Campylobacter contamination in fresh whole chilled UK-produced chickens at retail: January – March 2016

This report presents the latest results of the UK Survey of Campylobacter contamination in fresh chicken at retail and its packaging. The results in this report are weighted to reflect retailer market share[1].The present survey began at the start of July 2015 and was planned to run for a full 12 months, sampling 4,000 UK-produced chickens from retail stores across the UK, and testing the chickens and the packaging for levels of Campylobacter contamination. Between July 2015 and March 2016[2] a total of 3,007 chickens were sampled at retail including 1,009 chickens during Jan-Mar 2016. The previous two reports for the current survey, referring to Jul-Sep 2015 and Oct-Dec 2015 respectively, can be found at:

www.food.gov.uk/sites/default/files/campylobacter-retail-survey-jul-sept-2015.pdf
www.food.gov.uk/sites/default/files/campylobacter-survey-report-oct-dec-2015.pdf

The present survey may be referred to as Year 2 as it follows on from an equivalent survey (Year 1) which was intended to represent the 12 month period from mid-February 2014 to mid-February 2015 (but over-ran into the start of March 2016). As such, the set of months for which there is data from both surveys, on which to base year on year comparisons is July to February. So while the latest results in this report are for the period Jan-Mar 2016, the latest year on year comparisons will be reported for the period Dec 2015 - Feb 2016.

The figures in this report are estimates based on a sample survey and so there is a degree of uncertainty associated with them. All tables and charts include 95% confidence intervals which reflect the uncertainty in the results. They provide a range of values within which the true value will lie 95% of the time.

In recent months, a methodological issue has arisen, which means our current measures are no longer providing a reliable indication of how levels of contamination in chickens at retail are changing over time, or providing a like for like comparison between retailers. This issue was first mentioned in the report (referring to the Oct-Dec 2015 results) and is detailed on pages 2 to 5 of this report. As a consequence of this issue the survey has been suspended while alternative measures of Campylobacter contamination in chickens are considered. See: www.gov.uk/government/statistics/announcements/uk-survey-of-campylobacter-contamination-in-fresh-retail-chicken-and-its-packaging-4th-quarterly-release-of-results

For transparency, we are publishing this final set of results covering the full time period over which data was collected. However unlike previous editions of this report we are not including a breakdown by retailer, as this has ceased to provide a fair comparison.

Please note that our measure of Campylobacter contamination on the outer packaging of chickens at retail is not affected by this issue and we believe that it remains robust.

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[1] The weighting is based on market share data provided by Kantar for the 52 weeks ending 1st February 2015.
[2] A small number chickens were collected at the start of April (4th-5th) and these will be treated as though they were collected in March 2016.

Summary

Based on our current methodology for assessing the levels of Campylobacter on chickens at retail, the proportion of chickens with a high level of Campylobacter (over 1000 cfu/g) has consistently been significantly lower during the Year 2 survey, than for the same time the previous year. This is also the case for the proportion of chickens positive for Campylobacter. However the increasing trimming of chicken neck skins by the industry (while being a welcome development, as the neck skin is thought to generally be the most contaminated part of the chicken carcass) means that the current measure may have ceased to be a reliable measure of how the extent of Campylobacter contamination in chickens at retail is changing over time.

Our measure of Campylobacter contamination on the outer packaging of chickens at retail is not affected by this issue and we believe that it remains robust. Looking at the period for which there is data for both the Year 1 and Year 2 on which to base year on year comparisons, there was a statistically significant reduction in the percentage of chicken packaging samples positive for Campylobacter from 7.5% in Jul 14 - Feb 15 to 5.6% in Jul 15 - Feb 16.

Background to the survey

Foodborne Campylobacter is estimated to make more than 280,000 people ill each year in the UK and is the biggest cause of food poisoning. An EFSA Opinion[3] stated that up to 80% of cases can be attributed to raw poultry meat and a tenfold decrease in the exposure levels from this source is likely to reduce the number of human Campylobacter cases by 50 to 90% across all Member States.

We report three summary measures of the extent of Campylobacter contamination in chickens at retail:

- The percentage of chicken skin samples positive for Campylobacter
- The percentage of skin samples with a level of Campylobacter over 1000 cfu/g
- The percentage of outer packaging samples positive for Campylobacter

All chickens, regardless of which retail outlet they are bought from, are at risk of being contaminated with Campylobacter, which is why it is important for consumers to handle and cook their chicken safely. Effective cooking will kill any Campylobacter on the chicken.

A methodological issue arising from the increasing trimming of chicken neck skins

The protocol for measuring the level of Campylobacter contamination in chickens at retail aims to test a sample of 25g of the neck skin. This is in line with the principle of measuring Campylobacter levels on the most contaminated part of the chicken carcass. The protocol
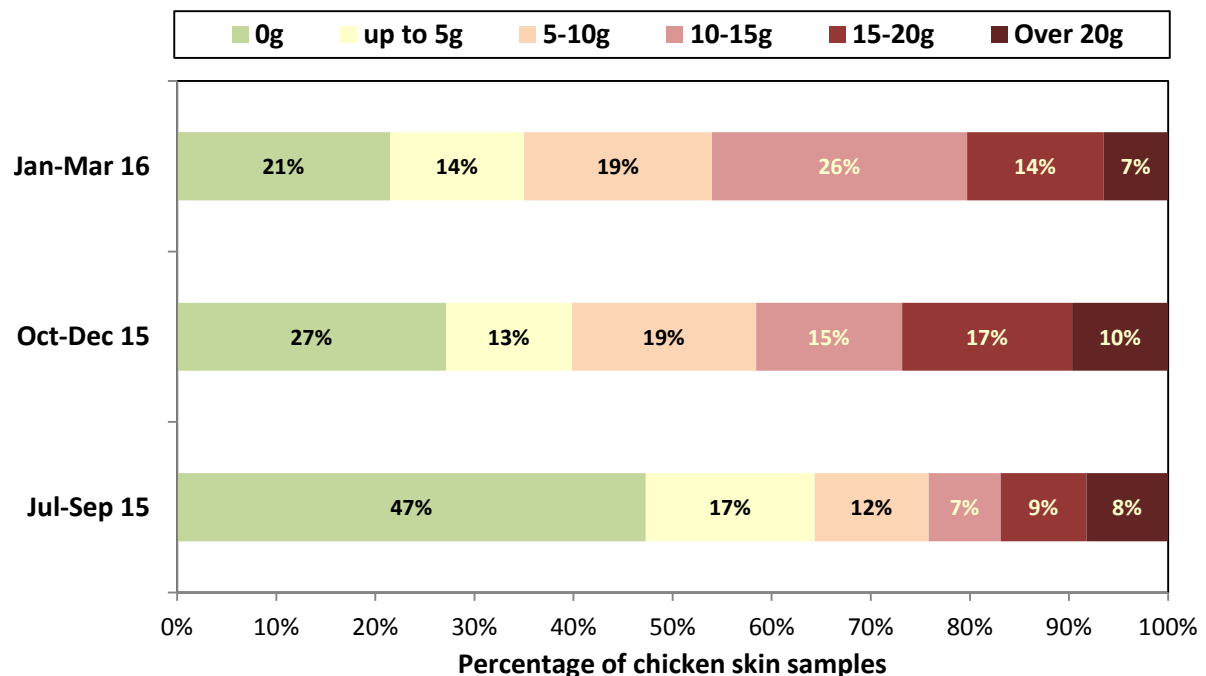
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[3] Scientific Opinion on *Campylobacter* in broiler meat production: control options and performance objectives and/or targets at different stages of the food chain: www.efsa.europa.eu/en/efsajournal/doc/2105.pdf

specifies that should 25g of neck skin not be available, the sample should be topped up with breast skin to make up the 25g.

