Update on the campylobacter reduction strategy and future priorities for tackling human infection in Scotland

1 Purpose of the paper and summary of key findings

1.1 Campylobacter remains the biggest cause of bacterial foodborne illness in Scotland and preventing its transmission through the food chain remains a key priority for FSS. This paper aims to update the Board on the latest findings of FSS research on campylobacter epidemiology in Scotland, and the current status of the UK strategy for reducing campylobacter in chicken; the most important source of this pathogen.

1.2 The key findings identified in this paper are:-

- rates of campylobacter infection in Scotland are consistently higher in males than females across all age groups (4.4)

- the highest incidence (per 100,000 population) is observed in the 65-69 age group (4.4) and that the proportion of hospitalised cases and the mean length of stay increases with age (4.7)

- fewer cases of campylobacter are reported for people living in more deprived areas of Scotland compared with those in the less deprived areas (4.5) and people with campylobacter infection living in more deprived areas are more likely to be hospitalised (4.8)

- the prescribing of proton pump inhibitors (PPI) for gastric reflux/heartburn (to reduce the production of acid in the stomach), is a risk factor for campylobacter infection (4.9)

- chicken-related campylobacter strains continue to be most commonly identified in human illness in Scotland (52-68%) followed by strains from ruminant (cattle and sheep) sources (4.11)

- despite the fluctuations in the number of human cases reported in Scotland and the progress being made by industry in reducing contamination in chicken there has been very little change in the attribution of human illness to chicken related strains of campylobacter (4.12)

- understanding the relative contributions of foodborne and non-foodborne transmission will continue to be important in identifying interventions which can reduce the overall burden of campylobacter infection in Scotland (4.13)

- for the period October to December 2018 the 9 major retailers have reported results for campylobacter contamination in UK retail chicken below the target of 7%. On-going action will be required by the industry to sustain these levels.(4.15). Research suggests that there remains scope for improvements in biosecurity on Scottish broiler farms (4.19)

- consumer research indicates that there continues to be a need to raise awareness of campylobacter and motivate attitudinal and behavioural change in food hygiene behaviours, particular amongst the groups which are at greatest risk of infection (4.23).

2 Strategic Aims

2.1 Campylobacter reduction is a commitment in our Corporate Plan to 2019[1], supporting FSS Strategic Outcome 1 – Food is Safe. The development of interventions for controlling the transmission of campylobacter has been identified as a priority in our strategy for reducing foodborne illness in Scotland[2].

3 Background

3.1 The Executive previously updated the Board on the UK campylobacter strategy on 16 August 2017, and provided details on how FSS aimed to support future work on campylobacter through its own strategy for reducing foodborne illness in Scotland.

3.2 The Board agreed that FSS should continue to work with FSA in implementing the UK campylobacter strategy by promoting effective controls by the food industry to reduce the levels of contamination in UK produced chicken. The Board also approved proposals for the major retailers to take responsibility for monitoring campylobacter levels and ensure transparency by publishing their own testing data. Further to this, it was agreed that, based on the findings of the FSA's retail chicken survey, focus should shift to supporting smaller producers and retailers in taking action to reduce campylobacter.

4 Discussion

Epidemiology of campylobacter infection in Scotland

4.1 Campylobacter remains the biggest cause of bacterial intestinal infection in Scotland, with 6096 laboratory reports received by Health Protection Scotland (HPS) in 2018 (Figure 4.1)[3]. This was the second consecutive year that reports of campylobacter had increased in Scotland following a decline in the number of reported cases in 2015 and 2016. Notwithstanding this increase, the number of reports remains below the peak of 6636 reports that was recorded in 2014. The reasons behind the recent increase in campylobacter reports is unclear, however, HPS has confirmed that the observed changes are not due to reporting artefacts or changes in laboratory testing methods, suggesting that it is indicative of an actual increase in infection rates. It should be noted that laboratory reports represent only a fraction of the number of cases of

[1] https://www.foodstandards.gov.scot/downloads/FSS_Strategy_Doc_Final_2.pdf
[2] https://www.foodstandards.gov.scot/downloads/A_Strategy_for_reducing_foodborne_illnesses.pdf
[2] https://hpspubsrepo.blob.core.windows.net/hps-website/nss/2708/documents/1_annual-summary-campylobacter-2018-12022019.pdf
[3] http://doc.ukdataservice.ac.uk/doc/7820/mrdoc/pdf/7820_iid2_final_report.pdf

campylobacter infection which occur in the community, with the actual number estimated to be approximately 9 times the number of reported cases[4].

