesitant to accept novel food technologies, a phenomenon called food technology neophobia. Food technology neophobia can occur due to negative feelings evoked by the unfamiliar, its perceived unnaturalness, or some distrust in the food industry (Brunner, Delley, & Denkel, 2018; Caulier, Doets, & Noort, 2020; Siegrist & Hartmann, 2020). A consumer survey study on high pressure freezing in The Netherlands, Belgium, Spain and

Finland showed that their attitudes were neutral (around 3 on 5-point scale), even though the term 'high pressure freezing' was unfamiliar for most consumers (Lampila & Lähteenmäki, 2007). Another study among soldiers showed also an initial neutral attitude towards foods that were 3D printed, with an average score of 3.5 for 'good', 4.2 for 'important' and 3.1 for 'attractive' on a 6-point scale (Caulier et al., 2020). However, the findings are in line with previous studies about a TTI, which showed that consumers are generally interested in such technologies and find them useful (Pennanen et al., 2015; Pennanen et al., 2013; Sherlock & Labuza, 1992).

The finding that test group participants were even more positive than the control group and that control participants gave higher scores for the six evaluation statements about the static date as compared to the Keep-it indicator, may be explained by the difference in familiarity and experience. Previous studies suggest that experience, or information provision, may support a positive attitude and thus enhance consumer acceptance of this new technology (Brunner et al., 2018; Caulier et al., 2020; Lampila & Lähteenmäki, 2007; Siegrist & Hartmann, 2020).

Respondents in both groups expected – on average – that the Keep-it indicator would be helpful in several food management practices, with average scores above five on a 7-point scale and between 75-90% agreeing on the statements and 3-16% disagreeing on the statements. The majority of participants expected that Keep-it® will make it easier to see how long a fresh product can be used (86-92%; $p < 0.001$), will help to determine how long a fresh product can be eaten safely (84-88%; $p = 0.02$), will give more assurance that a fresh product is of good quality (78-85%; $p < 0.001$), will indicate the shelf life of a fresh product more accurately than the date stamp (79-83%; $p < 0.001$) and will show if fresh products are not stored at the right temperature (79-82%; $p = 0.03$), with the test group giving higher scores than the control group. These positive expectations are in line with the survey result among Norwegian consumers (Rema customer study, 2019), where 82% agreed on the statement 'I get more secured on the shelf life and quality of foods in my refrigerator'. In this Norwegian survey, a lower percentage (54%) agreed on the statement 'I get more secured that the food I buy is of good quality'. The difference between the scores in the two groups in our study on these expectations, can probably be explained by the fact that the test group received the information flyer (which described the actual characteristics of the Keep-it indicator) and received the actual indicator in their HelloFresh box.

4.2 Strengths and limitations

When interpreting the findings, it is important to acknowledge the strengths and limitations of this study.

A strength of the current study is the large sample size. With over 400 respondents in the test group and over 1000 in the control group, the study was able to detect differences between the groups, indicating that the study had sufficient power. Another strength is the comprehensiveness of the survey. By asking various questions about the same topic focussing on a different outcome (perceptions, expectations, expected behaviour and actual behaviour), results could be compared and these insights provided a broader picture for the specific research questions than when a single question was asked. Finally, the fact that the test group participants received the Keep-it indicator at home in their regular HelloFresh box (real-life situation), strengthened the ecological validity of the study.

A limitation of the study is the fact that the Keep-it indicator was distributed to 6000 3-person households and that there was no control over the demographic characteristics of the two groups. The test group was slightly younger (43y versus 46y), had a larger household size (3.6 versus 2.4) partly due to having more children and relatively more Flemish participants (38% versus 32%). Whereas the age difference is very small in relation to food waste findings, having children and larger households have been shown to have more food waste than childless and smaller households (Visschers, Wickli, & Siegrist, 2016). The test group also seemed to pay a bit more attention to expiry dates of food products compared to the control group and they reported to throw away overdue meat and fish more often, whereas the control group more often reported to inspect before consumption. The control group also seemed to better know the meaning of the best before date. This could mean that the test group was somewhat more food safety risk avoiding, although this is a speculation. On the other hand, the differences between the groups in demographic characteristics and in checking and handling expiry dates were small and the general food waste related questions were not significantly different

between the groups. Therefore, we expect that these differences have not influenced the perceptions about the Keep-it indicator to a large extent, although we cannot completely rule out these influences.

It is important to realize that the results are applicable to HelloFresh users, which may generally be a higher educated, more food conscious group than the general Dutch and Belgian population. The fact that about 75% of the participants had a high education level, supports this assumption as about 37% of the Dutch population is higher educated, with 40% middle and 21% lower educated (CBS, StatLine Onderwijsstatistieken 2018). Some previous studies indicate that higher educated people self-report more food waste (Secondi, Principato, & Laureti, 2015), although this is not confirmed in all studies (Janssens, Lambrechts, van Osch, & Semeijn, 2019). Because participation was on a voluntary basis, it is likely that consumers who were more interested in date marking and food waste reduction participated in the survey. The participants' high motivation scores for having as little food waste as possible underpin this postulation. Therefore, one should be careful in generalizing the results to the general Dutch/Belgian population. On the other hand, the results give good insights in how HelloFresh users experience and handle expiry dates and what they think of the Keep-it indicator when they receive this indicator with information (test group) or did not receive it (control group).

Finally, it is important to realize that the data are self-reported. Respondents may have over- or underestimated their own perceptions and behaviours. Also some social desirability in responses cannot be ruled out. We tried to diminish these influences by stating that we were interested in the respondents' perceptions and experiences, thereby stimulating honest answers. Furthermore, by asking various questions around the same topic, and observing that the results generally point in the same direction, we are fairly confident that the results are a proper reflection of the actual perceptions and experiences of the participants.

5 Implications and recommendations

This study dealt with two aspects. On the one hand, it focused on how HelloFresh consumers perceive and handle different expiry date methods, and the potential of the Keep-it indicator as a novel shelf life indication method. On the other hand, it focused on the potential of a dynamic shelf life indicator such as Keep-it®, in relation to food waste reduction.

With regards to the understanding and use of different expiry date methods, the results point to the fact that understanding of the current use by and best before date marking is sub-optimal, which has also been shown in previous studies (Aschemann-Witzel et al., 2015; Milne, 2012; Parfitt et al., 2010). This could mean that the naming (framing) of the current date marking methods should be improved (Holthuysen, Kremer, & Bos-Brouwers, 2016) and/or that HelloFresh consumers could be assisted with a novel method.

