



Consumer Perceptions of Food Risks



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Executive Summary

The Food Standards Agency (FSA) is an independent government department set up to protect the public's health and consumer interests in relation to food. Food Standards Scotland (FSS) is the public sector food body for Scotland. The FSS's role is to ensure that information and advice on food safety and standards, nutrition and labelling is independent, consistent, evidence-based and consumer-focused. In order to add to the evidence base about how best to communicate food risks, and to help in the FSA's prioritisation of which risks to address, the FSA and FSS commissioned Kantar Public to conduct research into consumer perspectives of food risks. In 2016, a project 'Exploring consumer's risk perception and behaviour in relation to food hazards, a case of the United Kingdom' was conducted at the FSA, which included a pilot survey. Based on this pilot, the FSA/FSS commissioned research with Kantar Public to understand consumer classification of different food risks.

Research design

The primary aim of the research was to assess how consumers determine food risks, in terms of how risks are understood, classified, and responded to. To this end, Kantar Public conducted 6 focus groups in London, Birmingham, Leeds, Glasgow, Belfast and Aberystwyth between the 8th and the 16th February 2017 with a total of 41 participants. The groups explored knowledge, concern and relative level of acceptability of 8 food risks: *E.coli*¹, campylobacter, food allergens, coeliac disease, pesticides, acrylamides, TSE variant CJD and radioactivity. In addition, the groups explored how people responded to more detailed information about 3 specific risks: campylobacter, food allergens and acrylamides.

Key findings

Knowledge and familiarity

Despite mixed levels of knowledge, participants had a high level of confidence in their personal food safety knowledge and practices in general, reinforced by a heavy reliance on 'common sense' and instinct in determining food risks. When prompted on their understanding of 8 specific risks, though knowledge varied across individuals, certain risks were generally more well-known (allergens, pesticides, *E. coli*), whilst others were less familiar (radioactivity and campylobacter).

Concern and acceptability

Levels of concern and acceptability were not always consistent and there were some differences observed within and across groups. However, on the whole, concern tended to be higher for risks such as *E. coli* and allergens and lower for risks such as radioactivity and acrylamides. Willingness to accept or tolerate a risk was linked to concern: the higher the concern about a risk, the less willing people were to tolerate it.

High concern risks: *E. coli* was of high concern due to knowledge of serious consequences, particularly in terms of potential effects amongst vulnerable groups and exposure to recent media coverage of serious cases. Similarly, food allergens were concerning due to the severity of consequences and the number of people affected. Participants who connected campylobacter with food poisoning and chicken also classified this risk as one of higher concern.

Medium concern risks: Risks of medium concern to participants included pesticides, coeliac disease and TSE variant CJD. Pesticides were relatively concerning to participants given their association with chemicals, but concern was mitigated by a lack of knowledge

¹ *E. coli* refers to *E. coli* 0157 (hereafter referred to as *E. coli*).

of actual consequences and the perception of delayed effects. Coeliac disease was concerning insofar as participants knew people who had it and were therefore more aware of the consequences. TSE variant CJD – though relatively well known and considered serious – was no longer viewed as a major risk as it was viewed as something that did not pose a current threat.

Low concern risks: Those that were aware of acrylamides tended to discount the risk on the basis that there was a perceived lack of evidence. In terms of radioactivity, most had made no connection between radioactivity and food and were therefore less worried about its effects.

Drivers of concern and acceptability

Participants' level of concern and willingness to tolerate the 8 risks were driven by 7 key factors:

- **The severity of impact/consequences:** severe/high concern risks reduced participants' willingness to tolerate them. Participants were particularly concerned about *E. coli* and campylobacter due to the fact that they were understood to have potentially life changing health impacts and in some cases resulted in fatality.
- **Familiarity with risks:** greater familiarity, for example through exposure to local media stories, personal experience and those of friends and family, tended to make risks feel more 'real' which in turn increased concern.
- **Knowledge of risks:** level of knowledge, which related to familiarity, commonly increased participants' level of concern. Thus, risks for which participants had higher levels of knowledge/awareness such as *E. coli* and allergens tended to be of higher concern than those they had not heard of, such as radioactivity.
- **Past experience:** exposure to and personal experience of the consequences of food risks increased concern and drove down acceptability across all groups. This was particularly strong in the case of food poisoning where some participants had experienced severe consequences.
- **Perceived level of control over the risk:** on the whole, participants were more concerned when a risk was perceived to be difficult for them to personally control, in particular if the risk was 'unobservable'. On the other hand, concern was lower when participants perceived a risk to be controlled by government (in the case of pesticides) or someone else's responsibility (where participants did not personally suffer from allergies).
- **Whether risk is perceived to be current or old:** past high-profile food scares, such as 'mad cow disease' were generally discounted as 'dealt with'; whilst risks perceived to be current, emerging or on-going tended to be taken more seriously by participants.
- **The immediacy of effects:** risks associated with consequences that were quickly felt (e.g. food poisoning) tended to be most concerning. Risks, such as pesticides and radioactivity, the effects of which were viewed as cumulative over time, tended to be less concerning.

On the whole, participants were most likely to be influenced by personal experience, perception of control and familiarity when assessing risk.

Informed perceptions: campylobacter, food allergens and acrylamides

When reviewing detailed information about risks, participants paid particular attention to 'new' and surprising information (e.g. high percentage of chickens containing campylobacter) and the severity of some of the consequences associated with risks. Participants were less engaged with complex statistics, such as references to the calculated Margin of Exposure (MOE). Detailed information could also be overwhelming if numerous sources of risk were listed, for example in acrylamides.

Conclusions

Drivers of concern tend to mirror participants' communication needs. In particular, appetite for communication is highest when consequences are severe and when people can take actions to mitigate risks. There are a number of challenges to influencing overall perceptions, including overcoming the effects of 'confirmation bias' - as participants tended to give precedence to existing knowledge over 'new' information in risk communications. This limited participants' focus to information that confirmed their existing knowledge at the expense of the overall picture.

Ultimately, behaviour around food risks was primarily driven by 'common sense' and instincts, with participants making quick, often subconscious decisions when taking action. Communications are more likely to affect consumers on a subconscious level when consequences are severe, visceral, 'real', or local; and when information is presented alongside clear and memorable actions. In other words, the closer a risk feels to an individual, the greater the impact of information on changing perceptions and ultimately behaviours.

1. Research Design

1.1 Background

The core objective of FSA and FSS is to protect public health from risks which may arise from the consumption of food. This involves using science, evidence and risk data to conduct careful risk analysis, in order to protect consumers from unacceptable levels of risk. However, consumers are unlikely to conduct similarly robust risk assessments when it comes to food. In fact, previous research suggests that decisions about risk are often instinctual and/or emotional.

In order to add to the evidence base about how best to communicate food risks, and to help the FSA and FSS in prioritising which risks to address, they need to understand how consumers perceive and determine food risks. In 2016, a project 'Exploring consumer's risk perception and behaviour in relation to food hazards, a case of the United Kingdom' was conducted at the FSA², which included a pilot survey. Based on this pilot, the FSA/FSS commissioned research with Kantar Public to understand consumer classification of different food risks. This included:

- A quantitative survey, to measure classification of food risks
- Qualitative focus groups, to understand in depth how consumers perceive different food safety risks, and the drivers of these perceptions.

This report focusses on the findings from the qualitative strand of research.

1.2 Research objectives

The overall aim of this qualitative research was to understand how consumers determine food risks, in terms of how risks are understood, classified, and responded to. More specifically, the research aimed to:

- **Understand consumer responses to specific food risks, such as types of food poisoning, chemicals in food, radioactivity in food, and food allergies.**
- **Uncover in detail the reasons that consumers perceive risks in particular ways, in terms of the factors that influence perception of risk.**
- **Build understanding of why some risks are considered higher than others.**
- **Explore the drivers of divergence between perception of risk level and tolerance and behaviour around it, i.e. the reasons why consumers may not act on the food risks they consider to be high.**

Findings from this strand of qualitative research were intended to inform the interpretation of quantitative research being conducted in parallel with this research. The quantitative research, which consisted of a survey of up to 1500 participants during March 2017, was conducted by Kantar Public and analysis was carried out by FSA. The aim of the survey was to measure consumer risk perception in relation to food, using the evidence to produce a risk evaluation grid that maps knowledge of a risk against fear of the risk and measure consumers' perception of other characteristics pertaining to risk, such as the perceived level of control, familiarity, and sources of information about the risk. The grid will also enable a comparison of risk perceptions across different types of food risk. Kantar Public conducted the survey and FSA completed the analysis. The results of this research will be published separately by the FSA.

² Spring, S. (2016). 'Exploring consumer's risk perception and behaviour in relation to food hazards, a case of the United Kingdom'.

1.3 Methodology

The qualitative research comprised two stages a brief evidence review and qualitative focus groups.

Brief Evidence Review

Kantar Public has conducted various research projects on behalf of the FSA that deal with perceptions of risk. To ensure that this research built on previous insight, Kantar Public conducted a brief evidence review covering 8 FSA/Kantar Public reports and presentations and 2 academic papers exploring consumer perceptions of food risk [see Appendix D for a full list]. The findings from the rapid evidence review informed the development of research materials and the analysis for this research.

Though not intended to be an exhaustive review of the existing literature, the review sought to ground the research in existing evidence and bring together the key findings on this particular issue. The findings of the review are summarised in section 2, and referenced where applicable throughout the report.

Qualitative Focus Groups

6 focus groups were conducted with a total of 41 participants (6-7 participants in each group). During the sessions, activities were carried out and in-depth information provided to the group, informing participants' discussions. The group discussions aimed to uncover existing levels of knowledge; and provide a deeper understanding of how people respond to additional information.

Each group lasted approximately 90 minutes and took place between the 8th and the 16th February 2017. The groups explored spontaneous awareness and understanding of 8 food risks and perceptions of these risks, before ranking these risks according to level of concern and willingness to tolerate the risks. These risks included campylobacter, *E. coli* O157 (this will be referred to as *E. coli* throughout the report), acrylamides, pesticides, food allergies, coeliac disease, TSE variant CJD and radioactivity (see appendix F for an overview of these food risks). These risks were chosen from an original list of 17 risks identified by FSA and FSS (see Appendix E for a list of 17 risks). As it is not feasible to include a large number of topics in focus groups, as it risks participant overwhelm and/or disengagement, this list was reduced to 8 risks for inclusion in the qualitative research. These particular risks were included because they cover a range of risk types from food poisoning, chemicals, food allergens and radioactivity and are known to have a mix of immediate and longer term effects.

Additionally, the groups gave participants an opportunity to engage with stimulus to learn more about 3 specific risks: campylobacter, food allergens and acrylamides. These particular risks were covered in more detail in order to understand responses to information that has recently been communicated to the public by FSA/FSS. The topic guide and stimulus materials are provided in Appendix B and C.

