Animal &
Plant Health
Agency

Year-end descriptive epidemiology report: Bovine TB in the Edge Area of England

County: East Sussex

Year-end report for: 2020

TB Edge Area - EAST SUSSEX

TR398 (Rev. 03/21)

Contents

Executive summary

Reporting area

East Sussex is part of the Edge Area that was established in 2013. In 2014, the bovine tuberculosis (TB) surveillance strategy for this area was incorporated into the UK government's strategy to achieve Officially Bovine Tuberculosis Free (OTF) status for England by 2038. This end of year report describes bovine TB in East Sussex.

Local cattle industry

East Sussex has a relatively low cattle density and is predominantly made up of small beef herds with a mean of 85 cattle per holding. There are only 12 herds with over 500 cattle, and these are mostly dairy herds.

New TB incidents

There was a 78% increase in the number of new incidents detected in 2020 (41) compared to 2019 (23). In 2020, there were 12 new Officially Bovine Tuberculosis Free Status Withdrawn (OTF-W, 9.3%) and 29 new Officially Bovine Tuberculosis Free Status Suspended (OTF-S, 70.7%) incidents.

This compares to four OTF-W (17.4%) and 19 OTF-S (82.6%) incidents in 2019. The annual herd incidence rate (incidents per 100 herd years at risk) increased from 5.1 in 2018 and 4.6 in 2019 to 8.1 in 2020.

Nineteen (66%) of the OTF-S incidents were disclosed by a retest of an inconclusive reactor that went on to have a second inconclusive result. In 2019 this was five out of 19 OTF-S incidents (26%). This explains much of the large rise in overall TB incidence in East Sussex in 2020 compared to previous years.

Risk pathways for TB infection

Most of the OTF-W incidents in the former High Risk Area (HRA) portion of East Sussex located in the south-west of the county were attributed to infected wildlife, whilst those in the northern portion were linked to movements of undetected infected cattle.

The most likely risk pathways for many of the OTF-S incidents, where by definition no genotype information was available, were uncertain and classified as undetermined.

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 to the 2020 bovine TB epidemiology reports.

Disclosing tests

The majority of new TB incidents in East Sussex in 2020 were disclosed by routine annual whole herd surveillance tests (51%), with the remaining by radial testing (17%), six month post-incident tests (10%), twelve month post-incident tests (10%), new herd check tests (5%) and check tests following a slaughterhouse case (5%). One incident (2%) was disclosed by a pre-movement test.

Reactor numbers

More skin test reactors were removed in 2020 (128) compared to 2019 (78). Fewer interferon gamma (IFN-y) test-positives were removed in 2020 (94) compared to 2019 (133). The mean number of skin test reactors per incident decreased to 5.4 in 2020 compared to 9.2 in 2019 however the number of reactors per 1,000 animal tests remained stable at 2.8.

The increase in reactor numbers in 2020 is explained by the increase in the number of incidents. The reduction in reactors per incident is explained by 20 of the 41 incidents in 2020 (49%) being disclosed by 2 x inconclusive reactors and 19 of these were in OTF-S herds, which tend to have incidents of shorter duration.

Risks to the reporting area

East Sussex is bordered by Low Risk Area (LRA) counties, so longer range cattle movements from higher incidence areas are the main threat of incursions of TB into East Sussex.

Risks posed by the reporting area

The areas with suspected endemically infected local badger populations in East Sussex remain stable with little threat to adjacent LRA counties by spread of infection in wildlife, although the homerange of *M. bovis* genotype 13:a now extends north of the A27 road.

The main threats to the LRA are from cattle movements out of the county and a few TB incidents that straddle the borders with the LRA.

These risks are mitigated somewhat by statutory pre- and post-movement TB testing and farms spanning the border taking on the annual surveillance testing regime of the Edge Area.

Forward look

There was a marked increase in the number of new TB incidents in East Sussex in 2020. OTF-W incidents have returned to levels similar to 2017 and 2018. OTF-S incidents increased, and these were spread throughout the county.

The lack of genotype information associated with OTF-S incidents makes the source of infection difficult to assess, particularly for incidents with no obvious link to cattle purchases.

The uptake of badger vaccination, improving on-farm biosecurity and taking advantage of the free advice available to cattle farmers in the Edge Area from the TB Advisory Service is to be encouraged.

Introduction

This report describes the level of bovine tuberculosis in cattle herds in East Sussex in 2020. Bovine tuberculosis is caused by the organism *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 this area, and the risks the disease in this county 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 UK government published its Strategy to achieve Officially TB Free (OTF) status for England by 2038. A key action was to recognise the different levels of TB in different parts of the country and to vary the approach to control accordingly. To this end three management areas were established (refer to Appendix 1).

East Sussex forms part of the Edge Area. Control efforts are seeking to slow down and reverse geographic spread, and to reduce the incidence rate. The aim is to obtain OTF status for the Edge Area as soon as possible.

Changes to the Edge Area

On 1 January 2018 the Edge Area boundary was expanded westwards to absorb the former High Risk Area (HRA) parts of the five previously split counties. Cheshire, Derbyshire, Warwickshire, Oxfordshire, and East Sussex all moved fully into the Edge Area.

Furthermore, the routine TB testing frequency of herds in the counties in the west of the Edge Area adjoining the HRA (or parts thereof) was increased from annual to six-monthly. The respective descriptive TB epidemiology reports for those five counties of the Edge Area will focus on the whole county and key differences between the old and new parts will be highlighted where relevant.

From January 2018, Defra introduced radial skin testing of herds located within a 3km radius of a new OTF-W incident in East Sussex and all other annual testing parts of the Edge Area to enhance the cattle TB surveillance regime.

Changes due to COVID-19

During 2020, public health measures adopted by the government to contain the COVID-19 outbreak impacted the ability to carry out some TB testing due to social distancing and self-isolation guidelines, affecting both veterinarians and farmers.

In particular, from 23 March 2020, routine or targeted TB skin tests were not mandatory for cattle under 180 days old where, in the official veterinarian's judgement, the young stock could not be tested safely in line with social distancing guidelines. The temporary amendment allowing calves under 180 days old to be excluded from TB testing did not apply to short interval tests in TB incident herds (required to restore a herds OTF status) or pre- and post-movement testing.

Routine TB skin tests are required within a pre-defined window of time to maintain a herds OTF status. From 23 March 2020, for tests that were allocated until 30 June 2020, the Animal and Plant Health Agency (APHA) permitted an extension to the TB skin testing windows on a case by case basis, where testing had not been completed due to valid reasons associated with COVID-19. The testing window for short interval tests was also extended by up to 30 days, where tests were unable to be completed due to COVID-19.

Furthermore, on-farm epidemiological assessments carried out to establish the route of infection for a TB incident herd were carried out remotely, by telephone, for the majority of 2020.

Cattle industry

Herd types

There was a slight decline in the number of cattle holdings in East Sussex from 543 in 2019 to 511 in 2020. As shown in Figure 1, the majority of holdings (57%) in East Sussex in 2020 had a small number of cattle (1-50) with only 4% (22 holdings) with over 350 cattle.

The mean number of cattle per holding has remained stable at 88 in 2019 and 85 in 2020. Beef suckler herds were the predominant farm type in East Sussex in 2020 although dairy herds tend to be the larger herds.

Of all cattle in East Sussex in 2020 66% were beef breeds, 29% dairy and 3% dual purpose (see Table A2.2 in Appendix 2). A higher area of cattle density (25 to 50 per square kilometre) is concentrated in the centre of the county with a surrounding band of low cattle holding density.

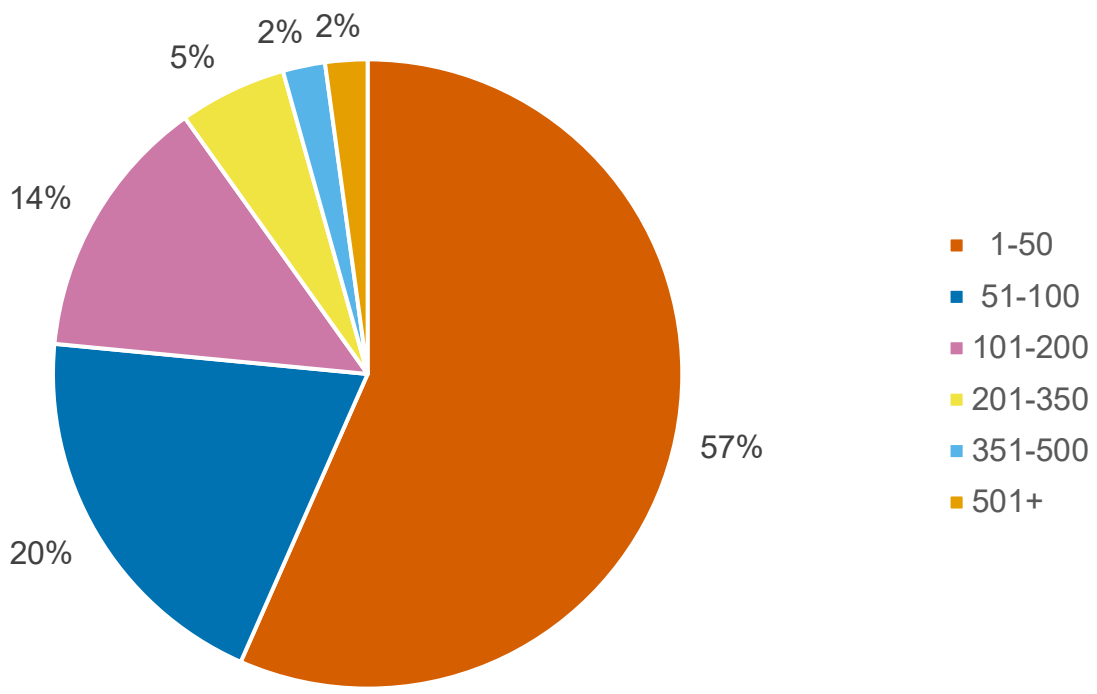


Figure 1: Proportion of cattle holdings in East Sussex, by herd size in 2020 (n=507). Note herds with an undetermined size are not shown.

Markets and abattoirs

There are two main cattle markets that provide a valuable outlet for cattle and selling of stores: Hailsham Market in East Sussex and Ashford market in the neighbouring LRA county of Kent.

