



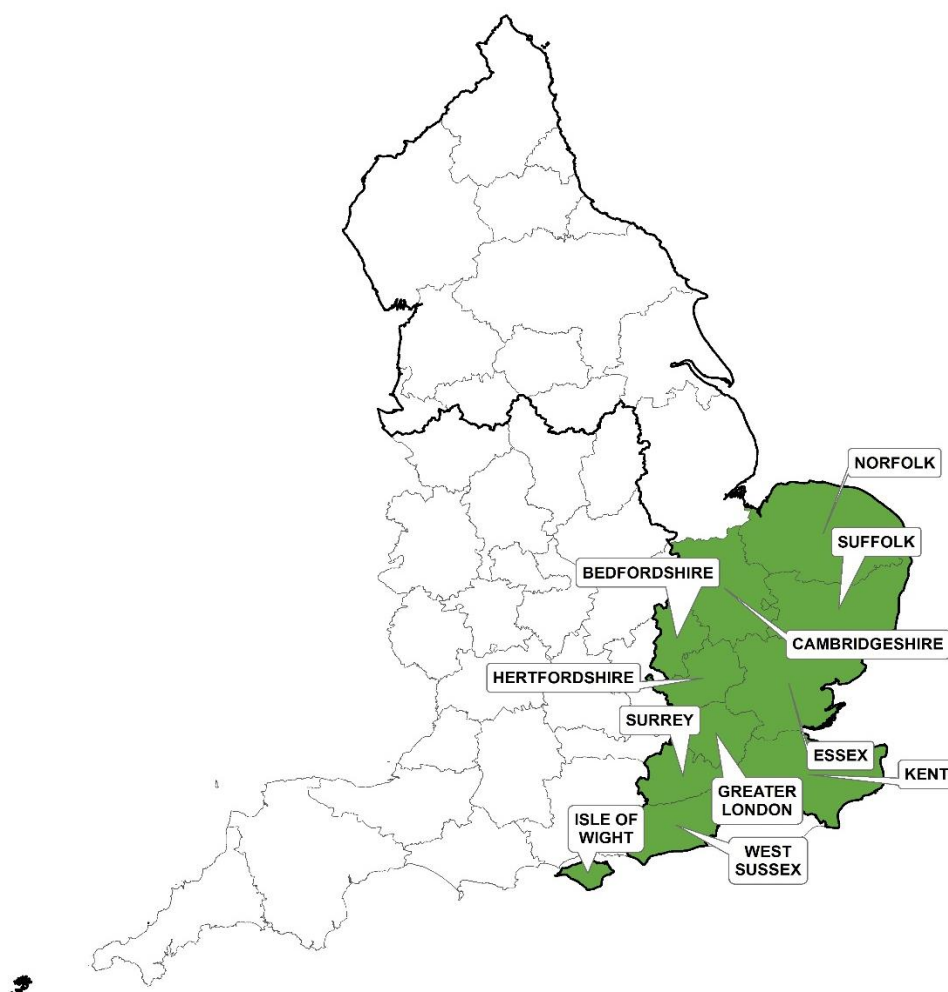
Animal &
Plant Health
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Year-end descriptive epidemiology report: Bovine TB in the Low Risk Area of England

County coverage: South East of England (including Bedfordshire, Cambridgeshire, Essex, Isle of Wight, Hertfordshire, Kent, Greater London, Norfolk, Suffolk, Surrey, West Sussex)

Year-end report for: 2019

TB Low Risk Area - SOUTH EAST



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Executive summary

Reporting area

The South East of England (including the counties of Norfolk, Suffolk, Cambridgeshire, Essex, Bedfordshire, Hertfordshire, Greater London, Kent, West Sussex, Surrey and Isle of Wight) is part of the Low Risk Area (LRA) that was established in 2013. The following year, the bovine tuberculosis (TB) surveillance strategy for this area was incorporated into the Government's strategy to achieve Officially Tuberculosis Free (OTF) status for England by 2038. Overall the LRA has a very low and stable incidence of infected herds. This end of year report describes bovine TB in the South East of England.

Local cattle industry

The herd types are predominantly fattening, with a reasonable number of suckler herds, and a few dairy herds. Cattle for finishing, or stores, are traditionally bought in from other areas of the country for finishing on areas of grazing that are unsuitable for arable production, or on grain/by-products from that arable production.

New incidents of TB

There were 12 new TB herd incidents with OTF status withdrawn (OTF-W) in the South East of England LRA in 2019 (one fewer OTF-W incidents than in 2018), plus another 38 incidents with OTF status suspended (OTF-S) (35 TB cases in 2018). Of the 12 OTF-W cases, two were disclosed in each of the counties: Cambridgeshire and Essex. One OTF-W incident was disclosed in the rest of the counties covered in this report, with the exception of Bedfordshire with no OTF-W incidents reported in 2019.

Potential or confirmed TB hotspot areas

There were two potential TB hotspot areas active in the South East of England LRA region in 2019: one in Norfolk (HS25) and one in West Sussex (HS24). As part of enhanced wildlife surveillance, one badger carcase (with no visible lesions of TB and a negative culture result) had been collected in 2019 in potential HS25.

Unusual TB incidents

In 2019 there has been one laboratory-confirmed case of *M. bovis* infection in a cat in Greater London, which was probably infected at the breeder's premises in Devon.

Suspected sources and risk pathways for TB infection

The most common risk transmission pathways for TB incidents reported in individual disease investigations remained the purchase of cattle with an undisclosed infection. These cattle movements originated mainly from herds in the High Risk area of England (HRA), but also (with lower frequency) from the Edge Area and High TB Areas of Wales and from farms in the LRA which had sourced cattle from farms in the HRA. Details of the methodology used to calculate the weighted contribution of the different suspected sources of *M. bovis* infection for all new incidents can be found in the main body of the report and in the [Explanatory Supplement for England 2019](#).

Disclosing tests

The surveillance methods disclosing TB in the 12 OTF-W incidents of 2019 were: routine herd testing (42%), meat inspection of non-reactor animal carcasses at routine slaughter (25%), trace testing (25%), and radial testing (8%).

Reactor numbers

A total of 200 TB test reactors were detected during 2019: 108 reactors were disclosed by skin testing and 92 by the interferon gamma (IFN- γ) blood test. This was a 37% decrease compared to 2018 (120 skin reactors and 196 IFN- γ test positive animals) despite there being two more incidents disclosed during 2019 than in the previous year. The difference is mostly due to a 53% reduction in the number of IFN- γ test positive animals compared to 2018, which is partly explained by reduced IFN- γ testing.

Risks to the reporting area

There was no evidence from cattle incidents occurring in 2019 in the counties covered in this report to suggest the presence of endemic infection in cattle or in potential wildlife reservoirs, including the areas adjacent to Edge Area counties.

Risks posed by the reporting area

The counties in the South East of England LRA do not pose a risk of spreading TB to other contiguous areas at present as all the OTF-W TB incidents have been associated to movements of infected cattle. Furthermore, these incident holdings triggered areas of enhanced cattle surveillance within three kilometres (radial testing), and none have disclosed secondary infection thought to be epidemiologically linked to the index TB cases. The majority of OTF-S incidents were associated with a cattle movement source, but compared to OTF-W incidents there is a greater degree of uncertainty around this hypothesis due to the lack of *M. bovis* genotyping information.

Forward look

Based on the current trends the counties of the South East of England LRA are likely to maintain their target of <0.1% of OTF-W incidence by 2025.

Introduction

This report describes the level of bovine tuberculosis in cattle herds in the South East of England (including the counties of Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Kent, Greater London, Norfolk, Suffolk, Surrey, West Sussex, and the Isle of Wight) in 2019. Bovine TB is caused by the bacterium *Mycobacterium bovis* (*M. bovis*), and will subsequently be referred to as TB. This report explores the frequency and geographical distribution of TB in cattle herds. It examines what is likely to be driving TB in the South East of England, and the risks the disease in these counties may pose to neighbouring cattle. Although other sources may refer to TB 'breakdown(s)', this report will use the term 'incident(s)' throughout. This report is intended for individuals involved in the control of TB, both in the local area and nationally. This includes, but is not limited to: farmers, veterinarians, policy makers and the scientific community.

In 2014, the Government published its Strategy to achieve Officially TB Free (OTF) status for England by 2038. A key action was to recognise the different amount of TB in different parts of the country and to vary the approach to control accordingly. To this end, three management areas were established (Appendix 1). The South East of England forms part of the LRA. Overall, the LRA has a very low and stable incidence of infected herds. The current strategy seeks to rapidly control infection when it arises through high sensitivity testing of affected herds and temporarily enhanced local surveillance (radial and hotspot testing). Compulsory pre- and post-movement testing of cattle entering the LRA from higher risk areas of the UK is also performed to reduce the risk of TB introduction. The aim is to preserve the favourable disease status of this county so that it can be declared OTF as soon as possible.

Cattle industry

In general terms, there is a large proportion of small cattle herds (up to 50 animals per herd) in the counties of the South East of England (Figure 1). A higher number of cattle herds are concentrated in Norfolk, Kent, West Sussex and Suffolk in comparison to the rest of the counties included in this report. Norfolk, Kent and West Sussex also have the largest cattle herd sizes (501+ animals per herd). West Sussex, Kent and Surrey have the greatest proportion of dairy herds in relation to the total number of cattle per county (see Appendix 2).

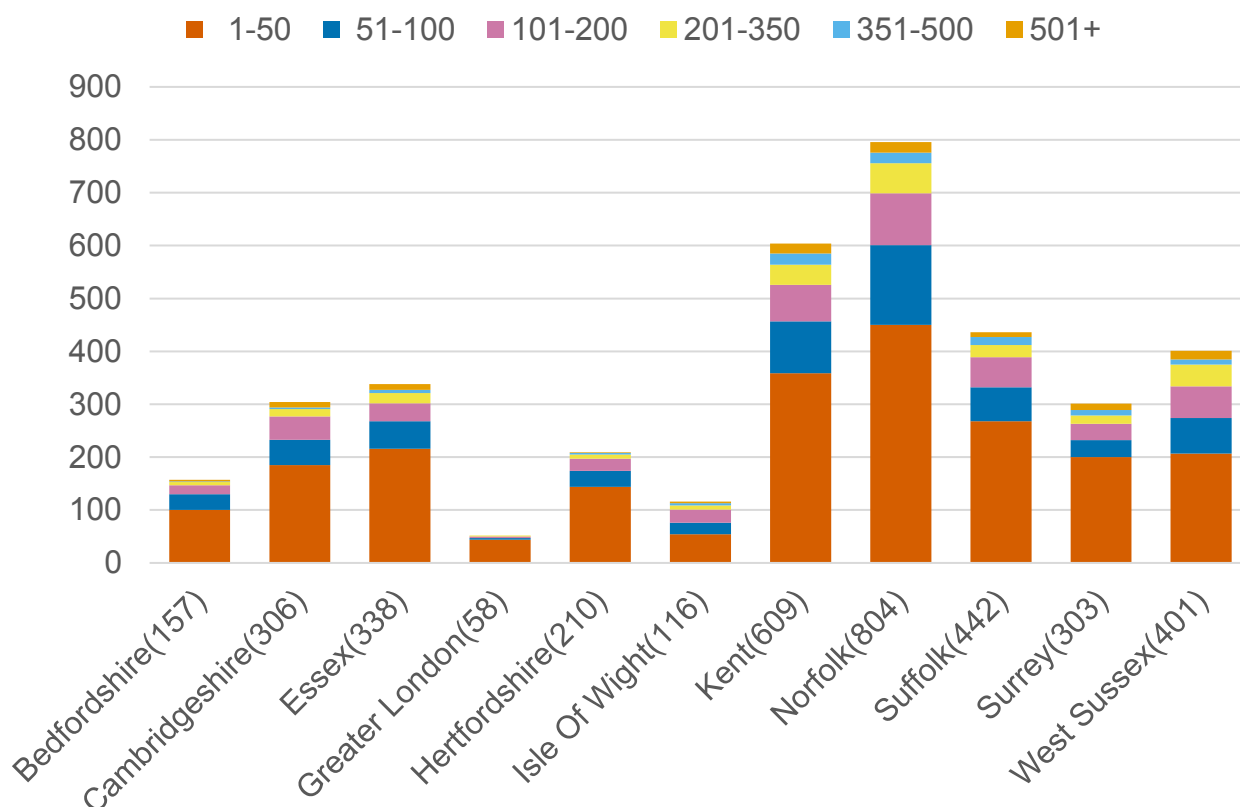


Figure 1: Number of cattle holdings in the South East of England, by herd size and county in 2019.

Finishing units

There are four active licensed finishing units (LFUs) in this region, all of which are subjected to annual re-approval visits by APHA: one in Norfolk, one in Suffolk and two in Cambridgeshire.

Markets

There are four regularly occurring approved livestock markets in this region, one in each of the counties of Norfolk, Suffolk, Essex and Kent. There are no APHA-approved sales/collections of TB-restricted cattle for onward consignment direct to a slaughterhouse.