1.4 Sampling

To ensure a range of consumer views were reflected in the research, the groups comprised a mix of gender, age, attitudes to risk, social grades and locations (including both urban and rural). The groups were held in six locations across the UK in: London, Birmingham, Leeds, Glasgow, Belfast and Aberystwyth. A breakdown of the achieved sample can be found in Appendix A.

Though a mix of ages were achieved, the sample was slightly better represented amongst the 35 to 65 age group.

1.5 Analysis

Analysis was conducted iteratively following each group, building understanding of participant knowledge, concerns and behaviours around food risks; although the content and structure of the topic guide remained unchanged

The analysis drew on multiple data sources, including: the brief evidence review, audio recordings from the groups, and materials completed by participants during the research. Matrix mapping was used to analyse the data from the groups. This is a thorough and robust approach to qualitative data analysis whereby structured charts are used to map data against the research objectives and emergent key themes. The data was systemically analysed to look for themes and explore variation across sub-groups. A formal analysis brainstorm session was held following completion of groups, where researchers explored findings against each of the key themes in detail, as well as against the over-arching objectives.

It is important to bear in mind a number of caveats when considering qualitative data from focus groups. Firstly, that there is often variation between participants' stated behaviour and how they actually behave in real life. Secondly, given the nature of group discussions, participants may be more likely to answer questions in a certain way – for example in a way that appears to be more socially desirable. These factors were taken into account in both the research design and analysis.

Verbatim quotes are used throughout this report to illuminate findings and are attributed as follows:

“Quote.” (Location).

2. Findings from the brief evidence review

This section reports on the findings from the brief evidence review, bringing together insight about consumer perceptions of risks from previous Kantar Public research and from two academic papers [see Appendix D for a list of sources].

2.1. Risk perceptions

Previous research on risk perceptions has found that people generally consider certain types of foods and situations more 'risky' than others. In terms of food types, chicken and pork are seen as particularly high risk³, along with raw or undercooked meat and fish. While beef is seen as a cleaner, less risky type of meat, the *Consumer understanding of food risk: rare burgers* research⁴ demonstrated that when people considered it, some felt that minced beef may have a higher potential for bacterial contamination or parasites because it was perceived as lower quality than steak and may be exposed to more unhygienic conditions. People were unaware of the source of or the nature of risk specific to mincing steak.

The *Consumer Attitudes Toward Campylobacter* research highlighted that while the public has a good level of understanding about cooking chicken safely, they only have a partial understanding of preparing it safely and are less aware of safe storage times in the freezer⁵. Consumers know that chicken can cause food poisoning but awareness of the specific bacteria, campylobacter, is low. They initially underestimated the severity of the threat from campylobacter, but once informed, many wanted the industry to work towards a 0% risk of chicken containing it, or at least maintaining consistently low levels across retailers.

People generally believe that the risk of food poisoning from eating at home is low⁶ and relate the main risk to poor hygiene standards. What happens outside the home, both in terms of restaurant hygiene and the safety of food production processes is seen as posing a greater risk to the public. However, there is greater concern about the possible long term impact from poor diet and from chemicals and additives in our food⁷. The horsemeat 'scandal' also raised concerns about malpractice, lack of transparency with the contents of our food, a feeling that the food industry is driven by profit and concerns that regulators are not effectively controlling what is in our food⁸.

2.2. How perceptions differ from actual risk

There is a lack of knowledge about the risks involved in eating some undercooked food. People understood that chicken needed to be well cooked but did not realise that processed meat such as beef burgers also need to be cooked thoroughly to reduce the risk of food poisoning⁹. As found in the *Balance of Risks and Responsibilities* research, even when consumers realise that there is a risk of food poisoning, there is a general feeling that only the vulnerable (such as older people and babies) are at risk of serious consequences so they do not need to change their practices¹⁰.

³ FSA Consumer understanding of food risk: rare burgers, Kantar Public, 2015

⁴ FSA Consumer understanding of food risk: rare burgers, Kantar Public, 2015

⁵ FSA Consumer Attitudes Toward Campylobacter, 2016, Kantar Public

⁶ FSA Balance of Risks and Responsibilities, 2014, Kantar Public

⁷ FSA Balance of Risks and Responsibilities, 2014, Kantar Public

⁸ FSA Trace DNA in processed meat: Consumer views about acceptability, Kantar Public, 2013

⁹ FSA Consumer understanding of food risk: rare burgers, Kantar Public, 2015

¹⁰ FSA Balance of Risks and Responsibilities, 2014, Kantar Public

There is a general perception that preparing food at home is safer than eating out because you can control hygiene standards and therefore avoid food poisoning¹¹. If you get food poisoning at home, many people feel that it is likely to be 'bad luck' from a contaminated food product, and that there is little they can do about it.

A study in Ireland¹² demonstrated that consumers felt they knew the rules about safe food storage, preparation and cooking at home but in reality, they were not adopting safe practices (e.g. only rinsing hands in cold water rather than washing thoroughly with warm soapy water and not storing meat on the correct shelf in the fridge). Even those who did know the correct rules did not always follow them.

Conversely, in the *Consumer understanding of food risk: rare burgers* research, consumers expected any risks to stem from poor hygiene practices rather than from within the burgers themselves.¹³ They felt that by choosing to eat at a venue with good hygiene and trained staff, they would eliminate the risks. They also expected such venues to use high quality ingredients and assumed that by offering to cook your burger rare, it must be safe. An expensive or luxury product gives the impression of quality and safety.

2.3. Factors influencing determination of risk by consumers

Previous research found that the most influential determinants of risk are habit and instinct.¹⁴ These social norms are very difficult to change. The *Balance of Risks and Responsibilities* research suggested that consumers often rely on food hygiene practices that their parents used (e.g. defrosting meat out of the fridge, not washing vegetables or smelling food to check if it is safe to eat) because it has not shown any negative effects on them or people they cook for¹⁵. People also tend to trust other people's recommendations (more than government) and use their own observations and judgement to decide if a food establishment is safe. This research suggested that saturation methods of communication - building up messaging through public relations, news and entertainment media may in the long run create a 'tipping point' - in changing social norms.

Existing **knowledge or beliefs about food safety** often lead consumers to underestimate food risks. For example, the research shows a lack of understanding about the potential severity of campylobacter¹⁶, lack of knowledge about the correct fridge temperature and a lack of understanding about consumption dates on food labels¹⁷. The level of willingness to research and use official food safety guidance, such as the Food Hygiene Rating Scheme (FHRS), - also affects consumers' perceptions of risk.¹⁸

The extent to which a consumer uses **rational thinking** can affect their behaviour towards food risks. For example, the *Nanotechnology* research¹⁹ showed that some consumers go

¹¹ FSA Balance of Risks and Responsibilities, 2014, Kantar Public

¹² Who is at risk and what do they know? Segmenting a population on their food safety knowledge, McCarthy. M, Brennan. M, Kelly. A.L, Ritson. C, de Boer. M, Thompson. N, 2005 in *Food Quality and Preference* 18 (2007) 205–217:

<http://www.sciencedirect.com/science/article/pii/S0950329305001576>

¹³ FSA Consumer understanding of food risk: rare burgers, Kantar Public, 2015

¹⁴ Habit is generally understood to refer to a fixed tendency or pattern of behaviour; whereas instinct is something acquired naturally.

¹⁵ FSA Balance of Risks and Responsibilities, 2014, Kantar Public

¹⁶ FSA Consumer Attitudes Toward Campylobacter, 2016, Kantar Public

¹⁷ FSA Balance of Risks and Responsibilities, 2014, Kantar Public

¹⁸ The Food Hygiene Rating Scheme (FHRS) in England, Wales and Northern Ireland helps consumers choose where to eat out or shop for food by giving them information about the hygiene standards in restaurants, takeaways and food shops.

¹⁹ FSA Nanotechnology and food, 2011, Kantar Public

through a process of weighing up the benefits against the potential risks of certain food before deciding if it would be acceptable to them, in particular circumstances.

Personal attitudes and identity can influence a consumer's risk determination. Those who self-identify as 'foodies' for example, were shown to be more adventurous in their food choices and less risk averse by being more likely to eat rare burgers²⁰. Consumers commonly held the attitude that they were already 'doing enough' to keep themselves safe from food poisoning, such as buying food from trusted sources and trying to buy fresh/organic/higher quality food rather than processed food.

Finally, people's attitudes about food risks can be affected by **who they think is responsible for ensuring food safety**. In the *Consumer Attitudes Toward Campylobacter* research²¹, those who believed that the consumer was predominantly responsible for the safety of their food tended to feel that food simply needed to be cooked correctly for it to be safe, and were less concerned about industry targets to reduce campylobacter levels in chicken. Although people were generally satisfied that they are being kept safe, those who felt that the food industry is ultimately responsible for food safety were more likely to have high expectations and wanted the industry to aim for 0% prevalence of campylobacter in chicken. Similarly, the *Nanotechnology and food* research demonstrated that trust in the food industry in terms of being transparent and well regulated, is key to the acceptance of nanotechnology.²²

2.4. Communicating food risks: successful approaches/elements

In terms of the information contained in food risk communication, research indicates that the following elements can be successful:

- **Likelihood of being affected** – using a ratio rather than a percentage of the population, as people can relate to whole numbers and tend to dismiss the risks in percentage form if they are low.²³
- **Severity of consequences** – this must be proportional to the likelihood, as messages outlining severe effects alongside very low likelihood were seen as inappropriate²⁴.
- Provide a **clear frame of reference** – presented as new information e.g. explaining why bacteria exists inside raw burgers and is different to raw steak²⁵, or using the farm to fork clear explanations for the Trace DNA (carryover)²⁶ helped people move from initial feelings of disgust and distrust with the industry to understanding why it exists, that it is not unsafe and manufacturers are not 'ripping people off'.
- Using **regulation** to encourage trust in the food industry by demonstrating that those breaking food safety regulations will receive heavy fines/prison sentences²⁷.
- **Official ratings** –e.g. the option to include percentage risk of campylobacter on food labelling was shown to impact positively on consumers' claimed shopping and

²⁰ FSA Consumer understanding of food risk: rare burgers, Kantar Public, 2015

²¹ FSA Consumer Attitudes Toward Campylobacter, 2016, Kantar Public

²² FSA Nanotechnology and food, 2011, Kantar Public

²³ FSA Consumer understanding of food risk: rare burgers, Kantar Public, 2015

²⁴ FSA Consumer understanding of food risk: rare burgers, Kantar Public, 2015

²⁵ FSA Consumer understanding of food risk: rare burgers, Kantar Public, 2015

²⁶ FSA Trace DNA in processed meat: Consumer views about acceptability, 2013, Kantar Public

²⁷ FSA Strategy 2015-2020, 2014, Kantar Public

food hygiene practices²⁸. The FHRS scores were more trusted when component scores were included, as it demonstrated the robustness of the overall rating and there was a preference for numerical scales rather than ambiguous word labels²⁹.

