

Qualitative research into the consumption of food with expired 'use by' dates

Report of findings

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Executive summary

About the research

The COVID-19 Consumer Tracker and the Food and You 2 survey indicate that a substantial minority of consumers eat food after the use-by date (UBD) has expired. The FSA wished to discover more about the drivers of consuming food after the UBD, and barriers to compliance with the UBD.

This report details the findings from a rapid evidence review and primary qualitative research with thirty participants from England, Wales and Northern Ireland. During the primary research, participants took part in two depth interviews and an app-based diary between the 22nd March and the 4th April 2021 designed to explore the reasons why they consume food past the UBD.¹

We have used the COM-B behavioural framework to structure our analysis, and this forms the basis for this report.

Key findings

Significant proportions of the UK adult population both consult UBDs and consume food that is past its UBD. A recent FSA study found that 76% of adults have knowingly eaten food past the UBD,² yet 64% state they always check the UBD before they cook or prepare food.³ This poses a question as to why people decide to eat expired food, despite checking the UBD. This research has highlighted five overarching findings about consumer attitudes and behaviours towards eating food past the UBD:

¹ During fieldwork, there were restrictions in place due to COVID-19. Please see Annex 2 for further details of these.

² Food Standards Agency (2021). <u>The FSA reveals that 50% of adults do not always check the use-by date</u> <u>on their food putting themselves and family at risk</u>. [Accessed 2nd April 2021].

³ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). <u>Food and You 2: Wave 1 Key Findings. Food</u> <u>Standards Agency</u>. [Accessed 2nd June 2021].

1. Although they could correctly define the UBD, in practice participants often confused UBDs and BBDs.

When prompted, almost all participants defined the UBD correctly, stating that food should not be eaten after that date. They understood that items would be safe to eat on the day of the UBD but not after midnight. However, in practice participants often misidentified the UBD for the BBD and took a blanket approach to date labels. During the app diary, they frequently shared images of products with BBDs despite being asked about UBDs. They also described eating items such as bread and eggs after the UBD, even though these products are likely to have a BBD.

The wider literature reports that up to 61% of participants were unable to make an accurate distinction between the BBD and the UBD.⁴ Similarly, a recent survey found that 50% of adults in England, Wales and Northern Ireland cannot identify the correct definition for a UBD 'that food can be eaten until the use-by date, but not safely after'.⁵

2. UBDs were treated as a guide, rather than a rule, and were consistently assessed in combination with other factors.

In advance of preparing a meal, UBDs were often seen as the starting point in assessing food safety. If an item was past the UBD, participants widely used sensory judgements including smell, visual cues, texture and taste to assess whether it was safe to eat. These tests regularly took precedence over the UBD, even if a product was several days out of date.

The FSA's Food and You 2 survey found that smell was most often used to assess raw meat (76%) and milk and yogurt (73%), while cheese was most often evaluated visually (65%).⁶ Another study highlights how these assessments often occur in combination with

⁴ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online] [Accessed on 18 March 2021].

⁵ Food Standards Agency (2021). <u>The FSA reveals that 50% of adults do not always check the use-by date</u> <u>on their food putting themselves and family at risk</u>. Available at: [Accessed 2nd April 2021].

⁶ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). <u>Food and You 2: Wave 1 Key Findings</u>. Food Standards Agency. [Accessed 2nd June 2021].

over 80% of individuals visually assessing and smelling a product (82.5%), followed by 67.5% looking at the UBD or BBD and 50.4% tasting it.⁷

Participants expressed scepticism about the UBD being an exact cut-off. Personal experience of food going off before the UBD or not being ill despite eating expired food reinforced perceptions and undermined consumer trust in the UBD as a safety marker.

3. Past experience and routines meant participants assessed the risk of eating expired food as low.

Existing habits, routines and assumptions were key in influencing participants' behaviour towards food safety. They relied on checks they had developed over many years, which gave them the confidence to make assessments on their own, knowing they had not been ill in the past. The absence of illness was a signal that it was unlikely to be severe or long-term, with participants assuming any adverse effects would be a 'one-off' event.

This was particularly important for items participants were familiar with, describing how they could identify whether the food was safe to eat based on their experience of preparing the same product. The wider literature also suggests that familiarity with a specific product lowers the perceived risk of eating items past the UBD.⁸ This included attitudes towards pre-prepared food (such as ready-meals or cooked meats), which participants often thought were less risky to eat after the UBD as they had already been cooked or treated in advance. As such, participants often associated food safety with preparation practices rather than the UBD.

Participants described ingrained habits for preparing expired food including cooking it at a hotter temperature or for longer, removing mouldy or discoloured parts, and using items as part of a larger meal rather than eating them on their own. Van Boxstael et al. found that 8.4% of people reported using heat to eliminate food safety issues in expired food.⁹

⁷ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. Food Control, 37, 85-97.

⁸ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance.</u> WRAP. [Online] [Accessed on 18 March 2021].

⁹ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. Food Control, 37, 85-97.

4. Values and upbringing shaped a reluctance to waste food, which led many to consume items past the UBD.

Experiences from childhood often had a long-term influence on participants' attitudes towards UBDs, with many referring to the cost of food when they were younger and their family's reluctance to waste food. Older participants also reflected on the lack of UBDs on items when they were growing up, encouraging them to rely on sensory judgements rather than the date.

Personal values around animal welfare, inequality in the global food system and a desire to avoid waste also influenced decisions to eat expired food rather than throw items away. The wider literature identifies that consumers concerned with global sustainability and food waste are more likely to consume food that is past its UBD.

5. Although there was little evidence that affordability led to UBD consumption, purchasing reduced or multi-buy items and wanting to avoid wasting money, were key drivers.

Participants were influenced by time pressure, access to shops and the cost of food, deciding to buy reduced price items or multi-packs as a way of saving money. This often meant they had less time to consume food before it expired, or they had too much of a certain product to consume before the UBD. Spontaneous purchases often led to greater UBD consumption, in contrast to participants who spent time planning meals before going to the shops. Wilson et al. suggests that items purchased in order to save money are more likely to not be completely consumed in time.¹⁰

While participants recognised that other households may eat food after the UBD due to their inability to afford new items, they felt this was not a reason for their personal consumption of expired food. Frequently, participants commented that if they had already spent money purchasing food, they would eat it past the UBD as they did not want items to go to waste. Although this was an important consideration, participants described how they were unwilling to make themselves ill for the cost of food. Instead, they would use their judgement to determine whether this was likely to be the case, often judging expired food to be safe. The wider evidence reports that individuals on low-incomes, or those

¹⁰ Wilson, L.W.N., Rickard, J.B., Saputo, R. and Ho, S. (2017). Food waste: The role of date labels, package size, and product category. Food Quality and Preference. 55. 35-44.

who describe their financial situation as poor, are more likely to want to prevent food waste and are more likely to consume UBD expired foods.¹¹

What could encourage greater UBD compliance?

Increasing knowledge and awareness

- Providing information about the difference between the UBD and the BBD is unlikely to result in greater compliance given participants can already largely define the difference between the two.
- Instead, explaining how UBDs are determined and providing information about the risks associated with specific products could help to raise awareness of which products have a UBD and why. This could also help to increase overall trust.
- Greater consistency in date labelling, the placement of the date and larger font size could also help increase UBD identification. Simplifying date labelling is a strong theme in the wider literature which suggests that more consistent wording may support a reduction in the consumption of UBD expired foods and reduce the food safety risks.¹² Studies recommend uniform classification methods for UBDs on similar foods as a way of reducing confusion.
- Encouraging more frequent assessment of UBDs after a product has been purchased and integrating this into food safety routines could also increase individual awareness about what food they have available and link UBDs with wider food safety practices.

¹¹ Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour.</u> WRAP and Ipsos MORI. [Online] [Accessed on 18 March 2021]. Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food</u> <u>attitudes and behaviours in the UK: findings from the Food and You survey 2012</u>. Unit Report 13. Food Standards Agency. [Online] [Accessed on 18 March 2021]. Zielińska, D., Bilska, B., Marciniak-Łukasiak, K., Łepecka, A., Trząskowska, M., Neffe-Skocińska, K., Tomaszewska, M., Szydłowska, A. and Kołożyn-Krajewska, D. (2020). Consumer Understanding of the Date of Minimum Durability of Food in Association with Quality Evaluation of Food Products After Expiration. International Journal of Environmental Research and Public Health. 17. 1632

¹² Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. Food Control, 37, 85-97.

Changing motivations by interrupting routines

- Encouraging people to rely on UBDs over their sensory judgements is unlikely to be fruitful, as these behaviours have been cemented over time for participants with no perceived ill effects.
- Instead, focusing on meal planning, shopping lists and checking the fridge before purchasing items could help individuals avoid ending up with excess food that is close to or past its UBD. Linking this kind of planning to reducing food waste and saving money could also tap into individual desires and values, making them more likely to stick.
- Hall and Osses proposes developing an assurance scheme for date labelling to increase consumer trust through certification.¹³ This could help reduce scepticism towards UBDs by increasing transparency around how the date is determined.

Creating an environment that supports compliance

- Personalising the risk of consuming expired food could encourage individuals to recognise the potential harm associated with eating items past the UBD, drawing on their reluctance to serve food to guests and vulnerable groups.¹⁴
 By making a link with an individuals' potential risk profile, this could encourage greater compliance as seen when serving food to others.
- Increasing the shelf life of reduced items and offering smaller packet sizes could also support greater compliance, giving individuals more choice to purchase cheaper products that last for longer. Wilson et al. suggest that manufacturers could help support the reduction of the consumption of expired foods by reducing packaged portion sizes.¹⁵
- Additionally, providing a UBD range for online shopping (for example, guidance on how many days a product will remain in date after delivery) could help to avoid

¹³ Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. International Journal of Consumer Studies. 37, 422-432.

¹⁴ Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. International Journal of Environmental Research and Public Health, 10, 4060-4085.

¹⁵ Wilson, L.W.N., Rickard, J.B., Saputo, R. and Ho, S. (2017). Food waste: The role of date labels, package size, and product category. Food Quality and Preference. 55. 35-44.

individuals being supplied with a large quantity of food with little time to consume it before the UBD.

How to read this report

Throughout the qualitative research, we have drawn on the COM-B behavioural framework to design our materials and structure our analysis.¹⁶ As such, this report is based upon insights related to: capabilities, motivations and opportunities. Our findings have been structured by these themes in the following chapters:

- In chapter 1 we summarise the background and methodology of the study.
 We detail our approach to the rapid evidence review as well as the sample of participants we spoke to during the qualitative research.
- In chapter 2 we separate the research findings into four subsections:
 - In section 1 we focus on capability, and the levels of knowledge around food safety and UBDs. We discuss the differences between UBDs and BBDs, where knowledge has come from and understanding of the risks associated with consuming expired food.
 - In section 2 we focus on motivations. This includes the food practices, judgements and assumptions that influence the decision to eat expired food.
 - In section 3 we focus on opportunity, and the role that the social and physical environment play on consumer behaviours towards UBDs.
 - In section 4 we focus on how participants felt compliance with UBDs could be encouraged and draw on insights from the wider literature.
- In chapter 3 we present conclusions and reflections from the research.

While every attempt has been made to recruit a varied sample of participants, possible limitations include:

1. **Self-selection bias.** This study may appeal more to some individuals than others given the focus on food behaviours. Although we purposefully described the focus

¹⁶ Michie, S., Van Stralen, M. M. and West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. Implementation Science, 6, 42.

of the study on food rather than UBDs explicitly, we are likely to have attracted participants interested in food. This may have been more likely given we recruited from the Food and You 2 survey sample meaning participants had already taken part in a survey about food before participating in this research.

- 2. Social desirability bias. Although the online app diary provided a space for participants to tell us about their food and shopping behaviours with questions posted at different times of day, the findings rely on self-reported data. In this way, it is possible the findings reflect the over-reporting of socially desirable attitudes and behaviours and the under-reporting of socially undesirable attitudes and behaviours such as consumption of food past the UBD. Attempts were made to design materials to limit this, including questions that did not always explicitly ask about UBDs as a way of encouraging participants to share their wider attitudes and approach to consumption.
- 3. **Generalisability.** The findings summarised reflect the self-reported behaviours and views shared by the thirty participants involved in the study. Qualitative research is designed to be exploratory and provide insight into people's perceptions, feelings and behaviours. The findings are therefore not intended to be representative of the views of all people who may share similar characteristics.

Full details on the qualitative sample can be found in Table 3 in chapter 1.

Throughout this report we have referred to "participants" as the individuals that have taken part in our research. We also refer to use-by dates as "UBDs" and best-before dates as "BBDs" throughout.

Anonymised verbatim quotes and photos, shared by participants during the app diary, have been used to help illustrate key findings. These quotes do not necessarily summarise the views of all participants that we spoke to. We have also drawn on key findings from the rapid evidence review to support the qualitative insights.

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Chapter 1: Background and methods

Background

The evidence on the consumption of food past its UBD presents a puzzling picture, with significant proportions of the adult population in the UK both consulting UBDs and consuming food that is past its UBD.¹⁷ A recent study found that 76% of adults have knowingly eaten food past the UBD, with 37% cooking expired food for other people.¹⁸ Yet 64% of adults state they always check the UBD before they cook or prepare food and never eat cooked meats (64%), smoked fish (85%), cheese (52%), bagged salads (49%) or milk (67%) past the UBD.¹⁹ This poses a question as to why people decide to eat expired food, despite checking the UBD.

The Food Standards Agency (FSA) commissioned Ipsos MORI to explore consumer behaviours towards UBDs. They wanted to understand more about consumer awareness and approaches to expired food given recent evidence that the number of people eating ready to eat foods such as cooked meats beyond the UBD is increasing.²⁰ There are also growing concerns about the impact of food affordability on the consumption of expired products. Recent data suggests that those cutting or skipping meals for financial reasons were more likely to report they or someone in their household had eaten expired food in the last month.²¹

The study was designed to answer the following research questions:

• Do consumers understand what a 'use by' date means?

¹⁸ Food Standards Agency (2021). <u>The FSA reveals that 50% of adults do not always check the use-by</u> <u>date on their food putting themselves and family at risk.</u> [Accessed 2nd April 2021].

¹⁷ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis.</u> Journal of Food Protection, 79, 263-272. [Online] [Accessed on 25 March 2021]. Samotyja, U. and Sielicka-Różyńska, M. (2020). How date type, freshness labelling and food category influence consumer rejection. International Journal of Consumer Studies, 1–15. Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. International Journal of Consumer Studies, 37, 422-432.

¹⁹ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). <u>Food and You 2: Wave 1 Key Findings</u>. Food Standards Agency. [Accessed 2nd June 2021].

 ²⁰ Food Standard's Agency (2020). <u>COVID-19 Consumer Tracker Waves 5 – 8.</u> [Accessed 13th April 2021].
 ²¹ Food Standard's Agency (2021). <u>COVID-19 Consumer Tracker Annual Summary Report</u> [Accessed 18th June 2021].

- What risk do consumers perceive from food beyond its 'use by' date?
- How do consumers prepare food beyond its 'use by' date? Is it cooked?
- What drives people to eat food with an expired 'use by' date?
- What barriers are there to stopping this behaviour?
- What differences exist between different consumer groups?

Methods

This report brings together findings from two strands of research:

- A rapid evidence review led by <u>ADAS</u> to explore the existing evidence about consumer behaviours and attitudes towards UBDs.
- Online qualitative research with thirty participants to understand their awareness of UBDs and daily behaviours over the course of two weeks.

The evidence review was conducted in parallel to the qualitative research, with fieldwork conducted between the 22nd March and the 4th April 2021. During this time there were national lockdowns across the United Kingdom, with different restrictions in place across England, Wales and Northern Ireland. There were also localised restrictions in various parts of the country. Please see Annex 2 for further information.

Rapid evidence review

The evidence review was developed using a Rapid Evidence Assessment (REA) approach, to draw out the evidence base with regards to existing knowledge about consumer behaviours and attitudes towards UBD. This was supplemented with purposive searches, and pragmatic adaptions to a full REA process including: the collation of only relevant titles to a maximum of ten in the first screening, forgoing the recording of excluded literature and the justification for exclusion.

Following three stages of screening the REA process identified 51 pieces of literature for data extraction. Evidence directly addressing the research questions, and UBD-centred studies in the UK context was found to be somewhat limited. While the majority of the literature included is from the UK, the evidence is broader in remit, extending to include relevant food related consumer behaviours. Highly relevant evidence emerging from EU countries and North America was also included to ensure a focus on UBDs (rather than

food waste). Due to the nature of the research questions, much of the evidence is underpinned by qualitative research. The full evidence review, detailed methodology and a summary of the literature taken forward to data extraction is available in Annex 3.

Online qualitative research

Qualitative fieldwork was conducted between the 22nd March and the 4th April 2021 with thirty participants from England, Wales and Northern Ireland taking part in three research stages: a 20-minute initial warm-up interview, a two week online diary using the Ipsos Applife platform and a 45-minute wrap-up interview designed to build a picture of participants' behaviours towards UBDs.

Figure 1: Methods summary

<u>Warm-up depth interview x</u> <u>30 (c. 20 mins)</u>

- Introduce participants to the research
- Get to know participants
 and their household
- Understand initial attitudes to food incl. UBD
- Support them to access the app/ check tech

Auto-ethnographic app diary x 30 (2 weeks)

- Capture in the moment experiences and behaviours towards food
- Interactive tasks to see how participants handle food incl. UBD
- Photo and video options

Follow-up interview x 30 (45 mins)

- Dig into attitudes and practices shared during the app
- Structured around COM-B framework to systematically capture drivers and barriers to behaviour

Evidence review collating current literature on the consumption of food with an expired UBD

Initial depth interviews were conducted to allow the research team to start exploring levels of UBD awareness and familiarise themselves with the participants ahead of the online AppLife diary. The 20-minute initial depth interviews were conducted over the phone or on MS Teams and were recorded with the permission of participants to allow researchers to make thorough notes to refer to. Participants then took part in a two-week self-led online AppLife diary where they posted regular updates on food behaviours and UBDs more specifically. This contained a mixture of written diary tasks, requests for photo and video content and polls/photo selection activities.

The online AppLife diary allowed an observation of the day-to-day lives of participants in a way that minimised social desirability and recall biases as participants could post in the

physical absence of a researcher and in real-time. During the two-week AppLife diary participants would receive one or two activity prompts each day asking them for instance to "Take a photo of an item close to its use by date". The research team monitoring the AppLife diary were able to prompt participants on aspects of their entries such as what they planned to do with the item, whether or not they check labelling, and at what stage, if at all, the UBD was noted by replying directly to AppLife posts. The full discussion guide used for the online diary is available in Annex 1.

After completing the two-week online AppLife diary, participants took part in a 45-minute follow-up depth interview. As with the initial depth interviews, these were conducted over the phone or on MS Teams and researchers utilised a discussion guide that was produced in collaboration with the FSA to direct the session. Ahead of each follow-up depth, researchers identified specific examples of the consumption of expired foods from the participants' AppLife diary entries so that they could explore these in greater detail. Following this, participants were compensated for their time with a monetary incentive.

Research question	Relevant qualitative method
Explore whether consumers understand	Initial depth interview including wider
the difference between UBD and BBDs.	discussion of attitudes to food shopping,
	safety and labelling.
Capture consumers' perceptions of the risk	Follow-up depth interview discussing
involved in consuming food beyond its	examples of risky behaviours shared
UBD and explore the extent of the problem.	during the app diary.
Understand consumers' preparation	Auto-ethnographic app diary including
practices of food consumed beyond	video tasks showing us their fridge,
its UBD.	approach to food shopping and
	preparation.
	Follow-up depth interview to discuss
	practices in more depth in relation
	to a specific example of expired food.

Table 1: Summary of the qualitative methods used for each research question

Explore consumers' drivers for consuming	Auto-ethnographic app diary including
food with expired UBD and barriers to not	tasks about consuming different foods.
doing so.	Follow-up depth interview using COM-B to capture barriers across domains.
Where possible, explore differences	Diverse purposefully selected sample
between consumer groups (age, life stage,	with a range of participants at different
family setting, gender, ethnicity).	ages, life stages and family settings.

Qualitative sample

Thirty participants were recruited by re-contacting respondents from the FSA's Food and You 2 survey. This allowed us to effectively target those who had already reported consuming food after the UBD, or that their behaviours varied too much to say. As the research was designed to understand what drives the consumption of expired food, it was important the sample included individuals who regularly reported doing so. Sampling aimed to capture a diverse range of participants in terms age, gender, region/nation, household composition and social grade. Food affordability, household income and ethnicity were also monitored in order to ensure representation across the variables of interest to the FSA. The achieved sample demographics are outlined in the tables below.

Demographic	Variables	Sample achieved	Total	
	18-34	9		
Ago	35-54	13	20	
Age	55-64	3	30	
	65+	5		
Candar	Male	14		
Gender	Female	16	30	
Casial grada	ABC1	12	2 <u>3</u> 30	
Social grade	C2DE	18		
	England	18		
Region (mix of urban,	Wales	7	30	
Som-arban and rarary	Northern Ireland	5		
	White	22		
Ethnicity	Asian or Asian British	4	30	
	Mixed White and Asian	1	1	

Table 2: Demographic variables

	Mixed White and Black Caribbean	1	
	Other ethnic group	2	
	Young children present (11 and under)	9	
Household composition	Older children present (12 and over)	7	20
	Multi-person household, no children present	8	30
	Single person household	6	

Table 3: Behavioural variables

Behaviour Variables		Sample achieved	Total
LIPD boboyiouro ²²	I keep it and eat it after the use-by dates	dates 17	
	It varies too much to say	13	30
Food offordability ²³	Often true that they have worried about whether food would run out before having money to buy more	21	20
	Sometimes or never true that they have worried about whether food would run out before having money to buy more	9	30

²² Food and You 2- Wave 1 (2020): 'When food you have bought is about to go past its use by date, which of the following do you usually do?' I eat it by the use by date; I freeze it by the use by date; I throw it away (after the use by date); I keep it and eat it after the use by date; It varies too much to say; I don't check use by dates.

²³ Food and You 2- Wave 1 (2020): 'Please say whether the statement below was often true, sometimes true or never true: you/people in your household in the last 12 months I/We worried whether our food would run out before we got money to buy more'.

Chapter 2: Research findings

1. Capability: Levels of knowledge around food safety and UBDs

In the COM-B framework, capability is defined as someone's psychological and physical capacity to engage in the activity concerned.²⁴ This includes having the necessary knowledge and skills, for example an understanding of the definition of a UBD and knowledge of the potential risks of consuming expired food.

Summary: Drivers and enablers related to capability

What drives people to consume food past the UBD?

- Levels of knowledge about UBDs were generally good, with participants identifying the UBD as related to food safety and being important for fresh products such as meat and dairy.
- However, this did not always translate to behaviour. In practice participants often mixed up the UBD and BBD when describing specific products and did not have a general understanding of which foods had a UBD. This was clear in responses during the online AppLife diary, as participants frequently described eating food past the UBD despite the product being labelled with a BBD.
- Confusion was exacerbated by a lack of consistency in where a UBD is located on a product, and the limited visual differences between how UBDs and BBDs are shown.
- There was little understanding about how UBDs are determined or the specific risks associated with expired food, beyond a recognition that they may become ill.
- This resulted in scepticism and mistrust towards UBDs, with participants instead relying on personal judgements.
- Participants were largely unaware of how their understanding of UBDs had developed or where it came from, often assuming they learnt about it from family, at school or had picked it up while cooking food over time.

²⁴ Michie, S., Van Stralen, M. M. and West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6, 42.

What could encourage greater UBD compliance?

- Providing information about the difference between the UBD and the BBD is unlikely to result in greater compliance given participants can already largely define the difference between the two.
- Instead, explaining how UBDs are determined and providing information about the risks associated with specific products could help to raise awareness of which products have a UBD and why. This could also help to increase overall trust.
- Greater consistency in date labelling, the placement of the date and using larger font size could also help increase UBD identification.
- Encouraging more frequent assessment of UBDs after a product has been purchased and integrating this into food safety routines could also increase individual awareness about what food they have available and link UBDs with wider food safety practices.

1.1 Understanding the difference between UBDs and BBDs

Overall, participants had a broad understanding that the UBD relates to safety and the BBD relates to quality. They described how the UBD was most important for fresh products such as meat and dairy, while the BBD is more commonly found on ambient products such as bread. When prompted, almost all participants defined the UBD correctly, stating that it should not be eaten after that date because it is not advised by the manufacturer or it is not safe after that point. They defined how the date meant items would be safe to eat on the day of the UBD but not after midnight. This reflects findings from the FSA's Food and You 2 survey in which 71% of respondents identified the UBD as the information which shows food is no longer safe to eat. ²⁵

"The use by date means that food has to be used by that date, in comparison to best before, where food can be used after its best before, but it is not at its optimum best... I would use it on the use by, that would be the last day." – Female, 44, White multi-person

²⁵ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). <u>Food and You 2: Wave 1 Key Findings. Food</u> <u>Standards Agency</u>. [Accessed 2nd June 2021].

household with younger children present in the household, Northern Ireland

However, in practice participants used both the UBD and the BBD interchangeably or referred to either as "the date" when describing their approach to expired food. They had little understanding about what items were likely to have a UBD in contrast to a BBD. During the online app diary, participants shared photos of BBDs when asked about the UBD and vice versa, as illustrated in the photos and quotes shared below. Similarly, in interviews participants frequently described eating products such as bread and eggs after the UBD, even though these items have a BBD rather than a UBD. This highlighted how participants understood the difference between the two dates, but in practice often treated them in the same way and did not have an appreciation of which food items should be treated differently due to their different date labels.