With regards to the potential of Keep-it® as novel shelf life indication, the results are positive. First, despite the fact that previous studies show that consumers are somewhat reluctant to new technologies (Brunner et al., 2018; Caulier et al., 2020; Lampila & Lähteenmäki, 2007; Siegrist & Hartmann, 2020), the HelloFresh consumers in our study had a positive perception of the Keep-it indicator. Both the test group and the control group judged the indicator as positive, reliable, useful, intuitive, value-adding and not confusing, with average scores between five and six on a 7-point scale. Seeing the indicator in real-life and reading the information flyer about Keep-it® in the test group led to a more positive perception. During their first encounter with this indicator, the test group participants in our study understood pretty well what it was stating. The control group gave slightly higher scores for the printed use by date compared to the Keep-it indicator on five of the six aspects, which may be due to the familiarity of this date marking method which they have experienced for many years. Nevertheless, the average scores in the control group for Keep-it® were also fairly positive, and these participants only saw a short explanation and picture of the indicator in the survey itself. So, given the finding that current date-marking can be confusing (as found in our survey and previous research), that respondents were generally positive about Keep-it® and they understood what it means, this implies that the Keep-it indicator might offer a promising solution as dynamic shelf life indicator. The information flyer about Keep-it® helped the test group participants to understand the indicator; it is therefore recommended to provide a short explanation, and give consumers the opportunity to actually see the Keep-it indicator in order to enhance consumer acceptance of the Keep-it indicator during their first encounters with this indicator.

Secondly, both the test group and control group participants had positive expectations regarding the Keep-it indicator, with scores for all nine expectations above 5.4 on a 7-point scale. It seems a bit contradictory that the control group evaluated the use by date as slightly more positive than the Keep-it indicator, whereas they also expected that the indicator shows the shelf life of a fresh product more accurately than the date stamp. This may be due to the fact that the evaluation aspects were more general (positive, reliable etc.) and it may be difficult to judge these aspects after only reading about the indicator in the survey without physically experiencing it for a longer period in real-life, whereas the expectation statements were more concrete, related to factual information of how the indicator works as was described in the survey.

Finally, about 20% of the consumers in both groups would eat foods when the Keep-it indicator showed two more days and the printed date had passed, which shows a kind of full trust in this Keep-it indicator for 20% of the participants.

Regarding food waste behaviours, the results showed that HelloFresh users expected that the Keep-it indicator would help them and others to reduce food waste and that a prolonged shelf life of the Keep-it indicator compared to the printed date may encourage them to eat the product and to discard less. On the other hand, expected influence on meal planning and moment of preparing the salmon did – on average – not differ between the two groups. Although the numbers of respondents were smaller for the actual shelf-life questions for salmon, it appeared that HelloFresh users generally consumed the salmon within the shelf life period, implying that not many consumers discarded the salmon. An often mentioned reason for preparing the salmon was that it was their first HelloFresh meal, and consumers ate the meal containing fish first. Also the recipe card encourages HelloFresh consumers to prepare fish dishes within three days. Since the indicator was only on the salmon, it would be interesting to study consumers' food waste-related behaviours more in detail when the Keep-it indicator is applied on more fresh products.

Since the current regulations require that besides the Keep-it indicator also the printed date stamp was present on the salmon and described as leading, it was not possible to test the situation where participants only received the Keep-it indicator and no printed date. It would be an interesting next step to investigate how participants would perceive the situation where they see the indicator on its own and whether they would understand and trust it without an accompanying printed date. In addition, the Keep-it indicator was received with an information flyer, and it seems likely that participants first read this information before they saw the indicator on the salmon. Therefore, it would also be interesting to investigate how many consumers would see the Keep-it indicator when there was no information flyer, whether consumers understand what Keep-it® states and what they can expect from it without this information flyer. In addition, a future research direction would be to investigate consumers' perceptions, experiences and food waste related behaviours with regard to the Keep-it indicator among general consumers, and not only among HelloFresh users.

It is good to realize that food safety aspects seems to be a counterpart of food waste reduction. When Keep-it® shows a longer shelf life than the printed date (in 11-24% of the cases in our study), this would mean that Keep-it® offers a way to reduce food waste, as the product can be used for a longer period. Yet, when the printed date shows a longer shelf life than Keep-it® is indicating (in ~ 45% of the cases in our study), Keep-it® would avoid that consumers eat potentially harmful food.

it would be interesting to see what this means and where this difference comes from. Did consumers not store the salmon at the right temperature, is the salmon still good to eat? It would be interesting to study where these differences in remaining shelf life come from.

It was interesting to see that about 5-10% of the respondents lowered their fridge temperature due to reading this suggestion in the flyer. Although this was not the main aim of the study, it is remarkable that such a small intervention (information flyer) led to action for some participants, despite the fact that many respondents had their fridge already at a low temperature. HelloFresh could make use of this strategy by providing simple and concrete tips for consumers, that help them in proper food management practices and food waste reduction.

6 Conclusion

In conclusion, the results of this experimental pilot study showed that consumer experiences regarding the Keep-it® time-temperature indicator in a Hello-Fresh box were positive. The concept was well understood, perceived as positive, reliable, useful, intuitive, value-adding, not confusing and positive expectations were attributed to the indicator. Actually seeing and experiencing the indicator led to a better understanding, a more positive perception and higher expectations. Therefore, when introducing this new technology on the market, it is recommended to explain how the indicator works and provide consumers with the opportunity to actually see or experience the indicator to enhance acceptance.

The study also showed that consumers expected that Keep-it® offers them more clarity on how long a fresh product can be used and that it will help them and others to throw away less food. Additionally, in the situation where the static date has passed, but Keep-it® shows some days left, the responses indicated that consumers would inspect the food more often and discard the food less often. This indicates a kind of trust in the indicator and shows the potential of a TTI in food waste reduction.. However, in order to fully understand the effect of the Keep-it indicator on food waste reduction, it is recommended to investigate a broader population for a longer period of time and to apply the indicator on a wider range of fresh products.

