

# FOOD BEHAVIOURS

# Food Safety

on the Island of Ireland

1234



# Volume 1

## Food safety behaviour on the island of Ireland

This document is the first in a three volume series. The terms of reference for the series are outlined in the introduction, which also provides an overview of the environmental, social and personal factors that can affect food behaviour. Volume 1 outlines the historical context of food safety issues on the island of Ireland (IOI), explains the major current public health issues and describes the available research on influences on food safety behaviour. Volume 2 provides the same information in relation to public health nutrition. Volume 3 relates to behaviour change and explores the development of behaviour change methods, current understanding of best practice and learnings from intervention studies. Recommendations for further research and for promotion of food-related behaviour change on the IOI have also been developed for each part of the report. This volume:

1. Gives an account of the major food safety related public health issues on the island of Ireland and explains the related behaviours
2. Outlines food safety related behavioural research conducted on the island of Ireland to date and describes research carried out by **safefood** for the purposes of the report
3. Identifies research gaps and communications priorities.

All volumes are available on [www.safefood.eu](http://www.safefood.eu)

# Abbreviations

|             |   |
|-------------|---|
| <b>ADI</b>  | Acceptable Daily Intake                         |
| <b>BSE</b>  | Bovine Spongiform Encephalopathy                |
| <b>CIR</b>  | Crude Incidence Rate                            |
| <b>EFSA</b> | European Food Safety Authority                  |
| <b>EU</b>   | European Union                                  |
| <b>FSA</b>  | Food Standards Agency                           |
| <b>FSAI</b> | Food Safety Authority of Ireland                |
| <b>GB</b>   | Great Britain                                   |
| <b>GBS</b>  | Guillain-Barré Syndrome                         |
| <b>GM</b>   | Genetic Modification                            |
| <b>GMOs</b> | Genetically Modified Organisms                  |
| <b>HUS</b>  | Haemolytic-Uremic Syndrome                      |
| <b>IOI</b>  | Island of Ireland                               |
| <b>MS</b>   | Member States                                   |
| <b>NI</b>   | Northern Ireland                                |
| <b>ROI</b>  | Republic of Ireland                             |
| <b>TDI</b>  | Tolerable Daily Intake                          |
| <b>UK</b>   | United Kingdom                                  |
| <b>USA</b>  | United States of America                        |
| <b>vCJD</b> | Creutzfeldt Jakob Disease                       |
| <b>VTEC</b> | Verocytotoxin producing <i>Escherichia coli</i> |
| <b>WHO</b>  | World Health Organisation                       |

# List of tables

|           |  |
|-----------|--|
| Table 1.1 | Food safety and the changing food environment in the EU since the 1950s  |
| Table 1.2 | Number of cases of foodborne disease for the Republic of Ireland and Northern Ireland for 2009 and 2010                                  |
| Table 2.1 | Surveys of consumer knowledge, attitudes and perceptions of food safety on the IOI   |
| Table 2.2 | Unprompted consumer concerns in the ROI about food production on farms and food safety in shops, supermarkets and in the catering sector |
| Table 2.3 | Perceived risk of contracting food poisoning   |
| Table 3.1 | Food safety focus group composition  |
| Table 3.2 | Research recommendations for food safety related behaviour change on the IOI   |
| Table 3.3 | Recommendations for communication of food safety related behaviour change on the IOI   |

# List of figures

- Figure 2.1 Consumer food concerns (prompted) - Safetrak 2003-2008
- Figure 2.2 Consumers food concerns (prompted) - Safetrak survey 2004/2005
- Figure 2.3 Consumers food concerns (unprompted) - Safetrak 2005/2006
- Figure 2.4 Spontaneous concerns about issues related to food - FSA 2006 (NI data)
- Figure 2.5 Food sources of most concern to consumers - Safetrak 2003-2004
- Figure 2.6 Food venues of concern to consumers (FSANI)
- Figure 2.7 Specific foods of concern for IOI consumers (unprompted) - Safetrak 2007/2008
- Figure 2.8 Perceived importance of food safety practices (prompted) - Safetrak 2003/2004
- Figure 3.1 Food safety concerns
- Figure 3.2 Food related issues of most concern
- Figure 3.3 Perceived importance of food safety behaviours
- Figure 3.4 Food safety practices that consumers wish to change
- Figure 3.5 Barriers to changing food safety behaviour

# Glossary

**Battery chickens:** Battery chickens are from an industrial type of agricultural system where a chicken's main purpose is to produce large numbers of eggs within a specific timeframe. They are housed in "battery cages" arranged in low rows and usually fed high protein foodstuffs.

**Culpable food:** This is food that is blameworthy as being wrong, improper or injurious. It involves a fault or breach of a duty imposed by law. While the act performed is wrong it does not involve any evil intent by the wrongdoer.

**Haemolytic anaemia:** Haemolytic anaemia is a rare form of anaemia due to haemolysis. Haemolysis is the abnormal destruction and removal of red blood cells in the blood vessels or elsewhere in the body at a faster rate than the body can replace them. It has numerous possible causes and ranges from relatively harmless to life-threatening.

**Intrauterine death:** Intrauterine death is the clinical term for the death of a baby in the uterus, during pregnancy and before birth. The term is usually used for pregnancy losses that happen after the 20th week of gestation.

**Likert scale:** Likert Scale is a format of questionnaire used in consumer research.

**Nanotechnology:** Nanotechnology (sometimes shortened to "nanotech") is the study of manipulating matter on an atomic and molecular scale with dimensions of the nanoscale ranging from 1 to 100 nanometres (nm). In its original sense, nanotechnology refers to the projected ability to construct items from the bottom up, using techniques and tools being developed today to make complete, high performance products such as many new materials and devices with a vast range of applications, such as in medicine, electronics, biomaterials and energy production.

**Primary reservoir:** The Primary reservoir (of an infectious agent) is the first person, animal, arthropod, plant, soil or substance in which an infectious agent normally lives and multiplies, on which it depends

primarily for survival, and where it reproduces itself in such manner that it can be transmitted to a susceptible host.

**Reiter's syndrome:** Reiter's syndrome is one form of reactive arthritis and is characterized by symptoms such as arthritis, nongonococcal urethritis, conjunctivitis and by lesions of the skin and mucosal surfaces. It is classified as an autoimmune condition that develops in response to an infection in another part of the body. It involves inflammation within and around joints particularly where ligaments and tendons attach to bones.

**Thrombocytopenic purpura:** Idiopathic thrombocytopenic purpura (ITP) is an autoimmune condition which results in having an abnormally low platelet count and incorrect blood clotting as the body produces antibodies against its own platelets. There is no known cause of ITP. Often ITP is asymptomatic however a very low platelet count can lead to visible symptoms, such as bruises or more seriously, bleeding diathesis, bleeding from the nostril, gums and excessive menstrual bleeding with a very low platelet count (<10,000 per  $\mu$ l) resulting in the spontaneous formation of blood masses in the mouth or on other mucous membranes.

**Vignette:** Vignette is a short, impressionistic scene that focuses on one moment or gives a particular insight into a character, idea or setting.

**Zoonotic:** This refers to any disease or infection that can be naturally transmitted from vertebrate animals to humans and vice versa. Zoonotic diseases and infections are caused by bacteria, parasites, fungi, viruses and other unconventional agents. *Examples: Rabies, West Nile virus, Lyme disease and CJD.*

# Executive summary

## Volume 1 Food safety behaviour on the island of Ireland

This report:

1. Gives an account of the major food safety related public health issues on the island of Ireland and explains the related behaviours
2. Outlines food safety related behavioural research conducted on the island of Ireland to date and describes research carried out by **safefood** for the purposes of the report
3. Identifies research gaps and communications priorities.

The safety of our food supply is determined by the presence of microbiological hazards, chemical residues, environmental contaminants and infestation. This report describes the historical developments in food safety and the changing food environment predominantly over the last 100 years with particular emphasis on the last 20 years, during which time a succession of high profile food scares took place. These food scares were a major impetus in the establishment of food safety legislation and infrastructure throughout the EU and on the island of Ireland (IOI).

## Current food safety related public health issues on the island of Ireland

Foodborne diseases comprise a broad group of illness caused by bacteria, viruses, parasites, chemical contaminants and biotoxins. There are five major bacteria that are responsible for the majority of cases of foodborne illness on the IOI: *Campylobacter*, *Salmonella*, *Clostridium perfringens*, verocytotoxigenic *Escherichia coli* (VTEC) and *Listeria*. These can be acute, chronic, or have long-term complications. Table 1 presents the number of cases for 2009 and 2010 for the five targeted microorganisms. These bacteria are important either because they cause a lot of cases of intestinal illness or because they can cause severe disease, or both. Viruses may also cause foodborne disease but they are primarily spread from person to person.

**Table 1: Number of cases of foodborne disease for the Republic of Ireland and Northern Ireland for 2009 and 2010**



| Number of cases                |                 |                 |                |                |
|--------------------------------|-----------------|-----------------|----------------|----------------|
|                                | <i>ROI 2009</i> | <i>ROI 2010</i> | <i>NI 2009</i> | <i>NI 2010</i> |
| <i>Campylobacter</i>           | 1808 (42.6)     | 1662 (37.2)     | 986 (54.6)     | 1040 (57.6)    |
| <i>Salmonella</i>              | 333 (7.9)       | 356 (8.0)       | 159 (8.9)      | 181 (9.3)      |
| <i>Clostridium perfringens</i> | *11 (0.02)      | -               | 18 (1.0)       | -              |
| VTEC                           | 241 (5.7)       | 117 (3.7)       | 48 (2.5)       | 60 (2.8)       |
| <i>Listeria</i>                | 10 (0.22)       | 10 (0.22)       | 4 (0.23)       | 2 (0.13)       |

\*2009 EFSA report is the latest data available for this pathogen.

Parentheses show the crude incidence rates (CIR) per 100,000 population.

## Consumer behaviour and food safety

Food behaviours and breaches of good hygiene practice can predispose consumers to a number of health consequences: from certain short-lived acute infections, to some more rare long-term diseases, all of which make up the spectrum of foodborne diseases. Normally a large number of food-poisoning bacteria must be consumed to cause illness. Therefore, illness can be prevented by (1) controlling the initial numbers of bacteria present, (2) preventing the small numbers of bacteria from growing, (3) destroying the bacteria by proper cooking and (4) avoiding re-contamination. Therefore the four main unsafe food behaviours are failure to cook, chill, clean and prevent cross-contamination. These behaviours can occur at a number of stages from the primary food producer (the “farm” stage), through the many processing stages, to the kitchen and ultimately consumer behaviour (the “fork stage”).

Information on actual consumer behaviour in relation to purchasing, transporting, storing, preparing and consuming food is essential to develop and underpin food safety promotional activities. From a consumer perspective the main food safety behaviours associated with foodborne illness are inadequate washing of hands, utensils, chopping boards and dishcloths (especially after contact with raw meat and chicken), inadequate washing of fruit and vegetables, improper storing, chilling and cooking of meat and chicken, cross-contamination of ready-to-eat foods and consumption of raw contaminated foods.

## **Influences on food safety behaviour on the IOI**

Food safety practices are influenced by a wide range of factors including personal factors, culture and the wider environment, social situation and the nature of the risk involved. For food safety, the nature of the risk, the economic and policy environment (legislation/regulation), media environment, experience (past and present) and habit, knowledge, cooking skills and food safety training, convenience and time pressures, socio-economic status, age, gender, attitudes, perceptions and beliefs, may all play a significant role in influencing food handling practices. This area of research is still in its infancy on the IOI and limited data are available on how many of these factors influence food safety behaviours on the island. Much of the research is confined to data on knowledge, attitudes and perceptions of food safety issues. In addition, the sampling frames, timing and methods varied between studies making direct comparisons difficult. While there has been an attempt to draw conclusions and make recommendations based on the available information, caution should be applied to interpretations.

### **Food safety knowledge**

While data on the wider influences on food safety behaviour are limited, several studies have examined knowledge of food safety among consumers on the IOI. The research shows that there are many gaps in food safety knowledge and practices that may result in foodborne diseases. Food can be mishandled at any number of places during food preparation, cooking and storage, and the evidence indicates that consumers have inadequate knowledge about the measures needed to prevent foodborne illness in the home.

These studies show that young people, and both older and younger men, may be particularly at risk of low levels of food safety knowledge. This is consistent with the international literature. The effect of educational level is unclear, but formal food safety training (e.g. home-economics courses or food hygiene courses) may be important.

Television remains an important source of information on food safety for adults, while the internet appears to be a more pertinent method for communicating with children and young people. Both home and school are important settings in which to communicate food safety messages. Scope remains to promote the use of food labels as important sources of food safety information and increase the proportion of the population utilising them. The use of social media to share food safety information among consumers is currently low. Overall, the results show that a variety of channels to communicate food safety messages could be utilised.

## Attitudes to food safety

Several reports help to document food safety attitudes on the IOI. Much of the data refer to consumer concerns, both general and specific. In both adults and children, a minority spontaneously expressed concern about food safety issues, however a large proportion did so when prompted. This may indicate that food safety is not a top-of-mind concern for consumers, however consumers express a high degree of concern about a wide variety of food safety issues when presented with a list of issues.

In summary, the issues of greatest concern to consumers on the IOI have varied greatly between surveys and years. Concerns have included issues such as food poisoning, BSE, antibiotics, hormones and steroids in meat, additives, preservatives, pesticides, chemicals, GM foods, date labels, country of origin and avian flu. Since 2004, food poisoning has been one of the key consumer concerns across all surveys on the IOI and may reflect increased consumer communication on this issue and a growing understanding of its importance. There is currently limited published data available on the IOI on public attitudes to emerging food technologies but new research is ongoing.

## Current consumer concerns, attitudes, perceptions and barriers to food safety on the island of Ireland: safefood research

To inform this review of consumer behaviour, **safefood** commissioned research to identify key consumer concerns, attitudes, perceptions and barriers to food safety and healthy eating among adults on the IOI. A mixed methodology (qualitative and quantitative research) was undertaken. The research aimed to provide additional up-to-date information on the factors that drive food safety behaviour and the barriers to behaviour change.

The quantitative research, which was carried out by Millward Brown Lansdowne in late 2009, formed part of **safefood**'s bi-annual consumer tracking research entitled Safetrak. The questions used reflect previous questions included in **safefood**'s Safetrak and aim to address some of the influences identified in the introductory section. Nationally representative samples of adults aged 15-74 years were interviewed face-to-face, at home in the ROI (n=504) and NI (n =300). The methodology used quota sampling as a basis to ensure the sample was representative of the population on the IOI in terms of age, gender, region, marital status and social grade.

The qualitative research involved a series of six focus groups in a variety of population groups and locations on the IOI. The research aimed to explore factors including knowledge, attitudes, prior experience, social norms, self-efficacy, habit, emotion and contextual factors in relation to food safety. It

also explored knowledge, attitudes and perceptions around food poisoning, motivations for change and factors participants felt would help them change their current behaviours. The findings are summarised below:

### **Influences on food preparation**

- Habit and convenience, taste and appearance and living arrangements influenced the types of meals prepared.
- The mechanics and ease of preparation, presentation and scheduling of meals had priority over food safety.
- There was clear gender and life stage variation in food safety practices:
  - males tended to be more haphazard in relation to their approach to food preparation practices than females
  - young mothers described very busy schedules, which did not allow prioritisation of food safety when preparing food.

### **Influences on food safety practice**

- Participants that took part in the focus group research reported a wide variety of influences on food safety behaviour. These included:
  - physical influences such as food storage space and sensory perception
  - social influences such as time pressure, perceptions of other people, inherited habits and traditions
  - personal factors such as perceived responsibility, perceived risk, past experience
  - wider environmental influences such as the media.

### **Food safety concerns**

- Seventy seven per cent of those surveyed expressed concern when asked to describe their attitude to food safety issues.
- Men were less likely to worry than women and those in the 15-25 year old age group were found to be least worried about food safety.
- Key issues of concern include preparation of pork and chicken, additives and colourings, undercooked food and food poisoning and date marks (freshness of food).

### **Risk perception**

- Qualitative research showed that females had a stronger association than males between illness and poor food safety practices.
- Younger males felt averse to any type of consequence borne out of risky food safety behaviour and felt invulnerable to many food hazards.

### **Behaviour change**

- Thirteen per cent of the adults surveyed felt that they needed to make changes to their current cooking, preparation and storage practices.
- Many of those who felt that they needed to make improvements claimed that “habit” was the main obstacle.
- Focus group participants felt that school-based education, media ubiquity, educational television programmes and publicity of foodborne disease outbreaks influenced behaviour.

## Conclusions

Little data is available on the wider environmental influences on consumer food safety behaviour on the IOI, and in particular, qualitative investigations have seldom been carried out. There is evidence of gaps in consumer knowledge, which may result in foodborne illness. Young people, and older and younger men, may be particularly at risk due to low levels of food safety knowledge. The qualitative and quantitative research conducted for this CFR has shown that while consumers on the IOI in general have a good knowledge of food safety behaviour, and a high level of risk perception best practice food hygiene behaviours are not always implemented. The mismatch between knowledge, attitudes and perceptions of food safety and actual behaviour requires further study. In particular, further investigation into the (i) predictors of and (ii) barriers to safe food safety practices is merited. Gender and socio-economic differences in attitudes provide a basis for segmentation and targeting of key food safety messages. For example, while women and those with higher education had greater perceived importance of food safety, women, those with higher socio-economic status and greater experience had higher perceived food risk.

A wide variety of factors influence food safety behaviour including physical, social, personal and wider environmental factors. Food hygiene practices and their influencers vary according to gender and life stage. Young men, young people living in shared accommodation and busy mothers under time pressure appear to be key groups to target. As the roles of fathers' in the home continue to change, particularly in the face of high unemployment levels among men, this group may also come to the fore. While food safety behaviour and attitudes appear to be less healthy in men than their female counterparts, women were more concerned and perhaps therefore more open to food safety messages than men. Therefore the question remains as to whether men should be targeted directly, or whether women could be targeted as key influencers of men.

Several communication channels could be used to encourage consumers to change food safety related behaviour but television and the school setting were particularly mentioned by participants. Recommendations for food safety behaviour research and communications are listed below.

## Recommendations

### Research recommendations for food safety related behaviour change on the IOI

| Knowledge gap   | Public health implication(s)   | Recommendation/solution   |
|---|--|---|
| Continuous need to update knowledge base to ensure effective targeting of food safety legislation and regulation and the safety of the food supply. | Requirement for safe food supply.  | <ol style="list-style-type: none"> <li>Continued monitoring and surveillance of key sources of bacterial infection and chemical contamination.</li> <li>Surveillance and horizon scanning for emerging pathogens.</li> </ol>                  |
| No longitudinal studies of public knowledge, attitudes and perceptions relating to food safety issues using consistent methodologies.               | <ol style="list-style-type: none"> <li>Difficulty tracking change.</li> <li>No clear understanding of consumer attitudes.</li> </ol> | <ol style="list-style-type: none"> <li>Co-ordinated approach by agencies to fund a long-term survey.</li> <li>Supporting qualitative research would offer an additional method to gain in depth insights in to consumer behaviour.</li> </ol> |
| Limited research on public attitudes to food scares on the IOI.   | Potential to improve risk communication during crises.   | Development of the evidence base of attitudinal research to better understand public responses to food scares.  |
| Evidence of poor domestic food safety practice but limited data on how to improve this.   | Risk of infection.   | Further research into domestic food safety behaviour and relating attitudes, perceptions and beliefs.   |
| Little evidence relating to wider environmental factors, such as economic factors, on food related behaviour.                                       | Need to consider all factors that may influence behaviour change.  | Consideration of broad set of influences in the design of research studies on food behaviour on IOI.  |
| Evidence of a mismatch between food safety knowledge, attitudes and perceptions and food safety   | Knowledge alone will not change behaviour. An understanding of the knowledge-behaviour gap   | The mismatch between food safety knowledge, attitudes and perceptions and food safety practices merits further study.   |

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| practices.  | is essential for the promotion of behaviour change.  |   |
| A number of key influences and barriers in food safety practice have been identified but it is as yet unknown how to effectively promote or overcome these.         | Potential to promote behaviour change with enhanced consumer understanding.                      | Key influences and barriers to correct food safety practices and methods to promote or overcome these should be investigated further, including the influence of habit, social pressure and trust in sensory judgement. |
| Enhanced data on consumer attitudes to food technologies would be beneficial, particularly for food manufacturers working in product development.                   | Improve understanding of consumer acceptability of novel foods and production methods.           | Conduct research on consumer acceptance of novel food technologies on the IOI.  |
| Research indicated that men and women on IOI perceive food risk differently but little is known regarding effectively communication of gender specific messages.    | Effective segmentation of consumer messages for men and women may help promote behaviour change. | Further research to gain insight into food risk perception and drivers of behaviour change in men and women.  |
| Key concerns for consumers included the safety of chicken and pork and continued monitoring of attitudes to these foods is necessary to monitor consumer attitudes. | Potential to address consumer concerns.  | Monitoring of consumer confidence around chicken and pork.  |



## Recommendations for communication of food safety related behaviour change on the IOI

| Priorities for communication/intervention   | Public health implication(s)  | Recommendation/solution   |
|---|---|---|
| <p>The main food safety behaviours associated with foodborne illness are inadequate washing of hands, utensils, chopping boards and dishcloths (especially after contact with raw meat and chicken), inadequate washing of fruit and vegetables, improper storing, chilling and cooking of meat and chicken, cross-contamination of ready-to-eat foods and consumption of raw contaminated foods.</p> | <p>Risk of foodborne illness.</p>                                   | <p>A continued focus on key domestic food safety messages for consumers.</p>  |
| <p>Age, gender and life stage have considerable influence on food safety knowledge, attitudes and perception. Therefore, food safety messages should be segmented based on these important factors.</p>   | <p>Certain group may currently be at risk of foodborne illness.</p> | <ol style="list-style-type: none"> <li>1. Young people, men and those from lower socio-economic groups may benefit from being the focus of communications campaigns to improve food safety practices.</li> <li>2. Young people living in shared accommodation and busy mothers under time pressure appear are also important target groups.</li> <li>3. As fathers' roles in the home continue to change, particularly in the face of high unemployment levels among men, this group may also merit particular attention.</li> <li>4. The apparent importance of habit in food safety behaviour indicates that food safety training during childhood may</li> </ol> |

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|  |   | be an important focus.   |
| Foreign travel is a risk factor for foodborne illness.   | Foodborne illness.  | Develop seasonal food safety messages re foreign travel and food safety.   |
| A wide variety of channels and settings can be used to communicate food safety messages.             | Effective target can enhance uptake of food safety messages and potentially behaviour change. | <ol style="list-style-type: none"> <li>1. Television should remain an important medium for communicating with adults, particularly women, while the internet may be more important for young people and children.</li> <li>2. Consumers identified the home and school as important settings for food safety learning.</li> <li>3. The use of social media for communicating food safety messages is in its infancy and should be explored further.</li> </ol> |
| Consumers continue to identify 'date marks' as important indicators of food safety.                  | Need to ensure this is correctly understood.  | Continue to issue consumer messages to clarify the meaning of date marks.  |
| Consumers suggested highlighting the benefits as well as the risks of food safety in communications. | May enhance motivation to change.   | Develop messages that outline benefits of food safety as well as consequences.   |
| Consumers requested practical advice on food safety.   | Enhance consumer understanding and potentially consumer practice.                             | Provide practice messages around food safety in the domestic setting.  |

# **1** Historical context and current public health issues

## **Key findings**

### **1.1 Introduction**

### **1.2 Food safety: an historical perspective**

### **1.3 Current food-related public health issues on the island of Ireland**

### **1.4 Consumer behaviour and associated outbreaks**

### **1.5 Conclusions**

## Key findings

- Food safety control measures are not a new phenomenon and have been practised across the globe for centuries using a variety of means.
- The beginning of the nineteenth century saw major advances in the prevention of ill health associated with foodborne illness.
- Food scares in the 1980s made food safety an issue of growing public concern.
- The public concern surrounding various food scares in the 1990s contributed to the distortion of various food markets and impacted on consumer behaviour.
- Food scares forced governments to change their approach to food control, which was evident in the formation of legislatively independent food safety agencies on the IOI and across the EU.
- In general, consumers continue to be suspicious of technologies such as genetic modification and irradiation of food, although in the ROI there are signs that this is changing.
- *Campylobacter* remains the most commonly reported cause of bacterial foodborne infection on the IOI.
- *Salmonella* is the second most commonly reported cause of bacterial foodborne infection on the IOI.
- The IOI along with England, Scotland and Wales have some of the highest reported rates of verocytotoxin producing *Escherichia coli* (VTEC) infection in Europe.
- The main food safety behaviours associated with foodborne illness are inadequate washing of hands, utensils, chopping boards and dishcloths (especially after contact with raw meat and chicken), inadequate washing of fruit and vegetables, improper storing, chilling and cooking of meat and chicken, cross-contamination of ready-to-eat foods and consumption of raw contaminated foods.
- A **safe food** study has highlighted a number of unsafe food behaviours practised by consumers on the IOI including:
  - Failure to cook meat and chicken adequately
  - Failure to adequately wash hands after handling raw chicken
  - Failure to adequately wash utensils and surfaces after handling raw chicken

These behaviours all pose a risk of foodborne illness.