"I would be happy to use this item past its use by date as with fruit I am less anxious about food past its date. I will visually and thoroughly smell check this item is fresh before I consume it." – Male, 35, White, with young child in the household, Northern Ireland



"This lettuce has a use by date today. I've had it since Tuesday. I have been storing it in the fridge. I'll use it for salad or in sandwiches. I didn't read the guidance. If it is not brown or soggy then I will eat it." – Female, 33, White, multi-person household with younger children in the household, England

Wider research has also identified confusion among the public regarding the distinction between UBDs and BBDs.²⁶ One study reported that up to 61% of participants were unable to make an accurate distinction between the two labels, suggesting individuals take a 'blanket' approach to dates.²⁷ Similarly, the FSA's recent survey on UBDs found that 50% of adults in England, Wales and Northern Ireland cannot identify the correct definition for a UBD 'that food can be eaten until the use-by date, but not safely after'.²⁸

Confusion was exacerbated by a lack of consistency in where a UBD is located on a product, and the limited visual differences between how UBDs and BBDs are shown. This made it more difficult for participants to interact with the UBD and was especially mentioned by time pressed parents and older participants who found it difficult to see UBDs, for example if they were not wearing their glasses. Inconsistencies in the location of date labels is also reported in the literature, which describes how the inability to quickly

²⁶ Evans, E. W. and Redmond, E. C. (2014). Behavioural Risk Factors Associated with Listeriosis in the Home: A Review of Consumer Food Safety Studies. Journal of Food Protection, 77, 510-521. [Online] [Accessed on 12 March 2021]. Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. International Journal of Consumer Studies. 37, 422-432, Hall-Phillips, A. and Shah, P. (2017). Unclarity confusion and expiration date labels in the United States: A consumer perspective. Journal of Retailing and Consumer Services, 35 (May 2016), 118–126. [Online]. [Accessed 26 March 2021]. Himmelsbach, E., Allen, A. and Francas, M. (2014). Study on the Impact of Food Information on Consumers' Decision Making. TNS European Behaviour Studies Consortium. [Online] [Accessed 26 March 2021]. Mcllveen, H. and Semple, L. (2002). Seeing is believing: current consumer use and understanding of food labels. Nutrition & Food Science. 32. Milne, R. (2013). Arbiters of waste: date labels, the consumer and knowing good, safe food. The Sociological Review, 60, 84-101. Priefer, C., Jörissen, J. and Bräutigam, K. (2016). Food waste prevention in Europe – A cause-driven approach to identify the most relevant leverage points for action. Resources, Conservation and Recycling, 109, 155-165. Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. Food Control, 37, 85-97. Wills, W., Meah, A., Dickinson, A. and Short, F. (2013). Domestic Kitchen Practices: Findings from the 'Kitchen Life' study. University of Hertfordshire. Social Science Research Unit. Food Standards Agency. [Online]. [Accessed on 25 March 2021]. ²⁷ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].

²⁸ Food Standards Agency (2021). <u>The FSA reveals that 50% of adults do not always check the use-by</u> <u>date on their food putting themselves and family at risk</u>. Available at: [Accessed 2nd April 2021].

locate and identify the UBD may be reducing consumer awareness of UBDs on the food they are buying.²⁹

"It made me more aware of labels regarding contents because I have to put my glasses on to read the small print of the dates and cooking instructions". – Male, 69, White, single person household, England

Cath is a regular shopper of food close to the UBD and often consumes food after the UBD. Her purchase of eggs below exemplifies how she often confuses BBDs as UBDs despite defining them correctly when asked.

Cath's bargain eggs

Female Single person 55-64 household, no children Wales	"If I've got anyone else here, I wouldn't serve them out of date food You wouldn't because you couldn't afford for them to be ill. I mean don't consider if I was going to be ill from it, but that chicken curry that had been heated up in my car was a consideration. Nothing else I've eaten since has ever been a consideration I am more concerned about little ones and old people"
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Shopping

Cath regularly purchases reduced food from different supermarkets as it means she can buy items she wouldn't usually be able to afford. She often eats eggs and bought a reduced pack as a spontaneous buy, describing them as a bargain. She knew at the time that she would eat the eggs past the date, identifying this as a UBD although the label says "best before".

Confusion about

UBD and BBD

bowl of water to see if they float, which she believes signals the eggs are unsafe to eat. If they sink, she will use the eggs regardless of the date label.

Water test rather than

date to judge safety

Assessing

Cath judges whether the

carrying out the water test.

She places the eggs in a

eggs are safe to eat by

Cath is conscious of preparing the eggs because of the risk of salmonella. She would not eat raw eggs regardless of the date. Because of this, she washes her hands regularly after cracking the eggs, but does not prepare them any differently because they are past their best.

Preparing

Cath is happy to use these eggs a month past the date label if they pass the water test. However, she wouldn't serve them to others and would be especially conscious of older people.

dium

ge Eggs

Always cooks eggs

Would not serve to others

1.2 Understanding how the UBD is determined

Although the meaning of the UBD as related to safety was understood, the date was viewed as more of a guideline than a rule. Participants often expressed scepticism about the date being an exact cut-off. They felt that food cannot suddenly expire, believing

²⁹ Hall-Phillips, A. and Shah, P. (2017). <u>Unclarity confusion and expiration date labels in the United States:</u> <u>A consumer perspective</u>. Journal of Retailing and Consumer Services, 35 (May 2016), 118–126. [Online]. [Accessed 26 March 2021].

there is a window after the UBD where it is acceptable to eat a product, which would differ according to the item.

"I wouldn't consider it a complete and utter cut-off date, there is a bit of leeway, even for the firms who prepare it, they must know it is safe. It is not going to drop off the end of a cliff after that day." – Male, 75, White, multi-person household, no children in the household, Wales

Participants explained how they had not been ill from eating food past the UBD, emphasising that this personal experience meant the date cannot be entirely accurate, but a conservative estimate from manufacturers. In some cases, especially by younger participants, this was supported by assumptions about how the UBD was estimated, suggesting it was based on an average safety level for the product. However, there was widely a lack of understanding about how a decision to determine the UBD is made.

> "The dates are based off some general analysis almost like a half-life. Most items of food are going to have gone off past this point, but I don't know what proportion... But they are going to be very cautious, conservative with those dates." – Male, 32, White, multi-person household, no children in the household, England

This is supported in the literature which suggests consumers often believe that manufacturers and retailers set conservative UBDs.³⁰ Thompson et al. found that the greater the strength of belief that food companies are setting dates conservatively, the more willing individuals are to consume food with expired UBDs.³¹

³⁰ Priefer, C., Jörissen, J. and Bräutigam, K. (2016). Food waste prevention in Europe – A cause-driven approach to identify the most relevant leverage points for action. *Resources, Conservation and Recycling,* 109, 155-165. Toma, L., Costa Font, M. and Thompson, B. (2020). Impact of consumers' understanding of date labelling on food waste behaviour. *Operational Research International Journal,* 20, 543–560. Waste Resources Action Plan (WRAP) (2019). Consumer behaviour, date labels and food waste. Waste Resources Action Plan: prepared by Linda Bacon with contributions from David Hall and Izzy Brennan.
³¹ Thomson et al. (2018). Quoted in Waste Resources Action Plan (WRAP) (2019). Consumer behaviour, date labels and food waste. Waste Resources Action Plan (WRAP) (2019). The prepared by Linda Bacon with contributions from David Hall and Izzy Brennan.

1.3 Understanding the risks of consuming expired food

Participants had a limited understanding of the causes of food poisoning and how this relates to expired food, even though they recognised that eating products past the UBD could make them unwell. There was a tendency to associate food poisoning with eating out, rather than food prepared at home, as well as with certain types of products such as meat or fish. They rarely mentioned the growth of bacteria as a risk associated with expired food that could make them ill. Those who did, explained how they had learnt about this in the workplace, such as working in a café, from a food safety course, or at school during food technology classes. They often related this to a specific food group rather than associating it with the risks of eating food past the UBD more generally.

"Fish and meat, if you go beyond the UBD, I feel it would have harmful bacteria such as salmonella³² and that can be very harmful. Whereas in cheese or yoghurt or bread, at most it gets mouldy." – Male, 46, Asian, multi-person household with older child in the household, England

Participants tended to engage with UBDs at the point of purchase and when a product had expired, but not in between. For example, one participant with younger and older children, described always checking the dates on everything she buys to identify the item with the longest shelf life. However, after storing items correctly at home, she mentioned that she does not think about food safety or UBDs.

1.4 Where knowledge about UBDs came from

Participants were largely unaware of how their understanding of UBDs had developed or where it came from. There was a widespread assumption that it was something they had picked up from parents or at school, but participants found it difficult to pinpoint exactly how this had happened. Those who cooked regularly described understanding more about UBDs as they started to buy and prepare food as an adult.

³² Salmonellas are a group of common bacteria that cause food poisoning. They are usually spread by inadequate cooking and through cross-contamination. Salmonella bacteria are most often found in: raw meat, undercooked poultry such as chicken or turkey, eggs, unpasteurised milk. More information can be found on the FSA website: Food Safety Hygiene Salmonella

"It could be my mum when I was young, years ago, but you just don't follow it until you start cooking yourself and get a bit more cautious." - Male, 39, older child present in the household, England

Broader food safety knowledge was developed from "experience over time" or watching parents during childhood. Participants who had worked in the food industry described learning about food preparation and hygiene practices in general, but they did not always recall covering UBDs explicitly as part of their training. For example, one participant described working as a manager in a fast-food chain where they attended food and hygiene courses, but largely remembered this relating to food temperature. Another single parent described how she had previously worked in the food industry and learnt to always take items from deep in the freezer, so they did not defrost, and put meat on the bottom shelf in the fridge. Although she understood the importance of the UBD relating to food safety, she was comfortable eating food after the UBD if it looked okay.

> "I am stricter with myself with stuff with the UBD on, but I must admit that I have. I think I used some meat last week that was a day over the UBD. It smelt and looked fine, so I did use it because obviously it was cooked for three hours. I also used a carton of single cream a few nights ago that was a week over its date, but it was fine." – Female, 50, White, older child present in the household, England

TV shows and public health announcements such as salmonella warnings were mentioned, mostly by middle-aged or older participants. These tended to be linked to specific types of food and were not connected to wider food safety or UBD knowledge. For example, one father described a salmonella outbreak which led them to be more careful with chicken and eggs. However, this had not influenced his knowledge or behaviours with other food types or his approach to UBDs.

> "Quite a while ago now, I remember the big scare in the 80s about Salmonella, think it was eggs that the scare was with and I don't think we ate eggs for a while as a family. Although it was a little bit unfounded really." – Male, 41, White, multi-person household with younger children in the household, England

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2. Motivations: Food practices, judgements and assumptions

Both deliberate and instinctive motivations influenced participants' behaviours towards UBDs. In some cases, participants were consciously aware of what they were doing, deliberately making decisions based on their assessment of risk or understanding of UBDs. At other times, behaviours were based on routines or instinct, with their approach becoming habitual over time without much consideration of 'why'. The wider literature suggests that when consumers prepare food, habitually ingrained behaviours come to the fore with the result that they are less likely to check the label when preparing familiar foods.³³ This emphasises a relationship between habitual behaviour, repeat experience, and a risk tolerant consumer attitude. Studies describe how individuals disregard UBDs on the justification of "having always done things this way" to no ill consequence.³⁴

This section summarises the findings related to motivations defined in the COM-B framework as all the brain processes that direct behaviour.³⁵ This includes habitual processes, emotional responses and analytical decision-making.

Summary of the drivers and enablers related to motivations

What drives people to consume food past the UBD?

- UBDs were not always seen as a key factor in assessing food safety. Instead, participants focused on food preparation and hygiene practices as the main ways for ensuring food was safe to eat.
- There was extensive trust in the sensory judgements employed by participants including the "sniff test", visual cues, texture and taste. Previous experience of using these techniques and not becoming ill gave them confidence to use the UBD as a guide rather than a rule.

³³ Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. *International Journal of Consumer Studies*. 37, 422-432.

³⁴ Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health,* 10, 4060-4085.

³⁵ Michie, S., Van Stralen, M. M. and West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6, 42

- Participants questioned the importance and specificity of UBDs, lacking trust in them in comparison to their own sensory judgements which provided a sense of control.
- Spontaneous personal desires were balanced against meal planning and individual values, which often focused on reducing waste.

What could encourage greater UBD compliance?

- Encouraging people to rely on UBDs over their sensory judgements is unlikely to be fruitful, as these behaviours have been cemented over time for participants with no perceived ill effects.
- Instead, focusing on meal planning, shopping lists and checking the fridge before purchasing items could help to avoid individuals ending up with excess food that is close to or past its UBD. Linking these types of planning to reducing food waste and saving money could also tap into individual desires and values, making them more likely to stick.
- An assurance scheme for date labels might support compliance by increasing trust in UBDs.

2.1 Sensory judgements

Participants widely used sensory judgements to decide whether expired food was safe to eat instead of, or in addition to, the UBD. They deliberately assessed food using a range of senses including:

- The "**sniff test**". Participants would be guided by the smell of an item past its UBD and choose not to eat it if it smelt 'off' to them.
- Inspecting the item for **visual cues** it is no longer safe to eat such as mould, liquid rising to the top or condensation in the packaging.
- Inspecting the **texture** of the item, for example if it has become 'slimy'.
- **Tasting a small quantity** of the item and assessing how similar it tastes compared to past experience of eating the same product.

The approach taken often differed depending on the product being assessed as summarised in Table 4 below. This also reflects the wider literature. For example, the FSA's Food and You 2 survey found that smell was most often used to assess raw meat

(76%) and milk and yogurt (73%), while cheese was most often evaluated visually (65%).³⁶ In Prior et al., 69% of participants used sight to see whether cheese was safe to eat, concerning themselves with mould, and 44% of participants checked whether meat was safe to eat or not based on colour.³⁷ The literature highlights that often these assessments occur in combination, with over 80% of individuals visually assessing and smelling a product (82.5%), followed by 67.5% looking at the UBD or BBD and 50.4% tasting it.³⁸

UBDs were not always seen as a key factor in assessing food safety. Instead, participants focused on food preparation and hygiene practices as the main ways for ensuring food was safe to eat. For example, handwashing, cleaning surfaces and keeping food groups separate when storing and preparing meals were often regarded as more important than UBDs. One participant living on their own described how they only shop at supermarkets for hygiene reasons as they would not feel comfortable with food being handled by others at a market. They used the UBD as a guide, but relied primarily on the smell, texture and look of the food as they felt confident in the storage and handling of the item before purchase.

Although participants assessed the UBD before making a meal, this was seen as one piece of information combined with wider sensory judgements and previous experience. Participants argued that reactions to food were often individual, meaning that only they could judge their personal tolerance for expired food. For example, one participant explained that they grew up in Spain eating raw hams, cured meats and Spanish omelette where the egg is often only just cooked. They felt this gave them a good tolerance for food and meant they were not overly concerned about food safety. Additionally, they commented that they felt British culture meant people were overly cautious about eating raw meat, and his daughter has a different diet to what she might have had if they lived in Spain.

³⁷ Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food attitudes and behaviours in the UK:</u> <u>findings from the Food and You survey 2012</u>. [Accessed 18 March 2021]

³⁶ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). <u>Food and You 2: Wave 1 Key Findings</u>. Food Standards Agency. [Accessed 2nd June 2021].

³⁸ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97.

Older participants in particular, were confident in their personal checks and experience with certain items and would make a judgement based upon this as opposed to the UBD. They did not see themselves as at a greater risk compared with others and in some cases described consuming food days beyond the UBD with little hesitation.

> "If its meat or fish usually 24-36 hours past date. If it's veg or dairy based then 48 hrs I find is fine." – Male, 69, White, single person household, England

Meah suggests that for many consumers, UBDs provide the 'starting reference point' for decisions about food safety, although it is habitual practices, habits, experience, and sensory tests that ultimately shape decisions regarding food consumption.³⁹ Sensory judgements were well practiced by participants who would employ the same approach regardless of whether food was past its UBD or not. They described how this was a part of their routine for preparing food, checking its suitability before starting to cook or consume a product. While this varied by individual, there were few patterns related to age, gender or household consumption.

"When I eat anything that's dairy, I'd always have a little smell and think 'is that alright?' I will always do that, even if it's in date." – Female, 50, Welsh Celtic, single person household, England

³⁹ Meah, A. (2014). Still blaming the consumer? Geographies of responsibility in domestic food safety practices. *Critical Public Health*, 24, 88-103.

Table 4: Breakdown per food group

Food group	Feelings towards food	Assessments and	Preparation	Participant's viewpoint
	safety	judgements employed	techniques	
Dairy (cheese)	Less caution towards cheese, common to have found mould on cheese and cut it off – not seen as a health risk.	Difficult to employ a sniff test with cheese, so would conduct a visual test and remove mould.	Mould on cheese cut off. Little change otherwise.	"Cheese would be fine to consume, and many cheeses have mould cultures anyway." – Male, 41, White, multi-person household with younger children, England
Other dairy (milk, yoghurt)	More caution with milk, cream or yoghurt – health risks seen as more likely. Mixed feelings towards butter; some would discard immediately whilst others employ sensory judgements.	UBD on milk often seen as inaccurate so reliance on other tests. Check the milk isn't lumpy. Sniff test all items. Consider storage for example in the fridge.	Use milk in cooking instead of for drinking. Combine yoghurt with other foods for example smoothie.	"I might use milk beyond the UBD if it was suitable. Taste, smell and visible cues are important." – Male, 46, Asian, multi-person household with older child, England
Raw meat	Less caution with red meat, seen as safe to eat after UBD so long as sensory checks okay. Chicken seen as riskier.	Storage plays a key role in decision making. Visual inspection, for example, has the meat changed colour. Sniff test all items.	Ensure the middle is piping hot before eating. Consider cooking for longer or at a higher heat.	"I would rely on smell a lot when deciding whether to eat this item. I would not eat if there was an off odour or excess liquid in the packaging. Once cooked I would visually check and smell again before eating." – Male, 35, White, with young child, Northern Ireland
Cured meats (salami, ham)	More acceptable to eat past the UBD than raw meat, UBD interpreted as a guideline. More relaxed if stored in the fridge, unopened or in an airtight container.	Inspect for darkening of colour. Sniff test. Consider storage including fridge/ opened packaging.	Might combine with another food item, or in a hot dish, for example, in a sandwich, on a pizza or pasta bake.	"I would eat salami after the use by as most of these contain nitrates / preservatives and are cured and are probably a little more durable than raw meat." – Male, 40, White, multi-person household with younger children, England

Food group	Feelings towards food	Assessments and	Preparation	Participant's viewpoint
	Salety	Judgements employed	techniques	
Fresh fish	More caution with fish, tend to be more likely to adhere to the UBD. UBD seen as less important if the fish is cured/smoked.	Visual inspections. Sniff test, although noted this can be difficult with fish due to existing smell.	Add to a hot meal, where the item will be heated. Ensure it is hot throughout, it is not watery.	"Much like cured meat, if smoked it has been treated to last. I'd likely continue to use it if it looked, felt and smelled ok. Perhaps, because it's fish and I'd worry about bacteria, I'd want to cook it at a high heat to kill any germs." – Female, 40, White, multi-person household with younger and older children, England
Ready meals	Comfort eating after the UBD if the item was frozen when purchased and stored. More caution if the meal contains meat/fish.	Visual inspections for example condensation in the packaging. Smell during cooking (especially if frozen). Change in texture/ structure.	Cook/microwave for longer, especially if it contained meat. Ensure it is hot throughout.	"I would eat a microwave curry shortly after the use by date (if refrigerated) or a long time after the use by date (if it had been frozen just after purchase) as it is precooked, seasoned and contains preservatives. I would prepare it the usual way." – Male, 40, White, multi- person household with younger children, England
Fresh, pre- packaged food (sandwiches, salad bags)	Dependant on sandwich filling for example if fish/meat/dairy more caution employed. Less of a food safety concern associated with fruit/salad, more about taste. View that items lose freshness before UBD.	Inspect the fruit for firmness, for example, tomatoes. Inspect the salad to see if has wilted/gone mushy. Try a small amount, for example, one piece of fruit.	Pick out any particular items that look off, have gone slimy or changed colour for example lettuce.	"Would definitely use this past its use by only if it was not covered in a dressing. Would judge the veg by their appearance." - Female, 44, White, multi-person household with younger children present, Northern Ireland

Martin often buys food at a reduced cost and freezes it to extend its life as the cost of food is important to him. His purchase of a pie below exemplifies how he is not concerned about the UBD, and that so long as it has been cooked for long enough, he is happy with its safety.



2.2 Control and trust in UBDs

Checks and personal assessments provided participants with a sense of control, reflecting on how their approach had prevented them from becoming ill in the past. Many chose to cook expired food items at a higher heat or for a longer duration having decided the food was safe to eat, a consistent finding across consumer groups. Van Boxstael et al. found that 8.4% of people reported using heat to eliminate food safety issues in expired food.⁴⁰ This practice was found to be most common amongst 18-30 year olds (9.4%), with 7.8% of both 31-65 year olds and over 65s reporting using heat in this way. Sensory judgements also informed storage and packaging decisions about opened products, such as whether to store an item in an airtight container.

⁴⁰ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97.

Participants described how they felt these judgements reduced the level of risk involved in eating an item past its UBD as they were in control of the process and trusted their personal assessment. This served to reinforce their assumed knowledge about the risks of eating expired food if they did not get sick afterwards. They described how they had taken a similar approach to assessing expired food for years and had never got unwell after eating a product, with routines often particularly ingrained in the behaviour of those who had been cooking for longer. This experience perpetuated participants' lack of trust in UBDs, prioritising their sensory judgements over the UBD based on their experience. However, often more caution was taken when preparing meals for others including instances of parents adhering to the UBD when cooking for their children (discussed further in section 3 of this report).

More generally, participants exhibited a lack of trust in UBDs. This was often driven by attitudinal factors including upbringing, past experiences, and risk-tolerance rather than demographic factors such as age or gender. Those with the least trust in UBDs often based this on their uncertainty about how UBDs are determined and suspicion about the potential ulterior motives behind UBDs mentioned above. It was also pointed out by a small number of participants who regularly bought products outside of a supermarket (such as meat from the butchers or a local farm, or fruit / vegetables and cheese from a local market) that these products do not come with a UBD. This group of participants questioned the importance of the date if it was not always required. This undermined confidence in the accuracy of the UBD combined with their experience consuming expired food safely. For example, one Northern Irish participant with a young child commented on how they probably never use the meat they purchase from the butcher within the UBD that a supermarket would place on the same item. This contributed to their lack of trust in UBDs as they had never become ill, undermining the role of UBDs in food safety.

Reflecting these factors, participants consistently viewed UBDs as a guide and not as a strict rule to adhere to. This attitude was held by participants across the study, without any patterns in demographic or consumer groups. They saw UBDs as one step in the process of assessing food safety, with their experience of sensory judgements reaffirming this.

> "I use the UBD as more of a guide, and then use my experience of the food itself to really guide my decision. I wouldn't want to waste it,

> > 34

but if I had any questions about it being safe to eat, I would throw it away and not feel guilty." – Female, 32, White, multi-person household, no children in the household, Wales

2.3 Past experience and routines

Experiences of food-related illness

Past experiences and routines formed the basis of participants' approach to food safety and were often prioritised in importance over the UBD. While participants were aware of and to some extent understood the risks of eating food past its UBD, these were often seen as short-term or mild. Frequently, participants drew on their personal experiences saying that they had never been ill after consuming expired food so they did not think this would happen in the future. The absence of illness was a signal that the risk was low, and that any illness was unlikely to be severe. In this way, the risks of eating expired food was assumed to be a 'one-off' event, with longer-term health impacts seen as highly unlikely and not consciously considered.

Those who had experienced food poisoning or food related illness tended to attribute this to the specific food group or food preparation. As such, it did not have an impact on the perceived risks of eating food past the UBD. In the literature, previous negative experiences with food-borne illness is reported to increase the perception of the risks of consuming expired food, particularly if experienced in childhood.⁴¹

"The cooking aspect is important to me, because of previous food poisoning. More with seafood rather than chicken or anything. Just makes me a bit more conscious about how it is cooked and if it is cooked because it is awful going through that." – Female, 29, Asian, multi-person household, no children in the household, Wales

⁴¹ Farr-Wharton, G., Foth, M. and Choi, J. (2014). <u>Identifying factors that promote consumer behaviours</u> <u>causing expired domestic food waste</u>. *Journal of Consumer Behaviour,* 13, 393-402. [Online]. [Accessed on 11 March 2021].

Jane regularly purchases yoghurt for her protein shakes and buys it in the knowledge she will use it past the UBD. Her purchase below exemplifies how doing this continually over time means she is confident in the safety of the item.

lana'a	nrotain	ahakaa
Jane s	•1(•1(+1))	Snakes
		0110100

Female	Multi-person
18-34	household, no children
Wales	British Asian

"I look at the yoghurt to see if it's watery at all. I'll taste a bit and if it tastes fine, I'll use it. And because I've done that and felt fine before, I know it works for me. I've had experiences when someone says it's out of date and I've smelt it and tasted it and it's been fine, so I just along with my experience of the product and what I've done in the past."



Although Jane would be

happy to eat the yoghurt

herself, she would check

with her boyfriend before

to make sure he is

what he eats.

giving it to him. She wants

comfortable and can make

his own decision about

Shopping

Jane regularly purchases protein yoghurt from the local supermarket. Although she knows the UBDs tend to be shorter here than at other shops, this is the most convenient and the prices are cheaper. She buys the product knowing she won't adhere to the UBD, as she plans to eat it afterwards.

> Convenience and routine

She stores the item in the fridge, but does not check the packaging. Before eating the item, she looks, smells and tastes a small amount. If it seems okay, she will use it up to four days past its UBD. In the past, she became ill from eating yoghurt five days past the UBD. This means she now uses four days as her cut-off point.

Sensory tests based

on past experience

Assessing

Jane uses the yoghurt in protein shakes. She doesn't prepare the shake any differently because the yoghurt has expired. However, she would use this yoghurt first even if she would prefer to have another flavour at the time.

first

Preparing

Eats expired product

Avoids serving to others

Upbringing

Often personal experiences from childhood had a lasting influence on participants' attitudes and behaviours towards food. For example, one participant grew up in South Africa where there had been a listeriosis outbreak when she was younger which had made her more cautious about food safety. Older participants often referred to the cost of food when they were younger or being brought up not to waste food. The wider literature also highlights the continued influence of rationing after the Second World War.42

> "My wife is more comfortable eating leftovers, she doesn't like waste. I don't like to eat the same things again and again. But she would prefer not to waste it, she has a wartime mentality to never waste

⁴² Milne, R. (2011). A focus group study of food safety practices in relation to listeriosis among the over-60s. Critical Public Health, 21, 485-495. [Online]. [Accessed on 11 March 2021].
your food." – Male, 75, White, multi-person household, no children in the household, Wales

A number of participants also made reference to their family struggling when they were growing up or knowing others who were in less fortunate positions when it came to food affordability. This made a lasting impression on participants, reflecting how their behaviours had often been developed during their upbringing.

> "My mum and dad never liked wasting food, they say that in their day they didn't have UBDs. And if it looks and smells fine and it is a waste thing as it costs money." – Female, 32, White, multi-person household with younger children in the household, England

However, participants also recalled stories of their parents being very strict about food safety including UBDs. This resulted in participants either sticking to UBDs and safety practices learnt from their parents or becoming more relaxed about food safety once they had grown up.

"Going back, we didn't have UBD then, it was unheard of. But I know that some years ago when my mum died, she would be horrified at me keeping stuff past its UBD, she would have said it's got to be gone by then, thrown or consumed." – Male, 69, White, single person household, England

In some cases, participants described their experience of food safety before UBDs were added to packaging. Those who had older parents described the lack of labelling or existence of UBD in the past, meaning that their parents or grandparents had to get by on judgement. This was reflected in the diaries of older participants who tended to rely more on personal judgement and experience than the instructions or dates on the labels.

