Evaluation of changes to legislation governing official controls in pig approved slaughterhouses

Monitoring framework

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Glossary
| **Glossary** |
|-------------------|----------------------------------------------------------------------------------|
| **Ante-mortem inspection** | The checks are usually carried out by the Official Veterinarian (OV) and must take place before an animal can be slaughtered (if an animal is slaughtered without ante-mortem inspection then it must be condemned). The OV checks for any signs of disease, injury, fatigue, stress and mishandling. The animal can then proceed to be slaughtered. |
| **Collection and Communication of Inspection Results (CCIR)** | The term given for the recording of ante and post-mortem observations, and their communication back to the farmer. It contains information on the identification of the animal, health status of the animal, veterinary medicine withdrawal periods and information on the animals housing condition. |
| **Competent Authority (CA)** | A body or individual that has legally delegated capacity or power to perform a particular designated function. The Food Standards Agency is the UK's central competent authority for official controls on food safety. |
| **Controlled housing** | For a producer to have reared their livestock in controlled housing they must have put in place the necessary conditions as defined by the EFSA\(^1\). This is relevant for this report as pigs reared in non-controlled housing conditions must be tested for *Trichinella*. |
| **Department for Environment, Food & Rural Affairs (DEFRA)** | The UK government department responsible for policy and regulations on environmental, food and rural issues. |
| **Department of Agriculture and Rural Development (DARD)** | The department with responsibility for food, farming, environmental policies and the development of the rural sector in Northern Ireland. Through a service level agreement with the Food Standards Agency, DARD is responsible for the official controls relating to the meat industry, to safeguard the health of the public, and the health and welfare of animals at slaughter. |
| **Endocarditis** | A disease characterised by the infection of the inner lining of the heart which can damage heart valves and have serious repercussions. It is commonly caused by bacteria travelling to the heart. |
| **Enforcement action** | Action required that pertains to a breach in legislation, non-compliance or an endangerment to food safety that is enforced by the OV of a plant. |
| **European Food Safety Authority (EFSA)** | An independent European agency funded by the EU, operating separately from European Commission, European Parliament and EU member states. Their role is to assess and communicate all risk associated with the food chain, providing independent scientific advice and clear communication on existing and emerging risks. |

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Food Business Operator (FBO) | The Food Business Operator (FBO) is the natural or legal person/s responsible for ensuring that the requirements of food law are met within the food business under their control.² Throughout this report, the FBO refers to the person who self-defined as such during research carried out to examine implementation of new legislation governing meat inspection in pig slaughterhouses.

Food Chain Information (FCI) | Food Chain Information (FCI) refers to the information on the health status of the animal consigned for slaughter and the holding of origin.

Food Standards Agency (FSA) | The Agency was created in 2000 as a non-ministerial government department, governed by a board, and tasked with protecting consumers in relation to food. It is the role of the Agency to help ensure that the meat industry safeguards the health of the public, and the health and welfare of animals at slaughter.

Full Inspection procedure (FIP) | The procedure in which the palpation of organs and incision of lymph nodes are carried out as standard, during the inspection of the carcase by the Meat Hygiene Inspector (MHI) or OV.

Hazard Analysis and Critical Control Point (HACCP) | HACCP is an internationally recognised way of managing food safety and protecting consumers. All food business operators except farmers and growers are required by EU food hygiene legislation, to implement and maintain hygiene procedures based on HACCP principles, including identifying any hazards that need to be eliminated and implementing appropriate controls.

Lairage | The lairage is the area where animals are held before slaughter. This is usually where the ante-mortem inspection takes place.

Meat Hygiene Inspector (MHI) | Meat Hygiene Inspectors (MHIs) carry out a number of official tasks including post-mortem inspections.³

Offal | Offal refers to the internal tissue of a dead animal excluding the carcase and bones. This is further divided into red offal (including heart, lungs, liver and kidney) and green offal (including stomach and intestines).

Official Veterinarian (OV) | Official Veterinarians (OVs) perform a range of official tasks, including ante-mortem inspections, and have responsibility for keeping a record of the findings of the inspections, including details of contraventions, actions required and monitoring of these actions.

Pericarditis | Inflammation of the tissue surrounding the heart.

Post-mortem Inspection (PMI) | Inspection carried out after the animal has been killed and processed through the plant. The inspection is usually carried out by the Meat Hygiene Inspector (MHI) (but occasionally by the OV) and involves

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² Regulation (EC) 178/2002
³ The OV need not be present during post-mortem inspection if:

- an MHI carries out post-mortem inspection and puts aside abnormal meat with uncommonly occurring conditions and all other meat from the same animal;
- the MHI documents their procedures and findings in a manner that allows the OV to be satisfied that standards are being met, and:
- the OV subsequently inspects all such meat.
| **Pyameia** | A form of septicaemia that leads to the formation of abscesses across the animal. |
| **Salmonella** | *Salmonella* are a group of bacteria which can cause food poisoning, usually found in animal or human intestines. |
| **Toxoplasma gondii** | A single-celled parasitic organism that is widespread in humans and causes toxoplasmosis. It can cause flu-like symptoms as well as other more serious symptoms, particularly for the immunosuppressed. These symptoms can be passed from pigs to humans in badly prepared meat. |
| **Trichinella** | *Trichinosis* is a disease caused by the larvae of a small nematode worm, which can affect many species including humans. Animals become infected when they ingest meat containing the larvae. ⁴ |
| **Tuberculosis** | A bacterial infection which mainly infects the lungs, although it can affect other parts of the body, which is transmissible from animals to humans. |
| **Visual inspection procedure** | Palpation of organs and incision of lymph nodes are no longer carried out as standard. Officials make a risk-based assessment as to whether a visual or full inspection (with routine palpation and incision) is required. |
| **Yersinia enterocolitica** | *Yersinia enterocolitica* is a commonly occurring bacteria found in animals and in the natural environment. Certain strains of the bacteria are pathogenic and can lead to food poisoning. ⁵ It passes from pigs to humans when pork is insufficiently cooked. |

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⁴ [http://www.food.gov.uk/business-industry/meat/trichinella-pigs](http://www.food.gov.uk/business-industry/meat/trichinella-pigs)

Introduction
1 Introduction

Ipsos MORI was commissioned by the Food Standards Agency (FSA) in April 2014 to undertake an evaluation of changes to legislation governing official controls in pig slaughterhouses. The changes relate to how pigs are inspected for diseases and contamination, and under what microbiological circumstances testing should be carried out. FSA also asked Ipsos MORI to develop a Monitoring Framework, compiled of a series of indicators, through which FSA could monitor the effects of the legislative changes. This report details the proposed Monitoring Framework.

1.1 Background to the legislative changes to pig slaughterhouses

In 2011, a scientific paper published by EFSA examined the public health hazards which can be caused by traditional post mortem inspection. It highlighted that incising lymph nodes and palpating organs as routine may contribute to the risk of cross-contamination of carcasses with foodborne hazards such as *Salmonella* spp. or *Yersinia* spp. If officials no longer undertake these tasks as routine, there could be improved public health outcomes. Although UK evidence from testing indicates that the risk from *Trichinella* is low in Scotland, the parasite can cause serious illness in humans.

In October 2013 the European Parliament voted to proceed with a number of these preventative measures. The aim of the new EU Regulation is to minimise this risk thereby promoting public health benefits. They were introduced on 1st June 2014. In practice, at slaughterhouse level these legislative changes have implications for three official controls:

- **Visual inspection**: Palpation of organs and incision of lymph nodes are no longer carried out as standard. Officials make a risk-based assessment as to whether a traditional inspection with routine palpation and incision is required, or whether a visual inspection is sufficient.

- **Salmonella testing**: The threshold (i.e. process hygiene criterion) for corrective action at a slaughterhouse level has changed from five positive samples over a 10-week period to three positive samples. Where a slaughterhouse, processing more than 37,500 pigs annually, exceeds this threshold then corrective action must be taken. UK-wide results must now be reported regularly by the FSA to the European Commission.

- **Trichinella testing**: Food Business Operators are currently required to test 100% of pigs sent to slaughter for *Trichinella*, but this requirement has not been fully implemented in the UK. Under the new legislation all sows and boars or 10% of pigs from controlled housing conditions and all pigs that do not originate from ‘controlled housing conditions’ are to be tested for *Trichinella*.

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8 This is the same day the regulatory change came into force.
9 There are guidelines available to assist officials in deciding, at ante or post-mortem inspection, whether a carcase or its offal require palpation and incision.
1.2 The purpose of the Monitoring Framework

This Monitoring Framework establishes a system to collect meaningful information about the implementation of the legislative changes for pig slaughterhouses. The Framework also includes a set of measures relevant to an understanding of the different components of the legislation. The Framework will help to demonstrate the extent to which different types of trend data have changed and are changing, where this may be due to the introduction of the legislative changes.

There are two types of measure which will contribute in different ways to the understanding of the legislative changes:

1. Descriptive measures: these will be used to provide a picture of how the legislative changes have been implemented locally, for example the number of animals that undergo traditional inspection.

Some descriptive measures may see little change over time (e.g. overall number of animals declared unfit for human consumption) but will still provide useful information – it is important to note this lack of change as a way to monitor whether any unintended consequences have occurred as a result of implementation.

2. Evaluative measures: these will be used to provide an assessment on if and how the anticipated outcomes are achieved. This information will allow the FSA to assess whether the legislative changes have the desired effect, e.g. reducing cross-contamination.

Evaluative information will also be used to measure the impact of the new legislative change; for example, if there are fewer Salmonella infected pigs in the UK.

1.3 Who is the Monitoring Framework for?

The Framework has been developed for the Food Standards Agency. The monitoring data may also be of interest to those who work in the slaughterhouse environment, including (but not limited to) Food Business Operators, Official Veterinarians, and Meat Hygiene Inspectors, as it may lead to further activities aimed at achieving compliance with the new legislation.

1.4 Development of the Monitoring Framework

The Framework is intended to group and list a series of indicators which, when tracked, will enable the FSA to monitor the outcomes and impacts associated with the new legislation, in particular:

- Immediate outcomes (e.g. whether visual inspection is implemented);
- Medium-term outcomes (e.g. whether risk-based and proportionate official controls are in place across pig slaughterhouses);
- Longer-term outcomes (e.g. whether, over time, there is a reduction in the instances of Salmonella infected pigs); and
- Impacts (e.g. has it contributed to improved public health outcomes).
Existing measures, those suggested by the FSA, and further measures identified through desk research\textsuperscript{10} were collated into a draft Monitoring Framework. For each measure (31 in total), an individual proforma was produced – the proformas for the eight shortlisted measures can be found in the report’s appendix and the remaining twenty-three are available on request. These were structured around the following headings to allow an assessment of a number of factors, including implications of data collection and overall suitability:

a. Group (CCIR/\textit{Salmonella} \textit{Trichinella} /Other)


c. Outcome measured

d. Minimum unit for which it is useful to assess data (Slaughterhouse, Regional, National, Batch)\textsuperscript{11}

e. Practicalities of collection (Feasible/Some difficulties/Difficult/Substantial difficulties/Unlikely to be possible)

f. Likely quality of data collected (Good, Fair, Poor, Varies, Unknown)

g. Confidentiality implications (Yes/No)

h. Additional resource implications for FSA (No/Low/Medium/High/Unknown)\textsuperscript{12}

i. Additional resource implications for businesses (No/Low/Medium/High/Unknown)\textsuperscript{13}

j. Other means of collection (Yes/No)

k. Usefulness for monitoring the legislative changes (Good/Useful/Limited/No – based on responses to the following sub-headings)

\begin{enumerate}
\item Does it measure something that might change as a result of the new legislation?
\item How big will any change have to be in order to be identified?\textsuperscript{14}
\end{enumerate}

\textsuperscript{10} The sources used were The European Food Safety Authority, Veterinary Epidemiology and Public Health Group, The Journal of Food Protection, Zoonoses and Public Health, The Journal of Veterinary and Public Health, Foodbase, Bpex and Google Scholar. Further information on the search terms used is found in the methodological plan.

\textsuperscript{11} Within the scope of this project and the resources available it is impossible to do more than provide an initial view here. To provide more detail attribution would require detailed data on the size of currently measured estimates at each level; their variability, range, the likely size (and variability) of any change that might be produced by the change in legislation, the likely size (and variability) of any change from any other factor that might alter it – at all the levels involved. The Ipsos MORI and SRUC project teams did not have access to that data, even where it exists and a lot of the required field data doesn’t, each one would be a design project in its own right.

\textsuperscript{12} Assessed at a relative rather than absolute level. Assessing the actual economic costs of collection of this data would require additional research.

\textsuperscript{13} As footnote above.

\textsuperscript{14} Within the scope of this project and the resources available it is impossible to do more than provide an initial view here, and suggest where further work is needed by those with access to the relevant datasets. There is very little data available in the public domain on the current data collected at a slaughterhouse level. For example, there are some point estimates for a subset of pigs in the report for FS145003 (http://www.foodbase.org.uk//admintools/reportdocuments/797-1-1410_Trial_visual_inspection_pigs_FS145003.pdf). However, there have been a number of changes to the recording, the classification and the databases since the report was published. Where this information has been used, it has
iii) Are there other factors that could cause this measure to change?

iv) If Yes to other factors, will it be possible to differentiate the two, i.e. identify the cause?

v) Can any observed change, therefore, be attributed to legislative change?

l. Resource implications for FSA – data interpretation (No/Low/Medium/High/Unknown) – assessed at a relative rather than absolute level

m. Additional comments

n. Overall assessment of suitability (Suitable/Has potential/Limited/Unsuitable).

This framework was further refined by SRUC and Ipsos MORI in order to provide a recommended shortlist for monitoring purposes.

1.5 Decisions underpinning the shortlisted measures presented in this report

The Framework presented in this report puts forward recommendations about the measures the FSA may wish to include in the final version of the Monitoring Framework. The recommendations are based on two key criteria. First, whether they map to the Theory of Change Model as this highlights their relevance to the new legislation. Second, an overall assessment of suitability, which itself is derived from issues such as data availability, collection, quality and interpretation.

Because of the number of factors used to assess each measure (see headings ‘a-n’ above) it was not always possible to provide a definitive recommendation on whether measures should be shortlisted or not. In such cases, we have assigned a ‘qualified yes’, and suggested what further work (e.g. cost / benefit assessment) would be required to make a definitive decision.

We recommend that eight data measures warrant further consideration by the FSA – they are set out in table 1 overleaf. It is important to note that a number of these measures are duplicated across different components of the Theory of Change if it enables the ability to monitor, directly or indirectly, multiple outcomes or impacts. The same measure can be assigned a yes or qualified yes depending on the outcome under consideration. This is due to difficulties associated with attribution.

been as part of the research team’s background experience in the industry and epidemiological knowledge, to inform the qualitative statements that have been made.

