



Evidence Project Final Report

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Executive Summary

7. The executive summary must not exceed 2 sides in total of A4 and should be understandable to the intelligent non-scientist. It should cover the main objectives, methods and findings of the research, together with any other significant events and options for new work.

Background and aims. At EU and UK government levels there is a commitment to reduce the regulatory burden on farmers by utilising a risk-based system of regulation and inspection so that farmers at greater risk of non-compliance are more likely to have farm inspections than those at lower risk. Previous work indicated that farms in farm assurance and organic certification schemes were less likely to fail animal welfare inspections when visited by the Animal and Plant Health Agency (APHA, formerly Animal Health and Veterinary Laboratory Agency) (KilBride et al., 2012) and this factor was subsequently added to the Defra risk model used to determine whether a farm is selected for inspection by APHA.

A consultation in 2011 suggested that other farm-level factors might also be indicative of passing APHA welfare inspections, including the level of compliance at non-welfare cross compliance inspections, membership of a herd health scheme, and ante and post mortem data reported to the Food Standards Agency (FSA) by abattoirs. The aim of AW0514 was to investigate whether these other sources of information could provide additional information to further improve the risk model used to select enterprises for cross compliance inspections.

Data sourced to test for inclusion in risk-based selection of farms for welfare inspections

As in KilBride et al (2012), all major farm assurance and organic certification schemes in GB were contacted. In addition, herd health schemes and retailer-led schemes were invited to participate. Lists of subsidy claimants and non-welfare cross compliance inspection results were obtained from the Paying Agencies, and abattoir data from the FSA. Data were requested from January 2006 to December 2013. All data were matched to animal welfare inspection records supplied by APHA, containing 54,201 inspections to 32,945 enterprises at 11,800 locations (farms). Matching was by County Parish Holding (CPH) number, or address and postcode where CPH was not available. Locations were coded as being a member of an assurance/ organic/ herd health/ retailer scheme, or subsidy claimant, when inspected by APHA. Breaches of non-welfare cross compliance outcomes were tested in the model.

Details of models. Multivariable multilevel binomial logistic regression models were built, comparing the outcome variable of compliance (APHA codes A or B) or non-compliance (codes C or D) with animal welfare legislation. Random effects were included to account for the repeated measures structure of the data, with inspections over time nested within enterprise type, farm location (CPH equivalent), and county. The year of inspection, reason for the visit, type and size of enterprise, claimant status and country were added to all models.

Results

The number and percentage of inspections coded A, B, C and D were 20,174 (37%), 23,439 (43%), 8,364 (15%) and 2,224 (4%) respectively. The proportion of inspections coded A-D varied by year, visit type, enterprise type and size. The response rate from schemes was very good with 22 schemes providing data. There was a significantly reduced risk of non-compliance (code C/D) in farms that were members of schemes, including herd health schemes and members of multiple scheme types had a lower risk of non-compliance.

Table 1. Odds ratios (OR) and confidence intervals (CI) of the association between membership of farm assurance, organic certification and herd health schemes

		Odds Ratio	Lower CI	Upper CI
Scheme membership [†]	Not a member	Baseline		
	Farm assurance	0.57	0.51	0.63
	Organic certification	0.49	0.34	0.70
	Herd health	0.55	0.45	0.67

^{*}OR <1 indicate a reduced risk of non-compliance, OR >1 indicate an increased risk. Where CI do not contain 1.0 we can be 95% sure that there is a difference between categories and the baseline value (in bold). [†]Adjusted for repeated inspections to enterprises, within farm, within county and including other factors that may affect compliance (enterprise type and size, year, country, visit reason, subsidy claimant).

There was no association between non-welfare cross compliance inspection outcomes and compliance with APHA welfare inspections. The FSA abattoir report data was not of sufficient quality to be included.

Selection of farms for risk-based inspections

After examination of the data and discussion with Defra and APHA to understand the current process for selection of farms for risk-based inspections and the requirements of Defra, a decision tree for selection of farms for risk-based selection is recommended.

Conclusions

Membership of farm assurance (including one retailer scheme), organic certification, and herd health schemes was associated with a reduced risk of non-compliance with animal welfare legislation. The reduction was similar across all scheme types and was quantitatively very similar to that observed in the previous study of farm assurance and organic certification membership (KilBride et al, 2012). In addition, enterprise size, reason for inspection, year of inspection, worst previous score (in seven years), and on-farm cattle mortality were associated with compliance. We recommend that membership of farm assurance and organic certification schemes remain in the risk model and that herd health membership and the participating retailer scheme are also included in the risk-based selection of farms for inspection. Finally we propose that, in time, Defra consider adding a weighting to reduce risk-based inspections to farms that are in several scheme types.

We recommend that selection for risk-based inspections is done using a decision-tree.

Project Report to Defra

8. As a guide this report should be no longer than 20 sides of A4. This report is to provide Defra with details of the outputs of the research project for internal purposes; to meet the terms of the contract; and to allow Defra to publish details of the outputs to meet Environmental Information Regulation or Freedom of Information obligations. This short report to Defra does not preclude contractors from also seeking to publish a full, formal scientific report/paper in an appropriate scientific or other journal/publication. Indeed, Defra actively encourages such publications as part of the contract terms. The report to Defra should include:
- the objectives as set out in the contract;
 - the extent to which the objectives set out in the contract have been met;
 - details of methods used and the results obtained, including statistical analysis (if appropriate);
 - a discussion of the results and their reliability;
 - the main implications of the findings;
 - possible future work; and
 - any action resulting from the research (e.g. IP, Knowledge Exchange).

Introduction

Across England, Scotland, and Wales the minimum legal standards for the care of farmed animals are laid out in The Animal Welfare Act 2006 (and Animal Health and Welfare (Scotland) Act 2006). These are supplemented in each country by The Welfare of Farmed Animals Regulations (with amendments) and codes. Each year APHA inspectors visit a proportion of farms to assess compliance with relevant animal welfare legislation and codes. There are a variety of reasons for these inspections (Table 2) including a complaint from the public, or where there was a previous non-compliant visit and increasingly, cross compliance inspections.

Table 2. Animal and Plant Health Agency reasons for inspection

Visit type	Definition
Complaint	Any complaint or allegation where a veterinary risk assessment (VRA) indicates there may be unnecessary suffering (US)
Targeted	Any inspection where there is reason to believe that an offence may be found, other than a complaint. Can include follow up to a previous visit where a problem was found, or as a result of information received from a reliable source, abattoir tracing (Food Standards Agency), or market tracing, which indicates a problem on farm.
Programmed	Any visit requested centrally by the Specialist Service Centre (SSC)
Cross compliance (XC) visit types (to claimants)	
XC Random	Cross compliance random selection
XC Risk-based	Cross compliance selection using risk model
XC Targeted	When another inspection type discloses a breach of a welfare statutory management requirement (SMR)
Other visit types	
Elective / Special / OTMS	Any other visit when there was no prior reason to suspect an offence. For example, visits can be carried out when inspectors are on the farm for another purpose, e.g. TB test. Visits can also be requested by the farm. OTMS was originally used for over thirty month scheme but now used to signify another type of special inspection

Since 2007, over 50% of welfare inspections are to farms that receive payments from rural development schemes or the Common Agricultural Policy (CAP) schemes, referred to as cross compliance inspections. It is an EU requirement that a minimum of 1% of subsidy claimants (from this point referred to as 'claimants') are inspected annually. Cross compliance is administered by the paying agencies in England (Rural Payments Agency), Wales (Rural Payments Wales) and Scotland (Scottish Government Rural Payments & Inspections Directorate). The regulations which farmers must adhere to in order to receive full payment are split into Statutory Management Requirements (SMRs), which from 2007 have included animal welfare regulations (SMRs 16 calves, 17 pigs and 18 animal welfare), and Good Agricultural and Environmental Conditions (GAECs). Inspections to claimant premises in respect of welfare-specific SMRs are selected and conducted by APHA, with the results passed to the Paying Agencies, who deduct penalties from subsidies for any non-compliance. The Paying Agencies themselves select and conduct the majority of inspections for non-welfare regulations.

There is a commitment to reduce the regulatory burden on farmers (Farming Regulation Task Force in England, Red Tape review in Wales and 'Doing Better' review in Scotland), without compromising animal welfare. This includes implementing a risk-based based system of regulation and inspection so that farmers at greater risk of non-compliance are more likely to have farm inspections than those at lower risk. Of the 1% of claimants inspected annually by APHA 20% are selected at random, with the remainder selected using a risk model. Previous analysis of inspection data indicated that farms that were members of farm assurance and organic certification schemes were more likely to be compliant at an APHA (then Animal Health and Veterinary Laboratories Agency) inspection (KilBride et al, 2012). Consequently, scheme membership was included in the risk model from 2012, with qualifying schemes having the opportunity to supply details of current membership to Defra, and their members have a lower likelihood of inspection the following year.