The types of messaging that seem to be most successful in making people take notice of food risks include:

- **Hard hitting emotional messaging/imagery mixed with a rational/logical message** – these combined messages tend to engage, motivate and have longevity. For example, messages such as ‘food poisoning is serious and can happen to you’ can be more effective than communicating more rational and logical information, such as incidence statistics. Moreover, the discomfort of graphic images (such as photos of germs or the effects of food poisoning) inspires action³⁰.
- **Concern for others/duty** – this was particularly effective with parents and women, who tend to have a strong sense of duty of care³¹.
- **Avoid making it personal** – consumers may be defensive about their actions. Highlighting specific actions they can take helps prevent people becoming anxious about their general safety. It is better to state that the problem is ‘out there’ and empower them by providing a solution, such as changing small everyday actions³².

²⁸ This research involved a survey that captured information on which actions consumers would take in response to finding that their retailer sold more high risk chicken (through labelling of campylocater contained in chicken). 83% of respondents were either very likely or likely to take more care preparing chicken if they were aware of the risk of campylobacter when purchasing chicken. FSA Consumer Attitudes Toward Campylobacter, 2016, Kantar Public

²⁹ FSA Consumer response to information about FHRS components, 2014, Kantar Public

³⁰ FSA Messaging for Food Safety Communications, 2014, TNS_BMRB

³¹ FSA Messaging for Food Safety Communications, 2014, TNS_BMRB

³² FSA Messaging for Food Safety Communications, 2014, TNS_BMRB

3. Knowledge, Concern & Acceptability of Risks

This section explores participants' knowledge of food risks. In particular, it explores participants' awareness and understanding of 8 specific risks - campylobacter, *E. coli*, acrylamides, pesticides, food allergies, coeliac disease, TSE variant CJD and radioactivity - as well as their comparative level of concern and willingness to tolerate these risks. Finally, this section explores the drivers of concern and reasons for the toleration of some risks over others.

Overall, participants had a high level of confidence in their personal food safety knowledge and practices, despite some uncertainty around washing chicken and storing and re-heating foods. High levels of confidence were reinforced by a strong reliance on 'common sense' and instincts in determining food risks. When prompted on their understanding of 8 specific risks, however, actual knowledge varied and was mixed across and within groups. Nevertheless, certain risks were generally more familiar (allergens, pesticides, *E. coli*); whilst others were less familiar (radioactivity and campylobacter).

Participant's existing knowledge - based on personal connections, experiences of consequences (or lack thereof), and exposure to media stories and campaigns - roughly correlated with their level of concern. In turn, participants' level of concern was closely aligned to their willingness to tolerate risks. Both concern and willingness to tolerate risks were driven by a number of factors including knowledge, control over risk, experience and severity as well as immediacy of consequences. Furthermore, willingness to tolerate a risk was based on whether it was something people felt they 'already lived with' or had eaten for a long time (e.g. in the case of pesticides and acrylamides).

3.1. General knowledge of food risks

Level of general knowledge of risks was mixed across and within groups. However, on the whole, participants were aware, when asked about their unprompted, spontaneous knowledge of risks, those risks associated with food poisoning from cross contamination and/or under-cooked meat; with some mentioning specific risks such as salmonella, *E. coli* and 'mad cow' disease.

Despite mixed level of actual knowledge, participants had a high level of personal confidence in their knowledge of and practices around food risks. Confidence was grounded in a strong belief in personal and intuitive judgements, 'common sense' and an innate trust in instinct.

"Food safety is mostly common sense". (Glasgow)

"I'll go by sight, taste, smell..." (London)

Personal confidence was reinforced by personal experience and connections - such as experience of working in restaurants, or sharing information with friends working in the food industry. In addition, participants cited the fact that they rarely suffered from serious food poisoning as evidence of knowledge of food safety practices.³³ Due to these high levels of confidence participants did not generally seek advice on food safety practices.

"I think 'common sense' plays a really big part...it's not just looking things up...your life experience with food...you tend to trust your own instincts before looking up on the internet." (London)

Nevertheless, some sought advice on certain foods – in particular, looking online for cooking times for meat or for preparing/cooking shellfish. Some asked trusted family members, often mothers, for reassurance. Food knowledge was the accumulation of

³³ This supports evidence from previous research indicating that people's risk perception is linked to their experience of food poisoning

people's experience, with a particular focus on upbringing – for example, watching food being prepared, cooked, and stored in the family home from a young age:

"[It's about] basic knowledge you pick up over the years." (Birmingham)

Despite high levels of confidence, there were clear areas of uncertainty within groups, such as whether or not to wash chicken and storing and re-heating foods:

"I'm never sure about freezing...someone said to me if you cook food from fresh, you can freeze it...but I still think I'm not sure." (London)

However, some areas of uncertainty rarely resulted in participants doubting their overall knowledge. Ultimately, confidence in knowledge was universally and strongly felt, with food knowledge closely linked to instincts and 'common sense'. As such, personal knowledge was rarely called into question by participants who had high levels of trust in the safety of their own practices.

3.2. Knowledge and familiarity of 8 risks

At this point in the research, participants were not given any information beyond the names of each of the 8 risks – e.g. food allergens, campylobacter etc. Exploring participants' spontaneous understanding of these risks was intended to supplement findings from the quantitative survey which included questions on these risks.

Participants' awareness of and familiarity with the 8 risks varied and level of knowledge was mixed across and within groups. However, some patterns emerged, and the risks that were most familiar across all groups were food allergens, pesticides and *E. coli*. Radioactivity and campylobacter tended to be less familiar.

Risks most well known

Food allergens

Participants had a high awareness of the consequences of food allergies, with many mentioning the range of food types they thought people were more likely to be allergic to, including fish and nuts. Consequences were understood to be severe and ranged from itchiness, swelling, and rashes to breathing difficulties and in extreme cases, fatality.

"There's lots of really nasty things that come with [allergies]." (London)

This high level of awareness was driven by personal connections – such as family members and friends with allergies. Personal connections also contributed to knowledge of the ways in which sufferers could be exposed to the risk. For example, some mentioned the sensitivity of those with allergies to foods beyond direct consumption, such as through cross-contamination and even by breathing in air. High awareness of allergies – evidenced by the number of participants directly and indirectly affected by allergies – resulted in high levels of personal knowledge and awareness across all groups.

Pesticides

Pesticides were also familiar and were associated with risk of chemicals in food. People were aware of pesticides being sprayed on fruits and vegetables and used in the farming industry to kill insects.

"It tends to cover things like fruit and veg." (London)

Some also commented on the wider impact of pesticides on the environment and the food chain. However, the impact of pesticides on consumers, which was perceived to be delayed or accumulated over time, was less well known.

Despite familiarity, there was a general belief that legislation prevented farmers using pesticides in excess. As such, participants commented that pesticides in food were probably restricted or regulated to a level deemed to be safe. In addition, participants

communicated that those who were concerned about pesticides could take simple actions to mitigate the risk by, for example, washing fruits and vegetables.

E. coli

In general, participants were aware that *E. coli* was a form of food poisoning. Some recalled campaigns warning against the risk and, as such tended to associate the risk with undercooked meat and, in particular, with the popularity of barbeques.

"[I'm familiar with] *E. coli*, because we have the campaigns about this every year, pre barbecue season..." (Belfast)

A number of participants had been exposed to media stories of the severity of consequences associated with *E. coli*. For example, participants in Glasgow and Birmingham recalled an outbreak in Scotland in which a child died. Participants in the Glasgow group were particularly aware of the ongoing local incident involving the contamination of blue cheese which increased awareness and concern about *E. coli* more generally. Similarly, those in the Leeds group had heard in the media of an outbreak in a restaurant, leading to higher concern.

However, there was some confusion among participants about the sources of the risk, which was exacerbated by participants confusing *E. coli* with campylobacter, claiming that *E. coli* was mostly present in chicken. But, on the whole, participants were aware of the connection between *E. coli* and bacteria and recognised that the consequences could be fatal, particularly when vulnerable (young and elderly) groups were exposed.

Mixed knowledge of risks

Coeliac disease, TSE variant CJD, acrylamides

Across and within groups, participants had mixed knowledge of coeliac disease, TSE variant CJD and acrylamides.

Coeliac disease was relatively unknown unless participants had personal connections with sufferers, in which case they had some knowledge of the connection with wheat and gluten. Some participants expressed scepticism of the risk, calling it a "trendy disease" associated with the rise of healthy eating/lifestyle choices that limit gluten intake; on the other hand, others were aware of its serious, potentially fatal consequences.

Generally, TSE variant CJD (e.g. mad cow disease) was familiar to participants and was associated with beef in the 1990s. Consequences for both humans and livestock were understood to be severe, but knowledge rarely extended beyond this.

Finally, acrylamides, which the FSA communicated about to the public prior to the focus groups, were familiar to those that were aware of the recent media coverage. Those exposed to the campaign or media coverage recalled the link with cancer and burnt toast, though also mentioning that the evidence about this was 'unproven.' Meanwhile, those who had not seen media references had little to no familiarity with the risk.

Risks least well known

Radioactivity and campylobacter

Risks least well known across groups were radioactivity and campylobacter.

Although radioactivity was a familiar term in the broader sense, there was very little knowledge of its connection with food.

Meanwhile, participants were generally unfamiliar with the term campylobacter despite having some knowledge and awareness of safe food practices when preparing chicken. Some participants made the connection between campylobacter and chicken, bacteria and food poisoning, but had limited knowledge beyond this.

Sources of knowledge

Overall, knowledge and familiarity were based on personal connections, experience of consequences (or lack thereof), and exposure to media and campaigns. Personal connections and word of mouth often shaped specific knowledge of risks, as in the case of high levels of knowledge of food allergies as a result of knowing sufferers. Personal experience of, for example food poisoning, often increased knowledge of risks, particularly in terms of their consequences (e.g. a participant had near fatal food poisoning and was more cautious with food as a result). Local and national media stories and campaigns – as in the case of the Glasgow, Leeds and Birmingham groups where participants mentioned media stories relating to *E. coli* – meant that certain risks were ‘top of mind’ and participants were therefore able to recount information they had seen or heard via the media.

3.3. Concerns about 8 risks

Following spontaneous discussions around awareness and familiarity across groups, participants were then asked to comment on and rank their relative level of concern for all 8 risks. Level of concern was not always consistent within groups and there were some differences across groups. However, on the whole, concern tended to be higher for risks such as *E. coli* and allergens and lower for risks such as radioactivity and acrylamides.