4.2 In the majority of clinical cases, campylobacter infection results in self-limiting gastroenteritis characterised by diarrhoea, abdominal pain and fever, with some cases also experiencing nausea and vomiting. The illness usually develops a few days after ingesting the bacteria and lasts around one week, however infection can lead to more serious health complications for some individuals.

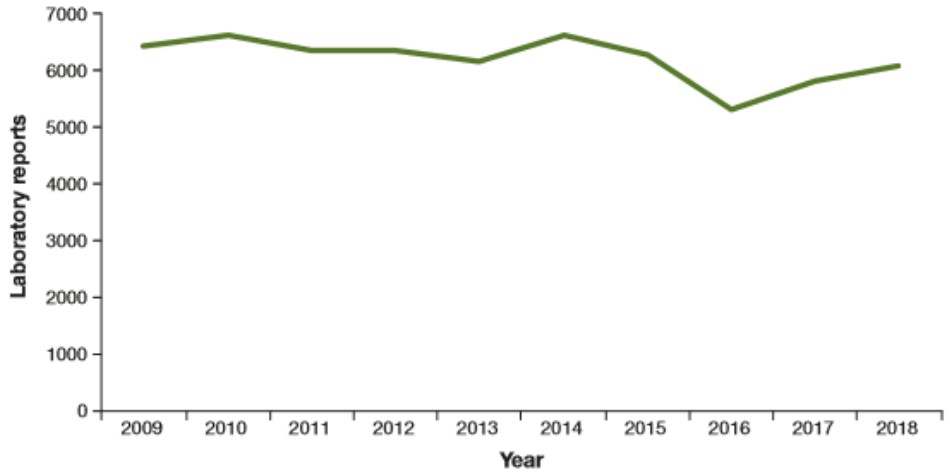

Figure 4.1: Annual number of clinical cases of campylobacter reported to HPS between 2009 and 2018.

4.3 To help us to understand the population groups that are most at risk, FSS has been funding two research projects on the epidemiology of campylobacter infection in Scotland. The first of these was undertaken by the University of Aberdeen (UoA) and examined the factors affecting variations in campylobacter disease rates reported across Scotland. The second was led by HPS, and involved the analysis of human case data from 2013 to 2017 that was linked with records relating to hospitalisations, deaths and medical prescribing data. Although these two studies were undertaken separately using different methods, they have generated similar findings, providing FSS with strong evidence on the key risk factors for campylobacter infection in Scotland. The valuable insights from this programme of work will help us to target interventions more effectively to the population groups that are associated with higher levels of infection and more severe health outcomes.

4.4 The HPS study showed that ***rates of infection in Scotland are consistently higher in males than females across all age groups***; a finding which is similar to that reported across Europe. ***Around half of all reported cases are aged 50 years and over, and the highest number of reported cases are in the 50-54 and 55-59 age groups*** (Figure 4.2). However ***the highest incidence (per 100,000 population) is observed in the 65-69 age group*** (Figure 4.3).

Peaks in incidence are also observed in the under 5 year olds and the 20-24 age group.

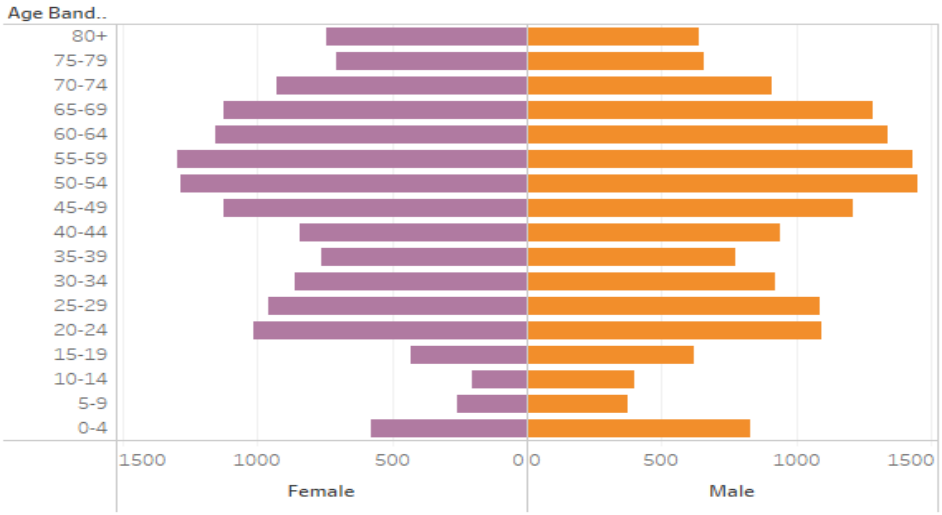

Figure 4.2. Total number of reported campylobacter cases in Scotland from 2013-2017 by gender and 5-year age bands