- A survey of consumer refrigerators temperatures on the IOI showed that almost half had an average temperature above the recommended 1-5°C temperature range, increasing the risk for the multiplication of foodborne pathogens.
- Consumers generally have no control over exposure to chemical residues and contaminants in their food. Therefore, the levels of these chemicals must be regulated at points in the production chain from farm to fork. This is accomplished through the establishment of permissible levels designed to protect the consumer from harm. These levels are enforced through comprehensive monitoring and surveillance programmes.

## **1.1 Introduction**

The safety of our food supply is determined by the presence of microbiological hazards, chemical residues, environmental contaminants and infestation. This chapter describes the historical developments in food safety and the changing food environment predominantly over the last 100 years, with particular emphasis on the last 20 years which saw a succession of high-profile food scares. These food scares were a major impetus in the establishment of food safety legislation and infrastructure throughout the European Union (EU) and on the island of Ireland (IOI). This chapter also outlines the current food-related public health issues on the IOI.

## **1.2 Food safety: an historical perspective**

Food safety control measures are almost certainly as old as human history itself and may have started with the recognition and subsequent avoidance of foods that were naturally toxic (5). Many rules and recommendations advocated in religious or historical texts are evidence of the concern to protect people against foodborne hazards and food adulteration (6). In 2000 BC, the book of Leviticus reported that Moses introduced laws to protect his people from food-related disease, such as the washing of clothes and bathing after the sacrificial slaughter of animals (7). Similar concerns were also expressed by the Egyptians, the Greeks and the Romans (8). However, it is really since the beginning of the nineteenth century that the major advances in the prevention of ill health associated with foodborne illness have been made. The most significant measures include the safe disposal of sewage, the chlorination of drinking water, the heat treatment of milk by pasteurisation and other thermal processing, and the use of refrigeration and freezing. Table 1.1 details the developments in food over the last 50 years.

Table 1.1: Food safety and the changing food environment in the EU since the 1950s [adapted from Kyprianou, 2007 (2)]

| Decade | Description  |
|--------|--|
| 1950s  | At this time production and storage of food still relied largely on traditional methods - few homes had refrigerators, so larders and storerooms were used to keep goods fresh. Since a lot of food could not be kept for long, people tended to shop daily and in local stores. Commercial pasteurisation had yet to be widely introduced therefore tuberculosis was frequently passed onto humans through dairy products.  |
| 1960s  | In the 1960s newly discovered international dishes began to appear alongside classics on dinner tables, as tourists brought ideas home with them. Food was increasingly pre-packed and so the role of packaging became more important. Not only did it have to catch the consumer's eye and be instantly recognisable, but it also played a crucial part in keeping food fresh and safe. As food products faced longer and more complex journeys, the risk of harmful bacteria finding their way into products increased. With hygiene systems and microbiological testing less developed than they are nowadays, food poisoning posed a greater threat to consumers' health. In 1967, the concept of fresh pasteurised milk was launched.   |
| 1970s  | In the 1970s a growing number of households owned refrigerators, meaning that food products could be kept for longer periods. In parallel with this, the growth of car ownership made it easier for consumers to do weekly bulk shopping, driving to the supermarket rather than visiting local shops daily. With new products appearing, packaging also continued to evolve. Plastic increasingly replaced classic paper wrappings, and some packaging was specially designed for new products. Freezers and frozen foods such as pizzas also started to become popular. This decade saw the arrival of fast food chains thus changing the way food was to be consumed and the start of a general food culture change. As greater quantities of food were produced in factories rather than coming straight from farms and small producers, ever higher amounts of chemicals were added to preserve and enhance the flavour of products. Tests were carried out to guarantee the safety of the additives used and ascertain |

## Changing Food Related Behaviour

|              |   |
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|              | any potential side-effects.   |
| <b>1980s</b> | In the 1980s society was changing fast and time-saving convenience was the order of the day, there was a rise in the number of young, single people with their own homes, while for many in the workplace, life was busier than ever. Food brands were crossing borders and going global, with products from across continents having influence on international markets. The microwave oven – a relatively new culinary phenomenon – became an essential feature in many households for its convenience and speed. Food scares in the 1980s made food safety an issue of growing public concern. Bovine Spongiform Encephalopathy (BSE) was diagnosed in cattle in the UK, then in Ireland. <i>Escherichia coli</i> , <i>Salmonella</i> and botulism outbreaks occurred. |
| <b>1990s</b> | In the 1990s BSE was identified in other countries and the link was made between BSE, the feed given to cattle and Creutzfeldt jakob disease (vCJD) in humans. Consumers were beginning to question how much confidence they could have in the products that they were being sold and demanding that more visible and effective measures be taken to protect them from eating products that could seriously affect their health.  |
| <b>2000s</b> | With food production becoming ever more complex, market choices ever wider and media focus on food issues ever greater, consumers became more alert to issues related to food safety. It was at the start of the new century that the EU (including the IOI) really pushed forward in building up its food safety legislation and infrastructure.   |



### 1.2.1 Food hygiene legislation

In the EU the first food hygiene rules were adopted in 1964 and were limited to requirements for fresh meat (2). Over the following decades, further hygiene legislation was developed and implemented for other food groups, including eggs, milk products, poultry meat, fishery products and game meat; this legislation accounted for food produced on the IOI. The introduction of hygiene rules undoubtedly had a positive impact on the level of food safety across the EU by preventing, eliminating or reducing contamination of food with harmful bacteria, parasites, chemical substances and unwanted debris such as glass particles (2). With developments in science and technology the hygiene legislation was added to and amended, so that by the mid-1990s there was a comprehensive set of directives on food hygiene for specific food types to be interpreted and transposed by Member States. While these laws were an important part of ensuring food safety, they were often regarded as complex and cumbersome by those who had to apply them. Therefore, the European Commission began to reflect on how to improve the hygiene legislation so as to heighten consumer protection and also clarify and simplify the rules which food producers had to follow. In 2004, the 'Hygiene Package' was adopted, replacing the numerous hygiene Directives with a harmonised, simplified and comprehensive set of rules on hygiene which were to apply at every stage of the food chain. This legislation, which entered into effect on the 1<sup>st</sup> January 2006, laid down general rules on food and feed hygiene, as well as specific hygiene rules for food of animal origin (2).

### 1.2.2 Food scares

Since the mid 1980s food safety has been placed firmly on the political agenda in the wake of a succession of significant food scares, with most developed countries, including the IOI, experiencing at least one or more of these scares which have had both public health and economic impacts. Food safety continues to be a matter of huge public interest and barely a day goes by without media reports of some new hazard in the food supply (9).

A food scare arises when a food or food process is alleged to contain a new or unexpected risk to public health (7). Over the last three decades some of the most highly publicised food scares have included *Salmonella* contamination of eggs (10), *Listeria monocytogenes* contamination of pâté (11), BSE infected beef carcasses (12), *Escherichia coli* O157:H7 contamination of beef (13) and more recently dioxin contamination of pork – all of which have contributed to the loss of consumer confidence in the food supply chain. Food scares can lead to a sharp decrease in consumption which can be extremely damaging to a particular commodity or associated brand name and have major cost implications for suppliers and retailers alike. This was particularly

exemplified by the BSE crisis in the UK, which according to estimates saw beef consumption fall temporarily by 40 per cent, not only in the UK itself, but also in countries such as Germany and Italy which had at that time no reported cases of BSE (14). Even six months after the BSE crisis broke, sales of all European beef were still down by 15 per cent, underpinning that significant costs were borne to Mainland Europe as well as with UK producers (15). Appendix A presents the chronology of food scares that have affected the IOI.

The series of food scares in the EU in the late 1980s and throughout the 1990s (most notably the BSE crisis) forced governments to change their approach to food control. The responsibility for food safety was shifted from government departments to legislatively independent food safety agencies. These moves were intended to improve the flow of independent and verifiable information about food safety to the public (16). In the ROI, this was evident with the establishment of the Food Safety Authority of Ireland (FSAI) in 1999. Similarly, in the UK the Food Standards Agency (FSA) was formed in 2000. Both the FSAI and the FSA have legislative remit for food safety on the IOI (FSAI: ROI and FSA: NI). **safe food** was established in 1999 to protect and improve public health by fostering and maintaining confidence in the food supply on the IOI. The European Food Safety Authority (EFSA) was set up in January 2002 as an independent source of scientific advice and communication on risks associated with the food chain. EFSA was created as part of a comprehensive programme to improve EU food safety, ensure a high level of consumer protection, and restore and maintain confidence in the EU food supply.

### 1.2.3 Technological concerns

Other food concerns that are not included as specific 'food scares' but that do raise suspicion from consumers are those involving technologies such as genetic modification (GM) and irradiation of food. A brief account of these is given here.

#### Genetically modified food

The debate surrounding the application of GM technology to food production systems is ongoing. Proponents of GM foods cite arguments concerning increased food production demands, climate change effects, a reduced dependency on pesticides, enhanced traits and the absence of adverse health effects. Opponents cite moral and ethical considerations including concerns over the potential impacts on human health, the environment and the economy (17). Current EU legislation controls the production, importation and marketing of GM food and feed. In particular, the right of the consumer to accurate information and labelling so they can make an informed choice is enshrined in EU law. Since 1997, labelling of GM food has been mandatory for products that consist of, contain, or are derived from genetically modified organisms

(GMOs). The GM crops from which food and feed can be produced and/ or marketed within the EU are cotton, maize, rapeseed oil, soyabean and sugarbeet (18). This same body of legislation also gives effect to the monitoring and traceability systems for GM food and feed.

Despite this body of legislation, the EU public continues to be more sceptical than their US counterparts when it comes to GM technology. A 2005 Eurobarometer survey on biotechnology reported that the European public considered GM as generally not being useful, morally unacceptable and a risk for society (19). Even if GM food was shown to be healthier, more environmentally friendly, cheaper and had regulatory approval, a majority of European citizens polled, who gave a definite view, opposed developments in this area. Nonetheless there is a demand among EU consumers for more information on GMOs and GM technology. This lack of information may be contributory to the negative image of GM technology (20). The ROI (but not the UK) was one of a number of countries which bucked the trend with a slight majority of those questioned supporting GM (19).

### Food irradiation

Even though food irradiation has long been approved by international experts such as the World Health Organisation and the Food and Agriculture Organisation, it has been slow to gain acceptance in the EU (21). The difficulty seems to lie in inadequate communication of what the technology entails and the advantages it can offer in improving the safety of the food supply. The main benefit of food irradiation is that it reduces harmful bacteria that may cause food poisoning. In Europe, EU Directive 1999/2/EC provides for the laws concerning foods and food ingredients treated with ionising radiation. To date, only one food category, dried herbs, spices and vegetable seasonings, has been included on the list of foods that may be irradiated although other food categories have been nominated. The Directive specifies provisions including the source of ionising radiation, controls on the level of radiation permitted and food labelling requirements. Conditions are also specified for the importation of irradiated foods. Food irradiation is one of the most carefully and extensively studied methods of food processing, yet its use remains controversial in many parts of the EU. Poor communication about the technology and its benefits has led to confusion and misunderstanding and has limited the adoption of irradiation throughout the EU (21).

## 1.3 Current food-related public health issues on the island of Ireland

Food behaviours and breaches of good hygiene practice can predispose consumers to a number of health consequences: from certain short-lived acute infections, to some more rare long-term diseases, all of which make up the spectrum of foodborne diseases. Normally a large number of food-poisoning bacteria must be consumed to cause illness. Therefore, illness can be prevented by (1) controlling the initial numbers of bacteria present, (2) preventing the small numbers of bacteria from growing, (3) destroying the bacteria by proper cooking and (4) avoiding re-contamination (22). Therefore the four main unsafe food behaviours are failure to cook, chill, clean and prevent cross-contamination. These behaviours can occur at a number of stages from the primary food producer (the “farm” stage), through the many processing stages, to the kitchen and ultimately consumer behaviour (the “fork stage”).

Foodborne diseases comprise a broad group of illness caused by bacteria, viruses, parasites, chemical contaminants and biotoxins. To date, there is no precise and fully standardised universal approach to estimating the burden of foodborne disease. However, **safefood** has adopted the general approach used by the UK (FSA) and the US Food Net System (Centre for Disease Control) of collating data on the main organisms causing foodborne disease as a reasonable estimate of the burden of these diseases on the IOI.

There are five major bacteria that are responsible for the majority of cases of food borne illness on the IOI: *Campylobacter*, *Salmonella*, *Clostridium perfringens*, Verocytotoxigenic *escherichia coli* (VTEC) and *Listeria*. These can be acute, chronic, or have long-term complications. Table 1.2 presents the number of cases for 2009 and 2010 for the five targeted microorganisms. These bacteria are important either because they cause a lot of cases of intestinal illness or because they can cause severe disease, or both. Viruses may also cause foodborne disease but they are primarily spread from person to person.

**Table 1.2: Number of cases of foodborne disease for the Republic of Ireland and Northern Ireland for 2009 and 2010**

|                                | Number of cases |                 |                |                |
|--------------------------------|-----------------|-----------------|----------------|----------------|
|                                | <i>ROI 2009</i> | <i>ROI 2010</i> | <i>NI 2009</i> | <i>NI 2010</i> |
| <i>Campylobacter</i>           | 1808 (42.6)     | 1662 (37.2)     | 986 (54.6)     | 1040 (57.6)    |
| <i>Salmonella</i>              | 333 (7.9)       | 356 (8.0)       | 159 (8.9)      | 181 (9.3)      |
| <i>Clostridium perfringens</i> | *11 (0.02)      | -               | 18 (1.0)       | -              |
| VTEC                           | 241 (5.7)       | 117 (3.7)       | 48 (2.5)       | 60 (2.8)       |
| <i>Listeria</i>                | 10 (0.22)       | 10 (0.22)       | 4 (0.23)       | 2 (0.13)       |

\*2009 EFSA report is the latest data available for this pathogen.

Parentheses show the crude incidence rates (CIR) per 100,000 population.

### 1.3.1 The major acute foodborne infections

#### *Campylobacter* spp.

*Campylobacter* is the most commonly reported cause of bacterial foodborne infection on the IOI. Between 2000 and 2010 over 28,000 laboratory confirmed cases were reported in the two jurisdictions, representing about two thirds of all acute reported gastroenteritis (23-25).

The illness is characterised by severe diarrhoea and abdominal pain, and symptoms may subside after a number of days or may persist for weeks. Rarely, more severe sequelae may develop such as reactive arthritis, Reiter's syndrome, or haemolytic-uremic syndrome (HUS) and approximately one in every 1,000 cases leads to a severe neurological disorder called Guillain-Barré Syndrome (GBS) (26).

An all-island case control study entitled 'Risk factors for sporadic *Campylobacter* infection', suggested that consumption of chicken, lettuce and food from takeaways accounts for the majority of *Campylobacter* infections on the IOI (27). The findings of this study highlight the need for an improved and more efficient approach to basic food hygiene behaviour to prevent campylobacteriosis and other infectious gastrointestinal illnesses in the community. The food

hygiene behaviours in the home commonly linked with exposure to *Campylobacter* are the consumption of undercooked chicken or cross-contamination to kitchen surfaces, utensils or ready-to-eat foods by raw chicken.

### Salmonella spp.

*Salmonella enterica* is a major cause of bacterial enteric illness in humans worldwide. *Salmonella* was the second most commonly reported cause of bacterial foodborne infection on the IOI in 2009 and 2010 (Table 1.2). Salmonellosis presents as an acute clinical illness with sudden onset of headache, abdominal pain, diarrhoea, nausea. Fever is almost always present. Dehydration, especially amongst vulnerable populations may be severe (28). *Salmonella* live naturally in the intestinal tracts of humans and other animals. *Salmonella* are usually passed to humans by eating foods contaminated with animal faeces. Food behaviours that pose a risk of *Salmonella* infection are usually the consumption of undercooked contaminated foods of animal origin, such as poultry, milk, eggs or beef. However, all foods, including vegetables may become contaminated by *Salmonella* through unsafe kitchen practices that result in cross-contamination.

### Clostridium perfringens

Illness due to *C. perfringens* occurs after ingestion of large numbers of enterotoxin-producing cells, after food has been temperature-abused - generally during cooling after a heat process, or stored unrefrigerated - both of which provide suitable conditions for spores to germinate and multiply (29). The symptoms of food poisoning caused by *C. perfringens* normally comprise diarrhoea and severe abdominal pain; nausea occurs occasionally; with fever and vomiting being unusual (30). The number of cases of *C. perfringens* in ROI in 2009 are highlighted in Table 1.2 (31).

### Verocytotoxigenic *escherichia coli* (VTEC)

VTEC, in particular serogroup O157, remains a highly significant zoonotic threat to public health. However, more recently, other non-O157 VTEC serogroups (O111, O26, O103 and O145) have emerged and have been associated with severe illness in humans. The ROI, NI, (Table 1.2) England, Scotland and Wales have some of the highest reported rates of infection in Europe (32).

The clinical manifestations of infection by these organisms range from symptom-free carriage, to diarrhoea, bloody diarrhoea, HUS, thrombocytopenic purpura and death (33-34). Although VTEC is associated with relatively few human infections in comparison with other foodborne pathogens (e.g. *Campylobacter* and *Salmonella*) on the IOI, it poses particular concerns, related

to its very low infective dose (which may be as low as 10 organisms), and the severity of the resultant disease (34).

Cattle are recognised as a primary reservoir of VTEC, following several outbreaks of VTEC O157 which were epidemiologically linked to undercooked beef products and raw milk (35-36). In recent years it is well recognised that VTEC can be transmitted to humans by means of contaminated food and water, from person to person and through contact with animals. VTEC, in particular VTEC O157, is often referred as the 'burger bug', as during the mincing process, surface bacteria are transferred to the centre of the meat, therefore, minced beef or beef burgers that are not cooked all the way through can result in food poisoning by VTEC.

In May 2011 Germany reported a large outbreak of haemolytic uremic syndrome (HUS) and bloody diarrhoea caused by a shiga-toxin producing *E. coli* serotype O104:H4, also commonly referred to as verocytotoxin-producing *E. coli* (VTEC). Between May and July almost 4,000 people were affected, with 50 deaths. The outbreak was traced to bean sprouts produced in Germany (37).

### *Listeria monocytogenes*

*Listeria monocytogenes* is the infectious agent responsible for human listeriosis, which is one of the most serious foodborne bacterial infections. The morbidity and mortality of listeriosis is very high, with notified cases invariably reported as being hospitalised. In England and Wales in 2009 there were 214 reported cases of human listeriosis (CIR 54/100,000) (38). In 2010, 10 listeriosis cases were reported in the ROI, with two confirmed cases in NI (25, 39). In the member states (MS) the number of confirmed cases of listeriosis decreased in 2007 and 2008 following a three-year increasing trend from 2004 to 2006 (31).

Clinical illness in adults may range from a mild flu-like illness to bacterial meningitis. Severe disease affects primarily the elderly, pregnant women, newborns, and adults with impaired immune function. Although *Listeria monocytogenes* infection in pregnancy may manifest as a mild flu-like illness in the woman, it can lead to premature delivery, intrauterine death or bloodstream infection, or meningitis in the newborn.

The foods most often associated with *Listeria monocytogenes* infection are ready-to-eat refrigerated and processed foods such as pre-prepared cooked and chilled meals, soft cheeses, cold cuts of meat, pâtés and smoked fish (40). In view of the fact that the majority of these foods are not cooked, *Listeria* can grow on these foods. Therefore their consumption by vulnerable individuals (elderly, pregnant women, newborns, etc), and especially immunocompromised individuals (people with impaired immune function) can subsequently lead to foodborne illness by *Listeria monocytogenes*. Therefore these vulnerable groups must be careful when consuming these foods or if possible avoid consumption. Failure of consumers to

adhere to the 'use-by-dates' of these types of foods also poses a risk of infection. Consumer confusion over date labels has been highlighted in a recent study which could mean that some are taking health risks by eating food that is past its 'use by' date (41). Only half (49%) of respondents in this study correctly identified the 'use by' date as the best measure of safety and just less than half (47%) said they would never eat cooked meat beyond its 'use by' date suggesting a large proportion are willing to. Another recent study highlighted that 41 per cent of Northern Ireland's (NI) over 60s put their health at risk by not checking the 'use by' date on food labels (42).

### 1.3.2 Long term complications of foodborne infections

#### Guillain-Barré Syndrome

GBS is a neurological condition characterised by paralysis (43). A considerable number (40%) of GBS patients present with a prior history of campylobacteriosis, and GBS is considered a sequela of infections caused specifically by *Campylobacter jejuni* (44). As *Campylobacter* is normally contracted through consumption of contaminated foods, including those derived from food animals, correct food safety practices will not only reduce the prevalence of campylobacteriosis but also potentially lessen the incidence of GBS.

#### Haemolytic ureamic syndrome

HUS is a disease of haemolytic anaemia, low platelet count, and kidney impairment (45). It predominantly, but not exclusively, affects children and most cases are preceded by an episode of diarrhoea caused by VTEC. It is a medical emergency and carries a 5–10 per cent chance of mortality, of the remainder, the majority recover without major consequences but a small proportion develop chronic kidney disease and require dialysis or transplant (46).

### 1.3.3 Chronic foodborne infections

#### Brucellosis

Brucellosis is a zoonotic disease transmissible from cattle and can be spread to humans through the consumption of contaminated foods such as unpasteurised milk/milk products (47). The organism is killed by pasteurisation or cooking.



The symptoms of acute brucellosis in humans are generally flu-like. Severe infections of the central nervous systems or lining of the heart may occur. Brucellosis can also cause long-lasting or chronic symptoms that include recurrent fevers, joint pain and fatigue which may persist for years (48). Human cases of brucellosis within the EU remain relatively low in comparison to other foodborne bacterial infections. There have been no confirmed cases in Ireland since April 2006.

### **1.3.4 Risks to consumers from both natural and man-made chemical toxins in food**

Exposure to toxic chemicals through the consumption of contaminated food is a significant public health risk. It is almost invariably associated with the food production environment with very little risk attributable to consumer behaviour. Establishing a cause-and-effect relationship between illness and exposure to chemicals in food can present a challenge for both scientist and public health practitioner alike, especially for low-dose chronic exposure.

The risk assessment process primarily relies on toxicology data from animal (high-dose) and structure-activity studies, as well as assessments of human exposure and epidemiological data, although these are usually sparse. If sufficient data is available to indicate a potential for harm, a precautionary approach is taken to the regulation of the chemical (49).

In relation to compounds such as dioxin, which achieved a high profile in 2008 with the discovery of contaminated Irish pork products, a substantial toxicity database now exists. This includes epidemiological data from human occupational and accidental exposures and which provided the basis for the product withdrawal which was instigated at that time (50). Conversely, the toxicity database for the Sudan Red group of dyes is incomplete. Despite the absence of clinical or epidemiological data concerning the toxic effects of these dyes, a substantial product recall was instigated following the discovery of Sudan Red 1 dye in a range of food products in 2003 (51). In both cases, the dose of chemical to which people were exposed was small (52-53). No clinical cases of disease directly attributable to exposure to either dioxin or Sudan Red dye were recorded during these episodes or to date. However, despite the differences in the database for both chemicals, essentially the same corrective action was followed by the regulatory authorities.

The prevailing scientific consensus on such chemicals is that there is no 'safe' level of exposure and every effort must be made to eliminate or reduce exposure to a minimum. However, specific exposure limits have been established for a number of chemicals on the basis that there is an acceptable level of exposure. There are essentially two methods of quantifying the exposure limit; the Acceptable Daily Intake (ADI) which pertains to residues of chemicals deliberately used in food production such as pesticides and veterinary medicines, and the Tolerable Daily Intake

(TDI) which pertains to unintended chemical contamination of food from the environment. This includes dioxins, heavy metals, chemicals used in the production of packaging material, biological toxins, etc. Both limits indicate the amount of a chemical in food or drinking water that is considered safe if ingested every day over a lifetime (54).