Higher concern risks

E. coli, food allergens and campylobacter

E. coli was of high concern due to knowledge of serious consequences, particularly in terms of vulnerable groups and exposure to current media coverage (e.g. Glasgow, Leeds, Birmingham)

“*E. coli*...it's the one that's most likely to hit you...it's really, really bad.” (Belfast)

Similarly, food allergens were concerning due to the severity of consequences and the number of people affected. Some were inclined to discount the risk of allergens given that it was in the hands of the individual to mitigate the risk themselves. It was believed that, generally those that had allergies were aware and would therefore be vigilant when approaching foods.

“So many more people have food allergies now than they used to.” (London)

Meanwhile, those participants with some knowledge of campylobacter, in terms of its connection to food poisoning and chicken, were concerned. This supports findings from the literature review on perceptions of the types of food considered to be risky. In this research, concern was driven by severity of consequences associated with under-cooked

chicken and the immediacy of effects. Those that were unaware of the term campylobacter as a food poisoning tended to be less concerned.

"If it's food poisoning I'd be concerned because I'd want to know how to prevent it...Nobody wants to get food poisoning...it's awful." (London)

Medium concern risks

Coeliac disease, TSE variant CJD, pesticides

Risks of medium concern to participants included pesticides, coeliac disease and TSE variant CJD. The risks associated with pesticides were relatively concerning to participants given its association with chemicals. However, concern was often mitigated by a lack of knowledge of actual consequences, a general belief that the risk was mitigated by government regulation, and the perception of delayed effects following consumption of foods containing chemicals.

Participants also tended to discount the risk because it was perceived to have been present for a long time and had not, as yet, posed any major problems for participants. This in some ways appears to conflict with findings from previous research (see section 3) that long term and uncertain health impacts are often a cause of concern to consumers. However, these findings do not suggest that participants in this research were unconcerned with long term health impacts, rather that short term effects are comparatively more concerning than longer term effects.

"We have learned to live with [pesticides]." (Glasgow)

Coeliac disease was concerning insofar as participants knew people who had it and were therefore more aware of the consequences. However, some participants discounted the risk on the basis that sufferers were aware of the disease and were therefore able to take mitigating action.

"When you know you've got something wrong with you you do tend to look after yourself and get as much knowledge as you can about the condition to look after yourself. And everything is marked now and labelled so you can't really go wrong." (Aberystwyth)

TSE variant CJD (e.g. 'mad cow disease') was known by all as connected with beef in the 1990s. Some recalled shocking images in the media, were highly aware of some of the consequences for humans and livestock and tended to be more concerned; whilst others no longer viewed it as a risk and tended to discount it as something that happened 'in the past'.

Lower concern risks

Acrylamides, radioactivity

Of the 8 risks presented, overall participants were less concerned about acrylamides and radioactivity. Participants had lower concern about these particular risks because they lacked knowledge, or (in the case of acrylamides) felt that they had been presented with uncertain or conflicting information about the risk. In terms of radioactivity, most had made no connection between radioactivity and food and were therefore less worried about its effects.

"[Radioactivity]...never heard of it." (Belfast)

Meanwhile, those that were aware of acrylamides tended to discount the risk on the basis that there was a perceived lack of evidence and because they felt disengaged when confronted with links to cancer. This is consistent with findings in wider research about consumer fatigue with the communication of cancer-risks, where sources of cancer are viewed as profuse and overwhelming. Moreover, a number of participants discounted the risk on the basis that there had been extensive media coverage which peaked interest, followed by little to no media coverage, suggesting that the risk was no longer present.

3.4. 'Acceptability' of 8 risks

Although participants were generally uncomfortable classifying any risks as 'acceptable' or 'tolerable', especially if the risk was perceived to be 'unavoidable', unwillingness to 'accept' risks tended to mirror level of concern. Furthermore, when discussing concern or tolerance, participants tended to focus on whether a risk was considered to be something they 'already lived with' / had eaten for a long time (e.g. pesticides, acrylamides) or not.

Risks perceived to be least acceptable were *E. coli* and campylobacter (for those that were aware of it) due to the fact that the related food poisoning was perceived as sudden and severe. Meanwhile, acrylamides and radioactivity, the consequences of which were unknown and/or 'unproven', were more acceptable to participants.

Coeliac disease and allergens were perceived to result in severe consequences and therefore relatively unacceptable to participants. However, some were reluctant to rate the 'acceptability' of risks such as allergens, that were perceived to be incurable or unavoidable. Moreover, in the case of allergies and coeliac disease, given that there was explicit trust in the accuracy of labelling by the food industry, participants claimed that it was the responsibility of the individual to avoid 'risky' foods as part of everyday life.

"Acceptability has become part of everyday life...It's your responsibility." (London)

Pesticides and TSE variant CJD were generally perceived to be more acceptable than coeliac and allergens because both were viewed as 'old' risks. In the case of pesticides, the consequences were understood to be cumulative rather than sudden and severe, thus slightly increasing acceptability. Some concerns were raised about the environmental effects of pesticides, and the fact that whilst regulated by government, the use of pesticides was 'in the hands of industry', who were not necessarily trusted to act in the public interest.

3.5. Drivers of concern and acceptability

Participants' level of concern and willingness to tolerate risks were driven by 7 key factors

- The severity of impact/consequences;
- Familiarity with risk
- Knowledge about risk;
- Past experience;
- Perceived level of control over the risk;
- Whether risk is perceived to be current or old; and
- The immediacy of effects.

Each of these drivers are explored in turn below.

Severity of impact/consequences

Severity of consequences was a key driver of concern, such that severe/high concern risks reduced participants' willingness to tolerate them. Participants were particularly concerned about *E. coli* due to the fact that it was understood to have potentially life changing health impacts and in some cases resulted in fatality. Similarly, food allergies were concerning due to knowledge of severe consequences from rashes and swelling to breathing difficulties. Meanwhile, campylobacter was of high concern for those that were aware of the link with chicken due to the harmful effects associated with food poisoning caused by chicken.

"[Campylobacter and E. coli are] unacceptable because I'm convinced they are food poisoning." (London)

Concern about risks was heightened when severity of consequences were 'top of mind' – i.e. when participants recalled recent media stories, personal experience or through word of mouth.

Thus, media outputs containing visceral images, personal stories and experience of consequences are likely to make risks seem more real. This will, in turn, tend to have a greater impact on risk perceptions than factors such as scale of impact and incidence.

Familiarity

On the whole, high levels of familiarity resulted in participants considering risks to be 'more real' and more relevant, and therefore of greater concern. Familiarity was driven by factors such as exposure to local media stories, personal experience and those of friends and family, all of which increased concern about particular risks. This was most clearly evidenced in the Glasgow group where concern about risks associated with unpasteurised cheese were heightened due to recent media stories that linked the death of a child and a number of non-fatal cases to consumption of a particular brand of unpasteurised blue cheese.

At the same time, participants recalled, for example, experiencing the effects of food poisoning and of hearing stories from friends or acquaintances who had suffered the consequences of allergies, which increased concern.

"If something nasty happened to someone you knew then you would sit up and take notice." (Glasgow)

Knowledge

The relationship between knowledge and concern was complex and dynamic. On the whole participants were more concerned about risks they knew about, though for some, concern increased as a result of discovering a new risk they had previously been unaware of (once convinced that this could pose a threat).

Whilst some research papers have suggested that increased knowledge about a risk leads consumers to become less concerned about food risks³⁴, this research found that level of knowledge³⁵ commonly increased participants' level of concern. Thus, risks for which participants had higher levels of knowledge/awareness such as *E. coli* and allergens tended to be of higher concern than those they had not heard of, such as radioactivity. This was not universally the case though, with some participants rating a risk as of high concern, even though they had limited knowledge. For example, participants in Leeds were concerned about radioactivity, despite no knowledge of the risk of radioactivity in food specifically, which may have been due to the fact that radioactivity was generally associated with high risk events such as nuclear incidents/exposure.

There were also situations where participants discounted a risk despite higher levels of knowledge, as in the case of acrylamides, where participants tended to dismiss the risk as a result of what was perceived to be contradictory or 'unproven' evidence. There were also cases, for example in the Birmingham group, where participants were reluctant to rate

³⁴ "Exploring consumer's risk perception and behaviour in relation to food hazards, a case of the United Kingdom" (2016), Spring, S.

³⁵ Knowledge in this context does not refer to detailed 'scientific' knowledge of food risks. Rather, it refers to whether participants had a reasonably accurate understanding of a risk (to be expected from a non-expert), gained through word of mouth, media sources, past experience and for some, campaigns. This research cannot comment on the relationship between in-depth scientific knowledge about a risk and the level of concern, given the general public audience.

their level of concern due to limited knowledge. Nevertheless, on the whole, there was a strong positive correlation between familiarity and knowledge on the one hand and level of concern on the other.

Past experience

Past experience of exposure to and personal experience of the consequences of food risks increased participants' level of concern and drove down acceptability across all groups. This was particularly strong in the case of food poisoning where some participants had experienced severe consequences. This resulted in participants rating concern about *E. coli* and campylobacter higher than, for example, radioactivity. Conversely, participants were less concerned when they felt they had not directly experienced the effects of particular risks – findings that substantiate existing research on factors influencing risk determination. These included acrylamides and radioactivity and to a lesser extent pesticides - risks that were viewed as long-present in human consumption. In the case of acrylamides, participants tended to discount the risk on the basis that they had eaten burnt toast in the past and were not adversely affected.

"I've been eating burnt toast for all my life." (London)

Control over risk

Echoing previous research, participants' tended to be less concerned when they were able to divest personal responsibility. This was the case for allergens and coeliac disease, where participants, who implicitly trusted labelling by the food industry, often discounted the risk on the basis that it was up to the individual to control or mitigate the risk.

"When you know you've got something wrong with you do tend to look after yourself and get as much knowledge as you can about the condition to look after yourself. And everything is marked now and labelled so you can't really go wrong." (Aberystwyth)

In addition, there were a number of risks that participants were less concerned about because they believed that the risk was mitigated by government. These included TSE variant CJD and pesticides – both of which were considered to be controlled by government through regulation and therefore not major risks.

As found in the in brief evidence review and wider research on risk, the extent to which people feel they have control over a risk is important to their classification of it. This certainly factored into people's determination of the level of concern held about a risk, and in general, the level of control people felt they personally could have over a risk tended to reduce their concern about it. However, the ways in which people determined their level over control were not always consistent. For example, participants tended to discount the risk of allergens on the basis that it would be up to the individual to take responsibility for controlling the risk, given that they trusted labelling to be accurate. At the same time, they were highly concerned about the risk of risks they perceived as 'unobservable' - i.e. where consumers would be unable to tell when the risk was present (e.g. with campylobacter). Similarly, participants expressed confidence about the risk of food poisoning in the home, based on their ability to personally control for risk by cooking meat through and washing surfaces, etc. However, when discussing the same risk in another context, the risks were classified as highly concerning. This suggests that whilst perception of control is an important factor in determining risk, it is not straight forward and likely to be context-dependent: with people responding to prompts around personal control, clear actions to mitigate the risk, and who is responsible for controlling the risk.