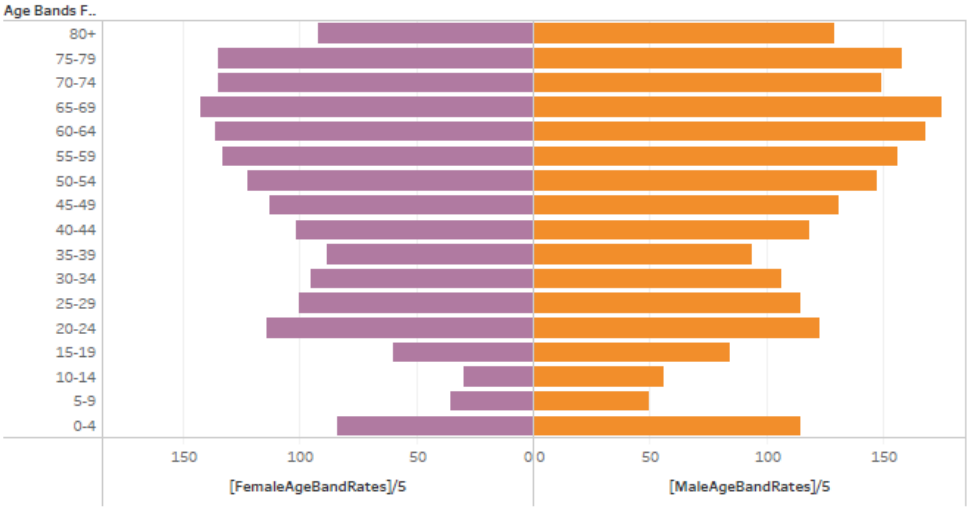

Figure 4.3: Average incidence per 100,000 of campylobacter by gender and 5-year age bands in Scotland 2013-2017.

4.5 Both studies confirmed the findings of earlier research, which found that ***fewer cases of campylobacter are reported for people living in more deprived areas of Scotland compared with those in the less deprived areas***. The UoA study tested this by looking at factors that may be likely to bias reporting rates in different socioeconomic areas through trends in surgery appointments and the triggers that prompt GPs to take stool samples from symptomatic patients. Whilst it found that individuals from less deprived backgrounds were more likely to make a doctor's appointment due to prolonged "nausea or

vomiting" symptoms than those in more deprived areas, it concluded that, on balance, this difference was likely to be due to an actual increase in incidence rather than being an artefact of the reporting system.

4.6 The UoA study also indicated that, regardless of socioeconomic status, recent foreign travel was a very important consideration for GPs when deciding whether to take a stool sample to test for campylobacter. It is worth noting that previous research[5] has shown that approximately 20% of UK campylobacter cases are associated with foreign travel. The study suggested that the increase in campylobacter reports in less deprived areas of Scotland may be partly due to more affluent population groups being more likely to travel overseas, increasing their risks of exposure out with the UK.

4.7 When considering the severity of illness and the burden of illness on health resources, the data shows that 14.0% of all cases are hospitalised and that ***the proportion of hospitalised cases and the mean length of stay increases with age*** (Figure 4.4). There has been a steady increase in the rate of hospitalisations of patients with campylobacteriosis since 2005, with this being most pronounced in the over 65 year old age group. With an ageing population in Scotland this increase in hospitalisations may become even more important in future years.