15 A Theory of Change approach was used to define the pathways through which changes in the legislation would lead to a number of outcomes and impacts. The Theory of Change model articulates each of the outcomes in the immediate term, medium term and longer term as well as the impacts.
# Table 1 – The eight shortlisted measures

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Description of measure</th>
<th>Outcome(s) / assigned recommendation: (QY) = Qualified Yes and (Y) = Yes</th>
</tr>
</thead>
</table>
| 1           | Incidence of lesions/conditions recorded in the Collection and Communication of Inspection Results (CCIR) - If possible differentiated between the ones recorded using Visual Inspection Procedure (VIP) and Full Inspection Procedure (FIP). | IO: Official veterinarian (OV)/ Meat Hygiene Inspector (MHI) implements visual inspection (QY)  
IO: Implementation of risk based palpation and incision (QY) |
| 2           | Number of animals that undergo FIP | IO: OV/ MHI implements visual inspection (QY)  
IO: Reduced carcase handling (QY)  
IO: Implementation of risk based palpation and incision (QY) |
| 3           | 1) Number of slaughterhouses/Food Business Operators (FBOs) that choose to incise hearts for quality assurance purposes 2) number of animals which had the heart incised and the number affected with Endocarditis. | IO: OV/ MHI implements visual inspection (YES)  
IO: FBO potential changes to meat quality controls / update HACCP plans to account for this (YES, 1) ONLY |
| 5           | Indicator measures/proxies for the adequate identification of meat that is declared unfit for human consumption: number of carcasses declared unfit for human consumption | ITO: Number of pigs declared unfit for human consumption remain the same (YES) |
| 7           | Results of the post-mortem verification tasks | IO: OV/ MHI implements visual inspection (YES)  
IO: OV/MHI supervises correction action (YES) |
| 8           | Summary of *Salmonella* test results (number positive and tested) | IO: Reduced carcase handling (YES)  
IO: FBO implements new *Salmonella* regime (YES)  
ITO: Reduced cross contamination (YES)  
LTO: Fewer positive samples reported to FSA (YES)  
I: Public health risk reduced (QY)  
I: More *Salmonella* free pigs (QY) |
| 13a         | Number of slaughterhouses (SH) which are consistently having satisfactory *Salmonella* results (satisfactory results over a period of 30 consecutive weeks) /number of SH testing for *Salmonella* | IO: FBO implements new *Salmonella* regime (YES)  
LTO: Fewer SH require corrective action (YES)  
LTO: Fewer positive samples reported to FSA (YES) |

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16 According to the Food Standards Agency Consultation, Title: Changes to Pig Meat Inspection in June the frequency is going to increase in the first 6 months after the implementation of the new legislative requirements
| 18 | Number tested for *Trichinella* from each type of housing and number of *Trichinella* positive samples. Outcome measure:
|    | 1) number of *Trichinella* positive results / number tested for *Trichinella*;
|    | 2) number of *Trichinella* positive results from non-controlled housing / number tested for *Trichinella* from non-controlled housing;
|    | 3) number of *Trichinella* positive results from controlled housing / number tested for *Trichinella* from controlled housing | I0: Implementation of risk based *Trichinella* controls and reporting of positive results to CA (YES)
I: Public health risk reduced (QY) |
Theory of change
This chapter presents a ‘Theory of Change’ of the changes to legislation governing pig slaughterhouses in the UK. It was developed by the Ipsos MORI and the FSA project teams. The Theory of Change depicts how the changes to the legislation have been rolled out and the changes that are expected to occur. Each link in the Theory of Change between the activities delivered and the outcomes achieved is underpinned by a series of assumptions – see section 2.2. The Theory of Change represents the framework against which the shortlisting of measures has been conducted and is illustrated overleaf in Figure 1.
Figure 1 – Theory of Change depicting new legislation governing pig slaughterhouses

**Inputs / Activities**

- **Outputs and immediate outcomes**
  - **Interim / longer term outcomes and impacts**

- **Outputs (Awareness and understanding of legislative changes)**
  - All aware of, understand implications in practice of new legislation
  - All aware of benefits (or costs) of compliance/non-compliance
  - All see value of compliance and support changes
  - All accommodate different inspection types in SH schedule

- **Immediate outcomes (changes in practice within slaughterhouses and their corresponding supply chains)**
  - OV/ MHI implement visual inspection (Reduced carcass handling), risk based incision/palpation (as relevant), supervise corrective action (as relevant) and enforce (as relevant)
  - FBO implement new salmonella test regime (per throughput), corrective action (as relevant), risk based Trichinella controls and report to CA
  - FBO potential changes to meat quality controls/update HACCP plans to account for this

- **Impacts**
  - Public health risk reduced
  - More salmonella free pigs

- **Longer term outcomes**
  - Fewer SH require corrective action
  - Fewer positive samples reported to FSA (as relevant)

- **Medium term outcomes**
  - Reduced cross-contamination
  - Number of pigs declared unfit for human consumption remain the same

**Individuals / organisations involved**

- **Food Business Owners (FBO)**
- **Meat Hygiene Inspectors (MHI)**
- **Official Veterinarians (OV)**
- **Plant staff**
- **Competent Authority (FSA/DARD)**
- **Other Government Departments**
- **Other stakeholders**

**Inputs / activities**

- **Food Business Owners (FBO)**
- **Meat Hygiene Inspectors (MHI)**
- **Official Veterinarians (OV)**
- **Plant staff**
- **Competent Authority (FSA/DARD)**
- **Other Government Departments**
- **Other stakeholders**

- **FSA run consultation and complete impact assessment**
- **Communication / support (pre and post, for officials and FBOs)**
  - Discussion on the FSA social network account
  - Articles on FSA website
  - Direct communications (letters, emails)
- **Training (pre & post for officials)**
  - 4 e-modules
  - F2F training in each SH (May 2014)
- **Training for slaughterhouse staff**
- **CA collect data from SH and report to EC**
- **Time / resources for preparation**
- **Data / information / systems**
- **Pigs / equipment**
- **Professional judgement**

**Outputs / activities**
2.1 Theory of Change description

This section describes each of the Theory of Change boxes and their interactions in detail. It starts with a description of the individuals and organisations involved in, and directly affected by, the new legislation. Following this, it explains how the different stages of the Theory of Change fit together.

2.1.1 Individuals / organisations involved in and directly affected by the new legislation

- The Food Business Operator (FBO) is the natural or legal person/s responsible for ensuring that the requirements of food law are met within the food business under their control.\(^\text{17}\) Throughout this report, the FBO refers to the person who self-defined as such during research carried out to examine implementation of new legislation governing meat inspection in pig slaughterhouses.

- Plant staff are employed by the FBO, and are defined as individuals who are responsible for performing any food safety or animal health and welfare related tasks as part of their roles within the slaughterhouse.

- Regulatory staff are employed directly or indirectly by the FSA, although the cost is in part recovered from FBOs.
  - Official Veterinarians (OVs) perform a range of official tasks, including ante-mortem inspections, and have responsibility for keeping a record of the findings of the inspections, including details of contraventions, actions required and monitoring of these actions.
  - Official Auxiliaries (OAs) or Meat Hygiene Inspectors (MHIs) carry out a number of official tasks including post-mortem inspections.\(^\text{18}\)

- The Food Standards Agency (FSA) is the Competent Authority in the UK in relation to the delivery of meat official controls. It has a statutory duty to provide these services on demand, 24 hours a day, 365 days a year, throughout England, Scotland and Wales. In Northern Ireland, the service level is provided by the Department for Agriculture and Rural Development (DARD).

- Other Government Departments such as Defra are working in partnership with the FSA and other stakeholders (e.g. industry representatives) to ensure the new legislation is implemented as planned.

2.1.2 Inputs/ activities from FSA

Prior to implementation, a range of activities were undertaken by the FSA; these activities were delivered and combined with a variety of inputs, as described in the Theory of Change above, as part of its preparations for the implementation of the legislative changes.

\(^{17}\) Regulation (EC) 178/2002
\(^{18}\) The OV need not be present during post-mortem inspection if:
- an MHI carries out post-mortem inspection and puts aside abnormal meat with uncommonly occurring conditions and all other meat from the same animal;
- the MHI documents their procedures and findings in a manner that allows the OV to be satisfied that standards are being met, and;
- the OV subsequently inspect all such meat.
In accordance with its regulatory obligations, the FSA published a consultation pack\textsuperscript{19} which invited feedback on the proposed legislative changes. Contained in the consultation pack document was the FSA’s impact assessment.\textsuperscript{20} This document provided a detailed account of a range of different legislative scenarios, including non, partial, and full implementation, and of the implications of each outcome respectively. The FSA also produced a communications strategy which set out how it would utilise a range of channels to communicate the new legislation to those affected by it. In practice, the FSA has raised awareness in a number of ways, namely:

**Officials**

- Since November 2012 there have been eight articles in *The Inspector*, a monthly printed newsheet for FSA Operations Staff, mentioning the changes. These articles provide Meat Inspectors with details of the changes and their rationale. The articles also advised MHIs about the training they would receive, and a link to them was posted on the FSA’s Yammer page (a social media account which the FSA uses to cascade information to its staff), which led to online discussions of the practical implications of the changes.

- Two articles were published in TEC Files, a publication produced in-house for issue to FSA operational staff. These articles provided detail about the changes with links to the relevant EU regulations. The articles also explained the rationale of the changes, and the FSA’s information delivery strategy.

- There were also articles produced in the online version of Meat Trades Journal: ‘Changes to EU meat inspection’ uploaded on the 12th September 2013 and ‘Modernising meat inspection’ uploaded on the 6th June 2014.

- Officials received direct communications about the legislative changes from their line managers. OVs and MHIs also received online training, and new legislation ‘facilitators’ – the OVs and MHIs that carried out site visits prior to implementation – received face-to-face training in York. In addition, the FSA publicised the new legislation via its online social network account (Yammer) in order raise awareness and to start a Q&A among MHIs.

**FBO**

- The largest plants were involved from an early stage in high-level discussions with the FSA about the legislation and how it would impact them.

- Dissemination via industry bodies; the FSA has been speaking to the Association of Independent Meat Suppliers (AIMS) and the British Pig Association (BPA) about the changes at regular intervals since summer 2012. The FSA’s intention was for these bodies to disseminate information about the changes to FBOs, particularly to smaller plants.

- Leaflets were sent directly to plants from February 2014, as it became apparent that not all plants had become aware of the changes through industry bodies as intended.

- By May 2014 the FSA was still concerned that some FBOs were unaware of the changes, and therefore ensured that all slaughterhouses received face-to-face visits. The primary function of these visits was MHI training, but they also provided an opportunity to answer FBO questions.

\textsuperscript{19} http://www.food.gov.uk/news-updates/consultations/2014/pigmeat-inspect-consult

2.1.3 Inputs /activities

In addition to these activities, implementation relied upon a number of different inputs, namely:

- Time and resources for preparation by officials, FBO and other plant staff
- Data and information systems, e.g. a protocol for identifying and communicating which carcasses require full inspection
- Resources from the plants e.g. testing equipment, pigs etc.
- Professional judgement, e.g. officials utilising FSA guidance combined with their own judgement to decide if a carcase should undergo FIP.

2.1.4 Outputs

The desired effect of the communication activities described above was that those directly and indirectly affected by the new legislation would be aware of the details of the legislation and of any requirements that would enable its implementation. The activities were also aimed at ensuring those affected by it would understand the rationale of the changes, i.e. to ensure that the controls are proportionate and risk-based and continue to provide protection to public health and animal health and welfare.

Whilst implementation is mandatory, the FSA felt that an understanding of the benefits (and also the costs of non-compliance) could increase buy-in and recognition of the importance of the changes among those affected by the legislation, and that this in turn might increase the likelihood of the desired behaviours being realised and maintained. These behaviours include the implementation and verification of modified official controls, corrective and enforcement action as required, and the fulfilment of the data reporting requirements of the Competent Authority and EU Commission.

2.1.5 Immediate outcomes

As with any change requiring new practices and ways of working, a process of embedding is usually needed before the new system can become the norm and run as intended. The Competent Authority expects that pig slaughterhouses in the UK will achieve full compliance with the different requirements of the new legislation as relevant. The desired outcomes of visual inspection are minimised carcase handling and/or fewer carcasses/offal being incised or palpated during post-mortem inspection.

2.1.6 Medium term outcomes

The FSA envisages the changes to visual inspection will reduce cross contamination, whilst the number of carcasses which are determined unfit for human consumption will remain the same.
2.1.7 Longer term outcomes

In the long term, the FSA expects that once the new legislation has become embedded and those affected by it are fully compliant then the amount of corrective action required and the number of reported instances of positive Salmonella test results will fall. 21

2.1.8 Impacts

Ultimately, the new legislation is intended to increase public health protection by reducing the potential for cases of foodborne illness caused by unsafe meat entering the food chain. It is also anticipated the changes will result in a reduced prevalence of Salmonella infected pigs in the UK.

2.2 Assumptions underpinning the Theory of Change

The Theory of Change described above depends on a series of underpinning assumptions about how the activities will lead to the anticipated outputs, and how these will in turn result in the anticipated outcomes and wider impacts. These assumptions are outlined below.

Inputs/activities → Outputs

- Communication is high quality, disseminated widely, unambiguous and timely
- Support and training is high quality, unambiguous and timely
- Communication and support promote an accurate and consistent level of understanding of the changes across slaughterhouses
- FBOs have sufficient resources to implement the legislation
- Officials have confidence in their own professional judgement

Outputs → Immediate outcomes

- Visual inspection leads to reduced carcase handling
- Officials are willing to use enforcement action appropriately to enforce the legislation at a slaughterhouse level

Immediate outcomes → medium term outcomes

- Visual inspection and changes to sampling regulations ensure that all pigs that would have previously been declared unfit for human consumption continue to be
- Reduced use of the knife and handling leads to reduced cross contamination

Medium term outcomes → longer term outcomes

21 In the shorter term they might increase due to better sampling.
- Strengthened *Salmonella* testing and monitoring leads to a reduction in the number of positive *Salmonella* results.

**Longer term outcomes** → **Impacts**

- Reduced cross contamination leads to reduced public health risk.
- Strengthened *Salmonella* testing leads to a reduction in the number of *Salmonella*-infected pigs.

The theory of change presented in this chapter provided an analytical framework for the process evaluation and also for structuring the design of a monitoring framework. The process evaluation report (published separately) provides a first assessment up to the point of immediate outcomes at an interim stage of implementation.

### 2.3 Theory of Change as a tool to guide the Monitoring Framework

The Monitoring Framework focuses on providing a series of indicators to measure the outcome and impact aspects of the Theory of Change only. Other components of the Theory of Change were considered throughout the process evaluation. This means that the remainder of this report is structured as follows:

- Chapter 3: Immediate outcomes
- Chapter 4: Medium term and longer term outcomes
- Chapter 5: Impacts
- Chapter 6: Shortlisted measures
Immediate outcomes
3 Measures of immediate outcomes

This chapter is focussed on the immediate outcomes as depicted in the Theory of Change. It presents all measures which could be used to monitor changes in practice occurring as a result of the new legislation. There are 9 main changes in practice for which monitoring indicators / measures have been considered:

Visual inspection

- OV/MHIs implement visual inspection (6 potential measures of which 4 have been shortlisted)
- Implementation of visual inspection will lead to reduced carcase handling (5 potential measures of which 2 have been shortlisted)
- Visual inspection will also lead to OV/MHIs using palpation and incision on the basis of risk (2 potential measures which have both been shortlisted)
- OV/MHIs supervise corrective action of a carcase (e.g. trimming an abnormality) which will be determined by a full inspection procedure (1 potential measure which has also been shortlisted)

The new regime for Salmonella testing

- FBOs implement the new regime for Salmonella testing (3 potential measures of which 2 have been shortlisted)
- FBOs take corrective action when Salmonella trends start to approach non-compliance (2 potential measures none of which have been shortlisted)

The new regime for Trichinella testing

- FBO implements risk-based Trichinella controls and report test results to the Competent Authority i.e. FSA (1 potential measure which has also been shortlisted).