Whether risk was perceived to be current or old

Views on whether a risk was considered to be current or 'old' was an important driver of concern and acceptability. Past high-profile food scares, such as 'mad cow disease' were generally discounted as 'dealt with'; whilst risks perceived to be emerging, current or on-going tended to be taken more seriously by participants. The latter included risks such as *E. coli*, campylobacter (for those that were aware of it) and allergies which were 'top of mind' and therefore perceived to be present risks. Radioactivity, pesticides or acrylamides

could sometimes be perceived as higher risk based on the fact that some of the effects or longer terms risks may still be unknown.

Immediacy of effects

Participants' perceptions in relation to the immediacy of risk effects or consequences tended to shape overall risk perceptions. Those risks associated with consequences that were immediately felt (e.g. food poisoning) tended to be most concerning. Those risks, such as pesticides and radioactivity, the effects of which were viewed as cumulative, over time, tended to be less concerning.

Summary

Overall, participants' level of concern and willingness to tolerate risks were driven by a range of factors from severity of impact, familiarity, and knowledge to whether a risk is perceived to be current or old. These drivers suggest that there is a gap in the principles underpinning the public's determination of concern and the ways in which risk is formally assessed. In particular, participants were more likely to be influenced by personal experience, control and familiarity than statistics relating to incidence and magnitude.

4. Responses to Information: Campylobacter, Food Allergens, Acrylamides

This section explores informed perceptions of three risks - campylobacter, food allergens and acrylamides - in terms of how participants responded to information, and whether/in what ways their level of concern and/or willingness to tolerate these risks changed in light of the information presented. Finally, the lessons for communicating about these risks, and food risks more generally, are drawn out.

Overall, participants paid particular attention to 'new' and surprising information, for example, relating to the percentage of chickens containing campylobacter and the severity of some of the consequences associated with campylobacter and allergies. But whilst participants paid attention to some new information, there were a number of challenges to influencing overall perceptions.

These included overcoming the effects of 'confirmation bias' - as participants tended to give precedence to existing knowledge over 'new' knowledge. This in turn limited participants' focus to information that confirmed their existing associations at the expense of the overall picture, including the range of sources and scenarios associated with a particular risk.

4.1. Campylobacter

Initial level of knowledge, concern and acceptability

Whilst there was low familiarity with the term campylobacter, the dangers associated with chicken were well known. This was reinforced by participant's spontaneous discussion of food safety practices which revealed the extent to which participants exercised caution when preparing, cooking and storing chicken. Whilst there was some confusion around washing chicken, all were able to communicate knowledge of and concern about the risks of undercooked chicken.

Response to information

Generally, participants were surprised by the fact that 50% of chickens contained campylobacter and some were shocked by the consequences, namely diarrhoea, tummy pain, headaches and fever to Guillain-Barré syndrome - a serious condition of the nervous system [see Appendix B for further information on the stimulus used]. But whilst the information provided explained that the bacteria was also found in red meat, unpasteurised milk and untreated water, participants focused almost exclusively on the risks associated with chicken without mention of the other sources. And, although, red meat, for example, is not considered to be an important source of campylobacter, it was interesting that participants emphasised the risks associated with chicken – a risk they knew something about. This suggests that it may be challenging to communicate on risks about which consumers have some existing knowledge, if the intention is to impart new information, change perceptions, or communicate detail.

Changes in perceptions

On the whole, participants claimed that the information would not necessarily increase their level of concern in this area, which was already quite high. However, some commented that, due to the high incidence of the bacteria and shocking consequences, they said they would take more notice of the risk.

"You must take notice of this - what to do about this, and why." (Belfast)

Some participants' communicated that they would take action, such as washing surfaces and using different chopping boards to mitigate the risk; but in order to take significant action, participants wanted recommendations on specific food safety practices.

4.2. Food Allergens

Initial level of knowledge, concern and acceptability

Participants had a high awareness of food allergies and their consequences due to personal experience or connections (described in section 3.2). Whilst the consequences were considered to be severe and concerning, some discounted the risk on the basis that it was up to the individual, and to a lesser extent, food businesses to mitigate.

Response to information

On the whole, participants found it hard to engage with allergens and the information presented to them. This was because participants did not commonly have food allergies themselves and tended to divest responsibility to sufferers, even if these were friends or relatives.

In addition, participants were aware of most of the information presented to them. However, they were surprised that allergies could be developed later in life and wanted to know more about why this was the case.

Changes in perceptions

On the whole, however, perceptions of the risks associated with food allergies remained unchanged as participants felt nothing could be done to avoid the risk of developing allergies.

"Why would they [inform people], people don't care unless they already have an allergy." (London)

They maintained that it was up to the individual to change their behaviour when made aware of an allergy. Similarly, participants communicated that, if they were to develop allergies later in life, the onus would be on them to control the risk.

"You take responsibility for checking things." (London)

4.3. Acrylamides

Initial level of knowledge, concern and acceptability

Participants had mixed awareness of acrylamides. Those that had been exposed to media coverage commented on the link with burnt toast and cancer, whilst communicating scepticism due to the perception that the risk was unproven and the 'hype' had died down. The sudden drop off in media coverage resulted in some participants thinking that the risk was no longer considered a high concern and they were consequently inclined to discount the risk

"Acrylamides, it appeared on the news three weeks ago. It was a big thing, then it just disappeared again. A big thing, then nothing. I think maybe because they don't have all the facts, they're not sure." (Belfast)

Response to information

Generally, participants focussed on the perceived lack of clear evidence, which reinforced initial responses to the risk and resulted in some being disengaged with the information. This was compounded by confusion about the figures presented. In particular, participants were put off by references to MOE (the calculated Margin of Exposure) – information which we presented to participants as stimulus material.³⁶ Moreover the range of scenarios (e.g. when baking, frying, grilling or roasting food) and types of food (e.g. coffee, crisps, bread and toast, and cakes and biscuits) were overwhelming for participants. Generally, they communicated that the information provided was overwhelming given that in order to mitigate the risk; they would need to be cautious with a range of foods and scenarios.

"When everybody talks about all these things that you're not supposed to eat, that will give you diseases and things, I just try to ignore it because there's too many things to worry about, to just not eat it. So I'd rather eat it and be happy, rather than just worrying myself sick." (Glasgow)

Not having specific guidelines or practical advice on how to deal with the range of sources of risk meant that it was hard for participants to process the information in a meaningful way.

Changes in perceptions

On the whole, for participants who were initially aware of acrylamides, perceptions of the risk did not change. In some cases, scepticism was reinforced by words such as 'might' and 'could', as in the case of the following statement: 'acrylamides could be increasing the risk of cancer'. As found in FSA research on chemical contaminants in food, participants paid attention to linguistic uncertainty in risk information, and tended to discount 'potential' risks compared to 'proven' ones.

"It doesn't feel like fact, the risk is that it 'could be'". (Birmingham)

Those that were previously unaware of acrylamides reacted in similar ways and focussed on the perception that the risk was unproven. As a result, most were unmoved by the information and some who already knew about the risk were even less concerned about risk than they had been initially. Despite the stated discounting of risk, however, some commented that they were likely to 'tweak' their behaviour, for example by turning down their toaster setting in response. This suggests that there may be a disconnect between people's stated determination of risk and their actual behaviour to mitigate the risk. In other words, just because people say or even think that something is not a worrying risk, they may still take actions to avoid it.

Recent FSA research on chemical contaminants explored whether information on different chemical contaminants would result in behaviour change. Out of all the risks included in the research, acrylamides was the only risk that effected specific behaviour change. This suggests that scepticism about evidence may be less important than having a clear, memorable action to reduce risk – or that some risks 'enter the subconscious'.³⁷ It may

³⁶ 'The calculated Margin of Exposure (MOE) for risk of cancer is up to 425 for average adult age groups. EFSA (European Food Standards Association) considers that an MOE of 10,000 represents a low concern for public health.' See <https://www.food.gov.uk/sites/default/files/csa-acrylamides-report.PDF> for FSA advice. [the URL should be incorporated into the text as hyperlink]

³⁷ 'Communicating with the public on chemical contaminants: Research report', FSA/Kantar Public (March 2017)

also suggest that people are more willing to take action to avoid eating burnt foods that are not considered to be particularly appealing or 'tasty'.

Communication channels

Some participants recalled seeing communications that had changed their behaviour in the past. A participant read online (unspecified source) that iceberg lettuce contained 50% pesticides and in response started to eat only organic lettuce. Some participants were influenced by a campaign about raw chicken and salmonella; others had become aware of the dangers of washing raw chicken through a campaign and word of mouth.

As part of the discussion participants communicated a range of channels through which they would like to be communicated about food risks. These included information on food packaging, leaflets and posters at doctor's surgeries, social media, and bus stop campaigns. Some thought that information should be embedded in cookery programmes (e.g. chef presenter mentioning risks and demonstrating the relevant hygiene practices), presented as part of news shows and documentaries and communicated in schools.

"You hear about things going wrong in the news or documentaries, becomes a marker in your head that you can refer back to. You might buy something that has something wrong with it or is not what you thought it was." (Birmingham)

Summary

Overall, participants were more engaged when presented with information about risks when:

- the consequences were perceived to be severe and far-reaching;
- when they felt that they were able to take clear action to mitigate the risk; and

In terms of the nature of information communicated, participants were most engaged when presented with clear and simple information that focussed on a few, rather than a range, of food sources and scenarios. In other words, the power of risk communication is easily diluted with multiple sources and consequences of risks. Moreover, engagement was enhanced when participants felt that there was a clear need for the information – i.e. information about risks which they came into direct contact with in their day to day lives.

Participants were less engaged when presented with complex statistics (e.g. margin of exposure for acrylamides) and when provided with too much information on consequences, as in the case of campylobacter, which was perceived by some as scaremongering.

"I think communicating [campylobacter] like that is very scaremongering to the public...they would have to be careful about how they present information..." (London)

Discussions around changes in perceptions revealed that participants required additional practical advice as well as a rationale underpinning this in order to consider changing their behaviour. However, the findings suggest that there may be a disconnect between people's stated determination of risk and their actual behaviour to mitigate the risk. These issues will be considered in the next chapter.

5. Behaviour around Food Risks

The ways in which individuals classify risk in a research environment will not necessarily directly relate to the ways in which risks are acted upon in real life. This section explores participants' (stated) behaviours around food risks and the relationship between behaviour on the one hand and knowledge, concern and acceptability on the other, with a particular focus on the deviation of stated behaviours from risk perception.

