Background and methodology to the Accredited Official Statistics on the Incidence of Tuberculosis (TB) in Cattle in Great Britain

History and background

1. Since late 2020 Defra publishes TB Statistics by month each quarter. 1996 was the first year that administration of TB testing was computerised, with records held on the Animal and Plant Health Agency's (APHA) old VETNET computer system. In September 2011, APHA rolled out the TB module of its new computer system "Sam". Information about Sam is available online. Methodological improvements in how the statistics were calculated were also made at this time, and following quality assurance of data from the new system, TB figures derived from Sam were first published in April 2012. Details of methodological changes and revisions to the published figures at that time are available online.

2. In December 2015 following public and scientific consultation, new headline measures for the incidence and prevalence of TB were introduced and published in a new format notice. These new incidence measures required more resource to produce. Additionally, month-on-month fluctuations in the trends make changes over time difficult to interpret. Consequently the decision was made to update them on a quarterly basis. However the testing, incident (also known as breakdowns), and slaughter statistics at a county and country level continued to be published monthly, whilst also being shown by England bTB risk zone and Wales bTB Area. In November 2020 statisticians announced the move to quarterly publication of monthly data.

3. The data used in the production of these statistics comes from the administration by APHA of the government's bovine TB (M. bovis) surveillance regime in cattle herds. More detail on Sam and APHA administration of the testing programme and the quality controls on data in these statistics can be found under the bovine TB National Statistics data and methodology page in the document titled 'Incidence of tuberculosis (TB) in Cattle in GB - quality assurance and data handbook.'

4. For further information on TB in cattle, TB testing in England and much more, please go to the Defra TB webpage.

5. For information on the bovine TB eradication programme in Wales see the Welsh government website.

6. For further information on Bovine TB in Scotland, see the Scottish government website.

7. The TB Hub is a source of advice on dealing with TB on farm.

Methodology

8. Data is extracted from Sam around three months after the end of the period covered in the statistics notice. This is to allow time for the majority of post-mortem and laboratory test results (which usually take at least six weeks to complete) to feed into the data to be published. Publishing earlier than this would result in greater levels of revision to incident figures. Data is extracted for the current year and previous two years each

month – so that any revisions made to records on the system such as test results or incident classification, etc. will feed into the subsequent quarter's publication. See also Revisions Policy.

9. The bovine TB statistics are presented by country England, Scotland and Wales and then by English TB risk area, Wales TB area and by county. Each English county falls into one of three areas High Risk Area, Edge, and Low Risk Area based on the epidemiology of the disease in that area. Some counties (Oxfordshire, Warwickshire, Derbyshire, Cheshire and East Sussex) straddled the High Risk and Edge areas up to 31 December 2017. From 1 January 2018 these five counties are all designated Edge area. The statistics were presented on a disaggregated basis for 2 years 6 months. From Quarter 3 2020 this was discontinued. Wales TB areas were introduced in October 2017. There are five areas for which the statistics are presented: High West, High East, Intermediate North, Intermediate Mid and Low.

10. Data is split into the different geographical areas and risk zones using the CPHH (County, Parish, holding, herd) number where the TB test or incident took place. Country, TB area and county statistics are presented back to 1996 for all data items apart from prevalence that can be derived from published series of herds under restriction and herds registered.

11. Certain statistics are affected by seasonal patterns and variations in the frequency of testing. TB testing is seasonal as more herds are tested in the winter when more cattle are housed. The herds and animals tested are not a random sample of the whole GB herd. Furthermore, herds are tested more frequently in areas of higher TB incidence than in those of historically low incidence.

Herd TB incidence

12. Following a public consultation in 2015 "new herd incidents per 100 herd years at risk" was adopted as a headline incidence measure from December 2015. This replaced the old measure "Number of OTFW incidents as a percentage of tests on officially TB free (OTF) herds". In the interests of transparency the old measure was published in statistics notice for a period of 1 year for comparison to the new incidence measure and was discontinued at the end of 2016. The old measure was regarded as misleading as large increases in the denominator (number of herds tested) could give the impression that the rate of new incidents were decreasing even when this was not the case.

13. **New herd incidents per 100 herd years at risk**

This measure is a rate calculated by dividing the number of new incidents (numerator) by the total amount of time the herds tested during the period in question were unrestricted and at risk of infection since the end of their last TB incident or negative herd test (denominator). This is an established methodology for disease incidence estimation and it already appears (on an annual basis) in the APHA annual Surveillance Reports on bTB. Its chief advantage is that it provides a more reliable time series because changes and differences in testing frequency regionally and over time are taken into account (e.g. it takes into account differences in testing frequency between annually tested herds and herds tested every four years). This measure is shown for all new herd incidents and those with the OTFW status separately. Further

description of this calculation and examples of how different herds are represented in the figures can be found online.