Each ‘change in practice’ and the associated measures are discussed in detail in the subsequent sub sections of this Chapter.22

3.1 OV / MHI implements visual inspection

From 1 June 2014, EU legislation introduced the visual inspection of pig carcasses and offal by government officials by default. Handling and cutting by the OV/MHI i.e. palpation and incision will still be carried out if visual inspection deem it to be necessary.

22 For further detailed information on the reasons why non-shortlisted data measures are assigned a “no”, an individual proforma for each respective measure is available on request.
3.1.1 Potential measures

The table below lists the six measures that could be used to establish whether visual inspection has been implemented by the OV / MHI. The four shortlisted measures which warrant further consideration are discussed below it.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Incidence of lesions / conditions recorded in the CCIR, if possible to differentiate between the ones recorded using VIPs and FIPs</td>
<td>Visual</td>
<td>Has potential</td>
<td>Differentiation – a qualified Yes i.e. requires a cost/benefit assessment(^{23}) Specific lesions - Yes</td>
</tr>
<tr>
<td>2</td>
<td>Number of animals that undergo FIP</td>
<td>Visual</td>
<td>Has potential</td>
<td>A qualified Yes i.e. requires a cost/benefit assessment(^{24})</td>
</tr>
<tr>
<td>3</td>
<td>1) Number of slaughterhouses/FBOs which choose to incise hearts for quality assurance purposes 2) number of animals which had the heart incised and the number affected with Endocarditis.</td>
<td>Visual</td>
<td>Has potential (1) Limited (2)</td>
<td>1) slaughterhouse/FBOs choosing to incise hearts for QA purposes - Yes (2) - Yes only if as one of the conditions/lesions recorded in measure no. 1; not as a subset of 1) in measure no. 3</td>
</tr>
<tr>
<td>6</td>
<td>Annual prevalence of Endocarditis based on a sample of carcasses</td>
<td>Visual</td>
<td>Limited</td>
<td>No</td>
</tr>
<tr>
<td>7</td>
<td>Results of the post-mortem verification tasks (PMVT), as the frequency is going to be increased in the first six months after the implementation of the new legislative requirements</td>
<td>Visual</td>
<td>Has potential</td>
<td>Yes</td>
</tr>
<tr>
<td>16</td>
<td>Number of accidents with knives reported by MHIs and OVs</td>
<td>Visual</td>
<td>Limited</td>
<td>No</td>
</tr>
</tbody>
</table>

3.1.2 Shortlisted measures

Measure no. 1 – Incidence of lesions / conditions recorded in the collection and communication of inspection results (CCIR), if possible to differentiate between the ones recorded using visual inspection procedure [VIP] and full inspection procedure [FIP].

\(^{23}\) FSA has told the Ipsos MORI and SRUC project team this will be difficult and require a system change

\(^{24}\) Ibid.
• **Outcome measure (OM):** number of lesions recorded / number of pigs inspected (incidence).

• **How this measure links with the Theory of Change:** visual inspection procedure and full inspection procedure did not exist previously. For the majority of lesions recorded (e.g. superficial abscesses, milk spots, pleurisy, pneumonia, tail bite, *Pericarditis*²⁵), which did not previously require palpation and incision [P&I] in order to be identified, the only way this measure indicated whether visual inspection had been implemented was if the lesions recorded were differentiated by whether they were identified during VIP or FIP. Differentiation measures an activity that is directly linked to a change in the legislation. Implementation of visual inspection is anticipated to lead to an immediate reduction in the detection of specific lesions that require, or are facilitated by P&I. The degree to which this will be reduced has been assessed in previous work,²⁶,²⁷ so an expected trend is likely to be fairly accurate.

• **Pros of utilisation:** data on the number of conditions/lesions is already collected daily by the MHI/OVs in slaughterhouses. Therefore, the quality of data collected can be assumed to be at least equivalent to the current system, though it would first be necessary to define which conditions/lesions, what level (i.e. slaughterhouse / national), what timescales and what outcome measures are used.

• **Cons of utilisation:** use of this measure presents a number of difficulties.
  
  o The need to differentiate between conditions and lesions that were identified during VIPs from those identified during FIPs would be difficult, e.g. in high throughput plants where extra time would be required to record the different information, and/or where a change in the current recording systems would be required to record when a carcase had been subject to FIP and what lesions or conditions were detected. This would be more problematic where the recording system is owned by an FBO.²⁸
  o Moreover, even if such a system change took place and differentiated data was collected, the resource implications of its analysis and interpretation are high.
  o In addition, there are a number of variables that could contribute to any observed change, including the herd level prevalence and the fact that export plants will undertake traditional as well as visual inspections.

• **Shortlisting recommendation:** Differentiation – a qualified Yes, i.e. requires a cost/benefit assessment of new recording system. Specific lesions – Yes.

**Measure no. 2** – number of animals that undergo Full Inspection Procedure²⁹.

• **Outcome measure (OM):** 1. Number of pigs which undergo FIPs; 2. Proportion of pigs that undergo FIPs.

• **How this measure links with the Theory of Change:** this measure indicates whether an activity that is directly linked to the implementation of visual inspection is taking place. FIPs did not exist prior to the legislation change, and therefore the number of pigs that undergo FIPs is currently zero. Following the changes in the legislation, VIPs will be the usual, default procedures; FIPs will be applied when deemed necessary by the OVs and MHI/VSs.

²⁵ The references above indicate the lesions/conditions that had statistical differences in terms of detection between visual and traditional inspection
²⁶ http://www.food.gov.uk/sites/default/files/884-1-1629_V5_Final_Report_F5516002_2-.pdf
²⁷ https://www.food.gov.uk/sites/default/files/695-1-1179_MC1002_FINAL_REPORT.pdf
²⁸ In the case of the Hellenic system (which was developed and is owned by a large processor of pig product) the company (the FBO) would be required to change and adapt its electronic system to fit any requirements that FSA stipulates.
²⁹ This measure is the denominator for use in the incidence of lesions assessed by FIPs i.e. measure no. 1.
Pros of utilisation: any initial changes are likely to be attributable to the legislation; however, attribution may prove more difficult to identify over time unless other factors that may influence this measure are identified and quantified.

Cons of utilisation: as with measure no. 1 above, this indicator would require a change in the current recording system, which is likely to have high resource implications for the FSA as well as those plants which have their own system.

- In addition, there are a number of external variables that could contribute to any observed change, including the herd level prevalence of a condition and the fact that export plants will undertake traditional as well as visual inspections.

Shortlisting recommendation: a qualified Yes i.e. requires a cost/benefit assessment of new recording system.

Measure no. 3 – Endocarditis / opening of hearts: 1. number of slaughterhouses/FBOs that choose to incise hearts for quality assurance purposes; 2. number of animals which had the heart incised and the number affected with Endocarditis.

Outcome measure (OM): OM 1. Proportion or %; number of slaughterhouses/FBOs that choose to open pig hearts/total number of slaughterhouses that could; OM 2. Number of affected hearts with Endocarditis/number of opened hearts.

How this measure links with the Theory of Change:

- OM 1. All slaughterhouses currently incise hearts with traditional inspection. This number will be reduced to those slaughterhouses that produce for export-only and slaughterhouses in which FIPs have been performed, where heart incision was deemed necessary. For the FBOs that choose to open pig hearts, collecting data as phrased – “slaughterhouses/FBOs choosing to incise hearts for QA purposes” – indirectly measures implementation of visual inspection, since slaughterhouses/FBOs would not chose to incise hearts for QA purposes if they were already being incised for meat inspection purposes under the traditional methodology.
- OM 2. For all slaughterhouses, Endocarditis is one of the conditions that it may be worth recording as part of measure no.1. OM 2 as a function of OM 1 does not measure implementation of visual inspection.

Pros of utilisation:

- Attribution should be fairly easy for OM 1 as any initial change from the current traditional baseline of “all” is likely to be due to the implementation of the legislation.
- An advantage of using OM 2 is that the current recording system includes this condition i.e. Endocarditis, so no changes in the recording system are necessary.

Cons of utilisation:

- OM 1 poses a challenge for data collection. Even if a suitable collection system can be designed to capture the required data, obtaining engagement and compliance with any new data collection requirement might prove to be difficult, as the submission of information to FSA has the potential to be seen as burdensome.
Although data on the incidence of Endocarditis would be useful, there are significant difficulties associated with its collection and submission.\(^{30}\)

Furthermore, those tasked with recording the information would need to be trained, and on-going monitoring would be required, to ensure the data was recorded in a standardised way.

**Shortlisting recommendation:**

- **OM 1.** Yes – slaughterhouse/FBOs choosing to incise hearts for QA purposes.
- **OM 2.** Yes only if as one of the conditions/lesions recorded in measure no. 1; not as a subset of OM 1, i.e. number of slaughterhouses which choose to incise hearts for quality assurance purposes. Otherwise OM 2 as a measure is assigned a No.

**Measure no. 7 -** results of the post-mortem verification tasks (PMVT), as the frequency is going to be increased in the first six months after implementation of the new legislative requirements.\(^{31}\)

- **Outcome measure (OM):** 1. number of lesions recorded by the MHIs in a sample; 2. number of lesions recorded by the OVs in the same sample; 3. difference between 1 and 2.

- **How this measure links with the Theory of Change:** The verification procedure (PVMT) is applied to provide assurance that visual inspection is effective in detecting conditions and that the procedures are being implemented correctly. The frequency of PMVT is only required to be increased during the first six months after implementation. Increased records of this verification procedure are associated with the implementation of visual inspection.

- **Pros of utilisation:** this indicator has a number of advantages.

  - Firstly, because this data is currently collected by the MHIs and OVs, its quality can be expected to be at least equivalent to that of data collected under the current system.
  - This also means that further resources for data collection are unlikely to be required from either slaughterhouses or the FSA. However, an increase in staff time required for an increased number of verification tasks is anticipated.
  - Despite the issues described below, this measure has potential for ongoing monitoring if a degree of standardisation of procedures between MHIs and OVs can be achieved; otherwise, its function will largely be to provide reassurance to the Competent Authority that PMVTs are being completed.

- **Cons of utilisation:**

  - A large change would need to occur systematically across the aggregated unit of analysis (e.g. type of lesion identified) for assessors to be able to conclude with confidence that its cause was due to the legislation.
  - This is because there are a number of factors affecting the MHIs’ ability to detect and identify a condition /lesion: changes in line speed, changes in the capability or confidence of MHIs, awareness of a particular

\(^{30}\) A number of these issues are outlined in measure no.1 above, e.g. implementation of and compliance with a new recording system.

\(^{31}\) 15 per cent of the plant’s throughout for the first six months after implementation and then it would return to the normal frequency. All these figures came from the document Food Standards Agency Consultation, Changes to Pig Meat Inspection in June 2014, page 27 (increase in post mortem verification).
lesion /condition due to, for instance, an increase or decrease of prevalence, and a change in within-batch prevalence.

- Shortlisting recommendation: Yes.

3.2 Reduced carcase handling

The introduction of visual inspection will lead to fewer carcasses being handled by officials and plant staff involved in the processing of meat. This should reduce the potential for cross contamination.

3.2.1 Potential measures

The table below lists the five measures which could be used to understand whether reduced carcase handling has been achieved. The two measures which warrant further consideration are discussed below it.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Number of animals that undergo FIP</td>
<td>Visual</td>
<td>Has potential</td>
<td>A qualified Yes i.e. requires a cost/benefit assessment</td>
</tr>
<tr>
<td>8</td>
<td>Summary of <em>Salmonella</em> test results (number positive and tested)</td>
<td>Visual / <em>Salmonella</em></td>
<td>Has potential</td>
<td>Yes</td>
</tr>
<tr>
<td>9</td>
<td>Summary of <em>Yersinia enterocolitica</em> results (from any survey or other study completed)</td>
<td>Visual</td>
<td>Limited</td>
<td>No</td>
</tr>
<tr>
<td>10</td>
<td>Indicator measures/proxies for the amount of handling of pig carcasses: average line speed, inspection time per carcase</td>
<td>Visual</td>
<td>Unsuitable</td>
<td>No</td>
</tr>
<tr>
<td>15</td>
<td>Summary of total aerobic count and the <em>Enterobacteriaceae</em> count results</td>
<td>Visual</td>
<td>Limited</td>
<td>No</td>
</tr>
</tbody>
</table>

3.2.2 Shortlisted measures

**Measure no. 2** – number of animals that undergo Full Inspection Procedure.

- **Outcome measure (OM):** OM 1. Number of pigs which undergo FIPs; OM 2. Proportion of pigs that undergo FIPs.

- **How this measure links with the Theory of Change:** this measure indicates how many carcasses are handled during an FIP. Traditionally, all carcasses would undergo the amount of handling required for a traditional inspection. VIPs should result in reduced handling.


Repetition of this survey would be ideal as it was a representative sample.
Pros of utilisation: an initial change will be attributable to the legislation.

Cons of utilisation: the desk research highlighted that there is a limited amount of information on how much handling is associated with a FIP, compared to a traditional inspection. This measure would therefore provide information on the number of carcasses that have had more than the minimum handling required for conducting a VIP. Although this is not a significant con it is assigned a qualified yes due the challenges associated with this measure, see section 3.1.2 above.

Shortlisting recommendation: Yes.

Measure no. 8 – summary of Salmonella test results (number positive and tested).

Outcome measure: number or proportion of positive samples (prevalence).

How this measure links with the Theory of Change: a key aim of the new legislation is to reduce handling of carcasses, and thereby reduce the risk of cross-contamination. It is hoped that this will reduce the prevalence of Salmonella on pig carcasses.

Pros of utilisation: a number of the data challenges that have already been discussed in relation to other shortlisted measures do not apply in this case. There is a recording system already in place and a new electronic system is being put in place that will collect test results from all slaughterhouses. The OVs will be responsible for recording these test results and their input into the relevant database, so system compliance and data standardisation is likely to be high.

Cons of utilisation:

- Measuring Salmonella prevalence would be a proxy for reduced handling; however, care must be taken, because this measure could also be influenced by a number of other factors, e.g. field prevalence or diagnostic methods.
- Attribution is also problematic. Since more than one change to official controls has been made at the same time, it will not be possible to determine which aspect of the legislative change is responsible for any reduction observed in the prevalence of Salmonella on pig carcasses, i.e. it will not be possible to separate the contribution of reduced handling, from the introduction of visual-only inspection, from the impact of the strengthened process hygiene criterion [PHC]. This means that it could be difficult to detect change.
- Salmonella controls in slaughterhouses are already in place, and the latest available figures, from Defra’s baseline sampling of pig zoonotic diseases\(^{33}\), showed that a reduction in Salmonella prevalence has been achieved with some success. Indeed, the Pig Survey highlights an alternative way to establish the prevalence of Salmonella. The trend over time can be monitored with a degree of confidence and accuracy.