As a result of the poultry industry's intervention of trimming back the chicken neck skin, over recent months an increasing amount of breast skin has had to be used in the 25g chicken skin samples. The changes in the amount of breast skin used in the 25g samples between the three quarters of the current survey are illustrated in Figure 1.

With the neck skin being the most contaminated part of the chicken carcass, its removal does (all else being equal) constitute an improvement in the level of contamination of chickens at retail. However this improvement may not be as large as reflected in our reported results, as the level of contamination on breast skin used instead, may not be as high as it is elsewhere on the carcass.

Figure 1 – The amount of breast skin used in the 25g chicken samples tested for Campylobacter: Jul – Sep 2015, Oct – Dec 2015 and Jan – Mar[1] 2016
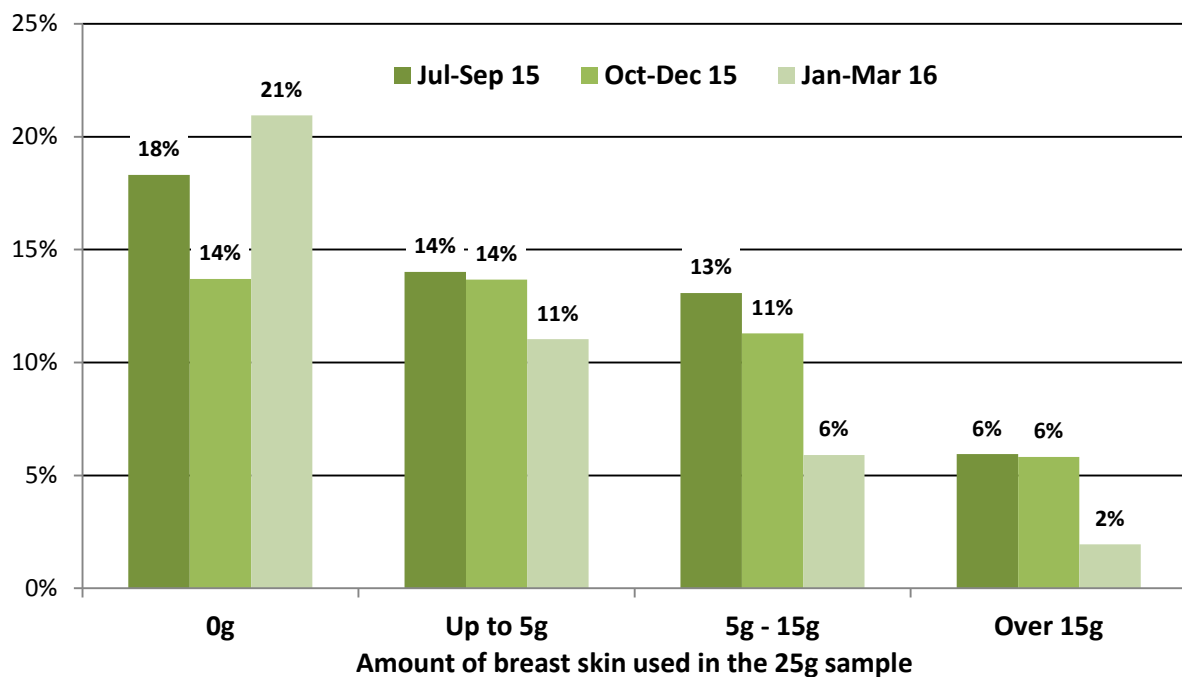

*Weighted by retailer market share

As such this trend of increasing trimming of neck skin, while being a positive development, is compromising our ability to make like-for-like comparisons over time, on the basis of the current survey protocol. In the same way, as the amount of breast skin which has to be used in the chicken samples has increased to a much larger degree for some retailers than for others, our ability to make like-for-like comparisons between retailers has also been compromised, and so retailer breakdowns are not included in this edition of the report.

If the breast skin was consistently the second most contaminated part of the chicken, then the practice of using breast skin to make up the remainder of 25g sample would be in line with the principle of enumerating the level of Campylobacter on the most contaminated part of the bird. The increasing use of breast skin in the sample over time, and differences in the amount of breast skin used between retailers, would then not pose as much of a problem in terms of our ability to make like-for-like comparisons. However this is not thought to be the case.

In terms of evidence from the survey, for each of the three quarters of the current survey, among samples containing the most breast skin there has tended to be a lower proportion giving a result over 1000 cfu/g (see Figure 2). This relationship persists after we attempt to control for differences in the retailer/plant the chickens were taken from.

However this is not necessarily a reliable reflection of how the amount of breast skin used affects the observed prevalence, as there may be other unknown factors involved e.g. it could be the case that chickens which tend to have their neck skins trimmed are also more likely to be those which have been subjected to other interventions to reduce their level of Campylobacter. A reliable comparison of the levels of Campylobacter in breast skin and neck skin (or other parts of the chicken) would require samples to be compared which have been taken from the same chicken carcass.

Figure 2 – The percentage of chicken skin samples with high levels of Campylobacter (over 1000 cfu/g), by the amount of breast skin included in the 25g skin sample: Jul – Sep 2015, Oct – Dec 2015 and Jan – Mar 2016

*Based on actual number of skin samples, not weighted by retailer market share

We could attempt to make a like for like comparison on the basis of only those chicken skin samples with no breast skin. However with the increasing trimming of chicken neck skin by the industry, the number of such samples has become too low to provide sufficiently precise estimates (see Figure 3, page 5) and therefore insufficient to show statistically significant differences over time (see Table 4, page 12).