To guard against any adverse health effects that could potentially arise from exposure to chemical residues, maximum residue levels (MRLs) have been established. The MRL is simply the maximum amount of a residue allowed in a food. The ADI is one of a number of factors taken into consideration when establishing an MRL which is invariably lower than the ADI. The MRL serves both to safeguard human health and to regulate trade in treated food commodities. They are a check that best practice is being adhered to during the production of food.

### 1.4 Consumer behaviour and associated outbreaks

Information on actual consumer behaviour in relation to purchasing, transporting, storing, preparing and consuming food is essential to develop and underpin food safety promotional activities. **safe food** has established a considerable body of consumer-based research to inform its activities. The following section provides an overview of typical deficits in consumer food safety practices on the IOI and their consequences.

#### 1.4.1 Temperature control

##### Cold chain

Control of food temperature is vital in maintaining the quality and safety of refrigerated foods throughout the continuum from 'farm to fork' (55). Temperature abuse can arise by leaving foods on countertops, in car boots, or in fridges at too high a temperature or by inadequate cooking of food products, and can result in outbreaks of foodborne disease. Foodborne pathogens thrive on many foods when held at a temperature above refrigeration temperatures. In 2007, inadequate chilling of food was listed as a contributory factor for several *Salmonella*, pathogenic *E. coli* and bacterial toxins outbreaks throughout the EU (3).

**safe food** has commissioned projects to investigate chill temperatures in the homes on the IOI. Bolton (2006) showed that the majority of householders (>75%) did not know the correct temperature for refrigeration. Most did not possess thermometers for either fridge (76.8%) or freezer (71.5%). A total of 57 per cent of householders reported the use of unsafe practices to defrost frozen meat, with over half defrosting meat at room temperature. In addition, approximately half of the refrigerators surveyed had an average temperature above the

recommended 1-5°C temperature range, increasing the risk for the multiplication of foodborne pathogens during storage (particularly *Listeria*) (56).

### Cooking

Cooking is the last line of defence in food preparation. Most pathogenic bacteria (excluding spore formers) do not survive cooking at high temperatures, so thorough cooking of meat and chicken will kill any harmful bacteria present. Inadequate heat treatment of food was named as a contributory factor in many foodborne outbreaks across the EU in 2007 for a variety of pathogens (3). **safe food** advises that poultry, pork, rolled joints, burgers, sausages and any meat that has been minced or skewered should be cooked until there is no pink meat left, the juices run clear and it is piping hot the whole way through. Most meats need to be cooked through, however, some exceptions include whole cuts of beef or lamb.

A study by Kennedy *et al.* (2011) investigated if **safe food**'s advice was put into practice by 120 participants preparing a warm chicken salad followed by a homemade beef burger in test and domestic kitchens across the IOI. In this study 77 per cent of participants did not check that the chicken was fully cooked by cutting it with a knife and looking at the colour in the middle. This contributed to raw meat bacteria being detected in 17 per cent of 'cooked' chicken (cross-contamination may have been another cause). After food preparation 30 per cent of 'cooked' beef burgers were still pink in the middle and 37 per cent of 'cooked' burgers contained raw meat bacteria. This research highlights the frequency of undercooking, even in test conditions amongst a group of consumers on the IOI (57).

#### 1.4.2 Cross-contamination

Cross-contamination is the transfer of pathogens from contaminated foods (usually raw) to other foods, either directly or indirectly. It is a major cause of food poisoning. Pathogens commonly implicated in food poisoning cases (including *Salmonella*, *Campylobacter*, VTEC and *Listeria*) are ubiquitous in nature and as a consequence they may be found in raw foods such as meat, poultry, eggs and vegetables (58). Thorough cooking of these foods will render the bacteria harmless.

The danger of cross-contamination arises when bacteria are spread from raw to ready-to-eat foods (ready-to-eat foods are not cooked further so any contamination remains) such as cheese, salads, sandwiches, etc., or to ready-to-eat prepared dishes. An example of how cross-contamination might occur in a refrigerator is by liquid dripping from raw meat or poultry on to ready-to-eat foods. There are many other routes in which cross-contamination can occur, from

unwashed hands, dishcloths, chopping boards or any kitchen utensil that has been in contact with raw food. Any food may carry some level of risk for foodborne illness if not properly handled in the home before consumption (59). Cross-contamination can occur in many circumstances ranging from the domestic, catering to other food processing settings.

A number of studies have demonstrated the ability of foodborne pathogens to become disseminated from contaminated foods, such as raw chicken, to hands and various food contact surfaces in the domestic kitchen (60-64). In 2007, the home was the most common setting (37%) reported in foodborne outbreaks in the EU, with *Salmonella* (39.2%) the most common causative agent in these outbreaks (3). Cross contamination was listed as a contributory factor in six per cent of the outbreaks caused by *Salmonella*, 20 per cent caused by *Campylobacter* and eight per cent caused by pathogenic *Escherichia coli* (3). However, since the cause of many outbreaks is not identified, it is likely that cross contamination is a much more common contributory factor in outbreaks.

A **safefood** commissioned project entitled 'Assessment of critical control points during domestic food preparation' identified frequent and widespread risky food safety behaviours in the domestic setting, many of which involved cross-contamination (57). This study involved filming 120 participants from across the IOI while they prepared a meal according to specified recipes in a test kitchen environment and in their own home. During food preparation, 84 per cent of people did not thoroughly wash their hands after handling the raw chicken and 72 per cent failed to properly wash a knife used in preparing raw chicken before its reuse on salad vegetables. A total of 57 per cent of people using a knife to prepare burgers failed to thoroughly wash the knife before reusing it to cut raw salad vegetables. These behaviours all resulted in raw meat bacteria being detected on ready-to-eat salad vegetables, hands and kitchen utensils.

### 1.4.3 Eating outside the home

Often, the kitchen facilities and the number of staff in commercial premises are inadequate to produce large numbers of meals on demand. Many premises prepare food in advance of food service to their customers to ensure a timely service. This delay in serving food can increase the risk of growth of food poisoning microorganisms which may result in illness. In 2007, EFSA reported that the catering sector was the second most common setting for foodborne disease outbreaks (3). **safefood's** consumer awareness campaign 'Speak Out' was designed to educate consumers about their rights with regard to food hygiene standards when eating outside the home. Research carried out for the campaign revealed that 53 per cent of consumers feel reluctant to speak out if they are unhappy with food hygiene standards. The campaign calls on consumers to change their behaviour and speak out if they observe inadequate cooking or chilling of food or if they have issues about the general cleanliness of the premises.

#### 1.4.4 Foreign travel and international trade

##### Foreign travel

Foreign travel is recognised as a risk factor for food poisoning and other infectious intestinal diseases. The main behaviours associated with foodborne illness while travelling abroad are the consumption of undercooked food and consuming contaminated water. Countries, particularly if they are underdeveloped and have hot climates, have different levels of food hygiene. Therefore it is important that consumers ensure that food has been cooked all the way through and that fruit and vegetables have been washed and peeled to prevent foodborne illness. In some countries tap water (which may also be used for ice) is not recommended for consumption and bottled or boiled water should only be taken from trustworthy sources. One high profile outbreak was that on the P&O cruise liner *Aurora* in 2003 (where more than 500 passengers suffered from the Norovirus). England, Wales and NI have seen a general decline in gastrointestinal illness reported since 1997, however, gastrointestinal illness is still the most commonly reported travel-associated infection. In 2004 and 2005, *Salmonella* spp. were the most commonly reported gastrointestinal illnesses associated with recent travel abroad in England, Wales, and NI. This is in contrast to the 1990s when *Campylobacter* spp. were the most reported (26). In the ROI, in 2007, 38 per cent of salmonellosis cases reported having a known history of travel (28).

##### International trade

Imported foods are recognised as new vehicles for foodborne illness in humans (65). During the past two decades the global trade in foods has increased. The availability of non-local food all year round, for example the demand for exotic fruits, has led to an increase in consumer demand for these foods which in turn has seen the emergence of outbreaks associated with these foods globally. A review of the global supply chain and outbreaks associated with imported foods was carried out by **safe food** and is available at [www.safe food.eu](http://www.safe food.eu).

A wide range of food products have been associated with foodborne illness caused by a variety of pathogens worldwide. Contaminated produce, eaten raw, is an increasingly recognised vehicle for transmission of *Salmonella* and other pathogens. Imported fresh fruit and vegetables have now been linked extensively, both epidemiologically and microbiologically, to infectious intestinal disease worldwide (66). Fresh produce have fewer barriers, such as added preservatives, to microbial growth and simple errors can therefore make the food unsafe. Improper washing of fruit and vegetables, undercooking of these foods, and/or improper storage during transport (temperature, packaging, etc.) may lead to foodborne illness. The involvement of multiple countries or regions is a particular feature of outbreaks associated with fresh produce. This is recognised as an important and emerging public health concern.



## 1.5 Conclusions

While food safety control measures are not a new phenomenon, food scares in the 1990s have been instrumental in changing government's approach to food control. This is evidenced by the formation of legislatively independent food safety agencies on the IOI and across the EU.

In the IOI key issues include control of pathogens such *Campylobacter* and *Salmonella*, the most common and second most reported cause of foodborne infection on the IOI, respectively. Rates of VTEC infection are also among the highest in the EU. Exposure to toxic chemicals through the consumption of contaminated food is a significant public health risk. This is usually associated with the food production environment, with little risk associated with consumer behaviour.

From a consumer perspective the main food safety behaviours associated with foodborne illness are inadequate washing of hands, utensils, chopping boards and dishcloths (especially after contact with raw meat and chicken), inadequate washing of fruit and vegetables, improper storing, chilling and cooking of meat and chicken, cross-contamination of ready-to eat-foods and consumption of raw contaminated foods. Recommendations for research and communications for food safety related behaviour can be found at the end of Chapter 3, Volume 1 (Section 3.7). A list of currently funded food safety related behaviour research projects is available in Appendix B.

## **2** Knowledge, attitudes and perceptions of food safety behaviour on the island of Ireland

### **Key findings**

#### **2.1 Introduction**

#### **2.2 Food safety knowledge on the island of Ireland**

#### **2.3 Attitudes to food safety**

#### **2.4 Perceptions of food safety**

#### **2.5 Barriers and promoters of food safety practice**

#### **2.6 Conclusions**



## Key findings

- Little data is available on how wider environmental factors influence food safety behaviours on the island of Ireland (IOI) and research is largely limited to studies of consumer knowledge, attitudes and perceptions of food safety.
- Food can be mishandled at any number of places during food preparation, cooking and storage, and evidence indicates that consumers have inadequate knowledge about the measures needed to prevent foodborne illness in the home.
- Young people, and older and younger men, may be particularly at risk of low levels of food safety knowledge.
- Consumers in general consider correct food safety practices to be important, however, this does not always translate into practice.
- Older individuals, women, those with high educational attainment and those following a specific diet are more likely to consider correct food safety practices as important.
- Level of perceived risk from unsafe food safety practices among consumer on the IOI is high. Studies conducted on the IOI show that risk perception is influenced by gender, previous experience of a food risk, the nature of the risk and socio-economic status.
- Key issues of concern, which vary over time, have included food poisoning, Bovine Spongiform Encephalopathy (BSE), antibiotics, hormones and steroids in meat, additives, preservatives, pesticides, chemicals, genetically modified (GM) foods, date marks, country of origin and avian flu.
- Since 2004, food poisoning has been one of the key consumer concerns across all surveys on the IOI.
- Consumers are currently most concerned about food prepared outside the home, particularly food from takeaways, fast-food outlets, restaurants and cafés.

- The individual food that consumers are most concerned about is raw chicken.
- Television remains an important source of information on food safety for adults, while the internet appears to be a more important method for communicating with children and young people.
- Scope remains to promote the use of food labels as an important source of food safety information.
- Both home and school are important settings in which to communicate consumer food safety messages.

## 2.1 Introduction

Food safety practices are influenced by a wide range of factors including personal factors, culture and the wider environment, social situation and the nature of the risk involved (see introductory section). For food safety, the nature of the risk, the economic and policy environment (legislation/regulation), media environment, experience (past and present) and habit, knowledge, cooking skills and food safety training, convenience and time pressures, socio-economic status, age, gender, attitudes, perceptions and beliefs, may all play a significant role in influencing food handling practices. This area of research is still in its infancy on the IOI and limited data are available on how many of these factors influence food safety behaviours on the island. Much of the research is confined to data on knowledge, attitudes and perceptions of food safety issues which dictates the focus of this chapter. The chapter aims to outline the evidence base in this domain and offer guidance on research gaps, influences, key messages, and population subgroups to target for behaviour change.

Surveys and published papers from the IOI are described and summarised in Table 2.1. Some of the surveys were carried out on an all-island basis, while others were conducted in either jurisdiction. One study from the United Kingdom (UK) is included to allow comparison of IOI with Great Britain (GB) (67). The sampling frames, timing and methods also varied between studies, making direct comparisons difficult. While there has been an attempt to draw conclusions and make recommendations based on the available information, caution should be applied to interpretations. Furthermore, it should be taken into account that findings from one jurisdiction may not apply in another.

Table 2.1: Surveys of consumer knowledge, attitudes and perceptions of food safety on the IOI

| <i>Study</i>  | <i>Organisation/<br/>Author</i>  | <i>N</i>   | <i>Location</i> | <i>Sampling</i>  | <i>Methodology</i>   | <i>Year</i>      | <i>Description</i>  |
|---|--|--|-----------------|--|--|------------------|---|
| A study of consumer food safety knowledge, microbiology and refrigeration temperatures in domestic kitchens on the IOI <sup>1</sup> . | <i>safefood/</i><br>Kennedy <i>et al.</i><br>(68-69) Bolton <i>et al.</i> (56) | 1,020 householders<br><br>Samples size was divided into two age groups; over 45 years and under 45 years of age. | IOI             | 102 sampling locations selected by Market Research Bureau of Ireland.<br><br>Size of the household, the occupation of the principal earner and the employment status of the main food preparer were put in place, as well as the socio-demographic profile of respondents.<br><br>Respondents were responsible for food preparation and cooking in their household. All the answers were unprompted. | Participants completed questionnaires about their domestic food practices and knowledge of food pathogens. In 79 per cent of the homes, the refrigerator was swabbed and microbiological investigation conducted. In 10 per cent of the homes refrigerator temperatures were | 2001-2002; 2005. | Quantitative study that used questionnaires, refrigerator swabs and recorded refrigerator temperatures to establish what is known about safe food practices by householders on the IOI and the general hygiene status and temperature status of their |

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<sup>1</sup>Island of Ireland (IOI)

|                                     |   |                                 |    |   |   |                          |  |
|-------------------------------------|---|---------------------------------|----|---|---|--------------------------|--|
|                                     |   |                                 |    |   | monitored.  |                          | refrigerators.   |
| Quarterly public attitudes tracker. | Food Standards Agency <sup>2</sup> (FSA) United Kingdom (UK) <sup>3</sup> (70). | 2,111 adults in the UK aged 16+ | UK | Random location sampling in order to gain a nationally representative sample. | The FSA places questions on the TNS <sup>4</sup> consumer face-to-face omnibus survey on a quarterly basis in order to monitor key Agency issues. Tracking began in 2001. | Data reported from 2010. | The questions cover awareness of the FSA, attitudes towards food safety and nutrition issues, concerns about specific food issues and confidence in all organisations (and in the FSA specifically). |

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<sup>2</sup>Food Standards Agency (FSA)

<sup>3</sup>United Kingdom (UK)

<sup>4</sup>Market Research Company (TNS)

|  |  |   |                        |   |   |             |   |
|--|--|---|------------------------|---|---|-------------|---|
| <p>Consumer Attitudes to Food Safety in Ireland.</p> | <p>Food Safety Authority of Ireland<sup>5</sup> (FSAI) (71).</p> | <p>800 adults (aged 15+) and 200 children (aged 10-14).</p> | <p>ROI<sup>6</sup></p> | <p>Households were selected using the random dialled numbers methodology. The selection process ensured a nationally representative sample.</p> | <p>60 sample points were selected, representative of urban and rural localities nationwide.</p> <p>Quantitative surveys of adult consumers (telephone interviews), quantitative surveys of young consumers (in-home interviews) and qualitative study among adult consumers (10 discussion groups and 6 accompanied</p> | <p>2002</p> | <p>Aim of research was to provide the Food Safety Consultative Council with an understanding of consumer attitudes, knowledge and awareness with regard to food safety and standards.</p> |
|--|--|---|------------------------|---|---|-------------|---|

<sup>5</sup>Food Safety Authority of Ireland (FSAI)

<sup>6</sup>Republic of Ireland (ROI)

|  |                             |  |     |  |  |      |  |
|--|-----------------------------|--|-----|--|--|------|--|
|  |                             |  |     |  | shops). Quotas were based on gender, age, social class and region.   |      |  |
| Risk management behaviour by the NI <sup>7</sup> food consumer.                    | Nelson (72)                 | 202 participants                           | NI  | Participants were food purchasers who were decision-makers within households from six areas of NI.<br><br>Seventeen staff from the Loughry Campus with 3 <sup>rd</sup> level qualifications in food also participated. | Administered questionnaires to primary food consumers.   | 2004 | Quantitative surveys of how consumers quantify and manage risk associated with food.                       |
| Who is at risk and what do they know? Segmenting a population on their food safety | McCarthy <i>et al.</i> (73) | 1,025 participants aged between 18 and 69. | IOI | Random location sampling.  | Exploratory focus groups with the general public and a survey of scientific experts informed the design of the study. Face-to-face | 2005 | Quantitative survey that used questionnaires to measure knowledge levels about food safety practices, food |

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<sup>7</sup>Northern Ireland (NI)

|   |                                    |  |     |                                |   |  |   |
|---|------------------------------------|--|-----|--------------------------------|---|--|---|
| knowledge.  |                                    |  |     |                                | interviews with participants.   |  | safety and food science amongst the population on the IOI.  |
| Safetrak  | <b>safefood</b> (74)               | ~ <sup>8</sup> 800 participants aged 15-74 (500 ROI and 300 NI) annually.        | IOI | Quota sampling                 | Face-to-face interviews in participants' homes.   | 2005-2009 initially on a bi-annual basis and later annually. | Quantitative surveys of consumer knowledge, attitudes and behaviours relating to both food safety and nutrition.              |
| Food safety in the Republic of Ireland: Attitudes among industry, consumers and | <b>safefood</b> and the FSAI (75). | 803 adult consumers (aged 15+); 209 young adults (aged 12-14); 300 food industry | IOI | Nationally represented sample. | For adult and young adult consumers: face-to-face interviews using a structured questionnaire measuring | 2007   | This study was built upon the FSAI benchmark study conducted in 2002. This study reports on the attitudes of adults, children |

<sup>8</sup>Approximately (-)



|                                       |  |                                |    |   |  |      |  |
|---------------------------------------|--|--------------------------------|----|---|--|------|--|
| young people.                         |  | personnel                      |    |   | behaviour, attitudes and opinions with regard to food safety. For industry: telephone interviews and online surveys. |      | and industry in relation to food safety.   |
| Consumer Attitudes to Food Standards. | Food Standards Agency Northern Ireland (FSANI) (1) | 712 aged 16+                   | NI | Random location sampling was used to select a representative sample based on gender, age, SES <sup>9</sup> , ethnicity, working and marital status. | Face-to-face interviews using CAPI <sup>10</sup> technologies.   | 2006 | Survey of shopping habits, eating habits, understanding and use of food labels, food safety concerns and sources of food safety information. |
| Why do consumers deviate from         | Brennan <i>et al.</i> (76)                         | 1,025 consumers aged 18 to 69. |    | There were 73 sample points. Quotas for age and social class were   | Quantitative survey was used to demographically  | 2007 | The objectives of this paper were firstly to profile   |

<sup>9</sup>Social Economic Status (SES)

<sup>10</sup>Computer Assisted Personal Interviewing (CAPI)

|   |                                 |   |            |   |  |             |  |
|---|---------------------------------|---|------------|---|--|-------------|--|
| <p>best microbiological food safety advice? An examination of 'high-risk' consumers on the IOI.</p> |                                 |   |            | <p>implemented. The selection of group participants for the qualitative research was based on the demographic profiles from the quantitative study.</p> | <p>profile 'high-risk' groups on the IOI. A series of statements were used to measure knowledge and questions on a number of demographic factors.</p> <p>Qualitative study consisted of 12 focus groups, 8 in the ROI and 4 in NI. Face-to-face questionnaires were used to recruit.</p> |             | <p>and identify 'high risk' demographic groups on the IOI and secondly to investigate, with these groups, their knowledge of microbiological food safety and the microbiological food safety handling and preparation behaviours they engage in.</p> |
| <p>Food safety education: a cross-border, comparative study of food risk perception</p>             | <p>Share <i>et al.</i> (77)</p> | <p>397 participants aged 14 to 17 year old children and their parents (237)</p> | <p>IOI</p> | <p>Purposeful sampling in 10 second-level schools (5 in NI and 5 in ROI)</p>  | <p>Quantitative study: students completed the questionnaires in the presence of a teacher. Parental</p>  | <p>2007</p> | <p>Quantitative survey of food risk perception, food choice, knowledge and attitudes to food safety and</p>  |

|   |                                   |   |            |  |  |             |   |
|---|-----------------------------------|---|------------|--|--|-------------|---|
| <p>in post-primary schools and the development of a model for implementing effective curricular change.</p> |                                   |   |            |  | <p>questionnaires were self-administered at home.</p>  |             | <p>nutrition among young people.</p>  |
| <p>Identification of critical control points during domestic food preparation.</p>                          | <p>Kennedy <i>et al.</i> (57)</p> | <p>120 consumers aged 18 to 67 years.</p> | <p>IOI</p> | <p>Quota control (60 participants). Sample representative of main food shopper in terms of age and gender.</p> | <p>Filmed participants while they prepared a meal according to specified recipes in a test kitchen environment (60 consumers) and in their own home (60 consumers); swabbed key contamination sites in the kitchens for microbiological testing; sampled</p> | <p>2009</p> | <p>Investigated consumer attitudes, knowledge, perceptions and actual behaviour related to food safety.</p> |

|  |  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|--|
|  |  |  |  |  | the meat and salad components of the cooked meals for microbiological testing; recorded chill-chain temperature data; inspected the meat after cooking; and administered a survey of knowledge, attitudes and perceptions to participants. |  |  |
|--|--|--|--|--|--|--|--|

|  |                  |  |            |   |  |             |   |
|--|------------------|--|------------|---|--|-------------|---|
| <p>A research study into consumers' attitudes to food labelling.</p> | <p>FSAI (78)</p> | <p>1,071 consumers<br/>16+ years<br/>15+ years</p> | <p>ROI</p> | <p>Quantitative survey consisted of participants that were spread according to gender, social class category and covered households which did and did not have children.</p> <p>Qualitative interview consisted of participants that were split across gender, age and social class category.</p> | <p>Investigation into consumer attitudes, knowledge and understanding of food labelling. Quantitative study (face-to-face surveys with 1,021 consumers aged 16+) followed by a qualitative study (face-to-face interviews with 50 consumers aged 15+).</p> | <p>2009</p> | <p>Objective of the study was to establish if consumers understand the various forms of labelling currently presented on foodstuffs and the efficiency of such labels to assist them in making informed purchasing choices.</p> |
|--|------------------|--|------------|---|--|-------------|---|

|  |                            |                             |     |   |   |      |   |
|--|----------------------------|-----------------------------|-----|---|---|------|---|
| Public perceptions of the dioxin crisis in Irish pork. | Kennedy <i>et al.</i> (79) | 350 panel members aged 18+. | ROI | <p>The participants of this internet-based longitudinal risk-monitoring panel were chosen randomly from the Irish population using the GeoDirectory<sup>11</sup> and invited to participate.</p> <p>350 panel members were questioned specifically on the dioxin issue. Socio-demographic characteristics were collected.</p> | Internet-based survey carried out in December 2008. | 2010 | The aim of this study was to assess public perceptions about the dioxin incident in late December 2008. |
|--|----------------------------|-----------------------------|-----|---|---|------|---|

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<sup>11</sup> GeoDirectory = database of all occupied residences in the Republic of Ireland compiled by Ordnance Survey Ireland and An Post (the Irish postal service).

## 2.2 Food safety knowledge on the island of Ireland

While data on the wider influences on food safety behaviour are limited, several studies have examined knowledge of food safety among consumers on the IOI. The research shows that there are many gaps in food safety knowledge and practices that may result in foodborne diseases. Food can be mishandled at any number of places during food preparation, cooking and storage, and the evidence indicates that consumers have inadequate knowledge about the measures needed to prevent foodborne illness in the home (80).

