

**Consumer Engagement research:
E-coli and vegetables**

TNS-BMRB Report FINAL

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Executive Summary

Background and approach

Recent outbreaks of E-coli (such as the outbreak in Germany in May 2011 which effected 3500 and caused 49 deaths) have indicated that E-coli may be becoming more virulent and highlighted the need for more work to educate consumers about food safety when handling vegetables. FSA commissioned this research to determine current behaviour, perception of risk and what messages are needed to encourage safer handling of vegetables.

There were two stages of research. Four in-home interviews in London, Birmingham and Wakefield used video ethnography to capture current behaviour and develop stimulus material for the second wave. This was followed by four focus groups (36 participants) that explored attitudes to risk, beliefs about safe food handling and effective triggers of change. Within this report, the term consumer refers to those participants who took part in this study.

Attitudes to risk and vegetables

Fruit and vegetables were seen as low risk and associated with healthy eating, while bacteria/food poisoning was more commonly associated with raw meat. Importantly, food safety considerations were not top-of-mind when handling vegetables.

Germs, dirt, contamination and chemicals were all raised as potential risks. However the nature of the risk was not clearly understood. E-coli was mentioned spontaneously, although the overall threat was perceived to be minimal and knowledge about how this occurred and how the risk could be minimised was limited.

Perception of risk was influenced by a range of factors, including:

- 1) Condition and appearance:** Dirt, decay and handling by other people were associated with risk, clean vegetables dis-incentivised food hygiene practices.
- 2) Source:** There was a perception that supermarkets employed stringent food quality checks to safeguard their reputation, although concerns were raised about the chemicals used.
- 3) Preparation:** Participants believed that cooking reduced and even removed risk, although eating vegetables raw was still seen as good for you.

Food hygiene practices

Consumers practiced a range of good behaviours, such as washing their hands, washing fruit and vegetables and keeping their kitchen clean. However, these were not applied consistently or by all participants. The range of behaviours adopted differed between types of participants involved. Afro-Caribbean participants were more likely to wash all vegetables, due to knowledge gained through growing vegetables. Parents took more care over the foods they would give to young children. Those living in shared houses had greater difficulty keeping areas clean and separating foods.

Food hygiene practices were generally habitual and engrained from childhood and what is clear is that the ability to make the link between the habitual practices and food hygiene (that is, understanding the reasons underlying practices), impacted on how likely consumers were to undertake these in a consistent way. The link between food hygiene and practices such as washing hands; washing vegetables; storing meat and vegetables separately; and using clean surfaces and utensils was generally recognised. However, the link between food hygiene and other practices was less clear, including cutting away bruises; ensuring food was piping hot and drying produce with a clean cloth.

It was noted that media coverage of outbreaks of food borne illnesses could reinforce good practice. However, in the absence of practical advice, consumers' response was generally to stop buying or eating certain foods rather than adopting other preventative behaviours.

Consumers were not conscious of the risk of cross contamination from vegetables to other foods. They were primarily concerned with preventing meat from contaminating vegetables and ensuring that dirt, germs and chemicals were not ingested.

Barriers to change and effective messaging

A range of barriers to change were noted, including:

- Lack of knowledge - a lack of knowledge meant consumers did not fully understand the risks associated with vegetables or how food hygiene practices worked.
- Efficacy - consumers questioned how effective food hygiene practices were and whether they were achievable and practical.

- Social norms - there was some resistance to deviate from the norm and consumers were reluctant to adopt practices that appeared overly-cautious.
- Balancing loss against risk – consumers balanced the perceived risk against a number of losses (inconvenience and reducing the enjoyment of food) and generally concluded that change was not worthwhile given the perceived low risk.

The key message for participants was simply that there was a risk of food poisoning from vegetables. Specific messages which they considered effective were:

- 1) Washing and scrubbing vegetables reduces bacteria as well as dirt and chemicals.
- 2) Bacteria carried on a range of vegetables could contaminate other foods.
- 3) Cooking vegetables killed bacteria and was perceived to be a potent defence.

Consumers might reject change altogether if they feel that the behaviours suggested are overly burdensome or lacking in common sense. Therefore messages should be simple, framed to reinforce existing behaviours, - such as washing, cooking and maintaining good storage practices - and avoid contradicting existing beliefs.

Conclusions

- The perceived risk of food poisoning from vegetables was low and did not incentivise behaviour change.
- There was limited awareness that cross-contamination from vegetables to other foods was a food safety risk. Risk was generally associated with raw meat.
- Behaviour was learnt at a young age from parents and was reinforced through education/ training and media coverage of food hygiene issues.
- Pre-packaged vegetables looked 'clean' and were therefore seen as low risk. Dirt and soil on food heightened the perceived risk and acted as a visual cue prompting people to wash vegetables properly.
- The use of chemicals on foods, handling by other people, soil and insects were all raised as potential food safety risks. There was some awareness of bacteria on vegetables; however this was conflated with other food safety risks.
- Although, on reflection, consumers recognised specific food safety risks, concerns about food poisoning and bacteria was not top-of-mind when handling vegetables.

- Raising awareness of the risk of bacteria in soil would reinforce existing practices without causing undue concern or creating new anxieties relating to food. Consumers were habitually more cautious when handling meat, which was considered high risk. This research suggests that there is scope to create a similar effect with vegetables.
- Consumers need more information about the risks of handling vegetables, in particular highlighting that bacteria on the skin can cause cross-contamination in people's homes. This coupled with a clear explanation of how food hygiene practices combat these risks will help to address existing knowledge gaps.
- Existing behaviours could be reinforced by simply making the reasons behind these practices clear to consumers. Reinforcing existing habitual behaviours by leveraging 'common-sense' attitudes about food safety may be effective.
- Consumers are likely to dismiss change where this was deemed too onerous or impractical. Therefore, broadening the scope of familiar behaviours may be more acceptable.
- Empowering consumers, so they feel able to protect themselves, may be necessary to counterbalance doubts about the effectiveness of food hygiene practices.

