

## A Foodborne Illness Strategy for Scotland



Reducing the risks of contaminants throughout the Scottish food chain



## Introduction

1. The Food Standards Scotland (FSS) Strategy to 2021<sup>1</sup> sets out our vision to create a food<sup>2</sup> and drink environment in Scotland that benefits, protects and is trusted by consumers. A key objective for delivering this vision and which is set out in the Food (Scotland) 2015 Act is to ***Protect the public from risks to health which may arise in connection with the consumption of food.***
2. The strategy outlined in this document will make a key contribution to addressing this objective. It sets out our overall approach for preventing the contamination of foods produced and sold in Scotland, and how we will improve our understanding of foodborne illness and increase awareness of effective food safety controls.
3. Our proposal to target the key transmission routes for microbiological, chemical and radiological contaminants represents a new approach which will allow FSS to identify intervention points at which action will be most likely to impact on food safety. Our strategy takes a holistic view which differs to previous approaches involving the development of individual programmes of work tailored to specific risks. By working with others to develop solutions for dealing with the sources and environmental factors which impact on food safety, this strategy aims to achieve a measurable improvement in public health outcomes associated with foodborne illness.
4. In taking this strategy forward, FSS will take full account of Scottish Government objectives, and the outputs are particularly relevant to the following outcomes in the National Performance Framework:
  - We live longer, healthier lives
  - We have tackled the significant inequalities in Scottish society
  - Our children have the best start in life and are ready to succeed
  - We reduce the local and global environmental impact of our consumption and production

## What we mean by foodborne illness and why it is a priority for FSS

5. For the purposes of this strategy, foodborne illness encompasses any sickness or disease which is transmitted through the consumption of food or drink that contains harmful contaminants<sup>3</sup>. It remains an important public health problem for Scotland, resulting in disruption to the workforce and burdens on health services which have consequences for the Scottish economy.
6. The true impact of foodborne illness in Scotland is unknown due to under-reporting and in most cases it is not possible to attribute an illness to a particular foodstuff. Foodborne illness caused by the chemical contamination of food is particularly difficult to quantify as toxicity will vary significantly depending on the type of chemical involved, the quantity of contaminated food stuff consumed, and the health status of the affected individual. Furthermore, because outbreaks of chemical poisoning

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<sup>1</sup> [http://www.foodstandards.gov.scot/sites/default/files/A13680902\\_0.pdf](http://www.foodstandards.gov.scot/sites/default/files/A13680902_0.pdf)

<sup>2</sup> In the context of this strategy, the term 'food' also encompasses animal feed

<sup>3</sup> For the purposes of this strategy, the term 'contaminants' encompasses harmful microorganisms (bacteria, viruses, or parasites), biotoxins, chemicals and radioactive contamination. The definition does not include food allergens, which are addressed through a separate programme of work

are rare and the health impacts are often due to long term, low level exposure, illness is not routinely recorded in national public health surveillance.

7. The only available measure of foodborne illness in Scotland is derived from figures on reported cases of infectious intestinal disease (IID) caused by pathogenic microorganisms (pathogens). These figures are recorded by Scottish NHS Health Boards through national surveillance programmes which are managed by Health Protection Scotland (HPS), and allow trends in reporting of IID to be monitored over time. Figure 1 shows the numbers of reported cases of IID in Scotland for each of the key pathogens which are associated with foodborne illness. As IID is under-reported<sup>4</sup>, and only a proportion of cases is attributable to food, these figures cannot be used in isolation to assess the impact of foodborne pathogens on public health.