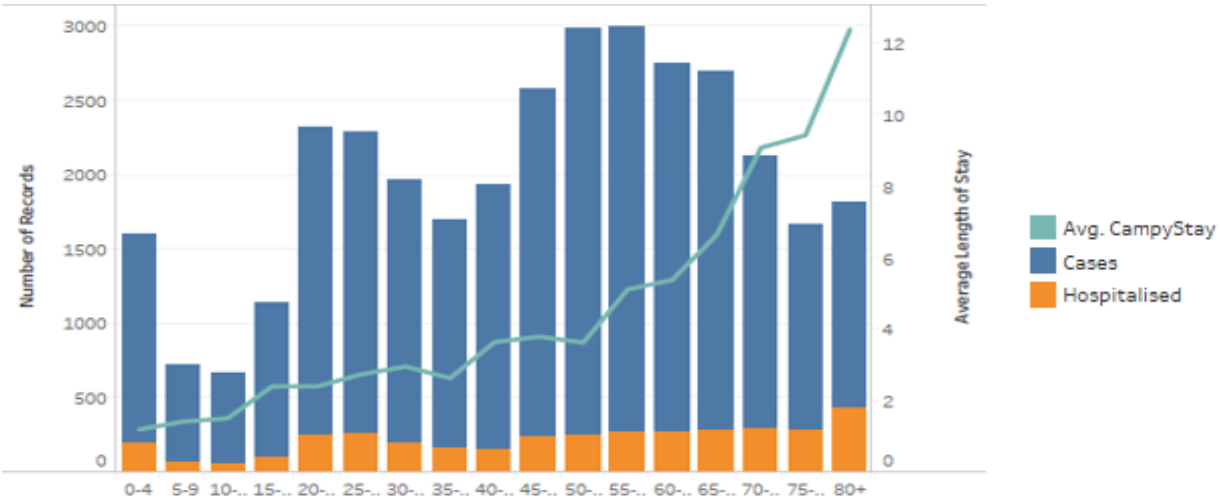

Figure 4.4: Hospitalisation of campylobacter cases by 5–year age band and mean length of stay in Scotland 2013-17.

4.8 In contrast to the trend for reported cases, the evidence suggests that ***people with campylobacter infection living in more deprived areas are more likely to be hospitalised*** (Figure 4.5), despite fewer cases of illness being reported in this group than in the less deprived areas. The reasons for this are unclear but may reflect the general health status of this demographic and pre-disposing conditions which could result in individuals belonging to this group being more vulnerable to illness or the severity being compounded by co-morbidities. In fact, although less than 0.6% of all cases resulted in severe health outcomes

[5] Charlett, A et al., 2003, Foreign and domestic travel and the risk of campylobacter infection: results from a population based sentinel surveillance scheme. Journal of Travel Medicine 10(2) p136-138

(admittance to an intensive care or high dependency unit or death), severe outcomes were reported in a higher proportion of cases from the more deprived areas.

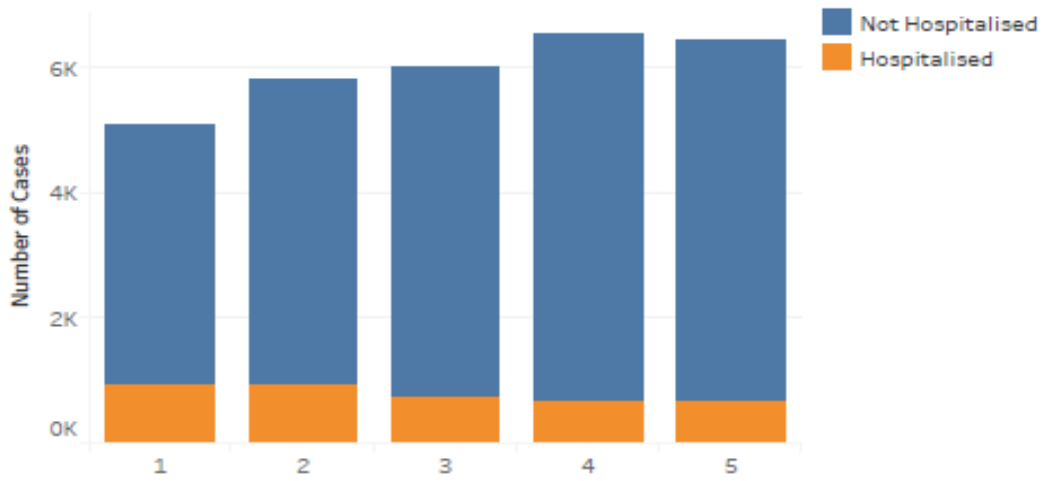

Figure 4.5. Proportion of campylobacter cases that resulted in hospitalisation in Scotland between 2013-17 by SIMD category.

4.9 Linkage of prescription data with case information and questionnaires has shown that, consistent with previous research, ***the prescribing of proton pump inhibitors (PPI) for gastric reflux/heartburn (to reduce the production of acid in the stomach), is a risk factor for campylobacter infection.*** Hospitalisation rates and length of stay was higher in PPI users and there was a higher proportion of cases prescribed a PPI prior to infection in the older age groups and from more deprived areas. Research has shown that PPI usage in the over 65 years increased substantially from 1997 to 2017 and this may partly explain the increase in campylobacteriosis and hospitalisation rates in this age group[6].

4.10 The findings of the data linkage project undertaken by HPS are currently being used to calculate the financial burden of campylobacteriosis in Scotland. This will ascertain the direct financial costs to the health care system associated with campylobacter infection and allow these to be broken down according to population demographic. This will help FSS to demonstrate more effectively where consumer focussed interventions for campylobacter reduction could make the greatest impact on NHS costs in Scotland.