1. Introduction

Background

1. The increasing incidence of E-coli poisoning over the past few years has highlighted an apparent gap in consumer knowledge and emphasised the need for the public to demonstrate good food hygiene practices when preparing vegetables.
2. The recent outbreak in Germany (during which 3500 cases were reported and 49 people died) indicated that E-coli may be becoming more virulent and outbreaks are more serious.
3. Based on this there is a growing need for work to be carried out to inform consumers about the cross-contamination risks associated with vegetables and fruit. This work aims to complement existing studies conducted by the FSA with consumers in relation to good food hygiene, which so far has focused on cross-contamination in relation to un-cooked meat and the risks of bacteria spreading.
4. The FSA commissioned TNS-BMRB to undertake research to establish consumer behaviour and attitudes towards food safety when preparing vegetables.

Research Aims

5. The research aimed to explore:
 - Consumers' understanding of food hygiene and existing behaviours when handling vegetables;
 - Perceptions of risk in relation to the safety of vegetables and contamination by E-coli and other bacteria;
 - Awareness and attitudes to safe food handling practices;
 - Triggers and barriers to changing existing behaviours;
 - Effective messaging to promote food safety practices when handling vegetables.

Approach

6. Qualitative research was undertaken with a mix of consumers across the UK. The research comprised of two stages: **in-depth interviews** and ethnographic filming with consumers to explore behaviour in the home and to understand how perceptions of risk impacted on practice/habits; and **focus groups** with consumers (drawing on outputs from the in-depth interviews) to explore attitudes to risk, beliefs about safe food handling and effective triggers of change.

7. **Stage 1:** A total of four in-home depth interviews and ethnography sessions were conducted (August 2011) in London, Birmingham and Wakefield. Participants were filmed preparing a meal for approximately 60 minutes and this was followed up with an in-depth interview lasting between 45 and 60 minutes. Following this initial stage a video was developed from the ethnographic filming and used as stimulus for stage 2. A breakdown of the sample is below:

Table 1: Depth interviews

Gender	Type of meal	Ethnicity	Age	SEG
Male	Meat/vegetables	White British	27	ABC1
Female	Meat/vegetables	White British	36	ABC1
Female	Meat/vegetables	Black or Black British - Caribbean	50	C2DE
Female	Vegetarian	Mixed Race – White and Black Caribbean	49	C2DE

8. **Stage 2:** A total of four focus groups were conducted with consumers (August 2011) in London, Birmingham, Leicester and Leeds. Each group was recruited to include consumers with a mix of demographic characteristics, including gender, social grade, ethnicity and age. The groups lasted for 90 minutes and comprised a mix of in depth discussion, debate and research activities. A breakdown of the sample for these groups is below:

Table 2: Focus groups*

Group no.	Location	No. of participants
Group 1	London	8
Group 2	Birmingham	9
Group 3	Leicester	10
Group 4	Leeds	9

* These groups included a mix of demographics according to Gender, Age, SEG and Ethnicity

2. Attitudes to risk and vegetables

- The risk of food poisoning from fruit and vegetables was judged to be very low when compared to meat and eggs. Awareness of the potential for vegetables to carry harmful bacteria was minimal.
- In contrast vegetables were considered natural and 'good for you'.
- E-coli was mentioned spontaneously in all groups, but there was evidence of more in-depth knowledge across participants in London.
- The effect of the E-coli outbreak on behaviour was limited because participants were unaware of actions they could take to protect themselves. When probed, the overall threat posed by E-coli was perceived to be low.
- When probed on food safety risks a range of considerations were found to affect views including: condition; form and appearance of vegetables; the source of the vegetable; and preparation methods.
- Dirtiness, decay, the use of chemicals, mass-production and handling by other people were all associated with risk. However, food hygiene concerns were not top-of-mind when handling vegetables.

9. The risk of food poisoning from fruit and vegetables was judged to be very low by participants when compared to meat and eggs. When asked to rank the perceived risk on a scale from zero to ten (with 10 being the highest level of risk), it was typically ranked at between zero and four out of ten. Reasons given for perceptions of low risk are outlined below:

- **Limited experience of food poisoning from vegetables** – consumers did not generally make a link between food poisoning and vegetables. Food poisoning from vegetables was not something consumers thought they had experienced and it was commonplace for people to eat vegetables without worrying about food hygiene and/or become ill.

“People all over the world eat veg straight out of the ground and everything’s been on it, animals doing whatever they do...I don’t see any risk with vegetables at all.” (Birmingham, Female)

- **Vegetables associated with good health** – previous messaging in relation to vegetables was said to have focused on the health-benefits

of vegetables and consequently vegetables were very closely associated with being healthy. As a result of this, the link between food poisoning and vegetables was seen as counter-intuitive.

"We've always been told that you don't cook your vegetables because you get rid of all the vitamins, and now we're being told you have to cook them properly." (Leeds, Female)

- **Previous messaging on the issue of food safety** - education on food hygiene was noted as traditionally having focused on the risks associated with preparing meat, with consumers highlighting previous advertising campaigns, such as FSA's ads on food hygiene at Christmas and at BBQs. Consumers were simply not aware of similar messaging in relation to vegetables.