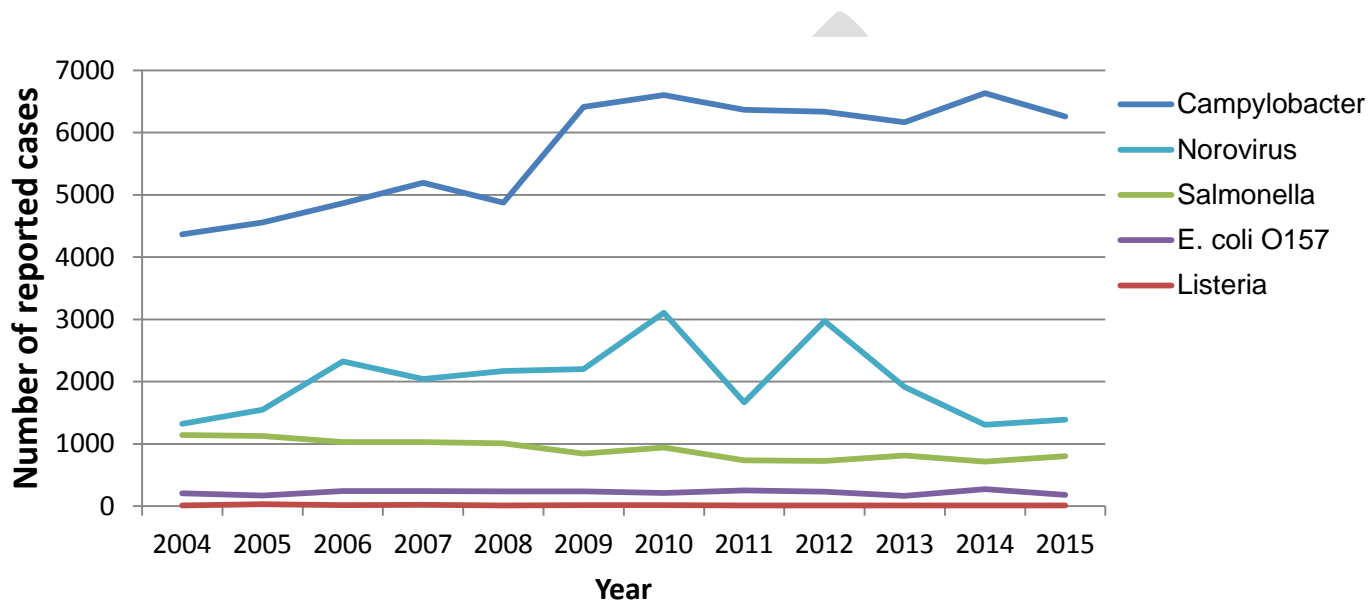


Figure 1. Reported Cases of Infectious Intestinal Disease in Scotland 2000-2015 attributed to the pathogens most frequently associated with foodborne illness (Data Courtesy of HPS).

8. Although IID is known to be under-reported, we can use multipliers to estimate its burden on society, such as those derived from the Food Standards Agency's (FSA's) research programme on IID in the UK<sup>5</sup>. This method has estimated that foodborne illness affects approximately **43,000 people in Scotland annually, with around 5,800 presenting to General Practice, and 500 requiring hospital treatment**. Campylobacter continues to be the most significant cause of IID in Scotland, and a key priority for FSS, as a high proportion of human cases are linked to a chicken source. The other pathogens which will be addressed through our strategy are Salmonella, Shigatoxin producing *E. coli* (STEC)<sup>6</sup>, *Listeria monocytogenes* and norovirus. Evidence from clinical surveillance, epidemiological studies and molecular attribution techniques has helped us to understand the key sources and risk factors for IID. However, the extent to which all of these pathogens are transmitted via the foodchain compared to other pathways is currently not well established.

<sup>4</sup> The figures represent only those cases which have been identified through laboratory confirmation of the causative pathogen in a faecal or blood sample taken from patients which present to General Practice (GP). Therefore clinical reports represent only a fraction of the number of cases of IID which have occurred in the community.

<sup>5</sup> [https://www.food.gov.uk/sites/default/files/711-1-1393\\_IID2\\_FINAL\\_REPORT.pdf](https://www.food.gov.uk/sites/default/files/711-1-1393_IID2_FINAL_REPORT.pdf)

<sup>6</sup> STEC is also frequently referred to as Verotoxin producing *E. coli*, or VTEC

## Scope and framework of the strategy

9. The foodborne illness risks which will be addressed by the strategy are:

<b>Pathogenic bacteria and viruses</b>	<ul style="list-style-type: none"><li>• Campylobacter, Shigatoxin producing <i>E.coli</i> (STEC/VTEC; including <i>E. coli</i> O157), <i>Listeria monocytogenes</i>, Salmonella, foodborne viruses including norovirus</li></ul>
<b>Biotoxins</b>	<ul style="list-style-type: none"><li>• Naturally occurring poisonous substances produced by microorganisms such as certain species of fungi, spore forming bacteria and marine phytoplankton</li></ul>
<b>Chemical contaminants</b>	<ul style="list-style-type: none"><li>• Potentially harmful chemicals derived from environmental pollution events and food processing</li></ul>
<b>Radiological contaminants</b>	<ul style="list-style-type: none"><li>• Radioactivity from authorised discharges, technologically enhanced naturally occurring radioactive material, historical contamination from past military or commercial practices, and radiological incidents</li></ul>

10. The framework of our strategy is based on a source – pathway – receptor approach, targeting the key transmission pathways for foodborne illness from the source of the contaminant through all stages of the food chain to the final consumer. The relationships between the various transmission routes for foodborne illness are represented in Figure 2, and it is apparent that interventions aimed directly at the food production system are only part of the picture. The potential for humans to become exposed to contaminants through a range of different transmission pathways, means that collaborative approaches will be required to fully understand the role of the food chain and to aid the selection of integrated risk management options which will reduce the overall risks to public health.

