

A typology of food safety activities

Paper 1

Food and You Waves 1-3 secondary analysis

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A typology of food safety activities

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Summary

- Latent class analysis was used to find out if the population could be divided into distinct clusters of people with similar profiles of food safety activities, based on responses to the FSA's Food and You survey. Food and You is a cross-sectional survey of adults in the UK, containing a range of questions around behaviour, attitudes and knowledge relating to food safety and other food-related issues.
- Overall, we identified some distinct groups in the population, although there was also quite a lot of similarity across the groups in terms of patterns of food safety activities. People in the largest cluster (54% of the sample) generally tended to report food safety activities that were in line with FSA recommendations, except for washing raw meat and poultry, and storing raw meat and poultry, for which a majority of people in the cluster reported activities that were not in line with FSA recommendations. This cluster had a very similar demographic profile (e.g. gender, age, ethnicity) to that of the population as a whole.
- People in the second largest cluster (29% of the sample) were the most likely to report a majority of food safety activities in line with recommendations. However, people in this cluster were also the most likely to report washing raw meat and poultry, which is not in line with recommendations. More than half of this cluster was female and a higher proportion than average lived in households which had children aged under 16.
- Those in the third cluster (10% of the sample) generally reported a similar pattern of food safety activities to those in the largest group (Cluster 1), but the cluster was distinct in that all members reported that they never re-heated food. This cluster included a higher than average proportion of people aged 75 years and over, and of white ethnicity.
- People in the fourth cluster (7% of the sample) tended to respond 'not applicable' to questions relating to the handling and cooking of raw meat, poultry and fish, suggesting they were rarely involved in these activities. In other aspects, this cluster was relatively similar to Cluster 1. Around two-thirds of the cluster were male, with a higher than average proportion of people aged 16 to 24 years and of black, Asian or other ethnicity. Over a third (38%) reported being vegan/vegetarian.
- Those in Cluster 5, the smallest cluster (1% of the sample), also tended to be more likely to respond 'not applicable' to questions relating to the handling and cooking of raw meat, poultry and fish. They also reported that they never reheated food, and they were also more likely to respond 'not applicable' to cooking food to steaming hot, suggesting that they were much less likely to be involved in cooking and preparing food in general. Around three-quarters of this cluster were male, with a higher than average proportion of people aged 75 years and over.
- Further analysis was undertaken to investigate the relationship between demographic, socio-economic and other food-related variables, and classification to the different clusters. The first cluster (containing the majority of respondents) and the second cluster (where respondents were most likely to report food safety activities in line with FSA recommendations) were then selected as two contrasting clusters, and regression analysis was undertaken to explore whether any particular factors were significant in classification to either cluster.
- The findings suggest that there is some clustering of food-safety-related activities, but some of the differences between the clusters may primarily reflect different levels of engagement with preparing and cooking food and consumption of different types of food, rather than different patterns in the food safety activities themselves. Further analysis is needed to explore this, as well as whether other food-safety-related activities included in Food and You follow a similar pattern.

Introduction

The Food Standards Agency (FSA or ‘the Agency’) is an independent government department responsible for food safety and hygiene in England, Wales and Northern Ireland.¹ As part of the Agency’s responsibility for protecting public health from risks which may arise in connection with the consumption of food, a key priority is the prevention of foodborne disease. Improving understanding of the population’s food safety activities, in shopping for, storing, preparing, cooking and eating food, is important to the successful delivery of this aim.

This paper, the first in a series based on secondary analysis of Waves 1-3 of the FSA's Food and You survey,² focuses on an exploratory analysis of clustering of domestic food safety activities.