McCarthy *et al.* (2007) examined consumer knowledge regarding food safety practices; food safety and food science amongst the population on the IOI (see Table 3.1 for study details). The authors found that the majority of study participants knew what they should be doing in their kitchen from a food safety perspective (73). However, they often did not follow the best practice guidelines and judged less than ideal food handling practices to be acceptable. Knowledge of best food safety practice was high, while the level of food science knowledge was rather low. The authors identified four segments within this population based on their food safety knowledge; 'At-Risk', 'Food Safety Conscious', 'Food Science Knowledge Deficient' and 'Informed'. The 'At-Risk' segment had less than ideal food safety practices and significantly lower knowledge about food safety and food science issues (81-82). Members were more likely to be male, in the 18–24 years or the 64 years-plus age categories, with a primary level education. They were less likely to read broadsheet newspapers or have completed a home economics course.

Kennedy *et al.* (2005) (see Table 2.1) also demonstrated that consumers in the IOI could be segmented successfully based on their food safety knowledge and reported practice. The authors identified three groups of consumers based on their knowledge; 'conscientious', 'cavalier' and 'careful' food handlers. The higher risk 'cavalier' group consisted mainly of consumers that were less than 45 years of age, male, living in urban environments and those with higher levels of formal education. Furthermore, this group was found to engage in less hygienic food handling practices (68).

These studies both show that young people, and both older and younger men, may be particularly at risk of low levels of food safety knowledge. This is consistent with the international literature (83-87). The effect of educational level is unclear, but formal food safety training (e.g. home-economics courses or food hygiene courses) may be important.

More recently, Kennedy *et al.* (2011) studied consumers' food safety knowledge and behaviour in the domestic food environment in relation to specific organisms, temperate control, food safety practices and foodborne illness in a group of 120 participants on the IOI (see Table 3.1 for details) (57). Participants' scores on the food safety knowledge and scores on the observed safe food behaviour were moderately and positively correlated and food safety knowledge was an

important predictor of observed food safety score. These results indicate that improving food safety knowledge can have an impact on food safety practice, but cannot be the sole solution for improving food safety behaviour. The authors also showed that consumers had, in general, a good knowledge and understanding of the importance of food safety, but this was not always practiced (57).

### 2.2.1 Sources of food safety information

A report from the Food Safety Authority of Ireland (FSAI) in the ROI conducted in 2003 showed that the main sources of information on food safety were newspapers/magazines (52%); television (40%); followed by supermarkets (14%) and food labels (12%) (71) (see Table 3.1 for further details). Reports from 2003 (71) and 2007 (75) found that for young people (aged 12-14) the main sources of food safety information include parents and schools. The 2007 report on children's attitudes also showed that one in five children used the internet to source food safety information (75). More recently Kennedy *et al.* (2011) also obtained responses on sources of food safety information from a small sample of adults ( $n^{12} = 57$ ). The six most commonly reported sources were similar to the previous study and included television (29%), food labels (14%), books (9%), newspapers (8%) and leaflets and supermarkets (each 6%) (57). The use of newspapers had fallen dramatically, with a modest reduction in the use of television, perhaps giving some indication of the reduced importance of newspapers and television in the face of growth in other media. The internet was also listed as a source of food safety information in five per cent of cases. With regard to social media, **safefood** has also recently investigated attitudes to using social media for food safety information. A representative sample of 2,041 participants from the IOI aged 15+ were interviewed face-to-face, during an in-home survey. Twenty one per cent of social media users in ROI would regularly or occasionally talk to friends about food safety on social media compared to eight per cent in Northern Ireland. Of all those surveyed, whether they currently use social media or not, 12 per cent in ROI and six per cent in NI said they would be interested in joining conversations on food safety. These results indicate that use of social media to share food safety information is currently low among consumers, with greater acceptance in the ROI.

With regard to food labels, a report published by the FSAI in 2009 showed that one in four consumers always consult food labels and 44 per cent *always* or *usually* consult food labels. Eleven per cent said that they were looking for best before dates (41). This was considerably lower than reported in previous surveys (71, 75), perhaps due to an increased emphasis on

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<sup>12</sup> n= sample size



healthy eating among consumers in the ROI. Other food safety information sought on food labels by consumers in the ROI includes cooking instructions and storage instructions (75).

Overall, the results show that a variety of channels to communicate food safety messages could be utilised. Television remains an important source for adults, while the internet appears to be a more pertinent method for communicating with children and young people. Both home and school are important settings in which to communicate food safety messages. Scope remains to promote the use of food labels as an important source of food safety information and increase the proportion of the population utilising them. The use of social media to share food safety information among consumers is currently low.

### 2.3 Attitudes to food safety

Several reports help to document food safety attitudes the IOI. These include **safefood**'s Safetrak surveys (74-75), the Food Standards Agency's (FSA) Consumer Attitudes Survey from 2006/7 (1), a number of consumer reports from the FSAI (71) and a recent report on domestic food hygiene by Kennedy *et al.* 2011 (57) (see Table 2.1 for an overview). Much of the data refer to consumer concerns, both general and specific.

#### 2.3.1 General level of food concern among consumers on the island of Ireland

The first data on food safety concerns among consumers in the ROI was published in 2003 by the FSAI (71). At that time the proportion of people concerned about food safety ranked higher (52%) than the number concerned about nutrition. Since 2003, **safefood** has conducted regular market research surveys including questions on attitudes to food safety and nutrition (74). The surveys included approximately 800 people [<sup>13</sup>500 from the ROI and ~300 from NI]. Data is available on the general level of concern about food safety, concern about specific foods and food issues, where we eat, and food handling practices.

From 2003 – 2008, the Safetrak data shows that the general level of concern about food safety has varied greatly. Peaks were seen in early 2005 and early 2007, with 74 per cent of those surveyed stating that they were concerned. A low of 56 per cent was seen in late 2005 and early 2006 (see Figure 2.1). There were a number of food and animal health incidents throughout the period, most notably in 2004 (avian flu) and 2006 (*Salmonella* in chocolate). Therefore it is difficult to determine why such variations in food safety concern levels existed, when levels of

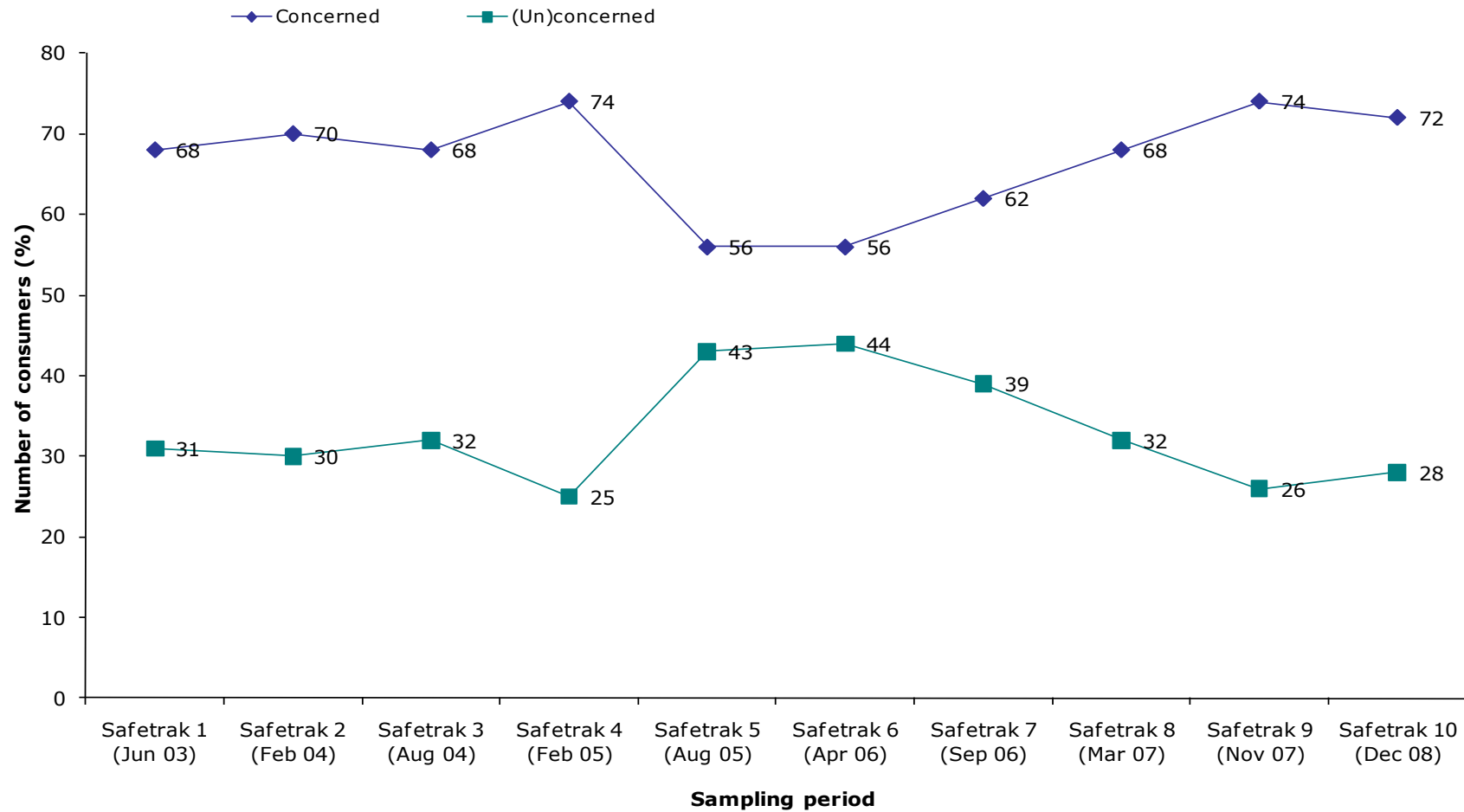
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<sup>13</sup> ~ approximately

## Changing Food Related Behaviour

concern might have been at their highest level (see Appendix A for a chronology). Research conducted in 2006 also asked participants to rank food safety among other major concerns. Concerns about crime (79% concerned) and the health service (76% concerned) scored higher than food safety concerns (62%) (75).

Figure 2.1: Consumer food concerns (prompted) - Safetrak 2003-2008



Data on attitudes to food safety in NI alone are available from the FSA's consumer attitudes survey (1). In comparison with healthy eating, food safety was seen as less of a concern for NI consumers, being mentioned by 12 per cent compared to 23 per cent for healthy eating. However, when asked directly, over three out of five respondents (63%) did claim to have some concerns over food safety issues, which is similar to the levels shown in the Safetrak research.

### 2.3.2 Specific food safety concerns

Between 2003 and 2009, surveys in the ROI, NI, IOI and the UK gathered data on consumer concerns about key food issues. The results of these surveys are influenced by the key food safety issues of the time. These surveys used a variety of methodologies, including both prompted and unprompted responses. This means that it is difficult to draw comparisons and conclusions regarding the key concerns but it is possible to give some indication of the food issues that are pertinent for consumers.

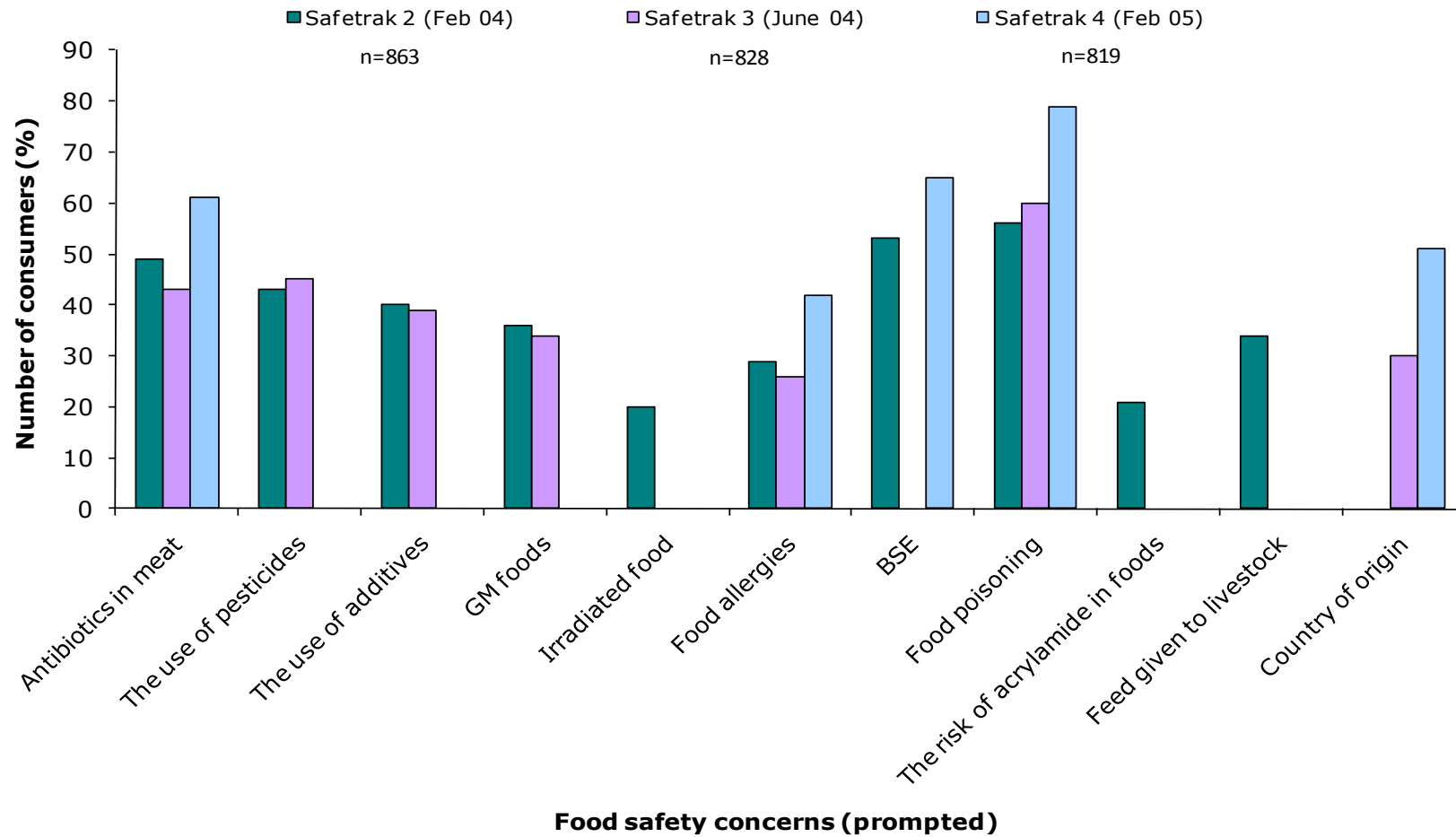
The FSAI study conducted in 2003 was the first study of consumer concerns in the ROI. Seventy per cent of consumers expressed concern about pesticides and herbicides, followed by Bovine Spongiform *Encephalopathy* (BSE)/Mad Cow Disease (67%) and food poisoning (65%) (71). In 2004 and 2005, consumers on the IOI participating in the Safetrak survey were asked, over three waves of the survey, if they were concerned about a number of listed key food issues. Issues of greatest concern to consumers on IOI included food poisoning<sup>14</sup> (65%), BSE (59%) antibiotics in meat (51%), additives (40%) and Genetically Modified (GM) foods (35%) (see Figure 2.2).

A Eurobarometer survey carried out across all 27 EU Member States, involving 26,691 individuals, aged 15 or over, found similar results for the level of concern about genetically modified organisms found in food and drink (46%). Fewer respondents were worried about the issues of BSE, i.e. 22 per cent of consumer in the ROI. The EU study showed that quality and freshness of food was found to be of major concern for consumers in the ROI (66%) (88). These reflect previous results from a study of food choice by the Institute of European Food Studies (1996) (89).

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<sup>14</sup> Values based on the average of three Safetrak surveys 2004-2005

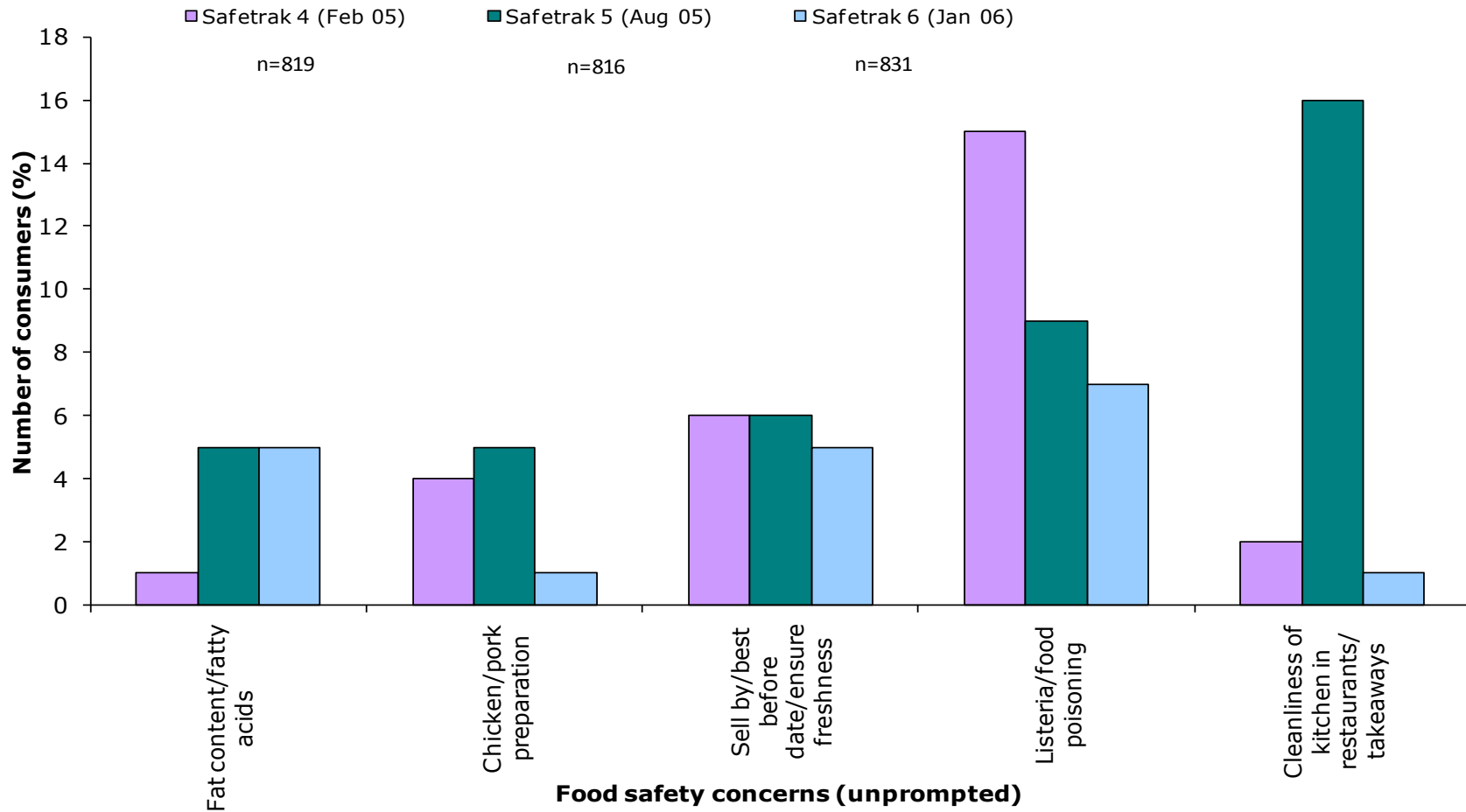
Figure 2.2: Consumers food concerns (prompted) - Safetrak survey 2004/2005



## Changing Food Related Behaviour

In 2005 and 2006 participants were asked to spontaneously list their food concerns. The results were highly variable but included cleanliness of restaurants and takeaways, food poisoning, chicken and pork preparation, sell-by and best before dates (see Figure 2.3).

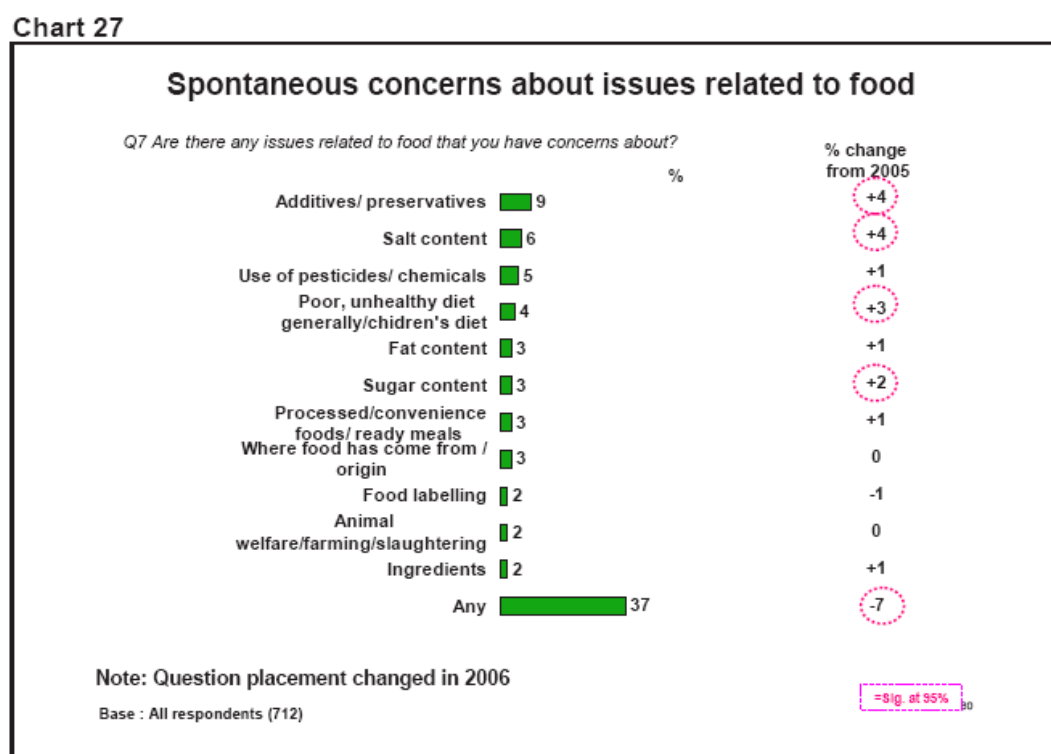
Figure 2.3: Consumers food concerns (unprompted) - Safetrak 2005/2006



Similar issues emerged in three surveys conducted in 2007 and 2008 (Safetraks 8-10), with food poisoning (22%), improperly cooked food (22%), date marks, best before dates, freshness (11%), hygiene around food (7.3%), county of origin (7%), handling/cross-contamination (6%) and additives/E-numbers/pesticides/dyes (6%) scoring highest.

In NI, the concerns relating to food safety that were spontaneously mentioned by participants included additives or preservatives (9%) and use of pesticides or chemicals (5%) (Figure 3.4) (1). In the same survey respondents were asked if they were concerned about a number of specific food issues (prompted). Concerns included food poisoning (46%), food additives (37%), pesticides (33%), hormones and steroids in meat (32%), antibiotics in meat (29%) and avian flu (28%).

Figure 2.4: Spontaneous concerns about issues related to food- FSA 2006 (NI data)



Results from studies carried out in the UK have shown a comparable level of food concern between the IOI and Great Britain. The FSA places six questions on the TNS<sup>15</sup> consumer face-to-face omnibus on a quarterly basis in order to monitor key food issues. The latest research was carried out in July 2010 with a representative sample of 2,111 adults in the UK (90). There was a significant decrease in concern about food safety issues from 70 per cent in December 2009 to

<sup>15</sup> TNS = Market Research Company



59 per cent in March 2010. The level of concern has fallen since tracking began in 2001. It was found that males were significantly less concerned about food safety issues than females. Those aged 26-35 were most concerned about food issues, as were those who were married and those working part-time.

The main issues of concern for respondents were the amount of salt in food (44%), food poisoning (43%), and the amount of fat in food (41%). Food hygiene when eating out (40%), the amount of sugar in food (38%) and the amount of saturated fat in food (38%) were also issues of concern. The unprompted concerns included food poisoning (17%), the amount of fat in food, amount of salt in food, food hygiene when eating out and date labels (13%) and the amount of sugar in food (12%) (90). Again, these mirror consumer concerns in both NI and the ROI.