"I just think the government needs to tell us about this, commercials such as the sausages, they had a big one about salmonella and eggs, at Christmas, the turkey." (London, Female)

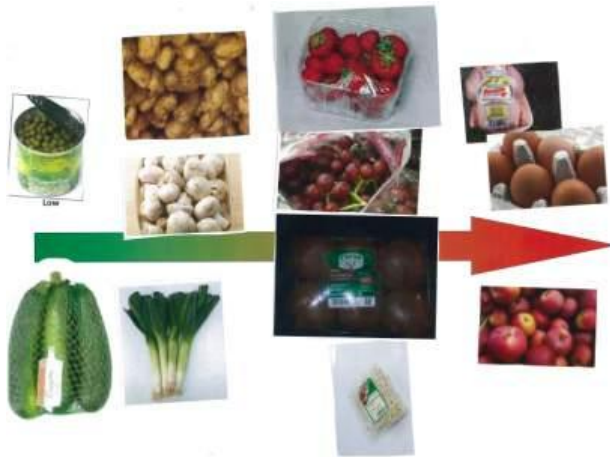
"You're probably meant to have a drawer full of all separate vegetables, but because it's not highlighted like it is with meat, you just don't do it." (London, Male, In-home observation)

10. It is important to note that food safety considerations were never overtly mentioned as a driver of purchase behaviours. Instead, decision-making was informed by a number of factors including price, quality, choice, convenience and quantity.

11. When assessing the level of risk of different food types, meat and eggs were consistently judged to be high risk whilst fruit and vegetables were low. During the focus groups, participants were divided into pairs and mini-groups and asked to position a range of produce from low to high risk. Examples from these exercises are included below and in the appendix.

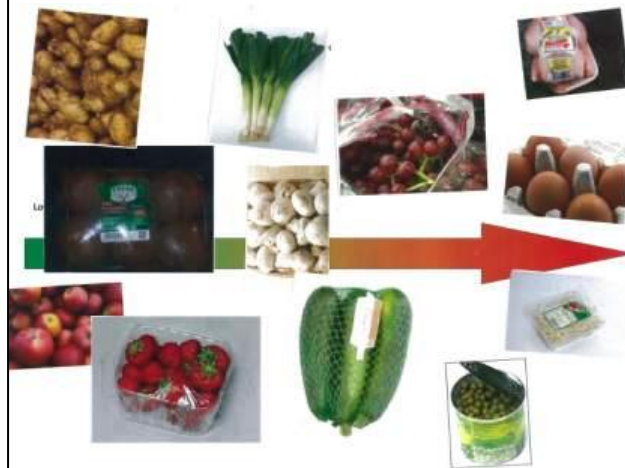


12. Condition and packaging influenced views about risk and led to variation between groups as illustrated below:



Packaging was associated with risk as it caused fruit and vegetables to sweat and decay. Loose apples were also identified as high risk as they could easily become contaminated.

Fruit and vegetables which took more time to decay (potatoes and apples) were considered lower risk and sealed packaging was thought to be safer. In the example to the right, bean sprouts were positioned as high risk because participants' were aware of the e-coli outbreak. Whilst tinned food was considered low risk, leaving vegetables in an open can was considered unsafe.



Awareness and understanding of bacteria and vegetables

13. Awareness of the potential for vegetables to carry harmful bacteria was minimal. In contrast, the health risks associated with meat and eggs were clearly understood by participants: *'you can get salmonella from both of those'* (Leeds, Male). There was less clarity about the types of harmful matter that might be found on vegetables and while participants were aware that vegetables could be unclean through germs, dirt, contamination or chemicals, the nature of the threat was not clearly understood. Chemicals were of particular concern to consumers, with both pesticides used during the farming process and chemicals used to clean vegetables mentioned by participants. By contrast, participants believed that bacteria could be killed off by cooking.

"I'm washing it to remove any excess, anything on it...dirt and stuff...people picking it up and touching it as they walk around the supermarket...germs and stuff" (London, Male, In-home observation)

"I always wash because you just don't know. ...it's just an unknown."
(Leicester, Female)

"I'd only be concerned about the pesticides, or the chemicals they put on them to make them grow bigger." (Leicester, Female)

Awareness of E-coli

14. Participants did mention E-coli spontaneously in a few instances. This was mainly in evidence in London but it was flagged up by a couple of individuals in the other groups. Participants in the London focus group also had a more detailed knowledge of where E-coli contamination could occur: *"It's the water that they use. I think that's where E-coli comes from"* (London, Male).

15. The impact on behaviour was generally very limited because participants had very little understanding of how they could minimise the risk. In response to the E-coli outbreak, participants were more hesitant when buying vegetables avoiding buying cucumbers, checking the country of origin and buying UK produce where possible and washing vegetables carefully.

'Once I found out about E-coli, I stopped buying cucumber from a market stall' (London, Female)

"I wouldn't eat any fruit or veg without washing it...because it's got pesticides on and you can get E.coli from unwashed fruit and vegetables."
(Leeds, Female)

16. When probed, the overall threat posed by E-coli was perceived to be low. It was associated with food poisoning, and identified as harmful bacteria. However, knowledge of what foods could be affected and where contamination could occur was generally inconsistent and unclear:

"I would have assumed it was a bacteria but I don't know much more about it." (Leeds, Male)

“It might be found in all foods. Can you get it in lettuce and things like that?”
(Birmingham, Male)

17. Many respondents took the attitude that this outbreak was a one-off and because of its occurrence in foreign produce, saw it as a very distant threat. Thus it seemed to be the case that the outbreak was quickly judged to not pose any immediate risk and was put to the back of the mind.

Factors influencing perceptions of risk

18. When probed on food safety risks a range of considerations were found to affect views including: **condition, form and appearance of vegetables; the source of the vegetable; and preparation methods.** Throughout the discussions, participants admitted to not being very risk conscious in regard to vegetables, and any risk they might pose was not considered to be very severe. The factors which affected their view of risk must be read in the context of there being a very low level of concern regarding vegetables. The factors that influenced their views are outlined below.

Condition, form and appearance

19. Dirtiness and decay was associated with risk. Checking for visible signs of dirt and contamination was perceived to be precaution against any risk and participants were less inclined to wash vegetables that did not look dirty.