> "I have been brought up to not waste food and when I was growing up things never had dates on and we never got ill." – Female, 72, Iranian, multi-person household, no children in the household, England

Similarly, one participant described learning about UBDs after moving to the UK from India. He continued to rely on his experiences of judging food safety based on how they had prepared food in India, focused on ensuring products were stored in hygienic conditions (such as meat being packed shortly after slaughter, or the product being kept chilled at all times). For this reason, he lacked confidence in how meat was stored in a butcher's shop as he was concerned about how many people might have handled an item. This meant he would always cook meat bought from the butchers on the day it was purchased.

Familiarity

Over time, participants had developed approaches to dealing with familiar foods, which created a degree of comfort in eating them past the UBD. The wider literature also suggests that familiarity with a specific product lowers the perceived risk of eating items past the UBD.⁴³ Personal routines had become crucial in participants' food safety decisions, leading them to rely on familiar processes which they trusted to keep them safe. The approach taken often differed depending on the product being assesses as summarised in Table 5 below. For example, one participant described their routine to assessing and preparing frozen ready meals:



"I bought this item on its last use by date and placed it in the freezer on that date. I have let this item defrost in the fridge from early this morning. Once defrosted I will place in the oven at a low heat for approx. twice the recommended cook time. This is to ensure it's cooked through. I will decide this item is fresh by visually inspecting it

⁴³ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].

when I remove the packaging before placing it in the oven. I will also smell the item. Once cooked I will visually and thoroughly smell inspect the item before eating. Once I begin eating, if the item tastes different at all then I expect I would not eat the item. This is what I always do." – Male, 35, White, household with a young child in the household, Northern Ireland

Table 5: Breakdown per food group

Preparation practices	Relevant foods	Approach and reasoning	Participant's viewpoint
Cooking food for longer	Microwave meals such as curry or pasta, pre- cooked	 Participants consciously decided to cook food for longer than usual or for longer than the packaging recommends, often to ensure it reached a hot enough temperature. In some cases, cooking food for longer in the 	"We probably over cooked it [vegan fish fingers], rather than under cooking it." - Female, 32, White other background, multi-person household, no children, Wales
	foods	 microwave was seen as a way to ensure the product was piping hot. This made them feel safer, with a small number of participants explaining this was because harmful bacteria were more likely to be killed. They would also check the food more frequently during the cooking process, paying attention to how hot the food was and to ensure the texture did not look unusual. 	"After a minute, I checked [the ravioli] it was not going runny inside and it was cooking as it should do. I check things through more half-way through cooking." - Male, 20, White, multi-person household, no children, England
Cooking food at a higher temperature or heating ready to eat food	Microwave meals such as curry or pasta, quiches	 Participants would cook food on a higher temperature than usual in the oven, and some mentioned how heat kills bacteria. However, this was rarely linked to reducing the chance of being ill. 	"It just feels if you heat something up, a lot of the baddies will die in the heating process." - Female, 32, White other background, multi-person household, no children, Wales
	and pies	 Cooking at a higher temperature was considered more important for microwave meals as participants did not know how the food had been processed before purchasing it. This meant they were less confident in its safety, compared to if they had prepared the meal from scratch and knew what they had done. Quiches and pies that were pre-cooked were more likely to be eaten heated than cold and at a 	"Anything in the microwave I will usually give it a go as I think it will be cooked at such a high temperature it will kill anything, as it cooks from the middle outwards but not the oven." - Female, 32, White, multi-person household with younger children, England "I absolutely make sure that it is piping hot. But that is mainly with pre-prepared meals." – Female, 50, White, multi-person household with older and younger children, England

Preparation	Relevant	Approach and reasoning	Participant's viewpoint
practices	foods		
		higher temperature. Again, this was because of	
		the belief that heat kills bacteria.	
Preparing food	Ready	Participants cooked expired food that they did	"Curry I would microwave it, taste it and then can
before making a	meals such	not want to taste raw so they could perform	immediately tell if it has gone off." – Male, 46, Asian,
sensory	as curry or	sensory tests before eating.	multi-person household with older child, England
Judgement	pasta	If it looked fine during cooking such as if there	
		was no unusual liquid, then they would taste it to	
		check the havour is as they expect.	
		• It was assumed that if it passes the visual test	
Pomoving	Hard	and then the taste test, it will be safe to eat.	"Blue cheese is mouldy anyway and with cheese, you
mouldy/	cheese	• Failicipalits said they offenscraped of cut mound	may come across a bit of mould or its old. I would not
discoloured	cream	of fruit and vegetables	hesitate cutting that part and eating the rest " - Male 75
parts	cheese.	 They believed that the other non-mouldy parts of 	White, multi-person household, no children, Wales
F	voghurt,	the product would be safe to eat	······, ······
	fruit,	 They also judged the extent of the mould or 	"If there was only a small bit of mould, I would not mind
	vegetables	discolouring. If more than half of the product was	eating [cream cheese] on a bagel." - Male, 33, White,
		brown or mouldy, they would not use it.	multi-person household, no children, Northern Ireland
		• For cheese, they explained how the product can	
		be bought mouldy and should therefore be safe	"Like a bit of fruit the other day, there was a couple of
		to eat.	strawberries where bits were soft and we just cut that off
			and you can eat the rest of it." – Female, 44, White,
			multi-person household with younger children present,
	E		Northern Ireland
Cooking with	Fruit,	Foods that can be eaten without cooking	If they [peppers] were past their UBD, I would definitely
a moal	dairy	(peppers, cheese or cooked meats) were more	might be lost and it feels safer to cook it " Eemale 32
ameai	dan y	likely to be cooked or added to a dish that	White other background multi-person household no
		requires cooking.	children Wales
		• For example, cheese or salami might be added	
		to a pasta sauce rather than eaten cold.	"I would cook it [salami] rather than eat it raw, thinking it
			would be better, a hot temperature would kill anything

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Preparation practices	Relevant foods	Approach and reasoning	Participant's viewpoint
		 Vegetables were also more likely to be mixed with other ingredients in a cooked meal rather than consumed raw in a salad. This was primarily said to make any changes in taste and texture less noticeable; safety was rarely mentioned. A handful of participants felt that cooking the product would kill any potential bacteria, but taste remained the primary concern. 	that has contaminated it." - Female, 44, White, multi- person household with younger children present, Northern Ireland "For example, cream cheese, I would be more likely to cook with it as the heat kills off any badness. But on toast or something I would be more wary as it is cold at that stage." - Male, 33, White, multi-person household, no children, Northern Ireland
Mixing food past the UBD with fresher food	Salad leaves, vegetables	 Participants said they mixed older and fresher foods, to make the older food less noticeable. For example, mixing fresh salad leaves with those after the UBD to make one meal. This was not associated with making the food safer but eating the food without noticing a decline in quality, texture, or taste associated with it being past the UBD. 	"When they started going a little limp, I mixed them in with fresher leaves so it didn't seem wilted, and to bulk it up." – Female, 40, White, multi-person household with younger and older children, England

Meal planning

The extent to which participants planned meals also influenced their behaviours. Those who regularly planned meals were often more likely to adhere to the UBD as they had considered the shelf life of products at the point of purchase. However, when their meal plan for the week was interrupted, for example with a spontaneous takeaway, change of plans or eating out, they described how they could forget about an item. This increased their likelihood of eating a product past its UBD, either because they wanted to avoid wasting the food or because they had adapted their meal plan and needed the item for a different day.

"I am an excellent planner so I know if I batch cook, which meals it will be used at in the next fortnight so it's rare anything hangs around. I'm not organised enough to label things, but I know when the food will be eaten." – Female, 43, Mixed White and Black Caribbean, younger child present in the household, England

In contrast, those who did not plan their weekly meals often lacked a routine for ensuring food was eaten before the UBD beyond checking the fridge before they started cooking. For these participants, decisions were made on an ad hoc basis throughout the week meaning the likelihood of eating something past its UBD increased as they were more likely to forget about what they had available. One Welsh participant commented that they had bought some vegan fish fingers on discount which were not suitable for freezing. They struggled with planning their lunches due to their work patterns and as a result ate the fish fingers after the UBD as they had forgotten about buying them.

2.4 Desires and values

In addition, participants described their in-the-moment desires for certain types of food influencing their decisions. They shared situations where they had planned a meal only to realise that the items they needed were out of date. In many cases the desire to eat as expected overruled the UBD with participants assessing the items and deciding they were safe to eat. This also influenced their decisions to purchase items, particularly if they were attracted to deals or reduced items as described further below. This could result in participants buying excess food which they were unable to consume before the UBD but also preferred not to waste resulting in the consumption of expired food.

"If I don't fancy it, I'm not going to force myself to eat a block of feta cheese. It does last longer than what it says on the packaging, so I will leave it and eat something I prefer at that time instead ." – Female, 29, Asian, multi-person household, no children in the household, Wales

Participants described their perceptions of the moral and ethical dilemmas associated with "wasting" food. The thought of disposing of food while others cannot afford everyday items posed a difficult dilemma for participants when it came to throwing things away. In some cases, they referred to their upbringing, their cultural heritage or the attitudes of their parents towards waste as described above having influenced their values and beliefs today. For example, one Northern Irish participant described being brought up in a large family where money was tight, while another emphasised their gratitude towards living in a country where food is available. The wider literature also identifies that consumers concerned with global sustainability and food waste are more likely to consume food that is past its UBD.⁴⁴ For this group, food was seen as precious and they felt it should not be wasted.⁴⁵

"I don't like wasting because I believe we are so grateful to be in a country where there is not an issue with food... That is my main reason I don't waste and use past the use by date even if it is a few days after." – Male, 39, Asian, older child present in the household, England

⁴⁴ Farr-Wharton, G., Foth, M. and Choi, J. (2014). <u>Identifying factors that promote consumer behaviours causing expired domestic food waste</u>. *Journal of Consumer Behaviour*, 13, 393-402. [Online]. [Accessed on 11 March 2021]. Meah, A. (2014). Still blaming the consumer? Geographies of responsibility in domestic food safety practices. *Critical Public Health*, 24, 88-103. Watson, M. and Meah, A. (2013). Food, waste, and safety: negotiating conflicting social anxieties into the practices of domestic provisioning. *The Sociological Review*, 60, 102-120. Wills, W. J., Meah, A., Dickinson, A. M. and Short, F. (2015). <u>'I don't think I ever had food poisoning'</u>. A practice-based approach to understanding foodborne disease that originates in the home. *Appetite*, 85, 118-125. [Online]. [Accessed on 25 March 2021]. Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour</u>. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021].

⁴⁵ Wills, W. J., Meah, A., Dickinson, A. M. and Short, F. (2015). <u>'I don't think I ever had food poisoning'</u>. A practice-based approach to understanding foodborne disease that originates in the home. *Appetite*, 85, 118-125. [Online]. [Accessed on 25 March 2021].

3. Opportunity: The social and physical environment

Opportunity is defined in the COM-B framework as all the factors that lie outside the individual that make the behaviour possible or prompt it.⁴⁶ This includes wider social influences, affordability and the physical environment such as proximity to the shops.

Summary: Drivers and enablers related to opportunity

What drives people to consume food past the UBD?

- Although participants felt comfortable preparing expired food for themselves, they
 were often more reluctant to do so for others. They had particular concerns about
 serving food past the UBD to children, older people, pregnant women and those
 with a weaker immune system. However, they also emphasised the importance
 of having a choice to consume expired food, which they did not want to take away
 from their guests, and the potential for social judgement if others found out.
- Participants commonly purchased items at a reduced cost or in bulk as a way of saving money. This led to the consumption of expired items due to the shorter shelf life of products or excess food that could not be consumed in time.
- Purchasing decisions interacted with a widespread reluctance to waste food, resulting in participants preferring to eat a product after the UBD than throw it away.
- The physical environment including proximity to shops, reduced choice from online shopping and lack of storage space also influenced participants' ability to consume food before the UBD or store it safely to prolong its shelf life.

What could encourage greater UBD compliance?

 Personalising the risk of consuming expired food could encourage individuals to recognise the potential harm associated with eating items past the UBD, drawing on their reluctance to serve food to guests and vulnerable groups. By making a link with an individuals' potential risk profile, this could encourage greater compliance as seen when serving food to others.

⁴⁶ Michie, S., Van Stralen, M. M. and West, R. (2011). The behaviour change wheel: A new method for characterising and designing behaviour change interventions. *Implementation Science*, 6, 42.

• Increasing the shelf life of reduced items, providing a UBD range for items bought online (for example advising there will be at least five days until the UBD from the point of delivery) and offering smaller package sizes could also support greater compliance, giving individuals more choice to purchase cheaper products that last for longer.

3.1 Social influences

The wider literature suggests that consumers have lower perceptions of self-risk regarding the consumption of expired foods as opposed to when preparing food to be consumed by "children, older people and guests".⁴⁷ This was highlighted in the social factors that influenced participants when deciding whether to consume a product after the UBD for themselves and for others. Participants were frequently prepared to take fewer risks when preparing and serving food to others due to their assessment of the risk, not wanting to take control or choice away from others and embarrassment or concern about potentially being judged for serving expired food.

Risks to vulnerable groups

Participants identified a number of groups for whom the level of risk from consuming expired food may be greater in comparison to themselves or a healthy adult.

Children (particularly younger children) were identified as a group who may be more vulnerable to infection and so could be at an increased risk of consuming expired food. They were identified as a vulnerable group by parents as well as individuals without children in their household. One parent described how he had greater concerns about his children, who are now aged over ten, when they were younger, reflecting the views of other parents with children under the age of 11 or 12 who shared similar concerns.

"If we are using things beyond the UBD, we feel it is okay for us but avoid it for our young daughter (aged 12). Our digestive system is better. She would be more vulnerable to getting sick." – Male, 46,

⁴⁷ Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour</u>. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021].

Asian, multi-person household with older child in the household, England

Some parents referred to past experiences of their children having illnesses or issues when they were younger which made them more cautious about their health. These experiences further embedded their belief not to take any risks when feeding children, including avoiding out of date food.

> "I take most risks in the family but for the family I wouldn't take the risks. You're more protective when you have children... One son had some illnesses when he was very little so we're careful." – Male, 56, White, multi-person household with older and younger children in the household, Wales

However, not all parents showed greater concern about their children eating food past the UBD. In some cases, parents made the judgement that if they were happy that the food was safe to eat, there was no difference in whether they were consuming it themselves or serving it to the wider family. This view was echoed by some grandparents who described the precautions they would take before concluding that food was safe for themselves and their grandchildren. One participant felt it was potentially a benefit for children to eat expired food when they were younger to strengthen their stomachs.

> "I have different attitudes but for the grandchildren it is good to give them it, so their stomach is not susceptible in the future." – Female, 72, Iranian, multi-person household, no children in the household, England

Older people were identified by younger participants as potentially at higher risk due to being more susceptible to infection and less able to recover quickly from an illness. Similarly, one participant approaching older age identified the similarities between younger and older people regarding the potential vulnerabilities of consuming expired foods. However, those aged over 65 remained confident about eating expired foods themselves. This reflects the wider literature which suggests older consumers have lower

perceptions of the risks involved in eating items past the UBD. This is despite older people being at high risk of food-borne illnesses such as listeriosis.⁴⁸

"You have to be extra careful with young children and older people because their immune systems aren't as good as other groups of the population." – Female, 62, White, single person household, Wales

Participants also identified other higher risk groups such as **pregnant women**, those with **weaker immune systems** or pre-existing conditions such as diabetes and coeliac disease. They highlighted the importance of food safety in preparing food for these groups, including items which may be deemed riskier for pregnant women regardless of the UBD such as eggs. Those with direct experience of health conditions due to family members or friends being ill were particularly conscious of this. Participants' heightened awareness of safety with these groups meant that they were less likely to take any risks.

"My wife is pregnant, so we don't take much risk at the moment... If someone was sharing food with a child, pregnant woman, or an elderly or weakened person I might have more concern." – Male, 32, multi-person household, White, no children in the household, England

The importance of choice

Participants felt it was crucial to be able to decide whether to eat expired food or not, emphasising the importance of individuals having control over the decision. They reflected on their own risk assessments of expired food, personal tolerances and the importance of having a choice over what to eat. As such, they did not feel comfortable serving expired food to guests as the individuals eating would not be in control of the decision.

> "You should let the other person know and let them decide if they want to eat it or not. If someone is unable to make the decision such

⁴⁸ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021].

as a young child, I wouldn't take the risk. A partner or adult who is able to make a decision and their own mind up should be asked." – Female, 29, Asian, multi-person household, no children in the household, Wales

One participant described how her family was used to the way she served foods and her willingness to use visibly out of date items. This meant she was more comfortable preparing expired food for her family, in contrast to guests who would not necessarily be aware of her approach. This meant she would be more hesitant to serve the same meals to them.

> "We would never give guests and our children/grandchildren some of the things my husband and I would be quite happy to eat! Not sure why? Just hospitality?" – Female, 72, Iranian, multi-person household, no children in the household, England

Concerns were also expressed about the potential to make others ill. Participants described how they would not want to take this risk with family, friends or guests. This was particularly acute in decisions regarding the vulnerable groups described above and meant participants tended to take greater precautions when preparing food for others.

"It's one thing to make yourself sick but another thing entirely to make your friends and family sick." – Female, 32, White, multi-person household, no children in the household, Wales

Social judgement

Participants also reflected on the perception of others. They worried that it if guests found out they had been served expired food, they may look poorly on the host and this would be a source of embarrassment. This social pressure meant participants said that they would avoid serving guests food past the UBD, as they worried about how they might look irrespective of whether they judged there to be a food safety risk.

> "It is more important, I take more care [serving others]. It would be embarrassing if someone got ill from something you had served them." – Female, 67, White other background, single person household, Wales

One participant said that she would leave the decision up to the guest or other person in this instance so that they could make the choice for themselves or have an alternative meal. In contrast another disclosed that he would serve the meal as standard with the guests being "none the wiser", judging the risk of illness to be very low. Indeed, the literature suggests that individuals perceive a greater risk of illness from eating food prepared by other people compared to themselves, with 90% believing food they have prepared is low risk compared with 41% judging the food prepared by others as low risk.⁴⁹ Another participant described how serving food or cooking for guests was often classed as an occasion, which would usually mean buying something fresh, eliminating the concerns around food expiry in those circumstances.

> "I would probably not serve food past UBD to people coming around because we would probably buy food especially for that occasion." – Female, 40, White, multi-person household with younger and older children in the household, England

3.2 Affordability and cost

Participants were recruited for this study using a number of demographic and attitudinal factors, as shown in Table 3. Participants were contacted based on their responses from the FSA's Food and You 2 survey to ensure inclusion of those who said that it was 'sometimes or often true that they had worried about whether food would run out before having money to buy more'. Household income and social grade were also monitored to ensure varied representation of participants across social grades and income bands where possible.

Despite this, explicit reference to food affordability or food insecurity as a factor in consuming expired foods was not a key finding in this research. Participants highlighted the financial struggles of others but not themselves when probed specifically on why people may consume foods beyond the UBD. Instead, participants focused on a reluctance to waste food and money more generally. They also described the ways

⁴⁹ Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health,* 10, 4060-4085.

in which they would try and prolong the life of food such as immediately freezing or cooking and then storing items approaching the UBD.

Purchasing reduced items and multi-buys

The wider evidence reports that individuals on low-incomes, or those who describe their financial situation as poor, are more likely to want to prevent food waste and are more likely to consume UBD expired foods.⁵⁰

The first point at which many participants noticed UBDs was whilst shopping, when they also considered the cost of items. Items which had been reduced (due to their proximity to the UBD) were chosen by participants as impulse buys or as a cheaper alternative to a regular purchase. For some, buying reduced items allowed them to shop in supermarkets deemed more expensive as a treat or to purchase items that they otherwise would not usually consider at full price.

"I eat food that is going out of date because I don't want to waste the money I've spent on that... In M&S, I can't really afford to buy if it's not going out of date and reduced." – Male, 35, White, with young child in the household, Northern Ireland

In the wider literature, Corrado contends that young, less affluent women with families typically buy products on promotion.⁵¹ As a consequence, the purchase of products with a short shelf life either as a deal or due to a lack of choice, may lead consumers to

⁵⁰ Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour</u>. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021]. Toma, L., Costa Font, M. and Thompson, B. (2020). Impact of consumers' understanding of date labelling on food waste behaviour. *Operational Research International Journal*, 20, 543–560. Farr-Wharton, G., Foth, M. and Choi, J. (2014). <u>Identifying factors that promote consumer behaviours causing expired domestic food waste</u>. *Journal of Consumer Behaviour*, 13, 393-402. [Online]. [Accessed on 11 March 2021]. Zielińska, D., Bilska, B., Marciniak-Łukasiak, K., Łepecka, A., Trząskowska, M., Neffe-Skocińska, K., Tomaszewska, M., Szydłowska, A. and Kołożyn-Krajewska, D. (2020). Consumer Understanding of the Date of Minimum Durability of Food in Association with Quality Evaluation of Food Products After Expiration. *International Journal of Environmental Research and Public Health*. 17. 1632. Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food attitudes and behaviours in the UK: findings from the Food and You survey 2012</u>. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021].

⁵¹ Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour</u>. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021].

disregard UBDs.⁵² Participants acknowledged the proximity to the UBD when purchasing reduced price food. They often intended to consume the items on the day of purchase, had a meal in mind or had a plan for storing the item to prolong its life such as freezing it. Participants again conflated different types of date when items were marked as reduced price and treated items with a UBD and BBD in similar ways as shown in the example below. Items such as ham, salami, cheese, fresh mixed fruits and yoghurts with UBDs were bought with the intention of consuming them quickly. In the same way, one participant described how he planned to eat hot cross buns with a BBD on the day of purchase.



"I noticed the UBD when we bought them [hot cross buns] as they were yellow stickered. The intention was to have them that day or next, but I ended having them a few days after." – Male, 40, White, multi-person household with younger children in the household, England

Often these items were not consumed as planned. For example, the spontaneity of the purchase meant participants no longer felt like eating the product, they forgot about it or simply opted for something else. In such circumstances, they either decided to freeze the

⁵² Wilson, L.W.N., Rickard, J.B., Saputo, R. and Ho, S. (2017). Food waste: The role of date labels, package size, and product category. *Food Quality and Preference*. 55. 35-44. Fisher, K., Herszenhorn, E., Harris, M. and Quested, T. (2019). <u>Helping consumers reduce food waste through better labelling and product changes</u>. Retail Survey 2019. [Online]. [Accessed on 25 March 2021].

item (usually on the day displayed on the use by label or date of purchase) or were content to make plans to eat it soon after. Some participants regularly purchased reduced items and had experience with how long they were willing to leave them in the fridge beyond the UBD before consuming them.

> "We quite often buy perishable food which is close to its use-by date and therefore reduced. Recently we have bought such items as blue cheese, lettuce and bananas. All were consumed within two or three days of purchase and were fine." – Male, 75, White, multi-person household, no children in the household, Wales

As well as purchasing reduced price foods, participants bought in bulk or multi-buy purchases. They described how they bought multiple of the same staple item for their household to reduce the overall cost such as if their children liked a particular brand and they were on offer.

Wilson et al. suggests that these foods, purchased in order to save money, are more likely to not be completely consumed in time.⁵³ In some cases, participants described purchasing multiple items or opting for multi-buy deals which they knew they would be unable to consume before the UBD or they knew they did not have adequate storage space for. Deals and offers, including impulse purchases, meant that they were persuaded to buy more than they needed or could consume before expiry. One participant noted that this was perhaps more apparent due to very young children in the family, meaning they did not consume the food as quickly as expected. On the other hand, another participant explained that this would be very unlikely to happen in her household with three teenage children.

"We still throw leftover food away which the children haven't eaten on a daily basis. As they are still very young (under two and three years old) I hope this will improve as they get older and their appetites increase." – Male, 41, White, multi-person household with younger children in the household, England

⁵³ Wilson, L.W.N., Rickard, J.B., Saputo, R. and Ho, S. (2017). Food waste: The role of date labels, package size, and product category. *Food Quality and Preference.* 55. 35-44.

The process of overbuying food meant participants had to assess whether to consume the food after the UBD, freeze or store it, or throw it away, as explored further below. Participants reflected on how they knew they were going to have to decide what to do with an item bought on impulse, describing how they regularly gravitated towards offers each time they shopped. Although they did not have a plan for the purchase, they were persuaded by the offer and felt they could decide what to do once they got home. However, this could result in participants eating food after the UBD as they had bought more than they needed and were concerned about food waste or led to participants simply throwing the items away.

> "I don't plan meals, I buy what I fancy. I do tend to regularly buy the same things that the children eat but I'm terrible with offers and it may go to waste." – Female, 50, White, older child present in the household, England

It was also more difficult for those living alone to finish products before the UBD. They described how it can be challenging to get through all the items they had bought, particularly if the product is produced or packaged with multiple portions in mind.

> "It's hard for single people. If I buy reduced, I'll end up eating it past the UBD because I can't finish it in one day, for example, cottage cheese." – Female, 62, White, single person household, Wales

Sue regularly buys reduced food and does not worry about eating items past the UBD as she lacks trust in them. She treats the UBD and the BBD in the same way, often conflating the two, preparing a sandwich with items past both date labels.

Sue's lunch Female Multi-person 65+ household, Iranian England Shopping	When talking about her lun BBDs as t "All out of "use by date" by fridge. I knew they were ok bé things out of date. They taste them, which I would have diff	ch, Sue refers to both UBDs and he use-by date. a couple of weeks. All kept in the ecause I have frequently had those ed fine and there was no mould on pinched off. The date made no ference." Preparing	Sostilities Consuming
Sue regularly buys food on the that is reduced. She prefers si at markets where products do UBD as she believes they are inaccurate. She plans meals a reduced items. For her lunch, she toasted two bread spread with plant-based cheese with lamb's lettuce and watercress, followed by a slice cinnamon fruit loaf. All were ei their UBD or BBD and bought reduced price at different time	e UBD As Sue doesn't trust hopping UBDs, she tends not to n't have a pay much attention to the date. Instead she visually around inspects the food to check for mould. She will also smell and taste the food to o slices of see if there is anything d cream unusual about it. Only if d the bread is very mouldy e of or looks too bad will she throw it away. at a	If there was a small portion of mould, for example on the bread, she would take this off and prepare the meal with the remaining slice. Similarly, she would remove mould from cheese and cut off brown or soggy parts of vegetables. She toasts both the bread and the cinnamon fruit loaf to improve the taste.	Sue was brought up not to waste food and has never become ill after eating items past the UBD. She will continue eating expired products, unless they taste bad, in which cases she will throw them away.
Purchases reduced	Visual inspections	Toasting food	Will throw away if

Reluctance to waste money

Once participants had bought an item, the cost of food also influenced decisions around whether to consume or throw it away. Participants felt that throwing food away was a waste of money which they had worked hard to earn, although they did not relate this to food insecurity or being unable to afford replacements. One participant referred to the strong financial incentive not to waste the food they had spent money on, describing this as a motivation to eat items past the UBD.