In summary, the issues of greatest concern to consumers on the IOI have varied greatly between surveys and years. Concerns have included issues such as food poisoning, BSE, antibiotics, hormones and steroids in meat, additives, preservatives, pesticides, chemicals, GM foods, date labels, country of origin and avian flu. Since 2004, food poisoning has been one of the key consumer concerns across all surveys on the IOI and may reflect increased consumer communication on this issue and a growing understanding of its importance.

### **2.3.3 Food producers and providers of most concern**

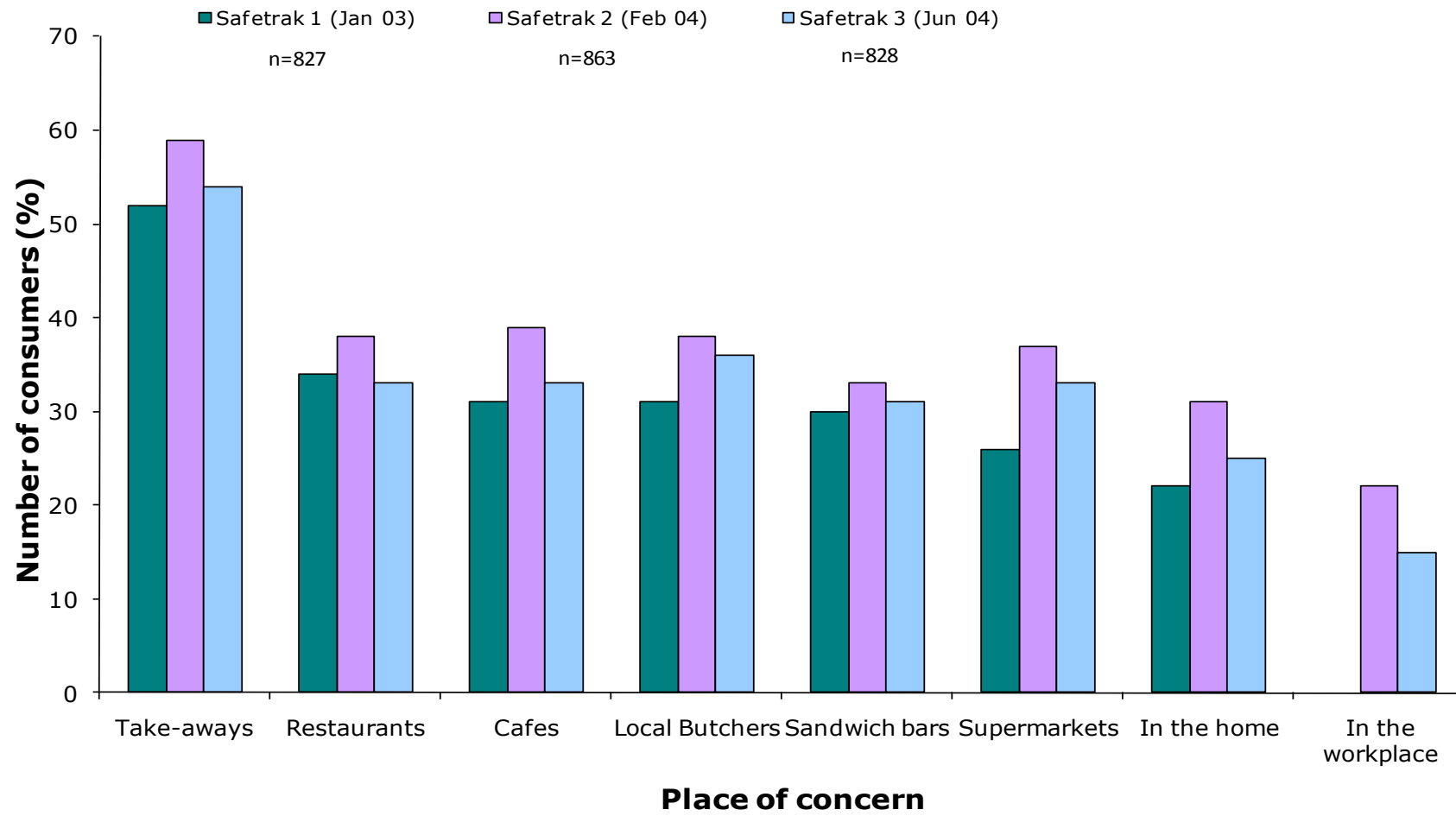
In 2002, the FSAI survey on consumer attitudes questioned consumers on their concerns about three sectors; farming, retail and catering. Thirty six per cent were concerned about the production of food on Irish farms, 37 per cent were concerned about food safety in shops and supermarkets, and 49 per cent were concerned about food safety in the catering sector. Of those who were concerned about food from Irish farms the main concerns were the use of chemicals/fertilisers/sprays (36%), BSE/foot and mouth/*E. coli*/*Salmonella* (21%) and hygiene/pollution (16%). Of those concerned about shops and supermarkets the main concerns were sell-by-dates/freshness (21%), where food comes from (19%) and hygiene (18%). Those who were concerned about the catering sector were most concerned about hygiene/handling of food (59%), followed by food not being cooked properly and where food comes from (both 16%) (see Table 2.2) (71).

**Table 2.2: Unprompted consumer concerns in the ROI about food production on farms and food safety in shops, supermarkets and in the catering sector**

|                        | Farms   | Shops and Supermarkets           | Catering Sector                   |
|------------------------|---|----------------------------------|-----------------------------------|
| <b>Overall concern</b> | 36%   | 37%                              | 49%                               |
| <b>Concern 1</b>       | Chemicals/fertilisers/sprays<br>(36%)                           | Sell-by-dates/freshness<br>(21%) | Hygiene/handling of food<br>(59%) |
| <b>Concern 2</b>       | BSE/foot and mouth/ <i>E. coli</i> / <i>Salmonella</i><br>(21%) | Where food comes from<br>(19%)   | Improperly cooked food<br>(16%)   |
| <b>Concern 3</b>       | Hygiene/pollution (16%)   | Hygiene<br>(18%)                 | Where food comes from (16%)       |

Between 2003 and 2004, over three waves of the Safetrak survey, consumers on the IOI were asked which food providers they were most concerned about. The responses were relatively consistent over each survey phase and reflect the FSAI's finding that consumers were most concerned about the catering sector. Consumers were most concerned about take-away establishments, restaurants, cafés and butchers and least concerned about their homes and workplaces (see Figure 2.5).

Figure 2.5: Food sources of most concern to consumers-Safetrak 2003-2004



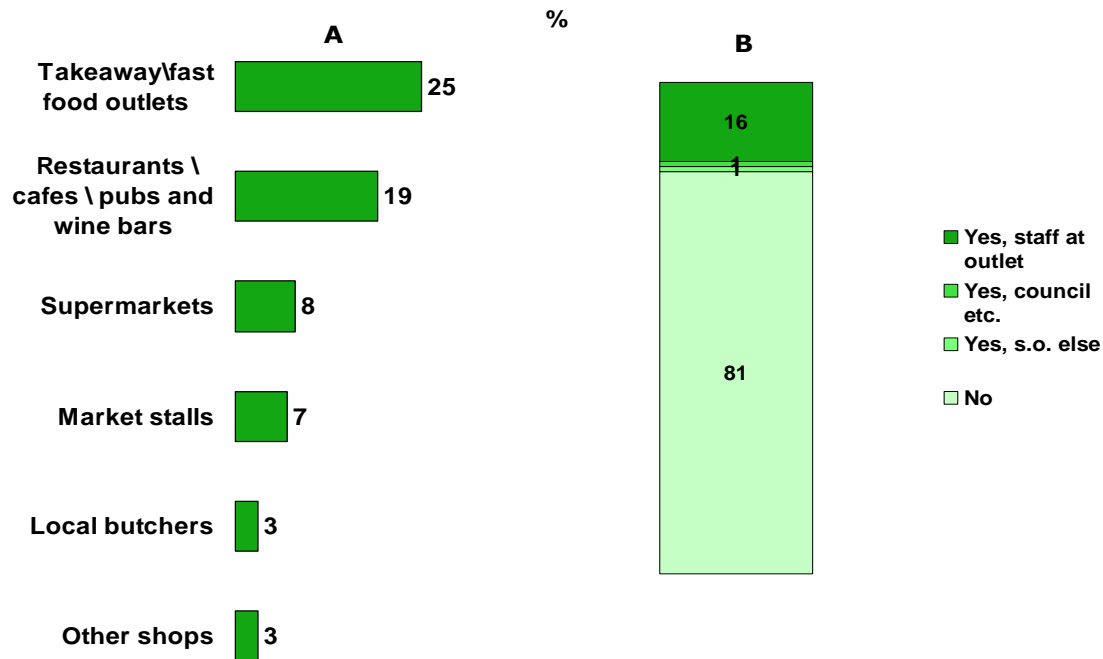
## Changing Food Related Behaviour

In 2006 NI consumers were asked if they had concerns in the past 12 months about particular eating venues (1). The most common response was takeaway/fast food outlets (25%) followed by restaurants/cafés/pubs/wine bars (19%). All other places were mentioned by less than one in ten respondents including supermarkets, market stalls and butchers (see Figure 2.6). The key places of concern reflect those of the all-island sample in the Safetrak survey.

Figure 2.6: Food venues of concern to consumers (FSANI (i))

**Concerns about hygiene**

A) Have you been concerned about hygiene in any of the following places in the last 12 months?  
 B) And the last time you were concerned about hygiene did you report your concerns to anyone?



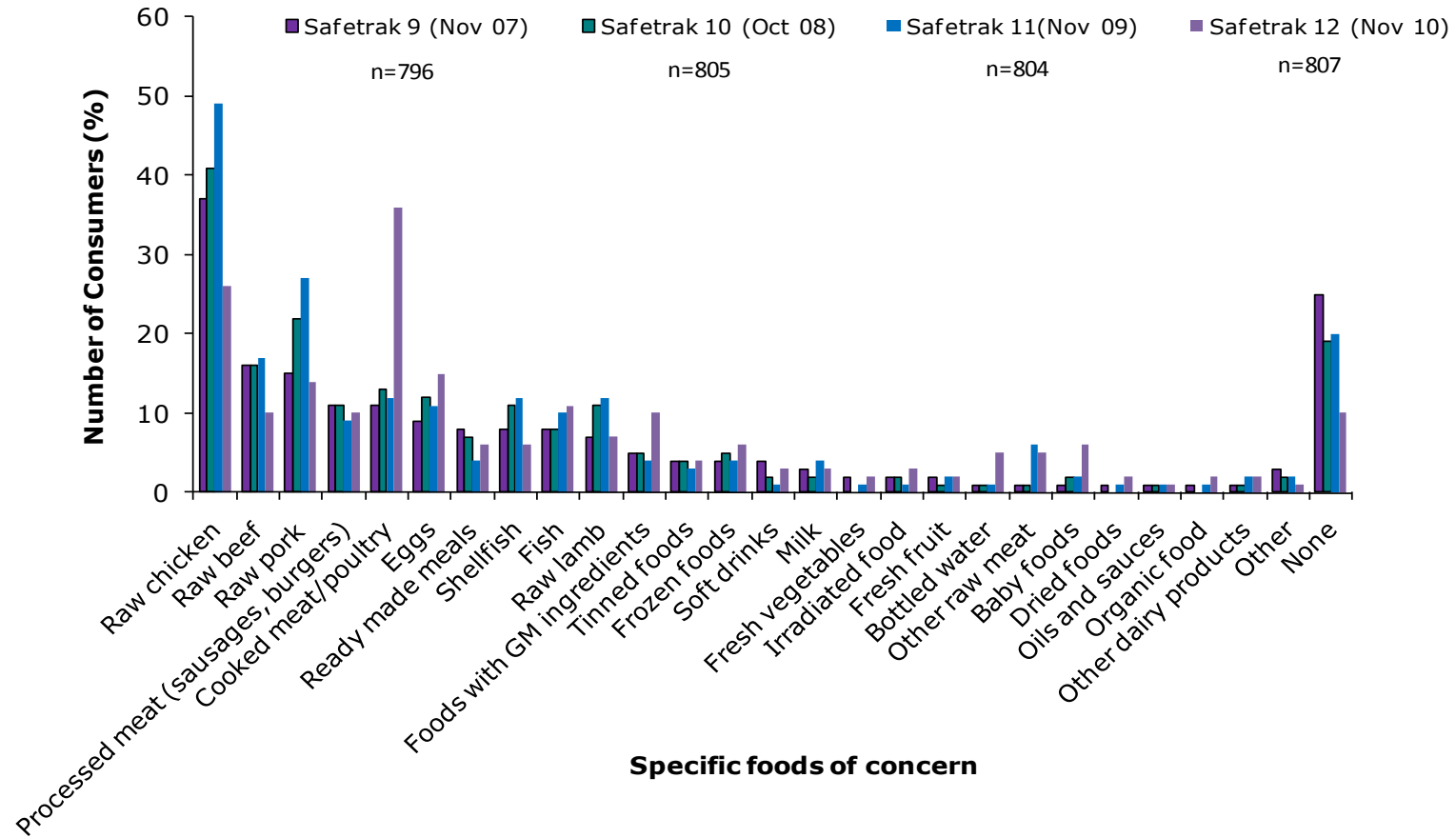
Base : All respondents (712) and all respondents concerned about hygiene in the last 12 months (289)

For children, survey questions asked about *perceived safety* rather than *level of concern* about particular establishments. This makes comparison of the responses of adults and children difficult. Restaurants were perceived as 'very safe' by almost three in ten (29%) 12-14 year olds, followed by convenience stores (23%) and cafés (19%) (71). As was observed in the adult responses, children also showed most concern for take-away establishments and considered them to be the least safe food establishments.

### **2.3.4 Specific foods of concern**

Between 2007 and 2010, consumers participating in Safetrak were asked about the foods that were of most concern. Raw chicken, raw beef and raw pork, processed meats, cooked meats and eggs (see Figure 2.7) emerged as key concerns. It should be noted that a high proportion of respondents said that they had no concerns about specific foods.

Figure 2.7: Specific foods of concern for IOI consumers (unprompted) Safetrak 2007/2008



The specific nature of the concerns around each food has been outlined in previous consumer focused reviews (see [www.safefood.eu](http://www.safefood.eu)). Data from 2004 showed that the main concern that respondents mentioned spontaneously (i.e. without prompting) was preparing and cooking chicken properly (12% NI, 19% ROI). In NI, this was followed by country of origin of the chicken (12%) and *Salmonella* poisoning (11%) while in the ROI the second and third concerns were battery chickens/what they are fed and *Salmonella*/food poisoning. When participants were shown a list of possible concerns, NI and ROI consumers most often selected 'getting food poisoning from chicken' (19% NI, 24% ROI).

As with Safetrak, respondents to the FSA's Attitudinal Survey (2007) were particularly worried about raw meat. 36 per cent spontaneously mentioned raw chicken, 16 per cent were concerned about raw pork and 15 per cent were concerned about raw beef (1).

### 2.3.5 Concerns among young people

A survey of 209 young people aged 12-14 years in the ROI revealed that a minority (19 per cent) were very concerned about the food that they eat (75). This was less than the proportion very concerned about societal issues such as drugs (30%), crime (27%) and racism (20%) but slightly higher than the proportion very concerned about the healthiness of food (16%). The level of concern about food safety was marginally higher than had been found in a similar survey conducted in 2002 (14%) (71). Those least concerned about food safety and healthiness of food were likely to be boys and those aged 12 years.

#### Specific food concerns among young people

When questioned about their most pressing food concerns, the primary concern expressed spontaneously was the fat content of food (11%), followed by the taste of food (9%), the amount of additives and E-numbers in food (9%), the nutritional value of food (8%) and the freshness of food (8%). The findings showed that girls were significantly more likely than boys to be worried about fat content, whereas boys were more likely than girls to be concerned about the taste of food (75).

When prompted with a list of food issues and asked to state their degree of concern, food safety rated higher than fat content with one in two (50%) young people expressing concern. In comparison, two in five were concerned about the fat and the calorie content of food (43% and 40% respectively).

By contrast, in 2003 children's main concern was identified as BSE or Mad Cow Disease with more than half expressing unhappiness about it. This was closely followed by concern about



food poisoning (46%). The majority of children did not identify genetically modified food or microorganisms in food as a concern (78% and 81%, respectively), but four in ten had concerns about animal welfare and three in ten reported that they were unhappy about additives (71). Like adults, a minority of children spontaneously expressed concern, however a large proportion do so when prompted.

### **2.3.6 Attitudes to food technologies**

There is currently limited published data available on the IOI on public attitudes to emerging food technologies, with the exception of GM foods in the Safetrak study (74) and Vilei and McCarthy (2001) (91). The Safetrak study showed that more than one third of consumers were concerned about GM foods when prompted (Figure 2.2). The recent EU Barometer study has shown that this has increased over time (46%) (88). Vilei and McCarthy surveyed 200 consumers, selected to reflect the population census and reported a high level of awareness, but a low level of understanding of the application of gene technology and acceptance of it. Only 11 per cent believed gene technology in food production was a positive development while 12 per cent were willing to buy products produced with, or containing, GMOs. Younger respondents, males, respondents with third-level education and respondents from upper socio-economic classes showed greater acceptance of gene technology (91).

In the UK, the FSA has recently commissioned a large-scale review in this area (70), which explores attitudes to a variety of technologies. The report showed that although the majority of individuals have a low level of knowledge, in general people are nonetheless wary, uneasy, and uncertain and, in some cases have negative feelings towards food technologies. Levels of awareness differed for different technologies. For example, 81 per cent of UK respondents had heard of animal cloning (92) and 94 per cent had heard of GM (93), while few had heard of nanotechnology (29% had heard of it while 19% could define it) (94). Consumers were more positive about functional foods because of their clearly promoted consumer benefits. Consumers were most negative about GM and animal cloning, followed closely by synthetic biology and nanotechnology. In general, women were more concerned, less positive and less likely to perceive benefits of food technologies than men.

Results from in-depth interviews and deliberative workshops showed that participants held a wide range of views on GM foods. These ranged from negative attitudes, where participants were concerned about the health and environmental risks, to positive views which centred on benefits to society. Others were undecided because of a perceived lack of knowledge (either personal or lack of available evidence), while a fourth group were defined as not having a view, either because the issue was not a priority or because the participant considered it a private

matter of choice. Attitudes were informed by views towards food and food production, attitudes towards science and technology and in some cases, pragmatic considerations (70).

## 2.4 Perceptions of food safety

Over the past decades few reports have examined food risk perceptions or perception of the importance of food safety behaviour on the IOI (79). Studies were mainly published by national agencies. Several have examined perceptions of individual foods or food chains including *safefood*'s consumer focused reviews and are not included here (available at [www.safefood.eu](http://www.safefood.eu)).

### 2.4.1 General perceptions of food safety

Data collected in 2002 and 2006 in the ROI showed that many consumers perceive that food safety was improving. In 2002, more than half (53%) of the consumers surveyed considered that food was safer then than it was 10 years previously, while in 2006 this had risen to 75 per cent (71, 75). However, according to data from EFSA collected in 2010, this figure had fallen to 56 per cent of consumers in the ROI (88).

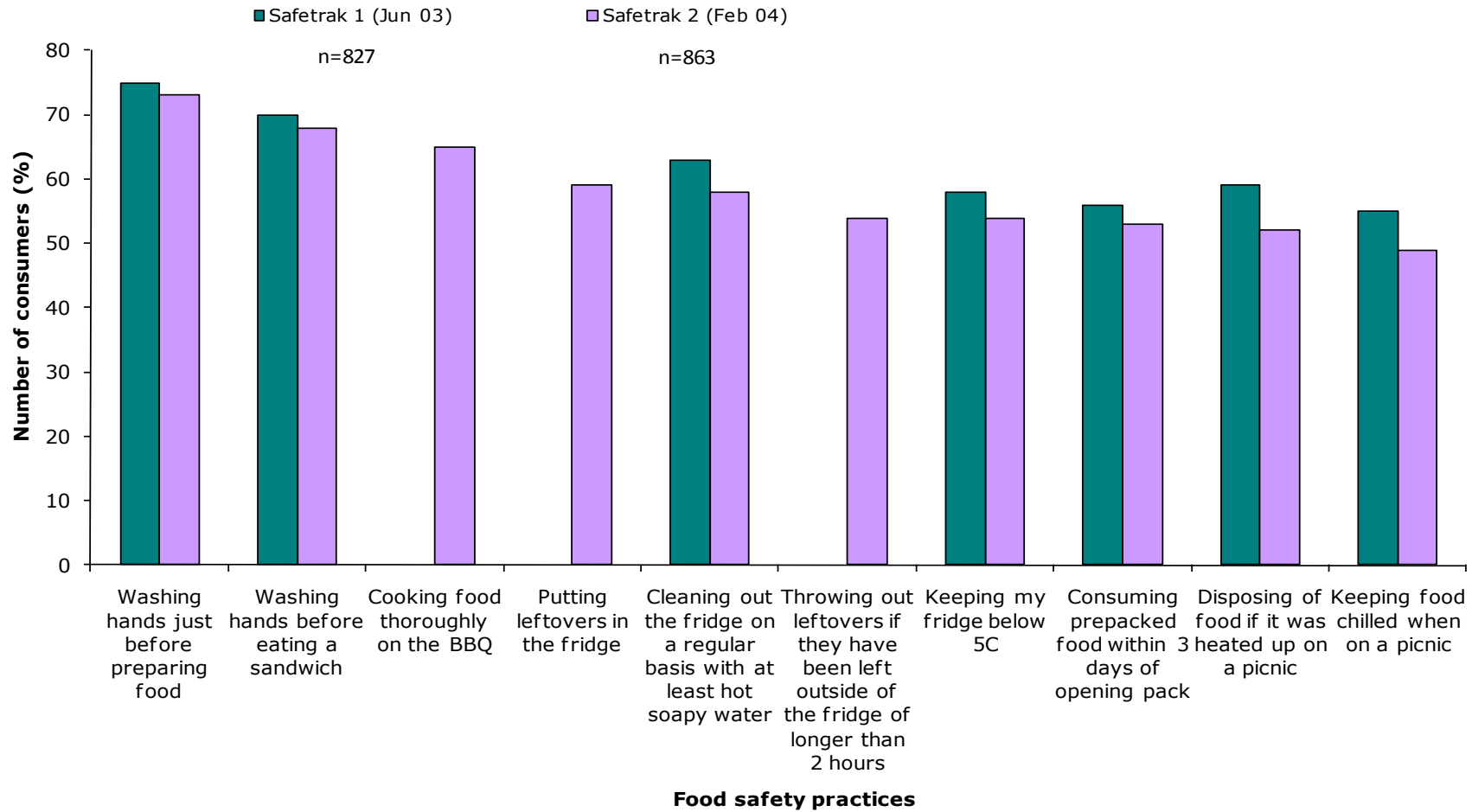
Reasons for the perceived improvement included greater public awareness, better hygiene, improved regulation and policing, and that safety is increasingly seen as an economic imperative (71). Concerns by those who believed that food is less safe include issues such as “the greater distances that food travels (food miles)” and “the lack of knowledge of the source of food”.

Sixty one per cent of respondents in 2002 expressed confidence in the food safety measures currently in place with one in five consumers (21%) reporting that they were not confident in the current food safety measures (71). The main reasons for lack of confidence included a perception that regulations are not enforced (18%), that consumers are not well informed (14%), that the regulations/standards are not adhered to (11%) and also based on their own personal experience (11%). Other respondents felt that media reporting and a lack of trust in imported food also contributed to their lack of confidence in the current food safety measures (71). The latest *safefood* consumer focused review on food origin showed similar scepticism with regard to the foods that are sourced outside the IOI (95).

#### **2.4.2 Perceived importance of food safety behaviour**

In 2003 and 2004, respondents to the Safetrak survey were asked which food safety behaviour they considered to be most important. Perceived importance was high for many behaviours with the greatest importance placed on washing hands before preparing food, washing hands before eating a sandwich and cooking food thoroughly on the barbeque (see Figure 2.8).

Figure 2.8: Perceived importance of food safety practices (prompted) - Safetrak 2003/2004



More recently Kennedy *et al.*, 2011 surveyed 60 consumers on the perceived importance of key food handling practices in the prevention of foodborne illness (57). Respondents indicated the importance of nine food safety behaviours relating to transport, storage, handling and cooking of foods. The importance of all behaviours was considered high. There was a significant relationship between perceived importance and educational attainment and age, with older individuals more likely to perceive correct food practices as important. Women and those following a specific diet were also more likely to consider correct food safety practices as important. There were no significant differences in perceived importance between participants from the ROI and NI.