11. To date, our primary focus for reducing foodborne illness has been microbiological safety, in light of the impact of IID on public health, and the potential for outbreaks resulting from breakdowns in food safety management by food businesses and consumers. Interventions for minimising the risks of foodborne IID have previously been based on commodity or pathogen-specific approaches which have separately targeted distinct areas of the food chain. Whilst targeted measures such as the vaccination of laying flocks for Salmonella previously had a significant positive impact on public health, the number of cases of IID in Scotland have remained relatively static over the past 10 years, suggesting that there is now a need for us to look at the problem in a different way. We therefore propose to incorporate a more integrated 'One Health' approach which recognises the need to understand pathogen risks in Scotland in the context of veterinary, environment, water and foodborne transmission in order to identify interventions that will be most effective in preventing human illness<sup>7</sup>.

12. Our strategy aims to build on this further by looking at multiple pathogen and contaminant risks across the whole system to identify where we can make the greatest impact. By focussing on sources and transmission pathways, and promoting collaboration and multidisciplinary approaches, our strategy will also support understanding of how drivers for change including climate, agricultural practice, antimicrobial resistance, changing demographics and consumer preferences will be likely to impact on risks to the food chain.

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<sup>7</sup> One Health Initiative: <http://www.onehealthinitiative.com/>

13. The types of interventions required to mitigate risks at each part of the food chain, and the evidence needed to support our strategy are outlined in Figure 2. This framework will act as the foundation for key workstreams and the identification of indicators to demonstrate outputs and impacts. Robust risk assessment models already exist for a range of contaminants and transmission routes and we will employ established approaches and existing evidence wherever possible to underpin our work.

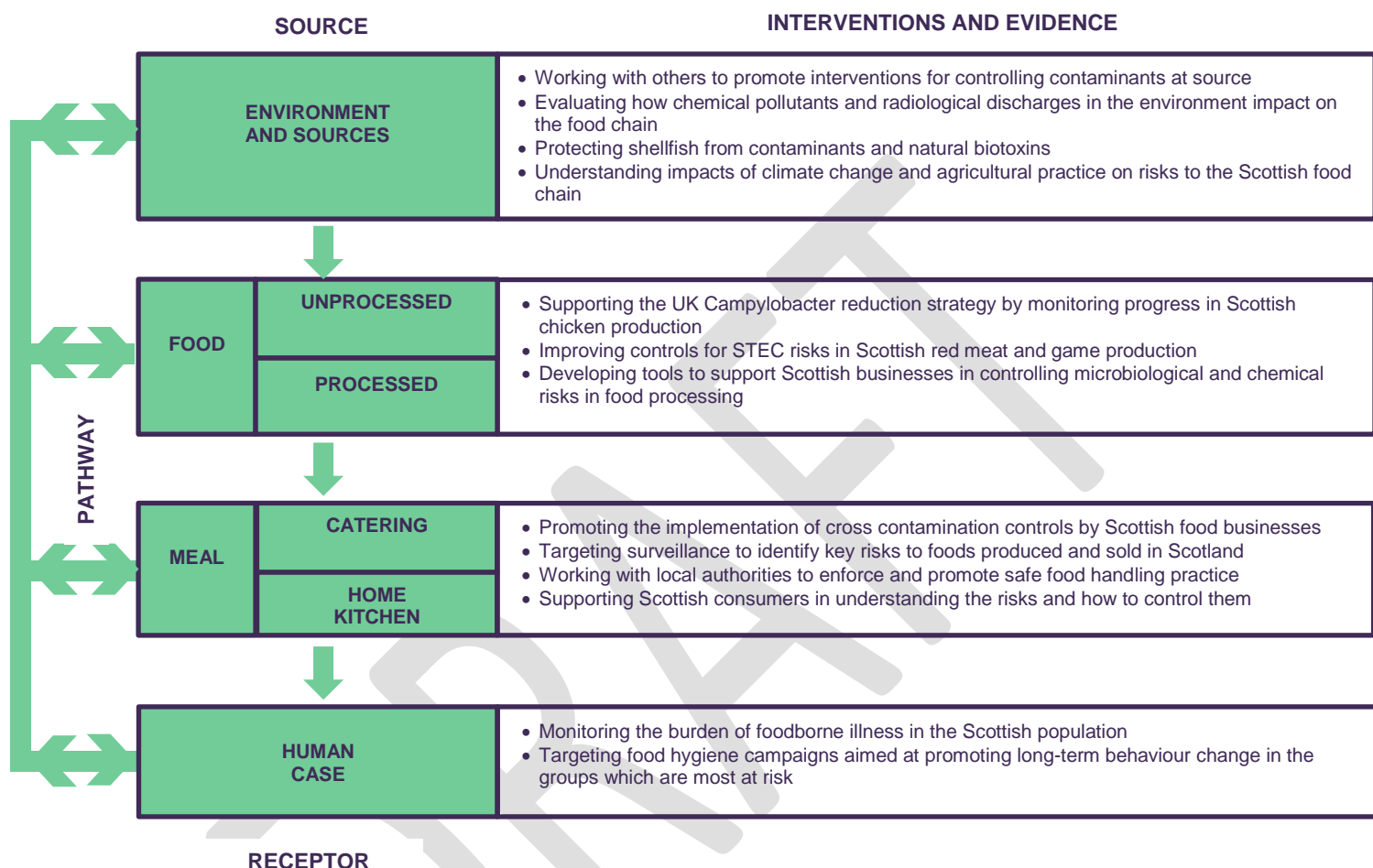


Figure 2. Framework of the strategy and intervention and evidence gathering activities which will support it.