Overall, in terms of actual behaviour, participants tended to adopt 'harder' and 'softer' rules about particular foods and contexts. Participants were on the whole more cautious with meats, particularly chicken, and when cooking or preparing food for others. Meanwhile, participants tended to take more risks with vegetables, fruits and dairy products and did not always follow use-by dates. On the whole, behaviours were shaped by quick decisions or heuristics (e.g. using a rule of thumb, an educated guess, or an intuitive judgment), with most participants using 'common sense' and instincts as the basis for action.

5.1. Actual behaviour

Participants reached consensus about the fact that certain meats and shellfish were more 'risky' than other types of food. In particular, participants were most cautious about chicken and pork, than other types of meat such as beef – views which were consistent with those of the evidence review.

"Certain meats like pork and chicken...you've got to be really careful...but beef you can eat rare." (London)

Stated behaviours to mitigate risks when preparing and storing 'risky' meats included using different chopping boards for meats versus other types of foods to avoid cross-contamination, storing different types of foods separately in the fridge, wiping work surfaces and washing hands before preparing food. Participants were particularly cautious when cooking meats, claiming that they took extra care to ensure that chicken was cooked thoroughly so as to avoid food poisoning.

"I tend to cremate chicken and I've passed that onto my daughter...she won't eat chicken unless it's cremated." (London)

"I'm very paranoid about meat and that it's been cooked right." (Leeds)

Meanwhile, participants were generally less cautious about fruits, vegetables and dairy – foods which they believed were not as 'risky' as meats.

"I don't think there's nearly so much risk associated with vegetables [as meat]." (London)

There was also a general belief that date labelling (e.g. use-by dates) were more to protect the seller and, as a result, participants were commonly less concerned about date labelling.

"If it's passed its use-by date I'll still use it, yeah if it hasn't got any mould on it." (Leeds)

"I believe they're more for the seller than the consumer...by law they're obliged to put a date." (London)

"If something's in my fridge and it's out of date...veg and fruit, it may still be in my fridge for two weeks after...I have no qualms about it...I would use my senses to see if it was out of date or worth eating or not eating." (Belfast)

However, participants communicated being more cautious with date labelling when cooking for others. Concern was heightened when preparing and cooking food for 'vulnerable' groups such as children and older people – perceptions that were reflecting in the existing literature on risk perceptions.

In terms of behaviours when eating out, on the whole, participants tended to avoid certain food establishments perceived to be more difficult to regulate (e.g. mobile take-away food

stalls). Those that were more cautious tended to be selective with the types of foods they ordered in restaurants. Some were reluctant, for example, to order foods perceived to be 'risky' such as chicken and shellfish, despite being confident preparing and cooking these foods at home.

"I'm very paranoid about meat and that it's been cooked right so I wouldn't choose chicken [when eating out] for that reason. I don't like to mess about with anything that is dangerous". (Leeds)

Participants were also inclined to assess a restaurant's food safety practices on whether or not it appeared to be clean, hygienic, or 'busy with customers'. However, on the whole, participants admitted that they tended to 'just trust restaurants' and communicated high levels of trust in regulatory standards - again, validating previous research

However, there were a number of situations and reasons for participants not behaving in the way they knew they should. These ranged from personal financial pressures to an innate trust that food businesses follow regulations.

Firstly, participants communicated taking a more relaxed attitude to risk mitigation when they were under financial pressure. This ranged from stretching use-by dates to re-heating foods numerous times which they acknowledged may be 'risky'. They were also more likely to buy foods from stores which may not have been particularly hygienic, but that sold cheaper products.

Secondly, participants often admitted prioritising the enjoyment of eating over safe food practices. Some expressed a state of 'denial' in the face of wanting to eat particular foods known or suspected to be potentially risky (e.g. eating raw shellfish straight from the sea). This was heightened when they did not have a duty of care for others (i.e. when they were cooking/preparing food for themselves).

Thirdly, an innate trust in food regulation and in businesses adherence to guidelines resulted in some participants discounting certain risks, in particular the risks associated with eating out.

"I don't give it any thought at all, when I'm eating out. A lot of places have certification up on display, things like that, but even then I don't go looking for it. I think there is an element of (thinking) 'standards will be adhered to', and it's safe enough. I feel reasonably confident I should be fine in there, there's some sort of legislation or governance in there." (Glasgow)

The reasons for these divergences between risk perception and behaviour are explored in the following section.

5.2. Drivers of behaviour

Overall, drivers of *behaviours* tended to differ slightly from the drivers of risk perceptions as explored in section 4.5. Though there is a high degree of overlap between the two, behavioural drivers were even more individualistic and habitual. This suggests that behaviours around food risks are primarily driven by instinct, with participants making quick, often subconscious decisions when taking action.

"It is more about 'common sense' than following a set of rules in your head." (Belfast)

Beyond instinct and habit, a number of personal factors shaped behaviours, including type of participant (e.g. life stage, urban versus rural dweller, risk appetite), knowledge and awareness and whether or not they have a duty of care for others.

Type of participant

Behaviours around food safety were also driven by life stage and risk appetite, reflecting findings from the literature review. In addition, this research found that whether participants lived or grew up in rural areas was another important driver. Participants in rural areas in Belfast and Aberystwyth for example often viewed what they perceived to be 'natural

foods' (e.g. unpasteurised milk) as healthy and therefore tended to take more risks. Some recounted consuming natural foods on farms and smallholdings where they had grown up or worked, such as drinking unpasteurised milk and using the 'smell test' to determine whether pig meat was 'fresh' or not.

In addition, participants who had retired, for example, communicated having more time to take action against food risks than they would have had whilst working. For example, a participant claimed that he was more careful to clean surfaces and wash chopping boards following retirement. Conversely, there was a general belief among participants that younger consumers were likely to take more risks due to, for example, lifestyle choices as a student.

"I wouldn't eat from a 'death burger' stand. But in my 20s, we'd fall out of a disco and go to eat something off these mobile places that open up specially for students coming out of clubs...Now I like to know it's good quality food and hygiene is important, too." (Glasgow)

Risk appetites and whether or not participants were adventurous with food was also a driver of behaviour irrespective of age.

"I take risks with things I haven't tried before, or haven't cooked with before. I love trying new things." (Belfast)

"I've eaten raw fish...It was eaten fresh from the water, with a friend who liked to try these things. I'd try anything, like raw shellfish. I've done that. It's probably really silly, and far riskier than a salad bar...Mussels straight out of the bay. Just to taste it. It's absolutely beautiful." (Belfast)

Knowledge and awareness

Rules underpinning behaviours were often driven by whether a food was already classified as 'risky' based on personal knowledge. Behaviours to mitigate risks associated with chicken, for example, were driven by awareness of the risks of food poisoning and salmonella. Moreover, knowledge of the risks of cross-contamination prompted action such as using different chopping boards for different types of foods. These behaviours tended to be automatic and instinctual.

"[There's] potentially a lot more harmful bacteria [in meat]...there's always that potential of food poisoning." (London)

Behaviours around cooking, preparing and storing meats also correlated with participants' high level of concern around food poisoning (which they perceived to be associated with meats, particularly chicken) over pesticides which were associated with fruits and vegetables.

"It's rarer to get ill from salads and stuff than it is eating a raw chicken!" (Aberystwyth)

Duty of care

On the whole, participants were inclined to trust their instincts and 'common sense', which shaped their behaviour around, for example, date labelling.

"Our mothers and grandmothers always did and they were fine." (Aberystwyth)

However, participants claimed that they were less likely to take risks when cooking or preparing food for others. This was heightened by their emotional sense of duty to protect 'vulnerable' groups such as children and the elderly, claiming that they were less likely to take risks with, for example, date labelling..

"I wouldn't tend to give kids things that are out of date even though I know it's fine and I would eat it...because they're so young." (Belfast)

Summary

Overall, people's stated determination of risk and their actual behaviour to mitigate the risk are often different. Whilst risk perceptions in a research environment may elicit more 'rational' responses, the drivers of risk determination may still be considered fairly

instinctual. Drivers of actual behaviour were even more individualistic, based on personal choices, heuristics and 'common sense'.

6. Conclusions

Risk perceptions and drivers

Consumers' perceptions and determination of risk is complex and highly individualistic, and thus difficult to predict at a population level. However, there are patterns and commonalities in terms of how people think about food risk. Overall, drivers of risk determination include familiarity and knowledge, consequences (including severity and immediacy of impacts), past experience, level of control and whether a risk is perceived to be current or old.

These drivers will help inform interpretation of the quantitative element of the research, in particular, the survey results in terms of how people make decisions about risks when asked to compare them, and validate much previous research on consumer approaches to risk. However, the disconnect between what people say they think is risky, and their actual behaviour around food risks, is important to bear in mind. Responses to the information on acrylamides, or people's decisions to take food risks in pursuit of personal enjoyment strongly suggest that people's actual risk toleration can be highly emotional, based on heuristics, or in other words operating at the subconscious level.

Consequently, although people are generally able to make more 'rational' judgements based on detailed information, it is unlikely that the detail will figure into later decisions about risks. In other words, changes to perceptions and ultimately to behaviour are not driven by detailed facts, but by emotions.

Challenges to changing perceptions

Participants' responses to information on the three risks presented to them reveal a number of challenges to changing risk perceptions.

Firstly, participants tended to focus on information that confirmed existing knowledge and association, often at the expense of other information. This was the case for campylobacter where participants largely ignored potential sources of the risk beyond chicken (e.g. unpasteurised milk).

Secondly, participants were generally put off by information that listed a variety of sources and consequences. Instead, on the whole, participants focussed on the relationship between one source and one consequence, as in the case of burnt toast and cancer. As a result, participants tended to disregard other sources and scenarios.

Thirdly, participants communicated on the one hand being engaged by information on severity of consequences, but on the other hand becoming disengaged when they felt the information was 'scare-mongering'.

Communicating risks

These challenges may be overcome by presenting clear, simple and reliable information along with practical direction. Moreover, information that includes key headline sources of risks and consequences, rather than an exhaustive list, may result in higher engagement.

Appetite for communication is highest when consequences are severe and when people can take actions to mitigate risks. Moreover, trust in existing practices is strong and, whilst people can be responsive to new information, they are less likely to pay attention to nuance in information they believe they know something about.

Building on the evidence base on risk perception in food, this research suggests that successful risk communication must enter the subconscious in order to increase the likelihood of being taken seriously and being acted upon. This is more likely when:

consequences are severe and visceral, and disruptive; where the risks feel real, local and familiar; and when communications present with a clear and memorable action for individuals to feel in control of a risk. In other words, the closer a risk feels to an individual, the greater the impact of information on changing perceptions and ultimately behaviours.