Domestic food safety is an important element in the prevention of foodborne disease, and the Agency seeks to promote certain activities that can help minimise risk to consumers.³

To support this work, the Agency carries out research into the food-safety-related behaviour of the population, which can help inform communications and policy making, and identify effective ways of engaging with certain consumers to provide them with the information they need to make informed decisions – a key theme in the FSA’s Strategy 2015-2020.⁴

A key source of information on consumers is Food and You, the FSA’s biennial, random-probability, cross-sectional survey of adults (16 years and over) living in private households. The survey provides a rich dataset with a wide range of questions around behaviour, attitudes and knowledge relating to food safety and other food-related issues. The Agency has previously commissioned analysis of Food and You data to examine associations between domestic food safety activities and a range of demographic, socio-economic, attitudinal and other food-related variables. This analysis found that age, gender, geographical region, ethnicity and household composition were associated with the likelihood of reported food safety activities being in line with FSA recommendations, although little evidence was found for links between attitudes and activities.⁵ However, findings from further analysis of Food and You data also suggest that there may be

¹ The FSA was previously the body for food safety across the UK. In April 2015, its responsibilities in Scotland were transferred to the new independent Scottish food safety body, Food Standards Scotland (FSS). This research was commissioned prior to this change, and is based on data from Waves 1-3 of the FSA’s Food and You survey, which was undertaken across the UK. For the purposes of this research, analysis and findings therefore relate to aggregate UK-level data.

² The topics of these papers were developed in consultation with leading academics in the fields of food and social science research, as well with reference to the FSA’s own policy-, science- and consumer-engagement-related priorities.

³ See, for example, the FSA’s ‘Kitchen Check’ campaign (2013). <https://www.food.gov.uk/news-updates/campaigns/kitchen-check>

⁴ Food Standards Agency (2015) Food We Can Trust - Food Standards Agency Strategy 2015-2020. <http://www.food.gov.uk/sites/default/files/Strategy%20FINAL.pdf>

⁵ Roberts C., Calcutt E., Hussey D., Howard, M., McManus S. (2014) Understanding domestic food safety practices. http://www.food.gov.uk/sites/default/files/869-1-1612_Understanding_domestic_food_safety_practices_report_FINAL_with_cover_0.pdf

associations between reported food safety and nutrition-related activities that cannot be explained in terms of simple demographic characteristics.⁶

In order to further explore whether there are patterns in food safety behaviour that cannot be explained through demographic characteristics, and whether this can be used to identify any particular 'at risk' groups, the Agency commissioned this research, which uses the technique of cluster analysis. While previous analysis considered the relationship between pairs of variables, this analysis takes a different approach by creating a classification or 'typology' based on multiple food-safety-related variables. Therefore, while demographic, socio-economic and other food-related variables have been the primary focus of previous analyses, these factors are considered here as a secondary aspect, as potential predictors of classification to particular clusters.

⁶ Roberts C., Calcutt E., Draper A., Hussey D., McManus S. (2014) Eating safe and well: Links between nutrition and food safety practices. https://www.food.gov.uk/sites/default/files/888-1-1636_Eating_safe_and_well_report_for_FSA_FINAL_0.pdf

About the analysis

Analysis was conducted to create a classification or 'typology' of reported domestic food safety activities. This was then interpreted through further analysis of demographic and socio-economic variables, and other food-related activities.

This research briefing presents a summary of the analytical techniques that were used to create the typology of activities. Full details for all analyses conducted for this paper are presented in the accompanying Technical Report.

The first stage of the analysis was to explore whether people could be classified into distinct clusters on the basis of their reported domestic food safety activities. This was done by using latent class analysis (LCA), which is a statistical method for identifying subtypes of related cases (or 'latent classes') within multi-variate datasets. This technique can be used to assign individual respondents to discrete, non-overlapping, clusters on the basis of patterns of responses to certain survey questions.

The source of data for the LCA was responses to domestic food safety questions from the Food and You survey. Fourteen variables covering different dimensions of food safety activities were included in the initial analysis, but due to high correlation between a number of variables and the fact that some of the variables did not contribute to discrimination

between clusters, the number of variables was reduced to eight.⁶ The following variables were included in the final analysis:

- How many times respondents would consider re-heating food after it had been cooked for the first time
- How respondents check that food has been re-heated properly
- How often respondents wash their hands after handling raw meat/fish
- How often respondents cook food to steaming hot
- Where and how respondents store raw meat and poultry in the fridge
- How often respondents wash raw meat and poultry
- How often respondents check use-by dates when cooking or preparing food
- How often respondents check use-by dates when shopping

With the exception of checking use-by dates when shopping, all these variables are included as an element or part of an element in the Agency's *Index of Recommended Practice*, a composite measure scored out of 100, based on responses to domestic food safety questions in the Food and You survey, which was used in the previous secondary analysis projects.⁷ This allows participants' responses used in this analysis to be categorised as in line (or not in line) with FSA recommendations.