These markets are relatively low volume, so the larger dairy and beef finishing herds have to source their cattle for restocking from further afield. This poses a risk of introducing TB infection into East Sussex from the HRA and from Wales, where the cattle density is much higher.

There are several small slaughterhouses for cattle, one located in Tottingworth in East Sussex and others in the neighbouring LRA county of Kent at Charing and Tunbridge Wells. A larger abattoir is located in the neighbouring LRA county of Surrey.

The South of England Show (Ardingly, West Sussex) and the Kent County Show (Detling, Kent) take place in neighbouring LRA counties. These did not take place in 2020 due to the COVID-19 outbreak.

Approved Finishing Units

There was one housed Approved Finishing Unit (AFU) in operation in East Sussex in 2020.

Common land

There are small areas of common land in East Sussex, but there were no TB incidents associated with cattle grazing this land in 2020.

Descriptive epidemiology of TB

Temporal TB trends

Three analytical measures are used to describe the level of TB infection in these reports.

1. The number of new herd incidents that were disclosed in each year (Figure 2).
2. The annual herd incidence rate, reported as the number of new incidents per 100 herd-years at risk (100 HYR) (Figure 3). This is the number of new TB incidents detected in the year, divided by the time those herds were at risk of contracting TB. The 100 HYR incidence rate is used in this report as it accounts for different intervals between herd tests that other incidence measures do not (such as new TB incidents per number of herds or tests).
3. The annual end of year herd prevalence (Figure 4). This is the number of herds under restriction due to a TB incident, divided by the number of active herds at the same point in time. Prevalence provides a snap shot of the burden of TB on the local cattle industry.

All three measures include 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) inspection, 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 inspection or bacterial culture.

TB incidents in non-grazing AFUs are not included in the prevalence and incidence calculations (excluding Figure 5) in this report due to the limited epidemiological impact of these cases.

Furthermore, herds restricted because of an overdue test rather than a TB incident are also excluded from calculations. Hence measures of incidence and prevalence in this report may be lower than those reported in the official TB statistics.

The county of East Sussex was previously split between the Edge Area and HRA. The former HRA portion of East Sussex was bounded by the A22 road in the north and east and by the county border in the west.

The local badger populations in this area are considered to be endemically infected with *M. bovis* (genotype 13:a and its associated mutations 13:c and 13:d) to the east of the river Ouse but south of the A27 road.

In the rest of the county, which is comprised of mostly the original Edge Area, local badger populations are not generally considered to be infected with *M. bovis* and the sources of the TB incidents are mostly attributed to movements of undetected infected cattle. At the beginning of 2018 the Edge and HRA parts of East Sussex were combined into the new Edge Area comprising the whole of East Sussex.

Over six years (2014-2019), the number of new incidents per year in East Sussex has been relatively stable ranging from 20 in 2014 to 27 in 2018. However, in 2020 there was a large increase in new incidents from 23 in 2019 to 41 in 2020 (Figure 2).

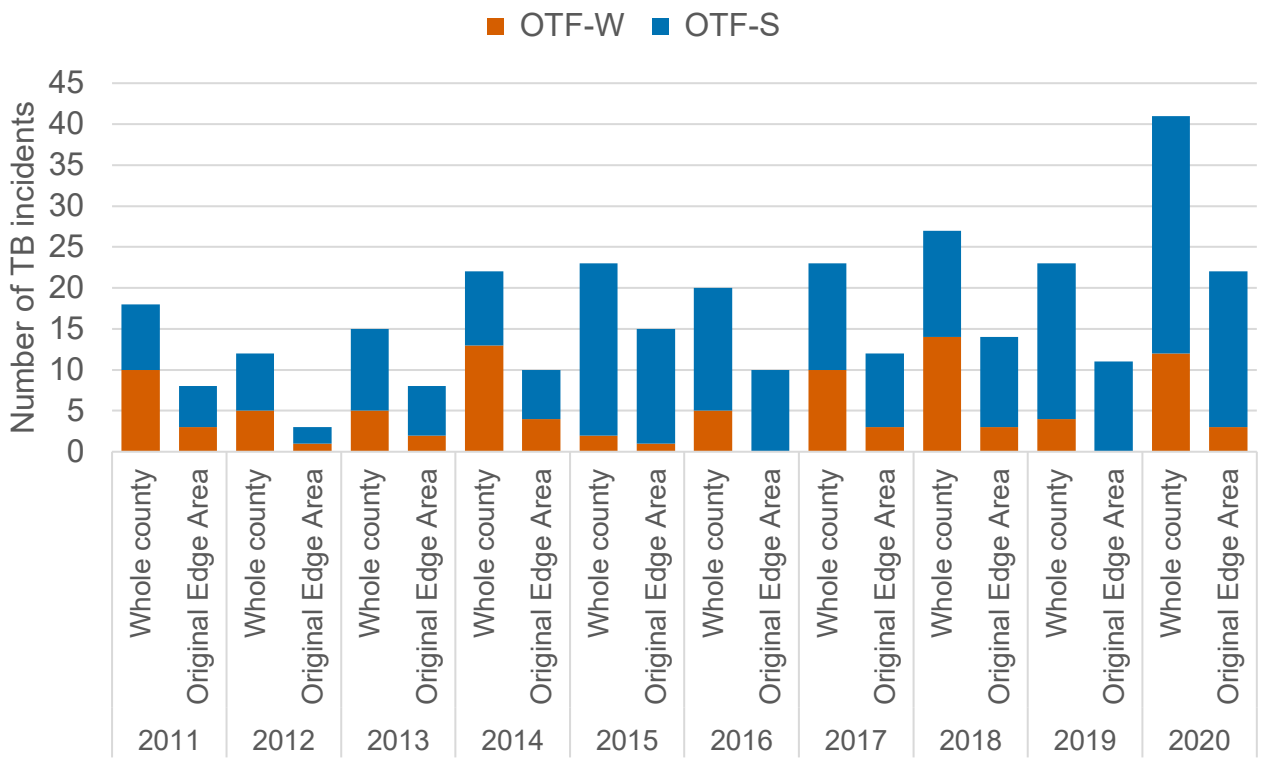


Figure 2: Annual number of new TB incidents in East Sussex, from 2011 to 2020, showing incidents for the whole county and the original Edge Area.

Figure 2 illustrates the annual number of new TB incidents in the whole county of East Sussex and shows that 2020 had by far the highest incidence of TB. The number of OTF-W incidents was very low in 2019 with only four. In 2020 there were 12 OTF-W incidents, which is similar to the levels found in 2017 and 2018.

When the original Edge Area and the whole county are compared, in 2020 there was a doubling of the number of new incidents in the original Edge Area from 11 to 22. This is the highest annual number of new incidents in the original Edge Area, with the previous high being 15 in 2015.

In 2020 the ratio of OTF-W compared to OTF-S incidents in East Sussex was 12 OTF-W to 29 OTF-S (1 to 2.4) compared to 4 OTF-W and 19 OTF-S (1 to 4.8) in 2019, and 14 OTF-W and 13 OTF-S (1 to 0.9) in 2018.

Over the last ten years this ratio has varied greatly, and a trend is difficult to ascertain especially with the small numbers of TB incidents involved. The number of OTF-W incidents in the original Edge Area has increased from none in 2019 to three in 2020.

As shown in Figure 3, the annual herd incidence rate (incidents per 100 herd-years at risk) in the whole county was significantly higher in 2020 (8.1) than in 2019 (4.6). This is the highest annual herd incidence rate in the last ten years with 2018 having the second highest (5.1).

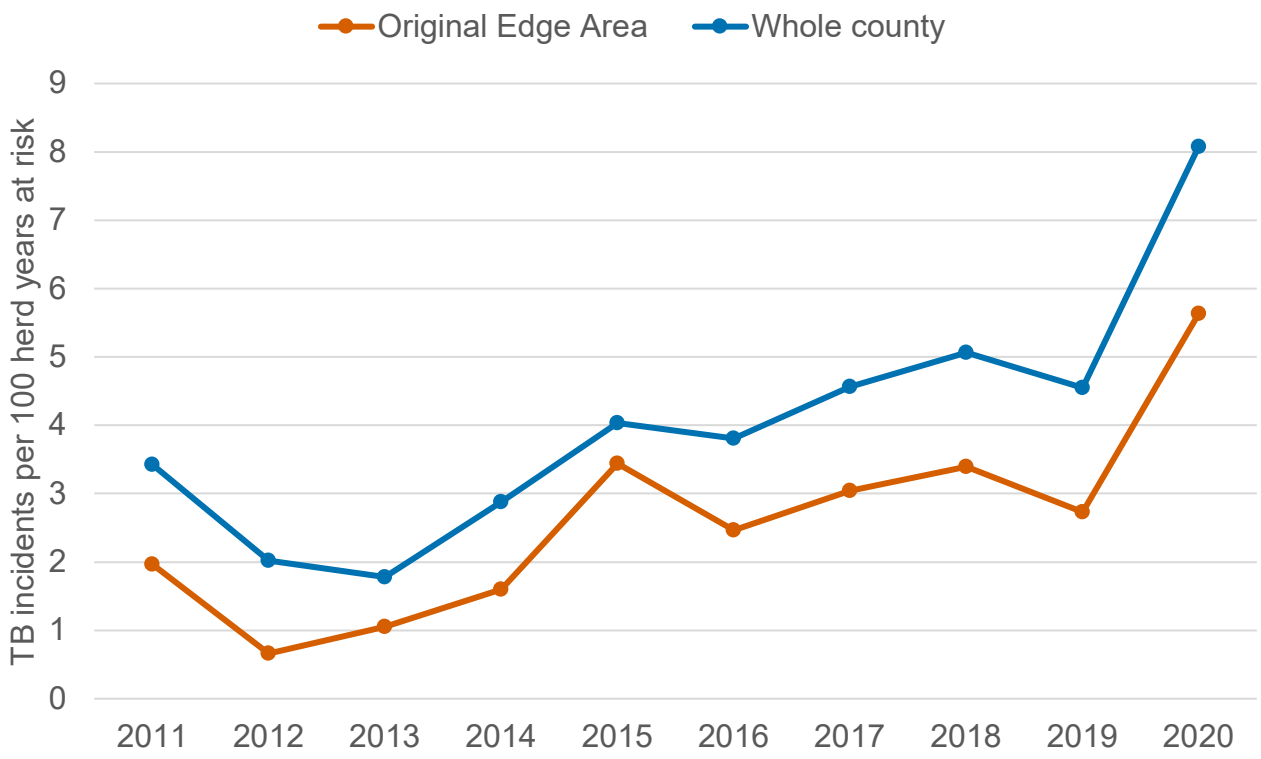


Figure 3: Annual incidence rate (per 100 herd-years at risk) for all new incidents (OTF-W and OTF-S) in East Sussex, from 2011 to 2020, showing incidents for the whole county and the original Edge Area.