The other main factor included in the current risk selection model is the worst score recorded on a previous visit. Compliance with animal welfare legislation and codes is scored as: (A) full compliance with legislation and code; (B) compliance with legislation but not code; (C) failure to comply with legislation but no unnecessary suffering seen; or (D) unnecessary suffering seen. APHA assess compliance in 12 areas of inspection (Aol); breeding, disease, environment, equipment, freedom of movement, feed and water, housing, inspections, mutilations, record keeping, space and staffing. Each type of enterprise (species and purpose of animal) on a farm is inspected and scored for each Aol separately, with the worst score across all Aol recorded as the overall score for that enterprise inspection. The number of enterprises inspected (all or selected enterprises) and the number of Aol assessed vary by the reason for the

inspection and what is found at the inspection: in general, all enterprises at a location and all Aol are assessed during cross compliance risk and random inspections or when a problem is found in one Aol when the farm is inspected for another reason. The worst score recorded at an inspection in the previous 5 years is included in the risk-based selection model, so that farms with a recent non-compliance are more likely to be inspected again than compliant farms (Table 3). Selection of farms is calculated by SMR, with 1% of claimant calf holdings (SMR16) selected first, followed by 1% of pig holdings (SMR17) and then 1% of all other types of enterprise (SMR18). For the selection of visits to calf holdings, a measure of on-farm cattle mortality is also included in the risk model (Table 3).

Table 3. Criteria and weighting currently used by APHA to select farms for cross compliance risk-based inspection

Current model:	Risk score
Worst recorded inspection score in previous visits	
A (compliance with law & codes)	-100
B (compliance with law)	0
C (non-compliance)	50
D (unnecessary suffering)	100
No inspection data available*	55
Farm assurance scheme membership	
Member	-40
Non-member	0
Cattle mortality (Calves only)	
Lowest 25 percentile	-30
Not in lowest 25 percentile	0
No data available	0

*For 2012, selection this was 'no data in the previous 3 years', but from 2013 this changed to 5 years. From 2012, in Scotland (and 2013 across GB) risk scores for previously non-compliant holdings (C/D) were reduced if they had achieved at least 2 compliant inspections (A/B) following the non-compliance.

During a joint consultation initiated by Defra and the Welsh and Scottish Governments (2011), stakeholder opinions were sought on whether further farm-level criteria might be predictive of compliance with welfare legislation and therefore added to the risk model. The three main proposals resulting from this consultation were to consider the addition of membership of herd health schemes, abattoir data of ante and post-mortem conditions, and the outcome of cross compliance inspections concerning farm and environmental management practices not directly related to animal welfare. The aims of the current study were to assess these three extra criteria in the risk model, to re-evaluate other criteria currently in the model, and to propose a transparent process for the selection of farms for risk-based APHA welfare inspections.

The objectives were to: 1) contact all relevant stakeholders to invite contribution of data to the project, 2) evaluate the quality of data received, 3) use mixed effects regression analysis to ascertain factors associated with reduced risk of non-compliance at welfare inspections, and 4) to propose an alternative model or approach to that currently used by Defra to select farms for risk-based inspection. All objectives were met.

Data and Methods

Animal and Plant Health Agency welfare inspection data (outcome variable)

APHA provided data on all animal welfare inspections to livestock enterprises in Scotland, England and Wales between 2007 and 2013. The data provided were: farm location (country, CPH, address); date of visit; reason for visit (Table 2); type of enterprise; number of animals present at time of inspection and the number inspected; and the outcome of the inspection (A-D) for each Aol.

Identification of farm assurance, organic certification, herd health and retailer schemes

It was decided that eligibility for inclusion would be schemes with members who were engaged in activities that could improve animal welfare, and that all farms within the scheme were inspected/tested (rather than a subset of members). For members of farm assurance, organic and retailer scheme, this entails following scheme codes and all member farms are inspected (usually annually) to ensure that these are being adhered to. Herd health scheme members have animals tested for diseases (the frequency of this can vary), and milk quality scheme members use information on milk quality (e.g. monthly or quarterly testing) to make decisions on farm. For schemes that did not use join and leave dates active members were those that had a test event up to two years prior to any APHA inspection.

All 10 farm assurance schemes (multi-species schemes classed as one scheme) and 6 organic certification schemes active in GB were invited to participate, as well as 7 cattle and/or sheep health

schemes. The three main dairy cow milk-recording services in GB were also contacted. There were no active herd health schemes for pigs or poultry enterprises. Retailers operating their own assurance schemes for GB producers were also invited to participate. From this point farm assurance, organic certification, herd health (including milk recording) and retailer schemes are referred to collectively as 'schemes'.

Initial contact was by email or telephone, preferably to a named contact, followed by a letter which included details of the study, the information requested, and how data would be used and protected. Further calls/emails followed on a two-weekly basis until the scheme reached a decision about participation. Schemes were asked to provide data from 2006 – 2013. Data requested were: members' name, address, postcode, CPH number, start/join date (if after January 2006), exit date and periods of non-continuous certification (e.g. temporary suspensions) where applicable. Herd health schemes that did not operate a system of joining or leaving (e.g. members registered for initial screening and chose frequency/quantity of tests thereafter) were asked to provide information on registration, testing and/or disease accreditation dates.

A data sharing agreement was signed with each data provider, this included access to the datasets being by password authentication and data encryption. All data were held confidentially at the University of Warwick. Names, addresses and CPH numbers were used to match datasets and were then removed from spreadsheets and replaced with a unique identification code to anonymise the data.

Following completion of the analyses each scheme was provided with a report summarising the main results and a summary of results specific to their scheme overall.

Paying agencies – cross compliance inspection records & claimant lists

SMRs were identical across GB, whereas the GAECs varied between country. At the project outset the SMRs and GAECs of interest were identified following discussion with representatives of APHA and Defra (Table 4). GAECs were agreed based on the English categorisation and equivalents selected for Wales and Scotland. Regulations selected concerned animal management (e.g. record keeping), including the management of wild animals (e.g. SMR1 wild birds).

Table 4. Statutory management requirements (SMRs) across all three countries, good agricultural and environmental conditions (GAECs) for England and equivalents used for Scotland and Wales[†]. Text in bold is used in subsequent tables

	Country	Description
SMRs	All	SMR 1 Wild Birds
	All	SMRs 6 – 8 Identification and registration: SMR 6 (pig); SMR 7 (cattle); SMR 8 (sheep & goats)
	All	SMR 11 Food and feed law
GAECs		Grazing
	England	GAEC 9 Overgrazing and unsuitable supplementary feeding
	Scotland	GAEC 4 Erosion caused by livestock; GAEC 10 Undergrazing; GAEC 11 Overgrazing
	Wales	GAEC B Overgrazing; GAEC D Supplementary feeding
		Weeds
	England	GAEC 11 Control of weeds
	Scotland	GAEC 18 Encroachment of unwanted vegetation
	Wales	GAEC C Under Grazing / Under Management: Control of weeds
		Boundaries
	England	GAEC 15 Hedgerows
Scotland	GAEC 15 Field boundaries	
Wales	GAEC E Boundaries	

[†]The information presented in table 4 was correct up to 2014, after which the organisation and categorisation of the SMRs and GAECs changed.

Each paying agency provided cross compliance inspection records from 2006 to 2013. There were some differences in the structure/format of the data received from each authority, although all supplied the following framework of assessment for breaches of regulations: nature/intent (negligent, intentional), extent (on or off farm), severity (minimum to very high), permanence (rectifiable, permanent) and repetition of breach within the previous three years (first offence, second offence etc.). These were used by the agencies to calculate any penalty, which was also supplied.

Data were recoded for each condition as: inspected for condition and no breach; inspected and at least one breach; and not inspected (no match within year period prior to APHA inspection). A composite measure was calculated to capture the more severe breaches, defined as: intentional, off-farm, medium to high severity, permanent, and 2nd occurrence or more.

Claimants could be subject to both cross compliance (XC) and non-XC inspections (Table 2). The paying agencies gave APHA permission to supply the University of Warwick with the identity of claimants so that this could be included in the model.

Food Standards Agency (FSA) abattoir reports

The FSA provided ante and post mortem conditions recorded at abattoirs. No data were available for sheep as conditions are not recorded at farm level electronically. Data were provided from July 2012 to July 2013 for cattle, Jan 2011 to Dec 2013 for pigs, and from July 2010 to Dec 2013 for poultry.

Information in the data varied with enterprise type. For pigs and cattle the data contained: the date of slaughter (or week for pigs), producer/farm identity (address, CPH number for cattle), whether the measure was ante or post mortem, body part affected, condition, number of animals and number affected, including the number of rejected carcasses. The pig data did not contain CPH numbers and the FSA supplied a separate spreadsheet of producer addresses and CPH numbers for cross-matching. The poultry data contained: week of slaughter, enterprise type, producer/farm name and postcode, number dead on arrival, condition, number of animals and number affected. Enterprise types included in the poultry data were broiler, duck, geese, guinea fowl, hen, quail, rabbit, turkey, and 'other'.

The total number of conditions by affected body part were: 443 for pigs, 218 for cattle and 126 for poultry. The occurrence of conditions, including rejected carcasses, and a composite measure of 'any condition reported' within the year prior to a welfare inspection on a farm was calculated.

Cattle mortality – British Cattle Movement Service (BCMS) records

Cattle mortality on farm per 1000 live cattle days in the year prior to an animal welfare inspection was calculated using a record of all cattle movements from 2006 to 2013 supplied by APHA (via Rapid Analysis and Detection of Animal-related Risks, RADAR).