“With vegetables you can see whether they are edible to eat or not, with meat you can’t.” (Leeds, Female)

“If it looks clean, and it’s going to sit in the oven for a while, I wouldn’t worry about it” (Leicester, Female)

20. In the case of consumers who preferred to buy organic or local produce, dirt was often associated with naturalness, fewer processes and fewer chemicals. This view was particularly prevalent in the Leicester group but also as a minority view in other groups. It is important to note that ideas of quality and freshness were often confused with issues of food safety, with more organic or home grown food being seen as safer.

"I see soil and mud, I know this sounds weird but, as organic and healthy. It's come from the earth." (Leicester, Male)

21. Views in relation to risks associated with pre-washed, pre-packaged or loose vegetables were mixed and food safety risks were raised for all types of packaging. Participants tending to see their preferred choice of packaging as safer and highlighting risks associated with others. It should be noted however, that food safety risks were not top-of-mind for participants when making choices about form or packaging.

- Pre-washed vegetables were treated as low risk and many took the assurances that it had been washed at face value. Participants suggested that food outlets would not risk their reputation by serving food that looked clean but was not safe to eat. However, participants also expressed concerns about the chemicals used during the washing process.
- Packaged vegetables appeared clean and therefore participants did not always think these had to be washed. However, the lack of air caused vegetables to sweat and decay more quickly which was thought to pose a food safety risk.

"Strawberries, bean sprouts – even though they are fresh, they're still packaged in plastic so they're sweating and the moisture collection can lead them to rot...then you've got fungus kicking in..."
(Birmingham, Male)

- Loose vegetables were viewed as higher risk because the public or market vendors were likely to spread bacteria by handling different vegetables. This was considered a particular issue for foods bought at a market, although loose supermarket vegetables were also of concern.

"If you buy vegetables from the market then the guy one minute has got his hands in carrots and then one minute has got his hands in tomatoes, it's passing everything around" (Leeds, Male)

22. What this tells us is that the appearance of vegetables impacts on consumer perceptions of risk and the food hygiene practices they adopt. Specifically this means that cleanliness might reduce the perceived need to wash packaged foods, thereby dis-incentivising good food hygiene practices and buying dirty vegetables may promote better behaviour as consumers are more likely to ensure these are washed properly themselves.

“It’s just subconscious isn’t it, you think because it’s in a packet it must be clean.” (Leicester, Male)

“In a weird way it’s good that you wash your own vegetables rather than having them pre-washed for you, when it’s been washed with bug spray and all sorts.” (Birmingham, Male)

23. Certain types of vegetable were viewed as more risky than others and this was dependent on whether they associated with a dirty appearance. For instance a dirty root vegetable would tend to be given a more thorough scrub than a clean-looking tomato. Similarly, a leek composed of layers where dirt could get lodged would typically be washed more conscientiously:

“If it’s been well in the ground then yes, you want to give it a good scrub to get all the soil off.” (Birmingham, Male)

“If it was a leek or something then I would take time to wash underneath the layers, but if it was a carrot I would just rinse it.” (Leeds, Female)

24. Risk was seen to be increased if vegetables or fruits were soft. Soft fruits, participants claimed, were likely to decay quicker and thus they required more care when packing, storing and preparing them. It was mentioned in the London group that if one fruit in a box goes bad then the whole lot should be discarded because all would have been contaminated.

Source

25. Big brand name supermarkets were thought to have a reputation to maintain and it was felt they might be subject to more stringent food quality checks. The high turnover of produce in supermarkets was reassuring to some participants, who felt that the vegetables were likely to be fresher.

“You know it’s quite fresh because the turnover’s quite quick.”

(Birmingham, Female)

Yet other participants were of the view that the pressure of supplying consumers en masse meant that supermarkets were likely to rely on intensive farming practices which entail a greater use of pesticides and chemicals, which was associated with greater risk:

“...they mass produce to keep supplying the big supermarket chains and you don’t know what kind of pesticides or if they’re fast growing them.”

(Birmingham, Male)

26. There was evidence of quite polarised attitudes towards markets. They were associated with fresher, better quality produce by some participants. However, there was also some concern that food hygiene standards may not be as high as larger supermarket and participants were also concerned that because the turnover of market produce is slow, market keepers would be more likely to display less fresh fruit and vegetables. On balance, people were more likely to exercise extra caution when preparing vegetables from the market, such as consuming it more quickly after purchase and washing it better:

“If I buy food from the market I would definitely wash it but if it comes from the supermarket most of the time I’ll wash it because it doesn’t have that dirty look.” (London, Male, In-home observation)

27. Participants appeared to shop at greengrocers less frequently on the grounds that the supermarket is much more convenient, but the attitudes expressed towards them were very similar to those displayed towards markets. Similar doubts were voiced over slow turnover leading to less fresh produce while certain participants perceived that the fruit and vegetables were likely to be locally-sourced and more natural.

Preparation method

28. In regard to the risk levels associated with the preparing food, the main distinction made was between the preparation of raw food or cooked food.

There was seen to be very little difference in risk according to the style of cooking - whether it was going to be boiled as opposed to roasted for instance. It was suggested on a number of occasions that cooking reduced and even removed risk, often to the extent that other preventative measures were seen to be unnecessary.

"I only wash fruit because you're going to cook everything else"

(Birmingham, Male).

29. However, it was mentioned that there was an enjoyment and ease to be found in consuming raw food like a snack without paying too much attention to hygiene, suggesting a more relaxed attitude to risk as well as a desire to preserve the goodness of raw food:

"To me, the great thing about fruit and vegetables is that you can just pick it up and eat it."