Literature

- Aschemann-Witzel, J., de Hooge, I., Amani, P., Bech-Larsen, T., & Oostindjer, M. (2015). Consumer-Related Food Waste: Causes and Potential for Action. *Sustainability*, 7(6), 6457-6477. doi:10.3390/su7066457
- Bhattacharjee, A., & Sanford, C. (2009). The intention-behaviour gap in technology usage: the moderating role of attitude strength. *Behaviour & Information Technology*, 28(4), 389-401. doi:10.1080/01449290802121230
- Brunner, T. A., Delley, M., & Denkel, C. (2018). Consumers' attitudes and change of attitude toward 3D-printed food. *Food Quality and Preference*, 68, 389-396. doi:https://doi.org/10.1016/j.foodqual.2017.12.010
- Caulier, S., Doets, E., & Noort, M. (2020). An exploratory consumer study of 3D printed food perception in a real-life military setting. *Food Quality and Preference*, 86, 104001. doi:https://doi.org/10.1016/j.foodqual.2020.104001
- Faries, M. D. (2016). Why We Don't "Just Do It": Understanding the Intention-Behavior Gap in Lifestyle Medicine. *American Journal of Lifestyle Medicine*, 10(5), 322-329.
- Farr-Wharton, G., Choi, J. H. J., & Foth, M. (2014). *Food talks back: Exploring the role of mobile applications in reducing domestic food wastage*.
- Fuentes, C., & Samsioe, E. (2020). Devising food consumption: complex households and the socio-material work of meal box schemes. *Consumption Markets & Culture*, 1-20.
- Gustavsson, J., Cederberg, C., Sonesson, U., Otterdijk, R. v., & Meybeck, A. (2011). Global food losses and food waste: extent, causes and prevention. (Study Conducted for the International Congress 'Save Food!' at Interpack 2011, Dusseldorf, Germany). In *Global food losses and food waste: extent, causes and prevention; 2011. :vi + 29 pp. 10 ref.* Rome: Food and Agriculture Organization of the United Nations (FAO).
- Heard, B. R., Bandekar, M., Vassar, B., & Miller, S. A. (2019). Comparison of life cycle environmental impacts from meal kits and grocery store meals. *Resources, Conservation and Recycling*, 147, 189-200.
- Hertz, F. D., & Halkier, B. (2017). Meal box schemes a convenient way to avoid convenience food? Uses and understandings of meal box schemes among Danish consumers. *Appetite*, 114, 232-239.
- Holthuysen, N. T. E., Kremer, S., & Bos-Brouwers, H. E. J. (2016). *Effect van houdbaarheidsdata van lang houdbare producten op weggoiedrag van consumenten*. Retrieved from Wageningen:
- Janssens, K., Lambrechts, W., van Osch, A., & Semeijn, J. (2019). How consumer behavior in daily food provisioning affects food waste at household level in The Netherlands. *Foods*, 8(10), 428.
- Lampila, P., & Lähteenmäki, L. (2007). Consumers' attitudes towards high pressure freezing of food. *British Food Journal*.
- Milne, R. (2012). Arbiters of waste: date labels, the consumer and knowing good, safe food. *The Sociological Review*, 60, 84-101.
- Parfitt, J., Barthel, M., & MacNaughton, S. (2010). Food waste within food supply chains: Quantification and potential for change to 2050. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365(1554), 3065-3081. doi:10.1098/rstb.2010.0126
- Pennanen, K., Focas, C., Kumpusalo-Sanna, V., Keskitalo-Vuokko, K., Matullat, I., Ellouze, M., . . . Ollila, M. (2015). European consumers' perceptions of time-temperature indicators in food packaging. *Packaging Technology and Science*, 28(4), 303-323.
- Pennanen, K., Keskitalo-Vuokko, K., Kumpusalo-Sanna, V., Korhonen, V., Smolander, M., & Ollila, M. (2013). *Consumer and time-temperature indicator: implications for further development*. Paper presented at the 26th IAPRI Symposium on Packaging.
- Rohm, H., Oostindjer, M., Aschemann-Witzel, J., Symmank, C., L Almlí, V., De Hooge, I. E., . . . Karantininis, K. (2017). Consumers in a sustainable food supply chain (COSUS): understanding consumer behavior to encourage food waste reduction. *Foods*, 6(12), 104.
- Secondi, L., Principato, L., & Laureti, T. (2015). Household food waste behaviour in EU-27 countries: A multilevel analysis. *Food policy*, 56, 25-40.
- Sherlock, M., & Labuza, T. P. (1992). Consumer perceptions of consumer time-temperature indicators for use on refrigerated dairy foods. *Journal of Dairy Science*, 75(11), 3167-3176.
- Siegrist, M., & Hartmann, C. (2020). Consumer acceptance of novel food technologies. *Nature Food*, 1(6), 343-350. doi:10.1038/s43016-020-0094-x
- Stenmarck, Å., Jensen, C., Quedsted, T., Moates, G., Buksti, M., Cseh, B., . . . Redlingshofer, B. (2016). *Estimates of European food waste levels: IVL Swedish Environmental Research Institute*.

-
- Toma, L., Font, M. C., & Thompson, B. (2020). Impact of consumers' understanding of date labelling on food waste behaviour. *Operational Research, 20*(2), 543-560.
- Van Geffen, L. E. J., Van Herpen, E., & Van Trijp, J. C. M. (2016). *Causes and Determinants of Consumers Food Waste*. Retrieved from
- Visschers, V. H., Wickli, N., & Siegrist, M. (2016). Sorting out food waste behaviour: A survey on the motivators and barriers of self-reported amounts of food waste in households. *Journal of Environmental Psychology, 45*, 66-78.

Annex 1 Approval ethical committee

6706 kn Hollandseweg 1 Wageningen | The Netherlands

To whom it may concern

The following project proposal has been reviewed by the Social Sciences Ethics Committee (SEC):

Title: Consumer experiences regarding a Time Temperature Indicator (Keep-it) in the Hello Fresh meal box
Project team: Gertrude Zeinstra, Sandra van der Haar
Funding: Voucher Stichting Samen Tegen Voedselverspilling (STV) + Hello Fresh
Period: June 2020 – November 2020
Location: The Netherlands and Belgium

The Committee has concluded that the proposal deals with ethical issues in a satisfactory way and that it complies with the Netherlands Code of Conduct for Research Integrity.

With kind regards,



Professor Dr Marcel Verweij
Chair Social Sciences Ethics Committee

DATE

02-07-2020

SUBJECT

Ethical approval of research project

POSTAL ADDRESS

6706 kn Hollandseweg 1
Wageningen
The Netherlands

VISITORS' ADDRESS

Building 201

INTERNET

www.wur.nl/university

COG NUMBER

09215846

HANDLED BY

Prof. Dr Marcel Verweij

TELEPHONE

+31(0)317484334

EMAIL

esther.roquas@wur.nl

Annex 2 Test-group invitation flyer for participation in the survey

NOG MINDER VOEDSEL VERSPILLEN met **Keep-it**[®]

Een datumstempel merkt het verschil tussen de zon en de koelkast niet, **Keep-it**[®] wel!



Van de leverancier tot het gekoelde bezorgbusje en jouw eigen koelkast – ingrediënten kunnen onderweg naar jouw bord blootgesteld worden aan verschillende temperaturen. Voedsel op de juiste temperatuur bewaren helpt de versheid te garanderen en vermindert voedselverspilling. Op de verpakking van jouw zalm zit een indicator met de naam Keep-it[®], die de temperatuur gedurende de hele keten continu bijhoudt. Op basis hiervan laat Keep-it[®] altijd de daadwerkelijke resterende houdbaarheid zien. Handig he?



Keep-it® helpt de kwaliteit en versheid van voedsel beter te garanderen



“Je hebt nog 5 dagen de tijd om van jouw zalm te genieten.”



“Nog 3 dagen, tijd om jouw maaltijd met zalm te plannen!”



“0 dagen over, je kunt de zalm helaas niet meer eten, zonde!”

Neem voor meer informatie een kijkje op keep-it.com

Tips

- Zet jouw koelkast op 3 of 4 °C. Ingrediënten blijven zo langer vers!
- Let op het verschil tussen TE GEBRUIKEN TOT (TGT) en TEN MINSTE HOUDBAAR TOT (THT).

TGT: Deze datum verwijst naar de voedselveiligheid. Het product mag na deze datum niet meer worden verkocht of geconsumeerd.