13. The probability that an animal (or a herd) with a positive test result is truly infected is known as the positive predictive value of a test (PPV). The PPV depends on (1) the test's specificity (probability that an uninfected animal is correctly identified as negative by the test), (2) the test's sensitivity (probability that an infected animal is detected as positive by the test) and (3) the prevalence of infection in the herd or in the locality. In areas where bTB prevalence is low, such as Scotland and the LRA of England, it is comparatively more likely that a test reactor represents a false positive result to the tuberculin skin test than elsewhere in GB, although the PPV is still high. Consequently, for low incidence regions it is important to present the number of incidents where TB has been confirmed by post-mortem examination or laboratory culture of tissue samples (OTFW incidents) alongside the number (and incidence) of total incidents. Further information on the test, as well as a short summary, is available online.

Herd TB prevalence

14. This is a headline measure of TB, and shows the proportion of herds under restriction as a result of a TB incident. This measure is the number of herds not officially TB-free due to an ongoing TB incident (nominator) at the end of each reporting period shown as a proportion of the number of active cattle herds registered on Sam at the end of each reporting period (denominator).

Data considerations

15. The data used for these statistics comes from an administrative data system and as such some anomalous or incomplete data is stored. For example:

a) GB totals include figures for a minority of herds and tests for which there is no further geographical information on Sam, referred to as the 'balancing item'. This means the GB figure will sometimes be higher than the sum of the figures for England, Scotland and Wales.

b) Sam uses a livestock unit identifier to count 'herds'. In a very small minority of cases some livestock units are attached to more than one herd. If these herds are in the same parish, the herd is counted once towards the total for that area and therefore features once in the GB total. However on the rare occasion that these herds are in different parishes, and when these parishes are in different risk areas of England, they will be counted twice and England, Wales and Scotland will sum to be more than the GB total. The most that this has historically affected the figures that the England, Wales and Scotland total exceeded the GB figure by 3 herds in May 2012.

Revisions Policy

14. The bovine TB statistics are published from three to five months in arrears. This is to allow time for post-mortem and laboratory results (which take a minimum of six weeks to complete) of TB reactor cattle to feed into the database. To make sure that published data accurately reflects records held in the Sam computer system, data for all items except "herds registered on Sam" is extracted for the current and previous two calendar years each month. Data for "herds registered on Sam" is extracted for the

current month. Historical data prior to this time is not updated, unless there are methodological changes which affect the published figures. In December 2015 a full dataset back to 1996 was published, partly as a result of the introduction of the new headline measures of incidence and prevalence, but also to fulfil government's commitment to publish a full back series of data at county level.

Revisions to data

15. There are a number of reasons why TB statistics are revised. These are:

a) The introduction of a new administration system or revisions to operations/administrative practices using that system, for example the switch several years ago from VETNET to Sam.

b) Changes to methodologies in the calculation of headline statistics, such as the introduction of the new headline measure of incidence introduced in December 2015.

c) Register cleansing. New cattle herds are reported to APHA using data collected by the BCMS Cattle tracing scheme. Periodically (at 2-3 yearly intervals) the herds registered on Sam are reviewed to see if they still exist. This is necessary because herd depopulations (where all the cattle are moved off that farm, for example to slaughter) are often temporary measures, with the farm being restocked a number of months later. If the farm were marked as inactive on Sam at the time of initial depopulation there is a risk it would subsequently be excluded from a TB test. Register cleansing can result in some large decreases in the number of herds. For example the number of herds in GB (registered as active in Sam) reduced from 77,700 herds in September 2014 to 76,100 in February 2015. Whilst new herds do come into existence, generally the number of herds is gradually declining.

d) Revisions to data as a result of more up to date information. This could be inclusion of laboratory test results, or the correction of minor errors in administrative records.

In general the reasons a) and b) above may tend to introduce larger revisions into a data series and because of this, the statistical notice (where the revisions are first published) or an additional document will explain reasons for the changes and what the impacts of the revisions or changes are. These additional documents detailing major revisions can be found online.

Level of revisions

14. Published figures from September 2013 to August 2014 have been analysed to see what the average level of revisions is for several key items shown in the statistics notice. Table 1 summarises this, focusing on changes to data arising for admin reasons.