⁶ A full list of the 14 variables can be found in Appendix A Table A1 of the accompanying Technical Report.

⁷ For the Index of Recommended Practice, the term 'practice' is intended to denote specific activities which are recommended by the FSA with the aim of minimising foodborne risks. It is not used in the academic 'Practice Theory' sense.

The LCA was run using responses to the above variables from 9,056 participants from the Food and You survey. Data was drawn from a combination of Waves 1 to 3 of the survey (conducted in 2010, 2012 and 2014), in order to maximise the sample size for analysis. The first stage of the analysis involved looking at combinations of different numbers of clusters, carrying out statistical tests to determine how well they fit with the data, and considering them in terms of more practical factors, such as the size of the clusters and the logical 'make up' of each cluster. A model with five clusters was selected as the one that best captured how food safety activities group together in the population.

Once distinct clusters were identified based on the eight food safety activities, the second stage of the analysis was to use observed frequencies of demographic and socio-economic characteristics, and other reported food-related activities that were not included in the initial clustering model, in order to produce a descriptive profile for each cluster. For example, this could be used to determine whether membership of a particular cluster was more likely for people of a particular age or gender, or for those with responsibility for the household cooking or shopping.

A CHAID analysis (*chi-squared automatic interaction detection*) was run to identify which of these additional variables were the most differentiating characteristics in classification to different clusters. Finally, multiple logistic regression was run to further analyse whether it was possible to predict classification to either the largest 'typical' cluster, or the cluster that was the most likely to report activities in line with FSA recommendations, using only demographic and socio-economic characteristics, along with other reported food-related activities.

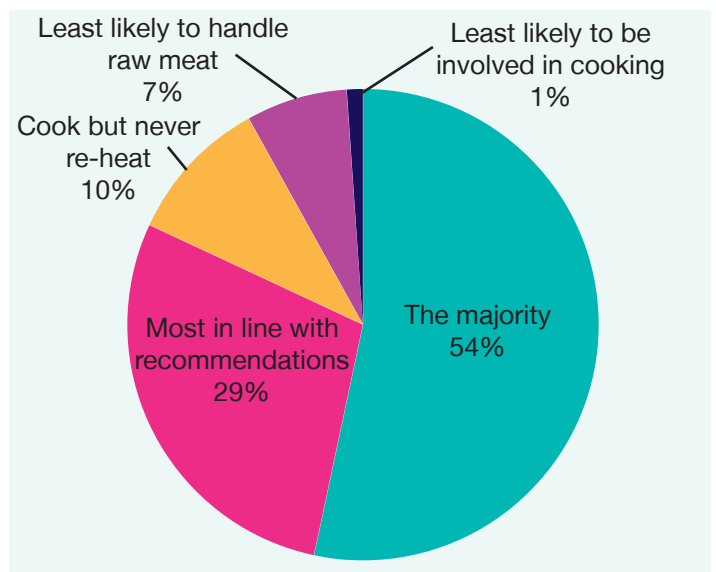
Typology of food-related practices

Respondents were assigned to five different clusters, based on their reported domestic food safety activities.

Figure 1 illustrates the distribution of membership of the five clusters that emerged from the final LCA model. In general, the clusters were not greatly differentiated because the majority of survey respondents reported activities in line with FSA recommendations, so their responses followed similar patterns.⁸ Clusters have been described below firstly in terms of differences and similarities in the extent to which respondents reported engaging in the domestic food safety activities that were included in the LCA model, and secondly in terms of demographic and socio-economic variables, and responses to other food-related questions.⁹ Each cluster has been given a title, based on the key differentiating factor for that cluster. This was done primarily for ease of reference and it should be noted that the titles are inevitably a simplification of the more nuanced profile for each cluster as outlined below.