We could be less restrictive and only exclude samples with more than a given amount of breast skin, e.g.10g of breast skin; however any such a measure would not be entirely a like for like comparison as it would retain some of the bias resulting from the trimming of neck skins.
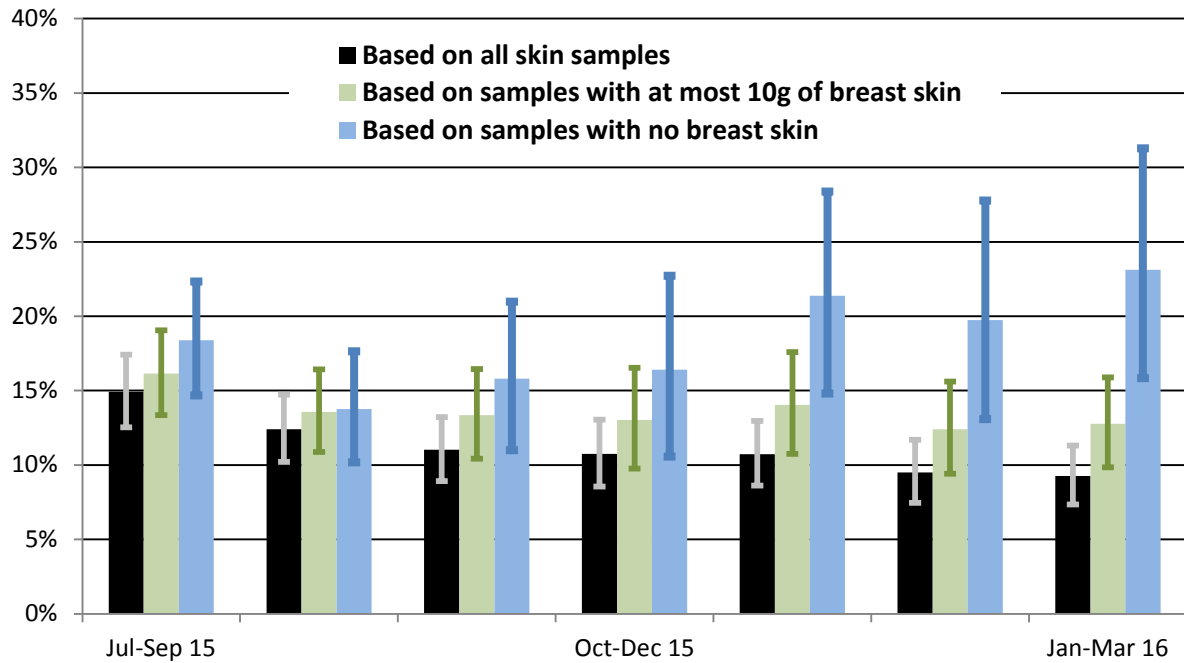
So the results for our two summary measures of the extent of Campylobacter contamination on chickens could be based on:

a) on all chicken skin samples
b) samples with at most 10g of breast skin
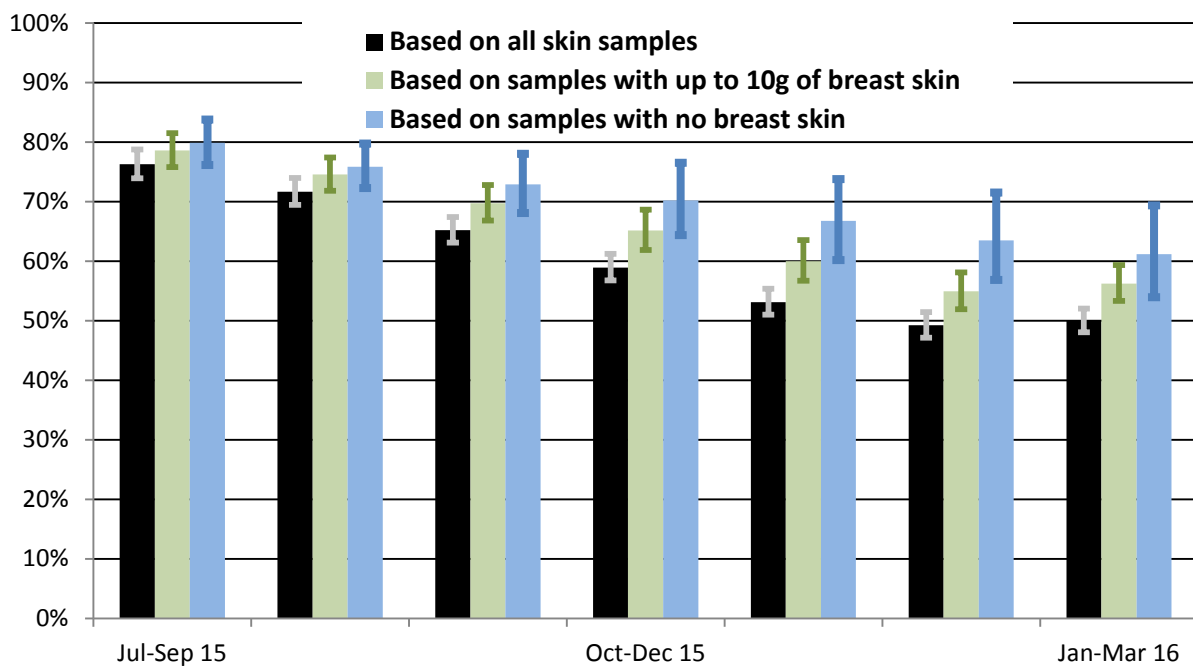
c) samples with no breast skin

A comparison of the results from these three alternatives are presented in Figures 3 and 4.

Figure 3 – The percentage of chickens at retail with high levels of Campylobacter (over 1000 cfu/g) for Year 2: 3-month rolling average based on all skin samples; those with at most 10g of breast skin; and on only those containing no breast skin

95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate, providing a range of values within which the true prevalence will lie 95% of the time.

Figure 4 – The percentage of chickens at retail positive for Campylobacter over the course of Year 2: 3-month rolling average based on all skin samples; those with at most 10g of breast skin; and on only those containing no breast skin

Unless otherwise specified all results in this report are based on using all samples.

Levels of contamination

The level of Campylobacter contamination on chicken skin is measured in terms of the number of colony forming units per gram of skin (cfu/g). Table 1 presents the levels of contamination found on chicken skin sampled during Jan-Mar 2016, showing the proportion of chickens in various bands of contamination. Where the test of Campylobacter on chicken skin gives a result below 10 cfu/g we are unable to conclude that any Campylobacter is present. So, only levels of Campylobacter of 10 cfu/g and over are detectable.

- Detectable levels of Campylobacter are split into three bands:
  '10-99 cfu/g', '100-1000 cfu/g' and 'Over 1000 cfu/g'.
- The highest band ('Over 1000 cfu/g') is the primary focus of attention.

Table 1 – Levels of Campylobacter (cfu/g) on chicken skin: Jan – Mar 2016

Chicken skin	Level of Campylobacter contamination (cfu/g)			
	Less than 10	**10-99**	**100-1000**	**Over 1000**
Percentage of chickens	50.0 (46.5 - 53.5)	21.0 (18.1 - 24.0)	19.8 (17.1 - 22.5)	9.3 (7.3 - 11.3)
No. samples	504	207	208	90

95% confidence intervals are shown in brackets. These reflect the uncertainty in the given estimate, providing a range of values within which the true percentage will lie 95% of the time.

- 50.0% of skin samples were positive for Campylobacter and 9.3% of skin samples showed levels of Campylobacter over 1000 cfu/g.

To measure Campylobacter contamination on the outer packaging of chickens at retail, a swab is thoroughly run over the entire outer surface of the packaging and tested. The level of Campylobacter contamination on packaging is therefore measured in terms of the number of colony forming units per swab (cfu/swab). The levels of contamination on the outer surface of the packaging of chickens at retail during Jan-Mar 2016 are presented in Table 2.