Figure 3 also illustrates the annual herd incidence rate for all new incidents comparing the original Edge Area with the whole county. The change in incidence rate appears to be driven by the original Edge Area with the incidence rate in the former HRA part of the county remaining fairly stable. The annual herd incidence rates in the original Edge Area, original HRA, and hence the whole county, are at a ten year high.

A detailed description of the methodology used to calculate incidence per 100 herd-years at risk is available in the Explanatory Supplement for 2020.

The annual end of year prevalence of TB-restricted herds has increased slightly for the whole county but remained relatively stable for the original Edge Area with a slight decline in 2020 (Figure 4). This indicates that the large increase in new TB incidents in 2020 which has affected the herd incidence rate, was mostly caused by incidents at the beginning of 2020.

By the end of 2020, the new incidents had mostly resolved, resulting in the annual end of year prevalence returning to the level seen in previous years.

There is an approximate linear increase in incidence rate against year since 2012 (Figure 3), suggesting that this trend of increasing incidence will continue under current TB controls and achievement of OTF status for East Sussex looks remote for the near future.

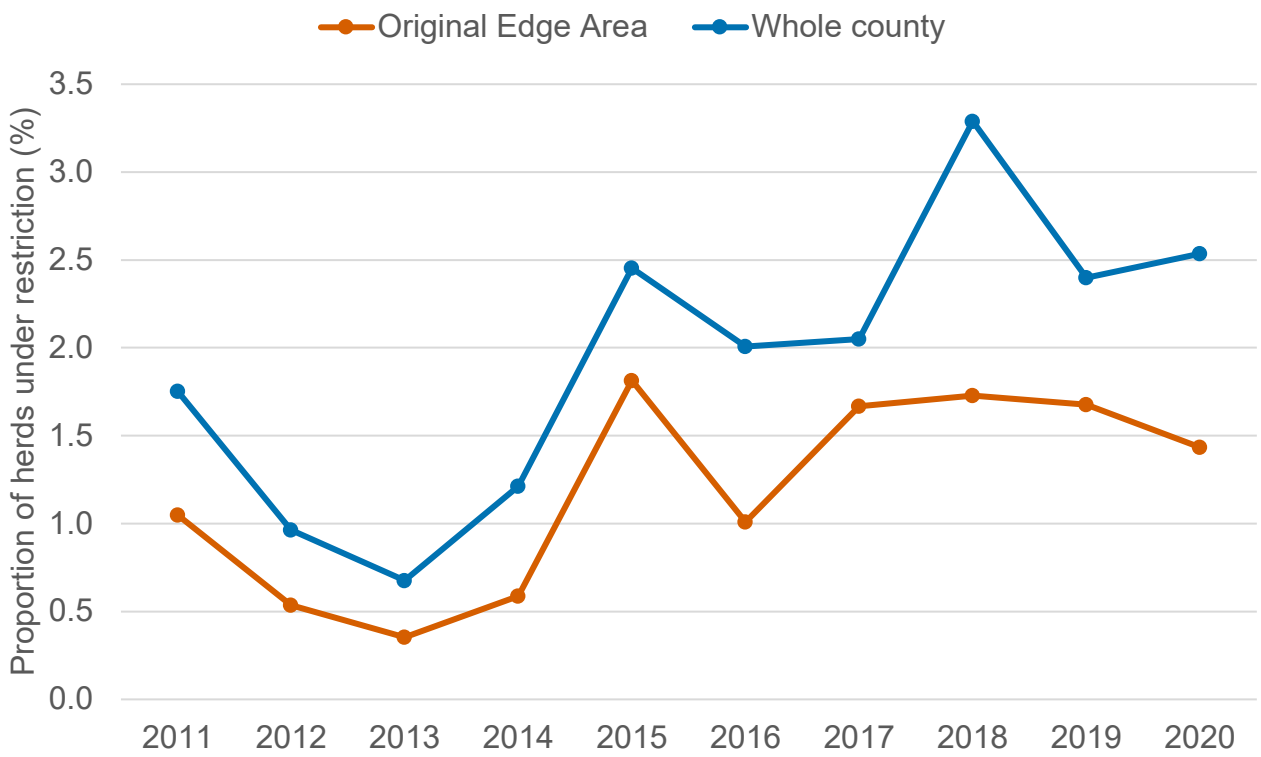


Figure 4: Annual end of year prevalence in East Sussex, from 2011 to 2020, showing incidents for the whole county and the original Edge Area.

Geographical distribution of TB incidents

The incidence rate in East Sussex (8.1) was lower than the average for Edge Area counties (10.1) with five other counties in the HRA and Edge Area having a lower incidence (Figure 5). The nearest counties of Buckinghamshire and Hampshire had a lower incidence rate (5.7 and 5.2, respectively) compared to East Sussex, although this changed from 2019 when they were higher.

East Sussex is unique amongst the Edge Area counties in that it is surrounded by LRA counties and is not adjacent to any HRA counties.

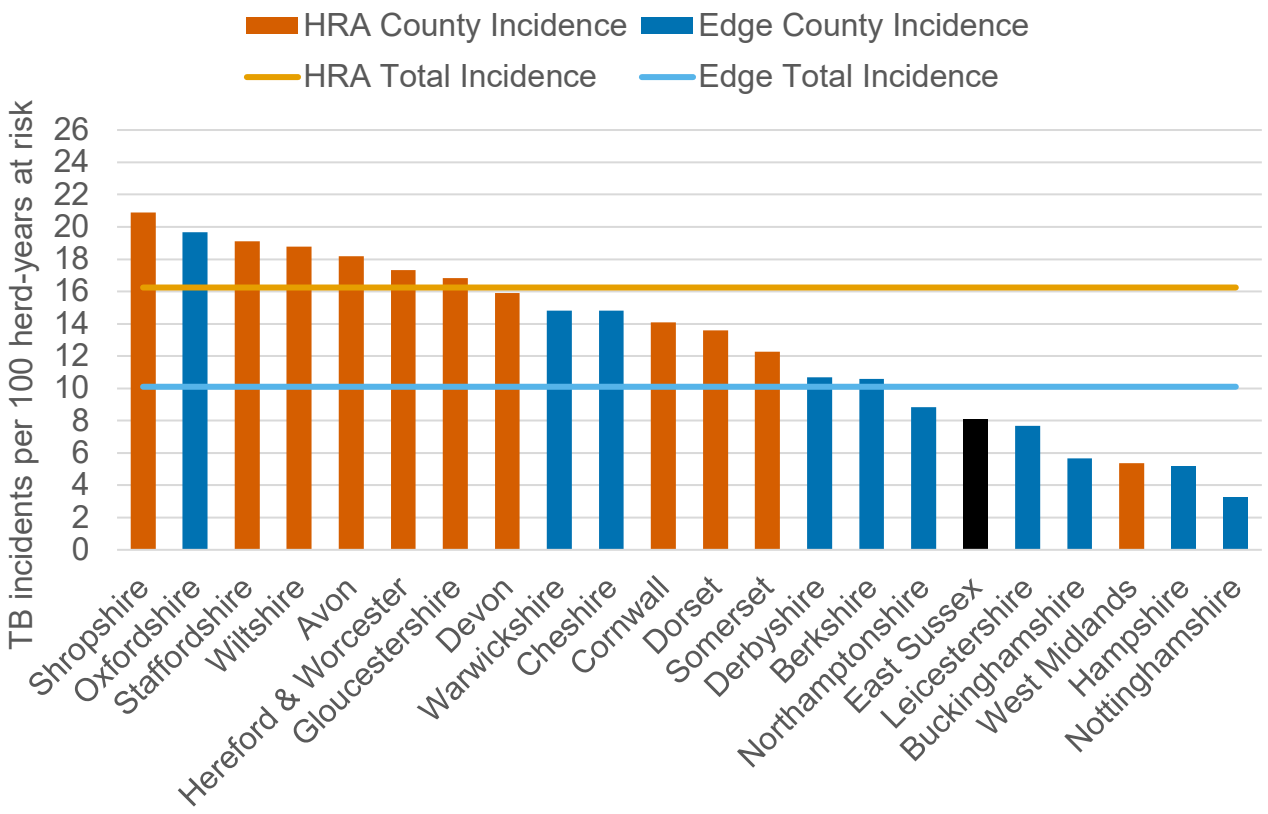


Figure 5: Incidence rate (per 100 herd-years at risk) for all new incidents (OTF-W and OTF-S including finishing units) in 2020, by HRA and Edge Area County, highlighting the county of East Sussex.

There were more TB incidents in the south of the county (Figure 6). In this area of lower cattle density, the distribution may be explained by the presence of *M. bovis* infected badgers.

Nine of the 12 new OTF-W incidents and the one ongoing OTF-W incident were located in the former HRA part of the county, where TB is considered to be endemic in local badger populations, and they all shared the same spoligotype (13) of *M. bovis*.

The 29 new OTF-S incidents were spread throughout the county with no obvious pattern as would be expected with mostly introduced infection through cattle purchases. There were 18 new OTF-S incidents in the original Edge Area of East Sussex and 11 in the former HRA part of the county. Almost all new incidents in East Sussex in 2020 (40 out of 41) were in the areas with higher cattle densities. All of the pre-2020 incidents were concluded during the report period.

The OTF-W incidents in East Sussex in 2020 for which infected wildlife was considered as a source with 75% or greater certainty, were all located within the former HRA portion of the county (Figure 7). This suggests that the area considered to be endemic for *M. bovis* infection in badgers is not expanding dramatically.