Descriptive epidemiology of TB

Temporal TB trends

Unless otherwise specified, this report includes all new TB incidents detected during the reporting period. This includes Officially Tuberculosis Free Status Withdrawn (OTF-W) incidents and Officially Tuberculosis Free Status Suspended (OTF-S) incidents. OTF-W incidents are those in which at least one animal was identified with typical lesions of TB at post mortem (PM), and/or positive for *M. bovis* on culture from tissue samples. OTF-S incidents are those with one or more reactors to the Single Intradermal Comparative Cervical Tuberculin (SICCT) skin test, but without full confirmation of *M. bovis* infection by PM or bacterial culture.

The counties in the Southern region with the highest number of incidents in 2019 were West Sussex (with total of 13 incidents) followed by Surrey, Norfolk and Essex (total of six incidents each). Cambridgeshire and Hertfordshire had a total of four and five incidents respectively. The lowest numbers of incidents in 2019 were reported for the Isle of Wight (three incidents) followed by Bedfordshire and Greater London (with just one incident). The number of OTF-W and OTF-S incidents are specified per counties in Figure 2a, Figure 2b, Figure 2c, and Figure 2d. Most of the 2019 incidents were disclosed in January (nine cases) and March (13 cases) followed by April and May (five cases). Remaining incidents were disclosed during the summer and autumn (23 cases).

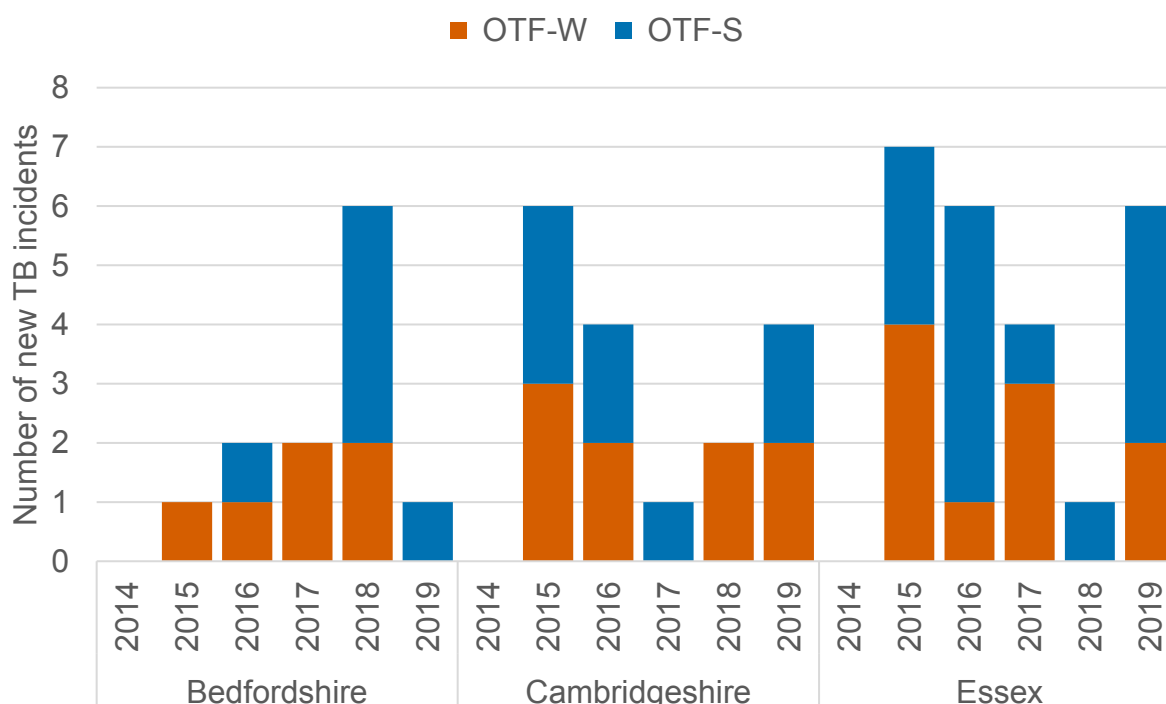


Figure 2a: Annual number of new TB incidents in Bedfordshire, Cambridgeshire, and Essex, 2014 to 2019.

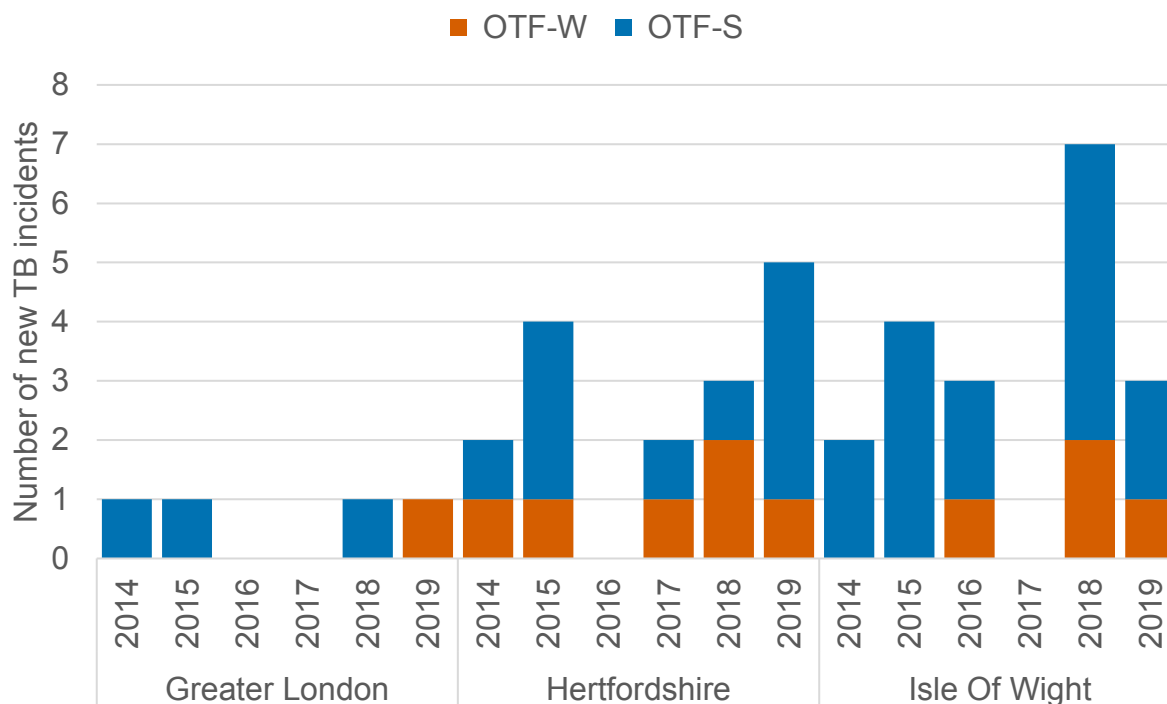


Figure 2b: Annual number of new TB incidents in Greater London, Hertfordshire, and Isle of Wight from 2014 to 2019.

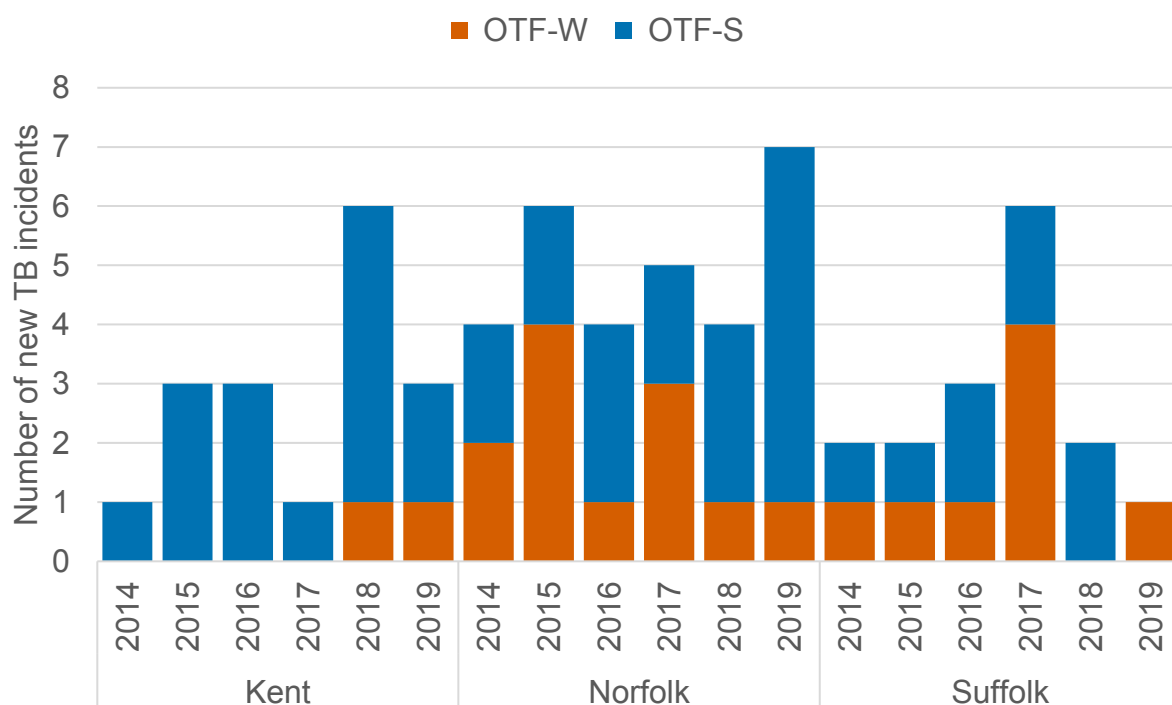


Figure 2c: Annual number of new TB incidents in Kent, Norfolk, and Suffolk from 2014 to 2019.

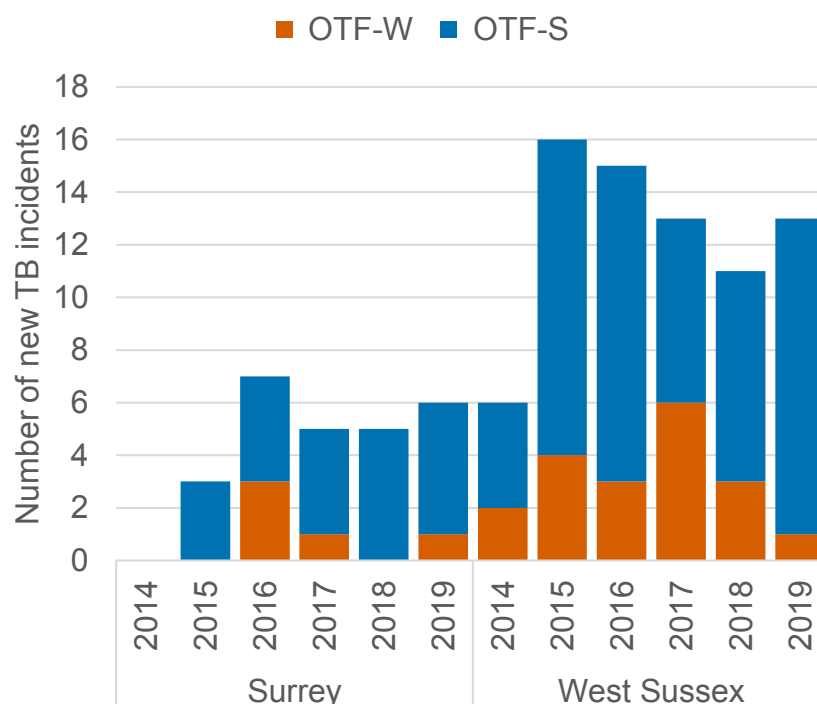


Figure 2d: Annual number of new TB incidents in Surrey and West Sussex from 2014 to 2019.

Geographical distribution of TB incidents

A significant number of TB incidents were disclosed in West Sussex (total of 13 incidents including one OTF-W), followed by Surrey, Norfolk and Essex (with a total of six incidents in each county, including one OTF-W each in Norfolk and Surrey). There were five incidents in Hertfordshire (one OTF-W, four OTF-S) and four incidents in Cambridgeshire (two OTF-W, two OTF-S). The Isle of Wight had three incidents (two OTF-S and one OTF-W). There was one OTF-W case in Greater London and only one OTF-S incident in Bedfordshire.

The number of TB incidents were concentrated in the areas of highest cattle density in Norfolk and Suffolk, West Sussex and Kent (Figure 3). During 2019, the total number of new TB cases (OTF-W and OTF-S incidents) detected in the region was 50, which represents an increase of two compared to the total number in 2018 (48 incidents).

There was one confirmed case of *M. bovis* infection in a non-bovine domestic animal, a cat in Greater London (see TB in Other Species).