THT: Deze datum verwijst naar de voedselkwaliteit. Het product kan zowel verkocht als geconsumeerd worden na deze datum, maar de kwaliteit is mogelijk niet optimaal.



JOUW MENING TELT

Wij zijn altijd op zoek naar innovatieve manieren om voedselverspilling tegen te gaan en kwaliteit te waarborgen. **Keep-it®** is er één van. We zijn heel benieuwd wat jij ervan vindt. Vul onze korte vragenlijst in op keepit-hf.questionpro.eu of door de QR-code te scannen en maak kans op een gratis HelloFresh Box! Alvast bedankt.



Noteer bij het uitpakken van jouw box de volgende gegevens, dit komt terug in de vragenlijst:

- Datum van vandaag (ontvangst box)
- Geprinte houdbaarheidsdatum zalm
- Aantal dagen op **Keep-it®** (zalm) bij ontvangst
- Datum gebruik zalm
- Aantal dagen op **Keep-it®** bij gebruik zalm



Dit is een consumentenonderzoek. Om te voldoen aan de huidige regelgeving rondom voedsel etikettering, is de zalmverpakking voorzien van zowel een datumstempel als **Keep-it®** als aanvullende informatie. In het kader van dit onderzoek geldt de datumstempel als de belangrijkste houdbaarheidsdatum, waarna het product niet meer mag worden geconsumeerd. Verschilt **Keep-it®** van de stempel? Houd dan de vroegste datum aan. Twijfel je wat te doen? Neem dan contact op met onze klantenservice via hellofresh.nl/contact-page.

Annex 3 Control-group invitation flyer for participation in the survey

B. Inbox Flyer 2: Control Group with information on date marking

FRONT



Jaarlijks wordt **88 miljoen** ton
voedsel verspild in Europa.

Wist je dat daarvan **10%** te maken
heeft met **datummarkering?**

Bron: European Commission, 2016

Draai om en help mee dit cijfer omlaag te krijgen!





Laten we samen nog minder voedsel verspillen



Van de leverancier tot het gekoelde bezorgbusje en jouw eigen koelkast - ingrediënten kunnen onderweg naar jouw bord blootgesteld worden aan verschillende temperaturen. De voedingsindustrie houdt bij het bepalen van de juiste TGT-datum voor elk product rekening met deze mogelijke temperatuurschommelingen.

Tip

Zet jouw koelkast tussen de 3 en 4 °C graden. Zo blijven ingrediënten langer vers en voorkom je voedselverspilling.



DEEL JOUW ERVARING

Ga naar datemarking-hf.questionpro.eu of scan de QR-code en vul een korte vragenlijst in over de relatie tussen datummarkering en het verminderen van voedselverspilling. Wie weet win jij een gratis maaltijdbox!



Noteer bij het uitpakken van jouw box de volgende gegevens, dit komt terug in de vragenlijst:

- Datum van vandaag (ontvangst box)
- Geprinte houdbaarheidsdatum (zalm)
- Datum gebruik (zalm)

Annex 4 Final survey

Survey intervention group (Salmon with Keep-It indicator)

[Screen 1]

Welkom bij dit consumentenonderzoek! Dit onderzoek wordt uitgevoerd door Wageningen Food & Biobased Research (WFBR) in samenwerking met HelloFresh en Keep-It. Het doel van deze vragenlijst is om inzicht te krijgen in hoe consumenten omgaan met de houdbaarheidsdatums van verschillende voedingsproducten. Verder zijn we geïnteresseerd in uw mening over nieuwe manieren om voedselverspilling tegen te gaan.

Het invullen van de vragenlijst duurt 5-10 minuten.

Vul de vragenlijst in en maak kans op een gratis HelloFresh box!

Ik geef toestemming om mee te doen mee aan dit vragenlijstonderzoek:

JA

Welcome to this consumer survey! This research is carried out by Wageningen Food & Biobased Research (WFBR) in collaboration with HelloFresh and Keep-It. The purpose of this questionnaire is to gain insight into how consumers deal with the expiration dates of different food products. Furthermore, we are interested in your views on new ways to reduce food waste.

Completing the questionnaire takes 5-10 minutes.

Fill in the questionnaire and win a free HelloFresh box!

I give permission to participate in this questionnaire survey:

YES

Toestemmingsverklaring:

- Ik ben voldoende geïnformeerd over dit vragenlijstonderzoek.
- Ik weet dat de antwoorden anoniem verwerkt worden voor het doel zoals hierboven omschreven.
- Ik weet dat de antwoorden verzameld worden door HelloFresh via QuestionPro; dat deze gedeeld worden met WFBR voor data-analyse, en niet met anderen (derden) gedeeld worden.
- Ik weet dat de geanonimiseerde onderzoeksgegevens - volgens de wettelijke bewaartermijn - tot 10 jaar na dit onderzoek bewaard worden.
- Ik weet dat meedoen vrijwillig is, en dat ik altijd kan stoppen zonder opgaf van reden.

Declaration of consent:

- I am sufficiently informed about this questionnaire survey.
- I know that the answers are processed anonymously for the purpose described above.

- I know the answers are collected by HelloFresh via QuestionPro; that they are shared with WFBR for data analysis, and not shared with others (third parties).
- I know that the anonymized research data - according to the legal retention period - will be stored for 10 years after this research.
- I know that participating is voluntary and that I can always quit without reason.

[Screen 2]

Wat is uw leeftijd? jaar

[If <18 years, then exclude/ stop participation --> next screen: Helaas, u komt niet in aanmerking voor deelname

[If 18 years or older, then continue to next question]

[Screen 3]

Vragen over houdbaarheidsdatums (algemeen + box) en gebruik zalm

	Nooit	Zelden	Soms	Vaak	Altijd
	1	2	3	4	5
1. In hoeverre let je normaal gesproken op de houdbaarheidsdatums van voedingsproducten voordat je ze gebruikt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. In hoeverre let je normaal gesproken op de houdbaarheidsdatums van de voedingsproducten in een HelloFresh box voordat je ze gebruikt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Never	Rarely	Occasionally	Often	Always
	1	2	3	4	5
1. To what extent do you normally pay attention to the date marking on food products before using them?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. To what extent do you normally pay attention to the expiration dates of food products in a HelloFresh box before using them?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Wat betekent volgens jou een Te Gebruiken Tot (TGT) datum? (meerdere antwoorden mogelijk) [multiple select]

- Het product kan gebruikt worden na deze datum, maar het is aan te raden om het product eerst te ruiken en te bekijken
- Het product kan gebruikt worden na deze datum, maar het is aan te raden om het eerst te proeven.
- Na deze datum kan de producent niet garanderen dat het product goed smaakt
- Het product mag niet gegeten worden na deze datum, vanwege risico's voor voedselveiligheid
- Weet ik niet
- Anders, namelijk: _____

3. What do you think a Use By (TGT) date means? (multiple select)

- The product can be used after this date, but it is recommended to smell and view the product first
- The product can be used after this date, but it is recommended to taste it first.
- After this date, the producer cannot guarantee that the product will taste good
- The product should not be eaten after this date due to food safety risks
- I do not know
- Other, namely:_____