The majority (54%): This was the largest cluster to emerge from the analysis, to which over half of respondents were classified. In terms of food safety, people in this cluster were likely to report activities that were generally in line with FSA recommendations, although for each of these variables, a significant minority of people reported activities that were not in

Figure 1 Five population groups based on their reported food safety activities¹⁰



line with Agency recommendations. For two variables in the LCA, a majority of people in this cluster reported activities that were not in line with recommendations. These were washing raw meat and poultry, where people were more likely to report doing this sometimes, most or all of the time, which is not in line with recommendations never to do this (see Figure 2), and storing raw meat and poultry, where Agency advice is to store this at the bottom of the fridge, properly wrapped or covered.

The profile of this cluster was generally very similar to the population as a whole in terms of demographic and socio-economic

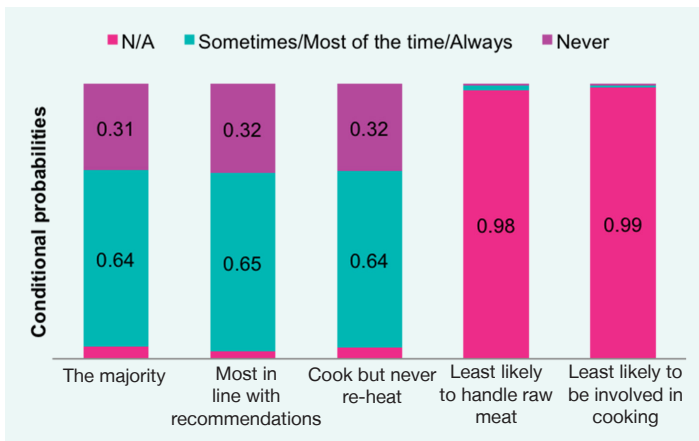
⁸ This is reflected in the limitations of the LCA model's ability to predict the classification of responses into clusters. If the same model was applied to the same eight questions, around 20% of the cases would be classified to different clusters than those they were classified to initially.

⁹ Interpretation of the clusters was based on the conditional probabilities of responses to domestic food safety practice questions used in the final LCA model (presented in Technical Report Appendix Table A2) and complemented with descriptive analysis of observed frequencies of a number of demographic, socio-economic, and other food-related variables (Appendix Table A3), enabling comparison to an average profile for all respondents.

¹⁰ Please note that totals may not sum to exactly 100% due to rounding.

characteristics, as well as other food-related activities such as the frequency of cooking for others and frequency of eating out.

Figure 2 Profile of the five clusters based on how often respondents report washing raw meat and poultry¹¹



Most in line with recommendations (29%):

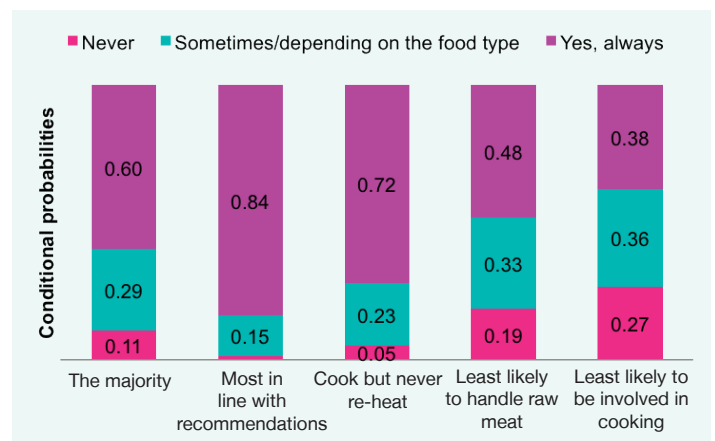
Compared to the other clusters, people in this cluster were the most likely to report food safety activities that were generally in line with Agency recommendations. For example, respondents in this cluster all reported always washing hands after handling raw meat or fish, and they also all reported that they would reheat food only once. Respondents were also the most likely to report checking use-by dates when buying and cooking food (see Figure 3), cooking food to steaming hot, and knowing that food had been reheated properly. Compared to the other clusters, respondents in this cluster were also the most likely to report following recommendations for storing raw meat and poultry in the fridge, although respondents were approximately equally likely to report activities not in line with recommendations for this variable. A key

exception (as with ‘The majority’ cluster) was for washing raw meat and poultry, with most respondents in this cluster reporting that they did this at least sometimes, which is not in line with recommendations (see Figure 2).