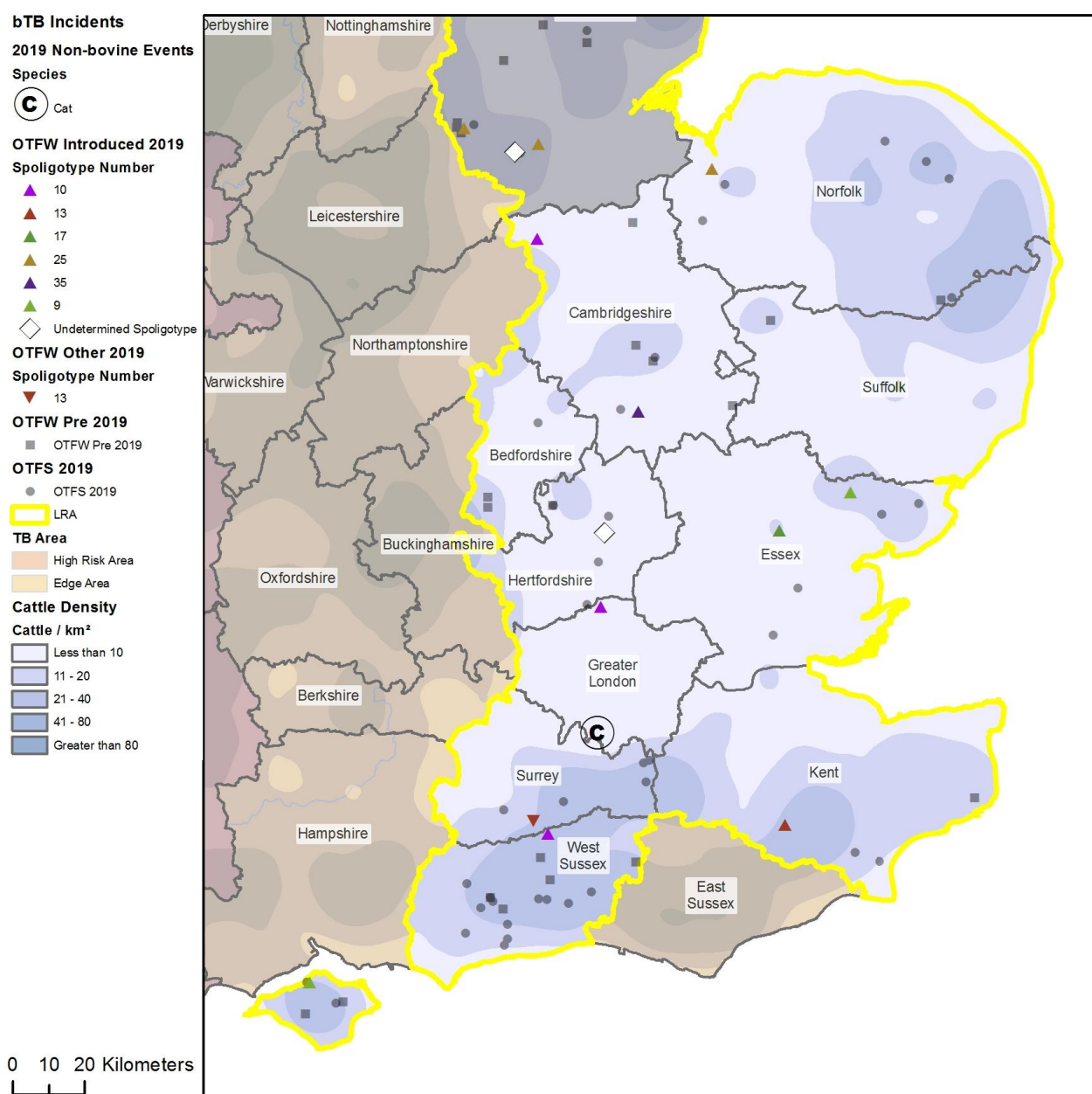
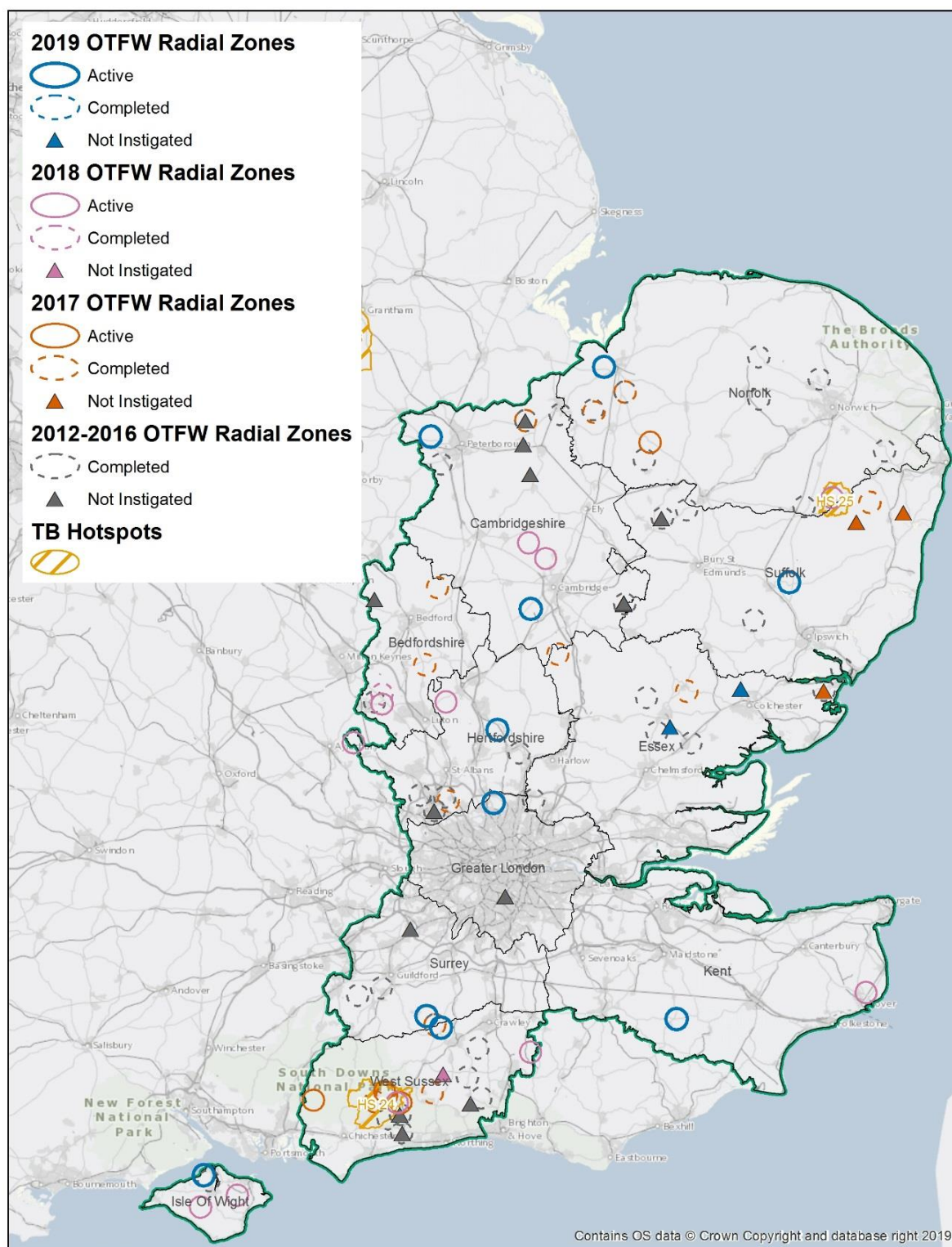


Figure 3: Location of cattle holdings in the South East of England region of the LRA with new TB incidents (OTF-W and OTF-S) in 2019, and cattle holdings with pre-2019 OTF-W incidents that are still ongoing at the end of 2019, overlaid on a cattle density map.

Potential hotspot areas

There were two potential hotspot areas active in the South East of England during 2019, located in West Sussex and Norfolk (Figure 4). The one in Norfolk (HS25 initiated in March 2019) was triggered by an OTF-W incident initiated by a homebred animal detected with TB lesions at slaughter in March 2018. This was the first OTF-W incident recorded in the parish of Needham. The index case could not be attributed to cattle purchase because only two animals had been purchased onto the holding from farms in the LRA in the last 10 years, both of which had clear TB histories.



Creator: GIS Team
Source: Sam
OTFW data as at 17th of April 2020
Ref: 20200428

Date: 28/04/2020

0 10 20 30 40 50 Kilometers

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Ordnance Survey 100051110

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Figure 4: Potential hotspot areas and OTFW radial surveillance zones that were active, completed or not instigated in the South East of England LRA during 2019, by year of initiation.

The genotype 25:a isolated in this parish in Norfolk was out of its homerange area and could not be linked to cattle movements or by other transmission pathways to the area of the country where this genotype is frequently isolated. By the end of 2019, only one badger carcase (with no visible lesions of TB and a negative culture result) had been collected in this potential hotspot area.

The potential hotspot area in West Sussex (HS24 initiated in March 2019) was triggered by a slaughterhouse case in April 2017. The source of TB was obscure, with no cattle movements recorded from the high risk area (HRA) or from premises which have had a TB incident. A very low number of movements were reported on to this holding in the last five years from the TB low risk area (LRA) and there were no contiguous cattle herds. The genotype of *M. bovis* isolated from the infected animal (11:a) was out of its homerange area. The wildlife surveillance in this hotspot has not yet yielded any relevant information.

Other characteristics of TB incidents

The duration of TB herd incidents that ended in 2019 varied between counties (Figure 5a, Figure 5b, Figure 5c, and Figure 5d). From all the TB incidents closed at the end of 2019, which includes some incidents starting before 2019, the majority resolved within 151-240 days (three to eight months). Those in the time interval of 151-240 days were likely to have passed either two, or three short-interval skin herd tests before restrictions were lifted. Some of the incidents in Cambridgeshire, Hertfordshire, Isle of Wight, Surrey and Kent lasted longer - in the 241-550 day range (up to 18 months).

West Sussex was the only county with a persistent TB incident (i.e. one that lasted over 551 days - more than 18 months).

Farms are impacted by TB restrictions in various ways depending on their cattle management systems. For dairy herds the issue is often finding an outlet for or having to rear calves which would normally have been sent to market. Those farms that usually sell stores rather than finished fat cattle have a limited outlet for these cattle, and usually with less of a return. Some, if feasible, adapt their business patterns and continue rearing them. Finishers can sell direct to slaughter or Approved Finishing Units but are required to apply for licences in order to buy in replacement stock.

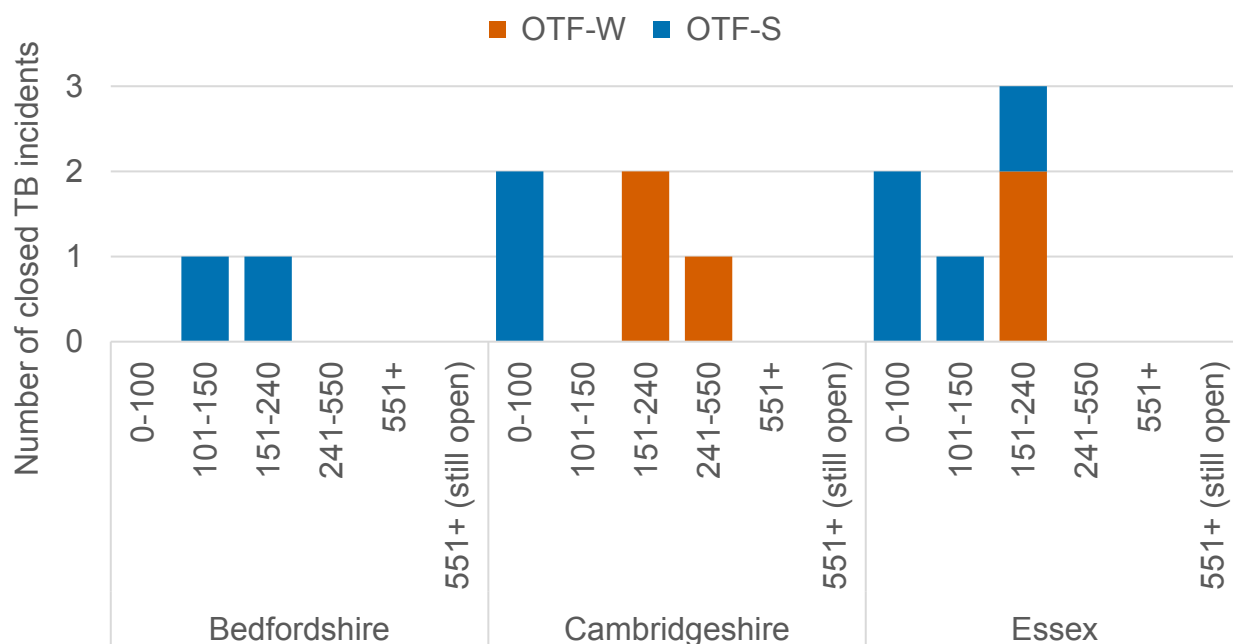


Figure 5a: Duration of TB incidents (OTF-W and OTF-S) that ended in 2019, in Bedfordshire, Cambridgeshire, and Essex. Note that Licensed Finishing Units (LFUs) have been excluded.