4. Wat betekent volgens jou een Ten minste Houdbaar Tot (THT) datum? (meerdere antwoorden mogelijk) [multiple select]

- Het product kan gebruikt worden na deze datum, maar het is aan te raden om het product eerst te ruiken en te bekijken
- Het product kan gebruikt worden na deze datum, maar het is aan te raden om het eerst te proeven.
- Na deze datum kan de producent niet garanderen dat het product goed smaakt
- Het product mag niet gegeten worden na deze datum, vanwege risico's voor voedselveiligheid
- Weet ik niet
- Anders, namelijk:_____

4. What do you think means a best before date (best before)? (multiple select)

- The product can be used after this date, but it is recommended to smell and view the product first
- The product can be used after this date, but it is recommended to taste it first.
- After this date, the producer cannot guarantee that the product will taste good
- The product should not be eaten after this date due to food safety risks
- I do not know
- Other, namely:_____

5. Wat doe je normaal gesproken met de volgende voedingsproducten als de houdbaarheidsdatum verstreken is? Kruis per productgroep 1 antwoord aan.

What do you normally do when the date marking is overdue for the following food products? Select one option per food product.

	Ik gooi het product weg, zonder na te gaan of het nog goed is om te eten	Ik eet het product op, zonder na te gaan of het nog goed is om te eten	Ik ga na of het product nog goed is om te eten door te kijken, ruiken en/of te proeven	Ik weet het niet
Vlees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Zuivel (zoals melk, kaas en yoghurt)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kant-en-klaarmaaltijden uit het koelvak	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Houdbare producten (zoals pasta, rijst, koekjes en crackers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- I throw the product away without inspecting if the product is still edible
- I'll eat it without inspecting if the product is still edible
- I inspect it and decide on look, smell and/or taste whether the product is still edible
- I don't know

8. Do you – based on the image - understand what the Keep-it indicator is stating? (Not at all – completely)

In de HelloFresh box zat een flyer over deze Keep-It® indicator.

In the HelloFresh box there was a flyer about the Keep-It® indicator.

[insert image of the flyer here]

9. Heb je deze flyer over Keep-It® gelezen? [single]

- Ja, helemaal
- Ja, gedeeltelijk
- Nee, niet gelezen
- Nee, flyer niet gezien

9. Have you read the flyer about the Keep-It® indicator?

- Yes, totally
- Yes, in part
- No, not read
- No, flyer not seen

[IF 9 is YES – (option 1 or 2) --> question 10+11+12]

[If 9 is NO (option 3 or 4) --> go directly to question 13]

10. Vond je de informatie duidelijk?

10. Did you think the information was clear?

Helemaal niet duidelijk							Heel erg duidelijk
1	2	3	4	5	6	7	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Very unclear – very clear

11. Vond je de flyer informatief?

11. Did you think the flyer was informative?

Helemaal niet informatief							Heel erg informatief
1	2	3	4	5	6	7	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Not at all informative – very informative

12. Heeft de informatie op de flyer je geholpen om de Keep-It® indicator te begrijpen?

Helemaal niet							Helemaal wel
1	2	3	4	5	6	7	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

13. Heeft u de temperatuur van jouw koelkast lager gezet na het lezen van de flyer?

[single]

- Ja, lager gezet
- Nee, ik vind een lagere temperatuur niet nodig
- Nee, ik had mijn koelkast temperatuur al laag staan (≤ 4 °C)

13. Have you lowered the temperature of your refrigerator after reading the flyer?

- Yes
- No, I don't think a lower temperature is necessary
- No, I already had my fridge temperature low (≤ 4 °C)

[Screen 5]

Vragen over maaltijdplanning

14. Op de flyer in je HelloFresh box stond een tabel om in te vullen. Wil je deze informatie hieronder overnemen? Mocht je dit vergeten zijn – of heb je de flyer niet gezien - : vul dan in wat je nog weet, en kruis ook de optie 'vergeten' aan onderaan deze pagina

[multiple options possible]

Datum van vandaag (ontvangst box)
Geprinte houdbaarheidsdatum zalm
Aantal dagen op <i>Keep-It</i> ® (zalm) bij ontvangst
Datum gebruik zalm
Aantal dagen op <i>Keep-It</i> ® bij gebruik zalm
Ik ben dit vergeten op te schrijven	<input type="checkbox"/>
Ik heb de flyer niet gezien	<input type="checkbox"/>

14. There was a table on the flyer in your HelloFresh box. Do you want to copy this information in the table below?

If you have forgotten this: fill in what you still remember, and also tick the option 'forgotten'.

- Today's date (receipt box) _____
- Printed expiry date salmon _____
- Number of days on *Keep-It*® (salmon) upon receipt _____
- Date of use of salmon _____
- Number of days on *Keep-It*® when using salmon _____
- I forgot to write this down
- I did not see the flyer

15. Waarom maakte je de zalm op deze dag klaar? [multiple select]

RANDOM ['Anders, namelijk....' option at the bottom]

- De geprinte houdbaarheidsdatum gaf aan dat het op moest
- De Keep-It® indicator gaf aan dat het op moest
- Op basis van de houdbaarheid van de producten, maakte ik een maaltijdplanning voor een paar dagen/week, en ik heb deze planning gevolgd
- Zonder op de houdbaarheid van de producten te letten, heb ik een maaltijdplanning voor een paar dagen/week gemaakt; en ik heb deze planning gevolgd
- Ik/mijn huishouden had deze dag zin in zalm
- Het was de eerste dag van de HelloFresh box en ik maak visgerechten altijd als eerste klaar
- Vanwege de bereidingstijd van dit recept
- Anders, namelijk:

15. Why did you prepare the salmon on this particular day?

RANDOM ["Other" option at the bottom]

- The printed date indicated that it had to be finished
- Keep-It indicator indicated that it had to be finished
- Based on the shelf life of the products, I made a menu planning in advance; and I stucked to that planning
- Without taking the shelf life of the products into account, I made a menu planning in advance and I stucked to that planning
- Me / my household was craving salmon this day
- It was the first day of the HelloFresh box and I always prepare fish dishes first
- Due to the preparation time of this recipe
- Otherwise, namely:

[Screen 6]

Vragen over Keep-it indicator

De Keep-It® indicator is een nieuwe indicator die de temperatuur van een product continu bijhoudt van leverancier tot huishouden. Op basis hiervan laat Keep-it® altijd de daadwerkelijke resterende houdbaarheid zien. [insert picture]

The Keep-It® indicator is a new indicator that continuously monitors the temperature of a product from supplier to household. Based on this, Keep-it® always shows the actual remaining shelf life.