- 4.2% of packaging samples were positive for Campylobacter and 0.1% of packaging samples had a level of Campylobacter above 1000 cfu/swab.

Table 2 – Levels of Campylobacter (cfu/swab) on chicken packaging: Jan – Mar 2016

Chicken packaging	Level of Campylobacter contamination (cfu/swab)			
	Less than 10	**10-99**	**100-1000**	**Over 1000**
Percentage of chicken packaging	95.8 (94.3 - 97.2)	3.0 (1.8 - 4.3)	1.1 (0.4 - 1.9)	0.1 (0.0 - 0.4)
No. samples	963	29	11	1

95% confidence intervals are shown in brackets. These reflect the uncertainty in the estimate, providing a range of values within which the true percentage will lie 95% of the time.

Change since last year

Table 3 shows the results, for the three summary measures of Campylobacter contamination in chickens at retail from both Year 1 and Year 2, for a rolling three month period. The results from both surveys are weighted using the same data on the market share of individual retailers and therefore do not take into account any changes in market share that may have occurred between the two surveys.

Table 3 – The overall prevalence of Campylobacter on chickens sampled and on the outside of the chicken packaging: Years 1 and 2, 3 month rolling average

Time period	No. of samples	% skin samples positive for Campylobacter	% skin samples over 1000 cfu/g Campylobacter	% packaging samples positive for Campylobacter
2014 – 2015[1]				
Mar-May	910	62.6 (59.1 – 66.1)	17.7 (14.8 – 20.6)	5.1 (3.6 – 6.9)
Apr-Jun	926	70.3 (67.0 – 73.6)	19.6 (16.7 – 22.6)	5.4 (3.8 – 7.2)
May-Jul	1,016	78.3 (75.6 – 80.9)	22.6 (19.7 – 25.6)	5.9 (4.3 – 7.6)
Jun-Aug	1,156	83.6 (81.2 – 85.9)	22.1 (19.5 – 24.9)	8.1 (6.3 – 9.9)
Jul-Sep	1,163	83.4 (81.0 – 85.7)	21.7 (19.0 – 24.4)	8.8 (7.0 – 10.6)
Aug-Oct	1,111	80.5 (78.0 – 82.9)	20.3 (17.7 – 22.9)	9.2 (7.4 – 11.1)
Sep-Nov	1,001	77.6 (74.8 – 80.3)	18.9 (16.2 – 21.7)	8.2 (6.4 – 10.2)
Oct-Dec	928	74.3 (71.3 – 77.2)	18.9 (16.1 – 21.7)	7.3 (5.5 – 9.3)
Nov-Jan	933	73.3 (70.1 – 76.4)	20.2 (17.2 – 23.2)	7.0 (5.0 – 9.0)
Dec-Feb[2]	**803**	**71.0 (67.2 - 74.6)**	**21.8 (18.2 - 25.5)**	**6.0 (4.0 - 8.3)**
2015 – 2016				
Jul-Sep	1,032	76.3 (73.3 - 79.2)	14.9 (12.5 - 17.4)	6.4 (4.9 - 8.0)
Aug-Oct	1,051	71.7 (68.6 - 74.7)	12.4 (10.2 - 14.7)	5.9 (4.3 - 7.6)
Sep-Nov	1,086	65.2 (61.9 - 68.4)	11.0 (8.9 - 13.2)	6.1 (4.6 - 7.8)
Oct-Dec	966	58.9 (55.4 - 62.5)	10.7 (8.6 - 13.0)	5.7 (4.1 - 7.4)
Nov-Jan	971	53.1 (49.5 - 56.7)	10.7 (8.6 - 13.0)	5.1 (3.6 - 6.7)
Dec-Feb	**916**	**49.2 (45.5 - 53.0)**	**9.5 (7.4 - 11.7)**	**3.8 (2.4 - 5.5)**
Jan-Mar[3]	1,009	50.0 (46.5 - 53.5)	9.3 (7.3 - 11.3)	4.2 (2.8 - 5.7)

95% confidence intervals are shown in brackets. These reflect the uncertainty in the estimate, providing a range of values within which the true prevalence will lie 95% of the time.

[1] The results for Year 1 are not consistent with those originally published in May 2014, as they are weighted based on more up to date data on the market share of each retailer

[2] Includes a small number of chickens purchased at the start of March 2015

[3] Includes a small number of chickens purchased at the start of April 2016

Table 3 presents the results based on all samples. As discussed on pages 2 to 5 there is an issue with the comparability of results for our two summary measures of the extent of Campylobacter contamination on chicken skin, and we could attempt to make these measures more comparable over time (on like for like basis) by excluding those which contain the most neck skin (or those that contain any at all). So we present three alternative bases for deriving summary measures of contamination on chicken skin and providing three alternative possible "versions of the truth":

a) including all chicken skin samples (see Figures 5a and 6a; and Table 3)

b) including only samples with at most 10g of breast skin (see Figures 5b and 6b)

c) including only samples with no breast skin (see Figures 5c and 6c)

Estimates of year on year changes for the three bases for deriving the results are presented in Tables 4 and 5 in the Annex on pages 12 to 13.

Looking at year on year changes in the **percentage of skin samples with a level of Campylobacter over 1000 cfu/g**:

- There was a statistically significant reduction in the percentage of chickens (skin samples) with high levels of Campylobacter over (1000 cfu/g) from 21.8% in Dec 14 - Feb 15 to 9.5% in Dec 15 - Feb 16 (see Table 3 and Figure 5a). However looking at the prevalence among only those skin samples with no breast skin (24.5% in Dec 14 - Feb 15 and 19.7% in Dec 15 - Feb 16) there was no statistically significant change; see Table 4 on page 12.

- On the basis of looking at *a) all samples*, or *b) only those with at most 10g of breast skin*: the proportion of chickens with a high level of Campylobacter (over 1000 cfu) has consistently been significantly lower during the Year 2 survey, than the same time the previous year. On the basis of looking at *c) only those samples which contain no breast skin*: all results from Year two are lower than the same time the previous year, but the year on year differences are not statistically significant from Oct-Dec 2015 onwards (see Table 4).

- Figure 5c, which is based only on those samples containing no breast skin, seems to indicate a rising trend in the percentage of chickens with a high level of Campylobacter (the green line). As indicated by the very wide 95% confidence intervals (the green bars) these estimates, being based on a low number of samples, are very imprecise. This is why the differences over time are not at all statistically significant and the implied trend is highly unreliable.