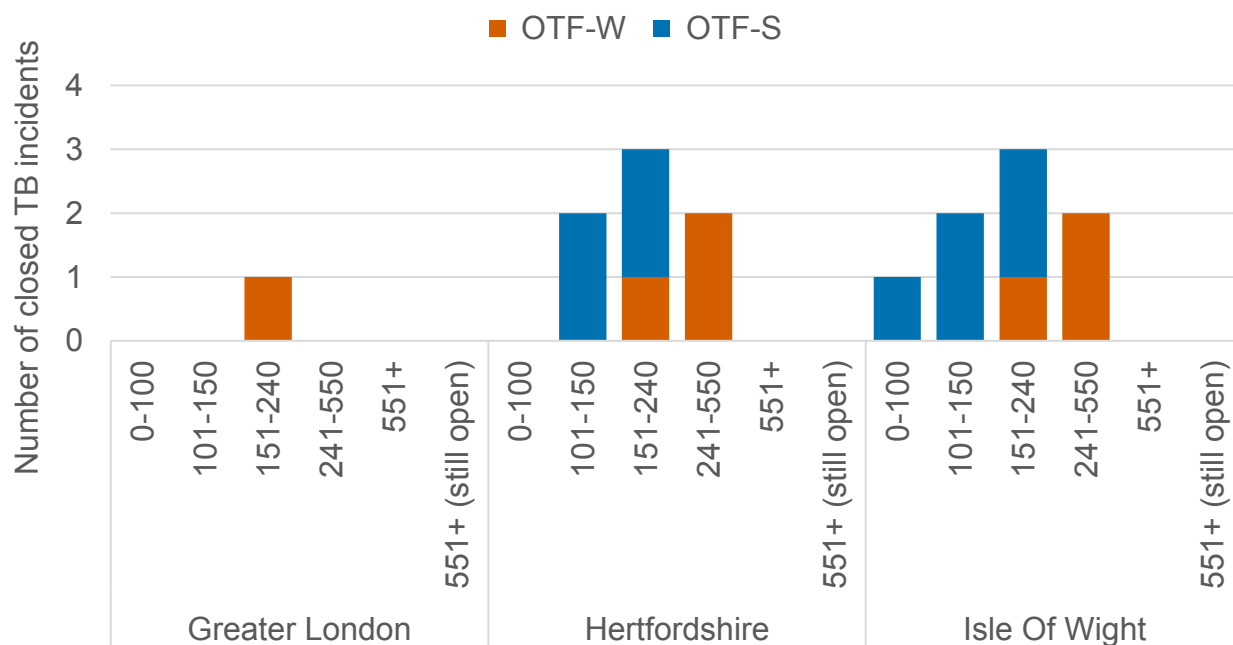


Figure 5b: Duration of TB incidents (OTF-W and OTF-S) that ended in 2019, in Greater London, Hertfordshire, and the Isle of Wight. Note that Licensed Finishing Units (LFUs) have been excluded.

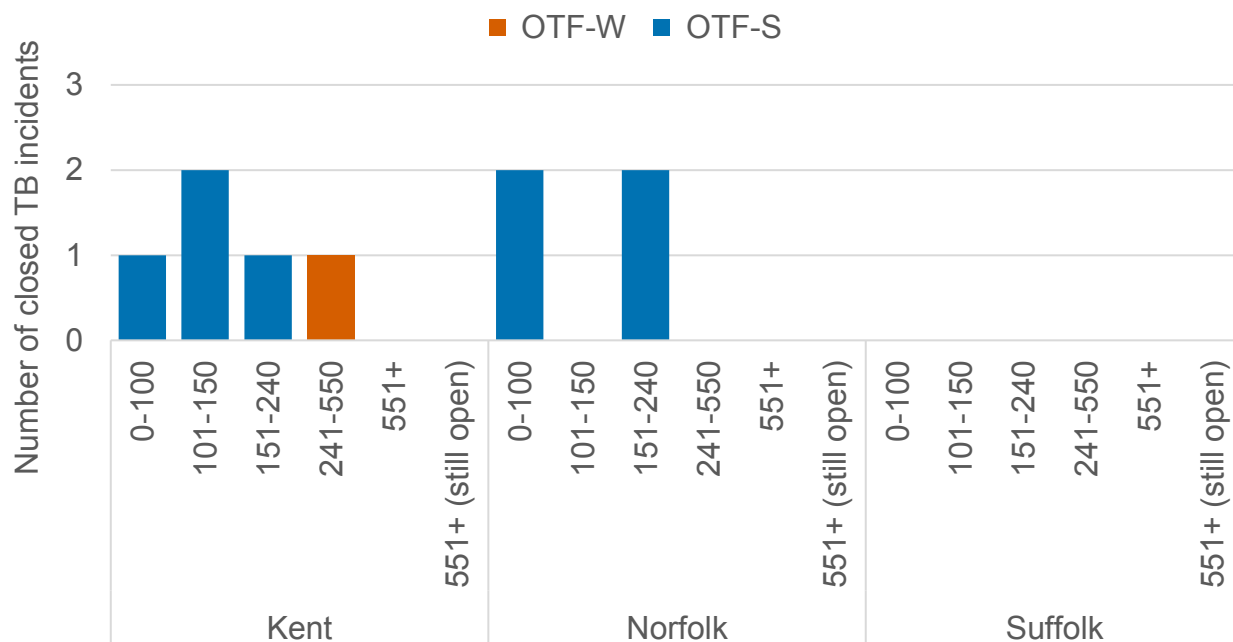


Figure 5c: Duration of TB incidents (OTF-W and OTF-S) that ended in 2019, in Kent, Norfolk, and Suffolk. There are no data displayed for Suffolk as no incidents ended in 2019 and ongoing incidents are less than 551 days. Note that Licensed Finishing Units (LFUs) have been excluded.

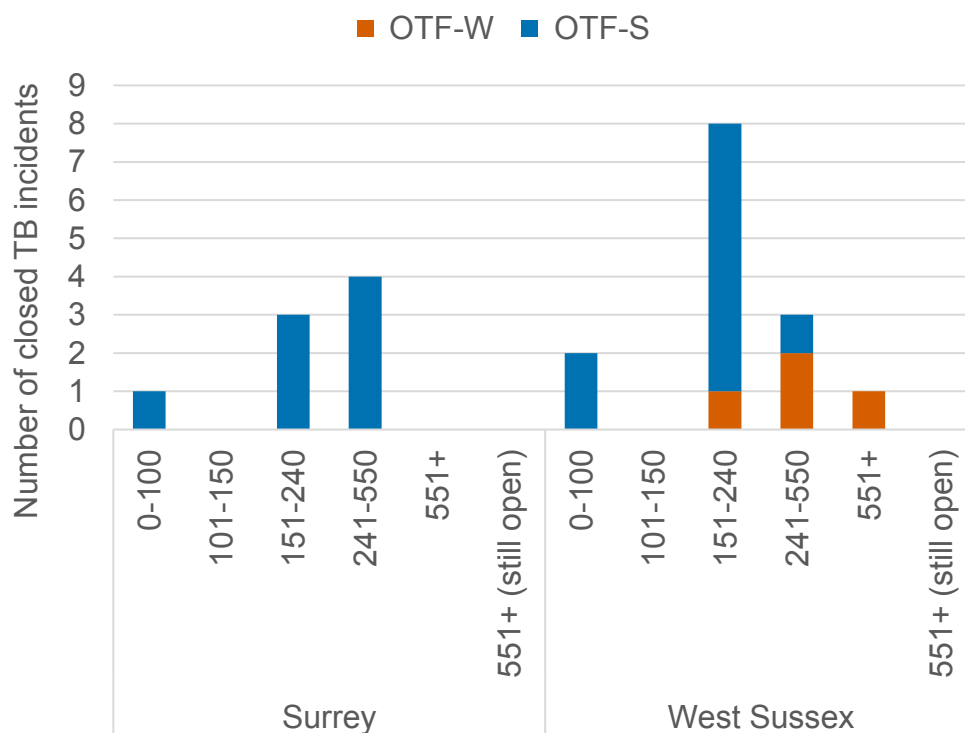


Figure 5d: Duration of TB incidents (OTF-W and OTF-S) that ended in 2019, in Surrey and West Sussex. Note that Licensed Finishing Units (LFUs) have been excluded.

The genotypes identified in 2019 (Figure 6) were all attributable to the purchase of cattle from the HRA and Edge.

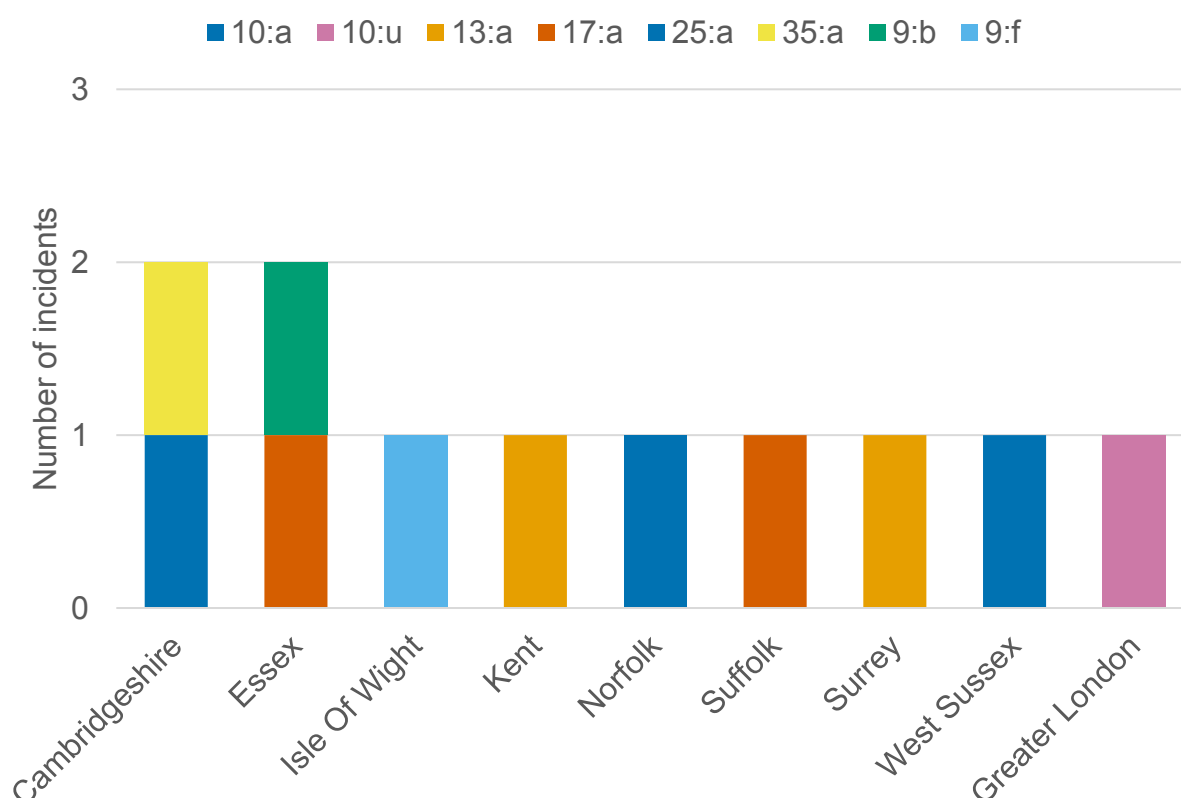


Figure 6: Genotypes of *M. bovis* identified in herds with OTF-W incidents in the South East of England LRA in 2019, by county.

Suspected sources, risk pathways and key drivers for TB infection

The key drivers of the few TB incidents detected in the reporting area were as follows:

- Cattle movements from the HRA of England and Wales and the Edge
- Residual infection
- Undetermined sources

It can be challenging to retrospectively establish the route of infection for a TB incident herd. The Animal and Plant Health Agency (APHA) aims to complete an epidemiological assessment for all TB incidents in the LRA (both OTF-W and OTF-S). This includes a thorough on-farm investigation and scrutiny of routinely collected data; such as cattle movement records, and the results of molecular analyses where available.

During the assessment up to three risk pathways of infection are selected for each herd. Each risk pathway is given a score that reflects the likelihood of that pathway bringing TB

into the herd. The score assigned has been updated this year to reflect developing understanding of how likelihood is being assessed in practice. It is recorded as either definite (score 8), most likely (score 6), likely (score 4) or possible (score 1). The source(s) for each incident are weighted by the certainty ascribed. Any combination of definite, most likely, likely or possible can contribute towards the overall picture for possible routes of introduction in to a herd. If the overall score for a herd is less than six, then the score is made up to six using the 'Other/Unknown Source' option. Buffering up to six in this way helps to reflect the uncertainty in assessments where only 'likely' or 'possible' sources are identified.

The weight of infection outputs in Appendix 4 are produced by combining the data from multiple herds and providing the proportion of pathways in which each source was identified, weighted by certainty that each source caused the introduction of TB. The outputs do not show the proportion of herds where each pathway was identified (this is skewed by the certainty calculation). Genotyping of *M. bovis* isolates can be a powerful tool in identifying a likely source of infection, however genotypes are not determined for OTF-S herds. The inclusion of OTF-S herds in these calculations increase the uncertainty in the outputs. As a result, the relative proportions of each risk pathway is very approximate and only broad generalisations should be made from these data. A more detailed description of this methodology is provided in the Explanatory Supplement to the 2019 bovine TB epidemiology report for England

(<https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2019>).