More than half of this cluster was female (62%) and a higher proportion than average lived in households which had children aged under 16 (31% compared with 27% of all respondents). The ‘Most in line with recommendations’ cluster was also one of the most likely to report being responsible for all or most of the household shopping, and was the most likely cluster to report cooking for others at least once a day, compared to respondents overall. Thirty-four percent reported that a good hygiene score was important to them when eating out, compared with 28% overall.

Cook but never re-heat (10%): People in this cluster reported a similar pattern of food safety activity to those in ‘The majority’, in that most reported activities were generally in line

Figure 3 Profile of the five clusters based on how often respondents report checking use-by dates when cooking or preparing food¹¹



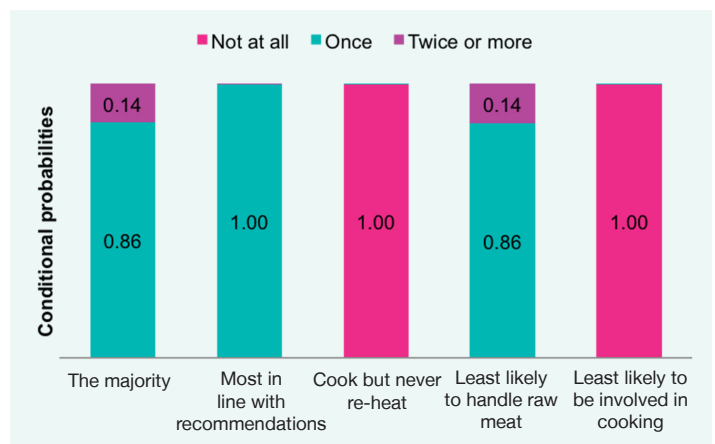
¹¹ Conditional probability indicates the likelihood of people belonging to a particular cluster based on their response.

with recommendations. As with 'The majority', most people did not report activities in line with recommendations for washing raw meat and poultry (see Figure 2), or storing raw meat and poultry in the fridge. The key difference between this cluster and 'The majority' was that all people in this cluster reported that they never re-heated food (see Figure 4). They were also more likely than those in 'The majority' cluster to report always checking use-by dates when buying or cooking food, although not as likely to do this as the 'Most in line with recommendations' cluster (see Figure 3).

This cluster included a higher than average proportion of people aged over 75 years (14% compared with 8% of the sample overall). They were more likely to be of white ethnicity (96% compared to 88%). They were also more likely than average to be retired, live in social housing, not have a degree and earn less than £10,399 per year.

Least likely to handle raw meat (7%): People in this cluster were among the most likely to report 'not applicable' to questions relating to the handling and cooking of raw meat, poultry and fish, suggesting they were rarely involved in these activities (see Figure 2). They were also more likely to report 'not applicable' to the cooking food to steaming hot question, suggesting that they may be less likely to be involved in cooking food generally. Along with 'Least likely to be involved in cooking', respondents in this cluster were the most likely to report never checking use-by dates when buying or cooking food (see Figure 3). In other aspects of the LCA, this cluster was relatively similar to 'The majority' cluster.

Figure 4 Profile of the five clusters based on how many times respondents reported they would consider re-heating food after it had been cooked for the first time



Around two-thirds of 'Least likely to handle raw meat' were male (66%). The cluster also included a higher than average proportion of vegetarians (38% compared with 6% overall), partly explaining the high level of 'not applicable' responses to questions around handling and cooking raw meat and fish. They were also less likely to report cooking for others on a regular basis, and being responsible for the household food shop. A higher than average proportion of 'Least likely to handle raw meat' were aged 16 to 24 years, of black, Asian or other ethnicity, and non-Christian. This cluster was also less likely than average to report ever having had food poisoning.