"It is the financial side of it. I eat food because it is going out of date because I don't want to waste the money, I've spent on that." – Male, 35, White, with young child in the household, Northern Ireland

Although this was an important consideration, participants described how they were unwilling to make themselves ill for the cost of food. Instead, they would use their judgement to determine whether this was likely to be the case, often judging expired food to be safe as described above.

> "Why throw food away that is perfectly palatable when it is a few days after its UBD when we have never been ill because of it, so far." – Male, 75, White, multi-person household, no children, Wales

Participants often suggested that the cost of food might be a factor influencing the reasons why other people ate expired items. Although this was not always something participants saw as relevant to themselves, they recognised the cost of living and the potential difficulties in affording food.

"I suppose maybe it is a concern about pricing and buying food that is wasted... I suppose it is probably more prevalent this year than in years gone by." – Female, 32, White Other background, multi-person household, no children in the household, Wales

Consistently, participants referred to others struggling, the cost of food in the current climate and the difficulties some people may be facing. However, this did not translate into personal concerns around food insecurity, but more of a reflection on society as a whole. One participant referred to the use of food banks as a source of 'shopping' for some, where there is no choice as to the freshness of food you are given.

"I worked with food banks where things going out of date have come in. People may only get things that are going out of date so they would have to eat past the UBD." – Male, 40, White, multi-person household with younger children in the household, England

Another participant thought that the financial incentive to not throw expired foods away was the main reason for consumption beyond the UBD and similarly mentioned charities that take these items from supermarkets before disposal.

"Some people can't afford to not eat their food in the fridge. There's things like charities getting supermarket food going to waste." – Female, 62, White, single person household, Wales

3.3 The physical environment

Time pressures and access to shops

Access to shops, time and capacity for storage also influenced UBD behaviours. Replacing items that had expired was more difficult for participants facing time pressures due to work, childcare or their distance from the shops. In these instances, participants had a choice as to whether they would consume the expired product or throw it away, knowing they could not immediately replace it.

> "Someone might then have no choice but to eat past the UBD if they don't have access to the shop, especially if they are elderly." – Male, 41, White, multi-person household with younger children in the household, England

Lunch items such as yoghurts, cheeses, pre-packaged sandwiches, sandwich meats, salads and fruit pots were consumed by participants after the UBD often because they were not bought for a meal on a specific day but left in the fridge either at work or at home. Sometimes these were impulse purchases which participants forgot about, left out of the fridge or took to work. For example, participants shared examples of kid's yogurts, ready-made sandwiches and fillings that they used at lunch and were more likely to forget about. Participants described judging ready-made sandwiches based on the quality of the ingredients, potential impact on the texture, for example if the sandwich was likely to dry out or go soggy, and the type of filling rather than the UBD on its own. They may be less likely to eat an expired sandwich containing fish or being cautious about ingredients which could visibly deteriorate quickly such as lettuce.

"Depending on the filling, I would eat a prepared sandwich up to a day after its use by date. Those containing prawns, for example, I wouldn't eat unless there were at least two days remaining before the use by date." – Female, 50, White, older child present in the household, England

Due to their ready to eat nature, participants thought that these products could be consumed after the UBD. They often bought items such as sandwich fillings at a reduced price or left them in the fridge beyond the UBD. One participant explained that they may throw away the top slice in an opened packet if it had begun to "dry or curl", whilst others described not considering the UBD and continuing to use as fillings for sandwiches until they had finished the packet.

"I bought these [mackerel fillets] on Monday (four days ago). I have stored them in my fridge. I don't read guidance around storing... As it's smoked, I'm happy to use it post use by date." – Female, 50, White, multi-person household with older and younger children in the household, England



There was a perception that these ready-made foods were less risky as they had been prepared or treated in some way, compared to foods like raw meat or eggs, which needed to be prepared by a consumer. One participant said that he would expect salami to have been smoked or treated, which would make him more confident that the risks were lower than if the meat was raw. This reflects participants' overall approach to judging food safety which tended to focus on food preparation rather than UBD labelling.

In these circumstances, participants were consuming foods on the go or preparing lunches or quick meals and so did not always have access to buy replacements or the time to return to the shops. This meant they took the decision to either eat or throw away the food after their own sensory checks.

Ismael often buys food on the go due to his busy work schedule. This can mean he forgets about ready-made food such as sandwiches, yogurts and fruit pots prefering to eat these after the UBD rather than throwing them away as he does not like waste.

Ismael's mixed fruit pot

Male	Single-person	
18-34 Mixed White and Asian	household, no children	
	England	

"I usually buy fruit boxes before work if I'm going to be busy in meetings all day. I have consumed a mixed fruit box a day after the use by date. It was sealed and when I opened it, it smelt fine... I decided to try one strawberry which was fine so I ate the rest of them. I'd have thrown them away if they didn't taste nice".

Ismael regularly buys food on the go or the day before he is going to eat it, due to his busy work schedule.Ismael once had a bad experience with a mixed fruit pot that was within date. This means he now checks the fruits visually to see if they are discoloured or look mushy.As with the sandwiches and yoghurts, the fruit pots don't require any preparation but he'll try to make sure they're kept in the fridge either at work or at home ready for lunchtime.Ismael will always look the UBD on fruit pots but his tests determine whether or not he ultimately eats it.This means he often buys food with a short shelf life and doesn't look at the UBD on these items, as he plans to take them to work the following day.He'll also often taste the strawberries as he finds the taste changes if they've gone off.Sometimes that means he forgets to take the items into work, but they're stored for the next day.Ismael will always look to the UBD on fruit pots but his tests determine whether or not he ultimately eats it.Shops on the goTaste test and visualsNo need to prepareHates food waste	-	Shopping	Assessing	Preparing	Consuming
He works shift patterns and so goes to the shops when it is most convenient for his lunch. He purchases items including pre-prepared sandwiches, yoghurts and mixed fresh fruit pots.Checks the fruits visually to see if they are discoloured or look mushy.Induce safe they re kept in the fridge either at work or at home ready for lunchtime.Ultimately eats it.This means he often buys food with a short shelf life and doesn't look at the UBD on these items, as he plans to take them to work the following day.He'll also often taste the strawberries as he finds the gone off.Sometimes that means he forgets to take the items into work, but they're stored for the next day.He says that he has "th best immune system ever" and he never gets ill. His parents and grandparents didn't like waste food, so he tends tay.Shops on the goTaste test and visualsNo need to prepareHates food waste	ls ti to	smael regularly buys food on the go or ne day before he is going to eat it, due o his busy work schedule.	Ismael once had a bad experience with a mixed fruit pot that was within date. This means he now excellent the final winnel to be	As with the sandwiches and yoghurts, the fruit pots don't require any preparation but he'll try to make sure they're kent in	Ismael will always look at the UBD on fruit pots but his tests determine whether or not he
Shops on the go Taste test and visuals No need to prepare Hates food waste	Ftt fc ir y T s L	le works shift patterns and so goes to ne shops when it is most convenient or his lunch. He purchases items including pre-prepared sandwiches, oghurts and mixed fresh fruit pots. This means he often buys food with a hort shelf life and doesn't look at the JBD on these items, as he plans to	checks the fruits visually to see if they are discoloured or look mushy. He'll also often taste the strawberries as he finds the taste changes if they've gone off.	Sometimes that means he forgets to take the items into work, but they're stored for the next	ultimately eats it. He says that he has "the best immune system ever" and he never gets ill. His parents and grandparents didn't like to waste food, so he tends to avoid throwing things
	Li	Shops on the go	Taste test and visuals	No need to prepare	Hates food waste

Online shopping

Similarly, access was an issue for those who shopped online. This may have been particularly pertinent due to the COVID-19 lockdown restrictions in place throughout the UK during the research, and in some cases, widespread closure or amended opening hours of supermarkets, convenience stores and markets.

Participants often chose to shop online due to the convenience of having a regular order and not having to go to the supermarket or living rurally with limited access to bigger shops. However, unlike purchasing in a shop, participants described how they were unable to select food with a longer shelf life or see the UBD until food was delivered. They recalled receiving items within their deliveries with inconsistent or short shelf lives due to this lack of choice. One participant noted that the supermarket included this information on the receipt so that shoppers were able to reject such items or at least be aware of them when unpacking and storing their food.

> "We do all our shopping online, so we don't get much choice in the date but can send things back." – Female, 42, White, multi-person household with older and younger children in the household, Northern Ireland

This limited the extent to which participants could plan their weekly meals as they were unsure how long products would last for. It also meant they relied on sensory judgements to check the safety of a product as they lacked the choice to purchase something with a longer shelf life. One participant described checking online food purchases as they were put away, making decisions on what meals to eat on which nights. This was determined by the dates on products and resulted in items being put in particular places in the fridge if they were close to expiry, as a reminder of what needed to be eaten first.

> "I would generally check things as they are going into the fridge then, if there is something particularly short it would be used up earlier." –Female, 43, Mixed White and Black Caribbean, multi-person household with older and younger children in the household, Northern Ireland

Available storage space and approaches to prolonging shelf-life

Dependent upon the amount of available storage space, participants described freezing items straight away, having to eat the item or throw it away if there was no space. Findings from the FSA's Food and You 2 survey suggests that most respondents either eat (38%) or freeze (26%) food that is about to go past its UBD.⁵⁴ Research from Van Boxstael et al. found that freezing products was more prevalent amongst older people with half (50.6%) of older respondents freezing products in comparison to just over a third of younger (36.4%) and middle-aged (37.7%) respondents.⁵⁵ Freezing on or before the UBD was a way for participants to ensure that the food was stored and preserved so that it could be consumed at a later date, and often happened on the day of purchase or day of expiry.

"I've been buying it for years by going at a particular time in Waitrose and Tesco. We plan meals depending on what we buy reduced. If we

⁵⁴ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). <u>Food and You 2: Wave 1 Key Findings</u>. Food Standards Agency. [Accessed 2nd June 2021].

⁵⁵ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97.

can't use it, we put it in the freezer." – Female, 72, Iranian, multiperson household, no children in the household, England

Participants explained that they may buy reduced items intending to effectively pause the UBD by immediately freezing them. This enabled them to buy cheaper produce including items they would not otherwise be able to afford. Similarly, participants described buying more items than they needed in the knowledge that they could freeze and eat them later, again meaning that they were not consuming expired foods but prolonging the shelf life.

"I had a steak pie that was ten days past its use by date. It had been kept in the freezer since day of purchase which I always do." – Male, 68, White, single person household, England

However, there were instances where participants described leaving things in the freezer for extended periods of time and then either cooking them or throwing them away. Similarly, other participants said that they would freeze items once the UBD had passed if they had previously intended to eat them or forgotten they were there. One participant, who was already unsure of the difference between the UBD and BBD, expressed confusion about how freezing food would impact upon the dates displayed on items.

"If I get poorly then it is my responsibility past that date, but the line is blurred with freezing food. Is it an absolute date except the freezer?" – Male, 40, White, multi-person household with younger children in the household, England

Another approach that participants used was to batch cook, using up items that were approaching expiry in a single dish and then freezing additional portions or leftovers to be reheated and eaten later. In these instances, participants were again prolonging the shelf life of the food by cooking it within the UBD and storing it.



"I keep all types of food in the freezer. Anything past it use by date or anything I'm not going to use straight away will be placed in the freezer. I have cooked food that is close to its use by date in order to be able to freeze it." – Male, White, 35, with young child in the household, Northern Ireland

However, participants were unable to extend the life of products in this way where storage space was limited. For one participant, this wasn't necessarily an issue as food would be eaten quickly in her large household with her older children. In contrast, this influenced the amount of food bought by participants living in smaller households who would buy on a weekly basis to avoid having to throw food away.

4. Encouraging compliance with UBDs

Overall attitudes to the drivers and enablers of UBD compliance

What drives people to consume food past the UBD?

- Overall, there was a lack of desire to comply with UBDs as participants saw consumption as unlikely to be harmful to them on an individual level. This was strengthened by preferences to reduce food waste both for ethical reasons and a desire to avoid wasting money.
- There were also questions about the feasibility of changing ingrained habits, even if awareness of UBDs was increased.

What could encourage greater UBD compliance?

- Participants felt that stronger, more consistent, and risk-focused messaging around UBD could lead to greater compliance.
- However, they felt that routines, meal planning and organisation were more important than information for changing behaviours.

4.1 The desire to comply with UBDs

Most participants usually did not perceive a lack of compliance with UBDs as a problem. Based on previous experience, they felt confident consuming expired food and had little desire to change their approach. This was especially held by participants who consistently ate food past the UBD or bought reduced items that were on or near expiry. This group did not believe they were putting themselves at risk and wanted to avoid wasting food often for moral and ethical reasons rather than affordability.

> "For me it is more of a waste thing for the country and the environment, I'd love it if people wasted less food... The thought of people getting ill doesn't really cross my mind." – Female, 32, White, multi-person household with younger children in the household, England

Participants who felt it was more important to comply with the UBD to reduce the chances of becoming ill, understood others may not have this choice due to their financial situation. They recognised that this group may need to eat expired food due to the cost

of replacing products, although affordability was not mentioned as a driver of participants' own behaviours.

"We both earn a decent wage, so I can afford to be a little bit profligate with throwing things away, if there's less risk of getting ill. . . We're relatively luckily in that position, but not everyone can throw away six quid's worth of chicken breast and nip up to Sainsburys to pay another eight pounds in the convenience store. People do need to eat those things [past the UBD]." – Female, 43, Mixed White and Black Caribbean, younger child present in the household, England

Widely, participants believed society had a duty to reduce food waste reflecting on the environment, animal welfare and increasing reliance on food banks. In this way, their values shaped their approach to UBDs and meant they did not necessarily see complying with UBDs as a positive. One parent described how her attitudes towards animals meant she was willing to give food to her children past the UBD if it seemed fine after a visual inspection, relying on her instincts rather than the package instructions.

"I don't like wasting food. If it is edible then it should be eaten, particularly meat because an animal has given its life for that and to me it seems all things wrong if it is thrown in the bin." – Female, 40, White, multi-person household with younger and older children in the household, England

Participants argued decisions about consuming food past the UBD were an individual choice. They emphasised their right to decide what to eat, even if it could affect their health, describing how it is the responsibility of an individual not the manufacturer or supermarket once an item has been purchased. Older participants, who often ate food past the UBD expressed this strongly. For example, one older male participant highlighted the importance of individuals assessing and choosing to take their own risks towards food.

"I think that's their decision really, I can't say any more than that. Some people will follow the guide strictly and some don't. And I think people who often do that have come to no harm and they will

continue doing it, just like us." – Male, 75, White, multi-person household, no children in the household, Wales

Sam is aware of the risk of food poisoning, but it does not put him off eating food past the UBD. The salami he buys in his weekly shop exemplifies the willingness to take on this risk to avoid throwing things away.



4.2 Information and improved labelling

There was a desire for more information around how UBDs are decided upon and the specific risks associated with eating different foods. This reflected the general lack of trust in UBDs and their accuracy. Participants argued that they were unlikely to change their behaviours unless it became clear there was a serious risk to their health. They suggested that adding warning labels or communicating the risks linked to a specific product could encourage compliance.

"Unless I know the seriousness or see the affects, my behaviour probably won't change." – Male, 39, Asian, older child present in the household, England Simplifying date labelling is a strong theme in the wider literature which suggests that more consistent wording may support a reduction in the consumption of UBD expired foods and reduce the food safety risks.⁵⁶ Studies recommend uniform classification methods for UBDs on similar foods as a way of reducing confusion. For example, Van Boxstael et al. suggest that UBD labelling should be confined to refrigerated products only as a way of communicating that 'use-by' products are unsafe to consume after the date.⁵⁷ Hall and Osses propose developing an assurance scheme for date labelling to increase consumer trust through certification.⁵⁸

Participants felt that improving the visual labelling such as using bold or larger typeface, and clearly distinguishing between the UBD and BBD consistently on products might also increase awareness of the UBD. Although, participants did not identify this as something which would help them to comply or change their behaviours, reflecting confidence in their own knowledge and existing approach.

> "Clearer information for example 'best before this date to ensure freshness' or 'use by this date due to safety'." – Male, 20, White, multi-person household, no children in the household, England

The wider literature suggests public education campaigns regarding UBDs or basic microbiology such as the role of bacteria relating to food safety could motivate consumers to use better food storage, preparation and cooking techniques.⁵⁹

⁵⁹ Newsome, R., Balestrini, C. G., Baum, M. D., Corby, J., Fisher, W., Goodburn, K., Labuza, T. P., Prince, G., Thesmar, H. S. and Yiannas, F. (2014). <u>Applications and Perceptions of Date Labelling of Food</u>. Comprehensive Reviews in Food Science and Food Safety, 13, 745-769. [Online]. [Accessed on 18 March 2021]. Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021]. Evans, E. W. and Redmond, E. C. (2015). <u>Analysis of older adults' domestic kitchen storage practices in the United Kingdom: Identification of risk factors associated with listeriosis</u>. *Journal of Food Protection*, 78, 738–745. [Online]. [Accessed 26 March 2021]. Evans, E. W. and Redmond, E. C. (2014). <u>Behavioural Risk Factors Associated with Listeriosis</u>. *Journal of Food Protection*, 77, 510-521. [Online]. [Accessed on 12 March 2021]. Sanlier, N. (2009). The knowledge and practice of food safety by young and adult consumers. *Food Control*, 20, 538-542.

⁵⁶ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97.

⁵⁷ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97.

⁵⁸ Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. *International Journal of Consumer Studies*. 37, 422-432.

They contend that UBD-related information should be provided alongside other food safety information on packaging so that consumers can create a routine and understand the full range of risks. Yam et al. also highlight the possibility of 'intelligent packaging' which could carry out functions such as detecting, sensing, recording, tracing or communicating information about the shelf life and safety of a product.⁶⁰

4.3 Planning meals and reducing food purchases

Habits around buying food and planning meals were often a key factor in whether participants complied with UBDs. They felt that improving their routines around finishing food before the UBD was more important than being stricter with throwing food away. For example, one participant said that the diary helped them to think about their future meal plans, deciding what they were going to eat and limiting the amount of food wasted.

> "In the past, perhaps, I was a bit more flexible with the dates whereas now I do look at things more frequently, like I was looking yesterday at something we've got in the fridge and I'd look at it normally as a product but now I look at the dates." – Male, 56, White, multi-person household with older and younger children in the household, Wales

Planning meals more, checking the fridge before going to the shops and making shopping lists were all steps taken by participants as a result of keeping a food diary. This was designed to reduce the amount of food they bought and therefore help to finish items before they expired. These were identified as steps others could take to improve compliance with UBDs.

> "Buying less food, I buy less food weeks in advance and I don't waste any food because I eat all that I buy... When I bought a big shop once a week, I was throwing loads away because I didn't want to eat it, or it was left in the fridge and would go off." – Female, 50, Welsh Celtic, single person household, England

⁶⁰ Yam, K.L., Takhistov P.T., and Miltz, J. (2005). Quoted in Newsome, R., Balestrini, C. G., Baum, M. D., Corby, J., Fisher, W., Goodburn, K., Labuza, T. P., Prince, G., Thesmar, H. S. and Yiannas, F. (2014). <u>Applications and Perceptions of Date Labelling of Food.</u> Comprehensive Reviews in Food Science and Food Safety, 13, 745-769. [Online]. [Accessed on 18 March 2021].

Associated with this was a request for different packet sizes for certain products that only require a small portion like feta or salad bags. This was particularly relevant for single person households as a way of ensuring food was consumed before it expired. It was seen as a way to allow individuals to buy items that reflected their needs and existing routines, rather than requiring them to consume the same meal repeatedly or throw food away. Similarly, Wilson et al. suggest that manufacturers could help support the reduction of the consumption of expired foods by reducing packaged portion sizes.⁶¹ For example, one participant reported that parmesan is hard to finish as the packet is too big for recipes, even for their whole family. This means they end up using it long after they purchased it, or they throw it away.



"The parmesan cheese went in the bin as we couldn't finish it, we used it for a risotto on Sunday... For the recipe you only need 50g, but the packet is 150g. If it was up to me, I would eat it but because of my wife, I threw away." – Male, 34, White, multi-person household with young child in the household, Northern Ireland

Other ideas for increasing compliance with UBDs included freezing foods, particularly meat, and batch cooking meals. Participants referred to this as being "organised", allowing them to extend the life of products and meant they felt they did not need to look

⁶¹ Wilson, L.W.N., Rickard, J.B., Saputo, R. and Ho, S. (2017). Food waste: The role of date labels, package size, and product category. *Food Quality and Preference.* 55. 35-44.

at the UBD as food would be safe. However, participants admitted they were not always strict with how long they kept food in the freezer and did not always have the space to freeze items. Learning approaches to keep the freezer more organised such as dating products and rotating items were mentioned as ways of tracking what they had available.

> "Perhaps it's the education of what you can do with food that is close to the date as there is lots of stuff you can do." – Female, 40, White, multi-person household with younger and older children in the household, England

4.4 Embedding new behaviours

Although, participants widely felt more aware of UBDs as a result of taking part in the research, this did not always impact their behaviour. This group described how although they had become more conscious of the UBD on different products, they questioned whether they would change anything as a result.

"I don't think it has necessarily changed my behaviour, but it has definitely changed my thinking. So maybe it will change my behaviour in some ways." – Female, 32, White, multi-person household, no children in the household, Wales

Behavioural tools such as lists or scheduling a time to check the fridge were mentioned as ways of building a routine around UBD compliance. Looking to address the issue of attitudinal change, Byrd-Bredbenner et al. suggest personalising the risk in order to promote consumer understanding of their own susceptibility, reflecting the finding that individuals judge the risks of consuming expired food prepared by others as higher than food prepared by themselves.⁶² They argue that personalising the risk would work to combat consumers' optimism bias that food is likely to be safe to eat, and mean individuals are more aware of the risk to their own health.

⁶² Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health*, 10, 4060-4085.

The literature also suggests making use of 'leverage points' such as pregnancy, movinghouse or a change in employment status to create lasting change.⁶³ Demonstrating the potential efficacy of leverage points, Robert and Downing report the impact of lifestyle changes brought about in response to COVID-19.⁶⁴ They describe a 30% increase in reported checking of UBDs in June 2020 compared to before COVID-19, and suggest there appear to be some lasting changes from lockdown. However, it is too early to tell if these changes have been locked in.

 ⁶³ Roberts, M. and Downing, P. (2020). <u>Food waste and Covid-19 - Survey 2: Lockdown easing</u>. WRAP & lcaro Consulting. Banbury. [Online]. [Accessed 26 March 2021].
 ⁶⁴ Roberts, M. and Downing, P. (2020). <u>Food waste and Covid-19 - Survey 2: Lockdown easing</u>. WRAP & lcaro Consulting. Banbury. [Online]. [Accessed 26 March 2021].

Chapter 3: Conclusions

Behaviours towards UBDs were influenced by a web of factors including understanding of UBDs, individual motivations and the wider environment. Participants widely relied on existing habits, routines and assumptions to judge whether food was safe, with UBDs forming one part of their assessments that could be overridden by sensory judgements, familiarity with an item or their personal values. **This suggests that a single approach to changing behaviours towards UBDs is unlikely to be effective.** Instead, interventions may need to focus on changing routines and habits, as well as the wider consumer environment and information campaigns to raise awareness of the risks of consuming different foods past the UBD.

The decisions participants made while planning, purchasing and preparing meals all influenced whether they decided to consume expired food, illustrating how this was not a one-off choice, but based on processes going back several days or weeks. **Identifying the key decision points both before and during meal preparation may help to isolate the times where interventions may be most effective.** For example, encouraging people to take more time planning meals may help to reduce the consumption of expired food later in the week. Messages could tap into participants' individual values and desires such as their preference to avoid wasting food and saving money by planning their meals more.

Although participants could define the UBD and the BBD, in practice they often confused the two when describing consumption of specific products. **This should be considered in future research, as self-reported behaviours may not be accurate.** Although respondents may report eating food after the UBD has expired, it is possible they are referring to items with a BBD. It may be useful to consider this in designing or interpreting survey results by asking about the consumption of specific products likely to have a UBD rather than asking about UBD compliance more generally.

This research has illustrated the value of exploring behaviours related to UBD consumption and can be seen as a starting point for building the evidence related to the reasons why UK consumers eat out of date food. Further research could focus on:

• Building the evidence around specific out of date products that hold the greatest risk and testing potential interventions which could encourage

greater compliance. For example, focusing on pre-prepared foods such as cooked meats and testing specific labels or wider interventions.

- While we have sought to explore affordability, this research has found limited evidence of this as a driver of consuming food past its UBD. Further studies could target a sample of participants on the lowest incomes or those who report using food banks.
- It may also be valuable to look at what drives compliance with UBDs, building on this research with individuals who report always following the UBD guidance. This could help to identify any differences between compliant and non-compliant behaviours including factors related to attitudes and values or routines.
- Considering large scale quantitative projects, where participants can be segmented, could also help to further understand motivations within each sub-group and test possible interventions to identify what would be most effective.

Research question	Key findings	
Explore whether	Although participants understood that the UBD is related	
consumers understand the	to safety and the BBD relates to quality, they often	
difference between the	confused the two labels in practice. Participants	
UBD and BBD.	repeatedly misidentified UBDs or referred to the UBD on	
	a product that carried a BBD.	
Capture consumers'	Participants across the study consistently felt the risk of	
perceptions of the risk	consuming expired food was low and unlikely to cause	
involved in consuming food	themselves any harm. Although there was an	
beyond its UBD and	understanding that food past the UBD could make them	
explore the extent of the	unwell, participants widely felt the risk was minimal and	
problem.	likely to be short-term if their sensory judgements and	
	past experience suggested an item was safe to eat.	
Understand consumers'	Participants took various approaches to preparing	
preparation practices of	expired food including: cooking for longer or at a higher	
food consumed beyond its	heat, removing mouldy or discoloured parts and using	
UBD.	items as part of a larger meal rather than eating them on	
	their own.	