Out of the 12 OTF-W TB incidents in 2019, 11 of these were sporadic 'one-off' incidents with no previous infection history in the herd. The predominant driver of these incidents in the South East of England LRA counties was the introduction of TB through the purchase of cattle with undisclosed infection (mostly from the HRA and Edge TB areas of England and Wales with a few from farms in the LRA which engage in high risk practice of sourcing cattle from herds in the HRA (Figure 7 and Appendix 4).

Risk pathways for OTF-S incidents are more difficult to attribute when there is not a clear link to purchase of infected cattle, and due to the lack of *M. bovis* genotyping information. In addition to cattle movements (purchase), risk pathways recorded were residual infection from a previous incident and non-specific reactor

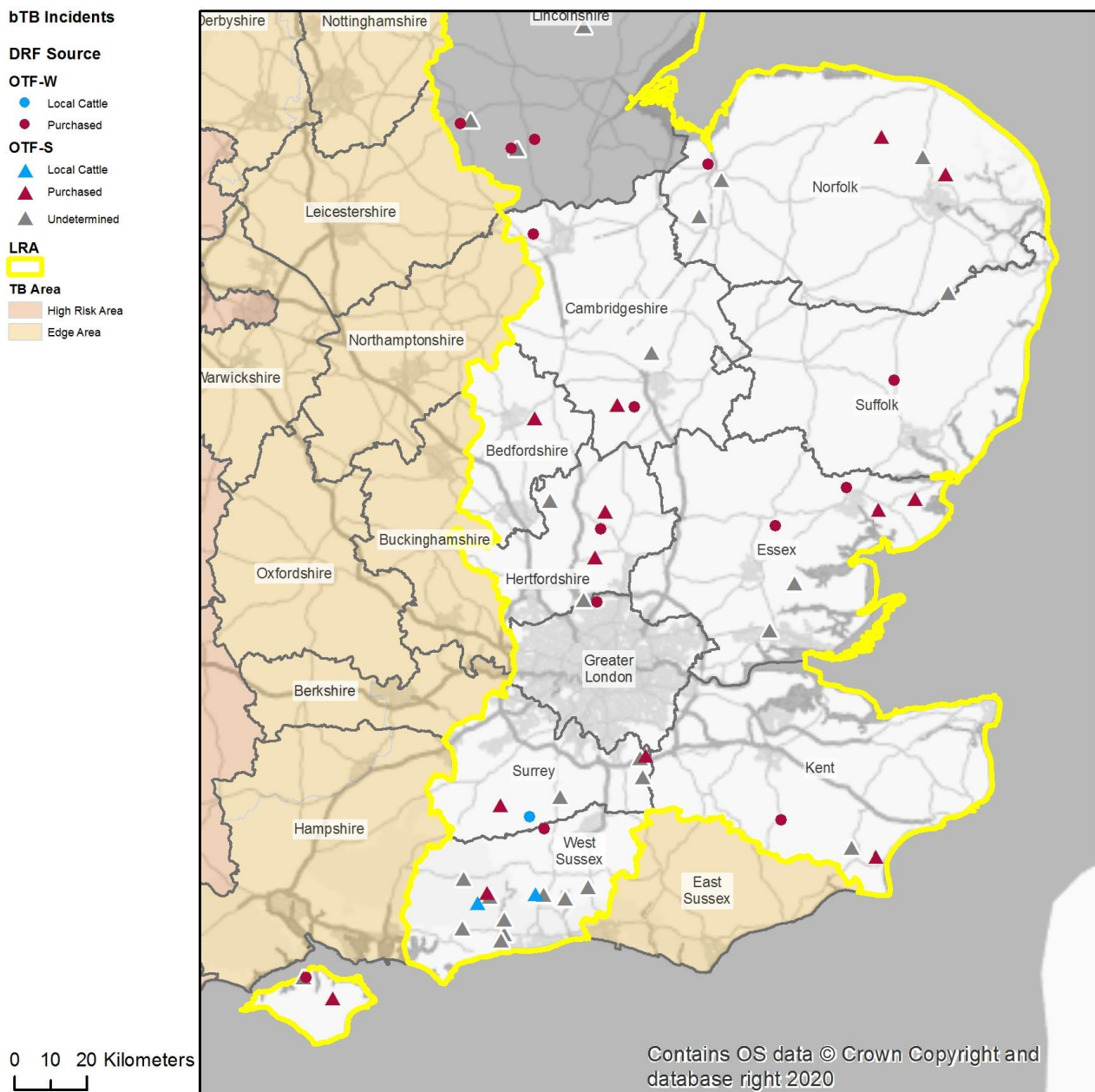


Figure 7: Map of the source of infection pathway recorded with the highest level of certainty for all TB incidents (OTF-W and OTF-S) in the South East of England, which started in 2019.

TB in other species

M. bovis infection was confirmed in January 2019 in the carcase of a 17 week old cat from Surrey referred to APHA by the PVS (see Figure 3). The findings were consistent with generalised TB with typical lesions in the mesenteric lymph nodes and lungs, with acid-fast bacilli seen on two stained smears. Genotype 11:e of *M. bovis* was isolated in bacteriological cultures at APHA. The commonest distribution area (homerange) of this genotype in cattle is in a part of Devon where the cat was bred on a small holding. The cat's mother was allowed occasional access to the garden whilst nursing the kittens providing a possible transmission route - becoming infected or contaminated from the

environment with *M. bovis*. Whilst in Surrey, the cat was housed entirely indoors, and was only fed a manufactured raw pet food.

Genotype 11:e and whole genome sequence information suggests that the cat was infected whilst on the original holding, because of the close geographical proximity to the highest cattle incidence area of genotype 11:e and closest genetically related isolates.

Detection of incidents

A large proportion of OTF-W and OTF-S cases were detected at routine herd tests and radial tests (Figure 8). Other methods of detection include slaughterhouse surveillance, trace tests, whole herd tests, post-movement and pre-movement tests, post incident six month and 12 month tests, and check tests of new herds. The surveillance methods which disclosed the 12 OTF-W incidents occurring in 2019 were routine herd testing (42%), slaughterhouse post-mortem examination (25%), trace testing (25%) and radial testing (8%).

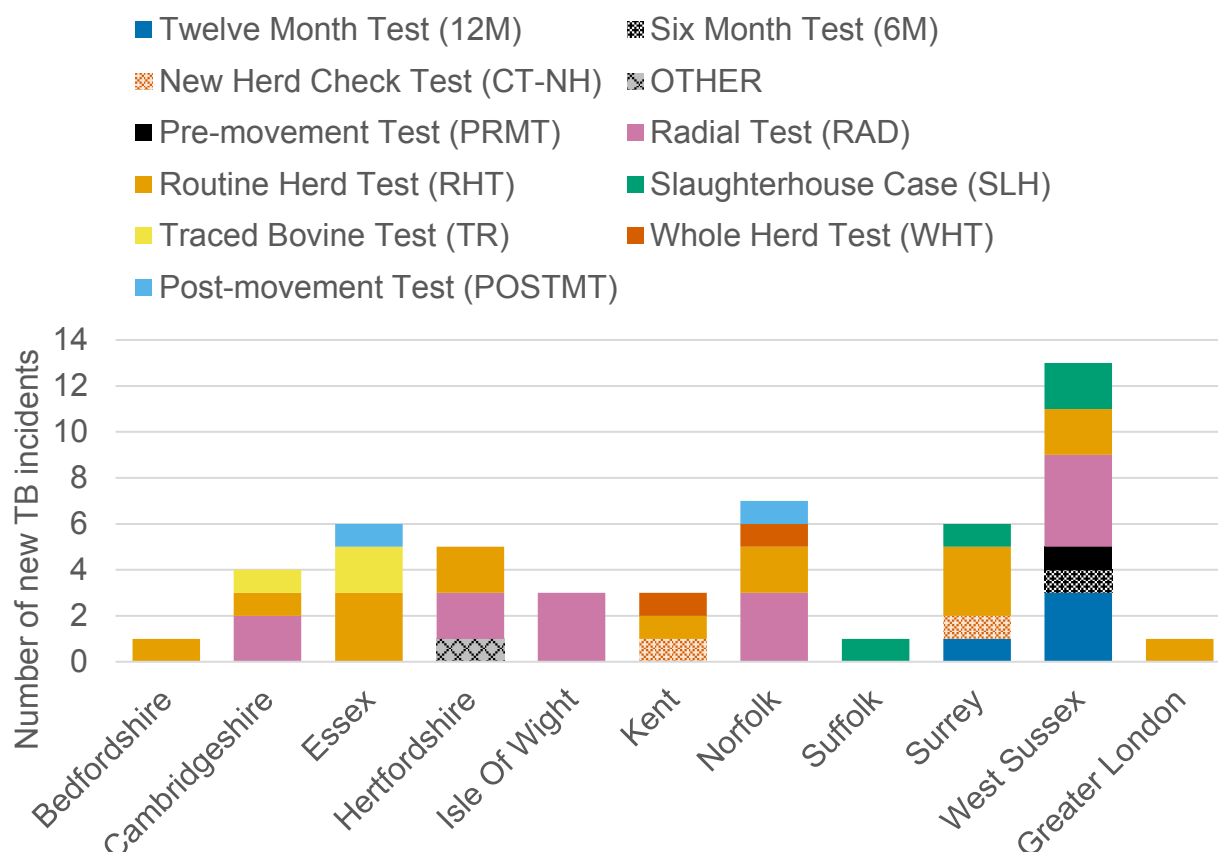


Figure 8: Number of TB incidents (OTF-W and OTF-S) in the South East of England in 2019, disclosed by different surveillance methods, by county.

Eleven of the OTF-W cases disclosed in 2019 had not experienced a TB incident within the previous three years, suggesting that these were not related to previous incidents. There was only one OTF-W incident herd in Surrey which had sustained another OTF-W incident in the previous three years. Residual cattle infection from the previous incident is the most likely cause of this recurrence. From the total number of incidents (OTF-W and OTF-S) only five cases were disclosed at herd check tests conducted six or 18 months after the conclusion of an incident, suggesting that TB infection was cleared effectively from most herds by statutory short interval skin testing and supplementary IFN- γ testing.

Skin test reactors and gamma interferon test positive animals removed

The total number of reactors detected in the South East of England counties of the LRA during 2019 was 200 (Figure 9a, Figure 9b, Figure 9c and Figure 9d), of which 108 were detected by the skin test and 92 by IFN- γ testing. Despite the total number of TB incidents increasing from 49 in 2018 to 50 in 2019 this was a decrease of 116 reactor cattle from 2018 equivalent to a 37% decrease in the number of reactor cattle disclosed by testing. Most of this reduction was in the number of IFN- γ reactors which fell by 53% (196 to 92). This is partly explained by one less OTF-W incident (from 13 to 12) and the change in policy in 2019 to limit the number of herd IFN- γ tests per incident to one. However, there would have been only a minor effect of the policy change on the total annual numbers of IFN- γ test positive animals as only one incident in 2018 had a second herd IFN- γ test.

The counties of West Sussex (45 reactor cattle), Hertfordshire (54 reactor cattle) and Cambridgeshire (29 reactor cattle) had the highest number of reactor cattle in the South East of England. However, the highest number of reactors detected per incidents disclosed during 2019 were in Hertfordshire, Cambridgeshire, Suffolk and the Isle of Wight.

TB surveillance testing can also be logistically challenging for farmers. This is particularly true in large herds of beef cattle where animals are often not accustomed to being handled and which, particularly during the summer months, may be located on parcels of land away from the home farm.

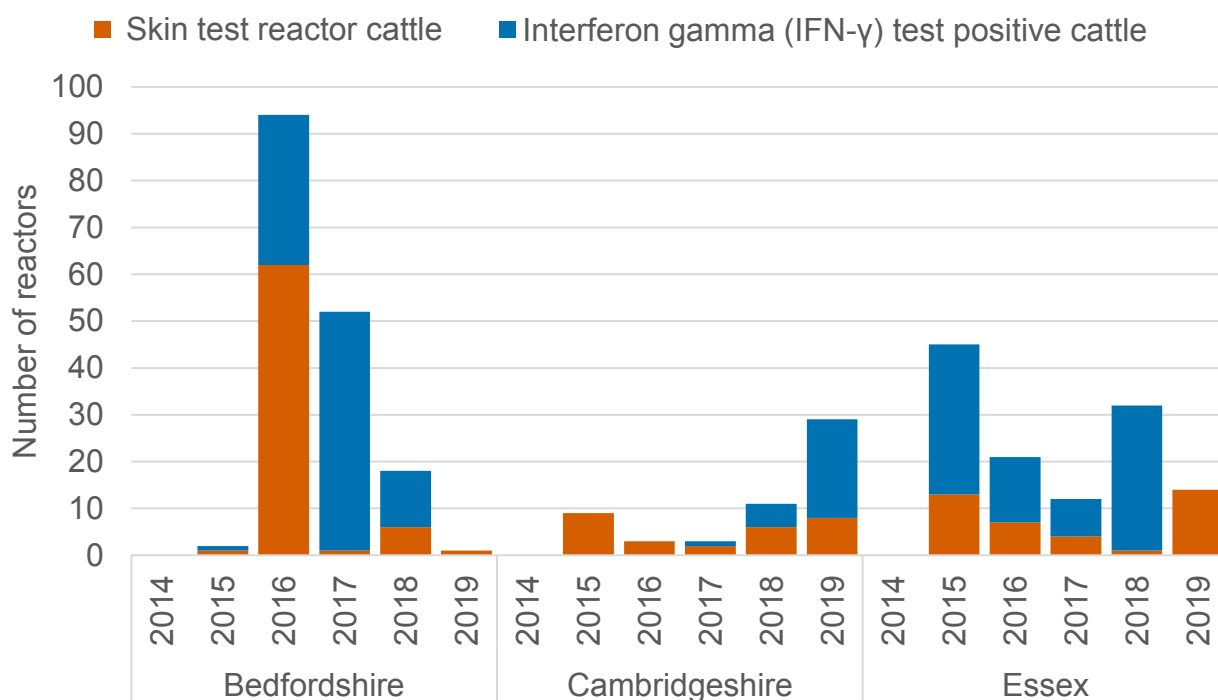


Figure 9a: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons, in Bedfordshire, Cambridgeshire, and Essex, 2014 to 2019.