### 2.4.3 Food risk perception

In NI, food safety risk perception was investigated by Nelson in 2004 (72). Nelson attempted to elicit both societal risk and personal risk by asking about 15 types of risk, of which four were generic food risks (diet related; food poisoning, food contaminants and food additives). Societal risk was measured by asking participants to estimate the consequences for others, while personal risk was estimated by asking about consequences for themselves.

When a total score for the societal and personal risk items was calculated, it was observed that the estimation of risk increased as the level of formal education increased. There is a strong correlation between perceived personal risk and perceived societal risk. Respondents who suffered a food safety incident in the past two years perceived the risk to themselves as significantly higher than those who had not suffered an incident. They considered this perceived high risk to be across the whole food chain and not just affecting the culpable food. As part of the same study the authors grouped risks as extrinsic (including nitrates, irradiation, food colourings, food preservatives, pesticides, angel dust, BSE, cling film and foreign bodies) or intrinsic risks (including food poisoning, fat, salt, sugar, personal hygiene, and temperature control of fridges and freezers) and assessed in relation to key attributes. Involvement (the degree of perceived participation and control respondents have in decision-making processes) was seen to be higher in the intrinsic group, and if involvement fell (for both groups) fear increased. These findings reflect the psychometric model, where control is a key factor risk perception (96).

Kennedy *et al.* (2011) used the novel methodology of vignettes<sup>16</sup> to assess risk perception (4). The vignettes portrayed short scenarios about other people, which removes the potential for bias regarding one's own behaviour and may provide a more valid and reliable measure of attitude (97). Respondents indicated their perceived risk of contracting food poisoning on a five point Likert Scale<sup>17</sup> in relation to nine of these situational vignettes, with responses ranging from "not at all likely" (1) to "very likely" (5)

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<sup>16</sup>Vignette: short, impressionistic scenes that focus on one moment or give a particular insight into a character/idea/ setting.

<sup>17</sup> Likert Scale is a format of questionnaire used in consumer research

(see Table 2.3). The vignettes considered most likely to cause food poisoning related to chopping raw meat and foods that would not be cooked on the same chopping board, and preparing food without washing hands when working on a farm (4). Overall, participants reported a high level of perceived risk of contracting food-borne illness from these scenarios. Higher perceived illness was associated with increased age.

**Table 2.3: Perceived risk of contracting food poisoning (4)**

| <b>Situational Vignettes</b>   | <b>Mean</b> | <b>SD</b> |
|--|-------------|-----------|
| Jim prepares food, which is not going to be cooked, on a chopping board and prepares raw meat on the same chopping board   | 4.27        | 1.24      |
| Mike is a farmer. When he comes home from work and prepares sandwiches, he often forgets to wash his hands first   | 4.27        | 1.27      |
| When Julie is barbequing she uses tongs to lift the raw meat and vegetables onto the grill. When the food is fully cooked, she uses the same plate and tongs to bring them to the patio table, where they are eaten within 3 hours | 4.20        | 1.24      |
| Sam keeps raw meat anywhere there is space in the refrigerator   | 4.17        | 1.21      |
| Lucy checks that her beef burgers and poultry are sufficient cooked by making sure they have a crisp, brown outer coating  | 4.02        | 1.28      |
| Susan does not have a thermometer so she is never sure what temperature the refrigerator is operating at   | 3.78        | 1.20      |
| Kate buys discounted food which is on its use-by date, stores it in the refrigerator and eats it within 2 days   | 3.55        | 1.46      |
| Susan ate in a restaurant that she later heard had received an 'improvement notice' a week previously  | 3.55        | 1.18      |
| When Mark goes shopping it usually takes him more than 90 minutes to get the food from the supermarket to home storage   | 3.43        | 1.29      |

### Risk perception in young people

Share *et al.* (2007) examined teenage students' perceptions of food risks in a study that involved 397 students in 10 second-level schools (5 in NI and 5 in the ROI). Students who took part in the study comprised two distinct age groups, 14 year olds and 17 year olds. The study showed that older students were more likely than younger students to think of contaminated food as a risk to their health, although the magnitude of the difference in the means was small. Socio-economic differences were also apparent between schools. Grammar school students in NI and private school students in the ROI were more likely than students in public state-funded secondary schools to think of food issues as a risk to their health. Parental perceptions mirrored those of their teenage children. In NI, parents with children in grammar schools were more likely than parents with children in public secondary schools to consider additives and preservatives as a risk to their health. In the ROI, parents with a child in a private school more so than those with a child attending a state-funded school, considered genetically modified foods and chemical residues in food a risk to health (77).

### Risk perception following a major food recall – the dioxin incident

In December 2008 the Dept. of Agriculture, Fisheries and Food in the ROI discovered, during routine monitoring, the presence of PCBs in pork fat, a possible indicator of the presence of dioxin. This resulted in the recall of all pork products manufactured from pigs slaughtered in Ireland over the previous 3 months. Local, international and online media coverage was widespread. One year prior to the incident **safefood** (2008) conducted a study which showed that consumers had no real food safety concern regarding pork, beyond that it should be cooked thoroughly (98). An online survey conducted by Kennedy *et al.* (2010) that was ongoing during the incident (Table 2.1), showed that following the pork recall a minority of respondents considered the human health risks from dioxin to be very high (8.6%). Respondents also rated the health implications from dioxin as a more important consequence (64.3%) than loss of reputation for Ireland as a food exported (19.8%), the economic loss to Irish farmers and processors (13.0%) and the temporary availability of pork products (2.9%). As part of the survey, the respondents rated 47 food and non-food related risks. The risk posed by dioxin was considered low compared to many other risks and lower than the fat content of food, as an example of a food-related risk. These results indicate that during a major food incident, consumers in the ROI were able to assess the risk posed and put it in perspective (79).



#### **2.4.4 Perceived responsibility for food safety**

Consumers on the IOI are most concerned about eating food prepared outside the home (71, 74). These findings are supported by results from the study by Kennedy *et al.* (2010) which asked respondents to attribute level of responsibility to key groups along the food chain. The highest level of responsibility was attributed to food service providers, followed by individuals themselves, food retailers and food manufacturers. Overall, this shows that the final preparer of the food is top of mind for the consumer. When compared to sources of foodborne outbreaks, results are broadly similar. An FSAI survey showed that the private home has been implicated as the third most frequent source of outbreaks of foodborne disease between 1998 and 1999 after hotels and restaurants/takeaways/cafés (99).

### **2.5 Barriers to good food safety practice**

In 2005, Bolton *et al.* examined consumer food safety knowledge, microbiology and refrigeration temperatures in domestic kitchens on the IOI (see Table 2.1 for further detail) (56). A representative sample (1,020) of households participated in a knowledge survey and refrigerator investigation (microbiological and temperature survey). In this study, the authors identified a range of food safety barriers. These were; time constraints, food safety knowledge, proper hand washing, cooking practices (time, temperature, etc), proper storage and handling of food. Overall, this study demonstrated that domestic kitchens represent an important potential source of food poisoning and has highlighted the need for householders on the IOI to be further educated about safe practices in relation to food purchase, storage, handling and preparation (56). Furthermore, Brennan *et al.* (2007) carried out similar research (see Table 3.1) where they profiled and identified 'high risk' demographic groups (1,025 participants) on the IOI and investigated, with these groups, their knowledge of microbiological food safety and the microbiological food safety handling and preparation behaviours they engaged in. The authors found that personal (overconfidence; lack of interest), environmental (technological) and lifestyle (time and energy investment) characteristics were the source causes of poor food practices (76).

## 2.6 Conclusions

Little data is available on the wider environmental influences on consumer food safety behaviour on the IOI, and in particular, qualitative investigations have seldom been carried out. From studies on consumer knowledge there is evidence of gaps in consumer knowledge, which may result in foodborne illness. Young people, and older and younger men, may be particularly at risk due to low levels of food safety knowledge. The use of prompted and unprompted questions in a variety of studies has shown that while food safety issues were not spontaneously mentioned and therefore may not be top of mind, consumers express a high degree of concern about a wide variety of food safety issues when presented with a list of issues. In recent years food poisoning, in particular, has become a significant perceived risk for consumers. Risk perception in relation to key food safety practices among consumers on the IOI is high. Women and those with higher education had greater perceived importance of food safety. Women, those with higher socio-economic status and greater experience, had higher perceived food risk. These gender and socio-economic differences in attitudes should inform targeting of food safety messages.

Despite the general high level of concern, best practice food hygiene behaviours are not always implemented. Equally, knowledge does not always result in better food safety practices. The mismatch between knowledge, attitudes and perceptions of food safety and actual behaviour requires further study. In particular, further investigation into the (i) predictors of and (ii) barriers to safe food safety practices is merited.

Recommendations for food safety behaviour research and communications are included in Section 3.7. A list of currently funded food safety related behaviour research projects are available in Appendix B.

### **3** Current consumer concerns, attitudes, perceptions and barriers to food safety on the island of Ireland: *safefood* research

## **Key findings**

### **3.1 Introduction**

### **3.2 Influences on food preparation practices**

### **3.3 Influences on food safety**

### **3.4 General concerns about food safety**

### **3.5 Changing food safety behaviour**

### **3.6 Conclusions**

### **3.7 Recommendations**

## **References**

## **Appendices**

## Key findings

### Influences on food preparation

- Habit and convenience, taste and appearance and living arrangements influenced the types of meals prepared.
- The mechanics and ease of preparation, presentation and scheduling of meals had priority over food safety.
- There was clear gender and life stage variation in food safety practices:
  - males tended to be more haphazard in relation to their approach to food preparation practices than females
  - young mothers described very busy schedules, which did not allow prioritisation of food safety when preparing food.

### Influences on food safety practice

- Participants that took part in the focus group research reported a wide variety of influences on food safety behaviour. These included:
  - physical influences such as food storage space and sensory perception
  - social influences such as time pressure, perceptions of other people, inherited habits and traditions
  - personal factors such as perceived responsibility, perceived risk, past experience
  - wider environmental influences such as the media.

### Food safety concerns

- Seventy seven per cent of those surveyed expressed concern when asked to describe their attitude to food safety issues.
- Men were less likely to worry than women and those in the 15-25 year old age group were found to be least worried about food safety.
- Key issues of concern include preparation of pork and chicken, additives and colourings, undercooked food and food poisoning, and date marks (freshness of food).

### Risk perception

- Qualitative research showed that females had a stronger association than males between illness and poor food safety practices.
- Younger males felt averse to any type of consequence borne out of risky food safety behaviour and felt invulnerable to many food hazards.

### Behaviour change

- Thirteen per cent of the adults surveyed felt that they needed to make changes to their current cooking, preparation and storage practices.
- Many of those who felt that they needed to make improvements claimed that “habit” was the main obstacle.
- Focus group participants felt that school-based education, media ubiquity, educational television programmes and publicity of foodborne disease outbreaks influenced behaviour.

**Communication**

- The need for segmentation of food safety messages according to gender and life stage was evident.

### 3.1 Introduction

This chapter provides an overview of results from qualitative and quantitative research carried out by **safefood** as part of this consumer focused review, to contribute to our understanding of knowledge, attitudes and behaviours around food preparation and hygiene behaviour on the island of Ireland (IOI). This research aimed to provide additional up-to-date information on the factors that drive food safety behaviour and the barriers to behaviour change. While the data provides some insight into the factors that drive behaviours, the limitations of both qualitative and quantitative research must be borne in mind in extrapolating the findings to the entire population.

#### 3.1.1 Background

To inform this review of consumer behaviour, **safefood** commissioned research to identify key consumer concerns, attitudes, perceptions and barriers to food safety and healthy eating among adults on the IOI. A mixed methodology (qualitative and quantitative research) was undertaken.

The quantitative research, which was carried out by Millward Brown Lansdowne between 23<sup>rd</sup> November 2009 and 8<sup>th</sup> December 2009, formed part of **safefood**'s bi-annual consumer tracking research entitled Safetrak. The questions used reflect previous questions included in **safefood**'s Safetrak and aim to address some of the influences identified in the introductory section. Nationally representative samples of adults aged 15-74 years were interviewed face-to-face, at home in the ROI (n=504) and NI (n =300). The methodology used quota sampling as a basis to ensure the sample was representative of the population on the IOI in terms of age, gender, region, marital status and social grade. For the ROI the quotas are based on the 2006 census for gender, age and region, and on the 2008/09 JNRS (Joint National Readership Study) for social grade. For NI the quotas are based on NISRA (Northern Ireland Statistics and Research Agency) population estimates for gender and age, and from the latest omnibus data for social grade (based on nationally representative of those aged 16-74).

The qualitative research involved a series of six focus groups in a variety of population groups and locations on the IOI (see Table 3.1). The research aimed to explore factors including knowledge, attitudes, prior experience, social norms, self-efficacy, habit, emotion and contextual factors in relation to food safety. It also explored knowledge, attitudes and perceptions around food poisoning, motivations for change and factors participants felt would help them change their current behaviours.

The research was conducted by Millward Brown Lansdowne, in association with a consultant social psychologist. Recruitment was carried out according to strict guidelines to reflect the population groups identified in Table 3.1. It must be noted that only participants who prepared three or more meals per

week were selected in most cases. Two researchers facilitated the focus groups. Analysis was carried out by both a Millward Brown researcher and by the consultant psychologist using thematic analysis (100). Themes identified by each researcher were compared and a final set of themes was compiled.

**Table 3.1: Food safety focus group composition**

| Group Number | Location | Gender | Age Group (y) | Social Class      | Life stage/Circumstance   |
|--------------|----------|--------|---------------|-------------------|---|
| 1            | Dublin   | Male   | 35 – 50       | BC1 <sup>1</sup>  | <b>Fathers</b> <ul style="list-style-type: none"> <li>• At least one child at home</li> <li>• Prepare ≥ 3 meals/wk</li> </ul>   |
| 2            | Cork     | Female | 30 – 45       | C1C2 <sup>2</sup> | <b>Older Mothers</b> <ul style="list-style-type: none"> <li>• At least one child at home</li> </ul>   |
| 3            | Ballina  | Male   | 50 - 65       | C2D <sup>3</sup>  | <b>Living alone</b> <ul style="list-style-type: none"> <li>• Combination single, divorced, separated and widowed</li> <li>• Prepare ≥ 3 meals/wk</li> </ul>                           |
| 4            | Limerick | Female | 20 – 29       | C1C2              | <b>Females with no children</b> <ul style="list-style-type: none"> <li>• No children</li> <li>• No students</li> <li>• None living at home</li> <li>• Prepare ≥ 3 meals/wk</li> </ul> |
| 5            | Strabane | Female | 25 – 34       | C2D               | <b>Young mothers</b> <ul style="list-style-type: none"> <li>• At least one child at home</li> <li>• Prepare ≥ 3 meals/wk</li> </ul>   |
| 6            | Belfast  | Female | 30 – 45       | C1C2              | <b>Older Mothers</b> <ul style="list-style-type: none"> <li>• At least one child at home</li> </ul>   |

<sup>1</sup>BC1 = Upper middle class

<sup>2</sup>C1C2 = Mixture of upper and middle class that are skilled working class

<sup>3</sup>C2D =Skilled and unskilled working class

The results will be presented together for both the qualitative and quantitative findings and will cover influences on food preparation practices, influences on food safety behaviour, food related concerns and attitudes to changing food behaviour.



## **3.2 Influences on food preparation practices**

The six focus groups revealed several key influences on food preparation practices among participants from a wide variety of socio-demographic groups.

### **3.2.1 Habit and convenience**

Most focus group respondents reported making meals that were easy to prepare and almost habitual in nature. Males were more pre-disposed towards cooking convenient and familiar foods and less likely to try new dishes on a regular basis. Convenience was also a key factor as respondents, both with and without families, readily admitted that they are under time pressure on a regular basis. The only cohorts who had time on their hands to prepare more extensive meals, were mature males living alone and mature females who no longer had children living at home.

### **3.2.2 Taste and appearance**

Flavour and taste were paramount in terms of meal preparation. It was essential, particularly for parents, to prepare meals their children would eat and enjoy. Females frequently mentioned presentation when it came to preparing a dinner, particularly in relation to cooking meals for guests. The importance of presentation for mothers was increased if they had fussy children. These mothers would hide vegetables in food for their children, e.g. using tomato sauce, mashing vegetables with potato and using gravy to disguise food.

### **3.2.3 Household composition**

Household composition generally dictated how/what meals were prepared for males. Younger (20-29 years) men without children generally prepared meals for themselves and possibly for housemates/girlfriends, while mature men living alone (50-65 years) generally prepared food for themselves. Fathers (35-50 years) generally prepared for their wives/children and want to have sole access to the kitchen during this time without multi-tasking, whereas mothers reported that they usually had to juggle a number of tasks while preparing their meal(s).

### **3.2.4 Kitchen management practices**

There were evident differences depending on life stage and gender amongst the participants. Males described a more haphazard approach to food preparation practices than females. For example, younger males tend to leave dirty kitchen utensils to accumulate and clean utensils on an as-needed basis. Younger men also displayed a poor knowledge of food safety practices. For example, they use an *ad hoc* approach for storing and defrosting foods. Research has shown that forms of masculinity such as risk-taking and invulnerability are factors that influence men's health practices (101). This reflects findings from previous research conducted on the IOI (68-69, 73) and internationally (see introductory section for references) and could leave young men at a higher risk of food poisoning.

*'I wouldn't re-heat something like KFC – you just sort of guess whether you should re-heat something or not' – Belfast BC1 Males 20-29 year of age and no children.*

Females and mature males portrayed a much more organised and methodological approach to food practices. They cleaned as they went along and said they had procedures in place with a view to being more efficient throughout the food preparation process. These efficiencies were driven by their attitudes and habits or by their circumstances. Having children, for example, necessitated an orderly approach to kitchen tasks. Fathers who were involved in meal preparation tasks described a structured approach to running the home and tended to break meal preparation into a series of tasks - preparation, cooking, mealtime and cleaning up.

### **3.3 Influences on food safety**

Participants in the focus group research mentioned a wide variety of physical, social, societal and wide environmental influences on their food safety practices. These often varied according to key socio-demographic factors such as gender, age and life stage.

#### **3.3.1 Physical factors**

Food storage space

Storage issues were described among younger males and females, many of whom have a room in a shared house. Due to limited storage space participants often purchased a minimum of fresh produce at a time. Storage shortage leads to the purchase of much more 'convenience' type meals, which are consumed in a short period. Many of the younger females were aware that meat should be stored at the bottom of the fridge. However, shared houses usually restrict each individual to one horizontal fridge shelf, therefore restricting optimal fridge management.

### Reliance on sensory inputs

The majority of respondents relied on sensory inputs to measure whether food was fit to prepare and consume. Men, in particular, trusted their own senses as a better indicator than 'use by' dates and were guided strongly by touch (meat and vegetables), taste (many different foods), smell (meat and dairy products) and the physical appearance of food (mould, green/grey colour of meat, etc.). Women, while also reliant on these sensory inputs, were more cautious.

### 3.3.2 Social and societal influences

#### Time pressure

Focus group discussions showed that females appeared to make a greater connection between poor food safety and illness, but in many instances time pressures meant that they were still haphazard in their approach to food safety. This finding did not emerge during the discussions with the male respondents, most likely because of their less systematic approach towards food safety and their humorous and dismissive attitude about the consequences of poor food safety. Some attitudinal differences between females at different life stages were apparent. Females aged 20-29 years without children claimed to be very alert to the link between behaviours and outcomes, although they did admit that lapses occurred on occasion if they were confident the lapse would not have a significant adverse consequence. Younger mothers aged 25-34 years used the term 'realistic' to describe their attitude to food safety. They described very busy schedules, which did not allow prioritisation of food safety when preparing food.

*'Sometimes you just don't have the time – if you are working full time you have to come in and get them fed and if they are crying you just throw it in and get on with it – and you would be trying to do a wash and brush floors and lift toys and do a hundred other jobs when you are trying to cook the teas as well.'* –  
*C2D Females 25-34 year of age with at least one child.*

## Changing Food Related Behaviour

Mothers aged 35-50 years also had busy lifestyles but because they had experience of consequences of poor food safety practices they were inclined to take food safety more seriously than the younger mothers.

### Social pressure

Mothers in particular were concerned about how they are perceived by friends and acquaintances both in terms of cleanliness of their homes and quality of dishes they prepared when entertaining. Males also held this view. They did not want anyone leaving their home with food poisoning and spoke particularly about having barbeques in the summer and making sure that the meat was cooked thoroughly. Respondents claimed to be more lax with regard to their food safety techniques when catering solely for themselves as opposed to catering for others (family members, children, friends, guests, etc.).

### Conditioning

While inherited habits and traditions were not a factor for younger males, mature males and fathers referred back to food preparation practices when they were children and commented how food safety practices have developed. This reflects the findings of a previous qualitative study on the IOI (76). Female participants reported being greatly influenced by their mothers. Many had a perception that the food safety practices of their childhood did not result in illness. However, while females admitted that habit was the main barrier to change, they are open to modernity and change if convinced of its benefits.

### Gender, role and identity

Due to current high unemployment among males and the blurring of the traditional male/female roles within the home, many male participants reported learning about food preparation (including food safety) and taking on a greater role within the home and more specifically within the kitchen. Even though males were participating more actively in the home, they felt that the home and the kitchen are traditional female domains and alleviated themselves of full food safety responsibility. This may stem from traditional values where the role of men was to provide for their family where women were the homemakers. Similarly there may be an element of masculinity ideology here (102).

In contrast, females felt that they had a better handle on food safety practices and their consequences than males and this may reflect their comfort with a traditional role as a food provider. The use of food has long been recognised as a way that a person assigns identity to herself/himself and others by what is considered edible, types of foods liked and disliked, and in this case, methods of preparation (103-105).

### Fear of causing offense

## Changing Food Related Behaviour

A common theme, more prevalent among females than males, was the fear of 'offending' if poor food safety practices were evident outside the home, either in a restaurant or in a friend's home. Rather than challenge the individual(s) and cause offense, they preferred to abstain from the food. Some spoke disdainfully of individuals they knew who practiced poor food safety and did not clean their homes.

## Wider environmental influences

### Media impact

Females had a high awareness of major news stories concerning outbreaks of foodborne illnesses due to *Salmonella*, dioxin and *E. coli*. The majority of females recalled television advertisements for biocides, which had a complementary effect in that it raised their awareness of food safety issues. Some females also recalled some more specific food safety advertisements (many of which were from **safefood** e.g. food safety campaign, Christmas campaign, etc.). Male participants did not display the same level of awareness. It's difficult to assess if this reflects general food safety awareness or simply how the advertising campaigns were targeted.

### 3.3.4 Personal factors

#### Experience of a food safety incident

Understanding the link between food safety practices and consequences varied according to personal experiences. A strong gender difference was apparent.

#### Females

Females had a strong association between illness and poor food safety practices. These associations included more evidence of first-hand food poisoning instances and outcomes than males. It must be noted that young mothers appeared to have weaker and more indirect experience of any food poisoning incidents and perhaps as a result, had a more lax attitude towards food safety in general. Those females with experience (direct or indirect) of food poisoning were not humorous or dismissive in their accounts of symptoms experienced and the types of reports of food safety related illness were varied and ranged in severity. Some examples included particularly serious emotive descriptions of a case of *E.coli* and *Salmonella* which resulted in children being seriously ill or hospitalised. The women involved spoke of the intense worry and guilt they felt at the time. Both of these cases evoked strong emotions amongst all the females and it was evident that these events have clearly shaped their attitudes and behaviours towards food safety.

### Males

The majority of males felt that they had experienced some level of food poisoning, however none described their symptoms as severe and their recollections of any more serious incidents were vague and distant. Male reports of food poisoning included upset stomachs, diarrhoea, nausea, weakness and fatigue. Most episodes lasted a short amount of time (one/two days) and more serious episodes reportedly lasted up to a week. The general attitude among males was;

*'You are not going to die from it' and 'what's the worst that's going to happen?'*

*'I mean is the worst that's going to happen if you didn't cook the burger through is that you get the runs, you are not going to be sick.'* – Young men, no children.

An element of invincibility was evident among male participants, particularly younger males. They felt adverse to any type of consequence borne out of risky food safety behaviour and felt invulnerable to many food hazards, e.g. perished food items.