Shortlisting recommendation: Yes.

\(^{33}\) Ibid.
3.3 OV / MHI implement risk-based incision/palpation

From June 2014, officials working in pig slaughterhouses are no longer carrying out routine incision and palpation of pig lymph nodes and organs. Palpation and incision will still be carried out where such further inspection procedures are deemed necessary.

3.3.1 Potential measures

The table below lists the two measures which could be used to establish whether a reduction in risk-based incision and palpation has occurred. Both warrant further consideration.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Incidence of lesions /conditions recorded in the CCIR (if possible to differentiate between the ones recorded using VIPs and FIPs)</td>
<td>Visual</td>
<td>Has potential</td>
<td>A qualified Yes, i.e. requires a cost/benefit assessment</td>
</tr>
<tr>
<td>2</td>
<td>Number of animals that undergo FIP</td>
<td>Visual</td>
<td>Has potential</td>
<td>A qualified Yes, i.e. requires a cost/benefit assessment</td>
</tr>
</tbody>
</table>

3.3.2 Shortlisted measures

**Measure no. 1** – incidence of lesions /conditions recorded in the collection and communication of inspection results (CCIR), if possible to differentiate between the ones recorded using visual inspection procedure and full inspection procedure.

- **Outcome measure**: Number of lesions recorded/number of pigs inspected (incidence).
- **How this measure links with the Theory of Change**: if the lesions recorded are differentiated by whether the lesions were recorded at VIPs or FIPs, this measure indicates that a two-stage inspection process is being implemented.
- **Pros of utilisation**: data on the number of conditions/lesions is already collected daily by the MHI/OVs in slaughterhouses. Therefore, the quality of data collected can be assumed to be at least equivalent to the current system, (though it would first be necessary to define which conditions/lesions), what level (i.e. slaughterhouse / national), what timescales and what outcome measures are used.
- **Cons of utilisation**: this measure does not enable a direct assessment of whether this is being done on the basis of risk, although the evidence collected in the case study visits identified that this is taking place. For further information on the challenges associated with this measure, see section 3.1.2 above.
- **Shortlisting recommendation**: a qualified Yes, i.e. requires a cost/benefit assessment.

**Measure no. 2** – number of animals that undergo Full Inspection Procedure.

- **Outcome measure (OM)**: OM 1. Number of pigs which undergo FIPs; OM 2 Proportion of pigs that undergo FIPs.
• **How this measure links with the Theory of Change:** this measure would establish that FIPs are being done, i.e. that the additional, more in-depth inspection type has been implemented; and measure the frequency of this type of inspection.

• **Pros of utilisation:** a number of the data challenges that have already been discussed in relation to other shortlisted measures do not apply in this case. There is a recording system already in place and a new electronic system is being put in place that will collect test results from all slaughterhouses. The OVs will be responsible for recording these test results and their input into the relevant database, so system compliance and data standardisation is likely to be high.

• **Cons of utilisation:** as with measure no.1, this measure does not allow a direct assessment of whether FIPs are being done on the basis of risk or for other reasons, such as lack of confidence. However, the evidence collected in the case study visits identified that risk-based assessment is taking place.

• **Shortlisting recommendation:** a qualified Yes, i.e. requires a cost/benefit assessment

### 3.4 OV / MHI supervise corrective action: visual inspection

An OV/MHI will supervise corrective action of a carcase (e.g. trimming an abnormality) if inspection deems it to be necessary.

#### 3.4.1 Potential measures

The table below shows that only a single measure was identified as having potential to be used to establish whether an OV/MHI has supervised corrective action pertaining to visual inspection.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Results of the post-mortem verification tasks, as the frequency is going to be increased in the first six months after the implementation of the new legislative requirements</td>
<td>Visual</td>
<td>Has potential</td>
<td>Yes</td>
</tr>
</tbody>
</table>

#### 3.4.2 Shortlisted measure

**Measure no. 7** – results of the post-mortem verification tasks, as the frequency is going to be increased in the first six months after the implementation of the new legislative requirements.

• **Outcome measure (OM):** OM 1 number of lesions recorded by the MHIs in a sample; OM 2 number of lesions recorded by the OVs in the same sample; OM 3 difference between OM 1 and OM 2.

---

34 As with measure no. 1 above, this indicator would require a change in the current recording system, which is likely to have high resource implications for the FSA as well as those plants which have their own system. In addition, there are a number of external variables that could contribute to any observed change, including the herd level prevalence of a condition and the fact that export plants will undertake traditional as well as visual inspections.
• **How this measure links with the Theory of Change:** this post-mortem verification procedure is applied to provide assurance that visual inspection is effective in detecting conditions, and that the procedures are being implemented correctly. This is a proxy measure; PVMT may in certain cases not lead to corrective action, and therefore care must be taken with interpretation.

• **Pros and cons of utilisation:** see section 3.1.2 for discussion of the pros and cons of this measure.

• **Shortlisting recommendation:** Yes.

### 3.5 FBO implement new regime for *Salmonella* testing

FBOs processing over 37,500 pigs a year are required to sample carcases and test for *Salmonella* as a process hygiene criterion. From June 2014, the level of permitted positives was reduced from 5 (the previous level) to 3, out of 50 samples over a ten week period. The requirement still only applies to FBOs processing over 37,500 pigs a year; for those FBOs processing less than 37,500 pigs a year (which is the majority) there is no change.

#### 3.5.1 Potential measures

The table below lists three measures which could be used to establish whether the new *Salmonella* test regime had been implemented by the FBO. The two measures which warrant further consideration are discussed below it.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Summary of <em>Salmonella</em> test results (number positive and tested)</td>
<td><em>Salmonella</em></td>
<td>Has potential</td>
<td>Yes</td>
</tr>
<tr>
<td>12</td>
<td>Number of slaughterhouses required to have an action plan for <em>Salmonella</em> control</td>
<td><em>Salmonella</em></td>
<td>Limited</td>
<td>No</td>
</tr>
<tr>
<td>13a</td>
<td>Number of slaughterhouses that are consistently having satisfactory <em>Salmonella</em> results (over a period of 30 consecutive weeks) / number of slaughterhouses testing for <em>Salmonella</em></td>
<td><em>Salmonella</em></td>
<td>Has potential</td>
<td>Yes</td>
</tr>
</tbody>
</table>

#### 3.5.2 Shortlisted measure

**Measure no. 8 – summary of *Salmonella* test results (number positive and tested).**

• **Outcome measure:** number or proportion of positive samples (prevalence).

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35 During PMVT an OV will verify the post-mortem inspection of a sample of carcases and offal that have been inspected by MHIs. In Great Britain, the frequency of verification is based on the number of days the slaughterhouse operates. In a pig slaughterhouse that operates on four or five days per week, the OV will carry out verification tasks on three days per week. For those that operate fewer than four days a week, the OV will carry out verification on a daily basis.
• **How this measure links with the Theory of Change:** the *Salmonella* testing regime has changed; this measure will provide information about whether FBOs are implementing the new regime. An expected number of tests under the new regime could be compared with what is observed.  

• **Pros and cons of utilisation:** see section 3.2.2 for discussion of the pros and cons of this measure.

• **Shortlisting recommendation:** Yes.

**Measure no. 13a** – number of slaughterhouses which are consistently having satisfactory *Salmonella* results (defined using the same criteria that are required to be met in order to apply for reduced testing frequency, i.e. results need to be satisfactory over a period of 30 consecutive weeks).

• **Outcome measure:** number of slaughterhouses which are consistently having satisfactory *Salmonella* results (over a period of 30 consecutive weeks) / number of slaughterhouses testing for *Salmonella*.

• **How this measure links with the Theory of Change:** This measure indirectly measures an activity that is linked to an FBO implementing the new regime for *Salmonella* testing. When the SHs have made adjustments to their control plans, an increase in this measure could indicate that improvements are being made, possibly as a result of the implementation of the new regime. The new legislation imposes a stricter cut-off for the PHC for *Salmonella* at slaughterhouse level; therefore, the number of slaughterhouses consistently having satisfactory *Salmonella* results is expected to decrease until the SHs have made adjustment to their control plans. Consequently, it is possible that short-term repeated measure may be better in the immediate period post-implementation, when changes are most likely to occur.

• **Pros of utilisation:** Once the slaughterhouses have made adjustments to their control plans, an increase in this measure could indicate that improvements are being made, possibly as a result of the implementation of the new regime. A new electronic system is set to be implemented to record *Salmonella* results. If this system is able to generate information on this measure automatically, the data collection resource implications for industry and the FSA would be minor.

• **Cons of utilisation:** this measure could also be affected by the prevalence of *Salmonella*, which itself could be due to a number of external factors such as on-farm prevalence.

• **Shortlisting recommendation:** Yes.

### 3.6 FBO take corrective action – new regime for *Salmonella* testing

FBOs will be required to take corrective action when *Salmonella* trends start to approach non-compliance.

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36 Information held by the FSA on *Salmonella* results per abattoir, abattoir throughput and usual frequency of testing per abattoir would enable an estimation of an expected number of tests under the new regime. For instance, in the old regime if an abattoir (with reduced testing frequency) had 5 positive test results in 50 samples (testing 5 carcasses once every two weeks) then in the new regime (if no change takes place) it would need to increase its testing i.e. testing 5 carcasses per week (as it wouldn’t be able to move to the reduce testing frequency regime).

37 Without an evidence base it is difficult to give an appropriate timescale. However, it is reasonable to assume that an FBO will need at the most one year to adjust to the new testing regime.
### 3.6.1 Potential measures

The table below shows that two measures were identified which could be used to establish whether corrective action pertaining to visual inspection has been implemented. Neither have been suggested for shortlisting.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>a) Number of slaughterhouses that need to take corrective actions following <em>Salmonella</em> testing. b) Number of corrective actions taken</td>
<td><em>Salmonella</em></td>
<td>Limited</td>
<td>No</td>
</tr>
<tr>
<td>14</td>
<td>Number of on-farm investigations</td>
<td><em>Salmonella</em></td>
<td>Limited</td>
<td>No</td>
</tr>
</tbody>
</table>

We recommend that neither of these indicators warrant further consideration due to the likelihood of substantial difficulties in their use. The key issues are discussed below, and further information regarding these difficulties is found in the respective proformas, which are available on request.

**Measure 11:** a) Number of slaughterhouses that need to take corrective actions following *Salmonella* testing. b) Number of corrective actions taken

- The need to take corrective action is not a new requirement. It does not, therefore, directly measure implementation of the new *Salmonella* test regime by FBOs, nor does it measure whether they are taking corrective action (as relevant). If the new regime is having the required impact on the prevalence of *Salmonella* within a slaughterhouse, then over time the number of slaughterhouses that need to take corrective action should decrease, showing that correct implementation of corrective actions was undertaken by the FBO.

- The new legislation imposes stricter cut-offs at which a slaughterhouse has to take corrective action, so it is expected that initially there will be a higher number of slaughterhouses required to take this action; this measure would contribute to verifying this assumption. Comparing which/how many slaughterhouses need to take corrective action with how many slaughterhouses do take a corrective action would allow for the fact that numbers required to take action are likely to increase short-term.

**Measure 14:** Number of on-farm investigations

- The instigation of an on-farm investigation is one of the possible corrective actions that FBOs can take to control *Salmonella*. If *Salmonella* PHC is more stringent, then consistent failures may lead to FBOs instigating more on-farm investigations.

- This measure would help to provide a more comprehensive picture of how slaughterhouses are dealing with unsatisfactory results against *Salmonella*.

- However, substantial potential difficulties have been identified with this measure, resulting in it being discarded. For example, there a variety of other factors that can cause this measure to change.

It has not been possible to identify an alternative measure that would allow this outcome to be monitored.
3.7  FBO implement risk-based *Trichinella* controls and report to the Competent Authority

Under the previous regulatory regime, FBOs were required to test 100% of pigs sent to slaughter for *Trichinella*, but this requirement had not been fully implemented in the UK. From June 2014 the *Trichinella* testing requirement became more risk based.\(^{38}\)

3.7.1  Potential measure

The table below shows that only a single measure was identified which could be used to establish whether FBOs implement risk-based *Trichinella* controls and report to Competent Authority.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control(s) the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Number tested for <em>Trichinella</em> from each type of housing and number of <em>Trichinella</em> positive samples</td>
<td><em>Trichinella</em></td>
<td>Suitable (1) /Has potential (2 and 3)</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### 3.7.2  Shortlisted measure

**Measure no. 18** – number tested for *Trichinella* from each type of housing and number of *Trichinella* positive samples.

- **Outcome measure (OM):**
  - OM 1 number of *Trichinella* positive results / number tested for *Trichinella*;
  - OM 2 number of *Trichinella* positive results from non-controlled housing/ number tested for *Trichinella* from non-controlled housing;
  - OM 3 Number of *Trichinella* positive results from controlled housing / number tested for *Trichinella* from controlled housing.

- **How this measure links with the Theory of Change:** The new legislation introduces changes to the *Trichinella* testing regime, which will in turn change the number of pigs being tested. An increase in the number of animals being tested will be easily identified. If the aim is to detect changes in the prevalence of *Trichinella* or to detect if *Trichinella* is present in the population, further investigation\(^{40}\) is required to ascertain if the number tested under the new regime will allow assessors to detect small changes in the *Trichinella* prevalence. Comparison between before and after the new legislation will be difficult, as the new legislation represents an increase in testing due to under-implementation of the old legislation.

---

\(^{38}\) The number of Salmonella samples taken in the slaughterhouse and the number of positive results found will be collected by the FSA. This data will be anonymised and submitted to the European Commission annually. The European Commission will gather similar data from all EU Member States.

\(^{39}\) The new legislation will set out testing requirements for all sows and boars or 10% of pigs from controlled housing conditions and all pigs that do not originate from “controlled housing conditions” to be tested for *Trichinella*.

\(^{40}\) It would be necessary to conduct a study to see if the number tested is enough (in terms of statistical power and sample size) to detect small changes in *Trichinella* prevalence or to detect *Trichinella* if present in the population.
This measure will monitor the change in numbers being tested and, at the same time, trends in the prevalence of *Trichinella*. To detect changes in the prevalence of *Trichinella*, further work has to be done to ascertain if the number tested under the new regime will be able to detect small changes in the *Trichinella* prevalence.

**Pros of utilisation:**

- Data for OM 1 is currently being collected on a monthly basis through contracted lab reports and invoices from in-house labs. The current system will be able to accommodate the changes in terms of a higher number of samples, and it is entirely feasible to collect this data for the purpose of monitoring. The challenge for achieving this outcome, however, will be accommodating the different formats in which the data is provided from different sources (contracted lab, in-house labs or other private labs), in order to collate the data.

- Data for OM 2 and 3 will use Food Chain Information (FCI) which is collected and incorporated into the FSA system. This will then need to be linked to the sample data.

**Cons of utilisation:** While the FCI data exists, resources would be needed to develop the IT infrastructure required to collect and collate the data for these outcome measures. There are a number of external factors that could influence this measure, e.g., an outbreak of the disease (currently it is considered exotic, i.e., an outbreak is unlikely to happen). While this would prove problematic for immediate attribution, a positive case will trigger an investigation of its causes, so it should be possible to ascertain if the outbreak was due to an imported case or due to endemic cases that were not detected by the former *Trichinella* testing regime.