Figure 5a – The percentage of chickens at retail with high levels of Campylobacter (over 1000 cfu/g) – based on all samples: 3-month rolling average for Years 1 and 2
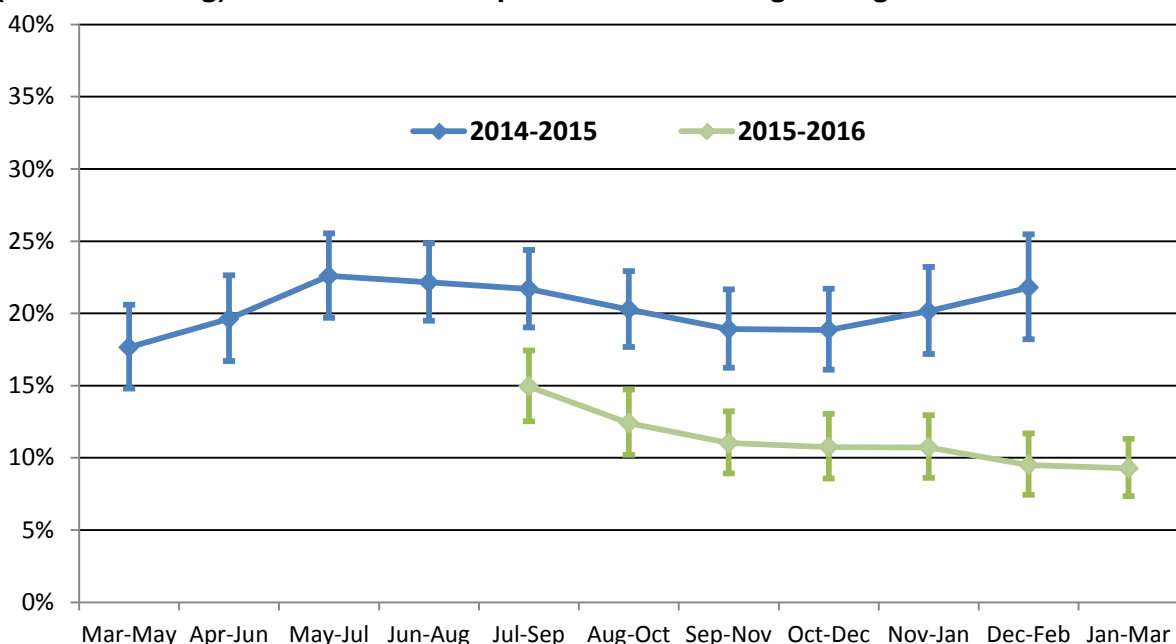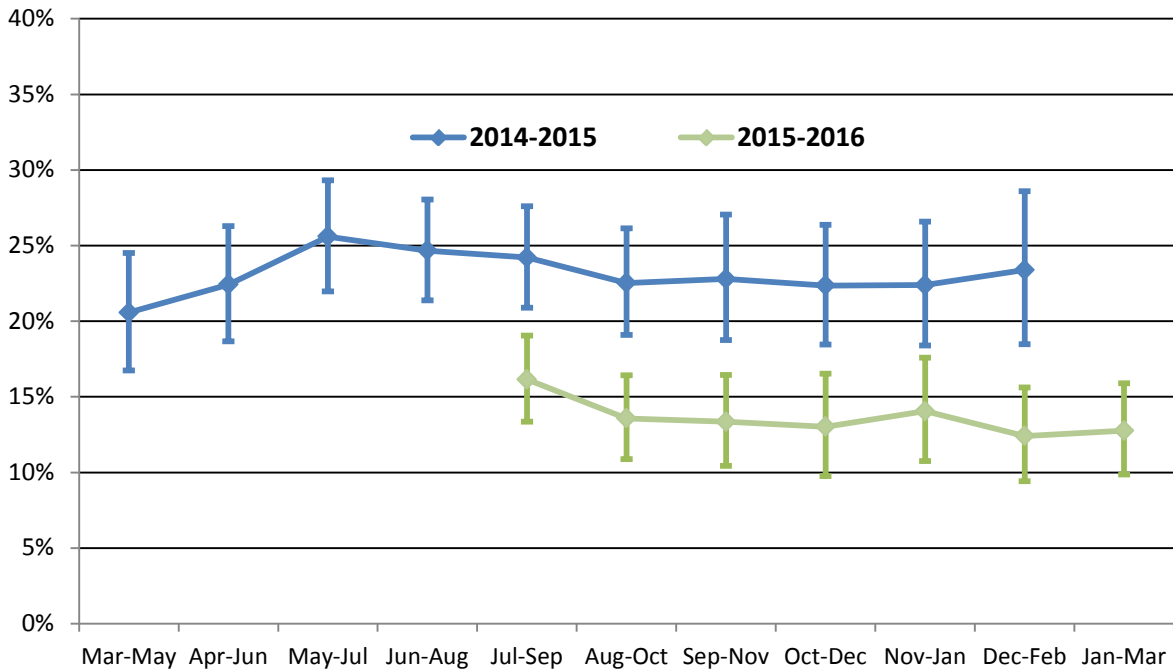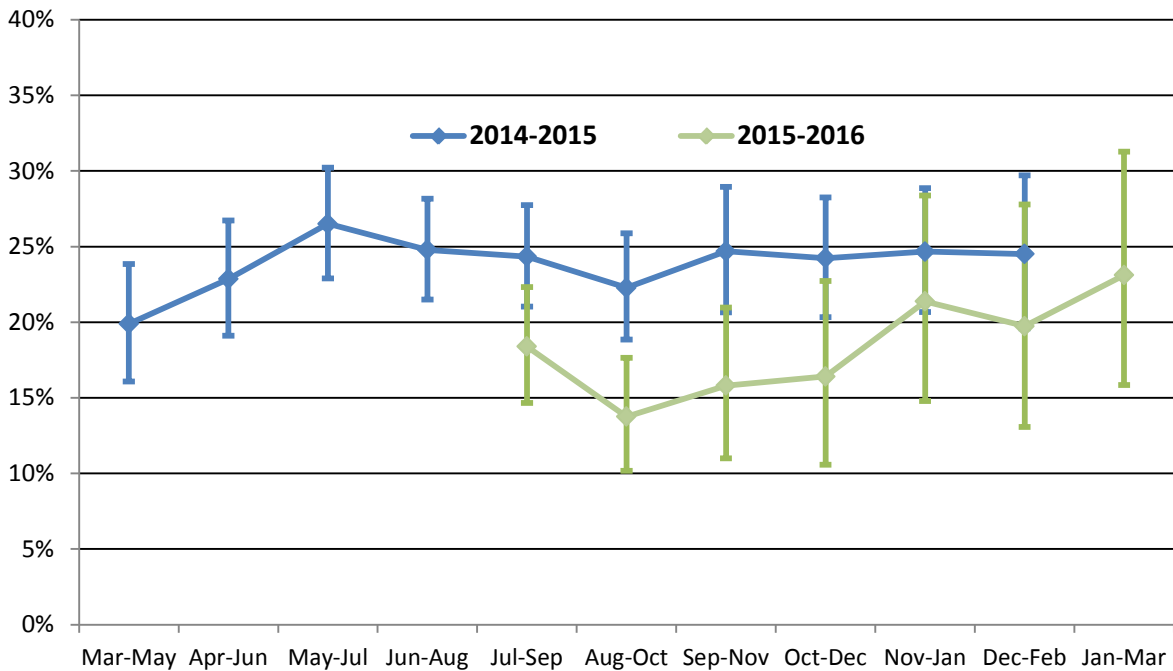
Figure 5b – The percentage of chickens at retail with high levels of Campylobacter (over 1000 cfu/g) – based on samples with at most 10g of breast skin: 3-month rolling average for Years 1 and 2

95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate, providing a range of values within which the true prevalence will lie 95% of the time.