The total number of new incidents in the former HRA portion of the county increased from 11 in 2019 to 20 in 2020 (nine OTF-W and eleven OTF-S) but remained largely within the same area. However, there has been some expansion of the area of endemic infection with one OTF-W incident (genotype 13:a) located north of the A27 in 2020

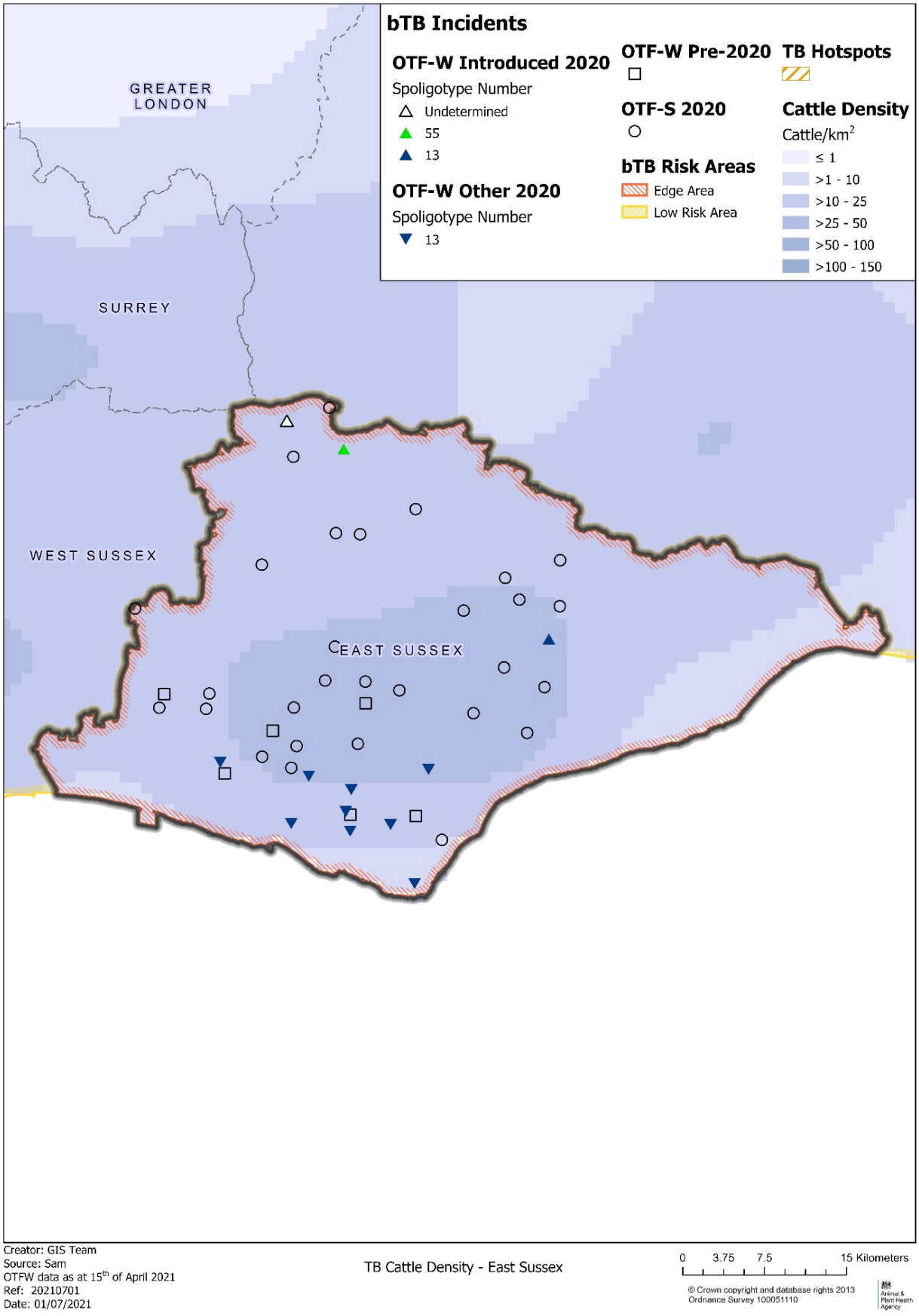


Figure 6: Location of cattle holdings in East Sussex with new TB incidents (OTF-W and OTF-S) in 2020 and cattle holdings with pre-2020 OTF-W incidents still ongoing at the beginning of 2020, overlaid on a cattle density map. Note 'OTF-W Introduced 2020' refers to OTF-W incidents in which cattle movements were the most likely source of infection.

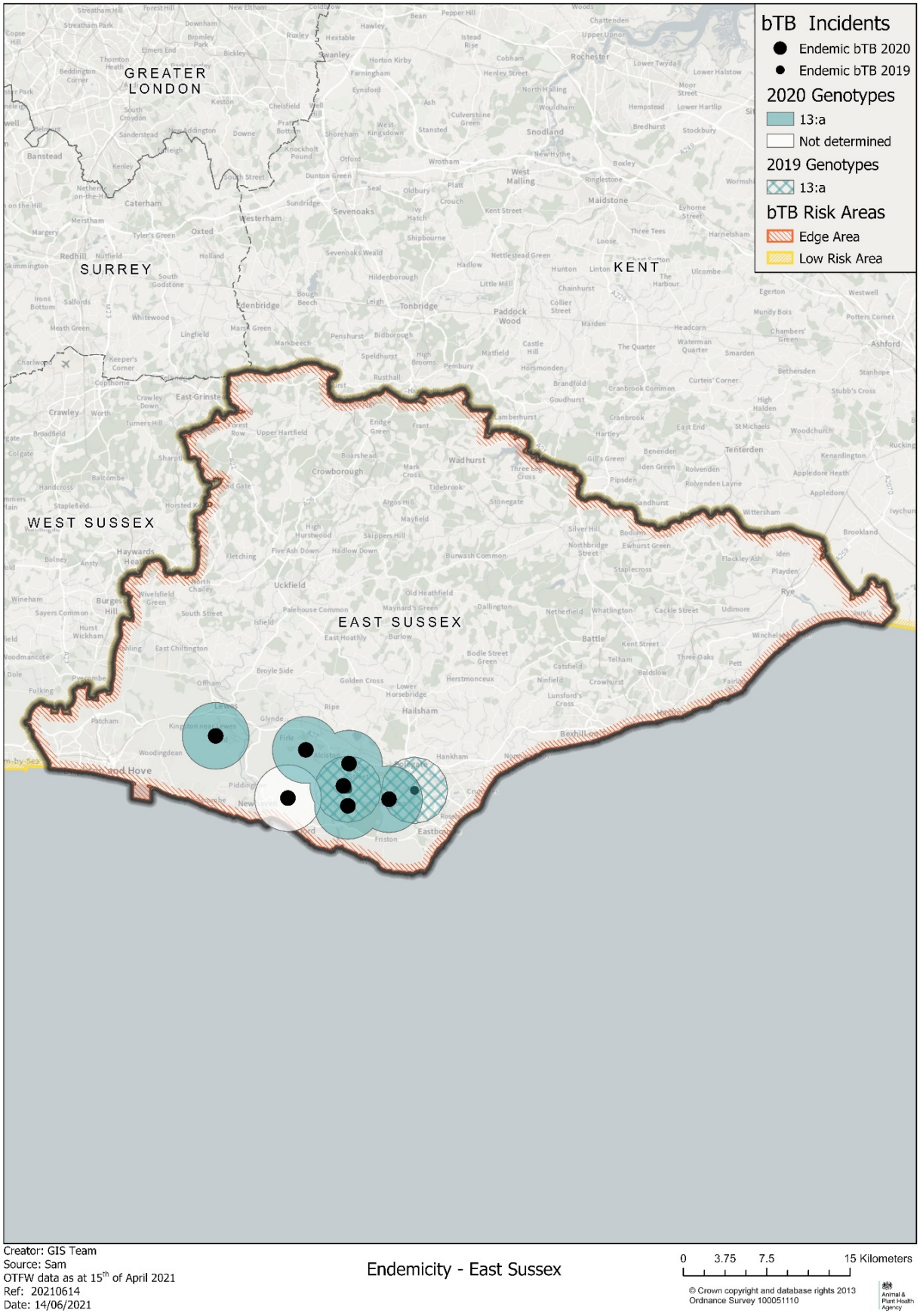


Figure 7: Genotypes of *M. bovis* detected in East Sussex between 2019 and 2020, where wildlife sources were attributed with a 75% certainty or above according to the DRF calculation, as an indication of a local *M. bovis* reservoir in wildlife populations (OTF-W incidents only).

Other characteristics of TB incidents

Incidents by herd type

As shown in Figure 8 (number of TB incidents in each herd size category) and Table A2.1 (number of herds of these sizes in East Sussex), the larger the cattle herd, the greater the likelihood of the herd experiencing a TB incident.

There were 50 herds with over 200 cattle and 28% of these had a TB incident in 2020 (14 incidents). There were 451 herds with 200 or less cattle and only 1.5% of these herds had a TB incident in 2020 (27 incidents).

The effect of herd size was even more marked when considering herds of over 500 cattle. There were only 12 herds in this category and eight of these had an incident in 2020 which represented 72% of these larger herds.