Table 6: Summary findings related to each research question
Research question	Key findings	
Explore consumers'	A wide range of factors influenced participants' decisions	
drivers for consuming food	to consume expired food including those related to their	
with expired UBD and	knowledge of UBDs and the risks associated with	
barriers to not doing so.	consumption; their motivations including control and trust	
	in UBD labels, past experiences and routines, and	
	personal desires and values; and the wider social and	
	physical environment including whether they were	
	cooking for others, the cost of buying or replacing food,	
	time pressures and proximity to shops.	
Where possible, explore	There was a significant degree of consistency in the	
differences between	approaches taken towards consuming expired food by	
consumer groups (age, life	participants across our sample. Notable differences	
stage, family setting,	include:	
gender, ethnicity).		
	 The past experiences of older participants 	
	including those who remembered a time without	
	UBDs and therefore relied more on their own	
	judgements.	
	 Those living alone were more likely to have 	
	excess food which they ate after the UBD,	
	compared to those living with others, particularly	
	in larger families with older children.	
	Those living with vulnerable people including	
	younger children were less likely to prepare	
	expired food for these groups, although they were	
	often comfortable eating items themselves.	

Annex 1 – Research materials

Warm-up interview topic guide

Welcome and intro (5 minutes)

Thank participant for taking part

You should have received an information sheet about this study from the recruiter you spoke to? No problem if not, we will talk through the research today and answer any questions you have. We'll also ask them to follow up with the information sheet in case it's useful to refer back to later on.

Introduce self, explain that...

Ipsos MORI is working with the Food Standards Agency, on a research study which aims to understand more about people's food and shopping habits.

This telephone call will help us get to know a bit more about you, understand your experiences and give us the chance to explain your role in the research. **The call shouldn't take longer than 20 minutes – is now still a good time?**

Check ok.

To give you a bit of background, lpsos MORI is an independent market research organisation and we are going to be speaking to a range of people across the UK.

In this first call, we've got a few questions about you, your household and your food and shopping habits.

After this call, we'd like you to complete an online app diary for two weeks, and then we'd like to speak with you again over the phone after you've completed the online app diary. We will talk more about the diary later in the call.

You will be given £100 for participating in the research as a thank you for your help after this final follow up interview.

I also want to assure you that all the information we collect will be treated confidentially and that it won't be possible to identify any individual in the report we write at the end of the study. The only time we may have to tell someone about something you say, is if you tell us something which suggests that someone, or yourself is at risk of serious harm.

Throughout the research, there are no right or wrong answers and we are just interested in hearing about your own experiences and views. You do not have to share anything that you do not want to share. **You can stop the interview at any point, and you are under no obligation to take part.**

You should have an information sheet with you which explains in more detail about this research and your involvement. Do you have any questions about the research? [Allow time here to answer all questions in detail and reassure participants. offer to go through information sheet with participants if necessary]

Can I check that you are happy to participate? [Confirm consent]

Thank you.

Get permission to digitally record and transcribe for analysis, no detailed attribution.

Turn on recording and record participant's consent that happy to take part and understand that responses will be kept confidential

Background andfFood shopping habits (10 minutes)

We have a few questions about you and your lifestyle, to help us better understand who we're talking to and give us some more context when you're filling out the app.

Firstly, can you tell me a bit about yourself and your living situation?

• Probe: age, employment, family, etc

What kind of home are you currently living in? And who, if anyone, do you live with at the moment?

- How satisfied are you with the amount of fridge and freezer space you have in your current home?
 - $\circ~$ Does the amount of fridge and freezer space you have impact what food or drinks you buy?

How regularly do you tend to go food shopping?

- Do you tend to go to the same shop, or does it vary?
 o [If it varies]: why does it vary?
- Are you more likely to shop online, or in-person?
 o Has this changed at all due to COVID-19?
- Do you tend to shop for your household or just for yourself?
- Does anyone else go food shopping on your behalf?

What sorts of things do you consider when picking food and drink items during a

shop?

- Probe: healthiness of food, quality, design of packaging, brand, cost, special offers, preference/taste (of self or family etc), convenience (for example ready-to-eat), knowledge of how to cook etc.
- Is food safety a consideration at all? For example whether you feel certain foods like shellfish or meat are safe to eat

Do you tend to look at the labels on food and drink items while shopping?

- IF YES: What kind of information are you looking for?
- Capture spontaneous responses but if needed labels could include: dietary information, ingredients, fair trade, allergens, organic, genetically modified, best before, use-by dates etc.
- Does this change at all depending on what you are buying? Where you are shopping? Any other factors?
- IF NO: For what reasons? For example lack of time, not interested, online shopping etc.

How likely are you to look at the use-by date on an item when shopping? For what reasons?

- What about the best-before date?
- What do you understand as the difference between a use-by date, and a best-before date?

How to access and use lpsos Applife (5 minutes)

There are instructions in your information leaflet about how to download lpsos Applife. Shall we try it together now?

Do you have access to your smart phone at the moment? If so, do you want to put me on speaker phone so we can do it together?

Refer to the leaflet with login details.

- You'll need to go to the place where you normally download apps from for example Apple Appstore or Android Playstore. The app is free to download. You just need to search 'lpsos Applife' and download the app.
- You will have to log in using the email address you gave to the recruiters and the following password: [moderator to read out individual password]

• You should see a screen with the study. If you click on this, you should see a 'Welcome to Applife' topic which you can read and respond to. Do you want to have a go now? You can click on the button in the middle of the page and you should see an option to share a message. Click on this and send a quick message saying hello. We can then respond to check it is working!

Then, you're all set up. For the next couple of weeks, we will send you regular questions asking about various topics to do with your food habits. These will be shown on the homepage; simply tap/click on a topic to share your experiences or upload a picture or video, clicking on the arrow symbol to send.

We're really interested in hearing from you, so please remember you don't need to wait to respond to our questions if there is anything you'd like to tell us! Please share pictures and videos too. If you have any queries or difficulties with the app, please contact Holly on 07513060925, or email at <u>Holly.Day@ipsos.com</u>.

Do you have any questions before we end?

Thank and close.

Applife moderating guide

The structure of each question/task on Applife normally includes:

- Question header (for example shopping this week) which participants see on the home screen and the top of the full question once they click through to it.
- On-screen prompts or instructions for example 'Please share a photo.' These are seen by all participants who click on the question.
- Additional researcher prompts which moderators can use to follow up or encourage participants after they have answered a question. These will not be seen by all participants but can help ensure our team probe on the important areas for a study.

Figure 2: Screenshot of Applife



General automated messages

Registration	Welcome to Applife!
	Hi everyone and welcome to our two week Applife diary on food practices and behaviours for the Food Standards Agency.
	We'll be in touch very soon with some activities, questions and tasks for you to do once we've completed all of the initial phone calls.
	In the meantime, please feel free to access any of the advice or support information on the topics we will be discussing and hold tight for your first activity on Monday 22nd March!
Day 7	Thank you for all your contributions so far!
	We're at the half way point in the diary and we've really enjoyed seeing all your messages so far. Thank you!
End of diary	Thank you
	Thank you very much for your contributions to this diary! We hope you enjoyed the experience. We will use your diary to help us understand more about food practices and behaviours.
	We are looking forward to speaking with you soon in the final interview phase of this research, to talk more about your experiences and what you've told us so far. If you have any questions or are unsure when your final interview has been scheduled for, please contact Holly via <u>holly.day@ipsos.com</u> .

Key research questions

Day	Question header	Prompts	Analysis/moderator notes
Days 1-7	Show us your shopping!	Take some pictures or a video of your shopping after you've brought it home and started unpacking.	Additional moderator probes if needed: – Price/offers – Branding and packaging
		Tell us about the items you've got and where you are going to put them. Why will you put them there?	 Convenience (ready to eat, easy to cook) Health considerations
		Do you take items out of their packaging or leave them as they are?	 Familiarity with cooking it Labelling (allergens, fair trade, ingredients, use by/best before)
		Please complete this activity after you have brought food and drink home. The question will remain available all week, so you can complete it when you are ready.	 Tastes and preferences in household

Day	Question header	Prompts	Analysis/moderator notes
Day 1	Describe a typical meal in your household	Do you have set meal times or a routine? What sorts of things do you eat at different times of day? Is this the same for every member of your household? If not, what does a typical day look like for others? Do you eat together? Do you eat the same things?	Potentially sensitive questioning so will be worded accordingly and moderating treated with caution. Note will be taken of those who might go for longer periods of time without food so future probes can be adapted accordingly.
Day 2	Where do you normally get your food from?	Tell us about all the places you get food and drink from and the reasons why. Please select all of the places that apply to you and tell us about your reasons for going there in the comment below. Multicode response: supermarkets, independent shops, online, speciality shops, meal preparation services, community centres, family and friends, food pantries, local food centres, markets, other locations	Be aware of sensitivities when probing.

Day	Question header	Prompts	Analysis/moderator notes
Day 2	Take us on a video tour of your fridge!	 Take a video of the items in your fridge, and tell us about: How you store items in different parts of your fridge What types of food and drink you keep here Why you decide to store food or drink in this way You can explain your thoughts to us either by speaking in the video or by writing a message.	 Moderators to probe on concept of risk in relation to storage of food, and importance of risk in relation to other factors. Additional probes: How full is your fridge at the moment? Is this normal? Why do you store things this way? Does this depend on the type of food? For example meat, dairy Does this have any relation to a concern that you could get ill if it's stored incorrectly? If so, why do you feel this way?

Day	Question header	Prompts	Analysis/moderator notes
Day 3	Take a photo of	 Take a photo of a ready-meal or ready-to-eat food you have in your home. How long ago did you get this? Where have you been storing it? Do you normally read the guidance on the packaging on how to store it? Have you followed it here? What are you planning on doing with it? How do you decide whether it is safe to eat? 	If not captured in the photo, moderators to ask specifically about labels/ dates Note strategies or techniques participants employ during storage to make food last longer.
Day 3	What would you recommend?	 Sarah has a ready-meal that is two days over its use- by date. She doesn't have anything else in her fridge, so she decides to have this for dinner. What advice would you give her about preparing the meal? Is this something you would do? Would you be worried about Sarah's safety eating the ready meal? How would you feel about Sarah sharing this meal with someone? Would that differ 	

Day	Question header	Prompts	Analysis/moderator notes
		depending on who she is sharing it with (for example her young child, her partner, an older relative)?	
Day 4	How many labels can you identify on your food?	 Select one item from the fridge and show us all of the different labels you can identify. Do you understand what they all mean? Are there any you don't understand or aren't familiar with? Please take a photo or video of some of the labels and tell us about what you see. 	We will have a list of probes on all of the different types of labels dependent upon what people say here Examples if needed: use-by dates, best-before dates, fair trade label, ingredient labels
Day 4	Leftovers	 Do you tend to have any food left over after meals? What do you normally do with it? How long will you tend to keep it for? When do you re-use or reheat it? What do you consider when deciding whether or not to consume it? 	Consider make-up of household here Do you label food that is leftover? Why/why not? Does the type of food (for example meat, vegetables) play a role in your decision?

Day	Question header	Prompts	Analysis/moderator notes
		 How do you prepare left-overs when you are going to consume them? 	Do you ever freeze your leftovers?
			Probe on perception of risk in relation to how long since cooking they are consuming it
Day 5	Take a photo of	 Take a photo of an item close to its use-by date. How long ago did you get this? Where have you been storing it? Do you normally read the guidance on the packaging on how to store it? Have you followed it here? What are you planning on doing with it? How do you decide whether it is safe to eat? 	If not captured in the photo, moderators to ask specifically about labels/ dates Note strategies or techniques participants employ during storage to make food last longer. Who do you think will be eating this item (yourself, your partner, your child)?
Day 5	Consuming food and drink	 Take a photo of an item of food you are planning on using today. Why do you want to use it today? 	

Day	Question header	Prompts	Analysis/moderator notes
		 Are you planning on preparing or cooking it in any way? 	
		Who are you going to eat it with?	
		 How will you decide whether it is safe to eat? 	
Day 6	Out of date food	Tell us about anything out of date (past its use-by	Moderators to consider
		date) you have consumed in the last week or so.	situation when probing
		How did you decide it was safe to eat?	situation when probing
		• What did you do to prepare or cook it?	Examples if needed: scraping
			or removing parts, cook for
		 Is this different to how you would have 	longer, cook in a different
		prepared it if it was in date?	way, hotter temperature?
Day 7	Take a photo of	Take a photo of an item close to its best before date.	If not captured in the photo, moderators to ask specifically
		How long ago did you get this?	about labels/ dates
		Where have you been storing it?	Note strategies or techniques participants employ during
		Do you normally read the guidance on the packaging on how to store it? Have you followed it here?	storage to make food last longer.

Day	Question header	Prompts	Analysis/moderator notes
		What are you planning on doing with it?	Who do you think will be
		How do you decide whether it is safe to eat?	eating this item (yourself, your partner, your child)?
Day 7	What's in your fridge?	Pick out three things from your fridge, or your	If use-by dates are included in
		cupboards, that are opened but not finished and take a photo.	the photo moderators can probe on these specifically
		Show or explain to us:	
		 How you have stored them 	
		 Whether they have any instructions or dates on the packaging 	
		 What you are planning on doing with the item 	
Day 8	Throwing food away	How do you decide what to throw away?	Moderators to probe/consider
		Tell us about any food or drink items you have thrown	making the decision, and who
		away this week and the reasons why you did so.	they are making the decision for (for example children) and
		 Who decides what to throw away in your household? 	the related risk factor.

Day	Question header	Prompts	Analysis/moderator notes
		 Who is in mind when these decisions are made? for example yourself only, your partner, your children, other household members How often would you say you throw away food or drink items that have not been opened? 	PROBE ON: Look, feel, smell, taste, use by date, best before date, something on packaging, replaced with fresher item, risk to health
Day 8	Tell us about the last meal you prepared.	How did you decide whether it was safe to eat? For example, did you look at it, smell it, check the labels, or do something else?	Prompts: sensory cues, looking at labels, sniff test, something else?
Day 9	Take a photo of	Take a photo of an item without any date labels.How long ago did you get this?Where have you been storing it?Did you receive any guidance on how to store it?If so, have you followed it here?What are you planning on doing with it?How do you decide whether it is safe to eat?	If not captured in the photo, moderators to ask specifically about labels/ dates Note strategies or techniques participants employ during storage to make food last longer.

Day	Question header	Prompts	Analysis/moderator notes
Day 9	Consuming food and drink	Tell us about an item of food or drink that you considered throwing away, but instead decided to keep and consume.	Probes will be dependent on participant responses
		What was the food or drink item?	
		Why did you consider throwing it away?	
		 How did you decide it was safe to eat? 	
		What did you do to prepare or cook it?	
Day 10	What would you eat!	 Select the pictures of food or drink items from the list that you would consume after the use-by date. Tell us about what you would do to prepare these items before consuming them. List to include pictures of the following: Ready meal 	Other food items could include: sandwiches, quiches, smoked fish, pies
		 Dairy items (for example milk, cheese) Fresh meat or fish Ready-made salad Sliced ham or salami Ready-made sandwich 	

Day	Question header	Prompts	Analysis/moderator notes
Day 10	Preparing meals	 What sorts of things do you consider when you are preparing food? Are there any checks you make when cooking or preparing certain types of food? Do you prepare food that has been frozen any differently to food that has been freshly cooked? Do you look at the labels or cooking instructions? 	PROBE ON: Food safety considerations- cleaning/washing food, washing hands, using different surfaces etc Cooking behaviours- cooking things thoroughly or in particular ways for example ready meals If use by date or best before date has passed, do you do something different?
Day 11	Getting ready for the Bank Holiday	 Are you planning any special meals over the Bank Holiday weekend? What are you planning to prepare? Who will you be eating with? Have you already bought what you need? How did you decide what to buy? 	(Meal plan, bought specially, preference of household, convenience, time it takes to cook, date determined it, items you had left etc) Food safety considerations- cleaning/washing food, washing hands, using different surfaces etc

Day	Question header	Prompts	Analysis/moderator notes
		How will you prepare or cook the meal? What might you do to ensure it is safe to eat?	Cooking behaviours- cooking things thoroughly or in particular ways for example ready meals
			Prompts: sensory cues, looking at labels, sniff test, preparing under time pressure and safety impacts
Day 11	Take a photo of	Take a photo of an item past to its use-by date.	If not captured in the photo, moderators to ask specifically
		How long ago did you get this?	about labels/ dates
		Where have you been storing it?	Note strategies or techniques
		What are you planning on doing with it?	participants employ during storage to make food last
		How do you decide whether it is safe to eat?	longer.
Day 12	Take us on a video tour of	Take a video of the items in your freezer, and tell	Additional probes:
your neezer:	us about:	- How full is your freezer	
		How you store items in different parts	normal?
		of your freezer	
		 What types of food you keep here 	

Day	Question header	Prompts	Analysis/moderator notes
		• Why you decide to store food in this way Do you ever cook food in order to make it last longer? You can explain your thoughts to us either by speaking in the video or by writing a message.	 Why do you store things this way? Does this depend on the type of food? For example meat, dairy Does this have any relation to a concern that you could get ill if it's stored incorrectly?
Day 12	Consuming food and drink	 In the last 3 months or so, have you eaten anything which you would have preferred to throw away but did not? What are some of the reasons for your decision? How did you decide it was safe to eat? What did you do to prepare or cook it? Is this different to how you would have prepared it if it was in date? 	

Day	Question header	Prompts	Analysis/moderator notes
Day 13	Take a photo of	Take a photo of an item past to its best before date.How long ago did you get this?Where have you been storing it?What are you planning on doing with it?How do you decide whether it is safe to eat?	If not captured in the photo, moderators to ask specifically about labels/ dates Note strategies or techniques participants employ during storage to make food last longer.
Day 13	Reflections	We are coming to the end of the online diary phase of this research, which will end tomorrow. Before it closes, we'd love to know your reflections! Have you thought about food practices and habits in any different ways over the last couple of weeks? Is there anything else you would like to tell us about your experience of taking part in this diary?	
Day 14	Tell us about the last meal you prepared for a special occasion or celebration.	 How did you decide what to eat? What was it? Who were you preparing the meal for? 	(Meal plan, bought specially, preference of household, convenience, time it takes to cook, date determined it, items you had left etc)

Day	Question header	Prompts	Analysis/moderator notes
		 What did you do to get it ready? 	Prompts: sensory cues,
		 How did you decide whether it was safe to eat? When you were purchasing the food for this meal, did you consider the use-by dates? 	looking at labels, sniff test, something else, preparing under time pressure and safety impacts

Follow-up depth interview guide

Before the interview:

- Review app diary data and identify any specific situations where a participant mentioned consuming food or considered consuming food past its use by date. These situations can be probed further during the interview to understand the reasons why a participant did this.
- FSA participants will be interviewed by the same researcher who conducted the initial pre-interview. If this is not possible in any cases (because schedules have changed), the researcher will also review the pre-interview notes to ensure they are aware of any relevant contextual factors.

Welcome and intro (3 minutes)

Thank participant for taking part

Introduce self, explain that...

You may recall from our initial call, that Ipsos MORI is working with the Food Standards Agency on a research study which aims to understand more about people's shopping habits and food behaviours. Soon after our initial call, you took part in the App diary, and we'd like to take this opportunity to say thank you for your contributions to the research so far.

During our call today, we will go into some more depth about the things you told us during the app diary. **The call shouldn't take longer than 45 minutes – is now still a good time?**

Check ok.

You will be given £100 for participating in the research as a thank you for your help after this interview.

I also want to assure you that all the information we collect will be treated confidentially and that it won't be possible to identify any individual in the report we write at the end of the study. The only time we may have to tell someone about something you say, is if you tell us something which suggests that someone, or yourself is at risk of serious harm. Please know, that throughout this interview, there are no right or wrong answers and we are just interested in hearing about your own experiences and views. You do not have to share anything that you do not want to. You can stop the interview at any point, and you are under no obligation to take part.

We are aware that you may have already told us about some of the things that we will ask you in this interview – that is fine. We just want to make sure that we understand as much as possible about your experiences, how you feel and think about food and if there have been any recent changes or likely changes in the future.

The findings from this research will help the FSA understand peoples' behaviour to inform government policies and future communication campaigns.

Can I check that you are happy to participate? [Confirm consent]

Thank you.

Get permission to digitally record and transcribe for analysis, no detailed attribution.

turn on recording and record participant's consent that happy to take part and understand that responses will be kept confidential

Before we start, do you have any questions about the research? [allow time here to answer all questions in detail and reassure participants/ refer back to the information sheet as needed]

Brief reflection on the Applife diary experience (5 minutes)

To get us started, it would be great to hear about your experiences of keeping a diary on Applife.

How did you find talking about your food behaviours during the two weeks?

- Has anything surprised you?
- Were some activities easier/harder than others?

The FSA is particularly interested in people's views towards use-by dates. Did participating in the app diary and reflecting on your food habits make you feel any differently about use by dates specifically?

• In what ways? Probe: knowledge, behaviours, feelings etc.

Did questions from the app make you more aware of use by dates? Or any other

food labels?

- What was the impact of this?
- Have you done anything differently while keeping the diary?
- Will you do anything differently in the future, as a result of keeping this diary?

Introduction to food safety and use by date knowledge (5 minutes)

In general, how important would you say food safety is to you?

- Would you describe yourself as conscious of food safety when you're buying, preparing and consuming food?
- Where do you think your knowledge or attitudes towards food safety have come from? If needed: For example from family, friends, school, training, advertising, information on products.
- And how important would you say food safety is when you're serving or supplying food to others? Probe: children, the elderly

What do you understand to be the meaning of a use by date on food and drink

products?

- What types of products have a use by date on them?
- And when you think of a use-by date, is your understanding that food should be eaten up to that date OR that you can eat it on that date?
- What risks do you think are involved in consuming food/drink after the UBD? Is this something you are concerned about at all?

Thinking generally, how important do you feel use by dates are?

- Are there any types of food you would feel particularly concerned about eating past their use by date?
 - Why is this? Probe for specific examples.
- Are there any types of food you would <u>not</u> feel particularly concerned about eating past their use by date?
 - Why is this? Probe for specific examples.

Where do you think your understanding of use by dates has come from?

- PROBE: did someone teach you for example parents, campaigns, school, assumed, "always done" etc
- During the diary and through the tasks, have your views changed at all towards consuming things after their use by dates?

Factors influencing use by date behaviours (20 minutes)

Thanks again for all your contributions to the app diary, it was great to see! Now we'd like to discuss an instance where you told us you consumed something after its use-by date. [Moderator to describe the specific example].

[If needed, remind that there are no right or wrong answers and we're not here to judge.] **Thinking about this example, why did you buy the product and when were you**

planning on consuming it?

- Was it part of a regular shop or a spontaneous buy?
- Did you check the use-by date in the shop? What did you think at the time?
- If relevant: What did you think might happen if you did not check the use by dates then?
 - PROBE: on routine, sense of safety, sense of control, upbringing, expectations for what might happen
- Did you have plans for eating it on a certain day/ for a certain meal/ with or for certain people?

When you brought the food/drink home, how did you store it?

- Did you follow the instructions or store it in a specific way? For what reasons?
- Is this something you would normally do?
- What did you think might happen if you did not store it in this way?
 - PROBE: on routine, sense of safety, sense of control, upbringing, expectations for what might happen

At what point did you notice the use-by date?

- How did this make you feel at the time?
- What kind of things did you consider when deciding what to do?
 - Probe: food safety, sense of risk, availability of other options, opportunity to buy different food (time, money, proximity of shops), routine etc.
- Did you change your plans for preparing the meal at all?
 - Change in <u>who</u> they made the meal for?
 - Change in <u>how</u> they prepared it? For example cooking for longer, cooking at a higher heat etc.
 - Change in <u>when</u> they made the meal?
 - Change in how long they kept it afterwards?

Did you have any concerns about preparing the food/drink?

- IF RELEVANT: For what reasons did you decide to throw the food/drink away rather than consume it?
 - What did you think might happen if you ate it instead of throwing it away?
- PROBE: on routine, sense of safety, sense of control, upbringing, expectations for what might happen

If relevant: What did you do when you came to prepare the meal?

- Did you follow the preparation and cooking instructions on the packing?
- [IF NOT COVERED ABOVE] Did you do anything differently because it was past its use-by date?

If relevant: You mentioned you live with other people – does this have an impact on whether or not you'd use an item after its use by date?

- Who in your household would you serve or not serve an item past its use by date to? Probe: young children, teen agers, elderly, someone with a health problem for example immune deficiency
 - Does this depend on the type item?
- If you were serving an item of food which is past its use by date to other people in your household, would you cook/prepare it any differently? In what ways?

How does this example compare to other times when you have decided not to eat something after the use-by date? [Moderator to describe any examples mentioned] in the app]

- Probe: type of product, occasion meal, who they were giving the meal to, availability of other options etc.
- What stopped you from throwing the food/ drink away on this occasion?

Barriers to use by date compliance (10 minutes)

What do you think are some of the reasons why other people do not adhere to use

by dates?

• Probe: information/knowledge, opportunity incl. affordability, access to shops, routines, assessment of risk/safety etc.

Thinking broadly, what are some of the reasons why you have chosen to consume

items after the use by date in the past?

Probe: information/knowledge, opportunity incl. affordability, access to shops, • routines, assessment of risk/safety etc.

- What stopped you from throwing the food away at the time?
- How have your behaviours changed since then, if at all?

What might help you or other people to consume food before the use-by date?

- Probe: information, availability of products, affordability etc.
 - What difference might this make?
- Is this something you would want to happen?

Can you think of any situations where you would <u>always</u> make sure you consume a food/drink item or type of meal before the use by date?

- Why is consuming this item before the use by date important to you?
- What risks do you think there would be if you chose to consume this item/these items after the use-by date?
- How would you feel if you weren't able to consume it by the use by date? What would you do?

Wrap-up (2 minutes)

Is there anything else you would like to tell us about food habits and use-by dates that we haven't already discussed today?

Thank you for sharing your thoughts with me and for taking the time to participate in this study. It's been really interesting talking to you and learning about the things you shared with us. As you know, the FSA is conducting this research to try and understand people's behaviours towards use by dates. This will help them understand consumer behaviour to inform government policies and future communication campaigns.

Do you have any questions about what we have discussed? Or about the research project overall?

Overall, how do you feel about this research project?

Annex 2 – COVID-19 restrictions present during fieldwork

Participants took part in two depth interviews and an app-based diary between the 22nd March and the 4th April 2021.

During this time period, there were national lockdowns across the United Kingdom, with different restrictions in place across England, Wales and Northern Ireland. There were also localised restrictions on various parts of the country. Individuals were encouraged to limit their travel and work from home where possible, while non-essential retail shops and hospitality venues including restaurants remained closed.

During this time, supermarket stock levels fluctuated with some items being in short supply. Additionally, the closure or amended hours of many shops and markets is likely to have influenced participants' routines and could have had an impact on their access to shops and in turn their purchasing habits.