(Leicester, Male)

3. Food hygiene practices

- Consumers practiced a range of good behaviours, such as washing their hands, washing fruit and vegetables and keeping their kitchen clean. However, these were not applied consistently or by all participants.
- Good food hygiene practices were often habitual and engrained from childhood.
- What is clear is that the ability to make the link between the habitual practices and food hygiene, impacted on how likely consumers were to undertake these in a consistent way.
 - Participants recognised the link between food hygiene and washing hands; washing vegetables; storing meat and vegetables separately; and using clean surfaces and utensils.
 - The link between food hygiene and practices such as cutting away bruises; ensuring food was piping hot and drying produce with a clean cloth was less clear.
- Consumers were not conscious of the risk of cross contamination from vegetables to other foods. They were primarily concerned with preventing meat from contaminating vegetables and ensuring that dirt, germs and chemicals were not ingested.

30. Although risk was perceived to be low, participants claimed that they regularly practiced a range of behaviours which they considered to be good practice, such as washing their hands, washing fruit and vegetables and keeping their kitchen clean. These were intended to guard against a range of (often poorly understood) food safety risks.

31. These behaviours were often learnt from parents at a young age and engrained through practice. As a consequence, participants did not always have a clear understanding of the purpose of these actions in terms of food safety; instead it was something they had simply always done.

“My mother always said start with a clean surface, always wash your hands, always wash your food.” (London, Female)

32. Participants were more aware of the rationale behind these practices when they had been taught home economics at school or had attended food hygiene courses. Understanding the rationale meant they were often more consistent in their approach.

33. Media coverage of outbreaks of food borne illnesses also reinforced good practice, making participants more careful when handling food. However, in the absence of practical advice, media coverage also discouraged consumers from buying certain foods rather than embedding other preventative behaviours. For example, in the case of E-coli coverage a number of people mentioned stopping buying cucumbers.

‘You kept away from cucumbers to start with, then when the next thing came out you kept away from them, after they found what it was...you just go back to normal again’ (Leeds, Male)

Food safety practices across different groups

34. There appeared to be differences between the types of participants involved, in terms of the level of care taken and the range of behaviours adopted and although this project did not aim to draw out differences between consumer types, a number of differences emerged naturally and these are outlined below:

- Afro-Caribbean participants were more likely to have been brought up to wash all vegetables regardless of whether they looked clean;
- Participants who grew their own vegetables also appeared to either be more knowledgeable of the risks associate with root vegetables or more concerned about the chemicals involved in commercial farming and where therefore more likely to wash all vegetables regardless of where they were bought or if they looked clean;
- Parents took more care over the foods they would give to young children. In a similar manner, participants who worked with children were more cautious and had usually completed food hygiene courses;
- Students/people living in shared houses generally adopted fewer food hygiene practices. This was due in part to practical barriers; it was

more difficult to keep a shared kitchen or fridge clean and hygienic and they did not have the space to separate foods. However, one student also expressed the belief that exposing themselves to bacteria would strengthen their immune system.

Attitudes to recommended food hygiene practices

35. As part of this research we explored reactions to a range of recommended behaviours identified by the Food Standard Agency to reduce the risk posed by bacteria carried on vegetables. (See appendix for the list of recommended behaviours). In many cases, the recommended behaviours were already being practiced, in some instances consumers were aware of the link between these behaviours and food hygiene and in others they were not. What is clear is that the ability to make the link between these habitual practices and food hygiene, impacted on how likely consumers were to undertake these in a consistent way.

Actual behaviour example (Ethnography, Birmingham) – Good practice without understanding the link to food hygiene. One mid-thirties mother of two practised several good food hygiene behaviours: she stored vegetables separately; washed her hands and chopping board between each item; and wiped down her surfaces regularly throughout the day. A range of drivers emerged which were not related to food hygiene including her fridge design (vegetable drawer), her husbands pet hates about mess and not wanting to be seen to have a dirty kitchen.

Practices already associated with food hygiene

36. Participants generally had a good sense of the importance of **washing hands and washing vegetables; separating vegetables from meats; and using clean boards and utensils.** Whilst these activities were generally understood to relate to food hygiene, consumers did not always fully understand the true purpose of their actions and as a result these behaviours were not carried out consistently. These issues are outlined below.

Washing hands

37. Hand washing was considered basic food hygiene and necessary to ensure that germs or dirt did not contaminate the food, particularly after handling meat. Differing degrees of care were taken when washing hands and participants did not always wash their hands with soap and water. During the focus groups, participants expressed the view that hand washing was not necessary after handling vegetables and this was supported by the observational data.

Actual behaviour example (Ethnography, multiple areas) - washing was common practice, but not after vegetables - All participants were observed washing their hands (usually using soap) before preparing food and after handling meat. Hand washing after handling vegetables was necessary to remove peel or dirt.

Washing fruit and vegetables

38. Washing vegetables was the most common practice which participants claimed to perform consistently and there was a perception that rinsing vegetables was sufficient to minimise risk.

39. Although participants were aware that they should wash fruit and vegetables their reasons for doing so were less consistent, with removing soil, chemicals, germs (or specific bacteria), or insects all given as reasons. Removal of bacteria was not at the forefront of participants' minds and one participant questioned the effectiveness of rinsing vegetables in order to remove bacteria.

Actual Behaviour example (Ethnography, London) – Rinsing vegetables

When preparing her meal all items were run under the tap but she wouldn't scrub unless dirt was visible. She also encouraged the children she looked after to eat vegetables straight from the fridge, after rinsing.

"It wouldn't all come off just because you washed it under water...washing something under a cold tap wouldn't wash

"Carrots I've never peeled. Especially working with children, they can't peel, but you want to encourage them to eat carrots and things like that, so just wash them and eat them."

off all the bacteria. The only reason I've started doing that is because of hearing about these sprays anyway.” (Leicester, Male)

40. Scrubbing was employed to remove deeply lodged dirt, rather than as a way to reduce bacteria. Participants scrubbed vegetables where dirt was engrained within rough skin but only if they were not going to peel it or they planned to eat the skin, as in the case of jacket potatoes. Participants were often unclear about how to handle vegetables/fruit where the skin would be discarded, such as bananas or melons, and generally suggested they would not wash this type of fruit or vegetable.