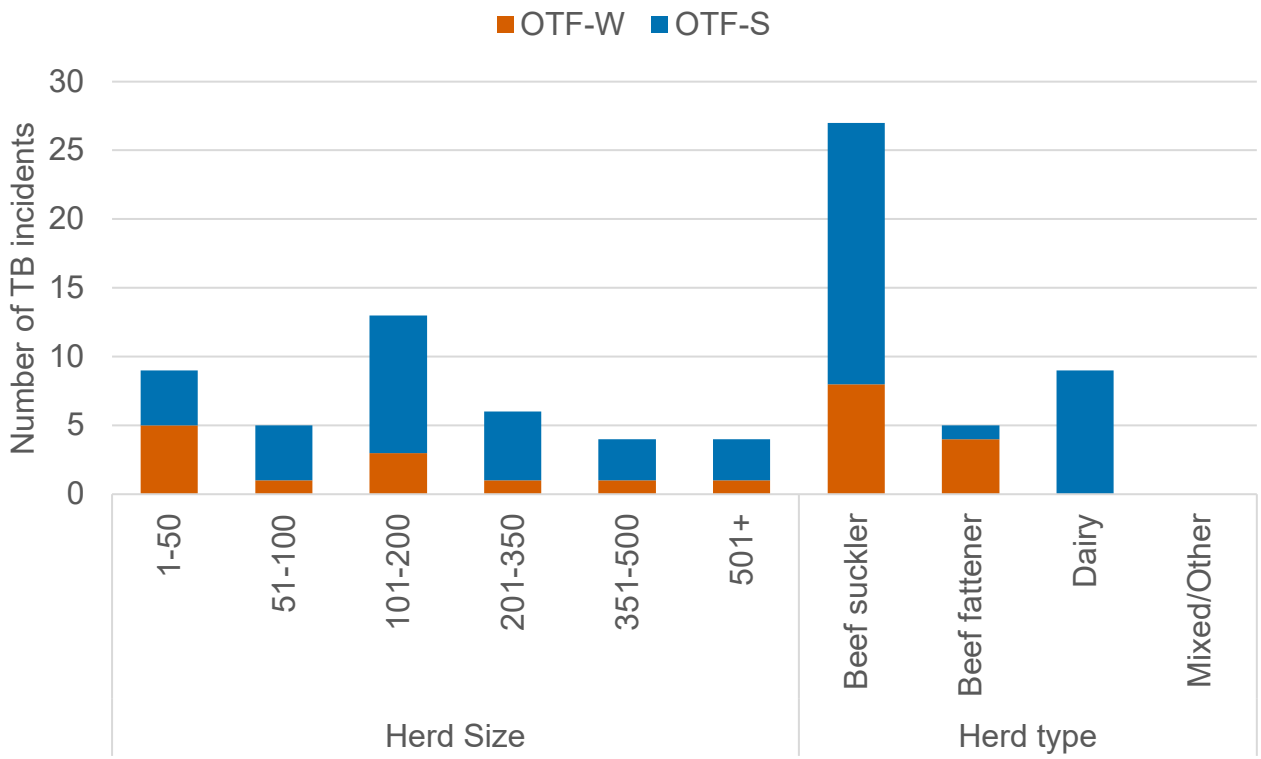


Figure 8: Number of TB incidents (OTF-W and OTF-S) in East Sussex in 2020, by cattle herd size and type.

Incidents by month of disclosure

About half of the incidents (21) in East Sussex in 2020 were disclosed in the first quarter of the year with a peak in March, and 78% of incidents disclosed within the first six months (Figure 9). This was not fully correlated with increased seasonal testing as the number of tests performed on OTF herds (Figure 10) in the first quarter represented 36% of the total for the year, and for the first six months this was 53%.

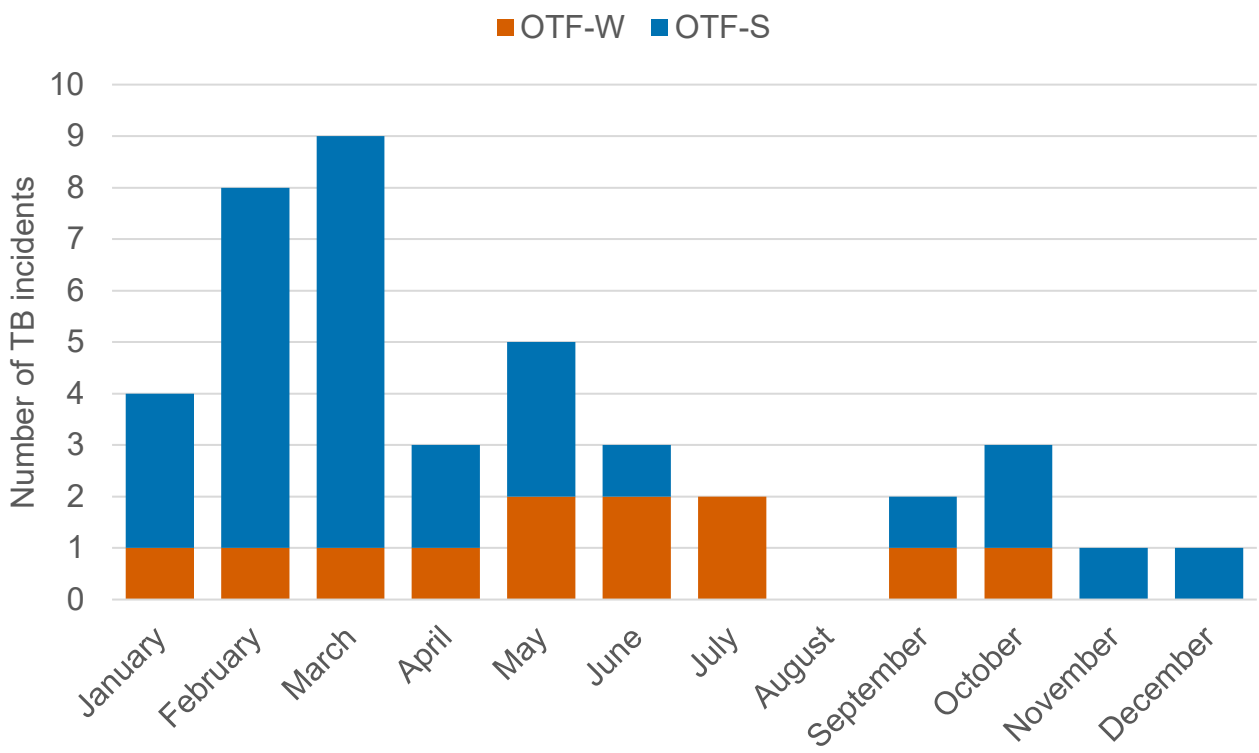


Figure 9: Number of TB incidents (OTF-W and OTF-S) in East Sussex in 2020, by month of disclosure.

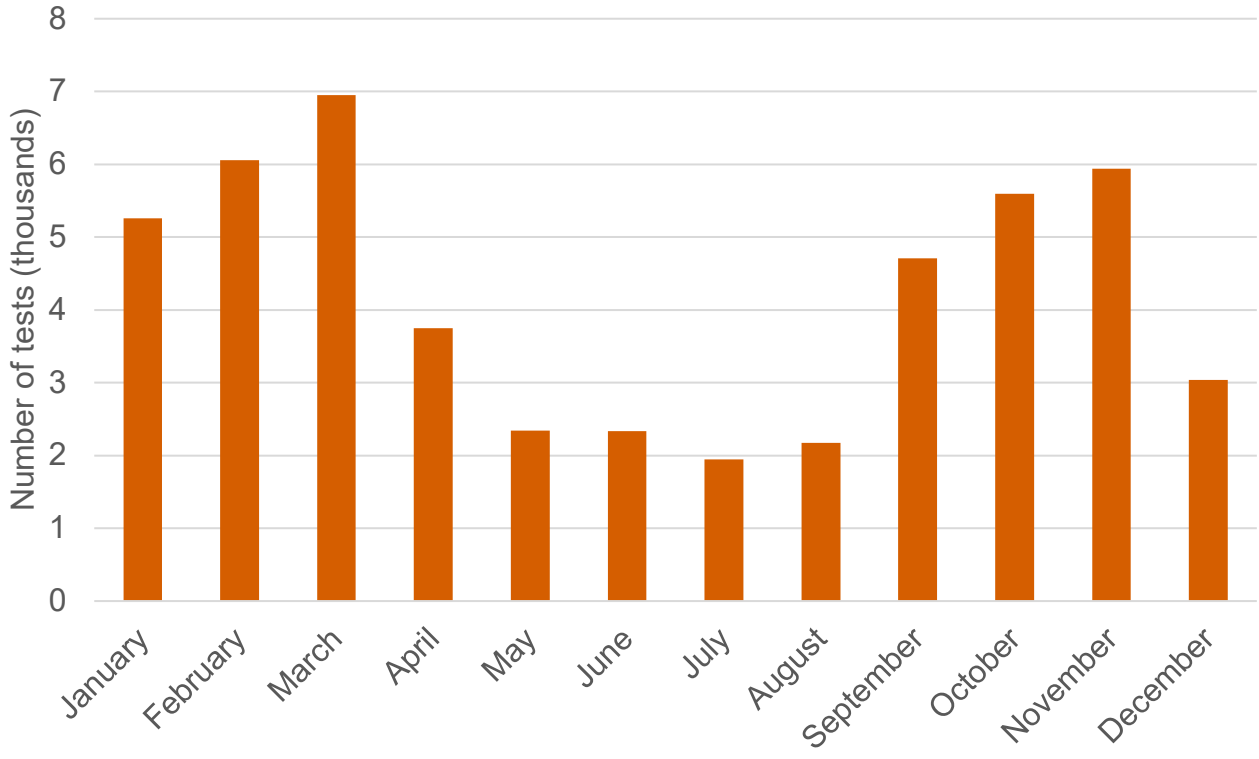


Figure 10: Number of tests undertaken in OTF herds in East Sussex in 2020, by month.

This contrasts with 2019, when TB incidents were distributed more evenly throughout the year. In 2020, the majority of incidents in the first quarter were OTF-S whereas the OTF-W incidents were more evenly distributed throughout the year.

An unusual predominance of incidents (all OTF-S) triggered by inconclusive reactors remaining inconclusive at retest accounts for much of this skewing of incidents towards the early part of the year.

Duration of incidents

The duration of TB incidents in East Sussex in 2020 mostly lasted between 151 and 550 days (Figure 11) with 46% lasting between 151 and 240 days. The mean length of an incident was 193 days for OTF-S incidents and 290 days for OTF-W incidents.

All incidents will last at least 120 days because all infected herds in the Edge Area require at least two consecutive herd tests 60 days apart (short interval testing). OTF-W incidents tend to last longer, partly because these herds also require a mandatory herd IFN-γ test which increases the likelihood of disclosing further reactors.

Any additional visible lesion and/or culture positive reactors trigger two further short interval tests at severe interpretation, again increasing the likelihood of disclosing further reactors and the herd requiring further rounds of testing. There were only two herds with incidents lasting over 551 days: one concluded in 2020 and one was still ongoing at the end of the reporting period.