## How we will deliver the strategy

### Targeting our activities

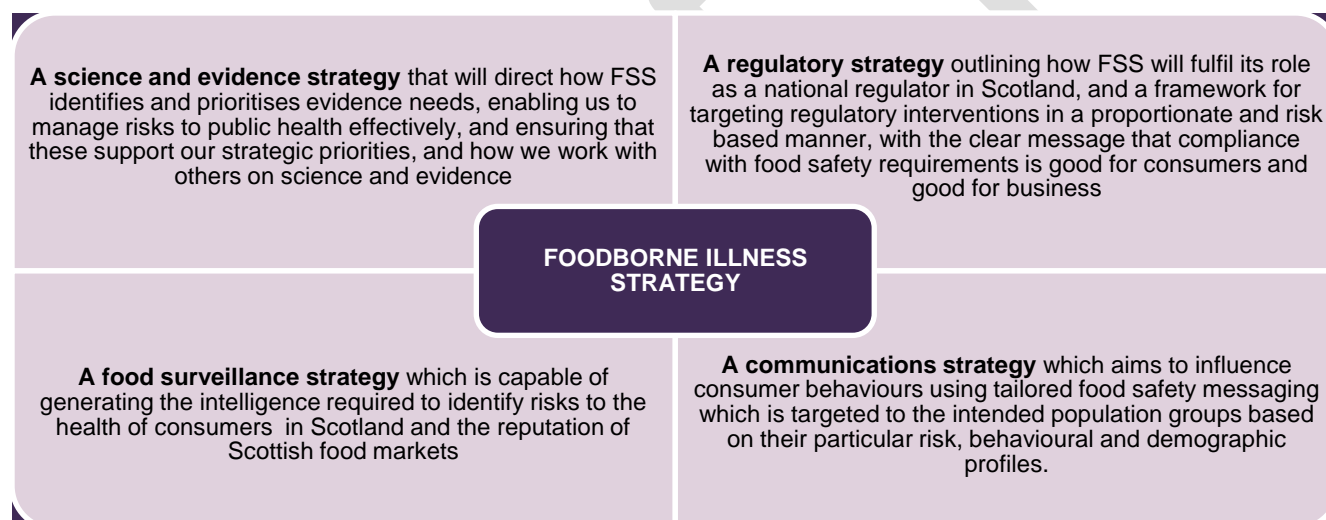
14. Activities to support the strategy will be targeted to areas where FSS, either alone or in collaboration with others is able to direct interventions which are capable of making a measurable impact on the transmission of contaminants. In some cases, interventions exist which are capable of eradicating contaminants at source (e.g. a livestock vaccine for zoonotic pathogens, or effective pollution prevention). In addition, there may be individual intervention approaches which are capable of controlling a number of different contaminant risks (e.g. cross contamination control). However, in most cases control will rely on the application of a range of interventions at various points in the food supply chain.

15. The prioritisation and design of new activities will be influenced by risk assessment and available evidence on the impact of approaches applied at each point in the food chain. Before investing in new intervention strategies, we will assess each one against a set of established criteria which will include evidence for efficacy against known risks, feasibility, acceptability, regulatory impact economic implications etc.

### **Linking with other FSS strategies**

16. Implementation of the foodborne illness strategy cuts across the regulatory, operational, science and communication functions of FSS and will require expertise across the organisation to identify, develop and apply interventions which make best use of resources to achieve a measurable impact on the risks associated with foodborne illness in Scotland.

17. We will therefore ensure that priority workstreams are aligned to parallel FSS programmes which are defined in our Strategy and Corporate Plan, and that new projects which are developed to reduce foodborne illness risks are consistent with the aims and objectives of these complementary strategies.