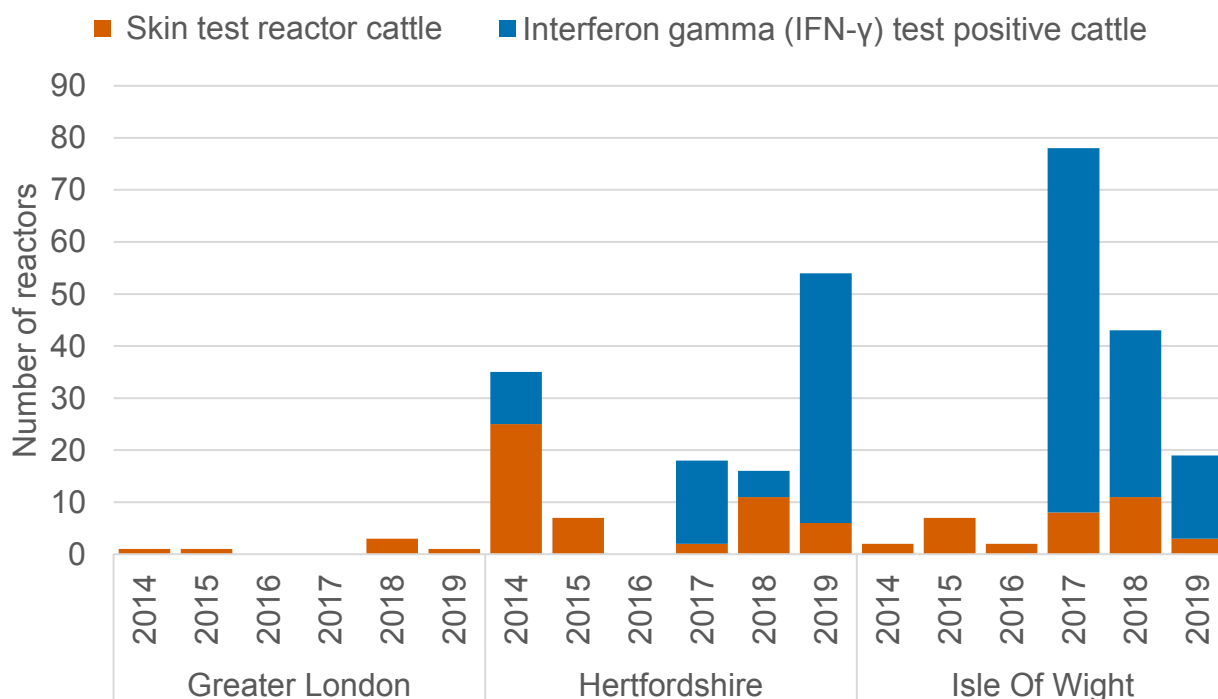


Figure 9b: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons, in Greater London, Hertfordshire, and the Isle of Wight, 2014 to 2019.

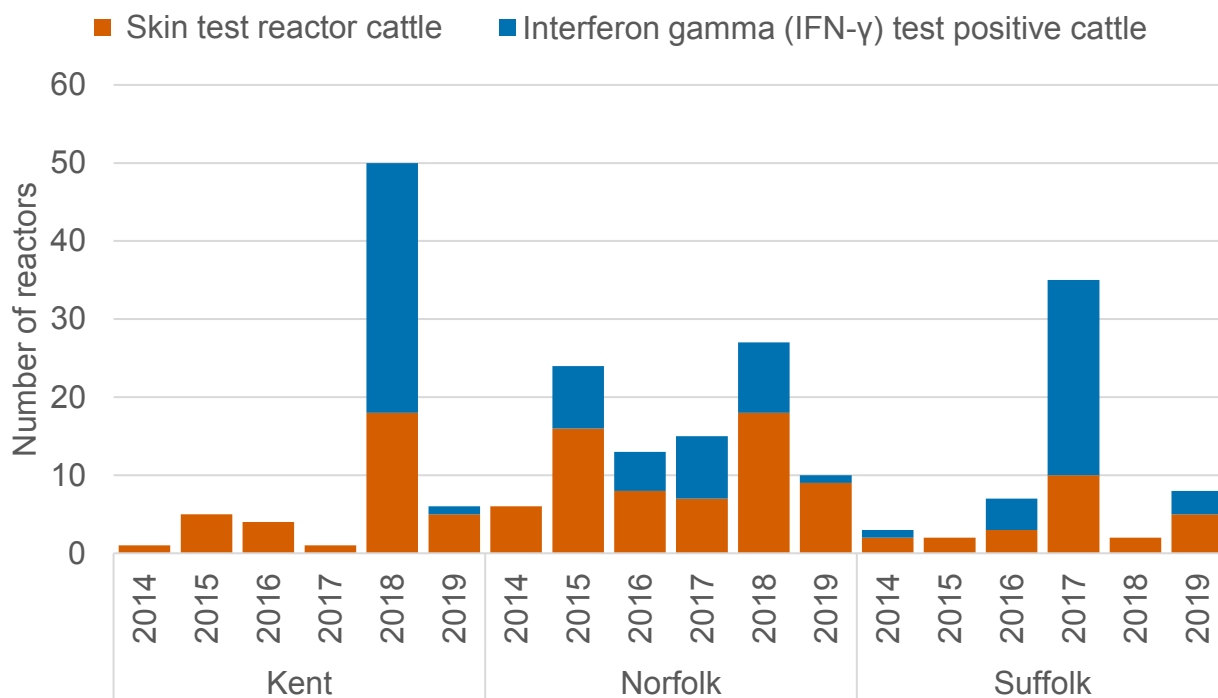


Figure 9c: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons, in Kent, Norfolk, and Suffolk, 2014 to 2019.

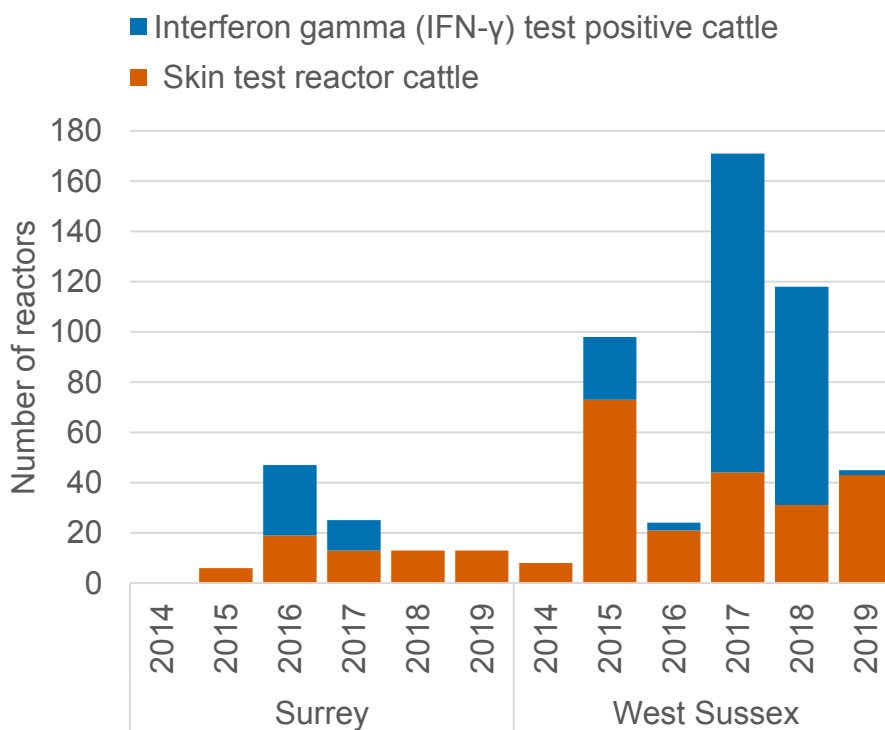


Figure 9d: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons, in Surrey and West Sussex, 2014 to 2019.

Summary of risks to the South East of England

The South East of England LRA countries are bordered by five adjacent counties in the Edge Area: Northamptonshire, Buckinghamshire, Berkshire, Hampshire and East Sussex.

The risk of bovine TB spreading from Northamptonshire to the adjacent Low Risk Area (LRA), represented by Cambridgeshire and Bedfordshire, is currently low. Both of these counties have a low cattle and cattle herd density and border the parts of Northamptonshire where cattle density is the lowest.

There is high cattle herd density in the western portions of Bedfordshire and Hertfordshire which border the Edge county of Buckinghamshire. Buckinghamshire could potentially pose a risk to the LRA counties exacerbated by the convoluted border shared with Hertfordshire which embeds part of the county in the Edge Area. However, the incidents in Hertfordshire and Bedfordshire have occurred in the middle and eastern parts of these two counties away from this border. Furthermore, the incidents have been attributed to movements of cattle with undisclosed infection.

West Sussex and Surrey have higher cattle herd densities concentrated in their middle and eastern areas, away from their county borders with the Edge Area counties of Berkshire and Hampshire. On the eastern and south-eastern boundaries of Berkshire, the M3 and M25 motorways may act as a physical barrier to spread of infection through wildlife movement to the LRA.

Kent is contiguous to East Sussex, another county of the Edge Area. However, there is no evidence to suggest the presence of a wildlife reservoir of infection in Kent and its TB incidents remain sporadic and mostly clearly attributed to purchased cattle. The majority of the incidents in East Sussex occur in the former HRA (southern) section of the county where infection is endemic in cattle and badgers, away from the border with Kent and West Sussex. The endemic TB area of East Sussex has remained relatively stable over the years and there is little evidence to suggest that it has expanded.

The infection front in west Berkshire has not advanced much in the last year and is still some 35km from the LRA county of Surrey. Its advance to the east may be slowed by the presence of large conurbations such as Reading, Wokingham and Bracknell, where there are low cattle and wildlife densities.

The closest distance to Surrey from the endemic area for genotypes 10:a and 10:u in the north-west of Hampshire, is about 20km along the northern boundary of Hampshire. However, in the path of this infection front, if it continues to spread, is the large conurbation running south to north comprising Farnham, Aldershot, Farnborough and Camberley. This may present a geographical barrier to wildlife spread and also has low cattle density.

There are no known endemic areas in close proximity to the southern LRA counties apart from the former HRA section of East Sussex, which is adjacent to West Sussex. This generalisation is caveated by the very restricted wildlife surveillance currently being carried out, which is only in areas of enhanced surveillance (hotspot areas).

Summary of risks from the South East of England to surrounding areas

The south-eastern counties of the LRA represent a low risk of TB to the surrounding areas. The counties with greater cattle herd densities (Norfolk, West Sussex, and Kent) are potentially a greater risk to other surrounding counties in comparison to other counties with lower cattle densities.

Purchase of cattle from markets and farms in the HRA and Edge Area for rearing and finishing in the south-eastern LRA counties poses the threat of introducing genotypes linked to endemic areas in England and Wales.

Assessment of effectiveness of controls and forward look

Despite the current controls, there is sporadic introduction of TB into the counties through the purchase of undetected infected cattle. There is no evidence in 2019 to suggest there is presence of a wildlife reservoir of infection in the southern LRA counties. However, targeted active surveillance for TB infection in wildlife would be valuable to monitor presence of endemic infection in the areas of the southern LRA which border the Edge TB area especially if endemic infection has been reported in close proximity. The area most at risk is the border of West Sussex with the former HRA of East Sussex although the likely endemic TB area in this county is still some distance away.

The radial testing policy is helping to reduce the risk of lateral spread of TB and increases the likelihood of early detection of areas of endemic infection should they emerge. This radial test is a valuable surveillance test, taking into account that the routine herd test is carried out every four years with the potential to allow infection to spread within the herd and beyond during the period between tests.

The mandatory post-movement testing policy introduced in April 2016 for cattle entering farms in the LRA (to live) from the annual or six monthly surveillance areas of England and Wales is now well embedded in the southern LRA region.

There are no known business or land (temporary land association) links which could facilitate the spread to the LRA.

The recommendation would be to continue to utilise all control measures and to encourage biosecurity awareness through communications with the farmers' own veterinary providers and farming associations.