Matching Animal and Plant Health Agency welfare inspections with data from schemes, Food Standards Agency and Paying Agencies

Data supplied from all sources were extensively cleaned and screened for errors and inconsistencies to maximise the information available whilst maintaining accuracy and reliability. CPH numbers were matched between APHA and other data. Where the first step did not result in a match (or where CPH was missing), postcodes and addresses were used. CPH numbers and postcodes were normalised to standard formats using automated methods. The postcode had to match exactly with a near-perfect match for the first line of the address (to avoid mismatching neighbouring farms with the same postcode). Scheme membership was considered at the farm, rather than enterprise level, so no constraint was made for enterprise type and whether particular inspections were to enterprises that were covered by the type of scheme (see Final Report AW0510: Appendix 2 Impact of certification status on other enterprises at the location). Membership start/join and end/exit dates were used to determine whether an enterprise was a member at the time of inspection.

Statistical analysis

Multivariable multilevel binomial logistic regression models

For each inspection record to an enterprise, the worst score (A, B, C or D) for all Aol was identified and coded into a binary outcome variable of compliance (AB) or non-compliance (CD) with animal welfare legislation.

A 4-level mixed effects binomial logistic regression model was used because the data were clustered with inspection (level 1) nested within enterprise type (level 2) nested within location (level 3) nested within county (level 4). MLwiN 2.34 (Rasbash *et al.*, 2009) was used for all multilevel analysis to account for correlation within and between. A random intercept structure was used. Complex variation was not explored because there was no obvious reason to investigate such complexity. Enterprise was included as a random effect to account for any dependency of enterprises being more similar to each other within a farm than between a farm and as a fixed effect to investigate enterprise type. The full model contained all inspection records from 2007 to 2013. To fully explore the data and ensure that this was representative of various sub-populations, separate models were also built for: England, Wales and Scotland; claimant and non-claimant populations; the risk-based inspections only; and inspections from 2010 to 2013, as this represented the most complete and up-to-date dataset. Additional models did not vary from the main model with the exception of loss of power and are not presented here. The models took the form;

$$\text{Logit}(p_{ijkl}) = \beta_0 + \sum \beta x_{ijkl} + \sum \beta x_{ijk} + \sum \beta x_{jk} + \sum \beta x_k + \mu_i + \nu_k + u_{jk}$$

Where p_{ijkl} is the probability of code C/D at an APHA inspection, β_0 is a constant, βx is a vector of fixed effects varying at level 1 (ijkl), level 2 (jkl), level 3 (kl) or level 4 (l), i is inspection, j is enterprise, k is

location and l is county, with $f_i + v_{ik} + u_{ijkl}$ being the residuals at county, location and enterprise level respectively. Level 1 variance ($ijkl$) was constrained to a binomial distribution.

The number of animals examined during APHA inspections was included in all models as a categorical variable calculated as quintiles within type of enterprise (Table 5). The least frequently inspected enterprise types were combined into the 'other' category.

Table 5. Enterprise size by quintile categories

Quintile	Cattle	Calves	Sheep	Pigs	Poultry	Deer	Goats	Horses	Rabbits	Other
1	0-10	0-4	0-26	0-2	0-4	0-1	0-1	0-1	0-3	0-1
2	11-25	5-9	27-84	3-6	5-11	2-4	2-4	2-3	4-7	2-4
3	26-51	10-19	85-199	7-17	12-29	5-8	5-7	4-6	8-11	5-12
4	52-100	20-39	200-489	18-65	30-132	9-23	8-15	7-13	12-19	13-49
5	≥ 101	≥ 40	≥ 490	≥ 66	≥ 133	≥ 24	≥ 16	≥ 14	≥ 20	≥ 50

Odds ratios (OR) and 95% confidence intervals (CI) are presented throughout. Odds ratios less than one indicate a reduction in risk of non-compliance, odds ratios greater than one indicate an increase in risk of non-compliance. Confidence intervals that do not include one indicate 95% confidence that there is a significant difference in risk from the reference category. Statistical differences are highlighted in bold.

Results

Schemes

In total 22 schemes provided data: 9/10 farm assurance (FA) schemes, 5/6 organic certification (OC) schemes, 5/7 herd health (HH) schemes, 2/3 milk-recording schemes, and 1 retailer scheme. For analyses the retailer scheme was added to the farm assurance category and the milk-recording schemes to the herd health scheme category. The main concern of schemes that declined to participate was whether passing membership information would breach their data protection agreements.

Constraints in the data and assumptions made

Data from most schemes were generally of good quality, although most were missing a small number of CPH numbers and joining dates. Where postcode and address were used for matching instead of CPH it was more likely that members were misclassified as non-members because a unique link was less likely.

If, following discussion with the scheme manager, it could be assumed that members with missing start dates had been in the scheme for some time (e.g. before recording join dates became standard practice, or where there had been a historic change in administration software) we assumed that these farms had been members from 2006 (or a date suggested by the scheme as appropriate). Where this assumption could not be made the individual farms were excluded. Two schemes provided annual lists of membership rather than joining and leaving dates. Three schemes had difficulty in providing accurate (or any) joining/leaving dates prior to 2009 and another two schemes either could not provide data from 2011 or started after this point. Where schemes did not maintain records of past members, some farms that were members at the time of inspection would have been misclassified as non-members. Almost all farm assurance and organic certification schemes either did not keep historical records of temporary suspensions or could not extract the information, which would mean that some members suspended at the time of inspection were classed as full members.

Welfare Inspections

Records were provided for 55,025 APHA inspections (from 2007-2013), although missing, duplicated or unusable values reduced the sample of complete records for analysis to 54,201. These inspections were to 11,800 farms and 32,945 unique combinations of farm and enterprise type. The number and percentage of inspections coded A, B, C and D overall was 20,174 (37%), 23,439 (43%), 8,364 (15%) and 2,224 (4%) respectively. Of the 32,945 enterprises, 73.8% appeared once in the data and 94.6% of these were compliant inspections (A or B). These one-off compliant visits accounted for 42.4% of inspections.

Table 6. Number of locations, visits (unique combinations of location and date), enterprises on farms, and inspections by country

Number of	England	Scotland	Wales	Total
farms	7951	2071	1778	11800
visits	14163	4149	3175	21487
enterprises	22648	5423	4874	32945
inspections	36801	9883	7517	54201

There were more visits in 2008 and 2009 (Table 7), to locations in England, to claimants, and for risk-based and targeted visit reasons. There were 5,806 inspections of pig enterprises, 7,255 of calf enterprises, 20,653 of cattle (excluding calves), 10,998 of sheep, 5,194 of poultry and 4,295 of other types of enterprise. Membership was greatest in the farm assurance (FA) category, followed by herd health (HH) and then organic certification (OC). The percentage of compliant inspections was similar across types of membership (FA 88.7%, OC 92.6%, HH 91.9%).

Table 7. Number and percentage (%) of APHA inspections at the enterprise level coded A-D by certification category, year, country, visit reason, claimant status, enterprise type and size (quintiles), and scheme membership