Appendix A – Achieved sample

	LONDON	BIRMINGHAM	GLASGOW	BELFAST	LEEDS	ABERYSTWYTH
TOTAL						
6 groups	7	7	6	7	7	7
Primary quotas						
Gender						
Male	3	3	3	3	3	3
Female	4	4	3	4	4	4
Age						
18-24	1	1	1		1	
25-34		1	1		1	
35-44	1	3	1	4	2	2
45-54	3		1	3		3
55-64	2	1	1		3	1
65+		1	1			1
SEG						
ABC1	4	4	4	3	4	4
C2DE	3	3	2	4	3	3
Rural/Urban						
Semi/rural or Rural			4	7	4	4
Urban			2		3	3
Urban London/Birmingham	7	7				
Secondary quotas						
Risk appetite/concern						
Very concerned	2	3	2	1	1	4
Somewhat concerned	2	1	1	3	3	3
Neither concerned or unconcerned	1	1	2	1	1	
Not very concerned	1	1	1	2	2	
Not at all concerned	1					

Appendix B –Topic guide

1. Background – 7 mins

	Stimulus / tasks	Approx timing
<p>1.1 CHAIR introduction</p> <ul style="list-style-type: none"> • Introduce yourself and Kantar Public – an independent research agency • We are conducting research on behalf of the FSA/FSS to explore public awareness and perceptions of food risk • Introduce FSA/FSS attendees (if present) • Length – 90 minutes • Research is confidential and anonymous – findings and quotes will be attributed anonymously. • Recording – shared only with the Kantar research team. 		2 mins
<p>1.3 Group introductions</p> <ul style="list-style-type: none"> • Participants introduce themselves to the group <ul style="list-style-type: none"> ○ Name ○ Who they live with – partner; number / age of children ○ What they do – work or hobbies ○ Last meal they cooked 		5 mins

2. General attitudes and behaviours around food and food safety/risk – 15 mins

Objectives of this section:

- Warm up and brief introduction of participants' attitudes towards food
- To gauge knowledge and perceptions of food safety – their knowledge of food safety practices in the home and what they do to mitigate food risks

	Stimulus / tasks	Approx timing
<p>2.1 EXPLORE current attitudes and behaviours regarding food generally</p> <ul style="list-style-type: none"> • How they would describe their interest in / attitude towards food E.g. Interest in cooking/learning new recipes, whether they tend to cook just for themselves/for others • Would they characterise themselves as someone more adventurous with food, or more conservative • Are they willing to take some food risks, or are they very careful with food 		5 mins

<ul style="list-style-type: none"> ○ Reasons for views ○ When/in what circumstances would they be willing to take food risks ○ Spontaneous, then probe: how this changes when eating out compared to eating at home ● If/whether they seek advice on food safety; <ul style="list-style-type: none"> ○ If yes, where from: magazines, family, tv programmes <p>2.2 EXPLORE current understanding of recommended food safety practice</p> <ul style="list-style-type: none"> ● How would they rate their knowledge of food safety practices (in terms of preparing, cooking, and storing food) <ul style="list-style-type: none"> ○ What areas of food safety are they less confident about ● How important do they think it is to follow food safety guidelines - in terms of: <ul style="list-style-type: none"> ○ Cooking chicken thoroughly ○ Following use by dates/best before ○ Cooking burgers and sausages thoroughly ○ Drinking raw/unpasteurised milk; eating unpasteurised cheese ○ Washing salad / vegetables <ul style="list-style-type: none"> ▪ Reasons for views ○ Checking whether the person they are cooking for has any food allergies ● To what extent do they actually follow the food safety rules that they are aware of <ul style="list-style-type: none"> ○ Which rules do they always follow – why ○ Which rules do they sometimes ignore – why ○ Are there any foods they are more likely to ‘take risks’ with ○ Are they more/less likely to take risks when eating out? ○ How confident are they that food businesses and Government protects them against risk? ● Has anything ever made them change their food safety practices (e.g. advertising, experiencing food poisoning, developing a long term condition, word of mouth) 		10 mins
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3. Knowledge of and attitudes to food risks – 40 mins

Objectives of this section:

- To explore participants’ understanding of food risk – what kinds of food risks are most commonly perceived and which are most concerning

- To explore knowledge of a specific list of food risks, to understand which concern consumers the most and why

	Stimulus / tasks	Approx timing
<p>3.1 EXPLORE attitudes to food risk</p> <ul style="list-style-type: none"> How concerned are they about food risks <ul style="list-style-type: none"> Reasons for views What particular food risks are they most concerned about <ul style="list-style-type: none"> Reasons for views Explore any differences in views 	<p><i>Flipchart spontaneous responses</i></p>	5 mins
<p>3.2 INDIVIDUAL SORTING exercise exploring attitudes to food risks</p> <ul style="list-style-type: none"> Introduce stimulus A – participants to complete individually: <ul style="list-style-type: none"> How much they feel they know about each type of food risk What they know about each of the food risks How concerned they are about each type of food risk <p>Researcher explain there are no right/wrong answers - and we don't expect them to know about all of these, but interested in anything that comes to mind.</p> <ul style="list-style-type: none"> If needed: for coeliac disease and food allergens, they should think from the perspective of someone who is affected by the condition 	<p>HANDOUT A: Individual task</p>	8 mins
<p>3.3 EXPLORE knowledge of specified food risks</p> <p>Group discussion:</p> <ul style="list-style-type: none"> What do participants know about each of the food risks and how you could become exposed to them? Take each one in turn and flipchart responses. For each ask participants to rank their level of knowledge (on flipchart) – i.e. know a lot, know a little or know nothing <ul style="list-style-type: none"> Campylobacter <i>E. coli</i> O157 Acrylamides (e.g. burnt toast) Pesticides Food allergens (e.g. nuts, milk, shellfish) Coeliac disease TSE, variant CJD (e.g. Mad cow disease) Radioactivity in food 	<p>'CONCERN' AND SORTING STIMULUS</p>	10 mins
<ul style="list-style-type: none"> How interested are they to learn more about each food risk? Why? 	<p>'ACCEPTABILITY'</p>	2 mins
		13 mins
		12 mins

<p>3.5 SORTING exercise exploring the level of concern about each food risk</p> <p>Note researcher: Participants may know very little/nothing about some of the risks. If this is the case and they don't feel they are able to comment on how concerned they are, put that risk to one side.</p> <ul style="list-style-type: none"> • How concerned do participants feel about these risks? <ul style="list-style-type: none"> ○ <i>As a group, sort each food risk in terms of how concerning they are: A lot, a little or not at all.</i> ○ For coeliac disease and food allergens, they should think from the perspective of someone who is affected by the condition • Why did they group the risks the way that they did? <ul style="list-style-type: none"> ○ For each: How exactly does that impact on their perception of risk <p>SPONTANEOUS, then probe whether/how it was determined by:</p> <ul style="list-style-type: none"> ○ How much they know about it or have experienced it? ○ How likely they think they are to be affected? ○ How severe the consequences could be ○ Who is affected? (i.e. older people, children, vulnerable people) ○ How much control they think they have over it? ○ Whether the risk is considered voluntary? ○ Whether the risk is 'natural' or manmade? ○ The extent to which the food industry protects them from it? ○ Media coverage? <p>3.6 RANKING exercise exploring the level of acceptability of each food risk</p> <ul style="list-style-type: none"> • Based on what they already know about each of the food risks (and leaving out any that they are not familiar with): which risks are more / less acceptable? <i>As a group rank from most acceptable to least acceptable.</i> <ul style="list-style-type: none"> ○ How willing are they to accept any of these food risks – why? ○ Which risks are people more willing to 'tolerate' – why? ○ Reasons for views • What do they currently do to try and avoid each of these risks? 	<p>RANKING STIMULUS</p>
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4. Communicating about food risks – 25 mins

Objectives of this section:

- To understand responses to more detailed information about risk
- To identify information that may be effective in communicating about food risks


	Stimulus / tasks	Approx timing
<p>4.1 UNDERSTANDING the impact of information on risk perceptions</p> <p>Researcher to show stimulus E: additional information about some of the food risks mentioned earlier. Hand out stim and read out each slide to the group one by one, probing after each. Ask the following probes to the group taking each food risk in turn.</p> <ul style="list-style-type: none"> • What information was new • Anything surprising <ul style="list-style-type: none"> ○ For food allergens only: prompt around reactions to the idea that adults can sometimes develop allergies later in life • Was anything unclear or any information missing • What action (if any) do they currently take to try to avoid the risk • How acceptable do they find the risk (i.e. is it something we just have to live with or would they want to take steps to mitigate the risk) • Would any of the information make them change their behaviour to avoid the food risks; <ul style="list-style-type: none"> ○ Reasons for views • If FSA/FSS wanted to tell people about this food risk, what specific information do they think is the most important (i.e. what would be most compelling) <ul style="list-style-type: none"> ○ Who do they think this should be communicated to 	<p>STIMULUS E: Additional food risk info</p> <p>'CONCERN' SORTING STIMULUS</p>	<p>20 mins</p>
<p>4.2 UNDERSTANDING informed food risk priorities and preferred communication methods</p> <p>Researcher to remind participants of their ranking of the level of concern for the food risks shown above.</p> <ul style="list-style-type: none"> • Whether the additional information changes their ranking of how concerned they are about each risk <ul style="list-style-type: none"> ○ How; why ○ What information specifically • Which of the risks do they think they are most likely to take action on, going forward • If FSA/FSS had to choose two food risks to inform consumers about, which should they focus on? Why? • Aside from TV adverts, what do they think would be the most effective way to inform people about food risks 		<p>5 mins</p>

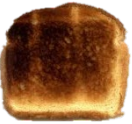
5. THANK AND CLOSE – 2 mins

- Any final comments for FSA/FSS


Appendix C – Stimulus material

Informed perceptions of risk: campylobacter, allergens and acrylamides

	Campylobacter
Sources of risk	Mainly in contaminated chicken but also found in red meat, unpasteurised milk and untreated water.
How can you be affected	It spreads easily and only a few bacteria in a piece of undercooked chicken, or bacteria transferred from raw chicken onto other ready-to-eat foods, can cause illness.
Incidence and likelihood of illness	It is the most common form of foodborne illness in the UK. 50% of all chickens sold contain Campylobacter. It was considered to be responsible for 263,000 cases of food poisoning in 2015. It is especially prevalent among under 5's and more men than women are usually affected
Consequences 	<p>Most people experience symptoms for a week, including diarrhoea (sometimes bloody), tummy pain, headaches, fever and dehydration and some will have nausea and vomiting. For some, Campylobacter can cause irritable bowel syndrome, reactive arthritis and, in rare cases, Guillain-Barré syndrome – a serious condition of the nervous system.</p> <p>Around 100 deaths occur each year from the effects of Campylobacter.</p>

	Acrylamide
Sources of risk	Acrylamide is a chemical produced naturally as a result of cooking starch-rich food at high temperatures, such as when baking, frying, grilling or roasting food. It is generally found in coffee, crisps, bread and toast, and cakes and biscuits
How can you be affected	Unless you work in the polyacrylamide production industry, or are a smoker, the main source of acrylamide exposure is through foods. Further cooking of carbohydrate rich foods, for example grilling of bread to make toast, causes more acrylamide to be produced.
Incidence and likelihood of illness 	<p>Effects depend upon the level of exposure. We cannot avoid exposure to acrylamide, but actual exposure will vary depending on diet, lifestyle and environment.</p> <p>The calculated Margin of Exposure (MOE) for risk of cancer is up to 425 for average adult groups. EFSA (European Food Standards Association) considers that an MOE of 10,000 represents a low concern for public health.</p> <p>Most of the evidence is based on effects seen in animals or cells studied in a laboratory. However, the data for cancer and reproductive system effects in humans are not conclusive.</p>
Consequences	Risk assessment indicates that at levels we are exposed to in food, acrylamide could be increasing the risk of cancer.