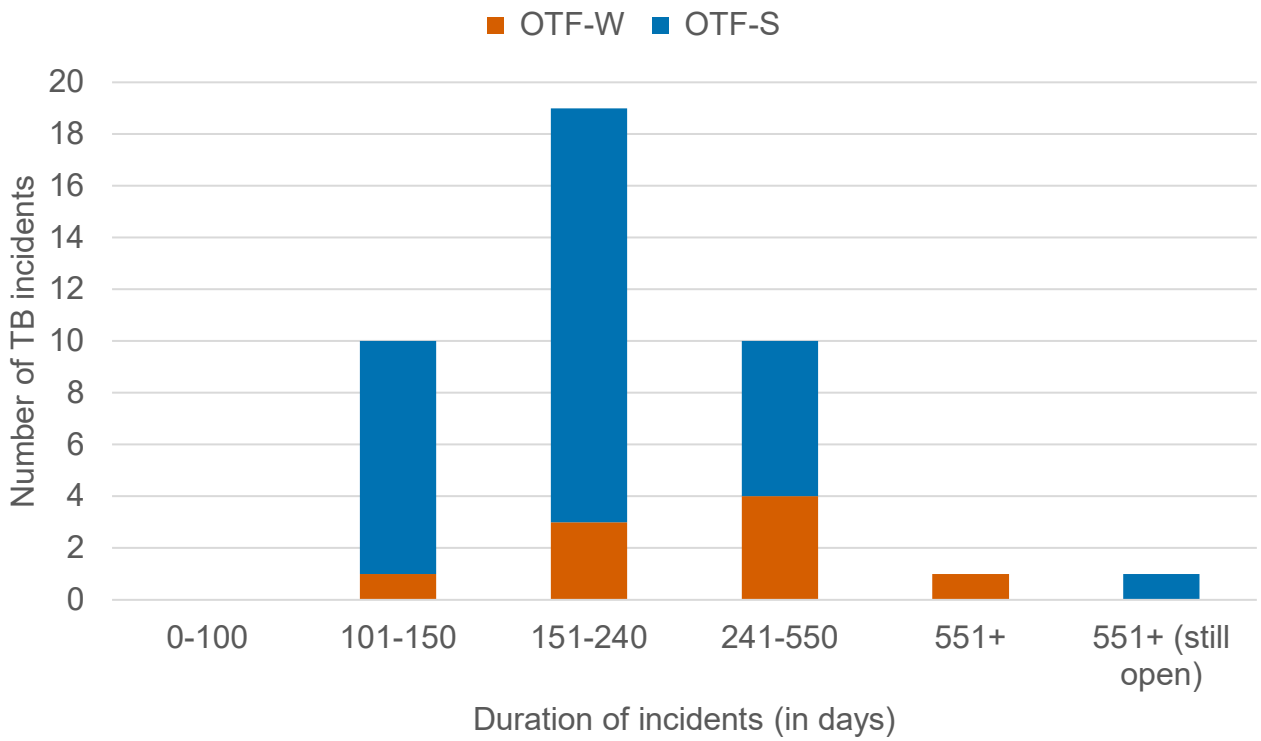


Figure 11: Duration of all TB incidents (OTF-W and OTF-S) that ended in 2020, and the number of persistent TB incidents (551+ days) that were unresolved at the end of 2020 in East Sussex. Note that Approved Finishing Units (AFUs) have been excluded.

Genotypes associated with TB incidents

Genotyping of *M. bovis* isolates has been used to trace the origin of TB infection. It is particularly useful in identifying where spread has occurred through cattle movements. Stable genotype clusters tend to be found in areas where there is a persistent local reservoir of infection.

APHA implemented whole genome sequencing (WGS) in place of genotyping from April 2021. During 2020 however, genotyping was still performed on *M. bovis* samples isolated from all OTF-W herds in the Edge Area.

Of the 12 new OTF-W incidents disclosed in East Sussex in 2020, *M. bovis* was cultured in 11 of them, eight with genotype 13:a (90%, Figure 12). One spoligotype 13 isolate could not be genotyped and is not included in Figure 12.

Eight of these nine 13 spoligotype isolates were within the homerange located within the original HRA, and one occurred outside this area. The genotype 55:5-3-4-5*-4-3.1 was disclosed in a herd on the northern border with Kent. This isolate does not have a homerange and is the only incident to date with this isolate recorded in GB.

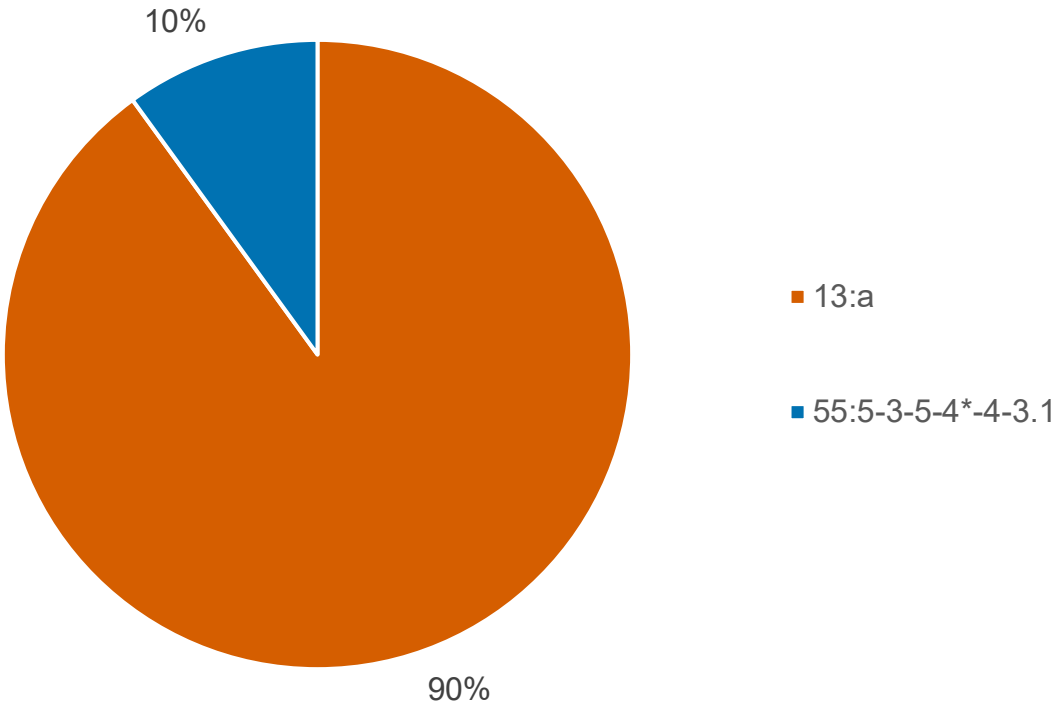


Figure 12: Genotypes of *M. bovis* identified in herds with OTF-W incidents in East Sussex in 2020 (n=10).

Unusual TB incidents

One TB incident was potentially linked to infection acquired historically at agricultural shows. The farm was located in the original Edge Area part of the county far away from the area with endemically infected wildlife.

The reactor animal was a show cow that attended shows all over South East England during 2011 and 2012 and spent some time on a farm in Kent in the LRA. Neither farm premises involved had a history of TB infection. The cow had lesions typical of TB in the mediastinal lymph nodes (chest) and in the lung tissue at PM inspection so was more likely to spread *M. bovis* via the respiratory route.

However, this was the only skin test reactor disclosed during the incident, and only one IFN-y test-positive was disclosed. This animal had no visible lesions of TB (NVL) at PM inspection. The six-month post-incident check test was negative, suggesting that cattle-to-cattle transmission within the herd was minimal. *M. bovis* with genotype 13:a was cultured from the lesions in the carcase of the single skin test reactor.

The incident that disclosed the most reactors (17) was an OTF-W dairy herd located in the former HRA of East Sussex. *M. bovis* with genotype 13:a was cultured and infection from local wildlife was considered the most likely source of infection. This farm had had several previous TB incidents. It attained OTF status after the minimum two short interval skin tests and one herd IFN-y test.

Suspected sources, risk pathways and key drivers for TB infection

Key drivers of infection

The key drivers of the TB epidemic in East Sussex during 2020 were as follows:

- Infected wildlife in the former HRA part of the county
- Movement of purchased cattle

Farmers need to be encouraged to increase on-farm biosecurity and reduce interaction between cattle and wildlife. Simple measures such as wildlife proofing of feed stores including maize and whole crop silage and raising water and feed troughs could have a positive impact on increasing herd resilience to TB especially in and near to the area with endemically infected wildlife. TB controls directed at wildlife reservoirs are needed such as vaccination of badgers.

Purchase of cattle from higher incidence areas of England and Wales where undisclosed *M. bovis* infection is more likely, should be avoided where possible or additional measures applied to mitigate the risk, such as post-movement testing.

Pre-movement testing helps mitigate this risk however a proportion of infected animals are not detected, and it is not mandatory for cattle purchased from the LRA which represent a potential but much less likely source of infection.

Although not currently required in the Edge Area counties, post-movement testing could potentially detect undisclosed infection earlier than at annual surveillance testing if routinely carried out.

The use of the interactive mapping tool ibTB may help farmers to make informed purchasing decisions.

Sources of infection and risk pathways

It can be challenging to retrospectively establish the route of infection for a TB incident herd. APHA aims to complete an epidemiological assessment for all TB incidents in the Edge Area (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. This information is captured on the Disease Report Form (DRF).

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 is recorded as either definite (score 8), most likely (score 6), likely (score 4) or possible (score 1). Risk pathway data are explored both at the herd and county level.

The most likely source of infection in individual TB incidents

The most likely source identified by the APHA veterinary assessment is explored spatially for individual TB incidents. The most likely source of infection for individual TB incidents discounts additional risk pathways identified with a lower level of certainty.

Where two sources were ranked equally as the most likely source for an incident, both sources are reported for the incident using a split symbol in the map.

As can be seen from Figure 13, the OTF-W wildlife attributed incidents (green dots) were clustered in the south-west area of the county. This was part of the former HRA portion with endemically infected wildlife in the south of the county. The *M. bovis* isolates from these incidents were spoligotype 13 and located within the homerange lending weight to the conclusions of a wildlife source where introduction by cattle movements can be ruled out.