		A		B		C		D		Total	
		Number	%	Number	%	Number	%	Number	%	Number	
Year	2007	3100	39.6	2806	35.8	1498	19.1	433	5.5	7837	
	2008	3575	35.5	4246	42.1	1829	18.1	430	4.3	10080	
	2009	3331	33.8	4660	47.3	1485	15.1	368	3.7	9844	
	2010	2949	40.1	3252	44.2	875	11.9	286	3.9	7362	
	2011	2201	37.5	2622	44.6	839	14.3	213	3.6	5875	
	2012	2488	39.8	2798	44.8	775	12.4	186	3.0	6247	
	2013	2530	36.4	3055	43.9	1063	15.3	308	4.4	6956	
Country	England	13136	35.7	16521	44.9	5725	15.6	1419	3.9	36801	
	Scotland	3484	35.3	4356	44.1	1710	17.3	333	3.4	9883	
	Wales	3554	47.3	2562	34.1	929	12.4	472	6.3	7517	
Visit reason	XC random	2849	60.0	1657	34.9	235	5.0	6	0.1	4747	
	XC risk-based	8058	49.2	6748	41.2	1384	8.4	193	1.2	16383	
	XC targeted	497	14.3	1113	32.0	1346	38.7	526	15.1	3482	
	Complaint	1514	21.2	3479	48.7	1524	21.3	625	8.8	7142	
	Targeted	3243	20.6	8069	51.2	3591	22.8	849	5.4	15752	
	Programmed	2685	61.6	1500	34.4	170	3.9	5	0.1	4360	
	Elective	1072	62.4	585	34.1	47	2.7	13	0.8	1717	
	OTMS	254	43.4	258	44.1	66	11.3	7	1.2	585	
	Special	2	6.1	30	90.9	1	3.0	0	0.0	33	
Claimant	no	5376	35.6	5931	39.3	3031	20.1	755	5.0	15093	
	yes	14798	37.8	17508	44.8	5333	13.6	1469	3.8	39108	
Enterprise	Calves	2890	39.8	3183	43.9	988	13.6	194	2.7	7255	
	Cattle - growing	2886	35.9	3637	45.2	1278	15.9	249	3.1	8050	
	Dairy cattle	1093	38.4	1278	44.9	304	10.7	174	6.1	2849	
	Beef - breeding	3203	32.8	4301	44.1	1753	18.0	497	5.1	9754	
	Sheep	3680	33.5	4946	45.0	1681	15.3	691	6.3	10998	
	Caged hens	26	19.5	58	43.6	38	28.6	11	8.3	133	
	Broilers/breeders	204	33.3	295	48.1	92	15.0	22	3.6	613	
	Ducks	451	45.9	395	40.2	125	12.7	12	1.2	983	
	Geese	391	46.4	349	41.4	93	11.0	9	1.1	842	
	Other layers	968	45.5	832	39.1	304	14.3	24	1.1	2128	
	Turkeys	233	47.1	197	39.8	58	11.7	7	1.4	495	
	Pigs - breeding	887	32.5	1120	41.1	586	21.5	133	4.9	2726	
	Pigs - growing	1038	34.0	1287	42.2	617	20.2	111	3.6	3053	
	Wild boar	17	63.0	6	22.2	4	14.8	0	0.0	27	
	Rabbits	310	65.5	147	31.1	15	3.2	1	0.2	473	
	Ratites - ostriches	56	60.2	27	29.0	10	10.8	0	0.0	93	
	Deer	80	52.3	64	41.8	9	5.9	0	0.0	153	
	Goats	699	45.1	595	38.4	210	13.5	47	3.0	1551	
	Horses	561	48.7	428	37.2	138	12.0	25	2.2	1152	
	Other	501	57.4	294	33.7	61	7.0	17	1.9	873	
		1	3981	40.1	4180	42.1	1467	14.8	295	3.0	9923
		2	4062	37.1	4764	43.5	1736	15.9	382	3.5	10944
		3	3810	35.5	4682	43.7	1791	16.7	437	4.1	10720
	4	3974	34.7	4923	43.0	1939	16.9	622	5.4	11458	
	5	4298	39.0	4819	43.7	1413	12.8	486	4.4	11016	
Scheme membership											
Farm assurance	no	13643	34.0	17466	43.6	7197	17.9	1798	4.5	40104	
	yes	6531	46.3	5973	42.4	1167	8.3	426	3.0	14097	
Organic certification	no	19578	36.9	22935	43.3	8299	15.7	2201	4.2	53013	
	yes	596	50.2	504	42.4	65	5.5	23	1.9	1188	
Herd health	no	18325	36.3	21874	43.3	8124	16.1	2162	4.3	50485	
	yes	1849	49.8	1565	42.1	240	6.5	62	1.7	3716	

Most areas of inspection were assessed in at least 75% of inspections. Scheme members of all types had a higher proportion of A inspections than non-members for all Aol except space; and a lower proportion of non-compliant (C/D inspections) for all except space and mutilations (Table 8). There were similar percentages of B scores whether or the farm where enterprise inspected was in a scheme. The largest differences between members and non-members were in records, disease, environment, feed & water, staffing and housing.

For all schemes compliance was higher for members than for the non-member category, although for small schemes the difference was sometimes not significant because the small number of inspections to farms in the scheme had low analytical power.

Table 8. Number and percentage (%) of inspections to each area of inspection that was scored as an A, or non-compliant (C or D) and the total number of inspections to each area of inspection, by the type of scheme membership*

Area of inspection	Score	Farm assurance		Organic certification		Herd health		Not scheme member		Total
		Number	%	Number	%	Number	%	Number	%	
Staffing	A	9614	71.3	849	73.8	2807	77.8	20320	55.8	31377
	C/D	442	3.3	20	1.7	38	1.1	2716	7.5	3179
	Total inspected	13475	95.6	1150	96.8	3607	97.1	36435	95.6	51837
Inspection	A	10509	77.4	909	78.7	3021	83.2	23205	63.6	35251
	C/D	196	1.4	10	0.9	15	0.4	1177	3.2	1385
	Total inspected	13578	96.3	1155	97.2	3632	97.7	36488	95.7	52005
Disease	A	8794	66.7	755	66.1	2547	71.6	18376	52.9	28442
	C/D	672	5.1	37	3.2	107	3.0	3169	9.1	3898
	Total inspected	13193	93.6	1143	96.2	3557	95.7	34767	91.2	49853
Records	A	8094	70.7	727	73.8	2337	72.9	14614	53.2	23838
	C/D	620	5.4	41	4.2	117	3.6	3717	13.5	4414
	Total inspected	11445	81.2	985	82.9	3206	86.3	27469	72.0	40614
Housing	A	8307	67.2	741	70.9	2414	71.1	17660	52.6	27230
	C/D	275	2.2	12	1.1	72	2.1	2362	7.0	2675
	Total inspected	12369	87.7	1045	88.0	3394	91.3	33562	88.0	47749
Environment	A	9342	68.9	817	71.6	2685	74.4	19994	54.3	30702
	C/D	469	3.5	28	2.5	80	2.2	3248	8.8	3762
	Total inspected	13561	96.2	1141	96.0	3611	97.2	36820	96.6	52299
Equipment	A	4369	77.5	386	80.9	1257	81.3	9272	66.7	14292
	C/D	80	1.4	3	0.6	7	0.5	347	2.5	429
	Total inspected	5635	40.0	477	40.2	1546	41.6	13898	36.4	20339
Freedom of movement	A	11645	86.4	1020	88.7	3166	87.9	28323	78.2	41635
	C/D	79	0.6	4	0.3	10	0.3	333	0.9	419
	Total inspected	13477	95.6	1150	96.8	3603	97.0	36213	95.0	51606
Feed & water	A	10199	74.2	851	72.9	2851	78.0	21376	57.4	33036
	C/D	367	2.7	30	2.6	48	1.3	3040	8.2	3438
	Total inspected	13751	97.5	1167	98.2	3656	98.4	37225	97.6	52924
Mutilations	A	10362	85.2	931	86.9	2907	87.1	24932	79.2	36789
	C/D	82	0.7	3	0.3	11	0.3	183	0.6	270
	Total inspected	12158	86.2	1071	90.2	3339	89.9	31469	82.5	45379
Breeding	A	9056	84.6	804	83.8	2644	88.2	20292	71.4	30697
	C/D	118	1.1	5	0.5	4	0.1	888	3.1	1011
	Total inspected	10705	75.9	959	80.7	2999	80.7	28428	74.6	40746
Space	A	788	77.9	78	73.6	250	83.9	2204	76.1	3152
	C/D	27	2.7	0	0.0	4	1.3	76	2.6	103
	Total inspected	1011	7.2	106	8.9	298	8.0	2895	7.6	4105

* $B\% = 100\% - (A\% + C/D\%)$

Table 9. Number of inspections and non-compliant inspections (CD) to members of farm assurance, organic certification and herd health schemes, by year, country, visit reason, claimant status, enterprise type and size (quintiles)