16. Geef aan in hoeverre u het eens bent met de volgende stellingen over deze Keep-it® indicator?

16. Please indicate to what extent you agree with the following statements about this Keep-it® indicator?

Ik vind deze Keep-It® indicator...	Helemaal mee oneens		Neutraal			Helemaal mee eens	
	1	2	3	4	5	6	7
ITEMS RANDOM							
1. Positief	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Betrouwbaar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Nuttig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Intuïtief in gebruik	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Waarde toevoegen aan het product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Verwarrend	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1. Positive
2. Reliable
3. Useful
4. Intuitive to use
5. Add value to the product
6. Confusing

[Screen 7]

Vragen over Keep-it vs. TGT

17. Stel, voor een voedingsproduct is de TGT (te gebruiken tot) houdbaarheidsdatum verstreken, maar de Keep-it® indicator geeft nog 2 dagen aan. Wat zou je met de volgende producten doen?

	Ik gooi het product direct weg	Ik eet het product in de komende 2 dagen op	Voordat ik mijn keuze maak, kijk en ruik ik of het product nog goed is om te eten	Weet ik niet
Een stukje vlees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Een stukje vis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Een pak melk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Een kant-en-klaarmaaltijd (uit het koelvak)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. Suppose, for the TGT expiry date has passed, but the Keep-it® indicator shows 2 more days. What would you do with the product?

- I throw the product away immediately
- I eat the product within the next 2 days
- Before I make my choice, I check and smell whether the product is still good to eat
- I don't know

Vragen Food waste related behaviours

[Screen 8]

Wat verwacht u van de Keep-It® indicator als deze op verschillende verse producten zit (zoals vlees, vis, kip, kant- en klaar-maaltijden)?

18. Geef aan in hoeverre u het eens bent met de volgende stellingen.

Please indicate to what extent you agree to the following statements.

Ik verwacht dat de Keep-It® indicator....	Helemaal mee oneens		Neutraal			Helemaal mee eens	
	1	2	3	4	5	6	7
ITEMS RANDOM							
1. De planning van mijn maaltijden zal beïnvloeden (welke producten ik wanneer gebruik)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Het makkelijker maakt om te zien hoe lang een vers product nog te gebruiken is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Nauwkeuriger de houdbaarheid van een vers product aangeeft dan de geprinte houdbaarheidsdatum	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Mij helpt om te bepalen hoe lang ik een vers product veilig kan eten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Mij meer zekerheid geeft dat het verse product van goede kwaliteit is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Het mij laat zien als verse producten niet op de juiste temperatuur bewaard worden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Mij stimuleert om meer aandacht te besteden aan de juiste manier van bewaren van levensmiddelen, om ze zo lang mogelijk goed te houden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Mij helpt om minder eten weg te gooien	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Anderen zal helpen om minder eten weg te gooien	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I expect the Keep-It® indicator

1. The planning of my meals will influence (which products I use when)
2. Makes it easier to see how long a fresh product can be used
3. More accurately indicates the shelf life of a fresh product than the date stamp
4. Helping me determine how long I can safely eat a fresh product
5. Gives me more assurance that the fresh product is of good quality
6. will show me if fresh products are not stored at the right temperature
7. Encourage me to pay more attention to the correct way of storing food, to keep it good for as long as possible
8. Helping me to throw away less food
9. Helping others to throw away less food

[Screen 9]

19. Geef voor onderstaande stellingen aan in hoeverre u het eens bent
 For the statements below, indicate to what extent you agree

ITEMS RANDOM	Helemaal mee oneens		Neutraal			Helemaal mee eens	
	1	2	3	4	5	6	7
1. Ik probeer zo min mogelijk eten weg te gooien (M)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Ik weet op welke temperatuur mijn koelkast moet staan om producten zo lang mogelijk goed te houden (A)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Ik vind het lastig om vast te stellen of voedingsproducten nog veilig zijn om te eten (A)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Door het gebruik van HelloFresh ben ik minder voedsel gaan weggooien (FW)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1. I try to throw away as little food as possible (M)
2. I know what temperature my refrigerator should be at to keep products fresh for as long as possible (A)
3. I find it difficult to determine whether food products are still safe to eat (A)
4. By using HelloFresh, I started to throw away less food (FW)

[Screen 10]

Tot slot volgen nog een paar algemene vragen.

Finally, a few more general questions.

20. Ik ben een:

- Man
- Vrouw
- Anders/wil ik niet zeggen

I'm a:

- Man
- Woman
- Other / I don't want to say

21. Uit hoeveel personen bestaat uw huishouden?

... personen, waarvan:

... kinderen 0-12 jaar

... kinderen 13-18 jaar

... volwassenen (18 jaar en ouder)

How many people does your household consist of?

... persons, of which:

... children 0-12 years

... children aged 13-18

... adults (18 years and older)

22. Waar woon je?

- Nederland
- België
- Zeg ik liever niet

23. Wat is uw hoogst genoten opleiding?

- Lagere school (en LAVO, VGLO)
- VMBO (en voormalige MAVO, LBO vormen) + 1^e 3 jaar Havo/VWO
- Havo/VWO (afgerond), Atheneum, Gymnasium, NMS, HBS, Lyceum
- MBO (MTS, UTS, MEAO)
- HBO en Universiteit
- PhD/promotie
- Dat zeg ik liever niet

What is your highest education?

Primary school (and LAVO, VGLO)

VMBO (and former MAVO, LBO forms) + 1st 3 years of HAVO / VWO

Havo / VWO (completed), Atheneum, Gymnasium, NMS, HBS, Lyceum

MBO (MTS, UTS, MEAO)

HBO and University

PhD / promotion

I prefer not to say that

Heel erg bedankt voor uw deelname.

[optional]

Wilt u kans maken op een gratis HelloFresh box, vul dan hier uw email-adres* in:

* Met het geven van uw emailadres, gaat u akkoord met de HelloFresh Privacy Policy [\[insert link\]](#) en de voorwaarden [\[insert link\]](#) van deze verloting.

Thank you very much for your participation.

[optional]

If you want to win a free HelloFresh box, enter your email address * here:

* By submitting your email address, you agree to the HelloFresh Privacy Policy [\[insert link\]](#) and the terms [\[insert link\]](#) of this drawing.

Survey control group (Salmon, without Keep-it Indicator)

[Screen 1]

Welkom bij dit consumentenonderzoek! Dit onderzoek wordt uitgevoerd door Wageningen Food & Biobased Research (WFBR) in samenwerking met HelloFresh en Keep-It. Het doel van deze vragenlijst is om inzicht te krijgen in hoe consumenten omgaan met de houdbaarheidsdatums van verschillende voedingsproducten. Verder zijn we geïnteresseerd in uw mening over nieuwe manieren om voedselverspilling tegen te gaan.

Het invullen van de vragenlijst duurt 5-10 minuten.

Vul de vragenlijst in en maak kans op een gratis HelloFresh box!

Ik geef toestemming om mee te doen mee aan dit vragenlijstonderzoek:

JA

Welcome to this consumer survey! This research is carried out by Wageningen Food & Biobased Research (WFBR) in collaboration with HelloFresh and Keep-It. The purpose of this questionnaire is to gain insight into how consumers handle food products and expiration dates. Furthermore, we are interested in your views on new ways to reduce food waste.