These factors should be taken into consideration when interpreting these findings.

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Annex 3 - Full evidence review

21-011705-01 FSA UBD Report v4 ICUO



Evidence Review: Consumption of food with expired 'use by' dates

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Final Draft

10th May 2021

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Definitions and acronyms

Definitions

Definitions of key terms, words and phrases used in this report.

Table 4: Definitions of key terms

Key Term	Definition
Use-By-Date	Use by dates (spelt with and without hyphens), indicate the date
(UBD)	after which the food is unsafe and should not be consumed (food
	is safe when in date as long as it has been stored appropriately,
	for example, refrigerated).
	In legislation: 'After the 'use by' date a food shall be deemed
	to be unsafe' Retained EU Law Regulation (EU) 1169/2011.
Best-Before-Date	The best before date (spelt with and without hyphens), sometimes
(BBD)	shown as BBE (best before end), is about quality and not safety.
	The food will be safe to eat after this date but may not be at
	its best.
Consumption	The term consumption is here referring to the act of food
	consumption. That is the periodic behaviour of eating and/or
	drinking, triggered at various moments of the day by a number
	of converging factors (time of day, need state, sensory
	stimulation, social context, etc.).
Food or	Refers to any substance or product intended to be, or reasonably
Foodstuff	expected to be ingested by humans.
Food Preparation	This refers to the socio-cultural processes of preparing (getting
Practice	ready) raw, pre-cooked and pre-prepared food items for
	consumption

Perception	An individual's belief or opinion of how things seem, here with regard to the risk of consuming UBD expired foods.
Risk	The possibility, and severity, of a 'negative health outcome' or something 'harmful to health occurring' as a result of consuming UBD-expired foods.
Driver	Factors underpinning an individual's consumption of UBD-expired foods behaviour, including economic (affordability), social, cultural, temporal, and infrastructural (kitchen/food storage and preparation for example, fridge, freezer, cooker, microwave).
Barrier	Factors limiting or preventing individuals from reducing or ceasing consumption of UBD-expired foods, including economic (affordability), social, cultural, temporal, and infrastructural.

Acronyms

Acronyms used in this report.

Table 2: Acronyms

Acronym	Meaning
FSA	Food Standards Agency
REA	Rapid Evidence Assessment
UBD	Use by date
BBD	Best before date
Introduction

Report objectives

This report is the evidence review submission to the FSA for the 'Qualitative research into the consumption of food with expired 'use by' dates'. The evidence review represents the first strand in this research project which ADAS, as Ipsos MORI subcontractors, have delivered with the overall aim of enhancing the FSA's understanding of the consumption of food past its UBD.

This includes the presentation of a high-level overview of existing literature identified together with a high-level review of the evidence provided by these studies, including key emerging themes to address the REA objectives. The evidence review is presented in the following sections:

- 1. Background: Drivers and objectives of the research.
- 2. Methodology: Overview of the approach taken to the evidence review.
- 3. An Overview of the Evidence: High-level overview of the evidence identified.
- 4. Results: The synthesis of the identified evidence as it relates to the research questions.
- 5. Concluding Evidence Reflections: Summary of key themes emerging in the literature identified.
- 6. Annex: Agreed search protocol and data extraction database.

Background

Recent research has indicated that a substantial minority of consumers eat food after the 'use by' date (UBD) has expired. Such practices present a potential risk to public health, and as such represent a potential priority policy issue for the Food Standards Agency (FSA) that requires further research. This research has been commissioned by the FSA to begin to address that need, and to examine the consumption of food with expired UBD, including the drivers underpinning, and barriers to reducing, such behaviour.

Ultimately, the research aims to better inform the FSA regarding the consumption of food past its UBD, in order to support evidence-based policy development, communications and potential interventions regarding the reduction of potential public health risk from consumption of food past its UBD. This supports the FSA's objective to protect consumer interests, and help consumers reduce consumption of food with expired UBD without increasing food waste. The research outputs will inform evidence-based policy recommendations, relevant stakeholders within the FSA, OGDs and NGOs, as well as highlight further research if appropriate.

The research comprises two parallel strands of work:

- 1. A focused evidence review to capture existing knowledge about consumer behaviours and attitudes towards UBD (ADAS).
- 2. In-depth qualitative research with 30 participants using auto-ethnographic diaries and two depth interviews (Ipsos MORI).

Aims of the Evidence Review

The aim of the evidence review is to capture existing knowledge about consumer behaviours and attitudes towards UBD. It has been designed to generate understandings of the existing evidence and literature regarding the consumption of food with expired UBD, including evidence about the causes and any barriers to reducing this behaviour. To meet these objectives the evidence review seeks to address six research questions:

- 1. For context, what is the evidence regarding the consumption of food with expired UBD in the UK?
- 2. What drivers does the identified literature suggest underpins the consumption of food with expired UBD?
- 3. What barriers preventing the reduction of the consumption of food with expired UBD are identified in the identified literature?
- 4. What is the evidence regarding consumers' perceptions of the risk involved in consuming food beyond its UBD?

5. Is there evidence regarding consumer preparation practices of food consumed beyond its UBD? If so, what are the core themes regarding preparation practices in this context?

Methodology

Research Approach

The evidence review has been developed using a Rapid Evidence Assessment (REA) approach, to draw out the evidence base with regard to existing knowledge about consumer behaviours and attitudes towards UBD. The REA was undertaken using a systematic search protocol approach, adapted to suit the needs of the FSA and the time constraints. The REA process was completed in four stages: i) design of a search protocol; ii) performance of searches and screening; iii) data extraction from relevant literature; and iv) data synthesis. See appendix 1 for the full methodology originally outlined in the search protocol submitted and agreed with the FSA.

REA Limitations

It is important to note here that the extent or scale of the REA (i.e., how much literature was sought and reviewed) was determined by three key factors:

- Availability of literature and evidence: It was anticipated that there would be a limited amount of UK specific UBD focused evidence.
- Timescale: This was a rapid delivery project, with seven weeks for the completion of the data identification, extraction, and synthesis.
- Budget: Allowed for up to 48 pieces of evidence (equivalent to full length journal articles).

The approach to the search protocol was systematic, supplemented with purposive searches, and pragmatic adaptions to a full REA process. This included: the collation of only relevant titles to a maximum of 10 in the first screening, forgoing the recording of excluded literature and the justification for exclusion.

Quality

The quality of evidence overall was relatively high with the vast majority being peerreviewed scientific community papers. Grey literature, including reports from key authorities in this area of expertise and research were also included, for example WRAP reports. The authority of these organisations supports confidence in the quality of the sources.

An Overview of the Evidence

Here we present a brief high-level overview of evidence identified for data extraction.

Following three stages of screening the REA process identified 51 pieces of literature for data extraction. Evidence directly addressing the research questions, and UBD centred studies in the UK context was found to be somewhat limited. Whilst the majority of the literature included is from the UK context, the evidence is broader in remit, extending to include relevant food related consumer behaviours. Furthermore, to ensure a focus on UBD (rather than food waste), highly relevant evidence emerging from EU countries and North America was included. It is also worth noting that due to the nature of the research questions much of the evidence is underpinned by qualitative research.

Country	Evidence format: Journal	Evidence format: Report
	Article	
UK	11	14
Belgium	1	No data
Germany	2	No data
North America	6	1
Sweden	2	No data
Other	9	No data
Multiple	3	2

Table 3: Sna	pshot of the	literature	taken	forward to	o data	extraction
		monataro	canceri	ion mara c	Jaata	

Area of interest	Evidence format: Journal	Evidence format: Report
	Article	
Food Waste	7	10
Consumer Use of	17	2
Food Date Labels		
Consumer Use of	No data	2
General Food		
Labels		

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Consumer Kitchen	10	3
Behaviourand		
General Food		
Safety Awareness		

Research Design	Evidence format: Journal	Evidence format: Report
Used	Article	
Review Paper	6	1
Social research –	19	8
Qualitative		
Social research –	1	6
Quantitative		
Scientific	5	1
experiment –		
Qualitative		
Mixed method	2	1
Other	1	No data

Total taken forward to data extraction:

- Journal article: 34
- Report: 17

The substantive content of the evidence broadly found a lack of research considering UBD related behaviours, practices, perspectives and understanding, specifically, and more so in the UK context. These limitations in the literature extend to evidence regarding the current picture and risks of consumption of food with expired UBDs, where a limited amount was identified. However, a considerable degree of evidence concerned with food safety behaviours more broadly was identified. This literature often focussed on older consumers, as a high-risk or vulnerable population, and the risk of Listeriosis sp. over other types of food poisoning caused from eating food that had gone past the UBD. Nevertheless, a reasonable degree of evidence addressing the drivers, and barriers

preventing the reduction, of consuming food beyond the UBDs was obtained. Though very little literature was found considering affordability of food as a specific barrier.

Reflecting food waste as something of a 'wedge issue' the searches returned a large volume of waste related literature. However, the vast majority of this was not relevant or specific enough to UBD in its focus to be included.

Finally, the spread of the identified literature as it addressed the research questions was not even. As outlined in Table 3, all research questions have at least six pieces of literature and, as some papers address more than one research question, others have up to 45 relevant papers identified against them.

Research Questions	Relevant Evidence
What are the risks regarding consumption of food with expired UBDs?	10
For context, what is the evidence regarding the consumption of food with expired UBD in the UK?	9
What drivers does the identified literature suggest underpins the consumption of food with expired UBD?	45
What barriers preventing the reduction of the consumption of food with expired UBD are identified in the literature?	26
What evidence suggests that affordability is specifically a barrier?	6
How can these barriers (preventing the reduction of the consumption of food with expired UBDs) be overcome?	25
What is the evidence regarding consumers' perceptions of the risk involved in consuming food beyond its UBD?	19
Is there evidence regarding consumer preparation practices of food consumed beyond its UBD? If so, what are the core themes regarding preparation practices in this context?	20

Table 5: Identified literature mapped against research questions

Results

The high-level review of the evidence that follows makes use of 31 journal articles and 15 reports identified in the REA process.

1. Evidence regarding the state of consumption of food with expired UBD in the UK

UBDs indicate the date after which the food is unsafe and should not be consumed. They are included on products that are highly perishable from microbes and could cause immediate danger to human health after a short period of time.⁶⁵ Despite the important role UBD labelling plays in promoting food safety, and the risks associated with consuming foods with expired UBDs, studies report a complex picture, specifically in terms of the proportion of the adult population consuming foods past their UBD. Significantly, the data suggest a paradoxical picture with significant proportions of the adult population in the UK both consulting UBDs and consuming food that is past its UBD.

The most recent Food and You 2⁶⁶ findings report 64% of survey respondents state always checking the UBD before they cook or prepare food, whilst a third (33%) check at least occasionally and just 2% never check UBDs. Moreover, the survey finds that high levels of respondents reported never eating cooked meats (64%), smoked fish (85%), cheese (52%), bagged salads (49%) or milk (67%) past the UBD. However, the survey also finds that respondents report having eaten those same foods past the UBD. For example, almost half of respondents had eaten bagged salad past the UBD, 6% every week, 21% some weeks and 17% just one week in the last month. Furthermore, when respondents were asked to indicate what they do with food which is about to go past its UBD, 8% state they eat it after the UBD.

 ⁶⁵ Samotyja, U. and Sielicka-Różyńska, M. (2020). How date type, freshness labelling and food category influence consumer rejection. *International Journal of Consumer Studies*, 1–15.
 ⁶⁶ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). <u>Food and You 2: Wave 1 Key Findings</u>. Food Standards Agency. [Accessed 2nd June 2021].

This paradox is found in previous studies, for example Evans and Redmond's (2016)⁶⁷ work with the over 60s found that 72% of participants reported checking UBDs to judge whether food is safe before consumption, whilst 57% also reported consuming UBD expired food. Moreover, Evans and Redmond (2015) found that just under half of respondents had food products beyond their UBDs in the fridge at the time of the study. Similarly, Van Boxstael et al. (2014)⁶⁸ found 67.5% of participants judged edibility by considering the shelf life of the product. Yet, Prior et al. (2013)⁶⁹ report finding that of their study respondents 29% eat bread three or more days after the UBD, 25% consume eggs three days after the UBD, 12% would eat dairy foods 5 or more days after the UBD, 9% would eat cooked meat 3 or more days past its UBD, and 3% would eat cooked meat 5 or more days after the UBD. Marklinder and Eriksson (2015)⁷⁰ identified that in the case of milk, whilst 12% of the milk cartons had exceeded their expiry date, only 3% was assessed as inedible.

Roberts and Downing (2021)⁷¹ found that in response to the first COVID-19 lockdown in the UK there was an initial increase of 30% in individuals who reported checking labels including UBD / BBD. It is suggested that these shifts in 'lockdown food management behaviours' continued to endure throughout 2021. Over nine in ten (91%) respondents who checked date labelling more often during the first lockdown, reported to still be doing so in September 2021. This includes 22% who said they were doing this even more than during the first lockdown. However, in keeping with the paradox of earlier literature, the FSA's recent survey (2021) showed that 76% of adults survey had knowingly eaten food past the UBD.

⁶⁷ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021].

⁶⁸ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97.

⁶⁹ Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food attitudes and behaviours in the UK:</u> <u>findings from the Food and You survey 2012</u>. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021].

⁷⁰ Marklinder, I. and Eriksson, K.M. (2015). Best-before date – food storage temperatures recorded by Swedish students. *British Food Journal*, 117, 1764-1776.

⁷¹ Roberts, M. and Downing, P. (2021). <u>Life under Covid-19: Food waste attitudes and behaviours in 2020</u>. WRAP and Icaro Consulting. [Online]. [Accessed 26 March 2021].

Notably, study findings regarding the consumption of UBD expired food varies across products. For example, Leib et al. (2016)⁷² outlined that whilst 50% of participants 'always' threw away raw chicken that was past the UBD, in the case of unopened canned goods and breakfast cereal the UBD was considered less important. Samotyja (2016) reported that more consumers would reject expired blue cheese (72.7%) and powdered milk (70.9%) than chocolate (35.4%) or oil (41.3%) based on date labelling.⁷³ Samotyja & Sielicka-Różyńska (2020)⁷⁴ identifying that acceptance of UBD expired food amongst Polish participants as edible products ranged from 31.5% to 60.2%.

This apparent paradox in the evidence is acknowledged in the literature by Samotyja & Sielicka-Różyńska (2020)⁷⁵ who describe it as "irrational". Hall and Osses, (2013)⁷⁶ also acknowledge the paradox and go on to highlight that whilst consumers do use date labels, there is often misunderstanding regarding the terms. Like many behaviours, use of labels is influenced by a wide range of factors including attitudes, knowledge, experience, socio-demographic characteristics, trust in message providers and labelling. Each of these factors are highlighted across the literature identified for this review and are covered in the evidence outlined below.

2. Consumers' perceptions of the risk regarding the consumption of foods with expired UBDs

The literature outlines a strong consumer belief that the consumption of UBD expired food is safe. Here in the UK, it is reported that only 23% of consumers hold the belief that consumption of expired food presents a "serious health risk".⁷⁷ Indeed, Evans and

⁷² Broad Leib E., Rice C., Neff R., Spiker M., Schklair A. and Greenberg S. (2016). <u>Consumer Perceptions</u> <u>of Date Labels: A National Survey</u>. Harvard Food Law and Policy Clinic, USA. [Online]. [Accessed on 18 March 2021].

⁷³ Samotyja, U. and Sielicka-Różyńska, M. (2020). How date type, freshness labelling and food category influence consumer rejection. *International Journal of Consumer Studies*, 1–15.

⁷⁴ Ibid

⁷⁵ Ibid

⁷⁶ Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. *International Journal of Consumer Studies*. 37, 422-432.

⁷⁷ Newsome, R., Balestrini, C. G., Baum, M. D., Corby, J., Fisher, W., Goodburn, K., Labuza, T. P., Prince, G., Thesmar, H. S. and Yiannas, F. (2014). <u>Applications and Perceptions of Date Labelling of Food</u>.

Comprehensive Reviews in Food Science and Food Safety, 13, 745-769. [Online]. [Accessed on 18 March 2021]

Redmond (2015)⁷⁸ report that participants "often" believed that expired food is safe to eat, with 67% of their 2016 study respondents report believing it is safe to eat food that had gone past its UBD despite 72% understanding that UBDs indicate food safety. According to a recent FSA survey (2021), 43% of the adults who stated they sometimes eat food past the UBD report do so in the belief that food just past the UBD is safe to eat.⁷⁹ Enright et al. (2010)⁸⁰ identified that confidence in high food standards together with the belief that food is still safe to consume past its UBD led to low perceptions of the risk of food poisoning.

Factors impacting the degree of risk perceived include: the food type, storage mode, familiarity with the food, previous negative experiences as well as age and the food preparation/ serving context.

The evidence suggests that **food type** is an important factor influencing individuals' perception of the degree of risk associated with consuming foods with expired UBDs. However, the data exploring food type as a factor shaping perception of risk related to the consumption of foods with expired UBD presents a mixed picture. For example, Prior et al.⁸¹ found in this study that 28% of people surveyed were very concerned about raw beef, lamb, pork, or poultry going past its UBD. However, 22% of respondents were very unconcerned about using the UBD on these foods to determine whether the food was still safe to eat. Similarly, Prior et al. (2013)⁸² also found that 33% of respondents were very concerned whilst 27% were very unconcerned regarding use of UBDs to determine whether milk and yoghurt were safe to eat or use in cooking. Most importantly, the literature identified that consumers' lack of risk awareness when it comes to the consumption of expired listeriosis-risky foods such as cooked sliced ham or pâté,

⁷⁸ Evans, E. W. and Redmond, E. C. (2015). <u>Analysis of older adults' domestic kitchen storage practices in the United Kingdom: Identification of risk factors associated with listeriosis</u>. *Journal of Food Protection,* 78, 738–745. [Online]. [Accessed 26 March 2021].

 ⁷⁹ Food Standards Agency (2021). <u>Best before and use-by dates</u> [Online]. [Accessed: 7th March 2021].
 ⁸⁰ Enright, G., Good, H. and Williams, N. (2010). <u>Qualitative Research to Explore Peoples' Use of Food</u> <u>Labelling</u>. Ipsos Mori. Unit Report 5. [Online]. [Accessed 2nd March 2021].

⁸¹ Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food attitudes and behaviours in the UK:</u> <u>findings from the Food and You survey 2012</u>. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021].

⁸² Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food attitudes and behaviours in the UK:</u> <u>findings from the Food and You survey 2012</u>. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021].

presented health risks; with particular reference to older consumers.⁸³ The study found that the lack of awareness related to hazards such as *L. monocytogenes*, with 36% and 33% of adults surveyed being aware that soft cheese and unpasteurized milk carry *L. monocytogenes* risk but only 1% of adults surveyed were aware that sliced cured meat is associated with *L. monocytogenes* and nobody was aware that cooked cured meat is associated with *L.*⁸⁴

The perception of risk related to the consumption of foods with expired UBD varies across **storage modes**. Consumers report higher perceptions of concern about consuming meat and fish, notably raw chicken, past its UBD.⁸⁵ Whilst foods stored at room temperature such as tinned, dry, or frozen products, usually labelled with BBD and not requiring a UBD, are seen as being lower risk.⁸⁶

The literature regarding perceptions of risk suggests that **familiarity** with a particular food or product may lower the perceived risk related to consuming expired foods.⁸⁷ Whilst previous negative experience with food-borne illness is reported to increase risk perception of consuming expired food; Farr-Wharton et al. (2014)⁸⁸ found that this was particularly acute in relation to food-borne illness experienced in childhood.

Furthermore, it has been suggested that consumers have lower perception of self-risk regarding the consumption of expired foods as opposed to when preparing food to be

⁸⁵ Broad Leib E., Rice C., Neff R., Spiker M., Schklair A. and Greenberg S. (2016). <u>Consumer Perceptions</u> of <u>Date Labels: A National Survey</u>. Harvard Food Law and Policy Clinic, USA. [Online]. [Accessed on 18 March 2021]. Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and</u> <u>Self-Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021].

⁸⁶ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control*, 37, 85-97. Samotyja, U. and Sielicka-Różyńska, M. (2020). How date type, freshness labelling and food category influence consumer rejection. *International Journal of Consumer Studies*, 1–15. Enright, G., Good, H. and Williams, N. (2010). <u>Qualitative Research to Explore Peoples' Use of Food Labelling</u>. Ipsos Mori. Unit Report 5. [Online]. [Accessed 2nd March 2021].
⁸⁷ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].

⁸³ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021].

⁸⁴ Ibid

⁸⁸ Farr-Wharton, G., Foth, M. and Choi, J. (2014). <u>Identifying factors that promote consumer behaviours</u> <u>causing expired domestic food waste</u>. *Journal of Consumer Behaviour*, 13, 393-402. [Online]. [Accessed on 11 March 2021].

consumed by "children, older people and guests".⁸⁹ Interestingly, Byrd-Bredbenner et al. (2013)⁹⁰ argue that whilst everyone is interested in food safety and has a positive attitude about food safety, most consumers have an optimism bias towards their own preparation techniques. They found that 90% believe the risk of illness from eating food that they prepared is low compared with 41% believing that the risk of illness from eating food that other people have prepared is low.

The evidence also suggests that older consumers have a lower perceived risk of consuming expired food when compared to younger consumers. For example, Evans and Redmond (2016)⁹¹ found that despite being at high risk of food-borne illnesses such as listeriosis, 67% of older consumers (≥60 years) believed that expired ready-to-eat products were safe to eat. Younger consumers were often found to pay closer attention to UBDs and to perceive higher levels of risk surrounding expired food consumption.⁹²

Risk Assessment

A WRAP study stated that over 85% of respondents report using personal judgement instead of UBDs to decide whether food is safe to eat.⁹³ The literature suggests a breadth of assessment practices being undertaken for food consumed beyond its UBD.

The most common practice reported is the sensory assessment of food, followed by a variety of preparation methods for foods deemed less satisfactory which are intended to nullify any perceived threat (for example, cooking). Finally, the literature reports the use of freezing food in order to extend the shelf life .⁹⁴

⁹¹ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021].

⁸⁹ Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour</u>. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021].

⁹⁰ Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health*, 10, 4060-4085.

⁹² Milne, R. (2011). <u>A focus group study of food safety practices in relation to listeriosis among the over-</u> 60s. *Critical Public Health,* 21, 485-495. [Online]. [Accessed on 11 March 2021].

 ⁹³ Waste Resources Action Plan (WRAP) (2017). <u>Helping Consumers Reduce Food Waste - Retail Survey</u>
 <u>2015</u>. Waste Resources Action Plan. [Online]. [Accessed 19 March 2021].

⁹⁴ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97.

Sensory methods were the most commonly reported method for checking food, aside from using date labelling. Sensory testing includes smelling food, visually inspecting food and tasting food.⁹⁵ The extent of the use of sensory assessment is demonstrated by Van Boxstael et al.,⁹⁶ where it is highlighted that the inspection of a food product visually together with smelling it was cited by 82.5% of the study's participants.

The evidence suggests that these assessment practices to determine if food is safe to eat or cook differs across food products.⁹⁷ In the most recent Food and You 2 survey⁹⁸ smell was most often used to assess raw meat (76%) and milk and yogurt (73%), while cheese was most often evaluated visually (65%). In Prior et al. (2013), 69% of participants used sight to see whether cheese was safe to eat, concerning themselves with mould, and 44% of participants checked whether meat was safe to eat or not based on colour. The literature highlights that often these assessments to judge the edibility of food products in the home occur in combination, with individuals visually assessing and smelling (82.5%), followed by looking at the shelf-life date (67.5%) or tasting (50.4%).⁹⁹

Significantly, the Food and You 2 survey¹⁰⁰ found that for fish (74%), eggs (62%) and dried or cured meats (68%) UBDs were most often used to judge safety. However, smell was found to be the most common sensory test for meat, fish (70%), milk and yoghurt (76%) and eggs according to Prior et al. (2013). Van Boxstael et al. (2014)¹⁰¹ found that women were more likely to use sensory testing than men (71.9% versus 60.8%). While

⁹⁵ Kavanaugh, M. and Quinlan, J.J. (2020). Consumer knowledge and behaviours regarding food date labels and food waste. *Food Control.* 115. 107285. Richter, B. and Bokelmann, W. (2017). Explorative study about the analysis of storing, purchasing and wasting food by using household diaries. *Resources, Conservation and Recycling,* 125, 181-187. Meah, A. (2014). Still blaming the consumer? Geographies of responsibility in domestic food safety practices. *Critical Public Health,* 24, 88-103. Watson, M. and Meah, A. (2013). Food, waste, and safety: negotiating conflicting social anxieties into the practices of domestic provisioning. *The Sociological Review,* 60, 102-120.

⁹⁶ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. Food Control, 37, 85-97.

⁹⁷ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].

⁹⁸ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). Food and You 2: Wave 1 Key Findings. Food Standards Agency.

⁹⁹ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. Food Control, 37, 85-97.

¹⁰⁰ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). Food and You 2: Wave 1 Key Findings. Food Standards Agency.

¹⁰¹ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control*, 37, 85-97.

the FSA's recent¹⁰² survey also reported that 80% of women compared to 73% of men decide whether food is safe to eat by smelling it. Age is also identified as a key differentiating factor.

The use of non-sensory assessments for freshness are also reported in the literature, including for example an egg floatation test. Wills et al. ¹⁰³ suggest that for individuals with reduced senses, such tests are important for determining freshness. It was implied that these non-sensory and sensory testing methods are passed from generation to generation.¹⁰⁴

The evidence suggests a trend in a large proportion of older adults reporting to rely on the senses of smell, taste, and appearance to check whether food was safe to eat.¹⁰⁵ However, it is highlighted that older populations are often managing age-related deterioration of the senses i.e. being less able to smell whether food is 'off'.¹⁰⁶ Corrado (2007)¹⁰⁷ found that older participants were more likely to use their own judgement on UBDs and often use multiple methods to manage this including: scrupulously planning meals, managing food stocks carefully, rotating items between the fridge and freezer, using leftovers, cooking in bulk and freezing portions, pickling vegetables, and using airtight containers.

Conversely, one study identifies that students tend to use UBDs to determine whether dairy products (fermented drinks, milk, cream, and cottage cheese) and meat products (pâté and preserved meat) are safe to eat. By contrast, they used sensory assessments for fruit, vegetables, other cheese products, bread, sausages, eggs, butter, and oil. For these products, UBDs were disregarded in favour of looking for mould and/or other

¹⁰² Food Standards Agency (2021). <u>The FSA reveals that 50% of adults do not always check the use-by</u> <u>date on their food putting themselves and family at risk</u>. [Accessed 2nd April 2021].