Table 1 – GB analysis of level of revisions

	Tests on Officially TB free herds	New Herd incidents (NHI)	NHI - officially TB free status withdrawn	Total animals slaughtered
Monthly Average – September 2013 to August 2014	6,336	389	251	2,635
Average change in value after 1 month	3	3	11	0
Average change in value after 3 months	7	3	16	-1
Average change in value after 12 months	10	3	20	-1
Average change in value after 12 months as a percentage of monthly average	0.20%	0.80%	8.10%	0.00%
Maximum change in value in a single month	49	9	32	-7

15. Table 1 shows that revisions for most of these items are very minor – less than 1% of the original published figure. The only large revisions are to "New Herd incidents of which officially TB free status withdrawn". This is to be expected as the time lag in the process of further testing and the processing of laboratory test results means that for some herds initially designated officially TB free status suspended (OTFS), positive culture result may not be available until several months into the TB incident (breakdown). This results in a change of the herd's official TB status from OTFS to OTFW and subsequent revisions to the published data.

Description of statistics notice measures

The headline measures of each release are described in paragraphs 11 to 14, but each statistics notice and the accompanying spreadsheets contain various other measures for tracking the progress of bovine TB. These are described in the following paragraphs.

Herds and Incidents (breakdowns)

16. **Number of cattle herds registered on Sam**
The number of herds registered on APHA's computer system (currently Sam and before 2011 VETNET) at the end of the month specified. Annual figures are at the end of December. Occasionally there are changes to the number of herds registered on Sam. As well as being due to real changes in the numbers this is the result of routine or ad hoc data cleansing and may result in some short term fluctuations in the dataset. For 1996 and 1997 the Welsh total is slightly different from the sum of the counties because the exact location of some herds could not be matched to current boundaries.

17. **Herds not officially TB free at the end of the period due to a bovine TB incident (non OTF herds)**
Herds which were not officially TB-free due to a TB incident at the end of the month specified. To be not officially TB-free, herds must have an open breakdown with OTF status suspended or withdrawn. Annual figures are at the end of December.

18. **Herds not officially TB free during the period due to a bovine TB incident (non-OTF herds)**
Herds which were not officially TB-free due to a TB incident during the period shown. A herd with more than one incident in the period will be counted more than once. As herds may be under restrictions for several consecutive calendar months, the monthly figures cannot be added together to describe the total number of individual herds restricted annually.

19. **Herds under movement restrictions at the end of the period**
Includes herds under disease restriction (as a result of confirmed or suspected disease from bTB tests or detection at slaughterhouse), herds under restriction due to an overdue test and some movement restrictions on animals testing as inconclusive reactors pending their next test. Any herd whose restriction notice has not expired by the end of the period shown will be included. Annual figures are at the end of December. The figures may include some herds which have subsequently been dispersed or herds at premises which are not currently active.

20. **New Herd Incidents**
New herd incidents (NHI): Herds which were previously OTF but either had cattle that reacted to a tuberculin test or had a tuberculous animal disclosed by routine meat inspection at slaughter, during the period shown.

21. **New herd Incidents – of which: officially TB free herd status withdrawn (OTFW)**
New herd incidents where OTF status was withdrawn from the herd due to the detection of typical lesions of TB during post-mortem examination/meat inspection of at least one TB test reactor or inconclusive reactor, or where post mortem tissue samples from at least one test reactor, inconclusive reactor or a slaughterhouse case prove positive for Mycobacterium bovis on PCR testing and/or bacteriological culture (the causative bacterium of bovine TB). In Wales from January 2022 onwards, all herds where skin test reactors (including animals that are inconclusive reactors at consecutive tests) and/or animals positive to gamma or antibody test have been disclosed are classified as OTFW regardless of the result of post-

mortem or PCR and/or bacteriological culture results. Also where one or more slaughterhouse cases prove positive for Mycobacterium bovis on PCR testing and/or bacteriological culture.

22. **New herd Incidents – of which: officially TB free herd status suspended (OTFS)**

The number of new herd incidents where OTF status was suspended because of the detection of at least one TB test reactor, but where conclusive post-mortem evidence of TB could not found in any of those animals. The official TB status of such herds remains suspended until they have completed all the prescribed follow-up testing with negative results. In Wales from January 2022 onwards, no incidents will be considered as OTFS, however, there are incidents recorded as OTFS on Sam which either relate to exemptions to this policy change, or to how the administration database is structured.

23. **New herd Incidents – of which: still unclassified TB incidents (pending culture results)**

New herd incidents that at the end of the period covered by the notice had not been designated OTFW, but where testing was still underway and could become OTFW if such tests revealed one or more reactors with post-mortem evidence of TB or a positive culture result.