Sources of campylobacter infection in Scotland

4.11 Raw poultry meat is recognised as a major contributor to campylobacter infection worldwide, but it can also be found in unpasteurised dairy products, red meat and untreated water. Understanding the key sources and transmission routes for human infection is key in identifying intervention strategies for reducing the number of cases, and has been a focus for our research programmes over the past 15 years. Molecular source attribution is an internationally recognised research tool which is used to compare the

[6] Strachan, N.J.C, et al 2013. Operationalising Factors That Explain the Emergence of Infectious Diseases: A Case Study of the Human Campylobacteriosis Epidemic. *Plos One,* **8**(11), pp. e79331.

genetic profiles of campylobacter strains isolated from patients with those found in different sources of the pathogen, and modelling of this data can determine the most probable sources for human infection. This method has been used in other countries (most notably New Zealand), to demonstrate how interventions for reducing campylobacter in the poultry supply chain have changed the proportions of reported human illness that are attributed to chicken compared to other sources. Between 2005 and 2016, FSS (and previously FSA in Scotland) applied molecular source attribution to compare campylobacter strains isolated from human clinical cases of campylobacter infection in Scotland with established sources of the pathogen (chickens, cattle, sheep, pigs and wild birds). The most recently published data sets (up to December 2016), showed that, regardless of the modelling approach employed, ***chicken-related campylobacter strains continue to be most commonly identified in human illness in Scotland (52-68%) followed by strains from ruminant (cattle and sheep) sources*** (Figure 4.6)[7]. Similar findings have been identified by studies in other European countries, including a recent FSA funded project, which used the same method to attribute human campylobacter cases in Oxfordshire and the north-east of England.

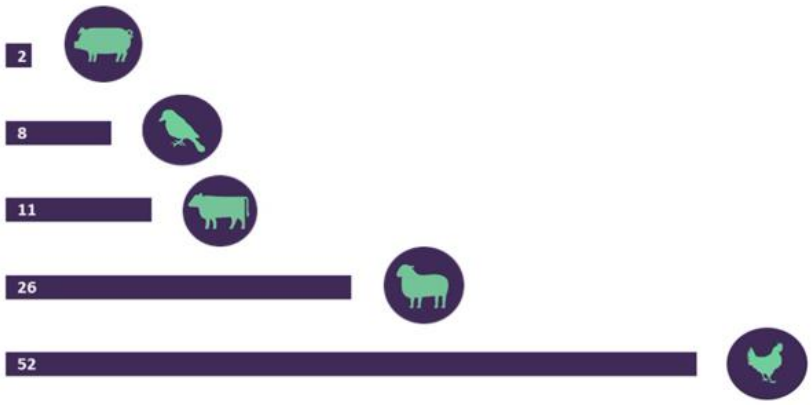

Figure 4.6: Percentage contribution of different sources of campylobacter to human infection using the STRUCTURE model of source attribution.

4.12 Our research has shown that, despite the fluctuations in the number of human cases reported in Scotland (Figure 4.1), and the progress being made by industry in reducing contamination in chicken (see below), ***there has been very little change in the attribution of human illness to chicken related strains of campylobacter.*** Further work is underway to refine the sensitivity of this method in detecting changes in attribution to chicken. However, this finding supports the need for on-going action to further reduce the levels of campylobacter contamination in fresh chicken.

4.13 It is also important to take account of the possibility that non-foodborne (environmental) pathways are playing a role in the transmission of chicken related strains which might not be fully addressed through current industry

[7] https://www.foodstandards.gov.scot/publications-and-research/publications/campylobacter-attribution-extension

interventions. Environmental exposure is considered to play an important role in the transmission of ruminant sources of campylobacter, through environmental contact with cattle and sheep faeces and contaminated water sources (Figure 4.6). ***Understanding the relative contributions of foodborne and non-foodborne transmission will therefore continue to be important in identifying interventions which can reduce the overall burden of campylobacter infection in Scotland.***

Update on the UK campylobacter reduction strategy

4.14 It is well established that campylobacter grows to high levels in the gut of infected chickens and can contaminate the skin and meat of birds during slaughter and processing. Evidence suggests that chicken contaminated with high levels of campylobacter (exceeding 1000 colony forming units per gram (cfu/g)) presents the greatest risk to consumers. Therefore strategies for protecting public health are aimed at reducing the levels below this threshold. The UK campylobacter reduction strategy, a partnership between FSA, FSS and the poultry industry, agreed a voluntary target to reduce the most highly contaminated birds (those with over 1000 cfu/g neck skin) from an estimated 27% in 2008 to below 10% post chill by the end of 2015 and subsequently to <7% at retail. In order to achieve this target a wide range of interventions have been trialled and implemented from the farm, through to processing and at retail:

- **At the farm level** improvements to biosecurity coupled with increased sampling of poultry houses to prevent transmission and identify when flock colonisation has occurred. Certain producers have also removed the thinning stage (when a portion of the flock is removed prior to depopulation to satisfy market demand for smaller chickens) from the growing process to reduce the risks of campylobacter contamination in the finished flock.