“To me, you're eating the inside. For the same reason I wouldn't wash a banana or an orange...but then again I don't wash apples, and I should.”
(Male, Leicester)

41. The following beliefs were given as **reasons for not washing vegetables**, by participants who did not habitually wash all vegetables:
- Packaged vegetables 'looked clean';
 - Peeling was an acceptable alternative to washing;
 - Cooking vegetables killed bacteria and vegetables were effectively washed when the water was drained away;
 - 'A bit of dirt is good for you' - participants thought it was beneficial to be exposed to and build immunity to types of bacteria.
42. There were also circumstances where there was a need for **extra care when washing vegetables** and these reflected participants views about risk as described in Chapter 2:
- Loose vegetables were higher risk as they were handled by other people;
 - Root vegetables required particular attention as dirt was considered unhygienic and participants were worried about soil or insects remaining on the foods.

Storing vegetables and meat separately

43. Despite knowing the importance of storing foods separately, participants were not certain they adhered to this consistently due to a lack of space in the fridge or a lack of time. Allowing fridges to become messy and

disorganised was a common experience, particularly amongst people living in shared housing who only had one shelf to store their food on, making it impossible to separate fresh meat and vegetables.

"I try to put my raw meat in the bottom of the fridge but saying that I bought some meat today and I actually don't know where I put it" (Leeds, Female)

'I felt very nervous watching that lady's fridge because I know that sometimes my fridge does look like that, I think it's important to keep everything clean inside the fridge' (London, Female)

**Actual behaviour example
(Ethnography, multiple areas) -
Avoiding cross-contamination**

Across the households, participants carefully kept meat and vegetables separate during preparation, either using separate chopping boards or cleaning the board with antibacterial spray after use.

However, fridges were often disorganised, meat was not always stored on the bottom shelf and vegetables were placed anywhere there was room.

Participants said this behaviour was a consequence of their busy lifestyles or other household members.

44. The following **food safety concerns when storing vegetables** affected behaviour:

- **Separating raw meat from other foods** was the primary food safety concern for participants. This was considered important even where meat and vegetables were pre-packed, as air holes allowed juices to mix. Packing meat separately was reinforced by supermarket staff who wrapped meat in a separate bag at the check out.
- **Muddy vegetables were considered unhygienic** and therefore should be stored separately. For example in a separate vegetable rack or in a sack in a dark dry place like a cupboard or garage rather than in the fridge which was considered a clean and hygienic space.
"If it was from a farmer's market and had soil on, I wouldn't put it in the fridge [...] You wouldn't go and put mud from the garden in the fridge"
(Leicester, Female)

- **Decay presented a food safety risk.** Bruising soft fruits increased the likelihood of decay, therefore it was advisable to store and pack these separately from heavy or hard foods. Good ventilation was also thought to reduce the likelihood of decay.

'The onions go in one basket, the potatoes in another...just in case they start going off. I don't mix the vegetables, I always keep them separate' (Leeds, Female)

45. Despite the known risks of cross contamination from meat, consumers were less aware that there was a cross contamination risk from vegetables to other foods. Separating vegetables (even from meat) was not consistent across all participants. There was less concern about separating foods that were all pre-packaged and one female respondent said she would be embarrassed to ask for a separate bag for meat if she were only buying a few items which would easily fit into one bag.
46. Other reasons given for separating foods not directly related to food safety risks were identified, such as not mixing strong flavoured foods together and the design of the fridge itself, which often had a draw at the bottom for the purpose of storing vegetables.
47. When packing shopping to carry home, food safety was not the driving factor in the separation of different foods, except in separating meat. Kitchen layout had an important effect on packing with foods that were stored together being packed in the same bag. Participants were also concerned not to damage fruit and vegetables.
- "All my veg, fruit in one bag, bottle, tins one bag, refrigerated stuff, one bag, I don't know whether its convenience, or its habit or its just a matter of keeping certain food groups together in the same bag"* (Birmingham, Male)

Using clean surfaces and utensils

48. It was deemed safe to use a single chopping board for all foodstuffs other than meat. Separate chopping boards were used to keep meat away from other foods. In other instances, participants said they disinfected their

chopping board between preparing meat and vegetables. Participants said that they may rinse the board after preparing vegetables if dirt or peel was left on the board, although this was not viewed as a food safety risk and was not common practice.

49. Using dirty utensils, which have been used to prepare meat, when preparing vegetables was also known to be a risky behaviour. Consumers claimed to use clean utensils and this was supported by the in home observation. Having separate meat and vegetable knives was less common and was not motivated by food safety alone. The quality of the knife in relation to the task was considered more important. There was a belief that cooking vegetables was sufficient to kill any bacteria, therefore one participant said that he thought it was safe to prepare meat and vegetables on the same board if it was all going to be cooked together.

"When it comes to fresh meat , I'll give the board a quick wipe but I won't sit there and disinfect it cause at the end of the day its going to be going into a frying pan and its going to be going well over 100 degrees which is going to kill any bacteria that's on there" (Birmingham, Male)

Practices not associated with food hygiene

50. Understanding of food hygiene issues was inconsistent in relation to **cutting away bruises; ensuring food was piping hot and drying produce with a clean cloth**. Participants' reasons for doing these activities were less clear, a combination of factors influenced these behaviours and food hygiene was seldom the primary motivation. These issues are discussed below:

Cut away bruises

51. Many people would remove bruises for aesthetic or taste reasons but the connection with food safety was not well known. Bruising was thought to cause rot which was associated with food safety, although not directly with bacteria. One respondent, who had training in food hygiene, was aware of the food safety issues associated with bruising but also recognised that others may not have this knowledge. Taste, aesthetics and ensuring that

vegetables kept fresh for a longer period were more commonly cited as reasons for removing bruises.