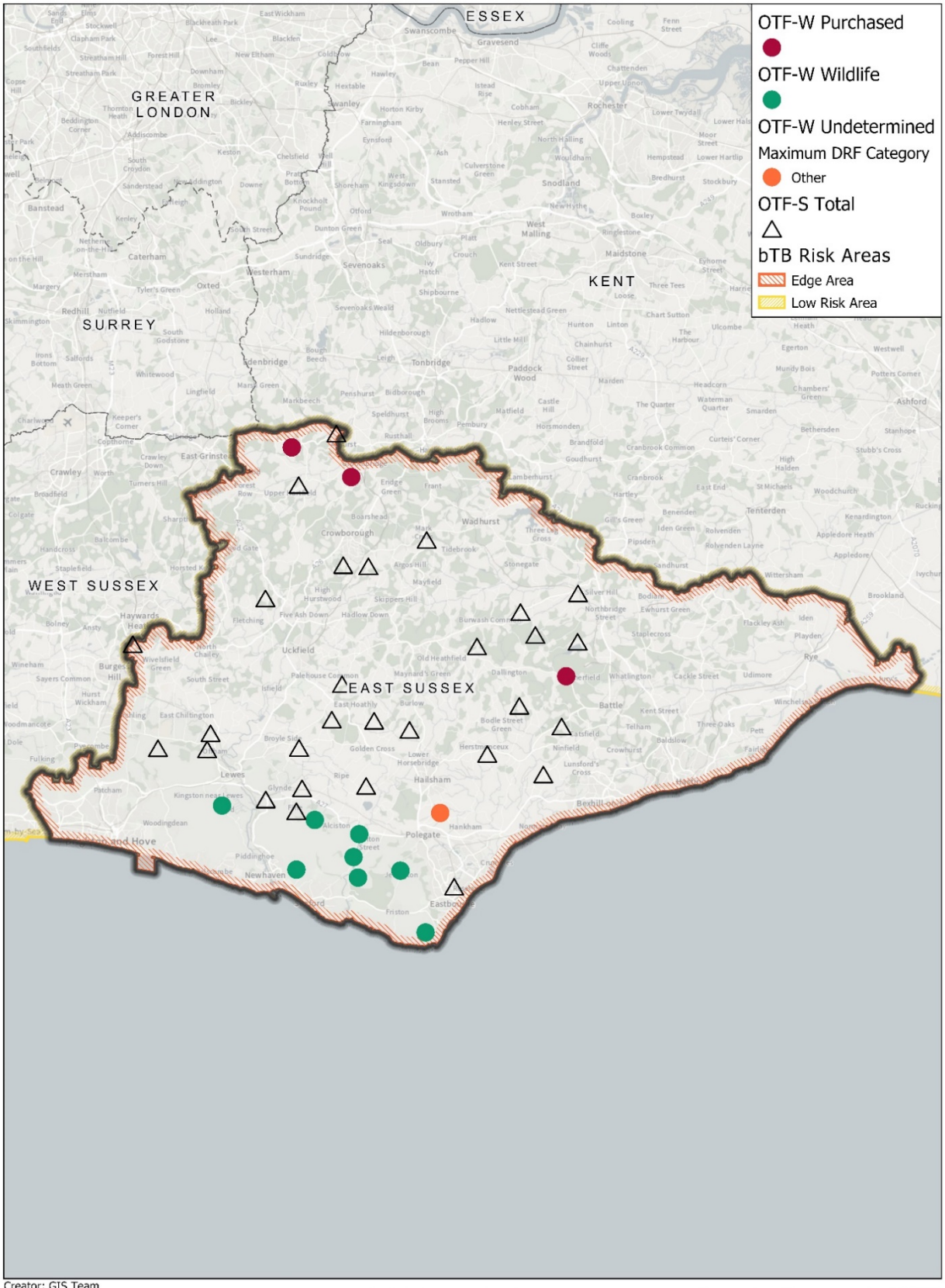
There were no TB incidents in the original Edge Area portion of the county attributed to local cattle spread in 2020. Movement of undetected infected cattle was attributed to two of the three OTF-W incidents in the original Edge Area portion of the county and one of these incidents was *M. bovis* genotype (55:5-3-5-4*-4.3.1) that was unique with no established

homerange. This farm had a previous TB incident in 2011 but with an unrelated genotype (17:t), so the true origin of this incident remains unexplained.

There was no culture or genotype result available for the third OTF-W incident but movements into the herd of undetected infected cattle from the HRA are thought to be the most likely source of infection.

The OTF-S incidents appear to be randomly scattered throughout the county. With no *M. bovis* genotyping information available, the certainty for source of infection is low.

One OTF-W incident with 13:a genotype (orange dot on Figure 13) is shown as ‘other’ as cattle movements and infection from wildlife were given equal weighting.



Creator: GIS Team
Source: Sam
OTFW data as at 15th of April 2021
Ref: 20210607
Date: 07/06/2021

DRF Source - East Sussex

0 3.75 7.5 15 Kilometers

Animal & Plant Health Agency

The weighted source of infection at county level

To consider the contribution of all sources of infection within an area, the source(s) for each incident are weighted by the certainty ascribed. Any combination of definite, most likely, likely, or possible sources 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. This presents the overall proportion of pathways in which each source was identified, weighted by the level of certainty 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.

Infected badgers accounted for 56% (Figure 14a) of the weighted source pathways recorded for the 12 new OTF-W incidents in 2020. However, this data set is small, so any uncertainty will have a large impact on interpretation. All incidents were located in the former HRA portion of the county. The *M. bovis* genotype results help to provide higher certainty to these most likely source attributions.

Movements of undetected infected cattle accounted for 26% of the weighted source pathways and the three incidents mostly contributing towards this were in the former Edge Area portion of the county. Contiguous infection accounted for 6% of weighted source pathways, with residual infection 1.5% and 1% fomite source and 8% with other or unknown.

Figure 14b shows that a wider variety of sources of infection were attributed to OTF-S incidents in 2020. This is explained by the larger data set (29 incidents) and the higher uncertainty for source of infection as there was no *M. bovis* genotype information to help determine the source. It is therefore difficult to draw useful conclusions about this uncertain data.

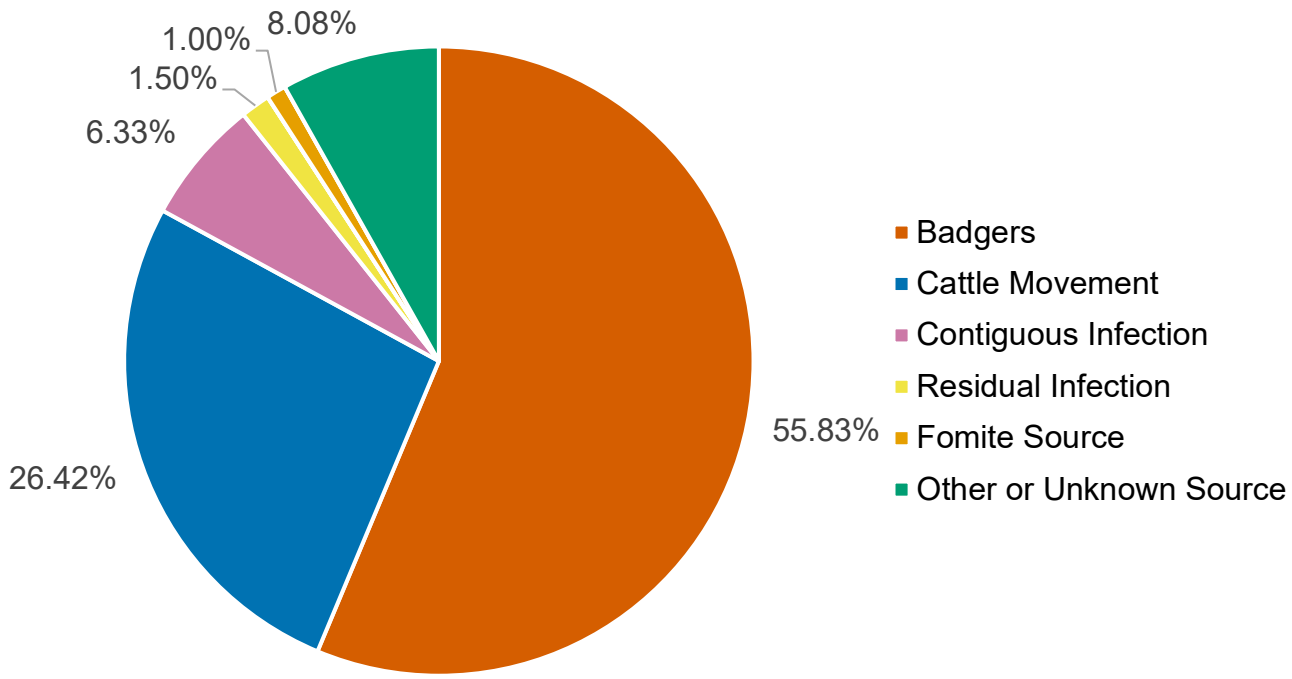


Figure 14a: Summary of the weighted source of infection pathways attributed for OTF-W TB incidents that started in 2020 in East Sussex, that had a completed DRF (n=12).

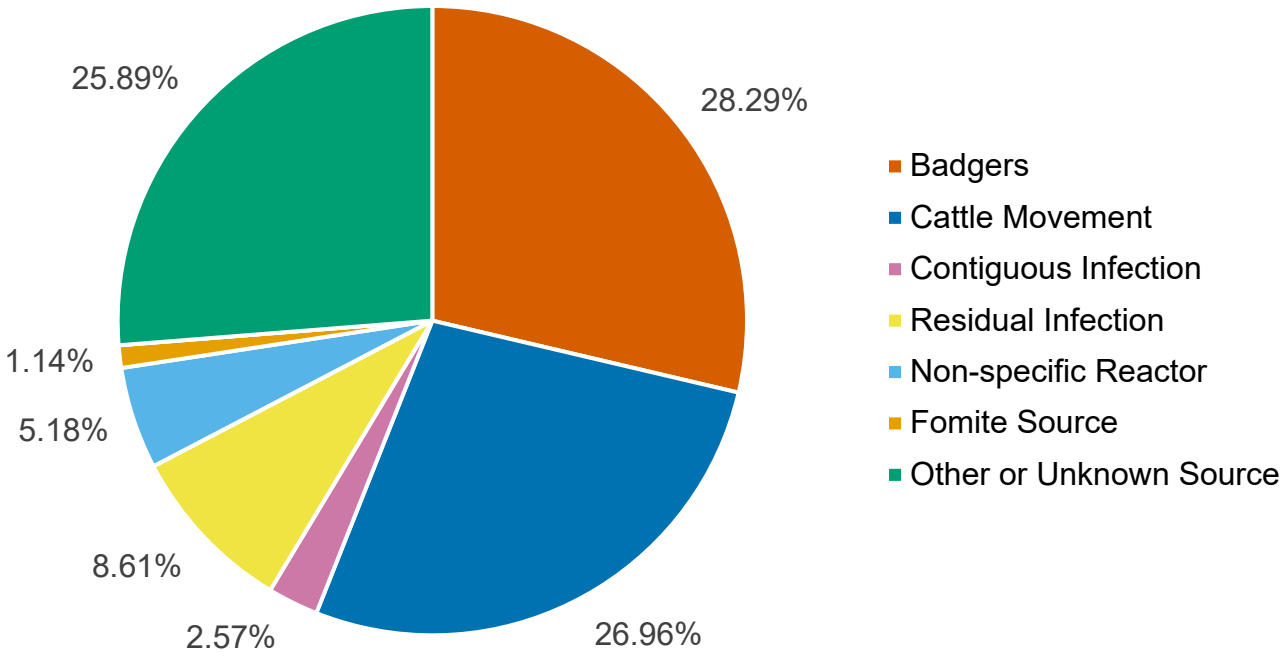


Figure 14b: Summary of the weighted source of infection pathways attributed for OTF-S TB incidents that started in 2020 in East Sussex, that had a completed DRF (n=28).