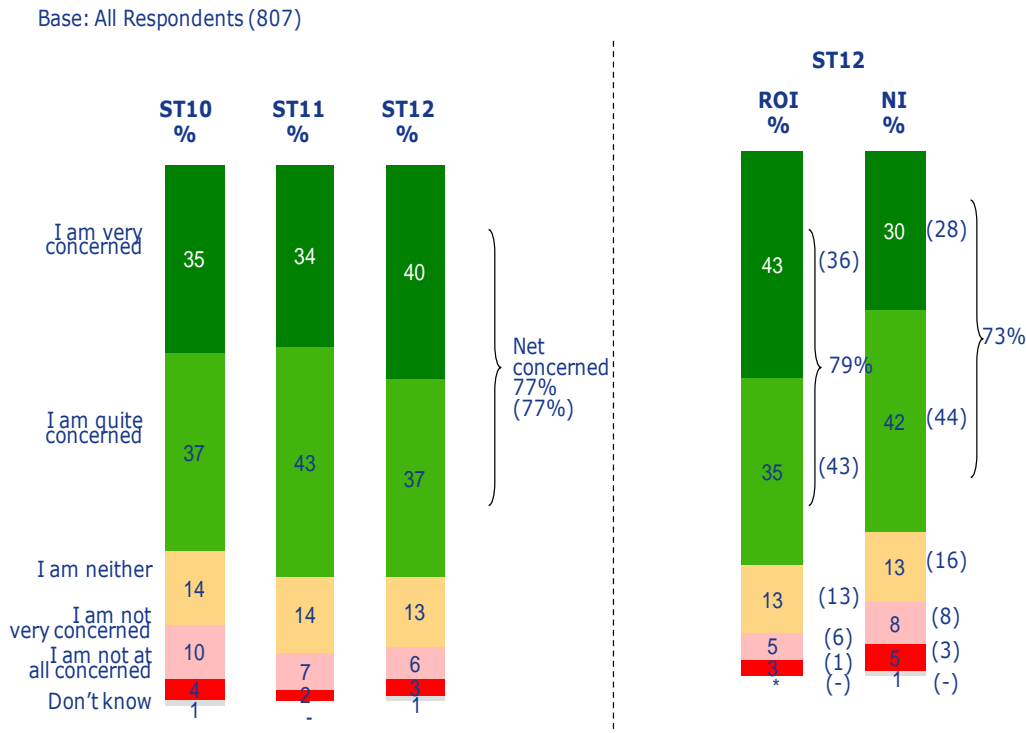
It is difficult to say whether the gender differences in perception of food poisoning described here reflect real differences in perceptions or simply the different ways that men and women interact in group settings, or both. Further investigation using other methodologies, are perhaps merited.

Interestingly, food poisoning in almost all instances was attributed to external bodies (i.e. the restaurant, take-away or supermarket) and very rarely to the individual themselves. Similar findings have been reported by Kennedy *et al.* (2005) and McCarthy *et al.* (2005) (68, 73) and previous Safetrak research. This was common among both males and females and across all life stages and may indicate some level of optimistic bias.

### 3.4 General concerns about food safety

Data on concerns around food safety was derived from both the quantitative and qualitative research. Safetrak data showed that most people realise the importance of food safety and good food hygiene, with 77 per cent of those surveyed expressing concern when asked to describe their attitude to food safety issues (Figure 3.1). The current results are in line with results of previous Safetrak surveys.

Figure 3.1: Food safety concerns



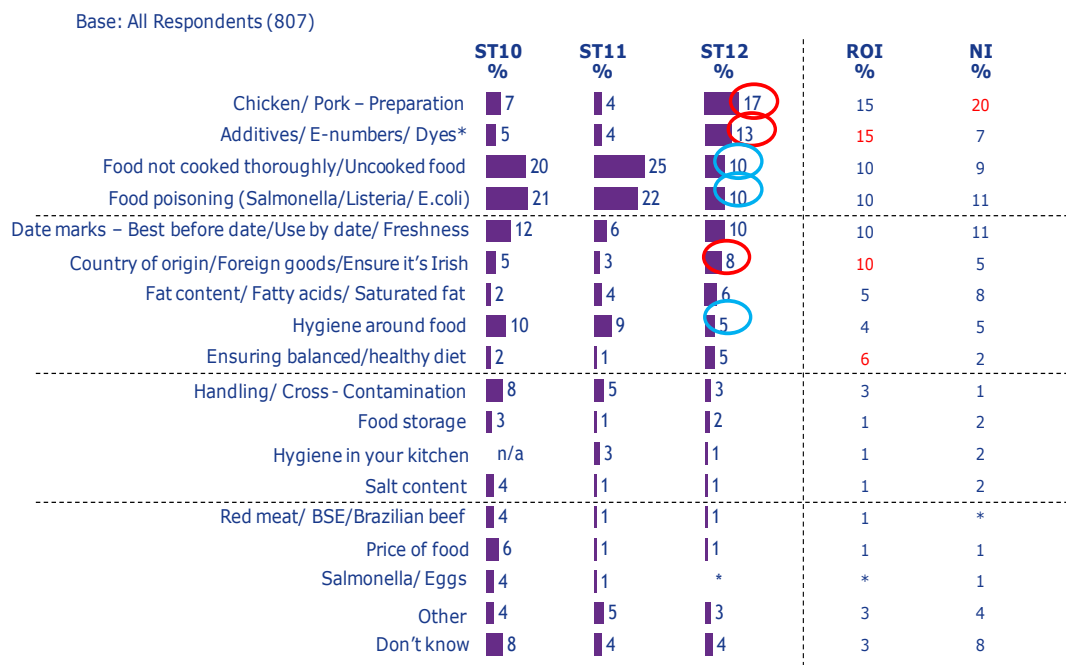
\*ST = Safetrak

Men were less likely to worry than women (11% unconcerned compared to 6% of women). In particular, the 15-25 years age group was found to be least worried about food safety (18% unconcerned). In the ROI, females aged 35-49 years and over 50 years were more concerned whereas in NI, females aged 35-49 years were more concerned. Again, these findings broadly reflect both previous research (106).

With regard to Safetrak 10 and 11, when asked which food-related issue was of most concern, respondents most often mentioned undercooked food (25%), followed by food poisoning (22%) and hygiene around food (9%) (Figure 3.2). These issues were key concerns for respondents surveyed in Safetrak 9 and 10 (2007 and 2008 respectively) along with date marks. In comparison, the same question was asked for Safetrak 12 when chicken/pork preparation (17%) and additives/E-numbers/Dyes (13%) were recorded as the issues of most concern. It is possible that the recent dioxin in pork incident and the FSA's recent work with industry to reduce the number of foods containing colours that may cause hyperactivity in children (107) may contribute to these findings. Food not cooked thoroughly, food poisoning and date marks were the next concerns (10%) as illustrated by Figure 3.2 below.



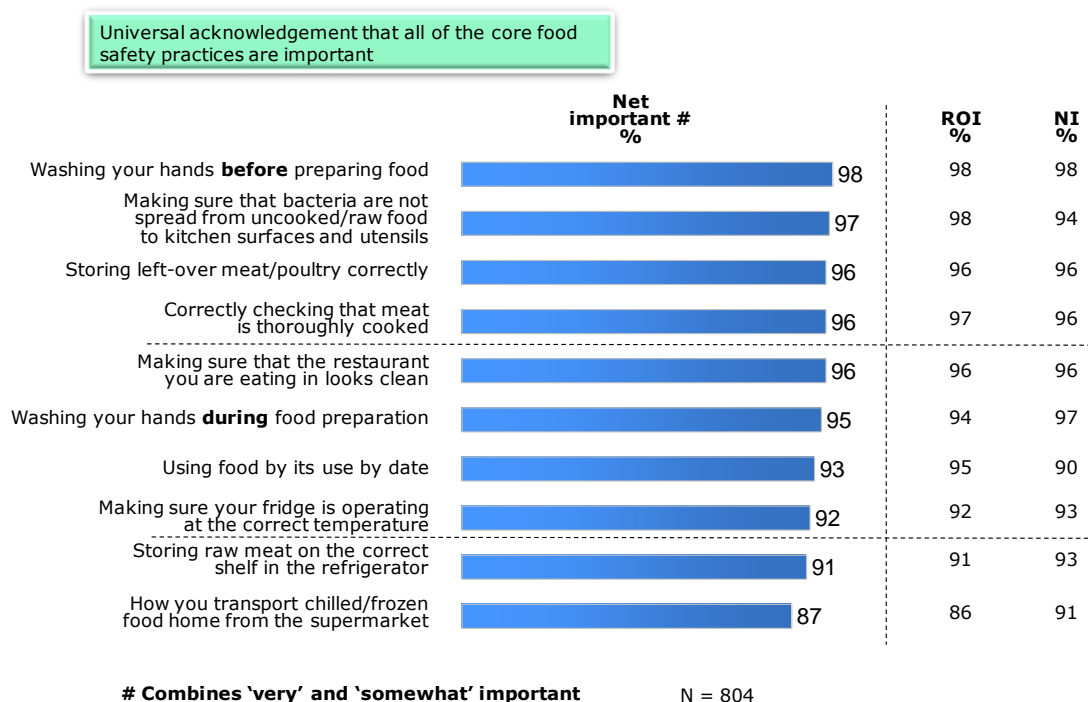
Figure 3.2: Food related issues of most concern



\*ST = Safetrak

When asked about a specific range of core food safety practices the majority (87-97%) acknowledged the importance of each (Figure 3.3). However, individuals in the 15-25 years age group were less likely to perceive these food safety practices as important when compared to other age groups surveyed.

Figure 3.3: Perceived importance of food safety behaviours



In contrast to the Safetrak results, the focus group discussions indicated that food safety may not be a priority concern during food preparation. Instead, the mechanics and ease of preparation, presentation and scheduling of meals take more priority. The exception to this prioritisation is when there are perceived high-risk factors. Chicken and pork were commonly referred to as high-risk foods and participants indicated that these meats would almost be *'burnt'* to ensure that they were cooked through properly.

### 3.4.1 Perception of risk

The focus group discussion also revealed some insights into risk perception among different demographic groups. For example, mature males discussed the relative risk of domestic food safety. They felt that the food safety consequences of domestic food hygiene practice were insignificant compared to the consequences of technologies such as food processing and industrial agriculture. This view supports the psychometric model, where risks that are unknown, or novel, are more feared than more commonly experienced risks (96).

There was also evidence of negation of risk among young mothers. There was a prevalent view among young mothers (and some older mothers) that a certain amount of exposure to germs is beneficial for children to *'toughen them up'*. Some mothers questioned the utility of biocides and the potential harm

they may cause. Lack of consequences of poor food safety practices strongly influenced these mothers similar to the male respondents.

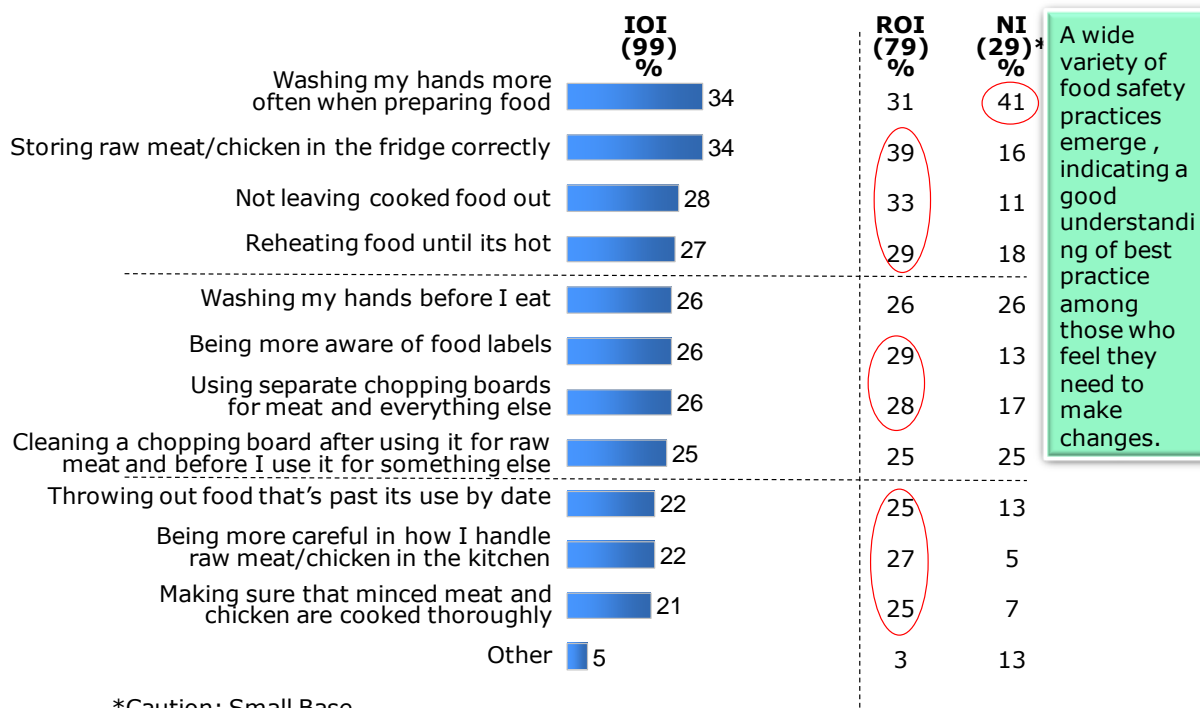
### **3.5 Changing food safety behaviour**

#### **3.5.1 Need for change**

The Safetrak survey showed that the majority were confident about their food handling practices (68%). Thirteen per cent of the adults surveyed felt that they needed to make changes to their current cooking preparation and storage practices. However, of those that felt improvements were required, most already had a good awareness of core food safety and hygiene practices, including hand washing, correct fridge storage and reheating food (Figure 3.4). Only 13 per cent of this group said that they did not have enough knowledge about food safety (Figure 3.5).

Figure 3.4: Food safety practices that consumers wish to change

Base: All who feel they need to make changes to the way they prepare, cook and store food (n=approx. 104, 13% of respondents)



Of the consumers who acknowledged that they need to improve their food safety practices, there was quite a difference between NI and the ROI consumers, with those from the ROI perceiving a greater need to change food safety practices (Figure 3.5). In the ROI respondents were three and a half times more likely to mention that they needed to take more care when handling raw meat, three times more likely to mention not leaving cooked food out, two and a half times more likely to talk about a need for correct fridge storage improvements and twice as likely to mention an improvement in awareness of food labels. It is worth noting that the behaviours identified for change were those communicated in the *safefood* 'Don't Take Risks' campaign which was airing at the time of the survey.

The focus group work also examined areas of food preparation practices that required improvement. Minor food safety misdemeanours were acknowledged and accepted by all as part of food preparation. Males admitted readily to careless food preparation practices such as eating out of date meat (younger males only), using the same knife for meat and vegetables (commonly mentioned) and eating food picked up from the floor, if it was there for less than five seconds (the 'five second rule'). Studies of masculinity and food have shown that, in their discussions of eating, diet and health, the men's

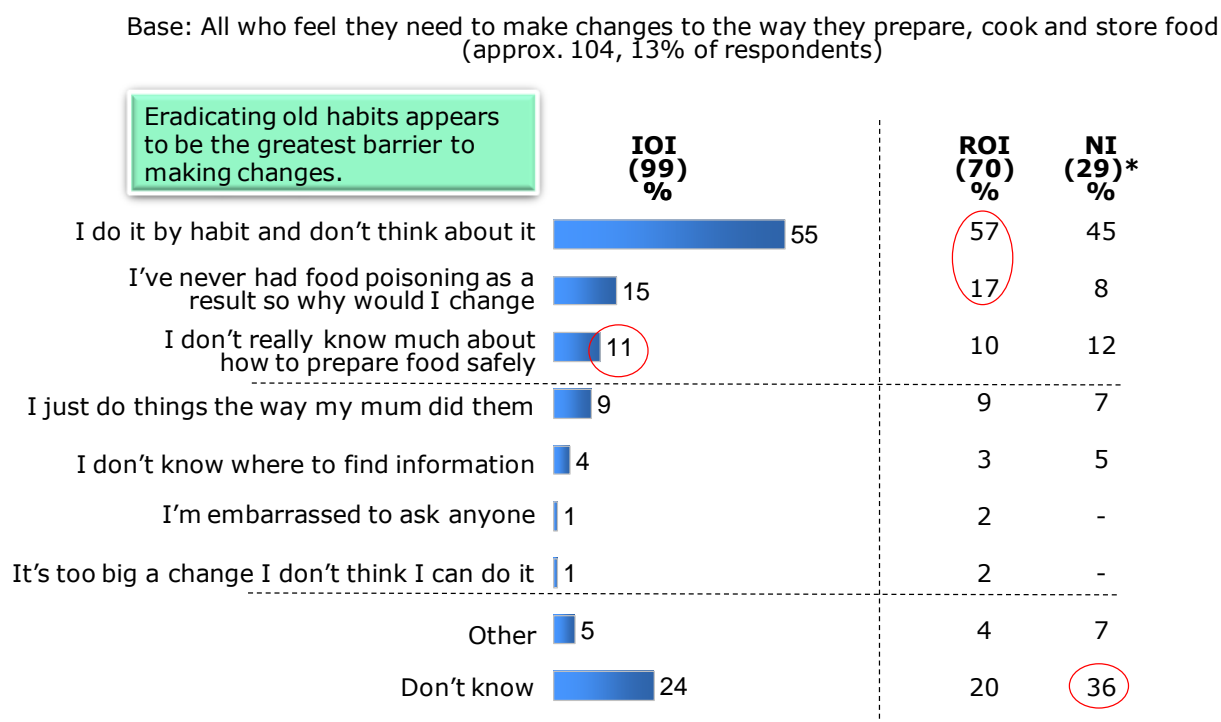
comments tended to reflect traditional constructions of masculinity that position food- and health-promoting behaviours as of little interest to men (108).

Females, although not as open about food safety inadequacies, did acknowledge that time pressures and habit influenced their behaviour. For example using the tea towel to wipe their hands instead of a separate hand towel and defrosting meat in hot water if under time pressure. Women may be less likely to admit food safety errors because their feminine identity is so deeply involved in the cooking and giving of food (109).

### **3.5.2 Barriers to change**

Respondents to the Safetrak survey were asked about the obstacles they faced when making changes to the way they prepare, cook and store food. Only consumers who felt that they needed to make changes responded. These results are self-reported and are outlined in Figure 3.5 below. The majority of those who felt that they needed to make improvements claimed that “habit” was the main obstacle (see habit section in introductory section to see how this reflects existing data). Furthermore, there were differences between consumers in NI and the ROI as to the obstacles stated. One in particular was the lack of incentive to change due mainly to the fact that these consumers never had food poisoning. This was an obstacle for over twice as many consumers in the ROI as NI. A large proportion of respondents couldn’t identify a barrier. There were significant differences between NI and ROI consumers with nearly twice as many respondents in NI stated that they “didn’t know” the obstacle to improving their food safety practices.

Figure 3.5: Barriers to changing food safety behaviour



\*Caution: Small Base

### 3.5.3 Proponents of change

Focus group respondents offered some suggestions as to the factors that stimulate behaviour change in relation to food safety. They included; media ubiquity, television programmes on food processing, foodborne disease outbreaks and school-based education. There were gender and lifestage differences in the nature of the food safety messages that respondents felt would be effective.

#### Media ubiquity

Media ubiquity refers to knowledge of high impact campaigns relating to food/food safety. A number of messages or campaigns were mentioned spontaneously including the 'five a day' fruit and vegetable campaign, the food pyramid (ROI), promotion of 'superfoods' in the media (e.g. goji berries were a regularly mentioned food type by mature females), advertising perceived as 'scientific' e.g. probiotics and some campaigns to highlight food safety e.g. germs on knife/meat (recent **safe food** campaign).

## Changing Food Related Behaviour

Since these messages and campaigns are so widespread and well known, they served to heighten awareness of the various issues. Campaigns that were recalled unanimously across life stage and gender were those that were constantly repeated, simple, easy to understand and easy to implement.

### Television programmes

Television programmes on food processing were regularly mentioned, particularly around meat (chicken/pork primarily). For males, such programmes were of interest but did not result in reported behaviour change. Females tended to be affected by these programmes more so than men and were more likely to experience behaviour change such as ceasing to eat chicken, eggs, etc. for a period. However, most admitted that this caution eventually wore off and they resumed consumption of these products, albeit more carefully in many cases.

### Foodborne disease outbreaks

Foodborne disease outbreaks that were well-publicised and particularly severe affected behaviour change. Many focus group participants spontaneously recalled outbreaks such as *E. coli* and *Salmonella*. Participants acknowledged that they served to make them more aware of the potential dangers of poor food safety. There was no discussion of recent food poisoning outbreaks (e.g. pork/dioxin crisis). However, participants mentioned swine flu frequently and many used it as an example of how behaviours have improved because of the awareness campaign. Heightened awareness after well-publicised outbreaks has also made them more reflective of their own behaviour within their own home. The respondents acknowledged that the more severe the outbreak and consequent impact, the more likely that behaviour change would occur.

*'Now we have swine flu that has altered everybody's views worldwide and everyone is talking about washing their hands' – Ballina C2D Males 50-60 years of age, living alone*

### Education

School-based education was more prevalent in female discussions. All the women participating in the focus groups had some food safety education in school and felt this was an appropriate setting for learning about food safety. Mothers also felt that in-home education was important and that not enough emphasis was placed on this type of education. Although girls may learn from their mothers, they were concerned about the education of boys with regard to food safety. They felt this was particularly important in the current time as males are being much more active within the home and playing a greater role in food preparation.

### Nature of food safety messages

## Changing Food Related Behaviour

Males of all ages and younger females felt that highlighting the benefits of food safety as well as the consequences of poor food safety would be beneficial for the population in general

*'It's all down to fear of catching something and showing how that can happen' – Ballina C2D Males 50-60 years of age, not married or living with a woman*

In contrast, mothers required a different approach to food safety messages. Rather than highlighting the consequences of poor food safety, they were more interested in practical and direct advice regarding the 'most dangerous' things to do and where they could 'cut corners' should their busy lifestyles require them to do so.



### **3.6 Conclusions**

The qualitative and quantitative research conducted for this CFR has shown that consumers on the IOI in general have a good knowledge of food safety behaviour. However, the qualitative research, in particular, reveals that this knowledge is not always implemented. A wide variety of factors influence food safety behaviour including physical, social, personal and wider environmental factors. Food hygiene practices and their influencers vary according to gender and life stage. Young men, young people living in shared accommodation and busy mothers under time pressure appear to be key groups to target. As the roles of fathers in the home continue to change, particularly in the face of growing unemployment levels among men, this group may also come to the fore. While food safety behaviour and attitudes appear to be less healthy in men than their female counterparts, women were more concerned and perhaps therefore more open to food safety messages than men. Therefore the question remains as to whether men should be targeted directly, or whether women could be targeted as key influencers of men.

Several communication channels could be used to communicate food safety messages but television and the school setting were particularly mentioned by participants. Recommendations for research and communications are included in Tables 3.2 and 3.3 below. A list of currently funded food safety related behaviour research projects are available in Appendix B.