**Shortlisting recommendation:** Yes.

### 3.8 FBO potential changes to meat quality controls/ update HACCP plans to account for corrective action

FBOs may decide to change meat quality controls in light of the move to visual inspection. This may be to reassure their customers the change has not impacted quality of meat.

#### 3.8.1 Potential measures

The table below lists five measures which were identified as having potential to establish whether an FBO changes meat quality controls or updates HACCP plans to account for corrective action.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control(s) the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>1) Number of slaughterhouses/FBOs which choose to incise hearts for quality assurance purposes</td>
<td>Visual</td>
<td>Has potential (1) Limited (2)</td>
<td>Yes (1) No (2)</td>
</tr>
<tr>
<td>12</td>
<td>Number of slaughterhouses</td>
<td><em>Salmonella</em></td>
<td>Limited</td>
<td>No</td>
</tr>
</tbody>
</table>

41 Ibid.
3.8.2 Shortlisted measure

**Measure no. 3 – Endocarditis: opening of hearts.**

- **Outcome measure:** 1. number of slaughterhouses/FBOs which choose to incise hearts for quality assurance purposes.

- **How this measure links with the Theory of Change:** This measure indicates whether, and to what extent, slaughterhouses/FBOs feel that they need to implement heart incision in order to be assured of the maintenance of their food quality requirements. These controls will only be introduced if the slaughterhouse/FBO notices or is concerned about changes in meat quality. Under the traditional inspection regime, all slaughterhouses currently incise hearts; this number should theoretically be reduced to only those slaughterhouses that produce for export-only, or where a FIP has been performed. A variation from the expected value could indicate a demand (an impact of the legislative change), the reasons behind which would need to be investigated. This demand and the reasons for it may vary with time.

- **Pros and cons of utilisation:** for further information on the pros and cons of this measure, see section 3.1.2.

- **Shortlisting recommendation:** Yes.

### 3.9 OV / MHI enforce: all official controls affected by the new legislation

An OV/ MHI will take enforcement action if there is non-compliance with the new legislation. Enforcement includes advisory visits, assisting the FBO with compliance, approval visits and formal enforcement action. Verbal advice, written advice and written warnings all constitutes informal enforcement action. Formal enforcement action includes official detention of food, the service of formal notices, formal warnings, cautions, referrals for investigation and prosecutions.

#### 3.9.1 Potential measures

The table below shows that only a single measure was identified as having potential to identify if enforcement action was being taken for non-compliance with the new legislation.

<table>
<thead>
<tr>
<th>Measure Description</th>
<th>Outcome Type</th>
<th>Potential</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required to have an action plan for Salmonella control</td>
<td>Visual</td>
<td>Has potential</td>
<td>No</td>
</tr>
<tr>
<td>Number of returns/complaints from cutting plants regarding conditions/lesions that were not detected at abattoir level</td>
<td>Visual</td>
<td>Limited</td>
<td>No</td>
</tr>
<tr>
<td>Number of unusual complaints from customers (wholesaler, butcher, supermarket) and consumers</td>
<td>Visual</td>
<td>Limited</td>
<td>No</td>
</tr>
<tr>
<td>Number of audits / inspections conducted</td>
<td>All i.e. the 3 affected by the new legislation</td>
<td>Limited</td>
<td>No</td>
</tr>
<tr>
<td>Measure no.</td>
<td>Measure Description</td>
<td>Official control the measure refers to</td>
<td>Overall assessment of suitability</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------</td>
<td>----------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>30</td>
<td>Number of enforcement actions recorded</td>
<td>All</td>
<td>Limited</td>
</tr>
</tbody>
</table>

Use of this measure is not recommended due to a number of factors that could affect it. First, a change in a plant's officials could lead to different enforcement approaches being taken as some are quicker to escalate to this action than others. Second, changes to the number of enforcement actions can be attributable to many other reasons (e.g. animal welfare, waste procedures etc.) For further information on these issues proforma no.30 is available on request.
The chapter presents all measures which could be used to monitor medium and longer term outcomes occurring as a result of the new legislation. There are four outcomes for which monitoring measures have been considered:

Medium term outcomes

- Reduced handling will lead to reduced cross contamination (3 potential measures of which 1 has been shortlisted)
- Number of pigs declared unfit for human for human consumption remains the same (1 potential measure which has been shortlisted)

Longer term outcomes

- Fewer slaughterhouses require corrective action (4 potential measures of which 2 have been shortlisted)
- Fewer positive *Salmonella* samples reported to FSA (2 potential measures of which both have been shortlisted)

Each outcome and the associated measures are discussed in detail in the subsequent sub sections of this Chapter.

### 4.1 Medium term outcomes

The implementation of the new legislation will lead to a change of practices within slaughterhouses. These practices are expected to reduce the spread of microbiological contamination while the detection of carcasses declared unfit for human consumption remains the same.

### 4.2 Reduced cross-contamination

A key aim of the new legislation is to reduce handling of carcasses, and thereby reduce the risk of cross-contamination.

#### 4.2.1 Potential measures

The table below lists the three measures identified as having potential to establish whether a reduction in the level of cross-contamination has been achieved. The measure which warrants further consideration is discussed below it.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Summary of <em>Salmonella</em> test results (number positive and tested)</td>
<td>Visual / <em>Salmonella</em></td>
<td>Has potential</td>
<td>Yes</td>
</tr>
<tr>
<td>9</td>
<td>Summary of <em>Yersinia enterocolita</em> results (from any survey or other study undergone)</td>
<td>Visual</td>
<td>Limited</td>
<td>No</td>
</tr>
<tr>
<td>15</td>
<td>Summary of total aerobic count</td>
<td>Visual</td>
<td>Limited</td>
<td>No</td>
</tr>
</tbody>
</table>
4.2.2 Shortlisted measure

Measure no. 8 – summary of *Salmonella* test results (number positive and tested).

- **Outcome measure:** Number or proportion of positive samples (prevalence).

- **How this measure links with the Theory of Change:** It is hoped that a reduction in cross contamination will reduce the prevalence of *Salmonella* on pig carcasses.

- **Pros of utilisation:** Monitoring the prevalence of *Salmonella* provides a measure of the level of contamination of carcasses.

- **Cons of utilisation:** Monitoring the prevalence of *Salmonella* does not, however, measure the level of cross-contamination. There is no existing evidence that proves a direct correlation between handling and *Salmonella* contamination (the pathway). Therefore, it can only be inferred that if contamination is reduced when handling is reduced, this is due to a reduction in the subset of contamination that is due to cross-contamination. In addition, care must be taken in interpreting trends in *Salmonella* prevalence, because such trends could also be influenced by a number of other factors such as field prevalence or diagnostic methods. See section 3.2.2 for further information on the pros and cons of this measure.

- **Shortlisting recommendation:** Yes.

4.3 Numbers of pigs unfit for human consumption remains the same

The Competent Authority believes that the legislation will not change the overall number of pigs declared unfit for human consumption. Any observed change would require investigation.

4.3.1 Potential measures

The table below shows that only a single measure was identified which could be used to establish that implementation of the legislative changes has had no discernible effect on the number of pigs declared unfit for human consumption.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Indicator measures/proxies for the adequate identification of meat that is declared unfit for human consumption: number of carcasses declared unfit for human consumption</td>
<td>Visual</td>
<td>Suitable</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4.3.2 Shortlisted measure

Measure no. 5 – indicator measures/proxies for the adequate identification of meat that is declared unfit for human consumption: number of carcasses declared unfit for human consumption.
• Outcome measure (OM):
  o OM 1. Number of carcasses declared unfit for human consumption;
  o OM 2. Proportion or % of carcases inspected that are declared fit for human consumption;
  o OM 3. Proportion of % of carcases detained that are declared unfit for human consumption.

• How this measure links with the Theory of Change: this measure is required since implementation of visual inspection should not significantly affect the number of carcasses declared unfit for human consumption. Analysis of historical data of the number of carcasses declared unfit for human consumption, from unpublished data held by the FSA, should provide an indication of the variation encountered in the absence of any legislative change. It would be reasonable to expect a generally similar pattern, unless there is an impact due to the legislative change, or major changes in external factors. Interpreting any observed change will therefore require sufficient background industry knowledge and data on the range of external factors contributing to the reasons why carcasses are declared unfit for human consumption.

• Pros of utilisation: this readily available data on this measure is currently collected by MHIs/OVs in a slaughterhouse, and therefore there are unlikely to be any additional resources needed for collection over and above the current requirements, unless changes in the system affect the ability of MHIs or OVs to record data.

• Cons of utilisation: an increase or decline in this figure could indicate a need for further investigation; however, this could prove challenging due to the number of external factors (e.g. condition of livestock) that can lead to a carcase being declared unfit for human consumption.

• Shortlisting recommendation: Yes.

4.4 Measures of longer term outcomes

This section is focussed on longer term outcomes as depicted in the Theory of Change. The FSA anticipates that compliance with the new legislation will increase over time. Consequently, it expects fewer slaughterhouses will require corrective action and fewer positive tests results for Salmonella will be identified.

4.5 Fewer slaughterhouses require corrective action

The FSA expects that once the new legislation has become embedded, and those affected by it are fully compliant, then the amount of corrective action required will fall.

4.5.1 Potential measures

The table below lists three measures which were identified as having potential to establish whether a reduction has taken place in the number of slaughterhouses requiring corrective action. The two recommended measures are explained in greater detail below

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Results of the post-mortem verification tasks, as the frequency is going to be increased in the first</td>
<td>Visual</td>
<td>Has potential</td>
<td>Yes</td>
</tr>
</tbody>
</table>
six months after the implementation of the new legislative requirements

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Description</th>
<th>Outcome Measure</th>
<th>How it links with the Theory of Change</th>
<th>Pros and cons of utilisation</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>a) Number of slaughterhouses that need to take corrective actions following <em>Salmonella</em> testing b) Number of corrective actions taken</td>
<td><em>Salmonella</em></td>
<td>Limited</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>13a</td>
<td>Number of slaughterhouse which are consistently having satisfactory <em>Salmonella</em> results (over a period of 30 consecutive weeks) /number of slaughterhouses testing for <em>Salmonella</em></td>
<td><em>Salmonella</em></td>
<td>Has potential</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Number of on-farm investigations</td>
<td><em>Salmonella</em></td>
<td>Limited</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>

4.5.2 Shortlisted measure

**Measure no. 7** – Results of the post-mortem verification tasks, as the frequency is going to be increased in the first six months after the implementation of the new legislative requirements.

- **Outcome measure (OM)**: OM 1 number of lesions recorded by the MHIs in a sample; OM 2 number of lesions recorded by the OVs in the same sample; OM 3 difference between 1 and 2.

- **How this measure links with the Theory of Change**: this post-mortem verification procedure is applied to provide assurance that visual inspection is effective in detecting conditions, and that the procedures are being implemented correctly. This is a proxy measure of this outcome; PMVT may in certain cases not lead to corrective action, and therefore care must be taken with interpretation.

- **Pros and cons of utilisation**: see section 3.1.2 for discussion of the pros and cons of this measure.

- **Shortlisting recommendation**: Yes.

**Measure no. 13a** – number of slaughterhouses which are consistently having satisfactory *Salmonella* results (defined using the same criteria that are required to be met in order to apply for reduced testing frequency, i.e. results need to be satisfactory over a period of 30 consecutive weeks).

- **Outcome measure**: number of slaughterhouses which are consistently having satisfactory *Salmonella* results (over a period of 30 consecutive weeks) /number of slaughterhouses testing for *Salmonella*

- **How it links with the Theory of Change**: This is an indirect measure; if slaughterhouses are consistently having satisfactory *Salmonella* results, they will over time have fewer corrective actions.

- **Pros and cons of utilisation**: see section 3.5.2 for discussion of the pros and cons of this measure.

- **Shortlisting recommendation**: Yes

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42 During PMVT an OV will verify the post-mortem inspection of a sample of carcasses and offal that have been inspected by MHIs. In Great Britain, the frequency of verification is based on the number of days the slaughterhouse operates. In a pig slaughterhouse that operates on four or five days per week, the OV will carry out verification tasks on three days per week. For those that operate fewer than four days a week, the OV will carry out verification on a daily basis.
4.6 Fewer positive *Salmonella* samples reported to FSA

The FSA expects that once the new legislation has become embedded, and those affected by it are fully compliant, then the number of reported instances of positive *Salmonella* test results will fall.\(^4\)

4.6.1 Potential measures

The table below shows that two measures were identified which could be used to establish whether a reduction in the number of slaughterhouses requiring corrective action had been achieved. Both warrant further consideration.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Summary of <em>Salmonella</em> test results (number positive and tested)</td>
<td><em>Salmonella</em></td>
<td>Has potential</td>
<td>Yes</td>
</tr>
<tr>
<td>13a</td>
<td>Number of slaughterhouses which are consistently having satisfactory <em>Salmonella</em> results (over a period of 30 consecutive weeks) /number of slaughterhouses testing for <em>Salmonella</em></td>
<td><em>Salmonella</em></td>
<td>Has potential</td>
<td>Yes</td>
</tr>
</tbody>
</table>

4.6.2 Shortlisted measures

**Measure no. 8** - summary of *Salmonella* test results (number positive and tested).
- **Outcome measure:** number or proportion of positive samples (prevalence).

- **How this measure links with the Theory of Change:** this measure appears to provide a direct measure of the outcome required. However, care must be taken in interpreting trends in *Salmonella* prevalence, since these may be influenced by other factors, including field prevalence, diagnostic methods, or changes in sampling strategies.

- **Pros and cons of utilisation:** see section 3.2.2. for further information on the pros and cons of this measure.

- **Shortlisting recommendation:** Yes.

**Measure no. 13a** – number of slaughterhouses which are consistently having satisfactory *Salmonella* results (defined using the same criteria that are required to be met to apply for reduced testing frequency, i.e. results need to be satisfactory over a period of 30 consecutive weeks)
- **Outcome measure:** number of slaughterhouses which are consistently having satisfactory *Salmonella* results (over a period of 30 consecutive weeks) /number of slaughterhouses testing for *Salmonella*.

- **How this measure links with the Theory of Change** – this is an indirect measure; if slaughterhouses are consistently having satisfactory *Salmonella* results, they will over time have fewer corrective actions.

\(^4\) In the shorter term they might increase due to better sampling.
• **Pros and cons of utilisation:** see section 3.5.2 for detailed information on the pros and cons of this measure.

• **Shortlisting recommendation:** Yes.
5 Measure of impact

This chapter is focussed on the anticipated impacts of the new legislation. The chapter presents all measures which could be used to monitor improvements in public health protection and animal welfare occurring as a result of the new legislation. There are 2 main improvements or changes for which monitoring indicators / measures have been considered:

- Public health risk reduced (four potential measures of which two have been shortlisted)
- Fewer *Salmonella* infected pigs (two potential measures of which one has been shortlisted)

Each outcome and the associated measures are discussed in detail in the subsequent sub sections of this Chapter.

5.1 Public health risk reduced

As noted in section 1.1, EFSA reported that incising lymph nodes and palpating organs as routine may contribute to the risk of cross-contamination of carcasses with foodborne hazards such as *Salmonella* spp. or *Yersinia* spp. If officials no longer undertake these tasks as routine, there could be improved public health outcomes. The aim of the new EU Regulation is to minimise this risk thereby promoting public health benefits.