- **At processing** secondary scalding (where birds are immersed in hot water following the defeathering stage, in addition to the initial scald which acts to soften feathers for removal) has proven to be particularly effective in reducing campylobacter contamination on carcasses, and has now been implemented by many of the major processors. Additional end of line treatments based on steaming, chilling or washing have also been trialled and implemented by some companies to effect further reductions in campylobacter levels.

- **At retail** a number of interventions have been taken forward including leak proof packaging, labelling to advise consumers not to wash raw chicken, and cook in the bag products to minimise handling and cross contamination risk in the domestic kitchen.

4.13 In Scotland, secondary scalding has been introduced as routine by one poultry slaughterhouse, in combination with an end of line chilling step, which applies a cold surface treatment to carcasses. Industry data has shown that these treatments have decreased the overall prevalence of campylobacter and led to

a reduction in the number of carcasses that fall into the most highly contaminated category.

4.14 The progress industry made in achieving the voluntary target was initially monitored by FSA over a three year period through surveillance of chicken on retail sale. The final year of the FSA survey, undertaken from August 2016 to July 2017, showed that 54% of fresh, whole chicken on retail sale in the UK was contaminated with campylobacter. The overall industry average of chickens testing positive for campylobacter within the most highly contaminated band (>1000 cfu/g) was 6%, which was a significant reduction from the 27% baseline set in 2008 and below the target set for retail chicken.

4.15 The FSA (with support from FSS) agreed to cease the retail survey following a commitment made by the nine major retailers[8] to carry out their own sampling and testing (based on protocols approved by the FSA), and to publish their results on a quarterly basis. ***The latest set of these results was published in March 2019 for the period October to December 2018 and showed that, on average, across all of the retailers, 3.1% of chickens tested positive for the highest level of campylobacter contamination, with all 9 retailers reporting results below the target of 7%.*** However, although it is encouraging that campylobacter levels are holding consistently low, on-going action is required by the industry to sustain these levels, especially during the summer months, when flock colonisation is known to peak.

4.16 Across the industry, the reduction in campylobacter prevalence in UK produced chicken has been largely driven by the improvements made by larger poultry companies throughout the production chain. The FSA retail survey showed that whilst the industry average for heavily contaminated birds was 6%, the figure for smaller retailers and butchers was significantly higher at 18%. Therefore the focus of the strategy has now moved towards supporting the smaller producers and retailers to implement interventions for reducing campylobacter contamination. Although it would be difficult for these businesses to replicate the action taken by large poultry producers and major retailers, it is considered that improvements could be made in relation to on-farm biosecurity and hygiene at processing which could make a positive impact on contamination. There is also scope to engage with smaller retailers and butchers on storage, handling, packaging and labelling practices which could help to reduce campylobacter risks to the consumers who purchase chicken from these establishments.

4.17 To monitor the progress that the smaller producers and the independent market are making in tackling campylobacter, FSA and FSS are currently funding a survey of fresh chicken sold at small retailers and butchers supplied through this sector. Sampling has suggested that, similar to the supply chain into the major retail market, a significant proportion of chicken sold at butchers and small retailers in Scotland is produced elsewhere in the UK. Of the 97 samples taken in Scotland from September 2018 to January 2019, only 20 had an approval mark from a Scottish slaughterhouse, with the remainder originating from England. ***Therefore, it will be essential to continue to work with FSA in***

[8] Aldi, Asda, Co-op, Lidl, Marks and Spencer, Morrisons, Sainsbury's, Tesco, Waitrose

order to influence campylobacter reduction by chicken producers supplying into Scotland. FSS can make a further impact by targeting interventions which support butchers and smaller retailers in Scotland in controlling the risks.

4.18 In January 2018, a new EU process hygiene criterion came into force to reduce campylobacter contamination of broiler carcasses. This is the first time a legislative target has been set for campylobacter, and has been initially set to allow 40% of carcasses to exceed 1000 cfu/g, with a commitment to reduce this to 20% by 2025. Whilst this target is significantly higher than the voluntary target agreed with the UK industry, the introduction of a legal criteria has required the smaller slaughterhouses to begin testing for campylobacter and consider their controls for reducing contamination. It is therefore anticipated that this will have a positive impact on the overall risk to consumers. FSS has been supporting the smaller slaughterhouses[9] in Scotland in implementing the process hygiene criteria through the provision of advice on appropriate testing methods and interpretation of results. Progress in achieving the criteria will continue to be monitored as part of FSS enforcement activities at these premises.