Least likely to be involved in cooking (1%): This was the smallest cluster. Along with 'Least likely to handle raw meat', people in this cluster were less likely to report checking use-by dates when buying and cooking food (see Figure 3), and more likely to report

‘not applicable’ to questions relating to the handling and cooking of raw meat, poultry and fish (see Figure 2). A key differentiating factor was that, like the ‘Cook but never re-heat’ cluster, ‘Least likely to be involved in cooking’ reported that they never re-heated food (see Figure 4), and they were also the most likely to report ‘not applicable’ to the question about cooking food to steaming hot, suggesting that they were much less likely to be involved in cooking and preparing food at all compared to ‘Least likely to handle raw meat’.

Around three-quarters of this cluster was male (77%), and the cluster included a higher than average proportion of people aged over 75 years (35% compared with 8% overall). A significant proportion reported that they were retired (49% compared to 22% overall). This cluster also included a higher than average proportion of people who were Christian, living alone or in a two-person household, and who had not eaten out in the last seven days. This cluster was also the most likely to report having a disability or long-term illness (40% compared to 17% overall). As the responses to the food safety activities suggest, 68% of ‘Least likely to be involved in cooking’ had little or no responsibility for shopping and they rarely cooked for others. Like ‘Least likely to

handle raw meat’, they were less likely than the sample overall to report ever having had food poisoning.

Index of Recommended Practice: comparison of the five groups

In order to produce a comparative measure across a range of food-safety-related activities, a mean score was calculated for each cluster on the Agency’s *Index of Recommended Practice* (IRP). As introduced in the analysis section of this paper, the IRP is a composite measure developed by the FSA, made up of 10 items based on questions or groups of questions from the Food and You survey, covering five domains of domestic food safety activities: chilling, cooking, cleaning, avoiding cross-contamination and use-by dates. Each item is scored 1 for responses in line with recommendations or 0 for responses not in line with recommendations. The overall score is then converted to a score out of 100.¹² In this way, a continuous variable is created, measuring the extent to which a range of reported domestic food safety activities for a particular respondent are in line, or not in line, with Agency recommendations. A higher IRP therefore indicates that a greater proportion of activities are in line with recommendations.

Table 1. Comparison of mean IRP score across the five clusters

| | The majority | Most in line with recommendations | Cook but never re-heat | Least likely to handle raw meat | Least likely to be involved in cooking | Total |
|----------------|--------------|-----------------------------------|------------------------|---------------------------------|--|-------|
| Cluster Size | 54% | 29% | 10% | 7% | 1% | 9056 |
| Mean IRP score | 61 | 72 | 67 | 60 | 63 | 66 |

¹² ‘Not applicable’ responses are scored as missing so an individual’s IRP score is calculated based only on those items where respondents have given a valid response. Respondents answering less than half (five) of the ten items do not receive an overall score.

Although the IRP is made up a number of measures that were included in the initial LCA model, it also includes a number of other measures that were not included in the model. It therefore provides a wider measure of overall food-safety-related activities, which complements the descriptive profiles provided earlier in this section. As Table 1 shows, a range of mean IRP scores was found across the clusters, which was generally in line with the profiles derived from the output of the LCA model. Respondents in the 'Most in line with recommendations' cluster had the highest average IRP score (72), followed by 'Cook but never re-heat' (67). The clusters with the lowest IRP scores were the 'Least likely to handle raw meat' (60), 'The majority (61) and 'Least likely to be involved in cooking' (63) clusters.

Further analysis of the clusters

Predictors of the classification

The results from the LCA suggest that the applicability of a number of the questions (e.g. those relating to the handling or preparing of meat) is driving some of the classification rather than differences between respondents who are undertaking similar types of food safety activities. Further analysis of a range of demographic, socio-economic and other food-related variables showed that vegetarianism was the variable that was the most significant predictor of cluster membership.¹³ This means that vegetarianism, compared with the other variables, offers the best explanation for the differences between the identified clusters (different patterns of food safety activities). For vegetarians, the next most significant variable was found to be gender, and for non-vegetarians it was age.

What differentiates ‘The majority’ from ‘Most in line with recommendations’?