"Partly taste and aesthetics, cause some people might not understand what a bruise actually could do which is then spoil everything else so they don't understand that they need to get rid of it"

(Birmingham, Male)

Ensure food is piping hot

52. Cooked vegetables were considered very low risk because participants believed that boiling vegetables was sufficient to kill bacteria, as well as cooking by any method at temperatures above boiling point. Therefore, other food safety measures, such as washing vegetables or separating vegetables from meat were considered less important when vegetables were destined for cooking.

53. Cooking vegetables was not considered necessary as vegetables were safe to eat raw, if washed and stored correctly. 'Cooking properly' also conflicted with the belief that vegetables lost their goodness when cooked for too long.

Drying produce with a clean cloth

54. The drying of produce with a cloth was often rejected as an approach, because it was seen as being impractical; it was felt this could increase the risk of contamination due to issues relating to the cleanliness of the cloth used; and because it was seen simply as being 'over the top' or 'OCD'.

"At this rate you'll have a melon brush and a melon rag, your kitchen will just be full of rags and brushes, it's just not needed" (Birmingham, Male)

4. Barriers of change and effective messaging

- There were opportunities for consumers to adopt new behaviours or apply existing behaviours across the board although a range of barriers to change were noted:
 - A lack of knowledge meant consumers did not fully understand risks or how food hygiene practices worked.
 - Consumers questioned how effective food hygiene practices were and whether they were achievable and practical.
 - There was some resistance to deviate from the norm and consumers were reluctant to adopt practices that appeared overly-cautious or burdensome.
 - Becoming too risk conscious involved unpleasant costs for consumers, both in terms of the added inconvenience and by undermining people's enjoyment of food.
- In order to support behaviour change, it was suggested that:
 - The most important message to communicate is simply that there is a risk of food poisoning from vegetables.
 - Messages should be framed to reinforce existing behaviours such as washing, cooking and maintaining good storage practices.
 - Messages should be simple and focus on highest risk aspects, so to not overload consumers.

55. Although there was evidence that a wide range of food safety behaviours were habitualised, for many participants there were gaps in their knowledge about bacteria and vegetables which meant these were not applied consistently and by all. There was therefore an opportunity for consumers to adopt new behaviours or to apply existing behaviours across the board in order to protect themselves further.

56. A range of barriers to changing behaviour were identified and it was felt these issues would need to be taken into account when promoting food safety practices. These barriers included:

- Gaps in knowledge about bacteria and vegetables;
- Concerns about efficacy;
- Social norms;
- Balancing loss against risk.

These barriers are discussed below:

Gaps in knowledge about bacteria and vegetables

57. Limited awareness of the food safety risk in relation to vegetables reduced the motivation for participants to improve food hygiene when handling vegetables. Put simply, vegetables were simply not perceived as being at risk of contamination, either in themselves or in terms of cross contamination and as a result consumers failed to adopt good hygiene practices as consistently as they might for meat or dairy. The realisation that vegetables carried a risk came as a shock to some consumers.

'I've probably had a realisation that you can be affected by vegetables, I'm one of those who never thought that a vegetable could do a bad thing in its life' (Leeds, Male)

Concerns about efficacy

58. Participants dismissed behaviours which appeared burdensome, particularly scrubbing and drying produce, because they were not able to judge whether they were effective. This was both a consequence of gaps in their knowledge about how bacteria are carried on vegetables and their own sense of powerlessness with regards to preventing bacteria contaminating their foods. Participants envisaged a range of unseen or unknown food hygiene risks during the process from farm to fork, and they questioned whether the measures suggested would be effective in combating these risks. It is clear that consumers need to have faith in and understand recommended behaviours.

"I don't know how you can really change anything [...] when you buy [vegetables] from a shop you don't know if they're contaminated"
(Birmingham, male)

"Would it make any difference if you wash it or not if it's contaminated?"
(Birmingham, Male)

59. Scrubbing and drying produce was considered impractical, when applied consistently to all fruit and vegetables handled and consequently consumers dismissed these actions as unrealistic and unnecessary. Participants did not understand why certain steps were necessary on some foods and not others and therefore there was a sense that these steps were futile unless applied across the board.

"I've never considered scrubbing. And if you scrub your melon, at what point do you stop? Do you scrub apples, each grape?" (Leicester, Female)

Social Norms

60. Social norms were critical to shaping food handling behaviours. Behaviours were most commonly learnt through family members and the belief that they were *"common-sense"* i.e. how most people behaved, justified participants' choice to maintain these habitual behaviours. Behaviour change could therefore be inhibited by the perception that the change deviated from the norm. Participants were concerned about appearing over-cautious, neurotic by adopting behaviours perceived to be abnormal and this was presented as a reason to reject new behaviours. Essentially, the reasons given for practices need to be clearly explained and understood and they need to resonate with consumers, that is they have to reflect a common sense approach where possible.

Balancing loss against risk

61. The risk of contracting a food borne illness was considered low, as described in Chapter 2. This perception prevailed despite being aware of the E-coli outbreak in Germany and understanding the severity of the consequences i.e. E-coli contracted from vegetables could be fatal. Participants down-played the risks by indicating that the likelihood of contracting E-coli from vegetables was minimal.