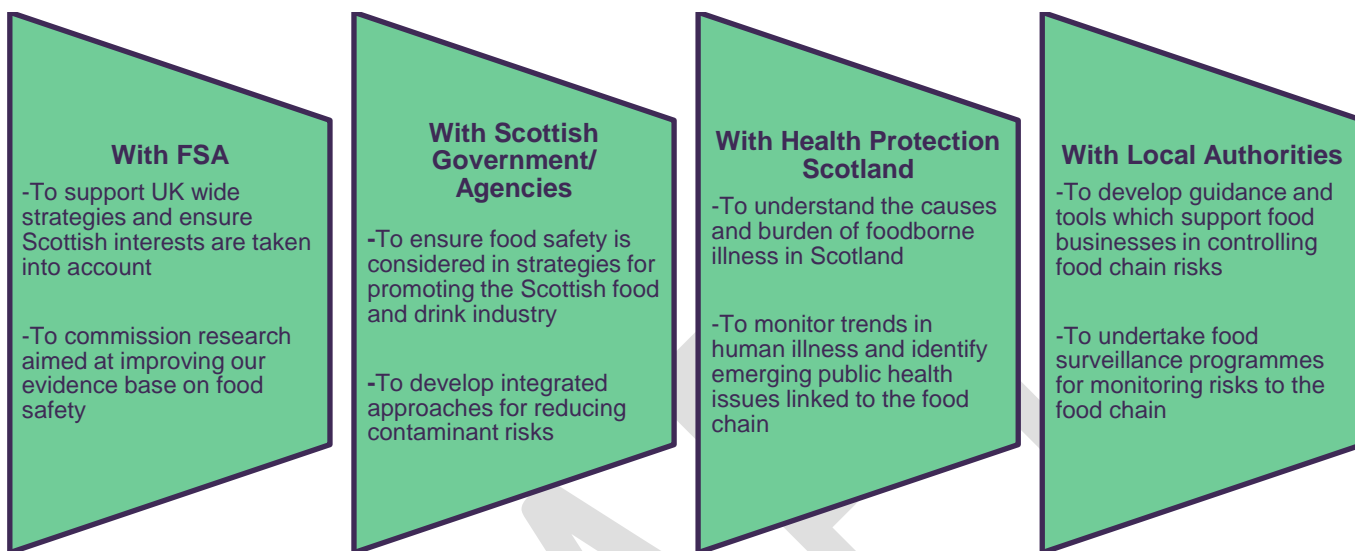
**Figure 3. Other FSS programmes which will be relevant to the aims of the foodborne illness strategy**

### **Collaborating with government partners**

18. Collaborative working will form a strong pillar of the strategy, and the relationships which will be key in ensuring FSS can deliver effectively are described in Figure 4. Improving the health of the Scottish population is at the heart of this strategy, however it is important to recognise that the food supply chain extends beyond Scotland, and co-ordinated approaches will be required to control the risks of contaminants in foods produced in the UK as well as imported products. Effective partnership working with FSA, the poultry industry and retail sector will be particularly important in addressing *Campylobacter*; a nationwide public health priority, which affects a highly integrated food industry operating across the UK.

19. In light of the environmental factors which can impact on the transmission of contaminants in the food chain, we will also seek to collaborate with other parts of government which play a role in the mitigation of environmental, veterinary and waterborne transmission. We will therefore aim to strengthen our existing relationships with partners in Scotland including Local Authorities, Health

Protection Scotland, Scottish Government and agencies such as the Scottish Environment Protection Agency (SEPA) to develop integrated and complementary programmes of work aimed at tackling the sources of contamination, and minimising transmission throughout the environment. We will use as a model the collaborative, multidisciplinary approaches led by the Scottish Health Protection Network (SHPN) to improve the safety of the environment and prevent the transmission of communicable diseases in Scotland. This includes the VTEC/*E.coli* O157 Action Plan<sup>8</sup>, which sets out the multi-agency strategy which was developed to reduce the transmission of pathogenic *E. coli* in Scotland.



**Figure 4. Key partnerships which will support FSS in delivering its strategy for reducing the risks of foodborne illness**

### ***Working with the food industry***

20. In addition to the consolidation of partnership working across government, the strategy will provide a new foundation for FSS to refresh and re-focus its relationships with the food industry with the aim of identifying and implementing interventions that will have the greatest impact on public health. Acting in its own right, and in the interests of Scottish consumers, FSS will forge new relationships with the major UK food producers and retailers to ensure that they drive forward the necessary improvements to the quality and standard of foods sold in Scotland.

21. It will be particularly important to align our strategy with the vision laid out in Scottish Government’s national food and drink policy<sup>9</sup>. In recognition of the landscape of the Scottish food and drink industry, a key strand of our strategy will be to promote the reputational and economic benefits of food safety and develop interventions which support Small and Medium Enterprises (SMEs), which dominate the food production sector in Scotland.