### 3.7 Recommendations

**Table 3.2: Research recommendations for food safety related behaviour change on the IOI**

| Knowledge gap   | Public health implication(s)   | Recommendation/solution   |
|---|--|---|
| Continuous need to update knowledge base to ensure effective targeting of food safety legislation and regulation and the safety of the food supply. | Requirement for safe food supply.  | <ol style="list-style-type: none"> <li>Continued monitoring and surveillance of key sources of bacterial infection and chemical contamination.</li> <li>Surveillance and horizon scanning for emerging pathogens.</li> </ol>                |
| No longitudinal studies of public knowledge, attitudes and perceptions relating to food safety issues using consistent methodologies                | <ol style="list-style-type: none"> <li>Difficulty tracking change.</li> <li>No clear understanding of consumer attitudes.</li> </ol> | <ol style="list-style-type: none"> <li>Co-ordinated approach by agencies to fund a long-term survey.</li> <li>Supporting qualitative research would offer an additional method to gain in-depth insights into consumer behaviour</li> </ol> |
| Limited research on public attitudes to food scares on the IOI.   | Potential to improve risk communication during crises.   | Development of the evidence base of attitudinal research to better understand public responses to food scares.  |
| Evidence of poor domestic food safety practice but limited data on how to improve this.   | Risk of infection.   | Further research into domestic food safety behaviour and relating attitudes, perceptions and beliefs.   |
| Little evidence relating to wider environmental factors, such as economic factors, on food-related  | Need to consider all factors that may influence behaviour change.  | Consideration of broad set of influences in the design of research studies on food behaviour on IOI.  |

|  |  |   |
|--|--|---|
| behaviour.   |  |   |
| Evidence of a mismatch between food safety knowledge, attitudes and perceptions and food safety practices.   | Knowledge alone will not change behaviour. An understanding of the knowledge-behaviour gap is essential for the promotion of behaviour change. | The mismatch between food safety knowledge, attitudes and perceptions and food safety practices merits further study  |
| A number of key influences and barriers in food safety practice have been identified but it is as yet unknown how to effectively promote or overcome these.    | Potential to promote behaviour change with enhanced consumer understanding.  | Key influences and barriers to correct food safety practices and methods to promote or overcome these should be investigated further, including the influence of habit, social pressure and trust in sensory judgement. |
| Enhanced data on consumer attitudes to food technologies would be beneficial, particularly for food manufacturers working in product development               | Improve understanding of consumer acceptability of novel foods and production methods.   | Conduct research on consumer acceptance of novel food technologies on the IOI.  |
| Research indicated that men and women on IOI perceive food risk differently but little is known regarding effective communication of gender specific messages. | Effective segmentation of consumer messages for men and women may help promote behaviour change.   | Further research to gain insight into food risk perception and drivers of behaviour change in men and women.  |
| Key concerns for consumers included the safety of chicken and pork and continued monitoring of attitudes to these foods is necessary to monitor                | Potential to address consumer concerns.  | Monitoring of consumer confidence around chicken and pork.  |

|                     |  |  |
|---------------------|--|--|
| consumer attitudes. |  |  |
|---------------------|--|--|

**Table 3.3: Recommendations for communication of food safety related behaviour change on the IOI**

| <b>Priorities for communication/intervention</b>   | <b>Public health implication(s)</b>                           | <b>Recommendation /solution</b>   |
|--|---|---|
| The main food safety behaviours associated with foodborne illness are inadequate washing of hands, utensils, chopping boards and dishcloths (especially after contact with raw meat and chicken), inadequate washing of fruit and vegetables, improper storing, chilling and cooking of meat and chicken, cross-contamination of ready-to-eat foods and consumption of raw contaminated foods. | Risk of foodborne illness.                                    | A continued focus on key domestic food safety messages for consumers.   |
| Age, gender and life stage have considerable influence on food safety knowledge, attitudes and perception. Therefore, food safety messages should be segmented based on these important factors  | Certain groups may currently be at risk of foodborne illness. | <ol style="list-style-type: none"> <li>1. Young people, men and those from lower socio-economic groups may benefit from being the focus of communications campaigns to improve food safety practices.</li> <li>2. Young people living in shared accommodation and busy mothers under time pressure appear are also important target groups.</li> <li>3. As fathers' roles in the home continue to change, particularly in the face of high unemployment levels among men, this group may also merit particular attention.</li> <li>4. The apparent importance of habit in food safety behaviour indicates that</li> </ol> |

|  |  |  |
|--|--|--|
|  |  | food safety training during childhood may be an important focus.   |
| Foreign travel is a risk factor for foodborne illness.   | Foodborne illness.   | Develop seasonal food safety messages re foreign travel and food safety.   |
| A wide variety of channels and settings can be used to communicate food safety messages              | Effective targeting can enhance uptake of food safety messages and potentially behaviour change. | <ol style="list-style-type: none"> <li>1. Television should remain an important medium for communicating with adults, particularly women, while the internet may be more important for young people and children</li> <li>2. Consumers identified the home and school as important settings for food safety learning.</li> <li>3. The use of social media for communicating food safety messages is in its infancy and should be explored further</li> </ol> |
| Consumers continue to identify 'date marks' as important indicators of food safety.                  | Need to ensure this is correctly understood.   | Continue to issue consumer messages to clarify the meaning of date marks.  |
| Consumers suggested highlighting the benefits as well as the risks of food safety in communications. | May enhance motivation to change.  | Develop messages that outline benefits of food safety as well as consequences.   |
| Consumers requested practical advice on food safety.   | Enhance consumer understanding and consumer practice.  | Provide practice messages around food safety in the domestic setting.  |

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Appendix A

**Table 2.2: Chronology of food scares that have affected the IOI**

| Year | Agent                         | Type            | Description  |
|------|-------------------------------|-----------------|--|
| 1988 | <i>Salmonella</i> Enteritidis | Microbiological | <p>Contamination of eggs with the foodborne pathogen <i>Salmonella</i> was one of the earliest food scares reported to have a negative effect on consumer perceptions and consumption on the IOI, in the UK and throughout Europe. In the late 1980s there was a dramatic increase in the number of human cases of <i>S. Enteritidis</i> reported in the UK and many countries in Western Europe (10). In 1988, a number of UK food poisoning incidents were reported from food consumed at public gatherings as well as the House of Lords, each of which were attributed to the consumption of eggs and cheese (110-111). This led the junior health minister Edwina Currie, to make a statement that “most of the egg production of this country, sadly, is now infected with <i>Salmonella</i>”, which aroused much public anxiety and political concern. This resulted in the slaughter of more than a million hens, mostly involving small producers, sales of eggs fell by 60 per cent overnight and many egg producers went out of business with no impact on the <i>Salmonella</i> poisoning (7). This caused particular anger in NI, where egg production is a significant part of the economy. Following a lawsuit by 12 UK egg producers, Edwina Currie MP resigned and the Ministry of Agriculture, Fisheries and Food (MAFF) set aside £20 million to compensate egg producers (112). Since 1988, the UK government has advised the public to avoid the consumption of raw eggs or uncooked foods containing raw eggs (113). The introduction of improved hygiene and storage practices together with the vaccination of laying flocks</p> |



against *Salmonella* has since resulted in a reduction in the incidence of *Salmonella* in eggs in the UK (114).

In 2004, **safe food** commissioned a three-year project (03-RESR-005) that investigated the prevalence of *Salmonella* in eggs on the IOI and compared the two approaches to *Salmonella* control in operation in the two jurisdictions. In NI (as in the rest of the UK), a vaccination regime is adopted, whilst in the ROI, controls based on routine monitoring for *Salmonella* and subsequent culling of infected flocks are applied. The study found that both methods are equally effective in controlling *Salmonella* and that eggs produced on the IOI are almost totally free from *Salmonella* (prevalence of 0.04%). Only two eggs sampled contained *Salmonella* with only the shells contaminated and no *S. Enteritidis* was found. Infections from *Salmonella* in the human population are therefore unlikely to result from eating eggs produced on the IOI.

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1989      *Listeria monocytogenes*    Microbiological

Human listeriosis is one of the most serious foodborne bacterial infections. Adak *et al* (2002) estimated that although listeriosis accounted for less than 0.1% of all foodborne illness, it accounted for approximately 17% of deaths related to foodborne illness (115). Between 1987 and 1989 the number of deaths in the UK from listeriosis rose dramatically. A survey of imported pâtés to the UK showed that it frequently contained the *Listeria monocytogenes* (116). Following health government warnings on pâté consumption and the suspension of importation of supplies from manufacturers supplying contaminated produce, the number of deaths resulting from listeriosis declined from this time

onwards. More recently there have been reports of an increase in cases of listeriosis predominantly in the over-60s age group in the UK (117).

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1989            BSE            Animal Disease

BSE, commonly known as mad-cow disease, is a fatal, neurodegenerative disease in cattle that causes a spongy degeneration in the brain and spinal cord. The first case of BSE was reported in Great Britain (GB) in 1986 and the government made it a notifiable disease 2 years later in 1988 (12). Before controls on high-risk offal were introduced in 1989, between 460,000 and 482,000 BSE-infected animals were estimated to have entered the human food chain (118). Until 1996, the British government advised the public that there was no risk to humans from cross species transfer. Then in March 1996, an expert committee of scientists announced that a human variant of a disease identified as Creutzfeldt-Jakob Disease (CJD) could be linked to BSE in cattle (119). This announcement caused the significance of BSE to change dramatically and prompted a European wide loss of confidence in British beef. This also affected the consumption of beef in other European countries.

Cases of BSE peaked in the UK in 1992 with 37,000 cattle infected. The number of deaths from variant CJD peaked in 2000 at 28 deaths. While the BSE crisis predominantly focussed on GB, there were a significant number of cases on the IOI. Following the introduction of a combination of controls and regulations, the numbers of BSE infected cattle on the island dropped from its peak of approximately 500 cases in the mid 1990s to 37 in 2007 (120).

A British inquiry into BSE concluded that BSE developed into an epidemic as a consequence of intensive farming practices including the recycling of animal protein in ruminant feed which was unchallenged over decades (121). The origin of the disease itself remains unknown. The infectious agent is distinctive for the high temperatures at which it remains viable. This contributed to the spread of the disease in Britain, where temperatures used during the rendering processes had been reduced (121). Another contributory factor was the feeding of infected protein supplements to very young calves (121).

The emergence of BSE, and its link to variant CJD, has been singularly responsible for profound changes to how food is produced and regulated in the modern farming era. BSE is commonly regarded as the food scare that initiated both the reform of EU food safety legislation and the establishment of many new regulatory institutions across the EU and on the IOI including the FSAI and the FSA (120).

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|      |                 |                 |  |
|------|-----------------|-----------------|--|
| 1989 | <i>Botulism</i> | Microbiological | <i>Botulism</i> is a paralysing disease caused by the toxin of <i>Clostridium botulinum</i> (122). In the UK in 1989, 27 people became ill and one person died after consuming hazelnut yoghurt manufactured with cans of hazelnut purée contaminated with <i>botulism</i> (123). It was later confirmed that each yoghurt carton contained between 1,750 and 3,750 mouse lethal doses of the toxin (124). Since this time the incidences of botulism have dramatically reduced mainly due to changes in domestic food practices, improved commercial food preservation techniques and industrial food processing (125). |
|------|-----------------|-----------------|--|

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|       |                       |                 |   |
|-------|-----------------------|-----------------|---|
| 1996  | <i>E.coli</i> O157:H7 | Microbiological | <p><i>E.coli</i> O157:H7 presents a highly significant threat to public health (especially individuals in vulnerable groups). Infection from this pathogen ranges from symptom-free carriage, to non-bloody diarrhoea, haemorrhagic colitis, haemolytic uremic syndrome, thrombocytopenic purpura and death (33-34). Cattle are recognised as a primary reservoir of <i>E.coli</i> O157:H7 following several outbreaks of this pathogen which were linked to undercooked beef products and raw milk (35-36). In 1996, an outbreak of <i>E.coli</i> O157:H7 in central Scotland linked to beef products from a butcher shop resulted in the largest number of recorded deaths associated with this pathogen (13). A total of 501 cases and 21 deaths were linked to the outbreak. The Pennington Group investigated the circumstances of this outbreak and in 1997 made a number of recommendations, all of which were accepted by the UK Government. The UK Government made £19 million available to improve food hygiene standards in butchers' shops and other high risk food premises (126). On the IOI, many small outbreaks linked to this pathogen have been reported, but to date a large scale foodborne outbreak has not occurred (120).</p> |
| <hr/> |                       |                 |   |
| 1999  | Dioxin                | Contaminant     | <p>In January 1999, 50 kg polychlorinated biphenyls (PCBs) contaminated with 1 g dioxins were accidentally added to a stock of recycled fat used for the production of 500 tonnes of animal feed in Belgium (127)). This animal feed was then further distributed to chicken farms (128) and initially led to abnormal laying hen mortality and decreasing egg hatchability. Consequent analyses indicated dioxin levels that exceeded the legal standards, (for example those applying to chicken fat), by 1,500 times. On the 28th May, all chicken and eggs were removed from the Belgian shelves and it then emerged that the broiler feed had been recycled into pig feed, thus also involving pork meat. The initial blocking of meat products in Belgium was soon followed by import bans of Belgian meat</p>  |

and egg products by other EU countries, backed up by the EU veterinary committee's decisions (129).

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|       |                              |                 |   |
|-------|------------------------------|-----------------|---|
| 2001  | <i>Botulism</i>              | Microbiological | In 2001, the FSAI confirmed the withdrawal of two baby food products manufactured in ROI following an incident in the UK. One batch of infant formula was linked to a case of <i>botulism</i> in a young child, who subsequently made a full recovery.  |
| <hr/> |                              |                 |   |
| 2001  | Foot and Mouth Disease (FMD) | Animal Disease  | <p>FMD is a highly infectious viral disease affecting cloven-hoofed animals (130). In 2001, there was an outbreak of FMD in the UK that lasted for over 6 months and led to the destruction of four million animals including 3 million sheep, 600,000 cattle and 138,000 pigs in 2002 infected holdings and 7,076 contact premises in an attempt to halt the disease (131). The epidemic cost the UK national treasury £2.7bn, including £1.2bn compensation paid to farmers for animals slaughtered under control measures, £701m spent on eradication measures such as the cleaning of infected premises and £471m compensation for animals killed for welfare reasons. It is estimated that it also resulted in losses in the tourist and other rural industries amounting to several billion pounds sterling.</p> <p>The FMD outbreak also spread to NI, ROI, France and the Netherlands. The location of the first FMD outbreak in NI close to the border at Meigh in South Armagh on 1<sup>st</sup> March 2001 and the subsequent outbreak at Proleek in County Louth on 22<sup>nd</sup> March 2001 meant that the cross-border aspects of the crisis were at the forefront of the responses of both the NI and ROI administrations (132). Strict precautionary measures to prevent the spread of the disease were introduced from the outset including the postponement or cancellation</p> |

of a whole range of events (including the annual St. Patrick's Day parade), restrictions on personal movement and the placing of disinfectant mats at entrances and other control points. Foot and mouth disease circulates among animals and human cases are very rare. Transmission of the disease to humans via the food chain was not considered to be a risk factor (133). The regulatory authorities took prompt action to assuage any concerns consumers may have had with regard to food safety.

An economic evaluation of the impact of FMD in the ROI estimated that the effort to limit the spread of the disease had cost the Exchequer €210 million (132). It is estimated that more widespread outbreaks would have cost the ROI economy over €6 billion (132). The initial source of the outbreak and the scale of infected animals were strongly linked to imported produce and production-related practices respectively (6).



2002      Acrylamide      Contaminant

In April 2002, the Swedish National Food Authority and the University of Stockholm jointly announced that certain foods that are processed or cooked at high temperatures contain relatively high levels of acrylamide. These foods contain the amino acid asparagine and sugars such as glucose which react in a process called the Maillard reaction (134). This is an important chemical reaction in food preparation and presentation and is responsible for the browning of food as in caramelisation. Not surprisingly, acrylamide has been detected in a wide variety of fried, baked or roasted foods produced domestically or during manufacturing. On the IOI, the principal source of acrylamide exposure via the diet is through the consumption of potatoes and potato products although bread, biscuits and coffee are also sources of exposure.

Acrylamide was only previously known as an industrial chemical. However, its discovery in food attracted worldwide interest, because it has been shown to be neurotoxic in humans and laboratory animals, is genotoxicity (DNA-damaging), induces tumours in experimental animals and has been classified as ‘probably carcinogenic for humans’ by the International Agency on Research on Cancer (135). The food industry has responded to this risk by modifying the technological processes to reduce the content of acrylamide in their products while regulatory agencies have issued advice to consumers concerning the storage and preparation of potatoes (136). Monitoring of foods for acrylamide content is conducted throughout the EU and the Institute for Reference Materials and Measurements of the Joint Research Centre of the European Commission, together with EFSA, have established the Acrylamide Monitoring Database which documents these findings (137).



2003      Sudan Red 1      Contaminant

In May 2003, the French Authorities discovered the presence of the dye Sudan Red 1 in a hot chilli product. This dye has a number of industrial applications, including shoe polish, but as a food additive it is prohibited worldwide, notable exceptions being some Asian and African countries (138). Indeed the source of the contaminated chilli was India. Sudan Red is a group of similar dyes that are viewed by EFSA as both as genotoxic and/or carcinogenic (53). A substantial product recall ensued throughout the EU as products containing the dye were recalled from retailers. The European Commission moved swiftly to prohibit the import of chilli spice and derivative products containing certain food colorants deemed to be carcinogenic (Sudan-I, Sudan-II, Sudan-III or Sudan-IV) all of which have been classified as carcinogens by the International Agency for Research on

Cancer (139). On 21<sup>st</sup> January 2004, a prohibition was declared meaning that chilli products, including curry powder, can now only be imported into the EU if they are accompanied by the appropriate chemical analysis datasheet showing that they do not contain the named dyes.

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2004      *Salmonella* Newport Microbiological

In late 2004, there was a large outbreak of *Salmonella* Newport, which affected over 350 people in England, NI, Scotland and the Isle of Man. At least 20 of those who were ill were admitted to hospital. The outbreak was linked with consumption of lettuce from restaurants, fast food and take away premises (140).

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2004      Avian Flu      Animal Disease

In 2004, reports emanated from Southeast Asia of confirmed human infections with avian influenza virus strain A (H5N1) which had been circulating in the region necessitating the mass culling of poultry. There had been previous outbreaks of this and other avian influenza strains in Hong Kong since 1997 and in the Netherlands in 2003. Human mortalities were recorded during each outbreak, albeit at an extremely low level. However, in the most recent outbreak, the virus continued to spread across the globe with several countries reporting human fatalities. As of 11th August 2009, 438 confirmed human cases of human H5N1 infection were registered by the WHO of which 262 were fatal. Animal-to-human infection occurred due to close proximity to infected birds while the possibility that sporadic cases may have been caused by human-to-human transmission was never verified.

This outbreak of avian influenza virus strain A (H5N1) received enormous media attention. The potential risk of infection via contaminated poultry food products was



acknowledged by the WHO who emphasised the importance of proper food handling and cooking. In so doing, it reiterated long-standing ‘consumer-focussed’ advice including that promulgated by **safe food** during its food hygiene campaigns. Undoubtedly this went some way toward alleviating consumer fears but not before a worldwide decrease in poultry consumption was recorded. Avec, the Association of Poultry Processors and Poultry Trade in the EU Countries, reported in 2005 that consumer dread of avian influenza was responsible for the downturn in the sale of poultry meat and poultry meat products throughout the world. In the EU, the fall in consumption was up to five per cent in the northern EU and up to 70 per cent in the southern EU (141). It contrasts sharply with the Avec report for the previous year which expected the consumption of chicken meat in the EU, which stood at 7.2 million tonnes in 2004, to remain ‘more or less stable’ in 2005 (141). In contrast, ROI and UK poultry markets hardly changed from 2005 to 2006 (142). The effective containment of the outbreaks in Europe, coupled with the assurances given in public hygiene campaigns and the eventual media disinterest in the topic, probably contributed to a restoration of confidence among EU consumers. The 2007 AVEC Annual Report confidently predicted a per capita poultry meat consumption increase from 22 kg in 2006 to 24.3 kg by 2014 in the EU-27 (141).

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| 2006 | <i>Salmonella</i> Montevideo | Microbiological | In June 2006, a major chocolate manufacturer was forced to withdraw over a million chocolate bars from stores in Ireland and the UK, when the FSA discovered a rare strain of <i>Salmonella</i> in one of its factories. The UK Health Protection Agency recorded a large number of consumers ill with <i>Salmonella</i> Montevideo. Investigations identified the strain of bacteria as the one that had been present at the chocolate manufacturer's plant. Since only the most severe cases are reported to the HPA, it is likely that many |
|------|------------------------------|-----------------|--|

more people experienced health-related problems due to the *Salmonella* contamination (143). At this time, the Advisory Committee on Microbiological Safety in Food (ACMSF) advised that there was no safe level for *Salmonella* in food and that *Salmonella* in chocolate could be particularly harmful, as chocolate may help protect the *Salmonella* from acid attack in the stomach and facilitate the bacteria's infiltration into the intestines, where they can multiply and cause damage.

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| 2007  | <i>Cryptosporidium</i>  | Microbiological | <p>In March 2007, the mains water supply in Galway City and the surrounding areas became contaminated by <i>Cryptosporidium</i> (a protozoan parasite that causes a diarrhoeal illness in humans known as cryptosporidiosis). This caused a waterborne outbreak of cryptosporidiosis in Galway which was the largest reported in ROI since surveillance for outbreaks began (144). <i>Cryptosporidium</i> can survive in chlorinated water and the water taken from Lough Corrib in Galway was thought to be most likely contaminated by migration of animal and human faeces. The general public and visitors to Galway had to use bottled or boiled water for drinking, washing uncooked foods (e.g. salads) and brushing teeth, whereas bathing and other uses of water was deemed safe. The Minister of the Environment allocated €48 million long term capital funding to upgrade water treatment facilities in Galway City and Tuam.</p> |
| <hr/> |                         |                 |  |
| 2008  | <i>Salmonella</i> Agona | Microbiological | <p>In July 2008, an outbreak of <i>Salmonella</i> Agona in the ROI, the UK and Finland was linked to an Irish food production company and a retail outlet chain supplied by the company. A number of food products were affected including beef strips, chicken in various forms,</p>  |

bacon in various forms and pork products were withdrawn. There was one death associated with the outbreak, an elderly female in the UK contracted *Salmonella* Agona and subsequently died (145).

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| 2008 | Dioxins | Contaminant | Dioxin is a term used for a group of chemicals that are known to have similar toxic effects. These include toxicity to the immune system, carcinogenicity, effects on the skin and reproductive toxicity and adverse effects on the developing foetus (146). They are highly potent and can remain in the body for extended periods of time. In late 2008, high levels of dioxin and dioxin-like PCBs were detected in samples of Irish pork fat that were taken as part of the Irish National Monitoring Programme. The results showed levels that were up to two hundred times the legal limit for these compounds in pork meat. The FSAI, in cooperation with the Department of Agriculture Fisheries and Food (DAFF), issued an alert recall for all Irish pork and bacon products on the 6 <sup>th</sup> December 2008 and advised consumers, as a precautionary measure, not to consume Irish pork and bacon products and to dispose of any purchased since the 1 <sup>st</sup> of September 2008 (the date after which actual contamination of the feed was considered to have commenced). A similar recall of these products was issued via the Rapid Alert System for Food and Feed in other EU countries, and to third countries as well, to which Irish pork and bacon products had been exported. The source of the contamination was traced to a single feed production plant where recycled food waste was used to produce animal feed in a process that involved a drying step using heat generated from contaminated industrial oil. |
|------|---------|-------------|--|

Contaminated feed had been distributed to farms throughout the country and restrictions with regard to the movement of animals were placed on a number of pig and beef farms. While meat from beef cattle in affected herds tested positive for dioxin, the more stringent traceability system for beef enabled swift and easy removal of these animals from the food chain without disruption to the broader beef processing industry. Consequently no recall of Irish beef products was necessary. However, the traceability system for pork meat is not as stringent as that for beef and does not permit the tracing of a given product back to the farm from whence the animal originated. Pigs from affected farms had been supplied to ten of the main abattoirs in ROI which accounted for approximately 98 per cent of national pork production. Approximately 10 per cent of pigs slaughtered between September and December 2008 had originated in farms that had used contaminated feed. Therefore, it was not possible to distinguish between contaminated and safe product and this resulted in a blanket recall. The negative ramifications for the Irish pork meat industry were obvious, this industry was worth €368 million in 2007, involved over 400 pig producers and approximately 2,000 people who were directly employed in pig meat processing and another 6,000 employed in associated sectors such as feed manufacturing, haulage and services (147).

The FSAI, in its recall alert notification of 6th December 2008, assured consumers there was 'no immediate risk to public health from short term exposure (148)'. In addition to this, EFSA carried out its own risk assessment in response to a request received from the European Commission requesting urgent scientific advice on the risks to public health due to the contamination by dioxins in pork from Ireland. It concluded that, even in 'very extreme' cases of consumption of totally contaminated Irish pork, while the WHO

guideline intake limits for dioxin would undoubtedly be breached, this would not necessarily lead to adverse health effects. For more likely consumption scenarios, the potential contribution to the body burden of dioxin due to exposure from contaminated Irish pork was of no concern (53). The body burden increase would still have been at the lower end of the range of average dioxin body burdens for people living in industrialised countries (149). That said the ongoing WHO advice is that human exposure to dioxin should be kept as low as possible.

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**Appendix B - List of ongoing food safety behaviour funded projects on the IOI**

| Title of Project  | Lead Organisation                 | Principal Contractor | Funding agency                            | Completion date |
|---|-----------------------------------|----------------------|---|-----------------|
| Persistence and dissemination of Salmonella and Campylobacter in domestic kitchen environments                        | UU                                | Prof. David McDowell | <i>safefood</i>                           | Completed       |
| Communicating to consumers about food hazards in the home   | UCD                               | Prof. Patrick Wall   | <i>safefood</i>                           | 2011            |
| FoodRisC  | UCD                               | Prof. Patrick Wall   | EU Commission (7 <sup>th</sup> Framework) | 2013            |
| The microbiological status of household dishcloths and associated consumer hygiene practices on the island of Ireland | Eolas International Research Ltd. | Ms Martine de Boer   | <i>Safefood</i>                           | 2011            |