Appendices

Appendix 1: overview of risk and surveillance areas of England and Low Risk Area objectives and controls

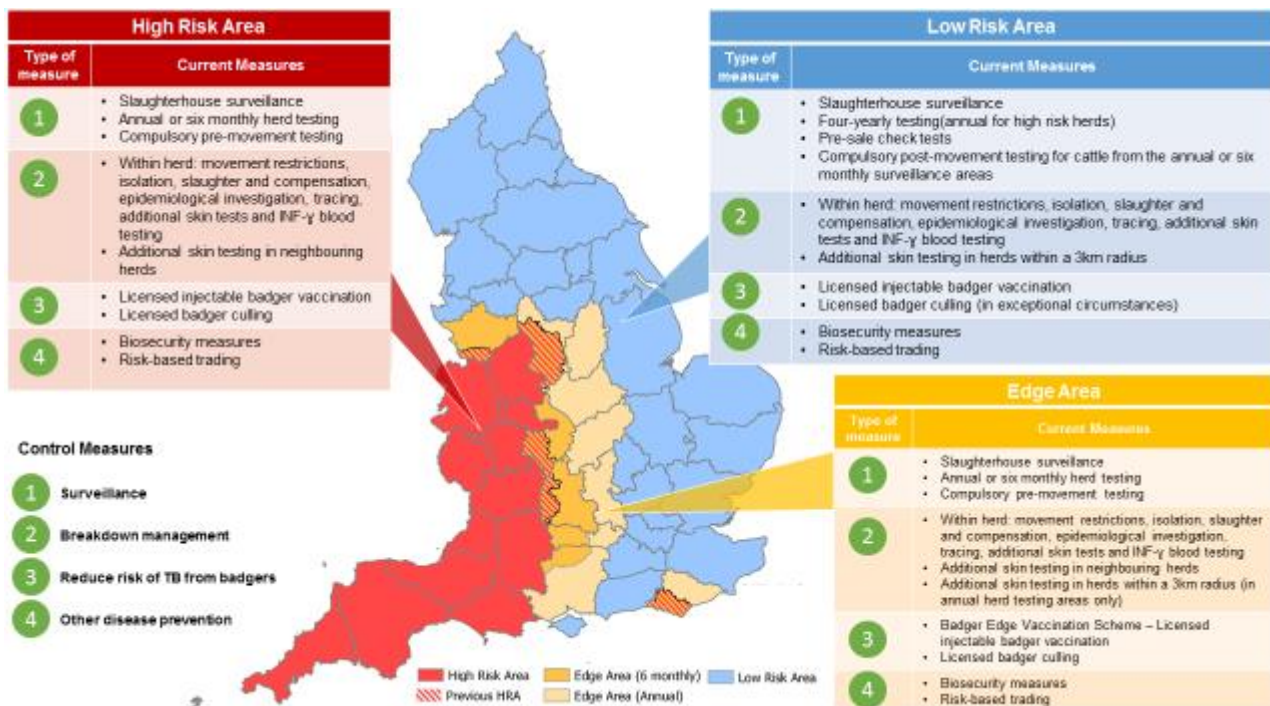


Figure A1.1: TB risk and surveillance areas of England effective since January 2018, as set out in the Government's Strategy for Achieving Officially Tuberculosis-Free Status for England. Map based on information published on www.tbhub.co.uk.

Policy objectives for the Low Risk Area

Progressive attainment of OTF status for individual counties (or groups of counties) within the current LRA, with the declaration of OTF status for all LRA counties by 2025. For more information about the government's strategy for achieving Officially Bovine Tuberculosis Free status for England, published in 2014 and independently reviewed in 2018, see:

<https://www.gov.uk/government/publications/a-strategy-for-achieving-officially-bovine-tuberculosis-free-status-for-england>

<https://www.gov.uk/government/news/government-sets-out-next-phase-of-strategy-to-combat-bovine-tuberculosis>

Key control measures in the Low Risk Area

Surveillance:

- default four-yearly routine surveillance (skin) testing of cattle herds, with annual testing for a small proportion of high risk herds
- voluntary pre-sale skin check tests
- compulsory pre- and post-movement testing for cattle entering farms in the LRA (to live) from the annual or six monthly surveillance areas of England and Wales
- additional targeted surveillance (radial testing) of cattle herds located within a 3km radius of new incident herds with OTF status withdrawn (OTF-W) following the detection of lesion-positive test reactors and/or culture-positive animals
- slaughterhouse (SLH) surveillance (through PM meat inspection) of all cattle slaughtered for human consumption

Management of incidents:

- herd movement restrictions, isolation and rapid slaughter of TB test reactors and any direct contacts with statutory compensation payments to farmers, epidemiological investigation, tracing tests (at severe interpretation), and short interval skin testing supplemented in all herds affected by OTF-W incidents with mandatory interferon gamma (IFN- γ) blood testing

TB controls in the wildlife reservoir (badgers):

- licensed injectable badger vaccination
- licensed badger culling in exceptional circumstances, where *M. bovis* infection has been confirmed in badgers and it has a clear epidemiologically link with a local cluster of TB in cattle (e.g. East Cumbria TB hotspot)

Other measures:

- biosecurity measures
- promotion of responsible sourcing of cattle (e.g. through the use of the ibTB online (www.ibtb.co.uk) mapping application)

Summary of enhanced TB control measures in the South East of England

There were no changes in the routine skin testing surveillance regime of cattle herds in this region in 2019. The mandatory post-movement testing policy introduced in April 2016 for cattle imported from higher risk areas of GB is well embedded in the region

Radial testing zones were set up around 3km of all the new OTF-W incidents detected in the region (Figure 4). Targeted surveillance (radial testing) around OTF-W cattle herds disclosed 14 new incidents (13 OTF-S and 1 OTF-W), the same number as in 2018, although there is no evidence to suggest that the new incidents are epidemiologically related to the respective index cases.

There have been no exemptions applied to the mandatory deployment of the IFN- γ blood test in new OTF-W incident herds.

No known cases of human *M. bovis* infection in the region attributable to recent contact with infected animals.

There were no known non-specific or suspected fraudulent skin test reactors.

There were no incidents involving producer-retailers of raw cows' drinking milk, or on open farms.

Appendix 2: cattle industry in the South East of England

Table A2.1: Number of cattle premises by size band in each county at 1 January 2019.
(RADAR data)

Size of Herds	Un*	1-50	51-100	101-200	201-350	351-500	501+	Total Number of Herds	Mean Herd Size	Median Herd Size
Number of Herds in Bedfordshire	0	100	30	17	6	1	3	157	68	30
Number of Herds in Cambridgeshire	2	185	48	44	14	3	10	306	88	31
Number of Herds in Essex	0	216	52	34	19	6	11	338	86	28
Number of Herds in Greater London	6	44	3	3	2	0	0	58	29	5
Number of Herds in Hertfordshire	1	144	30	23	8	3	1	210	55	23
Number of Herds in Isle of Wight	0	54	22	25	8	4	3	116	98	56
Number of Herds in Kent	5	359	98	69	38	21	19	609	93	31
Number of Herds in Norfolk	8	450	151	98	57	20	20	804	92	37
Number of Herds in Suffolk	6	268	64	57	23	15	9	442	80	26

Size of Herds	Un*	1-50	51-100	101-200	201-350	351-500	501+	Total Number of Herds	Mean Herd Size	Median Herd Size
Number of Herds in Surrey	2	200	32	31	16	10	12	303	91	21
Number of Herds in West Sussex	0	207	67	60	41	10	16	401	110	43

*The number of herds with an undetermined size.

Table A2.2: Number of animals by breed purpose in each county at 1 January 2019.

Breed Purpose	Beef	Dairy	Dual purpose	Unknown	Total
Number of Cattle in Bedfordshire	8062 (75%)	2291 (21%)	351 (3%)	1 (<0.01%)	10,705
Number of Cattle in Cambridgeshire	19,992 (74%)	5872 (21%)	1010 (3%)	0	26,874
Number of Cattle in Essex	22,151 (75%)	5691 (19%)	1327 (4%)	3 (~0.01%)	29,172
Number of Cattle in Greater London	1254 (73%)	337 (20%)	116 (7%)	0	1707
Number of Cattle in Hertfordshire	9060 (79%)	1974 (17%)	409 (3%)	2 (<0.02%)	11,445
Number of Cattle in Isle of Wight	8508 (74%)	2688 (23%)	208 (1%)	2 (<0.02%)	11,406
Number of Cattle in Kent	36,067 (63%)	19,510 (34%)	945 (1%)	2 (<0.01%)	56,524

Breed Purpose	Beef	Dairy	Dual purpose	Unknown	Total
Number of Cattle in Norfolk	58,472 (79%)	12,609 (17%)	2915 (3%)	6 (<0.01%)	74,002
Number of Cattle in Suffolk	24,751 (69%)	6817 (19%)	3807 (10%)	3 (<0.01%)	35,378
Number of Cattle in Surrey	17,763 (64%)	8469 (30%)	1476 (5%)	0	27,708
Number of Cattle in West Sussex	23,952 (54%)	18,298 (41%)	1753 (3%)	9 (~0.02%)	44,012

Appendix 3: summary of headline cattle TB statistics

Table A3.1a: Herd-level summary statistics for TB in cattle in 2019 for Bedfordshire, Cambridgeshire, Essex, and Greater London.

Herd-level statistics	Bedfordshire	Cambridgeshire	Essex	Greater London
(a) Total number of cattle herds live on Sam at the end of the reporting period	188	396	433	73
(b) Total number of cattle herds subject to annual TB testing (or more frequent) at the end of the reporting period (any reason)	24	57	19	17
(c) Total number of whole herd skin tests carried out at any time in the period	67	149	107	31
(d) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	61	114	91	25
(e) Total number of OTF cattle herds at the end of the report period (i.e. herds not under any type of TB2 restrictions)	184	384	425	70
(f) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period.	188	393	432	73
(g) Total number of new TB incidents detected in cattle herds during the report period	1	4	6	1
• OTF status suspended (OTF-S)	1	2	4	0
• OTF status withdrawn (OTF-W)	0	2	2	1

Herd-level statistics	Bedfordshire	Cambridgeshire	Essex	Greater London
(h) Of the new OTF-W herd incidents, how many:				
<ul style="list-style-type: none"> occurred in a holding affected by another OTF-W incident in the previous three years? 	0	0	0	0
<ul style="list-style-type: none"> could be considered secondary to a primary incident based on current evidence? 	0	1	2	0
<ul style="list-style-type: none"> were triggered by skin test reactors or 2xIRs at routine herd tests? 	0	1	0	1
<ul style="list-style-type: none"> were triggered by skin test reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, post-movement, etc.)? 	0	1	2	0
<ul style="list-style-type: none"> were first detected through routine slaughterhouse TB surveillance? 	0	0	0	0
(i) Number of new incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds				
<ul style="list-style-type: none"> OTF-S 	0	2	0	0
<ul style="list-style-type: none"> OTF-W 	0	0	0	0

Herd-level statistics	Bedfordshire	Cambridgeshire	Essex	Greater London
(j) Number of OTF-W herds still open at the end of the period (including any ongoing OTF-W incidents that began in a previous reporting period)	0	3	0	0
(k) New confirmed (positive <i>M. bovis</i> culture) incidents in non-bovine species detected during the report period (indicate host species involved)	0	0	0	1 (cat)

Table A3.1b: Herd-level summary statistics for TB in cattle in 2019 for Hertfordshire, Isle of Wight, Kent, and Norfolk.

Herd-level statistics	Hertfordshire	Isle of Wight	Kent	Norfolk
(a) Total number of cattle herds live on Sam at the end of the reporting period	260	141	733	1003
(b) Total number of cattle herds subject to annual TB testing (or more frequent) at the end of the reporting period (any reason)	45	64	74	38
(c) Total number of whole herd skin tests carried out at any time in the period	116	97	240	214
(d) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	88	80	207	202
(e) Total number of OTF cattle herds at the end of the report period (i.e. herds not under any type of TB2 restrictions)	256	137	719	988

Herd-level statistics	Hertfordshire	Isle of Wight	Kent	Norfolk
(f) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period.	259	140	732	1000
(g) Total number of new TB incidents detected in cattle herds during the report period	5	3	3	7
<ul style="list-style-type: none"> OTF status suspended (OTF-S) 	4	2	2	6
<ul style="list-style-type: none"> OTF status withdrawn (OTF-W) 	1	1	1	1
(h) Of the new OTF-W herd incidents, how many:				
<ul style="list-style-type: none"> occurred in a holding affected by another OTF-W incident in the previous three years? 	0	0	0	0
<ul style="list-style-type: none"> could be considered secondary to a primary incident based on current evidence? 	0	0	0	0
<ul style="list-style-type: none"> were triggered by skin test reactors or 2xIRs at routine herd tests? 	1	0	1	1
<ul style="list-style-type: none"> were triggered by skin test reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, post-movement, etc.)? 	0	1	0	0
<ul style="list-style-type: none"> were first detected through routine slaughterhouse TB surveillance? 	0	0	0	0

Herd-level statistics	Hertfordshire	Isle of Wight	Kent	Norfolk
(i) Number of new incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds				
• OTF-S	2	2	0	3
• OTF-W	0	1	0	0
(j) Number of OTF-W herds still open at the end of the period (including any ongoing OTF-W incidents that began in a previous reporting period)	0	0	1	1
(k) New confirmed (positive <i>M. bovis</i> culture) incidents in non-bovine species detected during the report period (indicate host species involved)	0	0	0	0

Table A3.1c: Herd-level summary statistics for TB in cattle in 2019 for Suffolk, Surrey, and West Sussex.