¹⁰³ Wills, W., Meah, A., Dickinson, A. and Short, F. (2013). <u>Domestic Kitchen Practices: Findings from the</u> <u>'Kitchen Life' study</u>. University of Hertfordshire. Social Science Research Unit. Food Standards Agency. [Online]. [Accessed on 25 March 2021].

¹⁰⁴ Ibid.

¹⁰⁵ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021].

¹⁰⁶ Wills, W. J., Meah, A., Dickinson, A. M. and Short, F. (2015). <u>'I don't think I ever had food poisoning'</u>. A practice-based approach to understanding foodborne disease that originates in the home. *Appetite*, 85, 118-125. [Online]. [Accessed on 25 March 2021].

¹⁰⁷ Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour</u>. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021].

sensory assessments to determine safety.¹⁰⁸ There is also evidence to suggest that as less of the population is directly involved in food production (i.e. further removed from growing the food that they eat) food related skills such as the ability to detect food freshness decreases.¹⁰⁹

3. Evidence regarding consumer preparation practices of food consumed beyond its UBD

The literature outlines a variety of food preparation methods intended to nullify the risk of consuming expired foods.

Van Boxstael et al.¹¹⁰ describe how 24% of participants removed mould from products and proceeded to consume the non-mouldy parts. They found the degree to which this was practiced increased with age: 23.4% of 18-30 year olds, 24% of 31-65 year olds and 26% of over 65s. A similar proportion of men and women reported using this practice, with 24.9% of male respondents agreeing to it and 23.8% of female respondents.¹¹¹

Using heating to eliminate food safety issues in foods with expired UBDs was reported by 8.4% of participants in the Van Boxstael et al. study.¹¹² This practice was found to be most common amongst 18-30 year olds (9.4%), with 7.8% for both 31-65 year olds and over 65s. 8.6% of female respondents in Van Boxstael et al.¹¹³ agreed with this practice, compared to 7.9% of male respondents.

The literature suggests that these practices may be employed in combination. For example, Wills et al. report one participant's approach as both removing the mould and microwaving the product for a couple of minutes.¹¹⁴ This was designed to kill anything

¹⁰⁸ Samotyja, U. and Sielicka-Różyńska, M. (2020). How date type, freshness labelling and food category influence consumer rejection. *International Journal of Consumer Studies*, 1–15.

¹⁰⁹ Newsome, R., Balestrini, C. G., Baum, M. D., Corby, J., Fisher, W., Goodburn, K., Labuza, T. P., Prince, G., Thesmar, H. S. and Yiannas, F. (2014). <u>Applications and Perceptions of Date Labelling of Food</u>. Comprehensive Reviews in Food Science and Food Safety, 13, 745-769. [Online]. [Accessed on 18 March 2021]

¹¹⁰ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97.

¹¹¹ Ibid.

¹¹² Ibid.

¹¹³ Ibid.

¹¹⁴ Wills, W., Meah, A., Dickinson, A. and Short, F. (2013). <u>Domestic Kitchen Practices: Findings from the</u> <u>'Kitchen Life' study</u>. University of Hertfordshire. Social Science Research Unit. Food Standards Agency. [Online]. [Accessed on 25 March 2021].

potentially still living and would make the food safe to eat. Other examples include the use of vinegar on meat, described as "the old-fashioned way",¹¹⁵ or adding oil to high oil content products to prevent them going off. In this case, the participant reported believing that the oil created a barrier between the food and the air.¹¹⁶

A noteworthy proportion (38.4%) of consumers assessed by Van Boxstael et al. (2014)¹¹⁷ freeze food products and believe this is sufficient for food safety, not continuing to take UBDs into account. Participants consider this technique as a good guarantee for preserving quality and freshness of the food products. Food and You 2 (Armstrong et al., 2021)¹¹⁸ respondents were asked to indicate what they do with food which is about to go past its use-by date. Here most respondents reported that they either eat (38%) or freeze (26%) food before it reaches its UBD. Van Boxstael et al. (2014)¹¹⁹ found that 50.6% of older participants froze products, as opposed to 36.4% of younger participants and 37.7% of middle-aged respondents. Similarly, more men than women used this practice with 59.6% of male respondents in Van Boxstael et al. (2014)¹²⁰ agreeing with the statement and 64.7% of female respondents.

¹¹⁵ Ibid.

¹¹⁶ Wills, W., Meah, A., Dickinson, A. and Short, F. (2013). <u>Domestic Kitchen Practices: Findings from the</u> <u>'Kitchen Life' study</u>. University of Hertfordshire. Social Science Research Unit. Food Standards Agency. [Online]. [Accessed on 25 March 2021].

¹¹⁷ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97.

¹¹⁸ Årmstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). <u>Food and You 2: Wave 1 Key Findings</u>. Food Standards Agency. [Accessed 2nd June 2021].

¹¹⁹ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97. ¹²⁰ Ibid.

4. Drivers underpinning the consumption of food with expired UBD

Understanding of food labelling

While the Food and You 2 survey¹²¹ finds that 71% of respondents identified the UBD as the information which shows that food is no longer safe to eat, historically studies identify a confusion among the public regarding the distinction between UBDs and BBDs.¹²²

The FSA's recent survey highlights the finding that 50% of adults in England, Wales, and Northern Ireland cannot identify the correct definition for a UBD (that food can be eaten until the use-by date, but not safely after). Studies have evidenced higher rates of incorrect understanding of the differences between UBDs and BBDs in the past, with reports of up to 61% of participants being unable to make an accurate distinction between the two labels.¹²³ In the Brook Lyndhurst study some participants differentiated the date labels but mixed up the label meanings (safety or quality).¹²⁴ The study also found that for those that could not differentiate UBD and BBDs in the same way. Understanding is found to be reduced further when a 'display until' date is included.

¹²⁴ Ibid.

¹²¹ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). <u>Food and You 2: Wave 1 Key Findings</u>. Food Standards Agency. [Accessed 2nd June 2021].

¹²² Evans, E. W. and Redmond, E. C. (2014). Behavioural Risk Factors Associated with Listeriosis in the Home: A Review of Consumer Food Safety Studies, Journal of Food Protection, 77, 510-521, [Online]. [Accessed on 12 March 2021]. Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. International Journal of Consumer Studies. 37, 422-432. Hall-Phillips, A. and Shah, P. (2017). Unclarity confusion and expiration date labels in the United States: A consumer perspective. Journal of Retailing and Consumer Services, 35 (May 2016), 118–126. [Online]. [Accessed 26 March 2021]. Himmelsbach, E., Allen, A. and Francas, M. (2014). Study on the Impact of Food Information on Consumers' Decision Making. TNS European Behaviour Studies Consortium. [Online]. [Accessed 26 March 2021]. McIlveen, H. and Semple, L. (2002). Seeing is believing: current consumer use and understanding of food labels. Nutrition & Food Science. 32. Milne, R. (2013). Arbiters of waste: date labels, the consumer and knowing good, safe food. The Sociological Review, 60, 84-101. Priefer, C., Jörissen, J. and Bräutigam, K. (2016). Food waste prevention in Europe – A cause-driven approach to identify the most relevant leverage points for action. Resources, Conservation and Recycling, 109, 155-165. Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. Food Control, 37, 85-97. Wills, W., Meah, A., Dickinson, A. and Short, F. (2013). Domestic Kitchen Practices: Findings from the 'Kitchen Life' study. University of Hertfordshire. Social Science Research Unit. Food Standards Agency. [Online]. [Accessed on 25 March 2021]. ¹²³ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].

In these cases, participants increasingly associated UBDs with quality as opposed to safety.¹²⁵

Recent studies by Roberts and Downing find that understanding of UBDs, and date labelling more broadly, has reduced in recent years.¹²⁶ Roberts and Downing identify a reduction in the percentage of respondents understanding date labelling from 2018 to 2020, with 72% of participants correctly understanding date labelling in 2020, compared to 85% in 2018.¹²⁷ However, research undertaken on older population (\geq 60 years) by Evans and Redmond identified that a significantly small number of participants expressed that checking UBDs is essential in determining food safety: "only 39% believed that it was essential to "always" eat food by the use-by date to ensure the safety of food."¹²⁸

Attitudes towards UBDs

Studies suggest a divided picture in consumer attitudes towards UBDs. Evans and Redmond suggest attitudes towards UBD to be functional with 62% of participants reporting to "always" take note.¹²⁹ These findings are very similar to that of Armstrong et al. 2021 ¹³⁰ Food and You 2 study as outlined above, with 64% reporting to always check the UBD before they cook or prepare food. At the same time, Evans and Redmond found that 67% believed it was safe to eat food beyond UBD, with 57% reporting doing so.¹³¹ Whilst Wills et al. found that attitudes to UBDs "ranged from ambivalence to uncertainty to cynicism and no participant reported consistent adherence to them".¹³²

¹²⁵ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].

 ¹²⁶ Roberts, M. and Downing, P. (2021). <u>Life under Covid-19: Food waste attitudes and behaviours in 2020</u>.
 WRAP and Icaro Consulting. [Online]. [Accessed 26 March 2021].
 ¹²⁷ Ibid.

¹²⁸ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection,* 79, 263-272. [Online]. [Accessed on 25 March 2021].

¹²⁹ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021].

¹³⁰ Armstrong, B., King, L., Clifford, R. & Jitlal, M. (2021). <u>Food and You 2: Wave 1 Key Findings</u>. Food Standards Agency. [Accessed 2nd June 2021].

¹³¹ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021].

¹³² Wills, W. J., Meah, A., Dickinson, A. M. and Short, F. (2015). <u>'I don't think I ever had food poisoning'</u>. A practice-based approach to understanding foodborne disease that originates in the home. *Appetite*, 85, 118-125. [Online]. [Accessed on 25 March 2021].

In addition, the literature suggests that attitudes towards UBDs vary depending on the food type and storage mode. Van Boxstael et al. (2014)¹³³ found fewer consumers were willing to eat food products that had passed their UBD if they were products normally stored in a fridge, such as dairy or meat, as opposed food products stored at room temperature. Research by Samotyja and Sielicka-Różyńska (2020)¹³⁴ suggest that products such as fruit, rice and soup are often based on sensory factors rather than UBD. Indeed, research suggest that consumers are comfortable overriding UBDs with personal sensory judgement to determine if a food is safe to eat.¹³⁵ As highlighted above, sensory assessment is reported in high proportions by up to 82.5% of study respondents.¹³⁶ The literature also suggests that a lack of trust in food labels, can lead consumers to rely on sensory testing.¹³⁷

Social factors

The literature identified suggests a relationship between social factors, such as education and social values, and adherence to food labelling guidance such as UBDs. Research by Zielińska et al. found that consumers with higher education were more likely to follow UBDs than consumers with secondary school, basic vocational or primary school education.¹³⁸ Similarly, Prior et al. identify a correlation between education level and the

¹³³ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control*, 37, 85-97.

¹³⁴ Samotyja, U. and Sielicka-Różyńska, M. (2020). How date type, freshness labelling and food category influence consumer rejection. *International Journal of Consumer Studies*, 1–15.

¹³⁵ Lind Melbye, E., Onozaka, Y. and Hansen, H. (2017). Throwing It All Away: Exploring Affluent Consumers' Attitudes Toward Wasting Edible Food. *Journal of Food Products Marketing*, 23, 416-429. McIlveen, H. and Semple, L. (2002). Seeing is believing: current consumer use and understanding of food labels. *Nutrition & Food Science*. 32.

¹³⁶ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control,* 37, 85-97.

¹³⁷ Swartz, H. (2019). <u>The Ethics of Labelling Food Safety Risks</u>. Food Ethics, 2 (2–3), 127–137. [Online]. [Accessed 26 March 2021]. Lind Melbye, E., Onozaka, Y. and Hansen, H. (2017). Throwing It All Away: Exploring Affluent Consumers' Attitudes Toward Wasting Edible Food. *Journal of Food Products Marketing*, 23, 416-429. McIlveen, H. and Semple, L. (2002). Seeing is believing: current consumer use and understanding of food labels. *Nutrition & Food Science*. 32.

¹³⁸ Zielińska, D., Bilska, B., Marciniak-Łukasiak, K., Łepecka, A., Trząskowska, M., Neffe-Skocińska, K., Tomaszewska, M., Szydłowska, A. and Kołożyn-Krajewska, D. (2020). Consumer Understanding of the Date of Minimum Durability of Food in Association with Quality Evaluation of Food Products After Expiration. *International Journal of Environmental Research and Public Health.* 17. 1632.

use of UBDs as the best indicator of food safety.¹³⁹ The study found 73% of higher educated participants report never consuming food past its UBD, compared with 63% of participants with no higher education qualifications.

The evidence highlights that social values play a role in adherence to UBD, and food labelling guidance. Himmelsbach et al. found that individuals valuing food quality and healthy food are more likely to pay attention to UBDs than people who lacked interest in quality and healthy products.¹⁴⁰ In contrast, multiple studies identify that consumers concerned with global sustainability and food waste are more likely to consume food that has passed its UBD.¹⁴¹ For this group, food is seen as precious and should not be wasted.¹⁴² Furthermore, research suggests that adults with experience of wartime rationing or scarcity are less inclined to throw food away regardless of UBD.¹⁴³

Despite the FSA's recent survey finding that 37% admit to cooking with products past their UBDs for other people, the wider literature suggests that individuals tend to be more cautious when feeding others, especially when cooking for children.¹⁴⁴ Multiple studies show that households with children were more likely to adhere to UBDs than households

¹³⁹ Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food attitudes and behaviours in the UK:</u> <u>findings from the Food and You survey 2012</u>. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021].

¹⁴⁰ Himmelsbach, E., Allen, A. and Francas, M. (2014). <u>Study on the Impact of Food Information on</u> <u>Consumers' Decision Making</u>. TNS European Behaviour Studies Consortium. [Online]. [Accessed 26 March 2021].

¹⁴¹ Farr-Wharton, G., Foth, M. and Choi, J. (2014). <u>Identifying factors that promote consumer behaviours</u> <u>causing expired domestic food waste</u>. *Journal of Consumer Behaviour*, 13, 393-402. [Online]. [Accessed on 11 March 2021]. Meah, A. (2014). Still blaming the consumer? Geographies of responsibility in domestic food safety practices. *Critical Public Health*, 24, 88-103. Watson, M. and Meah, A. (2013). Food, waste, and safety: negotiating conflicting social anxieties into the practices of domestic provisioning. *The Sociological Review*, 60, 102-120. Wills, W. J., Meah, A., Dickinson, A. M. and Short, F. (2015). <u>'I don't</u> <u>think I ever had food poisoning'</u>. A practice-based approach to understanding foodborne disease that originates in the home. *Appetite*, 85, 118-125. [Online]. [Accessed on 25 March 2021]. Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour</u>. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021].

¹⁴² Wills, W. J., Meah, A., Dickinson, A. M. and Short, F. (2015). <u>'I don't think I ever had food poisoning'</u>. A practice-based approach to understanding foodborne disease that originates in the home. *Appetite*, 85, 118-125. [Online]. [Accessed on 25 March 2021].

¹⁴³ Milne, R. (2011). <u>A focus group study of food safety practices in relation to listeriosis among the over-</u> <u>60s</u>. *Critical Public Health*, 21, 485-495. [Online]. [Accessed on 11 March 2021].

¹⁴⁴ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021]. Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. *International Journal of Consumer Studies*. 37, 422-432.

without children.¹⁴⁵ In addition, Hall and Osses found that single households, especially male single households, are less likely to follow food safety practices.¹⁴⁶

The research identified also suggests that personality type can impact the individual likelihood to consume food with expired UBDs. Brook Lyndhurst demonstrates that risk tolerant personality types are less likely to adhere to food date labelling guidance.¹⁴⁷

Demographic factors

Multiple socio-demographic factors are identified in the literature relating risky food safety practices, including the consumption of food with expired UBDs. Broadly, ethnicity is identified as a factor in risky food safety practices (not recommended practice), with white survey respondents 60% lower at reporting non-adherence with recommend food safety practices than none-white respondents.¹⁴⁸ The literature also suggests gender as a factor, with women tending to check and adhere to UBDs, and not consume UBD expired foods, more than men.¹⁴⁹

Age is often highlighted in the literature, with older populations reported as less likely to adhere to food labelling guidance including UBDs. This group is reportedly reluctant

¹⁴⁵ Broad Leib E., Rice C., Neff R., Spiker M., Schklair A. and Greenberg S. (2016). <u>Consumer Perceptions</u> <u>of Date Labels: A National Survey</u>. Harvard Food Law and Policy Clinic, USA. [Online]. [Accessed on 18 March 2021]. Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. *International Journal of Consumer Studies*. 37, 422-432.

¹⁴⁶ Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. *International Journal of Consumer Studies*. 37, 422-432.

¹⁴⁷ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].

¹⁴⁸ Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food attitudes and behaviours in the UK:</u> <u>findings from the Food and You survey 2012</u>. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021].

¹⁴⁹ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021]. Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health*, 10, 4060-4085. Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food attitudes and behaviours in the UK: findings from the Food and You survey 2012</u>. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021].

to waste food, and less likely to adhere to UBDs.¹⁵⁰ Brook Lyndhurst¹⁵¹ suggests that older individuals are more likely to treat all date labels as a 'best before' guide. However, this is not a universal finding, with research also conversely suggesting that a high proportion of older adults often use UBDs to decide whether food is safe to consume. Here, Evans et al. report 72% of older adults using UBDs in these decisions, 14% using BBDs and 13% not understanding date labelling.¹⁵² Finally, Byrd-Bredbenner et al. comment that teenagers may be easily influenced by other people in determining adherence to safe food practices.¹⁵³

Food practices

The literature identified highlights that food preparation and consumption is a sociocultural practice.¹⁵⁴ It is therefore tied up in temporal patterns, habits, technologies, and infrastructure.¹⁵⁵

¹⁵⁰ Wills, W. J., Meah, A., Dickinson, A. M. and Short, F. (2015). <u>'I don't think I ever had food poisoning'</u>. A practice-based approach to understanding foodborne disease that originates in the home. Appetite, 85, 118-125. [Online]. [Accessed on 25 March 2021]. Broad Leib E., Rice C., Neff R., Spiker M., Schklair A. and Greenberg S. (2016). Consumer Perceptions of Date Labels: A National Survey. Harvard Food Law and Policy Clinic, USA. [Online]. [Accessed on 18 March 2021]. Brook Lyndhurst (2011). Consumer insight: date labels and storage guidance. WRAP. [Online]. [Accessed on 18 March 2021]. Corrado, M. (2007). Understanding Consumer Food Management Behaviour. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021]. Evans, E. W. and Redmond, E. C. (2016). Older Adult Consumer Knowledge, Attitudes, and Self-Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis. Journal of Food Protection, 79, 263-272. [Online]. [Accessed on 25 March 2021]. Kavanaugh, M. and Quinlan, J.J. (2020). Consumer knowledge and behaviours regarding food date labels and food waste. Food Control. 115. 107285. Milne, R. (2011). A focus group study of food safety practices in relation to listeriosis among the over-60s. Critical Public Health, 21, 485-495. [Online]. [Accessed on 11 March 2021]. Prior, G., L. Hall, S. Morris, and A. Draper (2013). Exploring food attitudes and behaviours in the UK: findings from the Food and You survey 2012. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021]. Waste Resources Action Plan (WRAP) (2017). Helping Consumers Reduce Food Waste - Retail Survey 2015. Waste Resources Action Plan. [Online]. [Accessed 19 March 2021]. ¹⁵¹ Brook Lyndhurst (2011). Consumer insight: date labels and storage guidance. WRAP. [Online]. [Accessed on 18 March 2021].

¹⁵² Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021].

¹⁵³ Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health,* 10, 4060-4085.

¹⁵⁴ Warde, A. (2016). *The Practice of Eating*. Cambridge, Polity Press. Southerton, D. & Yates, L. (2015). Waste Management and Sustainable Consumption: Reflections on Consumer Waste. In *Exploring food waste through the lens of social practice theories: some reflections on eating as a compound practice*. London. Routledge, 2015. p. 133-149.

¹⁵⁵ Plumb, A., Downing, P. and Parry, A. (2013). <u>Consumer Attitudes to Food Waste and Food Packaging</u>. WRAP. [Online]. [Accessed on 18 March 2021]. Meah, A. (2014). Still blaming the consumer? Geographies of responsibility in domestic food safety practices. *Critical Public Health*, 24, 88-103.

Studies suggest that the habitual and routine nature of food preparation and consumption can lead to date labels being ignored or used incorrectly.¹⁵⁶ According to a recent FSA survey 51% of adults, that report to sometimes eat food past the UBD, continue to do so because they have done it before and felt fine. Meah suggests that for many participants, UBDs provide the 'starting reference point' for decisions about food safety, although it is habitual practices, habits, experience, and sensory tests that ultimately shape decisions regarding food consumption.¹⁵⁷ For example, one consumer in Meah reported always reheating rice in the microwave on the basis that they had never had food poisoning from this process so did not expect it to happen in the future.¹⁵⁸ Furthermore, cooking regularly is reported to have a positive effect on practicing food safety, as long as bad habits are not established.¹⁵⁹

The evidence in this area also suggests that a perceived lack of time underpins individuals disregard of UBDs.¹⁶⁰ These findings are supported by Enright et al.'s identification of a perceived lack of time driving low engagement with food labelling more broadly.¹⁶¹ Enright et al. suggest there is little evidence that consumers use UBDs in the home and meals are not often planned around UBDs.¹⁶² However, consumers use UBDs as a reassurance of shelf life within the supermarket when buying food.

The literature reports inconsistencies in the location of the date labels on food packaging as problematic for consumers. This relates to both the habitual nature of food preparation and consumption, as well as the impact of a perceived lack of time. For example, Hall-Phillips and Shah quote a participant stating that "what's challenging is that it's not in the same location every time... it's like, searching and searching for where the date is

¹⁵⁶ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].

¹⁵⁷ Meah, A. (2014). Still blaming the consumer? Geographies of responsibility in domestic food safety practices. *Critical Public Health*, 24, 88-103.

¹⁵⁸ Ibid.

¹⁵⁹ Lange, M., Göranzon, H. and Marklinder, I. (2016) Self-reported food safety knowledge and behaviour among Home and Consumer Studies students. *Food Control.* 67. 265-272.

 ¹⁶⁰ Roberts, M. and Downing, P. (2020). Food waste and Covid-19 - Survey 2: Lockdown easing. WRAP & lcaro Consulting. Banbury. [Online]. [Accessed 26 March 2021]. Roberts, M. and Downing, P. (2021). Life under Covid-19: Food waste attitudes and behaviours in 2020. WRAP and lcaro Consulting. [Online]. [Accessed 26 March 2021]. Enright, G., Good, H. and Williams, N. (2010). Qualitative Research to Explore Peoples' Use of Food Labelling. Ipsos Mori. Unit Report 5. [Online]. [Accessed 2nd March 2021].
 ¹⁶¹ Enright, G., Good, H. and Williams, N. (2010). Qualitative Research to Explore Peoples' Use of Food Labelling. Ipsos Mori. Unit Report 5. [Online]. [Accessed 2nd March 2021].
 ¹⁶¹ Enright, G., Good, H. and Williams, N. (2010). Qualitative Research to Explore Peoples' Use of Food Labelling. Ipsos Mori. Unit Report 5. [Online]. [Accessed 2nd March 2021].

listed".¹⁶³ It is suggested that this inability to quickly locate and identify the UBD may be reducing consumer awareness of UBD on the food they are buying and consuming.

However, it has been suggested by Roberts and Downing that there has been an increase in people using UBDs and more healthy food safety habits during the global pandemic.¹⁶⁴ The study suggests that improved food practices in the home were underpinned by a concern to maintain household food stocks. They suggest this was driven by a desire to reduce visits or the time spent in the supermarket during the pandemic as a way to reduce the risk of contracting COVID-19. Roberts and Downing highlight that motivations varied throughout the pandemic but that the primary motivations (to maintain food stocks and reduce supermarket exposure) were still evident in September 2020.¹⁶⁵ However, at this point other drivers had increased in importance since June 2020 such as the desire to make cost savings (up to 66% compared to 53% in June), avoiding waste of good food/ingredients (66% vs 35%), to be healthier/eat better (38% vs. 30%) and for the environment (32% vs. 22%).

5. Barriers preventing the reduction of the consumption of food with expired UBD

The literature identified found evidence of core overlapping themes between the drivers underpinning the consumption of food with expired UBD and the barriers preventing the reduction of consumption of food with expired UBDs.

Understanding of UBD labelling

The evidence suggests that a lack of understanding regarding UBDs as a safety label, as opposed to a quality label as is the case for BBDs, is a key barrier in the reduction of consumption of expired food. The literature highlights a specific confusion regarding the differences between UBD and BBD labels. Indeed, studies suggests that 24%-35% fail to

¹⁶³ Hall-Phillips, A. and Shah, P. (2017). <u>Unclarity confusion and expiration date labels in the United States:</u> <u>A consumer perspective</u>. Journal of Retailing and Consumer Services, 35 (May 2016), 118–126. [Online]. [Accessed 26 March 2021].

 ¹⁶⁴ Roberts, M. and Downing, P. (2021). <u>Life under Covid-19: Food waste attitudes and behaviours in 2020</u>.
 WRAP and Icaro Consulting. [Online]. [Accessed 26 March 2021].
 ¹⁶⁵ Ibid.

recognise that UBD labels show 'the last day on which the food is safe to eat',¹⁶⁶ and that some consumers believe UBD's are a quality indicator instead of a safety indicator.¹⁶⁷

There is also evidence that the media often fails to distinguish correctly between different date labels and can undermine trust in UBDs.¹⁶⁸ One study illustrates this with an example article from the Mail Online in 2009 which implied that date labels were a "cynical marketing ploy from retailers".¹⁶⁹ This is a challenge for increasing the understanding of the public as 25% of participants reported improved understanding in part due to information from the media. The media is also highlighted as being effective in the communication of food safety and driving change in consumer attitudes and behaviour.¹⁷⁰

Trust in food labelling

The literature suggests that trust in food labelling, as well as food manufacturers and retailers as a whole, may be a fundamental barrier to the reduction of the consumption of food with expired UBDs. Studies show that consumers can lack trust in retailers to provide honest and accurate UBDs, leading them to disregard the UBDs.¹⁷¹ Indeed, it is

¹⁶⁶ Waste Resources Action Plan (WRAP) (2019). Consumer behaviour, date labels and food waste. Waste Resources Action Plan: prepared by Linda Bacon with contributions from David Hall and Izzy Brennan. ¹⁶⁷ Broad Leib E., Rice C., Neff R., Spiker M., Schklair A. and Greenberg S. (2016). Consumer Perceptions of Date Labels: A National Survey. Harvard Food Law and Policy Clinic, USA. [Online]. [Accessed on 18 March 2021]. Enright, G., Good, H. and Williams, N. (2010). Qualitative Research to Explore Peoples' Use of Food Labelling. Ipsos Mori. Unit Report 5. [Online]. [Accessed 2nd March 2021]. Zielińska, D., Bilska, B., Marciniak-Łukasiak, K., Łepecka, A., Trząskowska, M., Neffe-Skocińska, K., Tomaszewska, M., Szydłowska, A. and Kołożyn-Krajewska, D. (2020). Consumer Understanding of the Date of Minimum Durability of Food in Association with Quality Evaluation of Food Products After Expiration. International Journal of Environmental Research and Public Health. 17. 1632. Evans, E. W. and Redmond, E. C. (2014). Behavioural Risk Factors Associated with Listeriosis in the Home: A Review of Consumer Food Safety Studies. Journal of Food Protection, 77, 510-521. [Online]. [Accessed on 12 March 2021]. Newsome, R., Balestrini, C. G., Baum, M. D., Corby, J., Fisher, W., Goodburn, K., Labuza, T. P., Prince, G., Thesmar, H. S, and Yiannas, F. (2014). Applications and Perceptions of Date Labelling of Food. Comprehensive Reviews in Food Science and Food Safety, 13, 745-769. [Online]. [Accessed on 18 March 2021]. ¹⁶⁸ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].