	Farm Assurance			Organic Certification			Herd Health			Not a member			Total inspect.
	Num. inspect.	Non-compliant (CD)	% CD	Num. inspect.	Non-compliant (CD)	% CD	Num. inspect.	Non-compliant (CD)	% CD	Num. inspect.	Non-compliant (CD)	% CD	
Year													
2007	2015	312	15.5	128	7	5.5	259	40	15.4	5632	1588	28.2	7837
2008	2952	344	11.7	230	17	7.4	671	60	8.9	6752	1877	27.8	10080
2009	1710	210	12.3	220	15	6.8	681	55	8.1	7603	1605	21.1	9844
2010	2303	230	10.0	189	9	4.8	626	34	5.4	4830	923	19.1	7362
2011	2070	200	9.7	175	19	10.9	476	30	6.3	3706	844	22.8	5875
2012	1581	134	8.5	114	15	13.2	472	42	8.9	4444	814	18.3	6247
2013	1466	163	11.1	132	6	4.5	531	41	7.7	5164	1179	22.8	6956
Country													
England	6674	797	11.9	753	51	6.8	2101	208	9.9	28642	6216	21.7	36801
Scotland	4782	519	10.9	261	30	11.5	1177	76	6.5	4784	1506	31.5	9883
Wales	2641	277	10.5	174	7	4.0	438	18	4.1	4705	1108	23.5	7517
Visit reason													
XC random	2100	39	1.9	179	2	1.1	580	19	3.3	2373	187	7.9	4747
XC risk-based	5209	293	5.6	470	35	7.4	1625	85	5.2	10289	1231	12.0	16383
XC targeted	940	400	42.6	62	20	32.3	175	71	40.6	2464	1438	58.4	3482
Complaint	1659	350	21.1	121	18	14.9	337	56	16.6	5308	1775	33.4	7142
Targeted	3480	477	13.7	253	13	5.1	724	61	8.4	11936	3925	32.9	15752
Programmed	386	14	3.6	57	0	0.0	163	8	4.9	3854	161	4.2	4360
Elective	196	11	5.6	43	0	0.0	74	1	1.4	1429	48	3.4	1717
OTMS	126	9	7.1	3	0	0.0	38	1	2.6	446	64	14.3	585
Special	1	0	0.0	0	0	0.0	0	0	0.0	32	1	3.1	33
Claimant													
Yes	1554	188	12.1	151	8	5.3	388	42	10.8	13268	3569	26.9	15093
No	12543	1405	11.2	1037	80	7.7	3328	260	7.8	24863	5261	21.2	39108
Enterprise type													
Cattle													
Calves	2512	222	8.8	181	12	6.6	896	63	7.0	4303	923	21.5	7255
Beef - breeding	2376	238	10.0	224	19	8.5	449	23	5.1	7110	1992	28.0	9754
Cattle - growing	2806	290	10.3	183	10	5.5	691	59	8.5	4934	1210	24.5	8050
Dairy cattle	1493	200	13.4	91	6	6.6	799	76	9.5	991	239	24.1	2849
Sheep	3052	437	14.3	244	30	12.3	472	34	7.2	7695	1914	24.9	10998
Poultry													
Caged hens	22	6	27.3	0	0	0.0	2	0	0.0	110	43	39.1	133
Broilers/breeders	101	15	14.9	23	1	4.3	13	3	23.1	491	96	19.6	613
Ducks	80	5	6.3	14	0	0.0	15	0	0.0	886	132	14.9	983
Geese	69	3	4.3	9	0	0.0	13	0	0.0	759	99	13.0	842
Turkeys	60	5	8.3	8	0	0.0	11	0	0.0	426	60	14.1	495
Other layers	257	7	2.7	47	1	2.1	60	2	3.3	1816	319	17.6	2128
Pigs													
Pigs - breeding	377	60	15.9	47	5	10.6	94	15	16.0	2290	652	28.5	2726
Pigs - growing	567	75	13.2	54	4	7.4	116	22	19.0	2419	647	26.7	3053
Wild boar	0	0	0.0	0	0	0.0	0	0	0.0	27	4	14.8	27
Other species													
Goats	115	21	18.3	16	0	0.0	29	3	10.3	1407	234	16.6	1551
Horses	117	5	4.3	19	0	0.0	27	2	7.4	1009	157	15.6	1152
Rabbits	29	1	3.4	6	0	0.0	7	0	0.0	434	15	3.5	473
Deer	6	0	0.0	4	0	0.0	4	0	0.0	140	9	6.4	153
Ratites/ostriches	6	0	0.0	1	0	0.0	4	0	0.0	83	10	12.0	93
Other	52	3	5.8	17	0	0.0	14	0	0.0	801	75	9.4	873
Enterprise size (quintiles)													
1	1208	123	10.2	125	6	4.8	353	21	5.9	8430	1624	19.3	9923
2	1726	181	10.5	176	8	4.5	483	39	8.1	8857	1910	21.6	10944
3	2513	284	11.3	259	25	9.7	561	47	8.4	7857	1917	24.4	10720
4	3438	407	11.8	259	28	10.8	829	79	9.5	7602	2107	27.7	11458
5	5167	593	11.5	367	21	5.7	1484	116	7.8	5293	1257	23.7	11016

Farmers could be members of more than one scheme type (Table 10); for example, of inspections to farms with organic certification, over 50% were also members of a farm assurance scheme, whereas 4% of inspections to farms recorded as farm assurance scheme members were also listed as organic scheme members.

Table 10. Number of inspections to farms with membership of multiple scheme types, with the percentage of multiple membership inspections within each scheme type

	Num. of inspections	Percentage of each category with shared membership		
		Farm Assurance	Organic Certification	Herd Health
		14907	1188	3716
Farm Assurance & Organic Certification	606	4.1 %	51.0 %	-
Farm Assurance & Herd Health	2257	15.1 %	-	60.7 %
Organic Certification & Herd Health	226	-	19.0 %	6.1 %

There was a small effect of multiple scheme membership on the proportion of inspections scored A, C or D (Table 11), with a greater proportion of compliant inspections to farms that were members of multiple scheme types.

Table 11. Number and percentage of inspections scored A - D, to members of one, two or three types (farm assurance, organic certification, herd health) of scheme

	Compliant				Non-compliant				Total n
	A		B		C		D		
	n	%	n	%	n	%	n	%	
One scheme type	6099	45.9	5661	42.6	1125	8.5	412	3.1	13297
Two scheme types	1311	50.1	1087	41.6	172	6.6	45	1.7	2615
Three scheme types	85	53.8	69	43.7	1	0.6	3	1.9	158
Not member of any scheme	12679	33.3	16622	43.6	7066	18.5	1764	4.6	38131

Cross-compliance

England (RPA). There were 7,062 welfare inspections which matched to a non-welfare cross compliance inspection within the previous year. This was 19% of inspections to English holdings (total 36,801) and of these 3,526 (50%) had at least one breach in any of the eight SMR/GAECs of interest. The greatest number of cross compliance inspections matching to the welfare inspections were for SMR7 (Table 12), followed by SMR8. Breaches were most frequent for SMR7, followed by SMR8, with less than 10% for SMR6, SMR11 and GAEC11, less than 1% for GAEC15, and no breaches under SMR1 and GAEC9 in the matched data.

Scotland (SGRPID). The Scottish Government Rural Payments & Inspections Directorate were unable to supply the details of which individual SMRs/GAECs were inspected where there was no breach. The condition inspected was inferred using the inspection type for SMRs 6, 7 and 8. For visits listed as 'random, risk, or manual it was assumed SMRs 1, 11 and all GAECs were inspected. Visits listed as 'Cross Compliance External Source' (referral of a potential breach from a third party) were excluded as inspections are to specific GAECs and/or SMRs and we did not have this information.

There were 9,883 welfare inspections to locations in Scotland of which 1,082 (10.9%) had at least one matching XC inspection within the previous year and 745 (68.9%) were breaches. As with the RPA data matching inspections were most frequent for SMR7 (Table 13). The number of compliant XC inspections may be underestimated due the identity of these records being inferred, for example, compared to the RPA and Welsh data there are proportionally fewer XC inspections for SMRs 7 and 8, but all matching records were breaches. None of the cross compliance records matching to welfare inspections for SMR1, SMR6, GAEC11 or GAEC15 were breaches and there was only one breach for GAEC10.

Wales (RPW). Rural Payments Wales did not provide details of individual GAECs inspected where there was no breach and it was therefore assumed that where there was a GAEC inspection all GAECs had been inspected. There were 7,517 welfare records relating to inspections in Wales, of which 1,304 (17.3%) had at least one matching XC inspection within the previous year and 665 (51%) of these were breaches. SMR7 and 8 were the most frequent (Table 14). Breaches were most frequent for SMR7 (62.5% of inspections), followed by SMR8 (16.4%). Of the 137 SMR11 inspections 13.8% were breaches. None of the records matching to inspections for SMR1, SMR6, GAEC C or GAEC E were breaches, although there were a number of breaches concerning 'grazing' (GAECs B and D).

Table 12. Number and percentage (%) of compliant and non-compliant welfare inspections in England (N = 36,801) matching to a non-welfare cross compliance (XC) inspection in the previous year

	Welfare inspection outcome				Total Number
	Number		% of welfare inspections / % of XC inspections [‡]		
	AB	CD	AB	CD	
SMR1 – Wild Birds					
No XC inspection	27092	8543	73.6	23.2	35635
XC inspection	841	325	2.3	0.9	1166
XC breach	0	0	0.0	0.0	0
no XC breach	841	325	72.1	27.9	1166
SMR6 – Pig ID					
No XC inspection	29362	7046	79.8	19.1	36408
XC inspection	295	98	0.8	0.3	393
XC breach	15	9	3.8	2.3	24
no XC breach	280	89	71.2	22.6	369
SMR7 – Cattle ID					
No XC inspection	26083	5834	70.9	15.9	31917
XC inspection	3574	1310	9.7	3.6	4884
XC breach	2188	880	44.8	18.0	3068
no XC breach	1386	430	28.4	8.8	1816
SMR8 – Sheep ID					
No XC inspection	28084	6593	76.3	17.9	34677
XC inspection	1573	551	4.3	1.5	2124
XC breach	332	138	15.6	6.5	470
no XC breach	1241	413	58.4	19.4	1654
SMR11 – Feed Law					
No XC inspection	28778	6791	78.2	18.5	35569
XC inspection	879	353	2.4	1.0	1232
XC breach	71	44	5.8	3.6	115
no XC breach	808	309	65.6	25.1	1117
GAEC9 - Grazing					
No XC inspection	29150	6984	79.2	19.0	36134
XC inspection	507	160	1.4	0.4	667
XC breach	4	0	0.6	0.0	4
no XC breach	503	160	75.4	24.0	663
GAEC11 - Weeds					
No XC inspection	28784	6880	78.2	18.7	35664
XC inspection	873	264	2.4	0.7	1137
XC breach	15	13	1.3	1.1	28
no XC breach	858	251	75.5	22.1	1109
GAEC15 - Boundaries					
No XC inspection	28851	6885	78.4	18.7	35736
XC inspection	806	259	2.2	0.7	1065
XC breach	8	2	0.8	0.2	10
no XC breach	798	257	74.9	24.1	1055

[‡] Percentage of 'No XC inspection' and 'XC inspection' calculated using total number of welfare inspections (n = 36,801), percentage of 'XC breach' and 'no XC breach' calculated using total XC inspections (see individual totals).