Food allergens

	Food allergens
Sources of risk	In the UK, allergy to peanuts, tree nuts (E.G. almond, walnut, and hazelnut), wheat, cows' milk, fish and egg are most common
How can you be affected	A food allergy is when the immune system responds to a particular food causes an allergic reaction. Some adults can develop food allergies later in life.
Incidence and likelihood of illness	Around 3,500 people are admitted to hospital each year. Children have higher rates of allergy to milk and egg whilst adults can be allergic to a wider range of foods, including fruits and vegetables.
Consequences 	Common symptoms of a food allergy include swelling and tingling of lips, nausea, vomiting, diarrhoea, skin rashes, shortness of breath, anaphylaxis, runny nose, and red, itchy eyes. In severe cases, reactions can be life threatening.

Appendix D – Bibliography

Brief Evidence Review

FSA/Kantar Public: research reports and presentations

[Balance of Risk and Responsibility \(2014\)](#)

Consumer Attitudes towards Campylobacter, unpublished (2016)

Consumer Insight Research: Messaging for Food Safety Communications, unpublished (2014)

Consumer response to information about FHRS components, unpublished (2014)

[FSA Strategy 2015-2020 \(2014\)](#)

[Trace DNA in processed meat: Consumer views about acceptability \(2013\)](#)

[FSA Citizens Forums: Nanotechnology and food \(2011\)](#)

[Consumer understanding of food risk: rare burgers \(2015\)](#)

Academic papers

McCarthy, M., de Boer, M., Brennan, M., Ritson, C., Thompson, N., Kelly, A.L. ['Who is at risk and what do they know? : Segmenting a population on their food safety knowledge'](#), in *Food Quality and Preference*, Vol. 18, No. 2, 01.03.2007, p. 205-217

Slovic, P., 'Perception of Risk', *Science*, Volume 236, Issue 4799 (1987), 280-285

Appendix E – List of 17 risks

- 1) Norovirus
- 2) Listeria monocytogenes
- 3) Food allergens
- 4) Acrylamide (e.g. Burnt toast)
- 5) Campylobacter
- 6) Generic food poisoning
- 7) TSE, variant CJD (e.g. Mad cow disease)
- 8) Food intolerance
- 9) Chemicals in food
- 10) Radioactivity in food
- 11) Aflatoxins (fungal toxins)
- 12) Mercury in fish
- 13) Pesticides
- 14) Coeliac disease
- 15) E Coli
- 16) Salmonella
- 17) Toxic mushrooms/berries

Appendix F - Overview of food safety risks discussed in focus groups

<p>Radioactivity in food</p>	<p>Radioactivity is both naturally occurring and man-made and can be found throughout the environment. It is found in all food and drink. The incidences where the food chain has had radioactivity enhanced in the food are from nuclear emergencies or from routine exposures. Examples of this are nuclear accidents (Fukushima or Chernobyl) or through authorised discharges into the environment nuclear power plants or hospitals. However, the authorised levels of discharge to the environment have been chosen so that members of the public should not receive an exposure greater than what would cause 1 in 20,000 fatal cancers in the population over their lifetime.</p> <p>It is highly unlikely that an instant death will occur from consuming contaminated food unless it has been deliberately added in a very high dose. The risk and severity are more likely to be from long term exposure and the potential for death from the production of cancers. This occurs due to the radioactive elements producing energy inside the body that alters the cells making them cancerous.</p>
<p>Campylobacter</p>	<p>Campylobacter is the most common cause of food poisoning in the UK. It usually develops a few days after exposure and leads to symptoms that last about a week including abdominal pain, severe diarrhoea and, sometimes, vomiting. For some, campylobacter can cause long term problems such as irritable bowel syndrome, reactive arthritis and in rare cases, Guillain-Barre syndrome (a serious condition of the nervous system). Research has shown that the most important source of campylobacter infection is chicken and surveys show that over 50% of chicken on retail sale are contaminated with campylobacter. Improper handling (leading to transfer of bacteria from the raw chicken to ready to eat foods) and inadequate cooking of chicken in the kitchen lead to infection.</p> <p>Other foods that have been associated with illness include raw milk, chicken/duck liver pate and consumption of water from a private water supply. It is also believed that campylobacter infection can be contracted through environmental exposures e.g. outdoor recreational activities.</p>
<p><i>E. coli</i> O157</p>	<p><i>E. coli</i> O157 infection is a relatively rare cause of gastrointestinal illness, however it can cause a spectrum of illness from mild gastroenteritis through to severe bloody diarrhoea and on some occasions it can cause haemolytic uraemic syndrome (HUS) which can lead to renal failure and death. <i>E. coli</i> O157 is carried by farm and wild animals (especially cattle and sheep) in their gastro-intestinal tract without causing them illness and then shed in their faeces. People can be infected by direct contact with animals and their faeces (such as at petting farms, visits to working farm); consumption of any food or water contaminated by the faeces of an infected animal; or through person-to-person spread. Common foods implicated in cases of infection include minced red meat products e.g. undercooked burgers and sausages; unpasteurised milk and cheese and raw unwashed vegetables and salad leaves.</p>
<p>Acrylamide (e.g. burnt toast)</p>	<p>Acrylamide is a chemical produced naturally as a result of cooking starch-rich food at high temperatures, such as when baking or frying. It is also likely to be produced by grilling and roasting food. Unless you</p>

	<p>work in the polyacrylamide production industry, or are a smoker, the main source of acrylamide exposure is the consumption of acrylamide-rich foods or beverages. Acrylamide is not deliberately added to foods, it is a natural by-product of the cooking process. Dietary exposure to acrylamide differs with age and body weight. The main contributors to total dietary acrylamide for different age groups are as follows:</p> <ul style="list-style-type: none"> ▪ Infants – potato and cereal based baby foods and products. ▪ Toddlers, children and adolescents – fried potato products, bread, biscuits, crackers, crisp bread, other products based on cereals. ▪ Adults – potato products, bread, coffee, porridge, breakfast cereals, cakes and pastries, biscuits, crackers and crisp bread. <p>The data for cancer and reproductive system effects of acrylamide in humans are not conclusive.</p>
<p>Food allergens (e.g. nuts, milk, shellfish)</p>	<p>A food allergy is when the immune system responds to a particular food and causes an allergic reaction. Almost any food can trigger an allergic reaction in a susceptible individual, but some foods are more common than others. In the UK, allergy to peanuts, tree nuts (such as almond, walnut and hazelnut), wheat, cows' milk, fish and egg are the most common. The difference in prevalence between children and adults is largely due to children having higher rates of allergy to milk and egg, which commonly resolve in later childhood. Allergy to a wider range of foods, including fruits and vegetables, are often reported in adults.</p> <p>The severity of reaction is acute; it can be severe and life threatening. Common symptoms of a food allergy are swelling and tingling of lips, nausea, vomiting, diarrhoea, skin rashes, shortness of breath, anaphylaxis, runny nose, and red, itchy eyes. On average, 2 children per school class will have a food allergy and 10 people die each year in England and Wales from food allergy.</p>
<p>Coeliac disease</p>	<p>In autoimmune conditions the immune system mistakenly attacks and causes damage to the body. Coeliac disease is a type of autoimmune condition in which the body reacts to gluten in food and causes damage to the gut. This affects the gut's ability to absorb nutrients from food. Gluten is found in cereals such as wheat, rye, barley and oats. It's not known why people develop coeliac disease. It also isn't clear why some have mild symptoms while others have severe symptoms. However, factors such as family history, environmental factors (e.g. a digestive system infection in early childhood), and other health conditions (e.g. type 1 diabetes) are known to increase your risk of developing coeliac disease.</p> <p>Symptoms of coeliac disease can range from mild to severe, and often come and go. Diarrhoea is the most common symptom of coeliac disease. There are also other gut-related symptoms such as vomiting, indigestion, constipation, etc. More general symptoms may include fatigue, unexpected weight loss, an itchy rash, difficulty getting pregnant, etc.</p>
<p>TSE, variant CJD (e.g. Mad cow disease)</p>	<p>Variant Creutzfeldt-Jakob Disease (vCJD) was mainly acquired by eating Bovine Spongiform Encephalopathy (BSE) contaminated beef products in the 1980s and 1990s. Three secondary cases (all in the UK) were transmitted by blood transfusion from infected donors. The risk to the general public is extremely low. Since 1989, strict measures have been in place to protect the public from any risk from</p>

	<p>British beef and other possible routes of infection, such as the blood supply.</p> <p>There have been 178 diagnoses of vCJD in the UK since 1995, with only two new diagnoses in the last five years. It has always been anticipated on the basis of a wide body of published scientific work that following the BSE epidemic further cases of vCJD could arise from time to time. Active surveillance is ongoing to identify new cases of vCJD in the population.</p>
Pesticides	<p>Pesticides (or plant protection products) are used on crops to prevent damage and harvest loss due to a variety of causes, but mainly by insects, fungi and other competing plants. Crops produced by conventional farming are exposed to a range of pesticides and residues remain in and on the crops and products made from them when eaten by consumers. Washing and peeling fruit and vegetables may reduce the amounts of pesticides taken in when they are eaten. Organic farming uses a restricted list of pesticides.</p> <p>Products that exceed the amount of a pesticide that is allowed by law to remain in edible plant commodities are not allowed to enter the market. However, testing is usually carried out on a proportion of a consignment and some may enter the market before results are known. The product that has entered the marketplace is then subject to assessment of the risk it poses to the consumer. The risk from consuming pesticides in food derives from the chemical nature of the pesticide and whether or not its action on the target pest may also affect human beings.</p>