Figure 5c – The percentage of chickens at retail with high levels of Campylobacter (over 1000 cfu/g) – based on samples with no breast skin: 3-month rolling average for Years 1 and 2
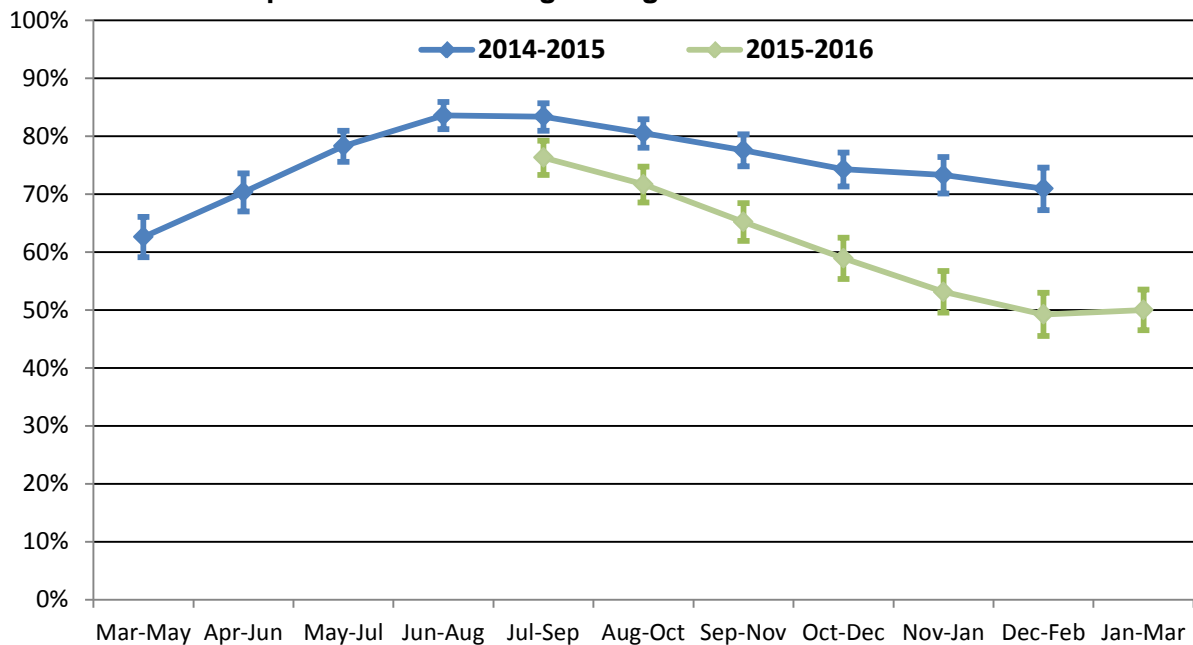

95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate, providing a range of values within which the true prevalence will lie 95% of the time.

Looking at year on year changes in the **percentage of skin samples positive for Campylobacter over 1000 cfu/g**:
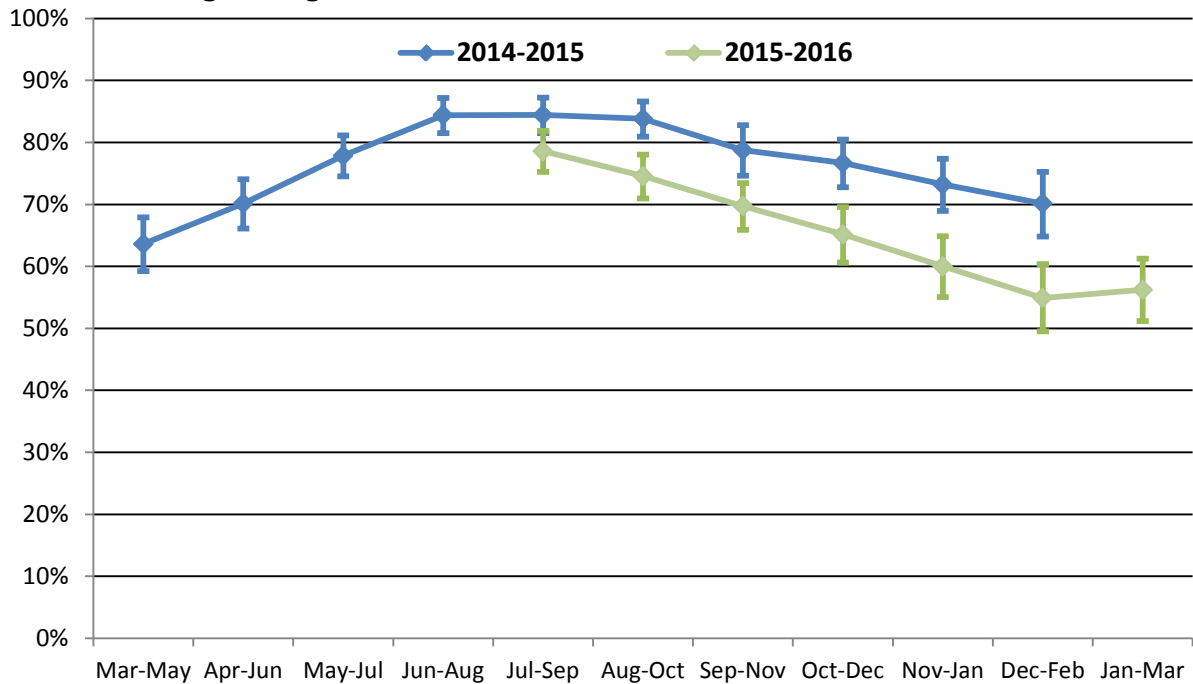
- There was a statistically significant reduction in the percentage of chickens positive for Campylobacter from 71.0% in Dec 14 - Feb 15 to 49.2% in Dec 15 - Feb 16. However looking at the prevalence among only those skin samples with no breast skin (72.9% in Dec 14 - Feb 15 and 63.5% in Dec 15 - Feb 16) there was no statistically significant change; see Table 5 on page 13.

- On the basis of looking at *a) all* samples, or *b) only those with at most 10g of breast skin*: the proportion of positive for Campylobacter, has consistently been significantly lower during the Year 2 survey, than the same time the previous year. On the basis on looking at *c) only those samples which contain no breast skin*: all results Year 2 are below the same time the previous year but the year on year differences are not always statistically significant (see Table 5).

Figure 6a – The percentage of chickens at retail positive for Campylobacter) – based on all samples: 3-month rolling average for Years 1 and 2

95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate, providing a range of values within which the true prevalence will lie 95% of the time.