4.19 Ensuring that campylobacter contamination entering the slaughterhouse is as low as possible requires good controls on farm to prevent the birds becoming colonised. FSS recently supported research in this area which was undertaken by Scotland's Rural College (SRUC) through the Scottish Government's Rural Affairs Food and the Environment Strategic Research (RESAS) programme. The project monitored levels of adherence, by farmers, to strict biosecurity during the lifetime of the flock. The outputs confirmed previous findings that serious breaches in biosecurity tend to occur after the thinning of flocks, at a time when campylobacter is known to colonise the birds. It has provided evidence that breakdowns in biosecurity were continuing to take place on Scottish farms and that further action is needed to reduce transmission at this stage in the production chain. ***Strengthening engagement with farmworkers and poultry catchers to promote consistent application of biosecurity is an area where there is further scope for FSS to work directly with the industry on campylobacter reduction.***

Tackling non-chicken sources of campylobacter

4.20 Whilst the attribution work has shown that chicken-related strains remain the biggest source of campylobacter infection in Scotland, other food sources have been shown to be contaminated with campylobacter and may a pose a risk to consumers if they are not handled or cooked properly. In particular, retail livers (from poultry and ruminants) and duck meat, have been shown to be contaminated with high levels of campylobacter, and are often cooked pink. ***Raising awareness with caterers and consumers about the risks of campylobacter in these foods and how to prepare them safely will be a further area of focus for FSS going forward.***

[9] When the PHC came into force there were two smaller poultry slaughterhouses in operation in Scotland, however there is now only one that remains operational.

4.21 Previous surveys of red meat have shown the prevalence of campylobacter to be very low and an on-going FSS survey of retail beef mince[10] will provide us with current evidence on the probable role of red meat in human infection. However, as many of the ruminant-related strains of campylobacter are believed to be acquired through environmental exposures, ***sustained collaboration with other Scottish health partners, such as HPS, to promote measures for infection control in the outdoors, will contribute to our overall strategy for reducing the transmission of foodborne pathogens including campylobacter[11].***

Consumer behaviours and attitudes

4.22 Consumer research undertaken by FSS has suggested that awareness of campylobacter remains relatively low. Wave 6 of the FSS Food in Scotland consumer tracking survey (run during summer 2018) reported that only 35% of respondents agreed that they knew what campylobacter was[12]. Knowledge levels appeared to be greater in females and increased with age. Awareness was also higher in more affluent socioeconomic groups.

4.23 A series of consumer forums undertaken by FSS in December 2017, explored consumers perceptions of food risk[13] and suggested that whilst people were well aware of the risks associated with eating undercooked chicken they had limited understanding of the reasons behind this. Responses in our tracker survey also suggest that awareness of the risks does not always translate to reporting of good kitchen hygiene behaviours. For instance, only 46% of respondents claimed to never wash raw chicken despite this behaviour being a risk factor for splashing campylobacter on to kitchen surfaces and the cross-contamination of other foods. Further to this, 13% reported eating chicken or turkey meat that was pink or had red juices[14]. These claimed behaviours suggest that further work is required to raise consumer awareness of campylobacter and the risk of illness from incorrect handling and cooking of chicken, with the aim of motivating attitudinal and behavioural change, particularly amongst the segments that are at highest risk of infection.

4.24 To date, the FSS social marketing strategy for campylobacter reduction has consisted of three strands based on evidence available at the time to inform objectives, timing and targeting:

- **The 'Pink Chicken' campaign** focussed on the summer period, when there are high numbers of reported illness. The campaign, which ran during the summers of 2016 and 2017, was aimed at raising awareness of campylobacter

[10] https://www.foodstandards.gov.scot/publications-and-research/scientists-and-researchers/food-safety-research
[11] https://www.nhsinform.scot/healthy-living/outdoor-health/bugs-and-germs/avoiding-bugs-and-germs-outdoors
[12] https://www.foodstandards.gov.scot/downloads/Wave_6_data_tables.pdf

[13]https://www.foodstandards.gov.scot/publications-and-research/publications/consumer-forums-perceptions-of-food-safety-risks
[14]https://www.foodstandards.gov.scot/downloads/FSS_Consumer_Trends_Attitudes_W5_Weighted_V6_DPV11_PRINTABLE.pdf

and the importance of cooking chicken thoroughly on the barbecue. the campaign creative and media strategy were targeted to young adults in higher socio-economic groups, particularly males, based on historic evidence for elevated reporting rates in this group, and lower levels of awareness of safe food handling practices. Evaluation of the campaign suggested that it made a positive impact on claimed food handling behaviours by those who had seen it, particularly in ensuring chicken was cooked thoroughly.