5.1.1 Potential measures

The table below lists four measures which could be used to establish whether a reduction in the risk posed to public health has been achieved as a result of implementation of the legislative changes. The two measures which warrant further consideration are discussed below it.

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Summary of <em>Salmonella</em> test results (number positive and tested)</td>
<td><em>Salmonella</em></td>
<td>Has potential</td>
<td>A qualified yes</td>
</tr>
<tr>
<td>9</td>
<td>Summary of <em>Yersinia enterocolitita</em> results (from any survey or other study completed)</td>
<td>Visual</td>
<td>Limited</td>
<td>No</td>
</tr>
<tr>
<td>18</td>
<td>Number tested for <em>Trichinella</em> from each type of housing and number of <em>Trichinella</em> positive samples</td>
<td><em>Trichinella</em></td>
<td>Suitable (1) /Has potential (2 and 3)</td>
<td>A qualified yes</td>
</tr>
<tr>
<td>25</td>
<td>Number of indigenous foodborne cases of <em>Salmonella</em> and <em>Yersinia</em> in humans, in the UK, attributable to the consumption of pork and pork meat products</td>
<td><em>Salmonella</em></td>
<td>Limited</td>
<td>No</td>
</tr>
</tbody>
</table>
5.1.2 Shortlisted measures

Measure no. 8 – summary of *Salmonella* test results (number positive and tested).

- **Outcome measure:** Number or proportion of positive samples (prevalence).

- **How this measure links with the Theory of Change:** the assumption is that a reduction in *Salmonella* prevalence over time will have an impact on public health. However, without being able to correlate or attribute human cases to the prevalence in the slaughtered pig population, this is only an inference. Caution must be applied, and over-interpretation avoided.

- **Pros and cons of utilisation:** See section 3.2.2 for further information on the pros and cons of this measure.

- **Shortlisting recommendation:** a qualified yes.

Measure no. 18 – number tested for *Trichinella* from each type of housing and number of *Trichinella* positive samples.

- **Outcome measure (OM):**
  - OM 1 number of *Trichinella* positive results/number tested for *Trichinella*;
  - OM 2 number of *Trichinella* positive results from non-controlled housing/number tested for *Trichinella* from non-controlled housing;
  - OM 3 number of *Trichinella* positive results from controlled housing/number tested for *Trichinella* from controlled housing.

- **How it links with the Theory of Change:** the assumption is that a reduction in *Trichinella* prevalence over time will have an impact on public health. However, without being able to correlate or attribute human cases to the prevalence in the slaughtered pig population, this is only an inference. Caution must be applied, and over-interpretation avoided. See section 3.7.2 for further information on the pros and cons of this measure.

- **Shortlisting recommendation:** a qualified yes.

5.2 More *Salmonella*-free pigs

The FSA anticipates the legislative changes will result in a reduced prevalence of *Salmonella* infected pigs in the UK.

5.2.1 Potential measures

The table below shows that two measures were identified as having potential to establish whether the new legislation has achieved a reduction in the number of pigs infected with *Salmonella*. The measure which warrants further consideration is discussed below it.
<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Measure Description</th>
<th>Official control the measure refers to</th>
<th>Overall assessment of suitability</th>
<th>Shortlisting recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Summary of <em>Salmonella</em> test results (number positive and tested)</td>
<td><em>Salmonella</em></td>
<td>Has potential</td>
<td>A qualified yes</td>
</tr>
<tr>
<td>25</td>
<td>Number of indigenous foodborne cases of <em>Salmonella</em> and <em>Yersinia</em> in humans, in the UK, attributable to the consumption of pork and pork meat products</td>
<td><em>Salmonella</em></td>
<td>Limited</td>
<td>No</td>
</tr>
</tbody>
</table>

5.2.2 Shortlisted measure

**Measure no. 8 - summary of *Salmonella* test results (number positive and tested).**

- **Outcome measure:** Number or proportion of positive samples (prevalence).

- **How it links with the Theory of Change:** this is an indirect measure; a reduced number of contaminated carcasses is a proxy measure for the number of *Salmonella*-free pigs. Moreover, this measure relies on inference since there is no clear link to demonstrate that these are correlated.

- **Pros and cons of utilisation:** see section 3.2.2 for further information on the pros and cons of this measure.

- **Shortlisting recommendation:** a qualified yes
The shortlisted measures
6 The shortlisted measures

6.1 Coverage of shortlisted measures

The recommended measures provide good coverage (see following table) in terms of the ability to monitor outcomes and impacts that would occur as a result of the implementation of the new legislation. The Theory of Change identified 15 outcomes and impacts. Of these, two outcomes, both of which are categorised as immediate, have not been assigned a shortlisted measure, namely:

- Immediate outcome: OV / MHI supervise corrective action – new regime for *Salmonella* testing
- Immediate outcome: OV / MHI enforce – all official controls affected by the new legislation

Given the likelihood of substantial difficulties in their use, the desk research suggests that none of the measures which could be used to monitor both of these changes of practices warrant further consideration.

6.2 Limitations of shortlisted measures

Before making a decision about the measures which are included in the final Framework, we suggest that further work for measures which focus on measuring immediate outcomes (i.e. ‘changes in practice’) is required. Measures no. 1\(^{44}\) and no. 2\(^{45}\) would allow the FSA to monitor a number of immediate outcomes; however their use would require a change of recording system, which is expected to have resource implications for the FSA and slaughterhouses. Therefore a cost benefit assessment would be helpful in order to inform a final decision on their use.

If the assessment concluded that both measures should not be used in the final Monitoring Framework, then using measures no. 3 and no. 8\(^{46}\) would allow monitoring of two of the three immediate outcomes measured by measure no.1 and no.2. Not including measures no.1 and no.2 would affect the FSA’s ability to establish if risk based palpation and incisions had been implemented since no alternative measure to monitor this outcome has been identified i.e. measure no.2 is the sole measure. The FSA may consider this an acceptable trade off because the use of measures no. 1 and no. 2 would not enable a direct assessment of whether palpation and incision is being done on the basis of risk.

There are also a variety of data issues to consider with many of the measures which are assigned a “yes”. These are summarised below under the corresponding component of the Theory of Change:

6.2.1 Immediate outcomes (7 shortlisted measures, of which 5 are assigned a yes)

- Measure no. 3 – this measure poses a challenge for data collection. Even if a suitable collection system can be designed to capture the required data, obtaining engagement and compliance with any new data collection requirement might prove to be difficult. Attribution should be fairly easy for OM 1 as any initial change from the current traditional baseline of “all” is likely to be due to the implementation of the new legislation.

---

\(^{44}\) Incidence of lesions / conditions recorded in the collection and communication of inspection results (CCIR), if possible to differentiate between the ones recorded using visual inspection procedure [VIP] and full inspection procedure [FIP]

\(^{45}\) Number of animals that undergo Full Inspection Procedure

\(^{46}\) Summary of Salmonella test results (number tested and positive)
Measure no. 7\textsuperscript{47} – this data is currently collected by regulatory officials and therefore has potential for the purpose of monitoring the following immediate outcome (OV/MHI implements visual inspection) if a degree of standardisation of procedures between MHIs and OVs can be achieved. This measure is only a proxy measure for the purpose of monitoring OV/MHI supervise corrective (immediate outcome) so care must be taken with interpretation.

Measure no. 8 – measuring \textit{Salmonella} prevalence would be a proxy for reduced carcase handling. However, its use would directly measure the implementation of the new regime for \textit{Salmonella} testing.

Measure no. 13\textsuperscript{a}\textsuperscript{48} – this indirectly measures the outcome of an OV/MHI implementing the new regime for \textit{Salmonella} testing.

Measure 18\textsuperscript{49} – an increase in the number of animals being tested for \textit{Trichinella} will be easily detected. Comparisons between before and after the new legislation will be difficult, as the old legislation was underimplemented.

6.2.2 Medium term outcomes (2 shortlisted measures, both of which are assigned a yes)

Measure no. 5 – this would allow the FSA to establish with confidence that the new legislation has not affected the number of carcases declared unfit for human consumption. An increase or decline in this measure could indicate a need for further investigation; however this could prove challenging due to the number of factors that can affect this measure.

Measure no. 8 – it is hoped reduced handling will lead to a reduction in the prevalence of \textit{Salmonella} on pig carcases. There is no existing evidence that proves a direct correlation between handling and \textit{Salmonella} contamination, and therefore a reduction in cross contamination can only be inferred.

6.2.3 Longer term outcomes (3 shortlisted measures, all of which are assigned a yes)

Measure no. 8 – this measure appears to provide a direct measure of whether fewer positive \textit{Salmonella} samples are reported to FSA. However, care must be taken in interpreting trends in \textit{Salmonella} prevalence, since these may be influenced by other factors, including field prevalence, diagnostic methods, or changes in sampling strategies. Measure no. 13 – this is an indirect measure which would establish the number of plants having satisfactory test \textit{Salmonella} test results over time.

6.2.4 Impact (2 shortlisted measures, both of which have been assigned a yes)

Measures no. 8 and no. 13a – the ability to conclude that the new legislation is having the desired impact is likely to be compromised due to challenges associated with attribution. Indeed, at best it is only possible to make an

\textsuperscript{47} Results of the post-mortem verification tasks – according to the FSA the frequency is going to be increased in the first six months after the implementation of the new legislative requirements.

\textsuperscript{48} Number of slaughterhouses which are consistently having satisfactory Salmonella results (defined using the same criteria that are required to be met in order to apply for reduced testing frequency, i.e. results need to be satisfactory over a period of 30 consecutive weeks).

\textsuperscript{49} Number tested for Trichinella from each type of housing and number of Trichinella positive samples.
inference of each measure which has been assigned to an impact since there is no clear link to demonstrate how they are correlated.

Finally, the table overleaf utilises a Red / Amber / Green (RAG) rating for all shortlisted measures. The RAG rating is based on an assessment of the pros and cons of using each measure in the final Monitoring Framework. It also takes into account the ability to conclude if an outcome being achieved could be attributed to the new legislation. The meaning of the colour coding is explained in greater detail below.

A green indicator means one of the following:

- A measure has potential and attribution should be fairly easy. This applies to measure no. 3 for the purpose of monitoring the following immediate outcomes: implementation of visual inspection and FBO implements changes to quality controls/HACCP.
- A measure has potential and there is a recording system in place that will collect test results from all slaughterhouses. This applies to measures no.8, and no.13a for the purpose of monitoring the immediate outcome: implement new regime for Salmonella testing, and to measure no.18 for the purpose of monitoring the immediate outcome: implementation of risk-based Trichinella controls and reporting to Competent Authority. It also applies to measure no.13a for the purpose of monitoring the following longer-term outcomes: few SHs require corrective action, and fewer positive Salmonella samples reported to FSA.

An amber indicator means one of the following:

- A measure has potential but until a cost benefit assessment is carried out a definitive recommendation cannot be made. This applies to measures no.1 and measure no.2.
- Again, a measure has potential but as it is a proxy measure care must be taken with interpretation. This applies to measure no.7 for the purpose of monitoring immediate outcome: OV/MHIs supervise corrective action, measure no.8 for the purpose of monitoring immediate outcome: reduced carcase handling, and measure no.8 for the purpose of monitoring longer-term outcome: reduced cross contamination.
- A measure is assessed to be suitable however attribution poses a significant challenge. This applies to measure no.5 for the purpose of monitoring medium-term outcome: number of carcases unfit for human consumption.
- A measure is assessed to be suitable but as it is a proxy measures care must be taken with interpretation. This applies to measure no.7 for the purpose of monitoring longer-term outcome: fewer SHs require corrective action; and measure no.8 for the purpose of monitoring longer-term outcome: fewer positive Salmonella samples reported to FSA.

- A red indicator means:

- There is no clear link between the expected impacts of the legislative changes and measures assigned to them. Moreover, such measures rely on inference since there is no clear link to demonstrate that
the impacts and measures are correlated. This applies to measures no. 8 and 18 for the purpose of monitoring the following impacts: more *Salmonella* free pigs and public health risk reduced.
Table 2 – Red Amber Green (RAG) rating for all shortlisted measures

<table>
<thead>
<tr>
<th>Measure no.</th>
<th>Official control measure relates to</th>
<th>Component of Theory of Change + shortlisting recommendation</th>
<th>Immediate outcome</th>
<th>Medium term outcome</th>
<th>Longer term outcome</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Visual</td>
<td>Implement visual inspection (Qualified Yes [QY])</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Implement risk-based palpation and incision (QY)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2</td>
<td>Visual</td>
<td>Implement visual inspection (QY)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Implement risk-based palpation and incision (QY)</td>
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<tr>
<td></td>
<td></td>
<td>Reduced carcase handling (QY)</td>
<td></td>
<td></td>
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<tr>
<td>5</td>
<td>Visual</td>
<td>Implement visual inspection (Yes [Y])</td>
<td></td>
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<td></td>
<td></td>
<td>Changes to quality controls/HACCP (Y)</td>
<td></td>
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<tr>
<td>7</td>
<td>Visual</td>
<td>Implement visual inspection (Y)</td>
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<tr>
<td></td>
<td></td>
<td>OV/MHIs supervise corrective action (Y)</td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>Salmonella</td>
<td>Reduced carcase handling (Y)</td>
<td>Reduced cross contamination (Y)</td>
<td>Reduced cross contamination (Y)</td>
<td>Fewer positive samples reported to FSA (Y)</td>
<td>Public health risk reduced (QY)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Implement new regime for Salmonella testing (Y)</td>
<td></td>
<td></td>
<td></td>
<td>More Salmonella free pigs (QY)</td>
</tr>
<tr>
<td>13a</td>
<td>Salmonella</td>
<td>Implement new regime for Salmonella testing (Y)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Fewer SHs require corrective action (Y)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Fewer positive samples reported to FSA (Y)</td>
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<tr>
<td>18</td>
<td>Trichinella</td>
<td>Implement risk based Trichinella controls and report to Competent Authority (Y)</td>
<td></td>
<td></td>
<td></td>
<td>Public health risk reduced (QY)</td>
</tr>
</tbody>
</table>

50 Outcome measure 1 only i.e. proportion or %; number of slaughterhouses opening pig hearts/total number of slaughterhouses that could incise
## Appendix

As stated in section 1.4, the appendix to this report provides a proforma for each of the eight shortlisted measures: 1, 2, 3, 5, 7, 8, 13a, 18. The proformas contain detailed information on which measures were assessed and shortlisting recommendations made. Proformas for each of the remaining measures are available on request.