### ***Focussing on the consumer***

22. In order to ensure our strategy is targeted to the needs of Scottish citizens, it will be important to engage effectively with them on an on-going basis to ensure we have a robust understanding of their values and concerns in relation to food. Consideration will also be given to the burden placed on the

<sup>8</sup> <http://www.gov.scot/Resource/0043/00437879.pdf>

<sup>9</sup> <http://www.gov.scot/Topics/Business-Industry/Food-Industry/national-strategy/good-food-nation>

consumer in terms of costs and responsibilities for reducing risks to an acceptable level, including the potential impacts on vulnerable groups<sup>10</sup>. When developing new intervention approaches, we will therefore take account of the following:

- the likelihood that the food will be consumed by individuals with underlying health problems;
- the reliability of measures available to the consumer to control the risk and the potential availability of alternative controls in the supply chain;
- any potential adverse effect on health inequalities, particularly where domestic control measures may be more difficult to implement for those in deprived circumstances;
- the relative burden of obligations placed on consumers in the context of protecting their wider interests.

23. Our consumer surveys indicate that there continues to be a relatively poor understanding of food safety risks in Scotland, suggesting that previous campaigns have had limited success in improving levels of awareness. This new strategy will seek to identify the most effective ways of supporting Scottish citizens in managing the risks, and implementing lasting behaviour change. This will require us to have a better understanding of the needs and motivations of different segments of the Scottish population and the food chain risks which affect them. Our work will therefore be informed by consumer engagement activities through which we will seek views on current food safety matters, and identify the knowledge gaps and behaviours which are putting them at risk.

### ***Developing the evidence base***

24. A relevant and up to date understanding of food chain contaminants and the potential public health risks associated with foods produced and sold in Scotland will be critical in delivering the strategy and in ensuring that FSS continues to be a trusted and authoritative source of information and advice on foodborne illness. We will therefore underpin the strategy through a science and evidence programme covering the four key themes which are presented in Figure 5.

25. The evidence used to inform the strategy will be based on improved use of existing data held by FSS and across government, as well as data generated by commissioned research. We will also actively promote collaboration with funding bodies, public sector laboratories and academic and research institutions to build on the considerable expertise that already exists in Scotland and support the development of world leading and resilient analytical services for monitoring food safety. Data sharing will be facilitated by strengthening our existing partnerships with the FSA, Local Authorities, SEPA, and multi-agency groups such as the Scottish Health Protection Network and the Co-ordinated Agenda for Marine, Environment and Rural Affairs Science (CAMERAS)<sup>11</sup>. In conjunction with our parallel strategies to develop regulatory and food surveillance strategies for FSS, we will also explore the potential contribution of industry data in informing our evidence base on the prevalence of contaminants in the food chain and emerging risks.

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<sup>10</sup> For the purposes of this strategy, references to vulnerability, unless otherwise stated, include both physiological and socio-economic components

<sup>11</sup> <http://camerasscotland.org/>



**FRAMING THE PROBLEM:**

**Utilising evidence on the profile of foodborne illness in the Scottish population to identify which risks need to be evaluated and how to achieve this**

**RISK ASSESSMENT:**

**Determining the key risks associated with foods produced and sold in Scotland by identifying which parts of the food chain are subject to contamination, and which population groups are at greatest risk**

**CONCERN ASSESSMENT:**

**Understanding human behaviours and attitudes which affect the safety of food to identify where intervention is needed and how it should be delivered to improve awareness of the risks and good practice by food producers and consumers**

**PILOTING AND EVALUATION:**

**Trialling of interventions and methods for monitoring risk to understand what measures are effective in improving food safety**

**Figure 5. The Science and Evidence Programme which will support our foodborne illness strategy**

26. Multidisciplinary approaches employing natural and social sciences will be employed to assess and monitor risks, develop and trial intervention strategies and identify and change the human behaviours which increase the risks of foodborne illness. Evidence to support prioritisation, risk assessment and evaluation will include intelligence from epidemiological investigations, food surveillance data, insight from consumer engagement activities and economic analysis. In generating our evidence base we will work with the scientific community in Scotland to promote the latest advances in next generation sequencing and analytical chemistry and explore the use of more novel data sets emerging through social media channels and the internet of things.

27. When assessing the risks to consumers, we will seek to identify how these impact on different population groups in Scotland (based on demographic, geographic, socioeconomic profile and health status) and target interventions according to the relevant trends. We will also aim to develop a more robust evidence base on the impact of health inequalities on foodborne illness in the Scottish population. An example is our on-going research on the profile of *Campylobacter* infection in Scotland, which aims to identify whether lower rates of infection in deprived post code sectors is due to differences in behaviours and eating habits, or a result of poorer access to healthcare (and therefore under-reporting of illness) compared with more affluent areas.

28. Another important strand of our food safety science and evidence programme will be to improve the reporting of evidence and underpinning data and make it more accessible to food producers (particularly SMEs), and consumers. This will include building on our existing programmes of work for developing guidance and tools on effective food safety management e.g. our safe smoked fish tool<sup>12</sup> for processors and biotoxin traffic light guidance for shellfish harvesters.<sup>13</sup>

<sup>12</sup> <http://safesmokedfish.foodstandards.gov.scot/>

<sup>13</sup> <http://www.foodstandards.gov.scot/managing-shellfish-toxin-risks-harvesters-and-processors>

## What we are aiming to achieve

29. The overarching objectives for our new foodborne illness strategy are outlined in Figure 6. These are aimed at improving understanding of contaminant risks, supporting the Scottish food industry in implementing effective food safety management, targeting our communication strategies to support behaviour change and promoting the understanding of consumers about the steps that they need to take to protect themselves and their families from foodborne illness. These objectives will inform the prioritisation and development of new work streams that will be implemented during the lifetime of the strategy.