Table 13. Number and percentage (%) of compliant and non-compliant welfare inspections in Scotland (N = 9,883) matching to a non-welfare cross compliance (XC) inspection in the previous year

	Welfare inspection outcome				Total Number
	Number		% of welfare inspections [‡] / % of XC inspections		
	AB	CD	AB	CD	
SMR1 – Wild Birds					
No XC inspection	7470	1965	75.6	19.9	9435
XC inspection	370	78	3.7	0.8	448
XC breach	0	0	0.0	0.0	0
no XC breach	370	78	82.6	17.4	448
SMR6 – Pig ID					
No XC inspection	7811	2042	79.0	20.7	9853
XC inspection	29	1	0.3	0.0	30
XC breach	0	0	0.0	0.0	0
no XC breach	29	1	96.7	3.3	30
SMR7 – Cattle ID					
No XC inspection	7416	1816	75.0	18.4	9232
XC inspection	424	227	4.3	2.3	651
XC breach	424	227	65.1	34.9	651
no XC breach	0	0	0.0	0.0	0
SMR8 – Sheep ID					
No XC inspection	7765	1998	78.6	20.2	9763
XC inspection	75	45	0.8	0.5	120
XC breach	75	45	62.5	37.5	120
no XC breach	0	0	0.0	0.0	0
SMR11 – Feed Law					
No XC inspection	7470	1965	75.6	19.9	9435
XC inspection	370	78	3.7	0.8	448
XC breach	5	7	1.1	1.6	12
no XC breach	365	71	81.5	15.8	436
GAEC4 - Grazing					
No XC inspection	7466	1965	75.5	19.9	9431
XC inspection	374	78	3.8	0.8	452
XC breach	13	7	2.9	1.5	20
no XC breach	361	71	79.9	15.7	432
GAEC10 - Grazing					
No XC inspection	7470	1965	75.6	19.9	9435
XC inspection	370	78	3.7	0.8	448
XC breach	1	0	0.2	0.0	1
no XC breach	369	78	82.4	17.4	447
GAEC11- Grazing					
No XC inspection	7470	1965	75.6	19.9	9435
XC inspection	370	78	3.7	0.8	448
XC breach	0	0	0.0	0.0	0
no XC breach	370	78	82.6	17.4	448
GAEC15 - Boundaries					
No XC inspection	7470	1965	75.6	19.9	9435
XC inspection	370	78	3.7	0.8	448
XC breach	0	0	0.0	0.0	0
no XC breach	370	78	82.6	17.4	448
GAEC18 - Weeds					
No XC inspection	7470	1965	75.6	19.9	9435
XC inspection	370	78	3.7	0.8	448
XC breach	0	0	0.0	0.0	0
no XC breach	370	78	82.6	17.4	448

[‡] Percentage of 'No XC inspection' and 'XC inspection' calculated using total number of welfare inspections (n = 9,883), percentage of 'XC breach' and 'no XC breach' calculated using total XC inspections (see individual totals).

Table 14. Number and percentage (%) of compliant and non-compliant welfare inspections in Wales (N = 7,517) matching to a non-welfare cross compliance (XC) inspection in the previous year

	Welfare inspection outcome				Total Number
	Number		% of welfare inspections [‡] / % of XC inspections		
	AB	CD	AB	CD	
SMR1 – Wild Birds					
No XC inspection	6033	1388	80.3	18.5	7421
XC inspection	83	13	1.1	0.2	96
XC breach	0	0	0.0	0.0	0
no XC breach	83	13	86.5	13.5	96
SMR6 – Pig ID					
No XC inspection	6015	1373	80.0	18.3	7388
XC inspection	101	28	1.3	0.4	129
XC breach	0	0	0.0	0.0	0
no XC breach	101	28	78.3	21.7	129
SMR7 – Cattle ID					
No XC inspection	5464	1144	72.7	15.2	6608
XC inspection	652	257	8.7	3.4	909
XC breach	387	182	42.6	20.0	569
no XC breach	265	75	29.2	8.3	340
SMR8 – Sheep ID					
No XC inspection	5855	1321	77.9	17.6	7176
XC inspection	261	80	3.5	1.1	341
XC breach	33	23	9.7	6.7	56
no XC breach	228	57	66.9	16.7	285
SMR11 – Feed Law					
No XC inspection	6009	1371	80.0	18.2	7380
XC inspection	107	30	1.4	0.4	137
XC breach	14	5	10.2	3.6	19
no XC breach	93	25	67.9	18.2	118
GAEGB - Grazing					
No XC inspection	5931	1360	78.9	18.1	7291
XC inspection	185	41	2.5	0.5	226
XC breach	11	16	4.9	7.1	27
no XC breach	174	25	77.0	11.1	199
GAECC - Weeds					
No XC inspection	5931	1360	78.9	18.1	7291
XC inspection	185	41	2.5	0.5	226
XC breach	0	0	0.0	0.0	0
no XC breach	185	41	81.9	18.1	226
GAECD - Grazing					
No XC inspection	5931	1360	78.9	18.1	7291
XC inspection	185	41	2.5	0.5	226
XC breach	159	20	70.4	8.8	179
no XC breach	26	21	11.5	9.3	41
GAECE - Boundaries					
No XC inspection	5931	1360	78.9	18.1	7291
XC inspection	185	41	2.5	0.5	226
XC breach	0	0	0.0	0.0	0
no XC breach	185	41	81.9	18.1	226

[‡] Percentage of 'No XC inspection' and 'XC inspection' calculated using total number of welfare inspections (n = 7,517), percentage of 'XC breach' and 'no XC breach' calculated using total XC inspections (see individual totals).

Abattoir reports

Between 0.9 and 2.5% of the 11,800 locations in the welfare data matched to locations in the FSA data (Table 15). The small number of matches and exploratory analyses indicated that the data were not representative and so were not included in the model.

Table 15. Welfare inspection records matching to Food Standards Agency abattoir reports

Number of	Cattle	Pigs	Poultry[‡]
Unique locations [§] in FSA data	15239	10993	7733
FSA locations matching to location/enterprise in welfare data by CPH	5743	2256	666
FSA locations matching to location/enterprise in welfare data by postcode/address	-	259	778
Within one year of welfare inspection:			
Welfare locations matched	297	258	102
(% welfare data locations matched)	(2.5%)	(2.2%)	(0.9%)
Location/enterprise records matched	903	797	224
Welfare inspections [¶] matched	1122	949	278

Location[§] (farms) total in welfare data 11,800. Location/enterprise^{||} (individual enterprises within locations) total in welfare data 32,945. Welfare inspections[¶] total 54201. [‡]No addresses provided, exact matches on postcode.

Multivariable models

There was a significantly reduced risk of non-compliance if a farm was a member of a scheme at the time of inspection compared with farms not known to be in a scheme at the time of inspection; this was true for all scheme types (Table 17). The numerical differences did not indicate a statistical difference between the types of scheme.

There was an increased risk of non-compliance before 2010, and for risk-based, targeted and complaint visit types, compared with the reference category for each variable (Table 17). Non-claimants had a higher risk of non-compliance compared to claimants. This is possibly a real effect, however, non-claimant farms are not similar to claimant farms in species, size and types of inspections in particular non-claimant farms had proportionally fewer random visits and more targeted visits. Non-compliance was higher in larger herd/flock sizes than the smallest quintile (for quintile sizes by enterprise type see Table 5). There was no difference between countries in compliance when accounting for all the other variables in the model.

There was no effect of non-welfare cross compliance inspection outcome on compliance at APHA inspection.

Odds ratios reduced as the number of scheme types per farm increased (Table 16), with members of more than one scheme type having a further reduced risk of non-compliance.

Table 16. Odds ratios for the effect of membership of one, two, or three types of scheme*

	OR	Lower CI	Upper CI
Not member of any scheme	Ref		
One scheme type	0.53	0.47	0.58
Two scheme types	0.36	0.29	0.46
Three scheme types	0.14	0.04	0.51

* using logistic binomial mixed effect model adjusted for inspection year, country, visit reason, claimant status, enterprise type and size, and accounting for repeated inspections within enterprises, within farms, and within county.