Tests

24. **Tests on officially TB free herds (OTF)**

This is a count of any TB testing event carried out in an OTF herd. The following test types are not included in this measure:

- Pre- and post-movement
- Gamma interferon blood tests
- Short interval tests
- Private tests
- TB Unit Tests

14. **Total Tests on Herds**

Herds for which tuberculin skin testing is carried out on at least one animal during the period shown. The following test types are not included in this measure:

- Pre- and post-movement
- Gamma interferon blood tests
- Private tests

14. **Total Cattle Tests**

Count of the number of tests on cattle. An individual animal could be tested more than once in each time period. Interferon-gamma blood tests used to supplement the skin test in known infected herds are included. Antibody tests were added in the December 2021 statistics and backdated to 2012.

Slaughter

15. **TB test positive animals slaughtered (formerly Reactors Slaughtered)**

An animal which was compulsorily slaughtered because it responded to the tuberculin skin test, interferon-gamma test or approved antibody test in a way that was consistent with it being infected with Mycobacterium bovis. Will include animals that were inconclusive reactors at previous tests and tested positive at retest.

16. **Direct contacts slaughtered**
An animal in an OTFW incident that, although not a test reactor, was considered to have been exposed to Mycobacterium bovis and compulsorily slaughtered.

17. **Inconclusive reactors slaughtered**
Inconclusive reactors are animals showing positive reactions to bovine tuberculin that are not strong enough for them to be deemed reactors. However, instead of being tested again after 60 days (the normal procedure in this case) the animals are compulsorily slaughtered. This applies in certain circumstances in Wales, where some IRs in persistent breakdown herds are automatically removed with compensation. Prior to April 2017, some animals slaughtered as reactors or direct contacts in Great Britain were incorrectly classified as IRs on Sam, and reported as IRs in the National Statistics and Official Statistics. These animals are now reported under total animals slaughtered', and they have been removed from the historical IR series.

18. **Total animals slaughtered**
TB test positive animals slaughtered + Inconclusive reactors slaughtered + direct contacts (DC) Slaughtered. Prior to April 2017, some animals slaughtered as TB test positive or DCs were incorrectly classified as Inconclusive Reactors (IR) on Sam, and reported as IRs in the National Statistics and Official Statistics. These animals are now reported under 'total animals slaughtered', and they have been removed from the historical IR series.

19. **Slaughterhouse cases reported to APHA**
Animals that displayed suspect lesions of TB during post-mortem meat inspection at routine slaughter and were notified to APHA by a meat inspection team or Official Veterinarian of the Food Standards Agency/Food Standards Scotland. These animals are neither reactors nor direct contacts and aren't recorded as such.

20. **Confirmed slaughterhouse cases**.
Slaughterhouse cases where laboratory culture of the suspect TB lesions has identified M. bovis. Only slaughterhouse cases confirmed by culture may initiate a new (OTFW) TB incident, unless the affected animal originated from a herd already under restrictions due to an incident. Unconfirmed slaughterhouse cases do not initiate new TB incidents, although they may trigger tuberculin check tests in the herds of origin, which could reveal test reactors and thus give rise to a new incident.

Other GB TB Datasets

21. **Statistics on pre- and post-movement TB testing of cattle:** All cattle over 42 days old in Wales or the Edge or High Risk Areas of England that are moving to another herd must return a negative skin test within 60 days before movement. In Scotland and the Low Risk Areas of England and Wales, cattle must also return a negative skin test between 60 and 120 days after arriving at their new herd. Statistics on the numbers and results of these tests are published quarterly.

22. **GB surveillance report**: Each year the APHA publish a surveillance report which presents detailed epidemiology statistics. The report for 2022 and previous years can be found online.

23. **Interactive dashboard:** Defra hosts an interactive dashboard to allow users to view bovine TB statistics for the various regions and risk areas in Great Britain.

24. **Wales TB dashboard**: The Welsh government also hosts an interactive dashboard showing statistics on bovine tuberculosis in Wales.

25. **Bovine TB in other species**: M. bovis doesn't only infect cattle, and so other domestic animals are tested in effort to control the spread from these animals to cattle. Defra publishes annual data on incidences of TB in non-bovine animals.

Bovine TB statistics and reports in other countries

26. Although published bovine TB statistics exist for other countries, they are rarely as detailed as those published for GB. The following are data sources of which we are aware. This is not an exhaustive list.

27. Statistics on TB in Northern Ireland

28. Statistics on TB in Ireland

Last Updated: March 2024