¹⁶⁹ Ibid.

¹⁷⁰ Enright, G., Good, H. and Williams, N. (2010). <u>Qualitative Research to Explore Peoples' Use of Food</u> <u>Labelling</u>. Ipsos Mori. Unit Report 5. [Online]. [Accessed 2nd March 2021].

¹⁷¹ Priefer, C., Jörissen, J. and Bräutigam, K. (2016). Food waste prevention in Europe – A cause-driven approach to identify the most relevant leverage points for action. *Resources, Conservation and Recycling,* 109, 155-165. Toma, L., Costa Font, M. and Thompson, B. (2020). Impact of consumers' understanding of date labelling on food waste behaviour. *Operational Research International Journal,* 20, 543–560. Waste Resources Action Plan (WRAP) (2019). Consumer behaviour, date labels and food waste. Waste Resources Action Plan: prepared by Linda Bacon with contributions from David Hall and Izzy Brennan.

highlighted that some consumers doubt the reliability of the dates, not trusting the science behind the labels, and suspect ulterior motives from retailers to "have you back in the shops" and "prey on your insecurities".¹⁷² In a similar tone, one study identified a belief among participants that UBDs are not for the consumer but to protect the producer: "To make sure [the producers] have done their bit basically, that they're not poisoning you".¹⁷³

Furthermore, the research identified outlines that consumers find it difficult to believe that one day a product is safe to consume and the next day it poses a danger.¹⁷⁴ Consumers often report believing that manufacturers and retailers set conservative UBDs¹⁷⁵ to encourage consumers to discard food and buy more.¹⁷⁶ Significantly, Thompson et al. found that the greater the strength of belief that food companies are setting dates conservatively, the more willing individuals are to consume food with expired UBDs.¹⁷⁷

Barriers to improving trust in UBD labelling are also outlined in the literature which highlights how there has been a number of inconsistencies in the messaging regarding UBDs. For example, providing guidance to not exceed the BBD as opposed to the UBD.¹⁷⁸ Furthermore, there is a broader inconsistency in labelling with products variably carrying BBDs having "guidance not to exceed the date" in 8% of products assessed.

Wills, W. J., Meah, A., Dickinson, A. M. and Short, F. (2015). <u>'I don't think I ever had food poisoning'</u>. A practice-based approach to understanding foodborne disease that originates in the home. *Appetite*, 85, 118-125. [Online]. [Accessed on 25 March 2021]. Swartz, H. (2019). <u>The Ethics of Labelling Food Safety</u> <u>Risks</u>. Food Ethics, 2 (2–3), 127–137. [Online]. [Accessed 26 March 2021].

¹⁷² Watson, M. and Meah, A. (2013). Food, waste, and safety: negotiating conflicting social anxieties into the practices of domestic provisioning. *The Sociological Review,* 60, 102-120. Wills, W., Meah, A., Dickinson, A. and Short, F. (2013). <u>Domestic Kitchen Practices: Findings from the 'Kitchen Life' study</u>. University of Hertfordshire. Social Science Research Unit. Food Standards Agency. [Online]. [Accessed on 25 March 2021].

¹⁷³ Wills, W. J., Meah, A., Dickinson, A. M. and Short, F. (2015). <u>'I don't think I ever had food poisoning'</u>. A practice-based approach to understanding foodborne disease that originates in the home. *Appetite*, 85, 118-125. [Online]. [Accessed on 25 March 2021].

¹⁷⁴ Meah, A. (2014). Still blaming the consumer? Geographies of responsibility in domestic food safety practices. *Critical Public Health*, 24, 88-103. Wills, W., Meah, A., Dickinson, A. and Short, F. (2013). <u>Domestic Kitchen Practices: Findings from the 'Kitchen Life' study</u>. University of Hertfordshire. Social Science Research Unit. Food Standards Agency. [Online]. [Accessed on 25 March 2021].

 ¹⁷⁵ Priefer, C., Jörissen, J. and Bräutigam, K. (2016). Food waste prevention in Europe – A cause-driven approach to identify the most relevant leverage points for action. *Resources, Conservation and Recycling,* 109, 155-165. Toma, L., Costa Font, M. and Thompson, B. (2020). Impact of consumers' understanding of date labelling on food waste behaviour. *Operational Research International Journal,* 20, 543–560.
 ¹⁷⁶ Waste Resources Action Plan (WRAP) (2019). Consumer behaviour, date labels and food waste. Waste Resources Action Plan: prepared by Linda Bacon with contributions from David Hall and Izzy Brennan.
 ¹⁷⁷ Waste Resources Action Plan (WRAP) (2019). Consumer behaviour, date labels and food waste. Waste Resources Action Plan: prepared by Linda Bacon with contributions from David Hall and Izzy Brennan.
 ¹⁷⁸ Brook Lyndhurst and WRAP. (2012). <u>Helping Consumers Reduce Food Waste – A Retail Survey 2011</u>. [Online]. [Accessed on 18 March 2021].

The authors suggest this "converts a 'best before' date into a 'use by' date" and confuses the consumer.¹⁷⁹ It is also noted that date labelling is not universal and as such differs between countries leading to confusion by tourists and expats.¹⁸⁰

As described above, there is also substantial evidence suggesting that consumers often feel their own sensory testing is rigorous enough to substitute for UBDs.¹⁸¹ Evans and Redmond contend that 45% of participants report disregarding UBDs and following their own judgement (for example, sensory testing) that food is safe to eat.¹⁸² As such the literature outlines a lack of trust in UBD labelling both in terms of the message, i.e., what the label is advising, and the messenger (manufacture and retailers). Both elements are crucial, as Tonkin et al. highlight: trust in the messenger is vital for trust in the message.¹⁸³

Awareness

The literature outlines some evidence to suggest that a proportion of consumers are not looking at UBDs at all. For example, Prior et al., ¹⁸⁴ found that 5% of survey participants never checked the UBD and McIIveen and Semple ¹⁸⁵ found that 24% of survey participants did not read food labels at all. Subsequently, awareness or concern for food safety labelling may be an issue in the reduction of consumption of foods with expired UBDs. Certainly, this lack of awareness or concern may be linked to the reported perception of low risk associated with the consumption of expired food.

¹⁸² Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection,* 79, 263-272. [Online]. [Accessed on 25 March 2021].

¹⁷⁹ Ibid.

¹⁸⁰ Kavanaugh, M. and Quinlan, J.J. (2020). Consumer knowledge and behaviours regarding food date labels and food waste. *Food Control.* 115. 107285.

¹⁸¹ Swartz, H. (2019). <u>The Ethics of Labelling Food Safety Risks</u>. Food Ethics, 2 (2–3), 127–137. [Online]. [Accessed 26 March 2021]. Meah, A. (2014). Still blaming the consumer? Geographies of responsibility in domestic food safety practices. *Critical Public Health*, 24, 88-103.

¹⁸³ Tonkin, E., Wilson, M.A., Coveney, J., Webb, T. and Meyer, B.S. (2015). Trust in and through labelling – a systematic review and critique. *British Food Journal.* 117, 318-338.

¹⁸⁴ Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food attitudes and behaviours in the UK:</u> <u>findings from the Food and You survey 2012</u>. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021].

¹⁸⁵ McIlveen, H. and Semple, L. (2002). Seeing is believing: current consumer use and understanding of food labels. *Nutrition & Food Science*. 32.

Food practices

It is important to understand food preparation and consumption as a socio-cultural practice when considering the barriers to the reduction of consumption of foods with expired UBDs.¹⁸⁶ For example, in relation to infrastructure one study identifies that respondents without a separate kitchen space reported lower adherence with recommended food safety practices than consumers with a kitchen space.¹⁸⁷

There is evidence that when consumers prepare food, habitually ingrained behaviours come to the fore with the result that consumers are less likely to check the label when preparing familiar foods.¹⁸⁸ It is suggested that there is a relationship between habitual behaviour, repeat experience, and a risk tolerant consumer attitude. Studies describe how individuals disregard UBDs on the justification of "having always done things this way" to no ill consequence.¹⁸⁹

Such habitual practices and attitudes, based on experience, are a barrier to the reduction of consumption of foods with expired UBDs. This may be exacerbated by consumers' faith in their own sensory judgements.¹⁹⁰ The literature suggests that some consumers believe manufacturers/retailers are solely responsible for food safety and therefore it is not something that they should concern themselves with.¹⁹¹

¹⁸⁶ Warde, A. (2016). *The Practice of Eating*. Cambridge, Polity Press. Southerton, D. & Yates, L. (2015). Waste Management and Sustainable Consumption: Reflections on Consumer Waste. In *Exploring food waste through the lens of social practice theories: some reflections on eating as a compound practice*. London. Routledge, 2015. p. 133-149.

¹⁸⁷ Prior, G., L. Hall, S. Morris, and A. Draper (2013). <u>Exploring food attitudes and behaviours in the UK:</u> <u>findings from the Food and You survey 2012</u>. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021].

¹⁸⁸ Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. *International Journal of Consumer Studies*. 37, 422-432.

¹⁸⁹ Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health*, 10, 4060-4085.

¹⁹⁰ Swartz, H. (2019). <u>The Ethics of Labelling Food Safety Risks</u>. Food Ethics, 2 (2–3), 127–137. [Online]. [Accessed 26 March 2021]. Meah, A. (2014). Still blaming the consumer? Geographies of responsibility in domestic food safety practices. *Critical Public Health*, 24, 88-103. Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-Reported Storage Practices of Ready-to-Eat</u> <u>Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021].

¹⁹¹ Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health*, 10, 4060-4085.

Whilst it is crucial to understand food preparation and consumption as a socio-cultural practice this review, due to practical limitations, has been unable to identified sufficient evidence to compare the significance of different practices as barriers.

Affordability as a barrier preventing the reduction of the consumption of food with expired UBD

The literature suggests that low individual/household income and affordability are issues in the potential consumption of food with expired UBDs. The evidence reports that individuals on low-incomes, or those who describe their financial situation as poor, are more likely to want to prevent food waste¹⁹² and are more likely to consume UBD expired foods.¹⁹³ One US study suggests that those in the lowest income category (less than \$35k/year) were more likely to "never" discard more expensive items like raw chicken and deli meats past the UBD compared to other income categories.¹⁹⁴

In addition, individuals with a lower income are more likely to purchase products that are on offer,¹⁹⁵ including products on offer because they are nearing the UBD.¹⁹⁶ Corrado contends that young, less affluent women with families typically buy products on promotion.¹⁹⁷ As a consequence, the purchase of products with a short shelf life either as a deal or due to a lack of choice, may lead consumers to disregard UBDs.¹⁹⁸

¹⁹² Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour</u>. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021]. Toma, L., Costa Font, M. and Thompson, B. (2020). Impact of consumers' understanding of date labelling on food waste behaviour. *Operational Research International Journal*, 20, 543–560. Farr-Wharton, G., Foth, M. and Choi, J. (2014). <u>Identifying factors that promote</u> <u>consumer behaviours causing expired domestic food waste</u>. *Journal of Consumer Behaviour*, 13, 393-402. [Online]. [Accessed on 11 March 2021].

 ¹⁹³ Zielińska, D., Bilska, B., Marciniak-Łukasiak, K., Łepecka, A., Trząskowska, M., Neffe-Skocińska, K., Tomaszewska, M., Szydłowska, A. and Kołożyn-Krajewska, D. (2020). Consumer Understanding of the Date of Minimum Durability of Food in Association with Quality Evaluation of Food Products After Expiration. *International Journal of Environmental Research and Public Health*. 17. 1632. Prior, G., L. Hall, S. Morris, and A. Draper (2013). Exploring food attitudes and behaviours in the UK: findings from the Food and You survey 2012. Unit Report 13. Food Standards Agency. [Online]. [Accessed on 18 March 2021].
 ¹⁹⁴ Broad Leib E., Rice C., Neff R., Spiker M., Schklair A. and Greenberg S. (2016). Consumer Perceptions of Date Labels: A National Survey. Harvard Food Law and Policy Clinic, USA. [Online]. [Accessed on 18 March 2021].

¹⁹⁵ Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour</u>. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021].

¹⁹⁶ Wilson, L.W.N., Rickard, J.B., Saputo, R. and Ho, S. (2017). Food waste: The role of date labels, package size, and product category. *Food Quality and Preference*. 55. 35-44.

¹⁹⁷ Corrado, M. (2007). <u>Understanding Consumer Food Management Behaviour</u>. WRAP and Ipsos MORI. [Online]. [Accessed on 18 March 2021].

¹⁹⁸ Wilson, L.W.N., Rickard, J.B., Saputo, R. and Ho, S. (2017). Food waste: The role of date labels, package size, and product category. *Food Quality and Preference.* 55. 35-44. Fisher, K., Herszenhorn, E.,

The literature also suggests a relationship between packaged food volumes, specifically bulk offers (such as buy one get one free) and large sized food packages, and the consumption of UBD expired foods. Wilson et al. suggests that these foods, purchased in order to save money are more likely to not be completely consumed in time.¹⁹⁹

Such purchasing practices, particularly when underpinned by issues of income and affordability, mean that there is an increased likelihood that food will not be eaten within the UBD. More broadly, multiple studies suggest that special offers on food that is approaching its UBD can lead consumers to make trade-offs between their normal health and safety practices concerning UBDs and saving money.²⁰⁰

How can these barriers be overcome?

The literature provides a number of recommendations to reduce the consumption of expired food including: the simplification of date labelling, supporting date labelling with an assurance scheme, providing education on date labelling, and reducing the opportunity for food to expire by reducing portion sizes.

The simplification of date labelling is a strong theme in the literature, complemented by a recommendation for greater consistency in labelling between products. It is suggested that more consistent wording around date labelling may support a reduction in the consumption of UBD expired foods and reduce the food safety risks.²⁰¹ Furthermore, it is suggested that the industry could do more to provide uniform classification methods to UBDs on similar food products, to reduce consumer confusion regarding food expiration.²⁰² With this in mind Van Boxstael et al. suggest that

¹⁹⁹ Wilson, L.W.N., Rickard, J.B., Saputo, R. and Ho, S. (2017). Food waste: The role of date labels, package size, and product category. *Food Quality and Preference.* 55. 35-44.

²⁰⁰ Waste Resources Action Plan (WRAP) (2017). <u>Helping Consumers Reduce Food Waste - Retail Survey</u>
 <u>2015</u>. Waste Resources Action Plan. [Online]. [Accessed 19 March 2021]. Brook Lyndhurst (2011).
 <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].
 ²⁰¹ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014).
 Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control*, 37, 85-97.

Harris, M. and Quested, T. (2019). <u>Helping consumers reduce food waste through better labelling and product changes</u>. Retail Survey 2019. [Online]. [Accessed on 25 March 2021].

²⁰² Farr-Wharton, G., Foth, M. and Choi, J. (2014). <u>Identifying factors that promote consumer behaviours</u> <u>causing expired domestic food waste</u>. *Journal of Consumer Behaviour*, 13, 393-402. [Online]. [Accessed on 11 March 2021].

refrigerated products only should carry a UBD label.²⁰³ They suggest this could help to communicate the distinction that 'use-by' products are unsafe to consume after the date, whereas for best before products the edibility can be judged by the consumer. Along similar lines, Hall and Osses recommend more research into the use of food safety information on labels, specifically observational studies to inform understanding of the issue and clarification for consumers about what information is important to food safety.²⁰⁴ They recommend that an assurance scheme for date labelling should be introduced to increase consumer trust in the current labelling system through the provision of a reliable certification.

Public education campaigns regarding UBDs could support the reduction of consumption of foods with expired UBD by addressing the issue of a lack of awareness. There is a call in the literature for population-wide education, as well as suggestions to target activities towards those of particular vulnerabilities such as the elderly.²⁰⁵ Sanlier suggests a need for the public to be educated on basic microbiology relating to food safety in order to motivate consumers to use better food storage, preparation, and cooking techniques.²⁰⁶ They contend that UBD-related information should be provided alongside other food safety information so that the consumer is better able to create a routine and understand the full range of risks. Marklinder and Eriksson,²⁰⁷ suggest providing education to school children is vital in order to avoid food safety risks as they learn to cook and would

²⁰³ Van Boxstael, S., Devlieghere, F., Berkvens, D., Vermeulen, A. and Uyttendaele, M. (2014). Understanding and attitude regarding the shelf life labels and dates on pre-packed food products by Belgian consumers. *Food Control*, 37, 85-97.

²⁰⁴ Hall, C. and Osses, F. (2013). A review to inform understanding of the use of food safety messages on food labels. *International Journal of Consumer Studies*. 37, 422-432.

²⁰⁵ Newsome, R., Balestrini, C. G., Baum, M. D., Corby, J., Fisher, W., Goodburn, K., Labuza, T. P., Prince, G., Thesmar, H. S. and Yiannas, F. (2014). <u>Applications and Perceptions of Date Labelling of Food</u>.
Comprehensive Reviews in Food Science and Food Safety, 13, 745-769. [Online]. [Accessed on 18 March 2021]. Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection*, 79, 263-272. [Online]. [Accessed on 25 March 2021]. Evans, E. W. and Redmond, E. C. (2015). <u>Analysis of older adults' domestic kitchen storage practices in the United Kingdom: Identification of risk factors associated with listeriosis</u>. *Journal of Food Protection*, 78, 738–745. [Online]. [Accessed 26 March 2021]. Evans, E. W. and Redmond, E. C. (2014). <u>Behavioural Risk Factors Associated with Listeriosis</u> 2021]. Listeriosis in the Home: A Review of Consumer Food Safety Studies. *Journal of Food Protection*, 77, 510-521. [Online]. [Accessed on 12 March 2021].

²⁰⁶ Sanlier, N. (2009). The knowledge and practice of food safety by young and adult consumers. *Food Control,* 20, 538-542.

²⁰⁷ Marklinder, I. and Eriksson, K.M. (2015). Best-before date – food storage temperatures recorded by Swedish students. *British Food Journal*, 117, 1764-1776.

increase understanding of UBDs. The study found that both pupils and teaching staff showed an increased awareness of UBDs after food safety lessons were conducted.

Knowledge about UBDs does not necessarily lead to behaviour change, and as a result, attitudes and habits also need to be addressed.²⁰⁸ Despite this, recommendations for achieving behaviour change remains heavily focused on the provision of knowledge and increasing awareness. Looking to address the issue of attitudinal change, Byrd-Bredbenner et al. suggest personalising the risk in order to promote consumers' understanding of their own susceptibility.²⁰⁹ Personalising the risk, Byrd-Bredbenner et al. argue, would work to combat consumers' optimism bias and increase individual perceptions of risk with regard to food safety.²¹⁰ For example, 90% of people surveyed in ²¹¹ thought that the food they prepared had low risk of illness, whereas only 41% of the group thought that food prepared for them by others had a low risk of illness. Furthermore, it was suggested that "those who believe food poisoning is a personal threat eat fewer risky foods".²¹²

The literature suggests making use of 'leverage points' which could be the most effective times to create lasting change. Potential leverage points include pregnancy, moving-house, and a change in employment status.²¹³ It is at these points where education may be most effective in changing food safety practices. Demonstrating the potential efficacy of leverage points, Robert and Downing report the impact of lifestyle changes brought about in response to COVID-19.²¹⁴ They describe a 30% increase in reported checking of UBDs in June 2020 compared to before COVID-19, and there appear to be some lasting

²⁰⁸ Brook Lyndhurst (2011). <u>Consumer insight: date labels and storage guidance</u>. WRAP. [Online]. [Accessed on 18 March 2021].

²⁰⁹ Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health,* 10, 4060-4085.

²¹⁰ Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health*, 10, 4060-4085.

²¹¹ Ibid.

²¹² Ibid.

²¹³ Wills, W., Meah, A., Dickinson, A. and Short, F. (2013). <u>Domestic Kitchen Practices: Findings from the 'Kitchen Life' study</u>. University of Hertfordshire. Social Science Research Unit. Food Standards Agency. [Online]. [Accessed on 25 March 2021]. Byrd-Bredbenner, C., Berning, J., Martin-Biggers, J. and Quick, V. (2013). Food Safety in Home Kitchens: A Synthesis of the Literature. *International Journal of Environmental Research and Public Health*, 10, 4060-4085. Roberts, M. and Downing, P. (2020). <u>Food waste and Covid-19 - Survey 2: Lockdown easing</u>. WRAP & Icaro Consulting. Banbury. [Online]. [Accessed 26 March 2021].
²¹⁴ Roberts, M. and Downing, P. (2020). <u>Food waste and Covid-19 - Survey 2: Lockdown easing</u>. WRAP & Icaro Consulting. Banbury. [Online]. [Accessed 26 March 2021].

changes from lockdown as a leverage point. However, it is too early to suggest these changes have been locked-in.

Finally, Wilson et al. suggest that manufacturers could help support the reduction of the consumption of expired foods by reducing packaged portion sizes.²¹⁵ This is based on the understanding that there is a relationship between packaging sizes and the consumption of UBD expired foods, with larger sizes being more likely to not be completely consumed in time. Increasing the availability of smaller portion sizes or multi-packs could lead to less food going out of date and posing a food safety risk. However, this solution does not address the wider social and cultural issues outlined above. Subsequently, this touches on issues of income and affordability linked with food offers related to UBD and points to a need for food offers to be applied further in advance of UBDs.

²¹⁵ Wilson, L.W.N., Rickard, J.B., Saputo, R. and Ho, S. (2017). Food waste: The role of date labels, package size, and product category. *Food Quality and Preference*. 55. 35-44.

Conclusion: Key Themes

The evidence review presented here synthesises 51 pieces of research in respect to the five core research questions. Table 5 below outlines an overview of the key themes emerging from the evidence as it relates to each research question.

The consumption of food with expired UBD in the UK

- The evidence presents a complex picture.
- There is a paradox of significant numbers of consumers reporting checking UBD and yet also consuming foods past the UBD.
- Significant numbers of adults in the UK eat food that is past the UBD, for example,
 Evans and Redmond's ²¹⁶ 57% reported consuming UBD expired food.
- Individuals often use the UBD to work out whether food is safe to eat. However, consumers show large variation in concern about whether to eat food that has gone past its UBD.

Consumers' perceptions of the risk involved in consuming food beyond its UBD

- Consumers believe that food is safe beyond the UBD, due to a perception of low risk.
- Assessments of risk are largely dependent on the type of food for example, dry, canned, or frozen food are perceived as lower risk than raw meat or refrigerated products.
- Some consumers override UBDs with sensory judgement, sometimes preferring to make assessments of food quality based on personal judgement and sensory assessment.

²¹⁶ Evans, E. W. and Redmond, E. C. (2016). <u>Older Adult Consumer Knowledge, Attitudes, and Self-</u> <u>Reported Storage Practices of Ready-to-Eat Food Products and Risks Associated with Listeriosis</u>. *Journal of Food Protection,* 79, 263-272. [Online]. [Accessed on 25 March 2021].
- Consumers may have a lower perceived level of risk when consuming foods that they are familiar or comfortable with.
- Previous experiences with food-borne illness affects consumer risk perception.
- Perception of risk differs depending on who the consumer is preparing food for, taking greater safety precautions when preparing food for children or older consumers, or guests.
- Older populations perceive a lower risk from consuming food past its UBD.

Consumer preparation practices of food consumed beyond its UBD

- The most common form of assessing whether food is safe to eat, if UBDs are not being used, is sensory testing.
- In some situations, non-sensory testing is used to check whether food is safe.
- A variety of food preparation methods for expired food that were believed to make food safer were presented in the literature, such as wiping meat with vinegar.
- Consumers use storage methods in an attempt to extend the shelf life and freshness of food.

Drivers underpins the consumption of food with expired UBD

- Consumers can have a lack of understanding of UBDs and often confuse quality and safety labelling.
- Consumers can lack trust in retailers for providing honest and accurate UBDs, leading them to disregard the UBD.
- Social factors such as education and values can influence consumer behaviours around UBDs.
- Consumers concerned about food waste are more likely to consume food that has past its UBD.
- Consumers who have experienced scarcity are more likely to disregard UBDs.

- Perceived lack of time can cause people not to check, or to disregard UBDs.
- Purchasing products with short shelf lives, either as deals or due to lack of choice, can cause consumers to disregard UBDs.

Barriers preventing the reduction of the consumption of food with expired UBD

- Some consumers find date labelling confusing and often confuse the UBD and BBD.
- There are inconsistencies in how UBDs are presented, leading to misunderstanding.
- There is a lack of trust in food labelling systems.
- Some consumers assume food safety is the responsibility of the retailer/ manufacturer.
- Habitual practices and ingrained experience undermine UBDs.
- Personal experience of food scarcity is a barrier, with consumers finding it challenging to adapt to new habits.

Affordability as a barrier

- Financial circumstances are linked to eating food that is beyond its UBD.
- Consumers on lower incomes are more likely to buy reduced products, nearing their BBD or UBD.
- Lower income customers may not always be able to afford to waste food that has passed its UBD.

Overcoming the barriers preventing the reduction of the consumption of food with expired UBDs

 Clear and consistent labelling would help consumers understand UBDs more easily.

- Improved communication with consumers about the importance of UBDs and the differences between UBDs and BBDs would help overcome some of the barriers to consuming food within the UBDs.
- Increased education around food safety and UBD would support increased awareness and adherence to UBD guidance.
- Attitudes and habitats are stronger drivers of behaviour than knowledge about UBDs.
- The literature recommends the use of observational studies to inform understanding of the issues and gain clarification for consumers about what information is important to food safety.

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Agreed Search Protocol

See separate appendices

Data Extraction

See separate appendices

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