Completing the questionnaire takes 5-10 minutes.

Fill in the questionnaire and win a free HelloFresh box!

I give permission to participate in this questionnaire survey:

YES

Toestemmingsverklaring:

- Ik ben voldoende geïnformeerd over dit vragenlijstonderzoek.
- Ik weet dat de antwoorden anoniem verwerkt worden voor het doel zoals hierboven omschreven.
- Ik weet dat de antwoorden verzameld worden door HelloFresh via QuestionPro; dat deze gedeeld worden met WFBR voor data-analyse, en niet met anderen (derden) gedeeld worden.
- Ik weet dat de geanonimiseerde onderzoeksgegevens - volgens de wettelijke bewaartermijn - tot 10 jaar na dit onderzoek bewaard worden.
- Ik weet dat meedoen vrijwillig is, en dat ik altijd kan stoppen zonder opgaf van reden.

Declaration of consent:

- I am sufficiently informed about this questionnaire survey.
- I know that the answers are processed anonymously for the purpose described above.

Declaration of consent:

- I am sufficiently informed about this questionnaire survey.
- I know that the answers are processed anonymously for the purpose described above.
- I know the answers are collected by HelloFresh via QuestionPro; that they are shared with WFBR for data analysis, and not shared with others (third parties).
- I know that the anonymized research data - according to the legal retention period - will be stored for 10 years after this research.
- I know that participating is voluntary and that I can always quit without reason.

[Screen 2]

Wat is je leeftijd? jaar

[If <18 years, then exclude/ stop participation --> next screen: Helaas, u komt niet in aanmerking voor deelname

[If 18 years or older, then continue to next question]

[Screen 3]

Vragen over houdbaarheidsdatums (algemeen + box) en gebruik zalm

	Nooit	Zelden	Soms	Vaak	Altijd
	1	2	3	4	5
1. In hoeverre let je normaal gesproken op de houdbaarheidsdatums van voedingsproducten voordat je ze gebruikt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. In hoeverre let je normaal gesproken op de houdbaarheidsdatums van de voedingsproducten in een HelloFresh box voordat je ze gebruikt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Never	Rarely	Occasionally	Often	Always
	1	2	3	4	5
1. To what extent do you normally pay attention to the date marking on food products before using them?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. To what extent do you normally pay attention to the expiration dates of food products in a HelloFresh box before using them?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Wat betekent volgens jou een Te Gebruiken Tot (TGT) datum? (meerdere antwoorden mogelijk) [multiple select]

- Het product kan gebruikt worden na deze datum, maar het is aan te raden om het product eerst te ruiken en te bekijken
- Het product kan gebruikt worden na deze datum, maar het is aan te raden om het eerst te proeven.
- Na deze datum kan de producent niet garanderen dat het product goed smaakt
- Het product mag niet gegeten worden na deze datum, vanwege risico's voor voedselveiligheid
- Weet ik niet
- Anders, namelijk: _____

3. What do you think a Use By (TGT) date means? (multiple select)

- The product can be used after this date, but it is recommended to smell and view the product first
- The product can be used after this date, but it is recommended to taste it first.
- After this date, the producer cannot guarantee that the product will taste good
- The product should not be eaten after this date due to food safety risks
- I do not know
- Other, namely:_____

4. Wat betekent volgens jou een Ten minste Houdbaar Tot (THT) datum? (meerdere antwoorden mogelijk) [multiple select]

- Het product kan gebruikt worden na deze datum, maar het is aan te raden om het product eerst te ruiken en te bekijken
- Het product kan gebruikt worden na deze datum, maar het is aan te raden om het eerst te proeven.
- Na deze datum kan de producent niet garanderen dat het product goed smaakt
- Het product mag niet gegeten worden na deze datum, vanwege risico's voor voedselveiligheid
- Weet ik niet
- Anders, namelijk:_____

4. What do you think means a best before date (best before)? (multiple select)

- The product can be used after this date, but it is recommended to smell and view the product first
- The product can be used after this date, but it is recommended to taste it first.
- After this date, the producer cannot guarantee that the product will taste good
- The product should not be eaten after this date due to food safety risks
- I do not know
- Other, namely:_____

5. Wat doe je normaal gesproken met de volgende voedingsproducten als de houdbaarheidsdatum verstreken is? Kruis per productgroep 1 antwoord aan.

What do you normally do when the date marking is overdue for the following food products? Select one option per food product.

	Ik gooi het product weg, zonder na te gaan of het nog goed is om te eten	Ik eet het product op, zonder na te gaan of het nog goed is om te eten	Ik ga na of het product nog goed is om te eten door te kijken, ruiken en/of te proeven	Ik weet het niet
Vlees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Zuivel (zoals melk, kaas en yoghurt)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kant-en-klaarmaaltijden uit het koelvak	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Houdbare producten (zoals pasta, rijst, koekjes en crackers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

[Screen 4]

Vragen over informatie in de box

In uw HelloFresh box zat een flyer over voedselverspilling.

6. Heeft u deze flyer gelezen?

- Ja, helemaal
- Ja, gedeeltelijk
- Nee, niet gelezen
- Nee, flyer niet gezien

6. There was a flyer about food waste in your HelloFresh box.

Have you read this flyer?

- Yes totally
- Yes, partly
- No, not read
- No, flyer not seen

[IF 6 is yes – (option 1 or 2) --> THEN question 7]

7. Vond je de informatie duidelijk?

Helemaal niet duidelijk							Heel erg duidelijk
1	2	3	4	5	6	7	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Vond je de flyer informatief?

Helemaal niet informatief							Heel erg informatief
1	2	3	4	5	6	7	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

9. Heb je de temperatuur van je koelkast lager gezet na het lezen van de flyer? [single]

- Ja, lager gezet
- Nee, ik vind een lagere temperatuur niet nodig
- Nee, ik had mijn koelkast temperatuur al laag staan (≤ 4 °C)

Have you lowered the temperature of your refrigerator after reading the flyer?

- Yes
- No, I don't think a lower temperature is necessary
- No, I already had my fridge temperature low (≤ 4 °C)

[Screen 5]

Vragen over maaltijdplanning

10. Op de flyer in uw HelloFresh box stond een tabel om in te vullen. Wil je deze informatie hieronder overnemen?

Mocht je dit vergeten zijn – of heb je deze flyer niet gezien - : vul dan in wat je nog weet, en kruis ook optie 'vergeten' aan.

[multiple options possible]

- Datum van vandaag (ontvangst box) _____
- Geprinte houdbaarheidsdatum zalm _____
- Datum gebruik zalm _____
- Ik ben dit vergeten op te schrijven
- Ik heb de flyer niet gezien

There was a table on the flyer in your HelloFresh box. Do you want to copy this information below?

If you have forgotten this: fill in what you still remember, and also tick the option 'forgotten'.