- **The 'Kitchen Crimes' campaign**, which ran in January 2018 and 2019, was aimed at those most likely to be preparing and cooking food in the home for themselves and others, including 'at risk' young children and older people, with the objective of reducing complacency about the risk of food poisoning from food eaten at home. This highlighted 20 food hygiene behaviours that should be followed at home (a reframing of the 4Cs), including several related to campylobacter reduction. An independent evaluation of the first run of the campaign indicated that 81% of those who had seen it were motivated to take action, including a reduction in those willing to risk eating undercooked chicken and a decrease in those who wash raw chicken.

- **The festive campaign, 'Food poisoning is the last thing on anyone's list'**, ran over Christmas 2015 and 2016. This targeted ABC1 women with children who are the main household shoppers and who prepare the majority of meals over the Christmas and New Year periods for family and friends. The key food safety messages from this campaign related to the storage, preparation and cooking of turkey and the risk of campylobacter poisoning from poor food hygiene practices.

4.25 In light of our most up to date evidence on campylobacter epidemiology and risk factors, there is scope for FSS to re-target its food safety messaging to the groups in the Scottish population which are known to be most affected, both in terms of the number of cases and severity of illness. Particular consideration will be given to the older age groups and those who are more vulnerable to serious illness such as those in more deprived areas and PPI users. ***Our strategy for reducing campylobacter infection in Scotland will therefore include the development of communication approaches which have the potential to drive behaviour change in these groups.***

5 Identification of risks and issues

5.1 Regardless of how the UK leaves the EU, EU Exit will likely require FSS to re-deploy scientific and policy resources to support food safety risk analysis functions, which will reduce capacity for implementing our strategy for reducing foodborne illness. FSS will need to work with others across governments to ensure momentum is not lost and engagement with industry continues. Existing avenues for collaborating across Scotland and the rest of the UK to share information and develop joint intervention approaches should be explored during this time to maximise resources available.

6 European Union considerations

6.1 Although the UK target for campylobacter reduction in chicken is currently stricter than legal EU hygiene criteria, control of this pathogen through integrated food safety management is a priority across Europe. With regard to the potential impact of EU Exit on this issue, FSS's position is to ensure that, whatever the outcome, there should be no reduction in the level of protection afforded to consumers in Scotland. Notwithstanding, the possibility that future trade negotiations could lead to changes in UK poultry import/export markets has generated significant media attention due to concerns over differences in production standards and approaches to hygiene controls in non-EU countries.

6.2 Industry statistics indicate that, in 2017, the UK was 75% self-sufficient with regards to poultry production and consumption, and that around 95% of UK imports of fresh and frozen chicken meat originated from other EU countries. Third country imports mainly consist of processed poultry meats with Thailand, Brazil and China being the biggest contributors[15]. It will be important for FSS to ensure that in future, that both domestically produced and imported meat continues to be safe to eat, and that there is no reduction in the level of protection to consumers.

7 Conclusion/Recommendations

7.1 **Conclusion :** Campylobacter continues to be the biggest cause of bacterial foodborne illness in Scotland and the increase in reported rates of infection over the last 2 years makes it a key focus for FSS's on-going strategy for reducing foodborne illness**.** Based on new evidence from our research programmes, and progress made to reduce campylobacter in UK chicken, the Executive proposes that future work in this area should focus on the recommendations below.

7.2 **The Board is asked to:**

- **Note** the progress made in understanding the key sources and risk factors for campylobacter infection in Scotland, and the impact of industry interventions for reducing the levels of contamination in UK produced chicken.

- **Agree** that the future focus for tackling campylobacter in Scotland should be based on:

    - Collaborating with FSA to drive further reductions in campylobacter in UK produced chicken by promoting sustained action by the major retailers, and supporting farmers and smaller producers/retailers in Scotland and the rest of the UK in controlling the risks.

[15] https://pork.ahdb.org.uk/media/275384/poultry-pocketbook-2018.pdf
http://beefandlamb.ahdb.org.uk/market-intelligence-news/poultry-market-update/
https://www.poultryworld.net/Meat/Articles/2016/6/UK-less-self-sufficient-for-poultry-2821542W/

- Working with HPS and health services in Scotland to develop our understanding of the epidemiology of campylobacter and identify avenues for ensuring at risk groups are appropriately informed about the risk of infection and how to avoid it.

- Reviewing our consumer advice on the 4C's (cooking, chilling, cleaning, avoiding cross-contamination) and methods for communicating it to consumers to ensure it is targeted effectively and reaches those who are at greatest risk from campylobacter infection and its impacts.

- Strengthening our evidence base on the sources and prevalence of campylobacter by undertaking surveillance of the Scottish food chain, to support risk assessment and the identification of interventions for reducing transmission through non-chicken sources.

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