<table>
<thead>
<tr>
<th>Number</th>
<th>Group</th>
<th>Type of measure</th>
<th>Potential measure</th>
<th>FSA term ‘Attribution’ - actually level at which analysis, or interpretation is possible and type of outcome measured</th>
<th>Practicalities of collection</th>
<th>Likely quality of data collected</th>
<th>Confidentiality implications</th>
<th>Additional resource implications (for FSA) with respect to data collection</th>
<th>Additional resource implications (for businesses)</th>
<th>Other means of collection</th>
<th>Usefulness to monitor the impact of the legislative change</th>
<th>Why?</th>
<th>Does it measure something that might change with the changes in legislation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CCIR</td>
<td>Animal Health (AH), Animal Welfare (AW), Public Health (PH)</td>
<td>Incidence of lesions/conditions recorded in the CCIR (if possible differentiated between the ones recorded using VIPs and FIPs)</td>
<td>Outcome measure: Number of lesions recorded/number of pigs inspected (incidence)</td>
<td>Some difficulties</td>
<td>Good</td>
<td>No</td>
<td>Medium</td>
<td>Varies</td>
<td>No</td>
<td>Limited</td>
<td>Yes</td>
<td>Changes in the legislation should have a direct impact on lesions that either required palpation and incision (P&amp;I) to detect them, or whose detection is aided by P &amp; I. The degree to which these will be reduced has been assessed in previous work. It should be apparent at both SH and national level. Additional change may occur in lesions that are detectable by visual-only (VO) inspection due to changes in working practices, lines of sight, time available, changes in classification etc. due to the implementation of new working practices, as a result of the legislation change. These changes could be either in increase or a decrease in detection and are likely to...</td>
</tr>
<tr>
<td>Question</td>
<td>Response</td>
<td>Description</td>
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<tr>
<td>How big a change will any change have to be to be able to be identified?</td>
<td>Varies</td>
<td>This will depend on the lesion, its within-batch, batch-level and higher unit of analyses levels of prevalence.</td>
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<tr>
<td>Are there other factors that will cause this measure to change?</td>
<td>Yes</td>
<td>At slaughterhouse level: will vary depending on - what herds submit to that slaughterhouse, when and how many pigs (i.e. proportional contribution to throughput) and what the individual within-herd prevalence is at the time - may spike with herd outbreaks, or a high prevalence herd contributing more pigs, decrease with effective within herd disease control measures, more pigs from very low prevalence herds etc. At national level: will also be influenced by the herd-level prevalence the national prevalence estimate. Exporting abattoirs: the majority of the plants which export only export a small % of pigs per day which could mean that they have to do traditional inspection for the pigs being exported and visual inspection for the ones being consumed in EU (or just do traditional inspection on all pigs). This is an additional external variable that could contribute to any changes seen (i.e. % examined for export).</td>
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<tr>
<td>If Yes to other factors, will it be possible to differentiate the two i.e. identify the cause?</td>
<td>Possible</td>
<td>Would need sufficient background industry knowledge and data on the range of prevalence estimates. Will be simpler immediately for VIP recorded non-visual only identifiable lesions – these should reduce; however, this relies on being able to identify which lesions are recorded at VIP and which are recorded at FIP. It will be more difficult if lesion recording is not stratified accordingly.</td>
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<tr>
<td>Can any change, therefore, be attributed to legislative change?</td>
<td>Difficult</td>
<td>See above – will require differentiation of VIP recorded lesions from FIP recorded lesions and is probably better to look at which lesions might be most relevant to measure on a case-by-case basis.</td>
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<tr>
<td>Resource implications (for FSA) with respect to data analysis and interpretation</td>
<td>High</td>
<td>Statistical, epidemiological and industry knowledge required to set up appropriate analyses. Epidemiological and industry knowledge required to interpret outputs from analyses appropriately. Data on true, or apparent, field prevalence – not readily available.</td>
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<tr>
<td>Additional points to note:</td>
<td></td>
<td>Will need to define which conditions, what level, what time scale to be used and what outcome measure is required. Will need to note any changes in the system that could influence any aspect of identification, classification and recording Comment from FSA staff: recording the animals that undergo further inspection procedures (FIPs) would be very difficult as it would need a change in the recording systems in place. This would be more problematic when the system is owned by the FBOs. It would also increase time spent on inputting the data, which may not be feasible. An option would be to include this info in the comment box; this would be very difficult to analyse as it would need to be done on an individual basis.</td>
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<tr>
<td>Overall assessment of suitability</td>
<td>Has potential</td>
<td></td>
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<tr>
<td>Number: 2</td>
<td>Group: CCIR</td>
<td>Type of measure: AH, AW, PH</td>
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</tbody>
</table>

**Potential measure:** Number of animals which undergo FIP

**FSA term ‘Attribution’ – actually level at which analysis, or interpretation is possible and type of outcome measured:**

Outcome measures:
1. Number of pigs which undergo FIPs
2. Proportion or number of pigs which undergo FIPs

Regular repeated measure at whatever level the unit of analysis is required and whatever temporal unit is required. Outcome Measure 2.1 above, is the denominator for use in the incidence of lesions assessed by FIPs

Minimum unit at which it is useful to assess data: Slaughterhouse level

**Practicalities of collection:** Some difficulties

MHIs and OVVs to record daily

It would require a change in the recording system.

**Likely quality of data collected:** Varies

Quality will be dependent on the system put in place to collect this information and staff engagement.

**Confidentiality implications:** No

N/A

**Additional resource implications (for FSA) with respect to data collection:** High

Training of MHIs and OVVs to record this extra information.

Changes to the recording system – see additional points to note below.

**Additional resource implications (for businesses):** High

For the FBOs using their own recording system (four major plants): changes to the recording system would be needed.

**Other means of collection:** No

N/A

**Usefulness to monitor the impact of the legislative change:** Useful

**Why?**

**Does it measure something that might change with the changes in legislation?** Yes

Technically, FIPs did not exist prior to the legislation change, therefore, the number, or %, of pigs that undergo FIPs is currently zero.

With the changes in the legislation VIPs will be the usual, or default, procedures; FIPs will be applied when deemed necessary by the OVVs and MHIs.

The impact of the implementation of the legislation, on the number of FIPs, may change with time for a number of reasons.

**How big a change will any change have to be to be able to be identified?** N/A

N/A

**Are there other factors that will cause this measure to change?** Yes

Any change in the frequency of occurrence of any factor (A) that contributes to a pig/carcase being declared as needing a FIP will cause this measure to change. For example:

At slaughterhouse level: will vary depending on - what herds submit to that slaughterhouse, when and how many pigs (i.e. proportional contribution to throughput) and what the individual within-herd prevalence of A is at the time - may spike with herd outbreaks, or a high prevalence herd contributing more pigs, decrease with effective within herd disease control measures, more pigs from very low prevalence herds etc.

At national level: will also be influenced by the herd-level prevalence of and the factors that affect who and what contributes to the national prevalence estimate.

**If Yes to other factors, will it be Possible**

Would need sufficient background industry knowledge
Can any change, therefore, be attributed to legislative change? | Yes – short term Possible/Difficult - medium/long term | An initial change will be attributable to the legislation. However, over the medium/long term further changes will be harder to attribute unless other factors (above) are identified and can be quantified.

Resource implications (for FSA) with respect to data analysis and interpretation | Low (short term) Medium/high (medium/long term) | Statistical, epidemiological and industry knowledge required to set up appropriate analyses. Epidemiological and industry knowledge required to interpret outputs from analyses appropriately. Data on changes in other factors that may influence the number of the different types of inspection required.

Additional points to note: | Will need to note any changes in the system that could influence any aspect of identification, classification and recording of what constitutes a carcase that needs a FIP.

1. According to FSA staff: Recording the animals which undergo further inspection procedures (FIPs) would be very difficult. It would require changes to the recording systems in place. This would be more problematic for the abattoirs that have their own electronic system. It will also mean more time spent on inputting the data; this may not be feasible. An option would be to include this info in the comment box but this would be very difficult to analyse.

2. Exporting abattoirs - the majority of the plants which export only export a small % of pigs per day, which could mean that they have to do traditional inspection for the pigs being exported and visual inspection for the pigs being consumed in EU. This is an additional external variable that could contribute to any changes seen (i.e. % examined for export).

Overall assessment of suitability | Has potential
<table>
<thead>
<tr>
<th>Number: 3</th>
<th>Group: CCIR</th>
<th>Type of measure: Animal Health (AH); Public health (PH)</th>
</tr>
</thead>
</table>
| **Potential measure:** | Endocarditis – opening of hearts | 1. Number of slaughterhouses which choose to incise hearts for quality assurance purposes  
2. Number of animals that had the heart incised and the number positive to endocarditis |
| **FSA term 'Attribution' - actually level at which analysis, or interpretation is possible and type of outcome measured:** | Outcome measure: 1. Proportion or %: number of slaughterhouses opening pig hearts/total number of slaughterhouses that could - Single point estimate, or regular repeated measure  
2. Number of affected hearts/number of opened hearts - regular repeated measure at whatever level the unit of analysis is required and whatever temporal unit is required – there is a possibility of developing a temporal trend measure |
| **Minimum unit at which it is useful to assess data:** | 1) National Level 2) Slaughterhouse level |
| **Practicalities of collection:** | Substantial difficulties | 1. From FBOs  
2. SH staff  
Potential difficulties in obtaining engagement and compliance with recording requirements (1 & 2). The current recording system includes this condition, so no changes in the recording system are necessary (2). Access by appropriate staff to the recording system may be an issue unless added to the requirements for MHs/OVs to record (2). Need to implement data collection system (1). Variability and inconsistency (1 & 2). |
| **Likely quality of data collected:** | Unknown | Not possible to evaluate as dependent on what system is put in place by FBOs and their willingness to record the data. |
| **Confidentiality implications:** | Yes | See additional notes) |
| **Additional resource implications (for FSA) with respect to data collection:** | Medium | 1. Collection and collation of data from FBOs  
2. As above |
| **Additional resource implications (for businesses):** | High | 1. Submission of information to FSA  
2. Training in the recording of the information required; adaptation or implementation of recording systems; submission of information to FSA |
| **Other means of collection:** | Yes | One-off, or annual, single or repeated industry wide survey |
| **Usefulness to monitor the impact of the legislative change:** | 1. Useful  
2. Limited |
| **Why?** | | |
| **Does it measure something that might change with the changes in legislation?** | Yes | 1. The number of slaughterhouses that currently incise hearts is "all" with traditional inspection. This should theoretically reduce to SHs that produce for export-only and where a FIPS has been performed A variation from the expected value could indicate a demand (an impact of the legislative change) – the reasons behind which would need to be investigated. This demand/these reasons may vary with time.  
2. Not really – may act more as a check that there has not been an unexpected impact |
| **How big a change will any change have to be to be able to be** | Unknown | 1. Any change could be detected (if the baseline figure is assumed to be 100%)  
2. Further work needed on existing data, which is |
<table>
<thead>
<tr>
<th>identified?</th>
<th>only accessible to FSA staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are there other factors that will cause this measure to change?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>1. Perceived risk/demand /need – but this is the impact of the legislative change.</td>
</tr>
<tr>
<td></td>
<td>2. A systematic distortion, or bias, due to the selection of specific batches for heart opening; changes in the batches/producers selected; changes in within and between herd prevalence</td>
</tr>
<tr>
<td>If Yes to other factors, will it be possible to differentiate the two i.e. identify the cause?</td>
<td>Possible</td>
</tr>
<tr>
<td></td>
<td>1. Any initial change from the current traditional baseline of 'all' is likely to be due to the implementation of the legislation.</td>
</tr>
<tr>
<td></td>
<td>2. More difficult – see above</td>
</tr>
<tr>
<td>Can any change, therefore, be attributed to legislative change?</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>For 1. With appropriate caveats for 2</td>
</tr>
<tr>
<td>Resource implications (for FSA) with respect to data analysis and interpretation</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Statistical, epidemiological and industry knowledge required to set up appropriate analyses. Epidemiological and industry knowledge required to interpret outputs from analyses appropriately.</td>
</tr>
<tr>
<td>Additional points to note:</td>
<td>Would need to note any changes in the system that could influence any aspect of identification, classification and recording.</td>
</tr>
<tr>
<td></td>
<td>1. The decision to incise hearts may be subject to customer demand (e.g. for one batch of pigs the hearts are incised while not for the following batch).</td>
</tr>
<tr>
<td></td>
<td>2. If sufficient SHs do incise hearts and record the outcome, providing they also record accurately the producer and batch – which would have confidentiality implications - then although any potential for bias (see above) cannot be ‘analysed’ out, it may be able to be investigated and partially mitigated in interpretation: then this measure may potentially be used to monitor trends for endocarditis (2) – to determine whether there has/has not been an unexpected impact.</td>
</tr>
<tr>
<td>Overall assessment of suitability</td>
<td>Has potential (1)</td>
</tr>
<tr>
<td>Number: 5</td>
<td>Group: CCIR</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Potential measure:</td>
<td>Indicator measures/proxies for the adequate identification of meat that is declared unfit for human consumption: number of carcases declared unfit for human consumption</td>
</tr>
<tr>
<td>FSA term 'Attribution' - actually level at which analysis, or interpretation is possible and type of outcome measured:</td>
<td>Outcome measure: 1/ Number of carcases declared unfit for human consumption 2/ Proportion or % of carcases inspected that are declared fit for human consumption 3/ Proportion of % of carcases detained that are declared unfit for human consumption</td>
</tr>
<tr>
<td>Regular repeated measure at whatever level the unit of analysis is required and whatever temporal unit is required – there is a possibility of developing a temporal trend measure</td>
<td>Minimum unit at which it is useful to assess data: Slaughterhouse level</td>
</tr>
<tr>
<td>Practicalities of collection:</td>
<td>Feasible</td>
</tr>
<tr>
<td>Likely quality of data collected:</td>
<td>Good</td>
</tr>
<tr>
<td>Confidentiality implications:</td>
<td>No</td>
</tr>
<tr>
<td>Additional resource implications (for FSA) with respect to data collection</td>
<td>No</td>
</tr>
<tr>
<td>Additional resource implications (for businesses)</td>
<td>No</td>
</tr>
<tr>
<td>Other means of collection:</td>
<td>No</td>
</tr>
<tr>
<td>Usefulness to monitor the impact of the legislative change:</td>
<td>Useful</td>
</tr>
<tr>
<td>Why?</td>
<td></td>
</tr>
<tr>
<td>Does it measure something that might change with the changes in legislation?</td>
<td>Yes</td>
</tr>
<tr>
<td>How big a change will any change have to be to be able to be identified?</td>
<td>Unknown – would need further work</td>
</tr>
<tr>
<td>Are there other factors that will cause this measure to change?</td>
<td>Yes</td>
</tr>
<tr>
<td>If Yes to other factors, will it be possible to differentiate the two i.e. identify the cause?</td>
<td>Possible</td>
</tr>
<tr>
<td>Can any change, therefore, be attributed to legislative change?</td>
<td>Possible</td>
</tr>
<tr>
<td>Resource implications (for FSA) with respect to data analysis and interpretation</td>
<td>High</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>Statistical, epidemiological and industry knowledge required to set up appropriate analyses. Epidemiological and industry knowledge required to interpret outputs from analyses appropriately. Data on true, or apparent, field prevalence – not readily available.</td>
</tr>
<tr>
<td>Additional points to note:</td>
<td>These data are already collected daily by the MHS/OVs in the SH independent of the size of the SH.</td>
</tr>
<tr>
<td>Overall assessment of suitability</td>
<td>Suitable</td>
</tr>
<tr>
<td>Number: 7</td>
<td>Group: CCIR</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>Potential measure:</td>
<td>Results of the post-mortem verification tasks (as the frequency is going to be increased in the first 6 months after the implementation of the new legislative requirements)</td>
</tr>
<tr>
<td>FSA term 'Attribution' - actually level at which analysis, or interpretation is possible and type of outcome measured:</td>
<td>Outcome measure: a) number of lesions recorded by the MHIs in a sample b) number of lesions recorded by the OVs in the same sample c) difference between a) and b) Regular repeated measure at whatever level the unit of analysis is required and whatever temporal unit is required Minimum unit at which it is useful to assess data: Slaughterhouse level</td>
</tr>
<tr>
<td>Practicalities of collection:</td>
<td>Feasible Data currently collected by the MHIs and the OVs. OVs or LVs verify the post mortem inspection of a sample of carcases and offal which have been inspected by the MHIs. As a result of the legislative changes, to be increased to a daily basis for a period of six months (15% of the throughput) and then return to the normal frequency.</td>
</tr>
<tr>
<td>Likely quality of data collected:</td>
<td>Good Should be at least equivalent to current system.</td>
</tr>
<tr>
<td>Confidentiality implications:</td>
<td>No As long as aggregated at a regional and population level.</td>
</tr>
<tr>
<td>Additional resource implications (for FSA) with respect to data collection</td>
<td>Low/Medium No extra time for data collection (as this data would be collected whether it was used to measure impact of changes or not. There will be increased staff time for higher number of verification tasks.</td>
</tr>
<tr>
<td>Resource implications (for businesses)</td>
<td>No Again, data collection will not have additional resource implications. The increased frequency of PM tasks may have implications: it will depend whether there are adequate facilities available for the increased numbers of carcases to be retained for the verification tasks – if not, potentially slower line speed, or some other adaptation may be required.</td>
</tr>
<tr>
<td>Other means of collection:</td>
<td>No N/A</td>
</tr>
<tr>
<td>Usefulness to monitor the impact of the legislative change:</td>
<td>Limited</td>
</tr>
<tr>
<td>Why?</td>
<td>Yes This verification procedure is applied to provide assurance that visual inspection is effective in detecting conditions and the procedures are correctly implemented.</td>
</tr>
<tr>
<td>Does it measure something that might change with the changes in legislation?</td>
<td>Yes A significant decrease in the detection of the conditions by the MHIs, is not expected (other than for those detectable by palpation and incision only). A large change would need to occur, systematically across the aggregated unit of analysis, to be able to identify any change that has occurred due to legislation.</td>
</tr>
<tr>
<td>How big a change will any change have to be to be able to be identified?</td>
<td>Large Anything that affects the MHIs ability to detect and ‘call’ a condition – such as:</td>
</tr>
<tr>
<td>Are there other factors that will cause this measure to change?</td>
<td>Yes Changes in line speed Changes in the proficiency/ability or confidence of MHIs to detect conditions (e.g. newly qualified) Awareness of a particular lesion/condition due to either an increase/decrease of prevalence, occurrence and advice/guidance/news</td>
</tr>
</tbody>
</table>