[multiple options possible]

- Today's date (receipt box) _____
- Printed best before date salmon _____
- Date of use of salmon _____
- I forgot to write this down

10. Waarom maakte je de zalm op deze dag klaar? [multiple select]

RANDOM ['Anders' at the bottom]

- De geprinte houdbaarheidsdatum gaf aan dat het op moest
- Op basis van de houdbaarheid van de producten, maakte ik een maaltijdplanning voor een paar dagen/week, en ik heb deze planning gevolgd
- Zonder op de houdbaarheid van de producten te letten, heb ik een maaltijdplanning voor een paar dagen/week gemaakt; en ik heb deze planning gevolgd
- Ik/mijn huishouden had deze dag zin in zalm
- Het was de eerste dag van de HelloFresh box en ik maak visgerechten altijd als eerste klaar
- Vanwege de bereidingstijd van dit recept
- Anders, namelijk:

10. Why did you prepare the salmon on this particular day?

RANDOM ["Other" option at the bottom]

- The printed date indicated that it had to be finished
- Keep-It indicator indicated that it had to be finished
- Based on the shelf life of the products, I made a menu planning in advance; and I stuck to that planning
- Without taking the shelf life of the products into account, I made a menu planning in advance and I stuck to that planning
- Me / my household was craving salmon this day
- It was the first day of the HelloFresh box and I always prepare fish dishes first
- Due to the preparation time of this recipe
- Otherwise, namely:

[Screen 8]

Vragen over Keep-it vs. TGT

13. Stel, voor een voedingsproduct is de TGT (te gebruiken tot) houdbaarheidsdatum verstreken, maar de Keep-it® indicator geeft nog 2 dagen aan. Wat zou je met de volgende producten doen?

	Ik gooi het product direct weg	Ik eet het product in de komende 2 dagen op	Voordat ik mijn keuze maak, kijk en ruik ik of het product nog goed is om te eten	Weet ik niet
Een stukje vlees	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Een stukje vis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Een pak melk	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Een kant-en-klaarmaaltijd (uit het koelvak)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

[Screen 9]

Vragen Food waste related behaviours

Wat verwacht je van de Keep-It® indicator als deze op verschillende verse producten zit (zoals vlees, vis, kip, kant- en klaar-maaltijden)?

14. Geef aan in hoeverre u het eens bent met de volgende stellingen.

Please indicate to what extent you agree with the following statements.

Ik verwacht dat de Keep-It® indicator....	Helemaal mee oneens							Neutraal			Helemaal mee eens	
	1	2	3	4	5	6	7					
ITEMS RANDOM												
1. De planning van mijn maaltijden zal beïnvloeden (welke producten ik wanneer gebruik)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Het makkelijker maakt om te zien hoe lang een vers product nog te gebruiken is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Nauwkeuriger de houdbaarheid van een vers product aangeeft dan de geprinte TGT houdbaarheidsdatum	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Mij helpt om te bepalen hoe lang ik een vers product veilig kan eten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Mij meer zekerheid geeft dat het verse product van goede kwaliteit is	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Mij laat zien als verse producten niet op de juiste temperatuur bewaard worden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Mij stimuleert om meer aandacht te besteden aan de juiste manier van bewaren van levensmiddelen, om ze zo lang mogelijk goed te houden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Mij helpt om minder eten weg te gooien	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Anderen zal helpen om minder eten weg te gooien	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

I expect the Keep-It® indicator

1. The planning of my meals will influence (which products I use when)
2. Makes it easier to see how long a fresh product can be used
3. More accurately indicates the shelf life of a product than the printed TGT best before date
4. Helping me determine how long I can safely eat a fresh product
5. Gives me more assurance that the fresh product is of good quality
6. It shows me if fresh products are not stored at the right temperature
7. Encourage me to pay more attention to the correct way of storing food, to keep it good for as long as possible
8. Helping me to throw away less food

9. Helping others to throw away less food

[Screen 10]

15. Geef voor onderstaande stellingen aan in hoeverre je het eens bent
For the statements below, indicate to what extent you agree

ITEMS RANDOM	Helemaal mee oneens		Neutraal			Helemaal mee eens	
	1	2	3	4	5	6	7
1. Ik probeer zo min mogelijk eten weg te gooien (M)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Ik weet op welke temperatuur mijn koelkast moet staan om producten zo lang mogelijk goed te houden (A)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Ik vind het lastig om vast te stellen of producten nog veilig zijn om te eten (A)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Door het gebruik van HelloFresh ben ik minder voedsel gaan weggooien (FW)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

1. I try to throw away as little food as possible (M)
2. I know what temperature my refrigerator should be at to keep products fresh for as long as possible (A)
3. I find it difficult to determine whether products are still safe to eat (A)
4. By using HelloFresh I started to throw away less food (FW)

[Screen 11]

Tot slot volgen nog een paar algemene vragen.

Finally, a few more general questions.

16. Ik ben een:

- Man
- Vrouw
- Anders/wil ik niet zeggen

I'm a:

- Man
- Woman
- Other / I don't want to say

17. Uit hoeveel personen bestaat uw huishouden?

... personen, waarvan:

... kinderen 0-12 jaar

... kinderen 13-18 jaar

... volwassenen (18 jaar en ouder)

How many people does your household consist of?

... persons, of which:

... children 0-12 years

... children aged 13-18

... adults (18 years and older)

18. Waar woon je?

- Nederland
- België
- Zeg ik liever niet

19. Wat is uw hoogst genoten opleiding?

- Lagere school (en LAVO, VGLO)
- VMBO (en voormalige MAVO, LBO vormen) + 1^e 3 jaar Havo/VWO
- Havo/VWO (afgerond), Atheneum, Gymnasium, NMS, HBS, Lyceum
- MBO (MTS, UTS, MEAO)
- HBO en Universiteit
- PhD/promotie
- Dat zeg ik liever niet

What is your highest education?

Primary school (and LAVO, VGLO)

VMBO (and former MAVO, LBO forms) + 1st 3 years of HAVO / VWO

Havo / VWO (completed), Atheneum, Gymnasium, NMS, HBS, Lyceum

MBO (MTS, UTS, MEAO)

HBO and University

PhD / promotion

I prefer not to say that

Heel erg bedankt voor uw deelname.

[optional]

Wilt u kans maken op een gratis HelloFresh box, vul dan hier uw email-adres* in:

* Met het geven van uw emailadres, gaat u akkoord met de HelloFresh Privacy Policy [\[insert link\]](#) en de voorwaarden [\[insert link\]](#) van deze verloting.

Thank you very much for your participation.

[optional]

If you want to win a free HelloFresh box, enter your email address * here:

* By submitting your email address, you agree to the HelloFresh Privacy Policy [\[insert link\]](#) and the terms [\[insert link\]](#) of this drawing.

To explore
the potential
of nature to
improve the
quality of life



Wageningen Food & Biobased Research
Bornse Weilanden 9
6708 WG Wageningen
The Netherlands
www.wur.eu/wfbr
E info.wfbr@wur.nl

Report 2101
ISBN 978-94-6395-628-4

The mission of Wageningen University and Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 6,500 employees (5,500 fte) and 12,500 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.