In order to explore whether there were any particular factors that were related to classification of people to certain clusters that were more, or less likely to report behaving in line with recommendations, it was decided that two contrasting clusters (in terms of reported food safety activities) would be selected and compared through further analysis. Firstly, ‘Most in line with recommendations’ was selected as respondents in this cluster were the most likely to report activities in line with recommendations across a range of variables, which was also reflected in the cluster having the highest average IRP score

(72). As a comparison, both ‘The majority’ and ‘Least likely to handle raw meat’ clusters had the lowest average IRP scores (61 and 60 respectively), but as ‘Least likely to handle raw meat’ was a relatively small cluster, and less likely to be involved in a number of food-safety-related activities, ‘The majority’ cluster was selected. ‘Most in line with recommendations’ and ‘The majority’ were also the two largest clusters, together representing around 83% of respondents. The two clusters were analysed with the aim of gaining insight into the make-up of the cluster that was most likely to behave in line with recommended practice, as compared to people classified to ‘The majority’ cluster, who were significantly more likely to undertake activities which were not in line with recommended practice.

A multiple logistic regression model was run to determine whether particular demographic and socio-economic characteristics could predict belonging to the ‘Most in line with recommendations’ cluster rather than ‘The majority’ cluster. The analysis confirmed that respondents classified to ‘The majority’ and ‘Most in line with recommendations’ have somewhat different demographic and socio-economic profiles as well as differences in the other food-related activities that were not used to derive the clusters.¹⁴ However, the derived model did not have good predictive properties, suggesting that these variables do not fully explain the differences between the groups.¹⁵ Nevertheless, the following variables were found to be significant in predicting the classification to one of the two groups and can

¹³ CHAID analysis using various potential demographic and socio-economic predictors of a classification to five clusters (modal assignment from the LCA model). See Section 3 of Technical Report.

¹⁴ When entered into the model together. See Section 4 of the Technical Report and Appendix B, Tables B1 and B2.

¹⁵ See Technical Report Chapter 4.

help us understand the differences between them:¹⁶

- Gender: women were more likely than men to be in 'Most in line with recommendations' than to be in 'The majority' (1.8 times higher odds).
- Country: people living in Wales or Scotland were more likely than people living in England to be in 'Most in line with recommendations' than to be in 'The majority' (1.5 times higher odds if living in Wales, 1.4 times higher odds if living in Scotland).
- Age: from the age of mid-twenties onward, the general trend was that the older the respondent, the lower the odds of being in 'Most in line with recommendations'. Compared to those aged 16-24 years, respondents aged 25-34 years had 1.5 times higher odds of being in 'Most in line with recommendations', while those aged 85 years and over had 50% smaller odds
- Ethnicity: black, Asian and other minority respondents were less likely to be in 'Most in line with recommendations' (20% smaller odds).
- Marital status: respondents who were not married or not living as married were less likely to be in 'Most in line with recommendations' (20% smaller odds).
- Vegetarianism: respondents who reported being completely/partly vegetarian or vegan were less likely to be in 'Most in line with recommendations' (40% smaller odds).
- Children in household: people living in households which had at least one child under 16 years were more likely to be in 'Most in line with recommendations' (1.2 times higher odds).
- Religion: those who declared their religion as non-Christian (rather than no religion) were less likely to be in 'Most in line with recommendations' than those who declared their religion as Christian (30% smaller odds).
- Working status: those who reported their work status as 'other' were less likely to be in 'Most in line with recommendations' than those in work (30% smaller odds).
- Household size: the general trend was that the more people that were living in a household, the lower the odds were of being in the 'Most in line with recommendations' cluster. Those living in the largest households (five or more persons) had 40% smaller odds of being in 'Most in line with recommendations' than those living alone.
- Education level: participants with GCSE or A-levels (or equivalent) were more likely to be in 'Most in line with recommendations' than those with degree or higher (1.2 and 1.4 times higher odds respectively).

¹⁶ See Technical Report Appendix B, Table B3.

¹⁷ Working status 'other' includes those in full-time education, looking after home or family,

In terms of other food-related activities, eating out was found to be associated with lower odds of being in 'Most in line with recommendations' than being in 'The majority', as was cooking for others less than once day. Reporting that a hygiene rating score was important when deciding where to eat out was associated with higher odds of being in 'Most in line with recommendations' (1.5 times higher odds).