- Ipsos MORI | August 2016 | Final | Public |
- 14-011677-01 | Final | Public || This work was carried out in accordance with the requirements of the international quality standard for Market Research, ISO 20252:2012, and with the Ipsos MORI Terms and Conditions which can be found at http://www.ipsos-mori.com/terms. © Food Standards Agency 2016.
<table>
<thead>
<tr>
<th>Question</th>
<th>Possible/Unlikely</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>If Yes to other factors, will it be possible to differentiate the two i.e. identify the cause?</td>
<td>Possible</td>
<td>With expert knowledge at a slaughterhouse level.</td>
</tr>
<tr>
<td>Can any change, therefore, be attributed to legislative change?</td>
<td>Possible</td>
<td>It will depend on the OV's experience and knowledge of the particular environment (SH) within which they are doing the verification tasks.</td>
</tr>
<tr>
<td>Resource implications (for FSA) with respect to data analysis and interpretation</td>
<td>Medium</td>
<td>Statistical, epidemiological and industry knowledge required to set up appropriate analyses. Epidemiological and industry knowledge required to interpret outputs from analyses appropriately.</td>
</tr>
<tr>
<td>Additional points to note:</td>
<td></td>
<td>This has potential for ongoing monitoring e.g. repeat at a later date and compare outcomes, if a degree of standardisation can be achieved; otherwise is more a tool for the provision of reassurance.</td>
</tr>
<tr>
<td>Overall assessment of suitability</td>
<td>Has potential</td>
<td></td>
</tr>
<tr>
<td>Number: 8</td>
<td>Group: Salmonella</td>
<td>Type of measure: Public Health</td>
</tr>
<tr>
<td>----------</td>
<td>------------------</td>
<td>------------------------------</td>
</tr>
</tbody>
</table>

**Potential measure:** Summary of Salmonella test results (number tested and positive)

**FSA term 'Attribution'** - actually level at which analysis, or interpretation is possible and type of outcome measured:

**Outcome measure:**
- Number or proportion of positive samples (prevalence).
- Regular repeated measure at whatever level the unit of analysis is required and whatever temporal unit is required.
- Possibility of developing a temporal trend measure

**Minimum unit at which it is useful to assess data:** Slaughterhouse level

**Practicalities of collection:** Feasible

**System already in place and on a voluntary basis** (the FBOs collect the info and report to FSA).

A new electronic system is being put in place that will collect these data from all SHs. The OVs will be responsible for recording these data in the database.

**Likely quality of data collected:** Good

**Should be at least equivalent to current system.**

**Confidentiality implications:** No

**Not at an aggregated level**

**Additional resource implications** (for FSA) with respect to data collection:

**Medium**

No additional resources are required for data collection over and above those for the implementation of the new requirements.

Database development, maintenance and management resources are required to be suitable to enable the aggregation of the results and to be queried appropriately for monitoring purposes.

**Additional resource implications** (for businesses):

**No**

There are no additional implications beyond those needed to implement the requirements of the new legislation.

**Database development, maintenance and management resources are required to be suitable to enable the aggregation of the results and to be queried appropriately for monitoring purposes.**

**Other means of collection:** Yes

The Pig Survey in 2013 was a good example of how the prevalence of Salmonella and the trend over time can be monitored, with a degree of confidence and accuracy.

**Usefulness to monitor the impact of the legislative change:** Useful

**Why?**

**Does it measure something that might change with the changes in legislation?** Yes

A key aim of the new legislation is to reduce the handling and therefore the risk of cross-contamination of carcases. It is hoped that this will contribute to the reduction of the prevalence of Salmonella on pig carcases.

In addition the process hygiene criterion (PHC) for Salmonella have been strengthened, which, combined with corrective action, should also lead to a reduction in the prevalence of Salmonella on pig carcases.

**How big a change will any change have to be to be able to be identified?** Large

Salmonella control at SH level is already in place and the latest available figures, from the Pig Survey 2013, showed that a reduction in Salmonella prevalence has been achieved with some success, so it will be more difficult to detect minor changes.

**Are there other factors that will cause this measure to change?** Yes

Salmonella prevalence on carcases can also decrease/increase due to the implementation (or not) of measures at farm level, therefore the interpretation of results has to take into consideration external factors.

**If Yes to other factors, will it be possible to differentiate the two i.e. identify the cause?** Possible

This will only be possible if there is a measure of Salmonella prevalence at farm and herd level that can be used to determine the contribution this external factor has on the SH sample-level.
<p>| Can any change, therefore, be attributed to legislative change? | Difficult | See above – appropriate field (farm/herd) level prevalence required for interpretation. |
| Resource implications (for FSA) with respect to data analysis and interpretation | High | Statistical, epidemiological and industry knowledge required to set up appropriate analyses. Epidemiological and industry knowledge required to interpret outputs from analyses appropriately. Data on true, or apparent, field prevalence – not readily available. |
| Additional points to note: | As this is a sample – 95% confidence intervals should always be provided for any estimates of prevalence. As more than one change has been made at the same time, it will not be possible to determine which aspect of the legislative change is responsible for any reduction in the prevalence of Salmonella on pig carcases that may be observed (i.e. the contribution of reduced handling from the introduction of visual-only inspection will not be able to be separated from that due to the change in PHC.) A repeat of the Pig Survey (Salmonella component) a short while after the implementation of the legislative changes have been made and ‘bedded in’ and then again a few years (2-3) later, would probably be the best way of validating the new system of Salmonella data collection. |
| Overall assessment of suitability | Has potential |</p>
<table>
<thead>
<tr>
<th>Number: 13a</th>
<th>Group: Salmonella</th>
<th>Type of measure: Public Health (PH)</th>
</tr>
</thead>
</table>

**Potential measure:**
Number of SHs which are consistently having satisfactory Salmonella results (defined using the same criteria that are required to be met to apply for reduced testing frequency i.e. results need to be satisfactory over a period of 30 consecutive weeks).

**FSA term ‘Attribution’ – actually level at which analysis, or interpretation is possible and type of outcome measured:**
Outcome measure:
- number of SH which are consistently having satisfactory Salmonella results (satisfactory results over a period of 30 consecutive weeks) /number of SH testing for Salmonella

Regular repeated measure at whatever level the unit of analysis is required and whatever temporal unit is required. The time interval will depend on how frequently it is expected that this number is likely to change. Minimum unit at which it is useful to assess data: National level.

**Practicalities of collection:** Feasible
A new electronic system is going to be implemented to record Salmonella results (see Measure 8). This system could be automated to generate this info.

**Likely quality of data collected:** Good
N/A

**Confidentiality implications:** No
Outcome measure at aggregated level

**Additional resource implications:**
- (for FSA) with respect to data collection: No
  - Potentially some work aggregating data.
- (for businesses): No
  - Reporting of these results already a requirement of the change to legislation.

**Other means of collection:** No
N/A

**Usefulness to monitor the impact of the legislative change:** Useful

**Why?**
- Does it measure something that might change with the changes in legislation? Yes
  - The new legislation imposes stricter cut-off for the PHC for Salmonella at SH level, therefore, the number of SH that are consistently having satisfactory Salmonella results is expected to decrease until the SHs have made adjustments to their control plans.
- How big a change will any change have to be to be able to be identified? Varies
  - This measure would include all the SHs slaughtering more than 37,500 pigs per year, so further work would be needed to assess if any change would be easily detected. This will depend on the numbers of SHs that are likely to meet the relevant criteria.
- Are there other factors that will cause this measure to change? Yes
  - Any change on salmonella prevalence at farm level (see Measure 8).
- If Yes to other factors, will it be possible to differentiate the two i.e. identify the cause? Possible
  - Would need sufficient background industry knowledge and data on the range of prevalence estimates.
- Can any change, therefore, be attributed to legislative change? Difficult
  - See above – it will be possible if the other factors can be taken into consideration in the interpretation of the results.
- Resource implications (for FSA) with respect to data analysis and interpretation: Medium
  - Statistical, epidemiological and industry knowledge required to set up appropriate analyses. Epidemiological and industry knowledge required to interpret outputs from analyses appropriately.
- Additional points to note: It is possible that short-term repeated, or rolling measure may be better in the immediate period post-implementation, when changes are most likely to occur.

**Overall assessment of suitability:** Has potential
<table>
<thead>
<tr>
<th>Number: 18</th>
<th>Group: Trichinella</th>
<th>Type of measure: Public Health</th>
</tr>
</thead>
</table>

**Potential measure:**
Number tested for Trichinella from each type of housing and number of Trichinella positive samples.

**FSA term ‘Attribution’ - actually level at which analysis, or interpretation is possible and type of outcome measured:**

<table>
<thead>
<tr>
<th>Outcome measure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Number of Trichinella positive results/ number tested for Trichinella</td>
</tr>
<tr>
<td>2. Number of Trichinella positive results from non-controlled housing/ number tested for Trichinella from non-controlled housing</td>
</tr>
<tr>
<td>3. Number of Trichinella positive results from controlled housing/ number tested for Trichinella from controlled housing</td>
</tr>
</tbody>
</table>

Each of these could be a regular repeated measure at whatever temporal unit is required (e.g. monthly, annually).

Minimum unit at which it is useful to assess data: Slaughterhouse level, although regional and business area analysis might be of particular interest.

**Practicalities of collection:**
Feasible (1)  
Substantial difficulties (2 and 3)

Data for outcome 1 is currently being collected on a monthly basis through the contracted lab reports and through the invoices from in-house labs. Data for outcomes 2 and 3 will need Food Chain Information (FCI) to be collected and incorporated into the FSA system. This will then need to be linked to the sample data.

**Likely quality of data collected:**
Good  
N/A

**Confidentiality implications:**
No  
(Yes at slaughterhouse level)

**Additional resource implications (for FSA) with respect to data collection**

<table>
<thead>
<tr>
<th>1 - Low/Medium (depending on whether SHs conduct their own tests or use established labs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&amp; 3 – Medium/High</td>
</tr>
</tbody>
</table>

The current system will be able to accommodate the changes in terms of a higher number of samples. The challenge for achieving outcome 1 will be accommodating the different formats in which the data have when sent from different sources (contracted lab, in-house labs or other private labs), in order to collate the data.

The FCI data exists; however, resources would be needed to develop the IT infrastructure required to collect and collate the data for outcomes 2 and 3.

**Additional resource implications (for businesses)**
Possibly/No

It is likely that there are no additional resource implications for businesses, providing that data collection is built into the reporting of the testing process.

**Other means of collection:**
No  
N/A

**Usefulness to monitor the impact of the legislative change:**
Useful

**Why?**

<table>
<thead>
<tr>
<th>Does it measure something that might change with the changes in legislation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

The new legislation changes the Trichinella testing regime which consequently should change the number of pigs being tested. This measure will monitor that change in the numbers being tested and at the same time the trend for Trichinella.

<table>
<thead>
<tr>
<th>How big a change will any change have to be to be able to be identified?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small</td>
</tr>
</tbody>
</table>

A small increase in the number of animals being tested will be easily identified. If the aim is to detect changes in the prevalence of Trichinella, further work has to be done to ascertain if the number tested under the new regime will be able to detect small changes in the Trichinella prevalence.

<table>
<thead>
<tr>
<th>Are there other factors that will cause this measure to change?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
</tr>
</tbody>
</table>

An outbreak of the disease (currently it is considered exotic) will influence this measure. Any disease control measures that are implemented. Any change in the population structure that affects the relative distribution of the subsets of the population that
<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>If Yes to other factors, will it be possible to differentiate the two i.e. identify the cause?</td>
<td>Possible</td>
<td>A positive case will trigger an investigation of the causes so it should be possible to ascertain if that was due to an imported case or due to endemic cases that were not detected by the former Trichinella testing regime.</td>
</tr>
<tr>
<td>Can any change, therefore, be attributed to legislative change?</td>
<td>Yes</td>
<td>In theory, yes.</td>
</tr>
<tr>
<td>Resource implications (for FSA) with respect to data analysis and interpretation</td>
<td>High</td>
<td>Statistical, epidemiological and industry knowledge required to set up and interpret appropriate analyses and their outputs.</td>
</tr>
<tr>
<td>Additional points to note:</td>
<td>Comparison between before and after the new legislation will be difficult, as the new legislation represents an increase in testing due to under-implementation of the old legislation.</td>
<td></td>
</tr>
<tr>
<td>Overall assessment of suitability</td>
<td>Suitable (1), has potential (2 and 3)</td>
<td></td>
</tr>
</tbody>
</table>
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