Table 17. Mixed effect binomial logistic regression model of the associations between 54061 inspection outcomes and scheme membership adjusted for inspection year, country, visit reason, claimant status, enterprise type[†] and size of enterprise

		Odds Ratio	CI	
Scheme membership	Not a member	Ref		
	Farm assurance **	0.57	0.51	0.63
	Organic certification	0.49	0.34	0.70
	Herd health	0.55	0.45	0.67
Year	2007	1.81	1.60	2.05
	2008	1.60	1.41	1.80
	2009	1.20	1.06	1.35
	2010	Ref		
	2011	0.91	0.79	1.05
	2012	0.82	0.71	0.95
Country	2013	0.95	0.83	1.10
	England	Ref		
	Wales	1.03	0.70	1.54
Visit reason	Scotland	1.20	0.92	1.55
	XC random	Ref		
	XC risk	1.45	1.22	1.71
	XC targeted	6.14	5.10	7.40
	Complaint	3.72	3.13	4.42
	Targeted	2.12	1.79	2.51
	Programmed	0.81	0.63	1.03
	Elective [†]	0.73	0.54	0.98
Claimant	OTMS	2.61	1.84	3.71
	No	Ref		
Enterprise	Yes	0.69	0.62	0.76
	Cattle-growing [‡]	Ref		
	Calves	0.89	0.80	0.99
	Beef - breeding	1.09	0.99	1.20
	Dairy cattle	1.03	0.88	1.21
	Sheep	1.14	1.04	1.26
	Battery hens	2.00	1.16	3.44
	Broilers/Breeders	1.03	0.76	1.38
	Ducks	0.86	0.68	1.09
	Geese	0.78	0.60	1.02
	Turkeys	0.78	0.55	1.10
	Other layers	0.85	0.72	1.01
	Pigs - breeding	1.24	1.08	1.44
	Pigs - growing	1.20	1.04	1.38
	Wild boar	0.78	0.20	2.96
	Goats	0.93	0.77	1.13
	Horses	0.79	0.63	0.99
	Rabbits	0.55	0.36	0.84
	Deer	0.64	0.33	1.25
	Ratites / ostriches	0.94	0.44	2.00
Other species	0.81	0.62	1.05	
Enterprise size (quintile)	1	Ref		
	2	1.08	0.99	1.19
	3	1.17	1.06	1.28
	4	1.25	1.13	1.38
	5	1.22	1.09	1.35
Random effects		Variance	s.e.	
	Intercept	-2.60	0.13	
	County	0.21	0.05	
	Location	2.59	0.07	
	Enterprise	0.00	0.00	
	N	54061		

Ref[‡], reference category with OR = 1. ** Each membership category added independently to model with reference category being not a member of that type of scheme. [†]Visit type special included with elective as too infrequent to model. [‡]ORs and significance at enterprise type level is compared to the reference value, cattle-growing.

Defra selection of farms for inspection

A model was built based on factors used in the current APHA risk model (scheme membership, worst previous score (WPS) in the previous 5 years and on-farm cattle mortality for calf selections) (Table 18). This was repeated with subsets of inspections to pig and calf enterprises because this is the basis of the selection process.

Members of the herd health schemes and retailer scheme were also included in the composite measure of 'member of any scheme' (the current Defra model uses only farm assurance and organic certification schemes). The OR for member of any scheme were similar to the separate categories of farm assurance, organic certification and herd health schemes in the main model.

Adding worst previous score (WPS) to the model reduced the sample size considerably (due to the number of farms that were only inspected once in the data). The risk of non-compliance was greater where the WPS was B, C, or D, compared with A. This remained the case when the time period was extended to worst previous score within 7 years and so this was added to the model for selection (Table 18). The OR was not significantly different between A and B scores in the calf-only model, but the coefficient was similar to that for the all enterprises model and so this lack of significance may be a result of the small sample size. On-farm cattle mortality within the lowest 25th percentile was associated with a reduced risk of non-compliance.

As size of enterprise was an important factor and could be used as a marker for selection, this was also included. Enterprises in the smallest 20th percentile were more compliant than larger herd / flock sizes. Although enterprise size was not significant in the calf-only model, as for WPS, the coefficient was similar to that for the all enterprises model so the lack of significance may again be a result of the small sample size.

Table 18. Suggested factors for the selection of farms for inspection for all species, calves and pigs

		All enterprises [†]			Pig enterprises			Calf enterprises		
		OR	CI		OR	CI		OR	CI	
Fixed effects										
Member of a scheme	No	Ref			Ref			Ref		
	Yes	0.58	0.50	0.66	0.49	0.34	0.71	0.39	0.30	0.51
Worst inspection score in previous 7 years	A	Ref			Ref			Ref		
	B	1.44	1.20	1.74	1.95	1.19	3.22	1.26	0.71	2.23
	C	1.59	1.32	1.92	3.97	2.47	6.37	2.31	1.37	3.91
	D	1.55	1.28	1.89	4.57	2.79	7.47	2.68	1.58	4.55
Enterprise size	Not smallest 20%	Ref			Ref			Ref		
	Smallest 20%	0.82	0.75	0.90	0.64	0.47	0.87	0.90	0.69	1.19
	Higher than 25% mortality							Ref		
Mortality rate*	Lowest 25% mortality							0.74	0.54	1.00
Random effects										
Intercept		-1.691	0.103		-2.174	0.232		-1.787	0.263	
County		0.197	0.052		0.238	0.098		0.082	0.058	
Location		1.937	0.084		1.119	0.156		1.045	0.162	
Enterprise		0	0							
Num. in model		24687			2888			2788		

*Cattle mortality rate calculated as whether location within the lowest 25th percentile of mortality across the data.

[†]Odds ratios and CI for all, pig and calf enterprises and are sourced from separate binary logistic regression mixed models.

Discussion

Effect of scheme membership

Membership of schemes was associated with a reduced risk of non-compliance with animal welfare legislation. The reduction in risk was similar across all scheme types. This is the same relationship and similar numerically to that observed in the previous study of farm assurance and organic certification membership (KilBride et al, 2012). We therefore recommend that membership of farm assurance and organic certification schemes remain in the risk model.

Effect of herd health and retailer scheme membership

Farms in herd health and retailer schemes are not necessarily in schemes currently providing data to Defra and so we recommend that these schemes are added to risk based selection visits by Defra.

Effect of multiple membership

We also propose that, if feasible, Defra consider the possibility of adding an additional weighting for farms that are in more than one scheme type.

Cross compliance inspections and subsidy claimant status

The data quality was generally good for inspections where there had been breaches, but the information for compliant inspections to locations in Scotland and Wales were more limited and this would have been useful data for comparison in the analysis. With variables tested, there was no association between compliance with APHA welfare inspections and non-welfare cross compliance outcomes (breaches/no breach/not inspected).

Although inspections to subsidy claimants were more likely to be compliant than those to non-claimants different processes are used to select non-claimant and claimant farms for welfare inspections. Consequently the number of inspections by year, country, enterprise type and size, and reason for visit were not randomly distributed between claimants and non-claimant, and all of these factors were associated with compliance.

Ante and post mortem abattoir data

Whilst stakeholders had highlighted that FSA data from abattoirs might be a useful indicator of on farm welfare, the data provided were not of sufficient quantity or quality to be used. There are many conditions recorded per species (e.g. approximately 400 for pigs) and the current recording system does not permit accurate tracing of data to CPH-level to make it a valuable resource. In addition, the data would require considerable manipulation and analysis before it could be used by Defra in risk-based selection of farms.

Interpretation of results

The results from the current analysis indicate that farms in a scheme at the time of inspection were more likely to comply with welfare legislation. It cannot be inferred that membership of schemes improves animal welfare. This is because whilst it might be that increased scheme inspections improve compliance with legislation, it might also be that farmers who are already more likely to comply with welfare legislation are more likely to join a scheme. Given that this is the second analysis of the data and the association continues to be present it is a robust tool to use in selecting farms for risk-based inspections.

Assessment for compliance with welfare legislation and code does not provide a full picture of the welfare of the animals on an enterprise. Schemes that target higher welfare standards than the minimum legal requirement are not necessarily differentiated by the analysis and so no conclusion can be made to differentiate schemes by the results. We can conclude from the results that compliance with welfare legislation was greater on farms that were members of schemes.

Although not all farm assurance, organic certification and herd health schemes participated, the majority within most of these sectors took part, with data provided by 21 of the 26 targeted schemes, which is a very good response rate. The main issue that prevented participation was a concern that the schemes would breach their data agreements by supplying member names and addresses.

Only one retailer scheme participated. Some retailers that did not participate could not provide data due to data protection concerns and others did not inspect all their members sufficiently regularly and were therefore not eligible under our criteria. Several do not make their codes available externally. It cannot therefore be extrapolated that other retailer schemes would be similar to the participating scheme and so it is not recommended that other retailer schemes are included in the selection for risk-based inspections.

Data quality was generally good, but there was some variation with some schemes only able to provide data for certain years and a small number unable to provide CPH numbers. The non-member baseline category is therefore likely to include some farmers that were scheme members. The result of this is that the OR might be more protective for scheme members than that estimated.

The lack of joining or exit dates may have increased the error in our analysis, but Defra only use current membership in the selection of risk-based inspections and all schemes could provide these data. Some herd health schemes do not record leaving dates and for these schemes to be included in the risk model Defra would need to define criteria for membership as we have done here.

Changes in the model for selection of farms for risk-based inspection, including the addition of scheme membership from 2012, have altered the selection of farms for inspection and therefore the sample of farms for which we have data. For example, a large number of farms are being inspected for the first time as a result of an increased weighting for farms where there was no inspection within 5 years. This has reduced the sample size for repeated visits to farms. Following this study, additional adjustments in the risk model are likely to alter the sample population further. It is therefore vital that random selection for inspection continues so that it will be possible to assess whether scheme members are at continued lower risk of breaching welfare legislation in any future analyses.

Suggested model for future selection

The main criteria for revision to the current selection of farms for risk-based inspections was that it provided clear evidence of how farms were selected and was workable, with a logical, transparent format that would allow for future for adjustment. After discussion with APHA and Defra it was decided that a decision-tree type structure based on the preceding analyses and results would be the most practical solution.