"I'm not going to stop doing what I'm doing because of one story in the newspaper, that's one in the whole of Britain, I'm not going to stress myself

out over it...it's like I'm not going to give up work tomorrow because I might win the lottery"
(Leeds, Male)

"When you think of [...] the controls they have to wash and treat vegetables before they get onto the shelf, you think, it's a horrendous slip up that happened [...] but in the grand scheme of things it seems miniscule"
(Birmingham, Male)

62. Loss aversion meant that participants were more sensitive to the perceived inconvenience of changing their current behaviours than they were to the risks associated with not doing so. Participants felt that becoming more risk conscious would undermine the image of vegetables as fresh, natural and pure which was part of their appeal. Becoming more anxious about food also reduced the pleasure associated with eating and discouraged people from enjoying food in the way they used to.

"To me, the great thing about fruit and vegetables is that you can just pick it up and eat it. That's one of the best things, this would just sap all the joy out of it"
(Leicester, Male)

"You'd never go to a restaurant and eat if you're worried about all this. I don't worry about things because if it happens it happens, it's a chance you take with anything, what you do on a day to day basis"
(Birmingham, Female)

Effective messaging

63. The focus groups also identified new information or messages which successfully engaged participants, thereby encouraging behaviour change.

64. The key message for participants was simply that there was a risk of food poisoning from vegetables. This knowledge motivated participants to handle vegetables more carefully and consider food safety risks across all food types, not just meat.

"It's just giving you that knowledge and information, this does happen, it can happen, here's what you can do to prevent it" (Birmingham, Male)

65. Participants responded more positively to messages that reinforced existing behaviours such as washing, cooking and maintaining good storage practices. This encouraged participants to apply these more broadly and consistently across different types of vegetables, including pre-packaged vegetables, fruits and salads.

'It would make me think twice about where I put things in the fridge and I would consider cooking my vegetables more thoroughly' (Leeds, Male)

66. When asked what they would do differently in future there were a range of specific messages that encouraged participants to apply food hygiene practices more consistently:

- Washing and scrubbing vegetables helped to reduce bacteria and removed more than just dirt and chemicals. Therefore participants would take more care to wash produce thoroughly rather than rinsing.
- Bacteria were carried on the skins of a range of fruits and vegetables, not just dirty foods. Therefore participants may consider washing the skins of a variety of fruits and vegetables - melons were singled out as an example.
- Cooking vegetables killed bacteria and was perceived to be one of the most potent defences against E-coli. However this could have an adverse effect as some participants questioned the safety of raw vegetables as a result of this discussion.
- Cross contamination from fruit and vegetables and other foods was not a known risk prior to the groups. As a consequence, participants said they would be more careful about where foods were positioned in the fridge.
- Discussion of the E-coli outbreaks caused participants to question whether vegetables that appeared clean were definitely safe to eat. Participants would consider washing pre-packaged fruits and vegetables intended for snacking, where before they had trusted that this would have been done by the producers. It was suggested by one participant that consumers should be more wary of ready meals and food served in restaurants.

67. Caution should be taken to avoid delivering messages that contradict existing beliefs about vegetables. In particular, participants were concerned that

emphasising the risk factor with vegetables would undermine the perception that vegetables were good for you. The messages around cooking were also confusing as the traditional view was that vegetables should be cooked as little as possible.

"We've always been told that you don't cook your vegetables because you get rid of all the vitamins, and now we're being told you have to cook them properly" (Leeds, Female)

68. Keeping messaging simple and perhaps focusing on high risk aspects may be more effective as consumers might reject change altogether if they feel that the behaviours suggested are overly burdensome or lacking in common sense.

"Focus on the highest risk areas. We've got a lot of things to worry about, messages about safety, so we only need to learn about the things that are quite high risk." (Leicester, Male)

69. Media coverage of outbreaks of food borne illnesses reinforced existing behaviours and could be leveraged in the future to promote better awareness and food hygiene practices. Participants complained that news stories were alarming but failed to provide practical guidance for minimising risk. It was also suggested that stories did not follow through – focusing on the story at the outset, but failing to complete the coverage.

'I don't remember anyone saying that beansprouts are OK as long as you cook them...instead of saying there's this and it's killing people, what they should of being saying is this is what you do about it' (Leeds, Female)

5. Conclusions

- The perceived risk of food poisoning from vegetables was low and did not incentivise behaviour change.
- There was limited awareness that cross-contamination from vegetables to other foods was a food safety risk. Food safety concerns when storing and preparing vegetables largely stemmed from the risk of contaminating vegetables with the bacteria living on raw meat.
- Behaviour was learnt at a young age from parents and was reinforced through education/ training and media coverage of food hygiene issues.
- Pre-packaged vegetables looked 'clean' and were therefore seen as low risk. Dirt and soil on food heightened the perceived risk and acted as a visual cue prompting people to wash vegetables properly.
- The use of chemicals on foods, handling by other people, soil and insects were all raised as potential food safety risks. There was some awareness of bacteria on vegetables; however this was conflated with other food safety risks.
- Although, on reflection, consumers recognised specific food safety risks, concerns about food poisoning and bacteria was not top-of-mind when handling vegetables.
- Raising awareness of the risk of bacteria in soil would reinforce existing practices without causing undue concern or creating new anxieties relating to food. Consumers were habitually more cautious when handling meat, which was considered high risk. This research suggests that there is scope to create a similar effect with vegetables. Caution regarding soil and dirt already exists. However, this is not supported by an understanding of the food hygiene rationale.
- Consumers need more information about the risks of handling vegetables, in particular highlighting that bacteria on the skin can cause cross-contamination in people's homes. This coupled with a clear explanation of how food hygiene practices combat these risks will help to address existing knowledge gaps.
- Existing behaviours could be reinforced by simply making the reasons behind these practices clear to consumers. Reinforcing existing habitual behaviours by leveraging 'common-sense' attitudes about food safety may be effective.

- Consumers are likely to dismiss change where this was deemed too onerous or impractical. Therefore, broadening the scope of familiar behaviours may be more acceptable.
- Empowering consumers, so they feel able to protect themselves, may be necessary to counterbalance doubts about the effectiveness of food hygiene practices.