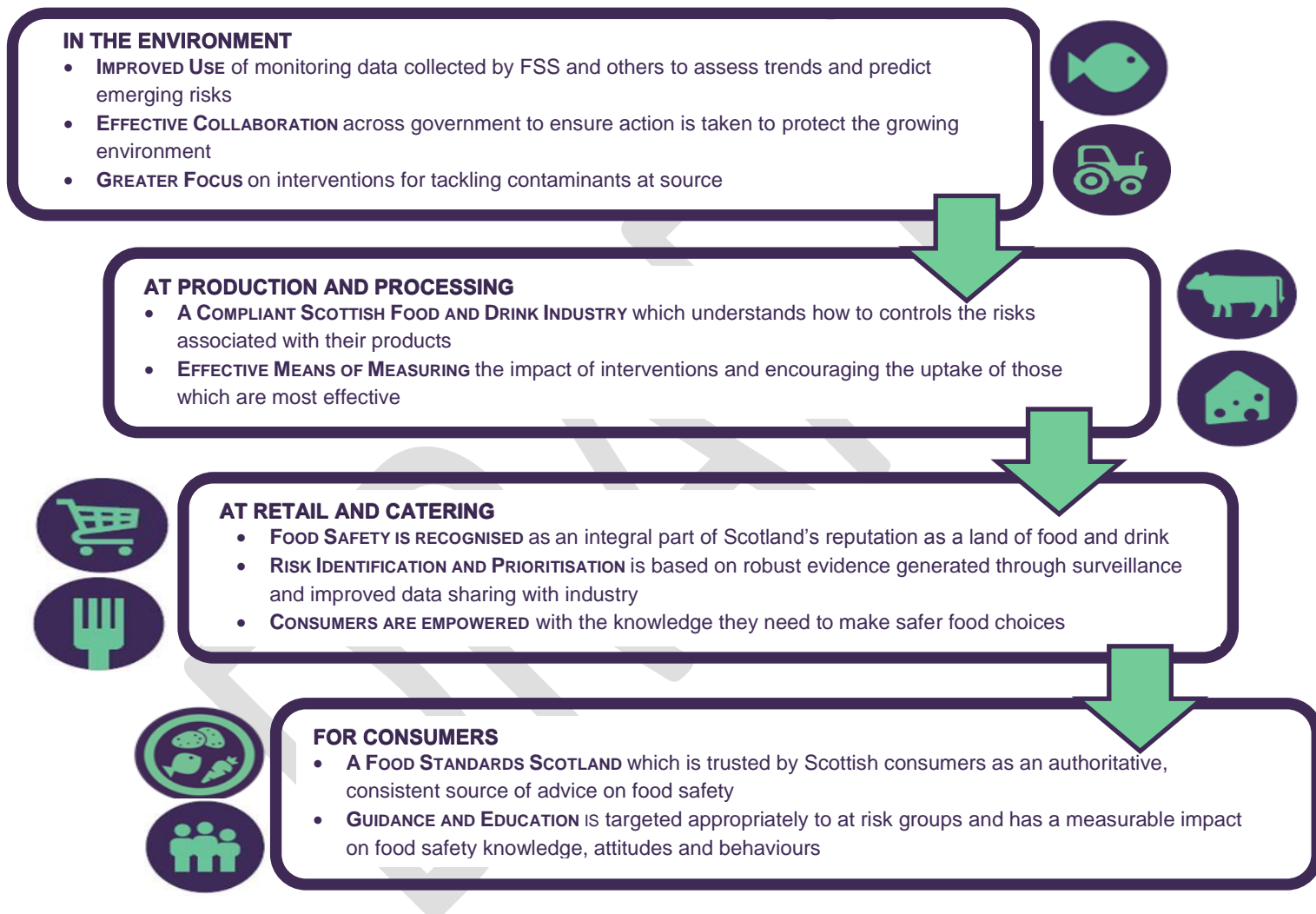


Figure 6. Key objectives for the foodborne illness strategy

## How will we measure success?

30. The key measures for the success of our strategy will be improved safety of foods produced in Scotland and the overall burden of foodborne illness in the Scottish population; achieved through the development of effective intervention approaches at appropriate points along the food chain. FSS holds a range of data sets which will help us to monitor our progress in achieving our aims, for example records of food incidents, the results of food surveillance activities and evidence on levels of food industry compliance. However, assessing our impact on public health outcomes will largely depend on information which is collected by others.