APHA currently select calves (SMR16), followed by pigs (SMR17), and then all other enterprise types (SMR18) for risk-based inspection. A decision tree was drawn up with these as the first selection criteria. Within each SMR the worst score at the most recent inspection is used as the next category to split the data. Where the worst previous score within 7 years was an A it is protective against further visits for a period of 7 years, which was the maximum period modelled. Those with no previous score are included within the BCD category. The next split in the tree is membership of a scheme which confers a reduction in risk of 0.5. Finally, farms in the smallest 20% herd/flock size have a 0.85 reduction in risk of being selected. For SMR16, calves, the final split in the tree is holdings in the lowest 25% of rate of cattle mortality, with a reduced risk of inspection of 0.7. The risk of being selected is multiplied for all levels of the tree and the scores at the bottom of the tree give the total weighting for reduction in risk to be applied to each category of farm. Those with a score of 1 have no reduction in risk, for example, an enterprise with a previous score of B, C or D (or no previous score within 7 years), classed within quintiles 2-5 for size and where the holding is not a member of any scheme.

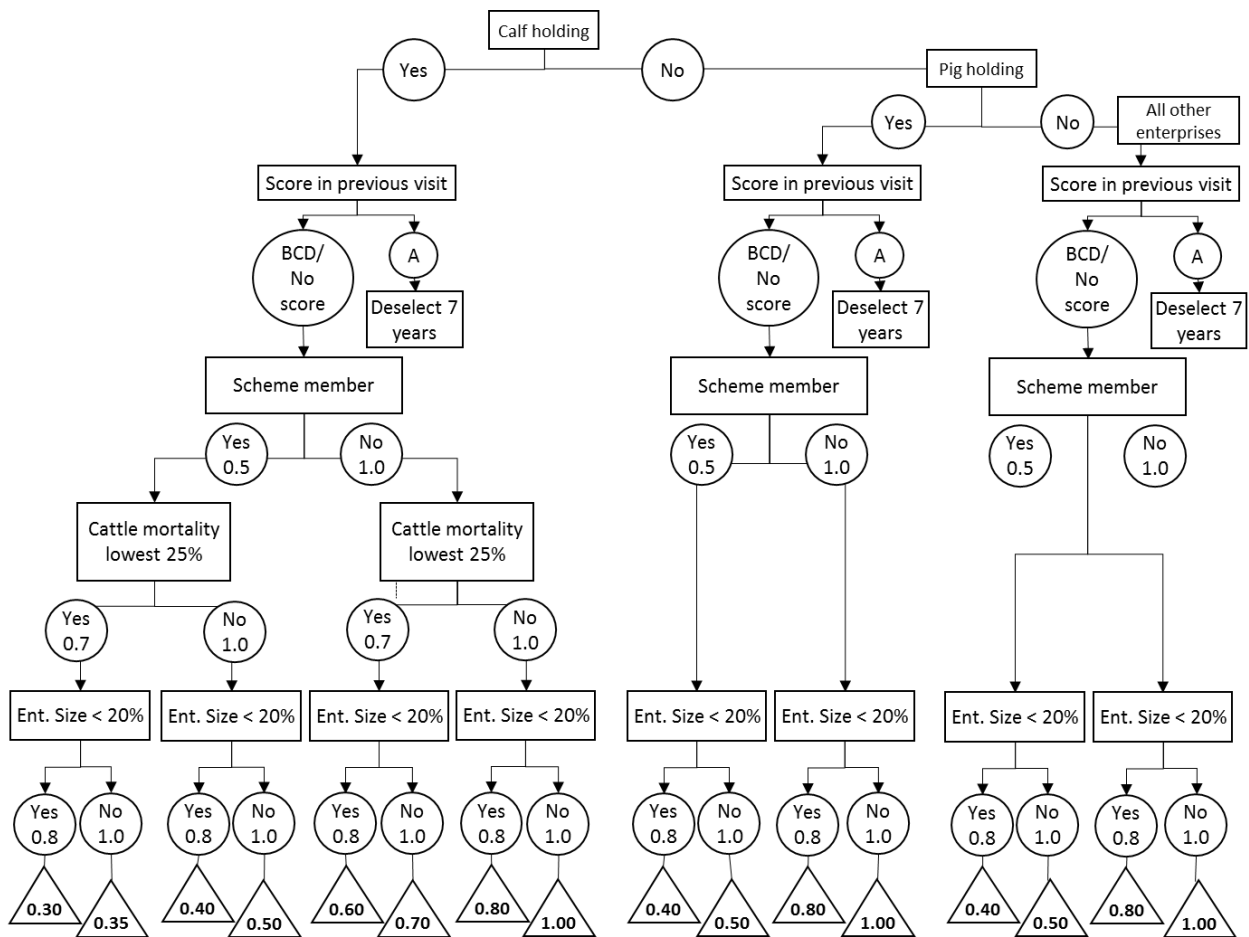


Figure 1. Proposed model for risk-based selection of farms for inspection. The numbers in the triangles indicate the degree of reduction of risk that should be applied to an enterprise based upon the combination of risk factors (enterprise size, scheme membership and cattle mortality for calf holdings).

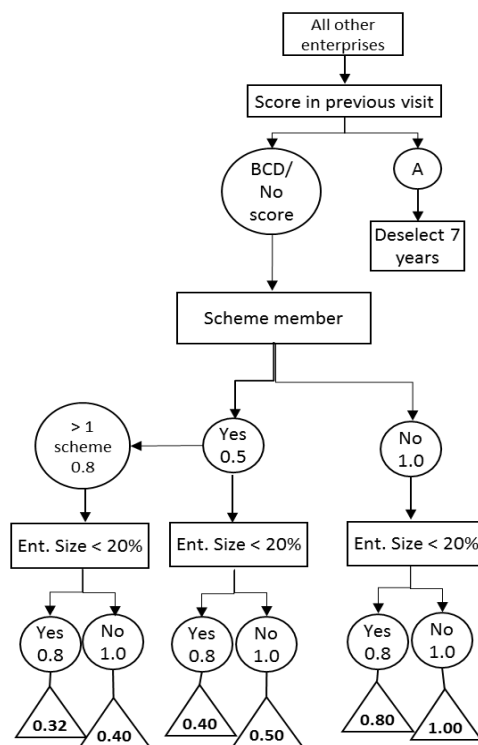


Figure 2. Proposed model for risk-based selection of farms for inspection should membership of >1 scheme be included, using the “All other enterprises” branch of the decision tree (Figure 1) as an example. The numbers in the triangles indicate the degree of reduction of risk that should be applied to an enterprise based upon the combination of risk factors (enterprise size and scheme membership).

References

- Defra 2011, Non-formal consultation on proposals to reform the animal welfare inspection regime. www.gov.uk/government/consultations/non-formal-consultation-on-proposals-to-reform-the-animal-welfare-inspection-regime
- Defra 2011, Independent Farming Regulation Task Force report. www.gov.uk/government/publications/independent-farming-regulation-task-force-report
- Defra 2011, Study to assess whether membership of a Farm Assurance Scheme affects compliance with animal welfare legislation and code - AW0510 (Appendix 2: Impact of certification status on other enterprises at the location)
- KilBride, A.L., Mason, S. A., Honeyman, P. C., Pritchard, D. G., Hepple, S., and Green L. E. 2012 Associations between membership of farm assurance and organic certification schemes and compliance with animal welfare legislation. *Veterinary Record*: Feb 11. 170(6):152.
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List of abbreviations

- Aol: Areas of Inspection
 APHA: Animal and Plant Health Agency (formerly Animal Health and Veterinary Laboratory Agency, AHVLA)
 CAP: Common Agricultural Policy
 CPH: County Parish Holding
 FA: Farm Assurance
 FSA: Food Standards Agency
 GAEC: Good Agricultural and Environmental Conditions
 HH: Herd Health
 OC: Organic Certification
 OTMS: Over Thirty Month Scheme
 RPA: Rural Payments Agency
 RPW: Rural Payments Wales
 SGRPID: Scottish Government Rural Payments and Inspections Directorate
 SMR: Statutory Management Requirement

WPS: Worst Previous Score

XC: Cross Compliance

Note

Visit / Inspection: Some farms have multiple enterprises and so a farm can be “visited” for multiple “inspections”

Acts and Regulations

The Animal Welfare Act 2006 (England & Wales)

The Animal Health and Welfare (Scotland) Act 2006

The Welfare of Farmed Animals (England) Regulations 2007

The Welfare of Farmed Animals (Wales) Regulations 2007

The Welfare of Farmed Animals (Scotland) Regulations 2010

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NMR HerdWise Johne’s Screening Programme

Premium Cattle Health Scheme

Premium Sheep & Goat Health Schemes

Farm Assurance Schemes

British Lion Quality

Farm Assured Welsh Livestock

Laid in Britain

Quality Meat Scotland

Red Tractor

The Duck Assurance Scheme

The Quality British Turkey Scheme

The Traditional Farmfresh Turkey Association

Organic Certification Schemes

Organic Farmers & Growers

Scottish Organic Producers Association

Soil Association

The Biodynamic Association

The National Goats’ Milk Scheme

The Welsh Organic Scheme

Retailer Schemes

Waitrose

References to published material

9. This section should be used to record links (hypertext links where possible) or references to other published material generated by, or relating to this project.

Clark CCA; Crump R; Kilbride AL; Green LE (2016) Farm membership of voluntary welfare schemes results in better compliance with animal welfare legislation in Great Britain. *Animal Welfare* 25 (4) 461-469