**Figure 6b – The percentage of chickens at retail positive for Campylobacter)
– based on samples with at most 10g of breast skin:
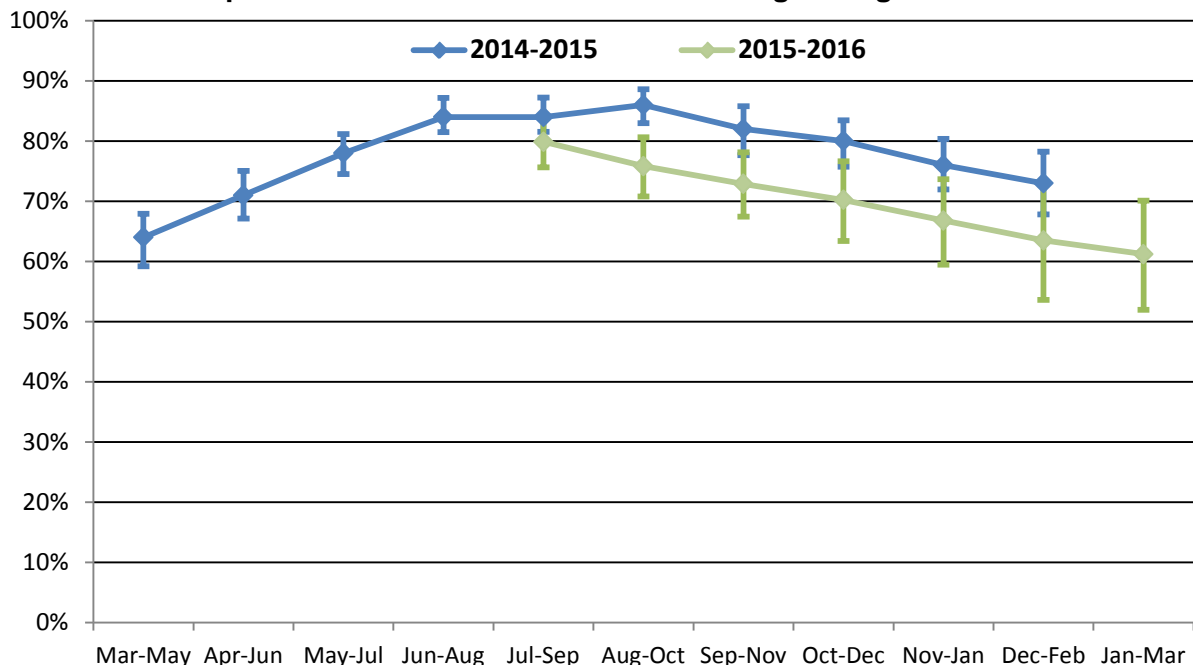3-month rolling average for Years 1 and 2**

95% confidence intervals are shown as vertical bars. These reflect the uncertainty in the estimate, providing a range of values within which the true prevalence will lie 95% of the time.

**Figure 6c – The percentage of chickens at retail positive for Campylobacter
– based on samples with no breast skin: 3-month rolling average for Years 1 and 2**

- Looking at the period for which there is data for both the Year 1 and Year 2 on which to base year on year comparisons, there was a statistically significant reduction in **the percentage of chicken packaging samples positive for Campylobacter** from 7.5% in Jul 14 - Feb 15 to 5.6% in Jul 15 - Feb 16.

Methodological Annex

The neck skin/ breast skin issue

As discussed on pages 2 to 5, the increasing use of breast skin in 25g chicken skin samples tested for Campylobacter, in place of neck skin is compromising our ability to make meaningful comparisons over time. Tables 4 and 5 show how our estimates of year on year changes in the two summary measures of the Campylobacter contamination on chickens would be different if we excluded the worst affected samples (section b), or if we excluded all affected samples (section c).

Table 4 – Year on year changes in the percentage of chickens at retail with high levels of Campylobacter (over 1000 cfu/g) based on: a) all skin samples; b) samples with at least 10g breast skin; c) no breast skin

Time period	% skin samples over 1000 cfu/g Campylobacter 2014-2015	% skin samples over 1000 cfu/g Campylobacter 2015-2016	Change (percentage points)
a) Based on all chicken skin samples			
Jul-Sep	21.7 (19.0 - 24.4)	14.9 (12.5 - 17.4)	-6.8 (-10.4 to -3.1)
Aug-Oct	20.3 (17.7 - 22.9)	12.4 (10.2 - 14.7)	-7.9 (-11.3 to -4.4)
Sep-Nov	18.9 (16.2 - 21.7)	11.0 (8.9 - 13.2)	-7.9 (-11.4 to -4.4)
Oct-Dec	18.9 (16.1 - 21.7)	10.7 (8.6 - 13.0)	-8.1 (-11.7 to -4.5)
Nov-Jan	20.2 (17.2 - 23.2)	10.7 (8.6 - 13.0)	-9.4 (-13.2 to -5.7)
Dec-Feb	**21.8 (18.2 - 25.5)**	**9.5 (7.4 - 11.7)**	**-12.3 (-16.5 to -8.1)**
b) Based on samples with at most 10g of breast skin			
Jul-Sep	24.2 (20.9 - 27.6)	16.1 (13.4 - 19.0)	-8.1 (-12.5 to -3.7)
Aug-Oct	22.5 (19.1 - 26.1)	13.6 (10.9 - 16.4)	-9.0 (-13.5 to -4.5)
Sep-Nov	22.8 (18.8 - 27.0)	13.4 (10.4 - 16.4)	-9.4 (-14.6 to -4.4)
Oct-Dec	22.4 (18.5 - 26.4)	13.0 (9.8 - 16.5)	-9.3 (-14.5 to -4.1)
Nov-Jan	22.4 (18.4 - 26.6)	14.0 (10.8 - 17.6)	-8.3 (-13.7 to -3.0)
Dec-Feb	**23.4 (18.5 - 28.6)**	**12.4 (9.4 - 15.6)**	**-11.0 (-17.0 to -5.1)**
c) Based on samples with no breast skin			
Jul-Sep	24.3 (20.6 - 28.2)	18.4 (14.7 - 22.3)	-5.9 (-11.3 to -0.5)
Aug-Oct	22.3 (18.6 - 26.1)	13.8 (10.2 - 17.7)	-8.5 (-13.8 to -3.2)
Sep-Nov	24.7 (19.7 - 29.9)	15.8 (11.0 - 21.0)	-8.9 (-16.0 to -1.7)
Oct-Dec	24.2 (19.5 - 29.1)	16.4 (10.6 - 22.7)	-7.8 (-15.5 to 0.0)
Nov-Jan	24.7 (19.6 - 30.0)	21.4 (14.8 - 28.4)	-3.3 (-11.8 to 5.4)
Dec-Feb	**24.5 (18.8 - 30.5)**	**19.7 (13.1 - 27.8)**	**-4.8 (-13.9 to 5.1)**

	statistically significant change

Table 5 – Year on year changes in the percentage of chickens at retail positive for Campylobacter based on: a) all skin samples; b) samples with at least 10g breast skin; c) no breast skin