Herd-level statistics	Suffolk	Surrey	West Sussex
(a) Total number of cattle herds live on Sam at the end of the reporting period	562	367	479
(b) Total number of cattle herds subject to annual TB testing (or more frequent) at the end of the reporting period (any reason)	34	26	67
(c) Total number of whole herd skin tests carried out at any time in the period	136	109	180
(d) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	129	89	152

Herd-level statistics	Suffolk	Surrey	West Sussex
(e) Total number of OTF cattle herds at the end of the report period (i.e. herds not under any type of TB2 restrictions)	557	362	462
(f) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period.	560	365	474
(g) Total number of new TB incidents detected in cattle herds during the report period	1	6	13
• OTF status suspended (OTF-S)	0	5	12
• OTF status withdrawn (OTF-W)	1	1	1
(h) Of the new OTF-W herd incidents, how many:			
• occurred in a holding affected by another OTF-W incident in the previous three years?	0	1	0
• could be considered secondary to a primary incident based on current evidence?	0	0	0
• were triggered by skin test reactors or 2xIRs at routine herd tests?	0	0	0
• were triggered by skin test reactors or 2xIRs at other TB test types (forward and back-tracings, contiguous, check tests, post-movement, etc.)?	0	1	0
• were first detected through routine slaughterhouse TB surveillance?	1	1	1

Herd-level statistics	Suffolk	Surrey	West Sussex
(i) Number of new incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds			
• OTF-S	0	0	4
• OTF-W	0	0	0
(j) Number of OTF-W herds still open at the end of the period (including any ongoing OTF-W incidents that began in a previous reporting period)	2	1	0
(k) New confirmed (positive <i>M. bovis</i> culture) incidents in non-bovine species detected during the report period (indicate host species involved)	0	0	0

Table A3.2a: Animal-level summary statistics for TB in cattle in 2019, in Bedfordshire, Cambridgeshire, Essex, and Greater London.

Animal-level statistics (cattle)	Bedfordshire	Cambridgeshire	Essex	Greater London
(a) Total number of cattle tested in the period (animal tests, blood and skin)	7857	16,273	8252	1731
(b) Reactors detected in tests during the year:				
• tuberculin skin test	1	8	14	1
• additional IFN- γ blood test reactors (skin-test negative or IR animals)	0	21	0	0
(c) Reactors detected during year per incidents disclosed during year *	1.00	7.25	2.33	1.00
(d) Reactors per 1000 animal tests	0.13	1.78	1.70	0.58
(e) Additional animals identified for slaughter for TB control reasons (DCs, including any first-time IRs)				
• DCs, including any first-time IRs	0	0	0	0
• Private slaughters	0	1	0	0
(f) SLH cases (tuberculous carcasses) reported by the Food Standards Agency (FSA) during routine meat inspection.	0	0	0	0
(g) SLH cases confirmed by culture of <i>M. bovis</i> **	0	0	0	0

Table A3.2b: Animal-level summary statistics for TB in cattle in 2019, in Hertfordshire, Isle of Wight, Kent, and Norfolk.

Animal-level statistics (cattle)	Hertfordshire	Isle of Wight	Kent	Norfolk
(a) Total number of cattle tested in the period (animal tests, blood and skin)	10,909	12,588	22,312	18,749
(b) Reactors detected in tests during the year:				
• tuberculin skin test	6	3	5	9
• additional IFN- γ blood test reactors (skin-test negative or IR animals)	48	16	1	1
(c) Reactors detected during year per incidents disclosed during year *	10.80	6.33	2.00	1.43
(d) Reactors per 1000 animal tests	4.95	1.51	0.27	0.53
(e) Additional animals identified for slaughter for TB control reasons (DCs, including any first-time IRs)				
• DCs, including any first-time IRs	0	0	0	0
• Private slaughters	1	0	0	0
(f) SLH cases (tuberculous carcasses) reported by the Food Standards Agency (FSA) during routine meat inspection.	1	0	2	0
(g) SLH cases confirmed by culture of <i>M. bovis</i> **	0	0	0	0

Table A3.2b: Animal-level summary statistics for TB in cattle in 2019, in Suffolk, Surrey, and West Sussex.

Animal-level statistics (cattle)	Suffolk	Surrey	West Sussex
(a) Total number of cattle tested in the period (animal tests, blood and skin)	15,202	17,150	36,571
(b) Reactors detected in tests during the year:			
• tuberculin skin test	5	13	43
• additional IFN- γ blood test reactors (skin-test negative or IR animals)	3	0	2
(c) Reactors detected during year per incidents disclosed during year *	8.00	2.17	3.46
(d) Reactors per 1000 animal tests	0.53	0.76	1.23
(e) Additional animals identified for slaughter for TB control reasons (DCs, including any first-time IRs)			
• DCs, including any first-time IRs	0	2	0
• Private slaughters	0	1	3
(f) SLH cases (tuberculous carcasses) reported by the Food Standards Agency (FSA) during routine meat inspection.	1	2	8
(g) SLH cases confirmed by culture of <i>M. bovis</i> **	1	1	1

Appendix 4: suspected sources of *M. bovis* infection for all of the new OTF-W and OTF-S incidents identified in the report period

Table A4.1: Suspected sources of *M. bovis* infection for all of the new OTF-W and OTF-S incidents identified in all the South East of England counties covered in this report combined, in 2019.

Source of infection	Possible (1)	Likely (4)	Most likely (6)	Definite (8)	Weighted contribution
Badgers	12				3.8%
Cattle Movements	14	12	7	6	46.0%
Contiguous	3				1.1%
Residual Infection	4	2	1		6.4%
Domestic Animals					0.0%
Non-specific Reactor	3	3	2		9.6%
Fomites					0.0%
Other Wildlife	1				0.2%
Other or Unknown Source	5				33.0%

Please note that each TB incident could have up to three potential pathways so totals may not equate to the number of actual incidents that have occurred. Details of the methodology used to calculate the weighted contribution of the different suspected sources of *M. bovis* infection for all new incidents can be found in the main body of the report and in the Explanatory Supplement for England 2019 (<https://www.gov.uk/government/publications/bovine-tb-epidemiology-and-surveillance-in-great-britain-2019>).

Appendix 5: assessment of the origin of (and potential for spread of infection from) all of the new OTF-W incidents identified in the report period

A risk matrix was used to identify isolated incidents that were likely to have been introduced to the LRA by cattle movements, while not causing any onward local spread. The following two questions were considered for each incident, and a score attributed. TB incidents with a score of 1A, 1B or 2A may be removed from the county TB incidence calculations during an application for OTF status (but remain in the incidence calculations in this report).

What is the probability of *M. bovis* infection being introduced to the LRA via infected cattle movements?

1. Definite - for example, traced reactors found in the LRA OTF-W incident herd in question as a result of spread tracings from another TB incident herd, genotype/WGS linked.
2. Likely - for example, a Reactor or IR originated from a previous incident herd (and the genotype does not suggest otherwise), other cattle were moved into the herd from previous incident herd (but were subsequently slaughtered without testing), or the trading practice of herd provides likely evidence (purchasing large numbers of cattle from High Risk Area (HRA), or Edge Area, High and Intermediate TB areas of Wales, or from the island of Ireland).
3. Possible - not a closed herd, but cattle are purchased from the LRA, Scotland and/or EU Member States.
4. Not likely - indigenous infection is known in the locality, closed herd, genotype/WGS has been identified in local wildlife.

What is the probability of this being an isolated, sporadic ('one-off') incident, without secondary local spread from the index case?

- A. Likely - no secondary incidents have been detected. There are **no** further incidents as a result of spread tracings anywhere and **no** genotype/WGS linked OTF-W incidents within 3km radial zone around the LRA OTF-W incident herd in question (or the 3km radial surveillance zone was not triggered).
- B. Possible - no secondary incidents have been detected, but the dataset is incomplete. For example, incidents have occurred in the 3km radial zone, but only OTF-S ones, or, if OTF-W, they were of an unknown/different genotype.
- C. Not likely - secondary spread from the index case, or exposure to a common wildlife source has occurred. For example, OTF-W incidents have occurred in the 3km zone linked by genotype or WGS, or there is known wildlife infection in the area with this genotype/close WGS.

Table A5.1: Risk matrix of the veterinary assessment of the origin of, and potential for spread of infection from, all the new OTF-W incidents identified in 2019.

Probability of <i>M. bovis</i> infection introduced through cattle movements (1, 2, 3, 4)	Probability of isolated, sporadic ('one-off') incident, without secondary local spread from the index case (A, B, C)		
	A. Likely	B. Possible	C. Not likely
1. Definite	5		
2. Likely	7		
3. Possible			
4. Not likely			

Appendix 6: herd incidence of TB in England

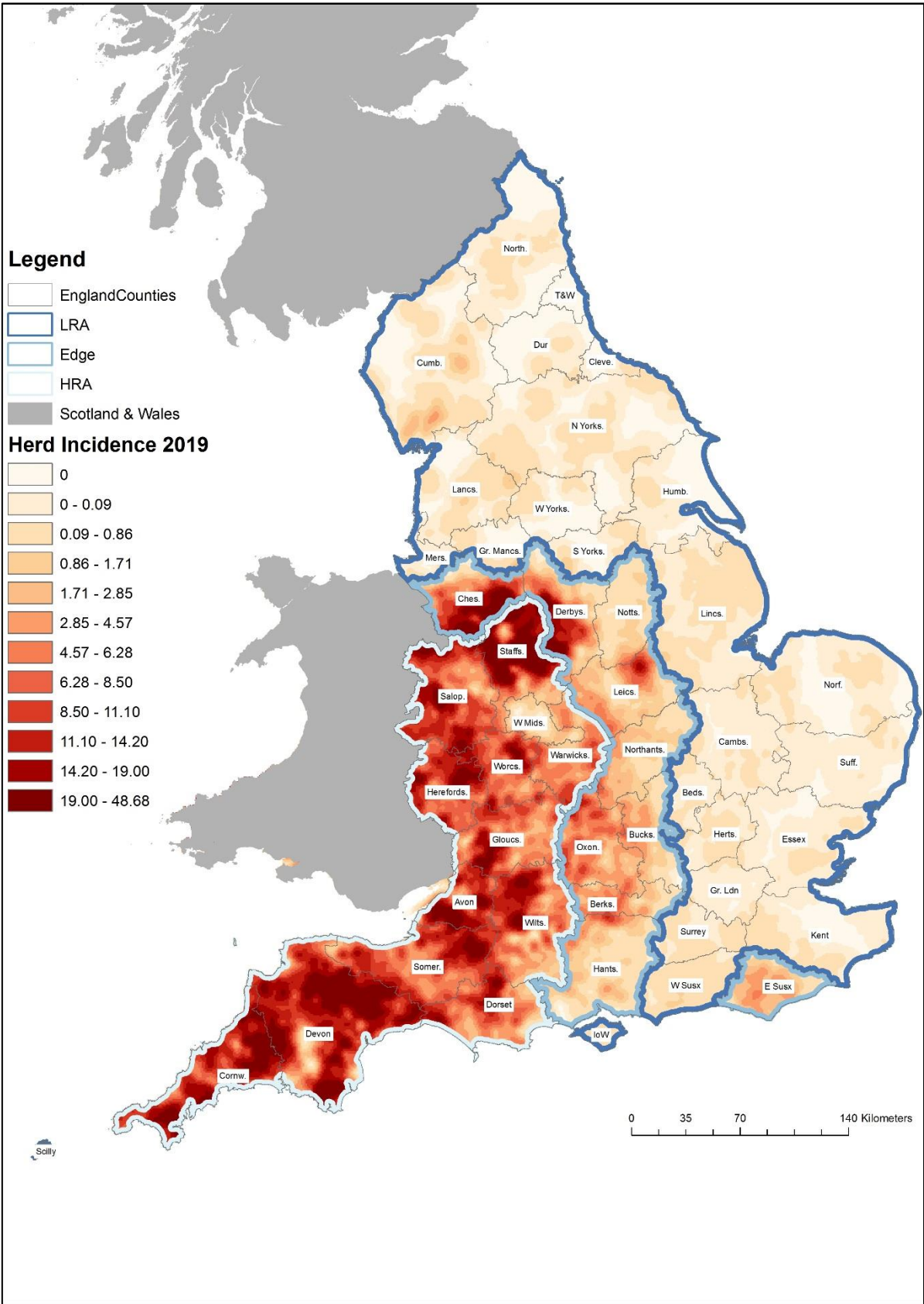


Figure A6.1: Herd incidence of TB in 2019 (incidents per 100 Herd Years at Risk), represented as a spatial kernel of the 100 closest herds per km².



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