31. The results of clinical surveillance published by HPS on reported incidence of IID currently provides the only method for monitoring the impact of foodborne illness on public health in Scotland. However, this data is limited due to the under-ascertainment of IID and the contribution made by non-foodborne transmission routes to reported incidence. There are a range of other data sources which FSS can use to determine the impact of its strategies for protecting consumers from the risks of contaminants in food. These are presented in Figure 7, and include data from research and surveillance programmes, enforcement activities and consumer engagement work. As part of this strategy, FSS will assess how these data sets, and other relevant sources of evidence can be used to monitor progress in achieving our goals. We will then set appropriate performance indicators which will allow us to demonstrate the impact of our strategy on food safety and public health.

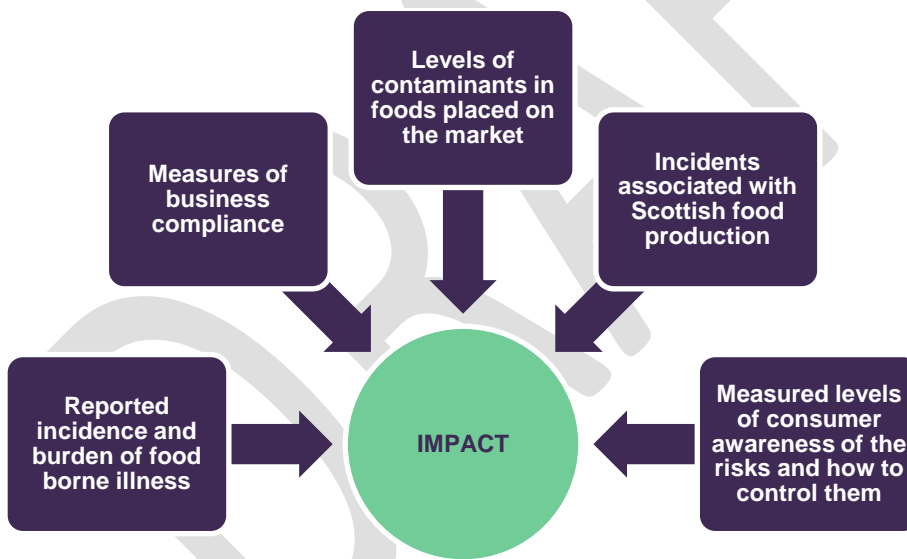


Figure 7. Data sources which FSS will use to measure its impact in reducing the risks of foodborne illness in Scotland

32. In order to be able to measure the true impact of our strategy, we will need to develop appropriate performance indicators that are capable of identifying where interventions have been effective in improving these public health outcomes. A long-term aim will be to generate more accurate estimates of the public health burden of foodborne illness using measures such as Disability Adjusted Life Years (DALYs)<sup>14</sup> to enable FSS to prioritise and target interventions more effectively to the needs of the Scottish population and provide a more accurate means of monitoring our impact on public health.

<sup>14</sup> [http://www.who.int/healthinfo/global\\_burden\\_disease/metrics\\_daly/en/](http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/)

## In conclusion

33. This strategy outlines FSS's approach to reducing the risks of foodborne illness over the next five years. It highlights how we will work collaboratively in Scotland and with FSA to tackle the main transmission pathways for the contaminants which are known to impact on food produced and sold in Scotland, and the role of science and evidence in delivering our objectives.

34. **The key proposals for delivering this strategy are to:**

- *Focus on the key transmission pathways for contaminants that are responsible for the greatest burden of foodborne illness;*
- *Mobilise expertise across FSS including the regulatory, operational, science and communication functions of the organisation to identify, develop and implement interventions which make best use of resources to achieve a measurable reduction in the risks associated with food chain contaminants;*
- *Collaborate across government and with other key stakeholders to promote integrated approaches for addressing contaminants from the source to the consumer hence safeguarding the Scottish food chain;*
- *Promote the importance of food safety to the Scottish food and drink industry and develop tools and guidance which support SMEs in controlling contaminant risks;*
- *Develop the evidence base on food safety risks to the Scottish population, and improve the use of existing data to target interventions and identify emerging risks to the food chain;*
- *Empower consumers with the knowledge they need to make safe food choices, and develop food safety communications which are targeted effectively and promote behaviour change;*
- *Identify appropriate indicators which will enable FSS to monitor its performance in delivering interventions which reduce the risk of foodborne illness and make a positive impact on public health outcomes in Scotland.*

DRAFT

***For more information please contact:***

*Food Standards Scotland  
Pilgrim House  
Old Ford Road  
Aberdeen  
AB11 5RL*

12 *Tel: 01224 285100  
Email: [enquiries@fss.scot](mailto:enquiries@fss.scot)*

***Foodstandards.gov.scot***