Time period	% skin samples positive for Campylobacter 2014-2015	% skin samples positive for Campylobacter 2015-2016	Change (percentage points)
a) Based on all chicken skin samples			
Jul-Sep	83.4 (81.0 - 85.7)	76.3 (73.3 - 79.2)	-7.1 (-10.9 to -3.3)
Aug-Oct	80.5 (78.0 - 82.9)	71.7 (68.6 - 74.7)	-8.8 (-12.8 to -4.9)
Sep-Nov	77.6 (74.8 - 80.3)	65.2 (61.9 - 68.4)	-12.4 (-16.7 to -8.1)
Oct-Dec	74.3 (71.3 - 77.2)	58.9 (55.4 - 62.5)	-15.4 (-20.0 to -10.7)
Nov-Jan	73.3 (70.1 - 76.4)	53.1 (49.5 - 56.7)	-20.2 (-24.9 to -15.4)
Dec-Feb	**71.0 (67.2 - 74.6)**	**49.2 (45.5 - 53.0)**	**-21.7 (-26.9 to -16.4)**
b) Based on samples with at most 10g of breast skin			
Jul-Sep	84.4 (81.5 - 87.2)	78.6 (75.2 - 81.8)	-5.8 (-10.2 to -1.5)
Aug-Oct	83.8 (81.0 - 86.6)	74.6 (71.0 - 78.0)	-9.3 (-13.8 to -4.8)
Sep-Nov	78.7 (74.6 - 82.8)	69.7 (65.9 - 73.4)	-9.0 (-14.6 to -3.5)
Oct-Dec	76.7 (72.7 - 80.5)	65.2 (60.6 - 69.6)	-11.5 (-17.5 to -5.6)
Nov-Jan	73.2 (68.9 - 77.4)	60.0 (55.0 - 64.9)	-13.2 (-19.7 to -6.7)
Dec-Feb	**70.2 (64.8 - 75.3)**	**54.9 (49.5 - 60.4)**	**-15.2 (-22.7 to -7.6)**
c) Based on samples with no breast skin			
Jul-Sep	84.5 (81.0 - 87.7)	79.9 (75.2 - 81.8)	-4.6 (-9.9 to 0.7)
Aug-Oct	85.9 (82.7 - 88.9)	75.8 (71.0 - 78.0)	-10.1 (-15.9 to -4.3)
Sep-Nov	81.5 (76.7 - 86.0)	72.9 (65.9 - 73.4)	-8.6 (-15.7 to -1.6)
Oct-Dec	79.8 (75.5 - 83.9)	70.2 (60.6 - 69.6)	-9.6 (-17.5 to -1.8)
Nov-Jan	75.7 (71.0 - 80.4)	66.8 (55.0 - 64.9)	-8.9 (-17.6 to -0.5)
Dec-Feb	**72.9 (68.0 - 77.7)**	**63.5 (49.5 - 60.4)**	**-9.4 (-20.4 to 1.1)**

[   ] **statistically significant change**

Eligibility criteria

Chickens eligible for inclusion in the survey are:

- Whole, chilled, raw, UK-produced standard, free range or organic chickens;
- Where contained in a package, it was unopened and undamaged;
- NOT frozen;
- NOT basted, herbed, stuffed, marinated or otherwise modified.

Samples are collected from retail premises (including both retailer own-brand and branded chickens) in the UK, and the information gathered, includes temperature on receipt, the approved premises code of the poultry plant and use-by dates.

Statistical features

This report includes prevalence estimates for the 9 retailers which have a market share greater than 4% - the 'named' retailers. All butchers and other smaller retailers are grouped together into an 'Others' category.

During the previous survey (Year 1, intended to represent the 12 month period starting mid-February 2014), chickens were sampled from retailers to reflect their market share, with a planned 4000 samples altogether. This was intended to estimate the overall mean prevalence of Campylobacter in fresh retail chickens in the UK over a full 12-month period.

The current survey (July 2015 – June 2016) is designed to give more robust prevalence estimates for individual named retailers, as well as to estimate the overall mean prevalence. To achieve this, a planned 400 chickens will be sampled from each of the 9 named retailers, with 200 for butchers and 200 for other smaller retailers. Adopting this design has a negligible effect on the precision of estimate for the overall mean prevalence, while resulting in better comparability between retailers. As with last year's survey, for each of the named retailers the split in terms of the types of chickens sampled (standard/ free-range/ organic) was based on the market share data.

To remove any bias from not sampling chickens according to market share, the survey data are weighted using the market share data. So the overall prevalence figures are a weighted average of the prevalence figures for each of the 9 named retailers, butchers and 'other smaller retailers'. The prevalence figures for the 'Others' category, are a weighted average of the prevalence figures for butchers and those for 'other smaller retailers'.

The market share data used were supplied by Kantar for the 52 weeks ending 1st February 2015 and are more up to date than the Kantar data used for the design of the Year 1 survey which referred to 2009/2010. As these data are a snapshot of a fixed period of time, they may not reflect the dynamic nature of the market. These data fulfil several criteria:

- They are derived from a large UK-wide consumer panel
- They are able to provide information specifically referring to chickens at retail which meet eligibility criteria for inclusion in the survey
- They provide breakdowns by type of chicken (standard, organic, free range)

Revised overall prevalence figures for Year 1, weighted based on the new market share data, are also included in this report, and they do not differ greatly from those originally published in May 2015.

Confidence intervals, for the estimated prevalence of individual retailers are exact confidence intervals. Since the estimates of the overall prevalence, and the estimates of prevalence for the "Others" category are weighted averages, bootstrap confidence intervals are used for these estimates.

Laboratory testing

The testing laboratories were the five Public Health England (PHE) Food, Water and Environmental Microbiology Laboratories, as well as the Agri-Food Biosciences Institute (AFBI) Laboratory in Northern Ireland. Once samples reached the laboratory, testing was initiated within 24 hours, and certainly before 48 hours after sampling. Chickens were tested before or on their use-by dates. Sampling and laboratory personnel prevented cross contamination between samples and from the surrounding environment at all stages, e.g. by wearing gloves and changing them between handling each chicken, and the cleaning of equipment and work surfaces after each sample.

Two samples for each chicken were analysed; one sample consisting of 25g homogenised skin (neck-skin topped up with breast skin if a 25g sample was not achieved by neck skin alone), and one sample representing the outer packaging (prepared by examining 1mL of liquid extracted from a Maximum Recovery Diluent (MRD)-wetted sponge swab thoroughly rubbed twice over the entire outer packaging of the chicken).

The chicken samples tested were examined utilising the enumeration method based on ISO/TS 10272-2:2006 Microbiology of food and animal feeding stuffs -- Horizontal method for detection and enumeration of *Campylobacter* spp. -- Part 2: Colony-count technique. Enumeration using direct plating with a detection limit of 10 colony forming units (cfu) per gram (g) of neck-skin, or per swab sample, was used.

Further information

Additional information on the survey design can be found in the original survey protocol at: www.food.gov.uk/sites/default/files/Campylobacter%20Retail%20Survey%20Year%202%20 protocol%20%28final%29.pdf

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