Other domestic food safety activities not included in the original LCA were also included in the regression model, and it was found that activities in line with recommendations around checking the fridge temperature, eating chicken or turkey if the meat was still pink or had pink/red juices, and eating leftovers were all associated with higher odds of being classified to the 'Most in line with recommendations' cluster. The regression therefore provides further evidence that overall, respondents in the second cluster were the most likely to behave in line with recommended practice, as was suggested by the LCA model and the highest average IRP score.

Next steps

The purpose of this exploratory analysis was to determine whether patterns could be identified in particular activities which were related to food safety, that could not be predicted by conventional analysis based on the demographic and socio-economic characteristics of respondents. This could then be used to determine whether there were groups that were particularly 'at risk' due to their patterns of activity.

Overall, the findings of this analysis suggest that there is some patterning of activities, but only to a limited extent. While five distinct clusters based on reported food safety activities were identified, the clusters only differed from each other in fairly subtle ways due to the majority of survey respondents reporting activities that were generally in line with FSA recommendations. Activities around preparing and cooking meat and re-heating food showed the most variation in responses across the clusters, although much of this variation may have been due to whether respondents were involved in these activities at all, rather than whether or not they were behaving in line with Agency recommendations. This may limit the use of this analysis for the identification and practical targeting of particular 'at risk' groups.

Differences between some of the clusters may therefore primarily reflect differing degrees and types of engagement in shopping for, preparing and cooking food, and consumption of different types of food such as raw meat, rather than different patterns in comparable food safety activities. This is supported by the most significant predictor of classification being found to be vegetarianism. This could potentially be overcome by replicating the LCA

with only those respondents who undertake comparable food-safety-related activities in relation to preparing/cooking meat and preparing food more generally (i.e. excluding those who responded N/A to these types of questions). Removing these factors, which currently act as key differentiators between some clusters, would enable us investigate potential patterning in relation to food safety activities across people who potentially have similar levels of exposure or engagement.

The regression analysis showed that demographic and socio-economic variables alone could not accurately distinguish between the cluster most in line with recommended practice (with the highest average IRP score) and 'The majority' cluster (with the lower average IRP score). However, analysis of the clusters did suggest that adherence to food safety practices may relate to the life course. For example, there was a general trend that, from their mid-twenties onward, the older respondents were, the less likely they were to belong to the 'Most in line with recommendations' cluster. As the Food and You survey is cross-sectional, it is difficult to confirm whether increasing exposure to risky food safety activities is related to ageing, or if it reflects inter-generational differences. However, this could be re-examined as further waves of the survey accumulate, and a longitudinal design could also explore whether there are 'critical points' in the life course that lead to changes in food-related activity. Identification of these could provide an entry point for targeted interventions.

This type of analysis was also constrained by the relatively limited number of activities that could be included in the model. We initially selected fourteen variables covering different dimensions of food safety activities, and further analysis would be needed to explore whether other food-safety-related activities included in Food and You may be part of this patterning. Future waves of the survey may include new questions on other food-related activities which will enable us to examine the ways in which these and perhaps other activities may be naturally clustered and what may be influencing these in terms of social context and motivations.

There would be value in employing qualitative research methods, as used for example in the FSA-commissioned Kitchen Life study, to identify other types of food-related activities that should be covered on the survey.¹⁸ Kitchen Life used ethnographic methods and found that people's kitchen practices are not discrete sets of activities, but rather are 'entangled' with other activities and social contexts. The findings of this study illustrate the potential utility in studying broader sets of practices and what drives these in the context of everyday life, how they may vary by population group, and how they might be changed. Further qualitative work could examine the validity of the clusters identified here and investigate whether other activities and variables would be useful for including in future waves of Food and You. This could even take the form of following up survey respondents.

While firm conclusions cannot be drawn from this analysis, the findings do suggest that there is some clustering of food-safety-related activities. Improving our understanding of this, with further investigation, could support better targeting of particular population groups who may be at higher risk of foodborne illness and help identify particular activities that contribute to this risk.

¹⁸ Wills W., Meah A., Dickinson A., Short F. (2013) Domestic kitchen practices: findings from the 'kitchen life' study. http://www.food.gov.uk/sites/default/files/818-1-1496_KITCHEN_LIFE_FINAL_REPORT_10-07-13.pdf

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