TB in other species

There is no statutory routine TB surveillance of live non-bovine species. PM examination is performed on suspected clinical cases reported to APHA. Furthermore, PM meat inspection is carried out on all captive animals (for example, sheep, goats, pigs or deer) slaughtered for human consumption.

Meerkats

TB infection was laboratory-confirmed in two meerkats that lost condition, with *M. bovis* genotype 13:a, in a zoo in East Sussex. This incident commenced in 2019 with a lesion typical of TB found in a meerkat PM but culture confirmation was not received until 2020 when subsequent skin testing of the co-located cattle took place.

The only two cattle present were slaughtered, both with visible lesions of TB seen at PM inspection, and *M. bovis* genotype 13:a was cultured from one animal. Whole genome sequencing (WGS) analysis supported a common source such as wildlife for both meerkats and cattle. This premises was located in the 13:a homerange area of the county where endemically infected wildlife is present.

Detection of TB incidents

With reference to Figures 15a and 15b, routine surveillance testing (whole herd test, WHT) disclosed most of the TB incidents in East Sussex in 2020, as was the case in previous years (2017 to 2019).

Radial testing (RAD) of herds located within 3km of OTF-W incidents disclosed seven incidents in 2020, compared to five incidents in 2019 and eight in 2018. Radial testing was unlikely to have increased the total number of TB incidents disclosed in 2020 because the incidents would have been disclosed at the WHT, albeit at a later date, but perhaps with more reactors and increased likelihood of onward spread.

Pre-movement tests accounted for only one incident in 2020. Four TB incidents were disclosed by six-month post-incident tests (6M) thereby identifying reactors before the next annual surveillance test.

Two incidents commenced with detection of lesions typical of TB in cattle sent for routine private commercial slaughter (slaughterhouse case). This illustrates the importance of passive surveillance to disclose TB infection at the earliest opportunity and thereby minimise disease spread.

Of the 29 OTF-S incidents, 19 were triggered by animals that had been tested twice with inconclusive results to the skin test. This proportion of 66% is high in comparison with 2019 when this was the case with 26% (5 out of 19) of OTF-S incidents. Much of the increase in TB incidence in East Sussex in 2020 could be explained by this. Incidence would be more in line with the expected gradual rising trend and similar to 2018 and 2019 figures if the OTF-S incidents disclosed by animals twice testing with inconclusive results were discounted.

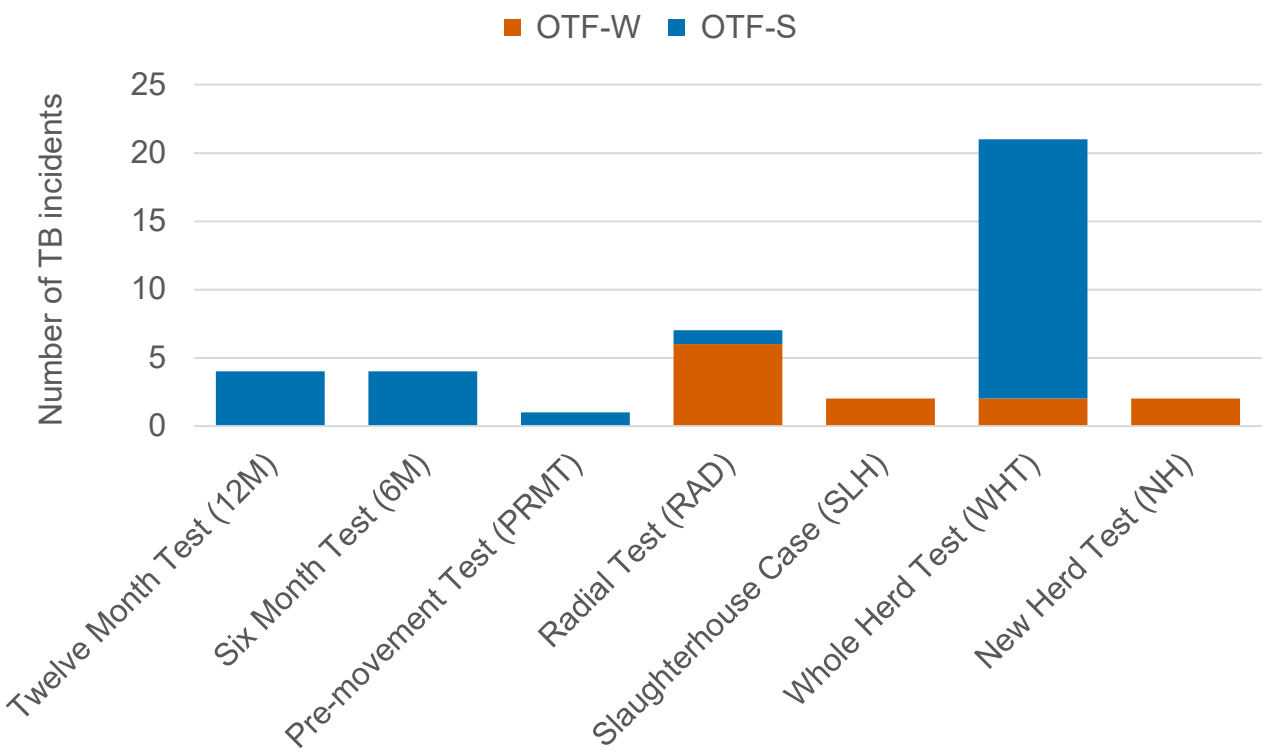


Figure 15a: Number of TB incidents (OTF-W and OTF-S) in East Sussex in 2020, disclosed by different surveillance methods.

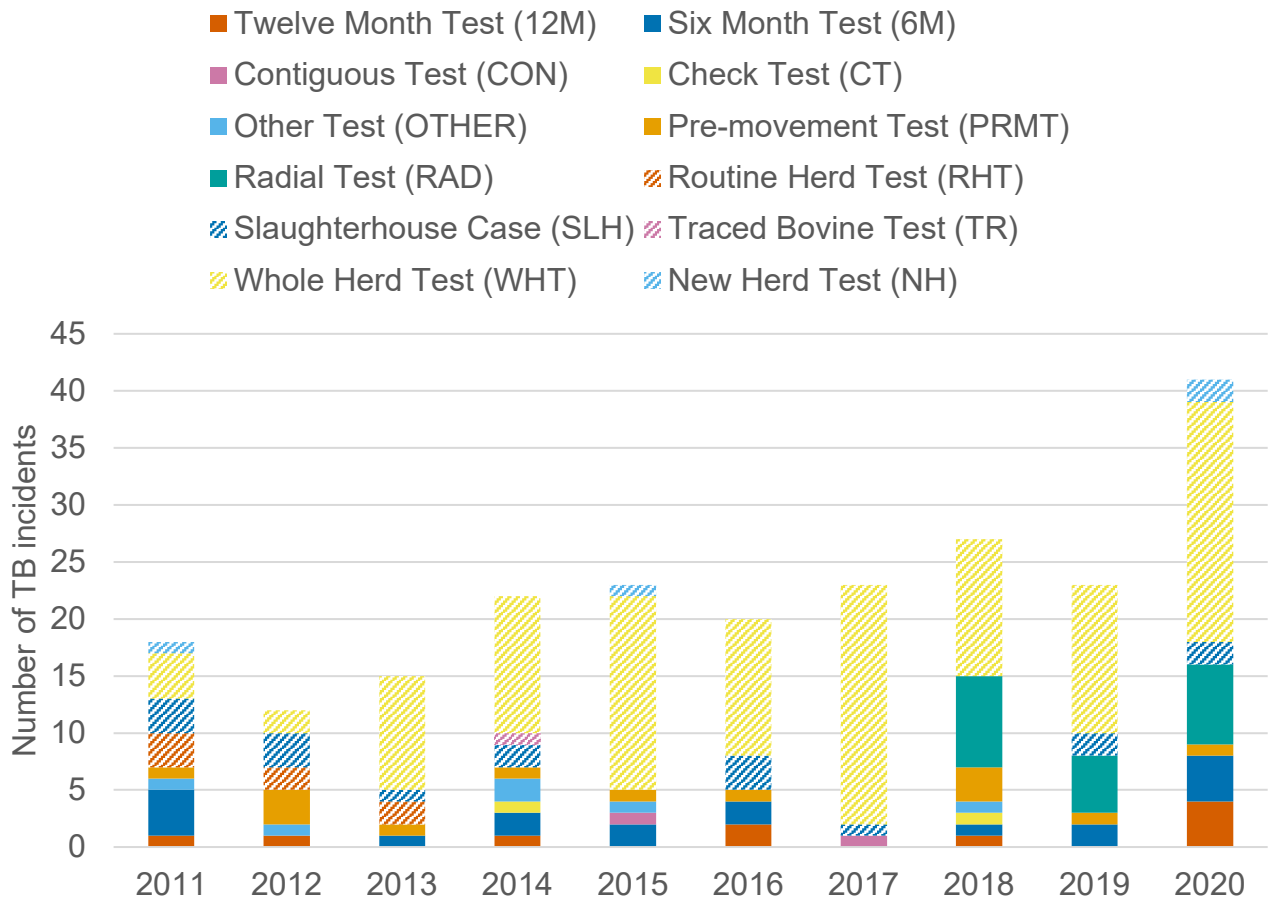


Figure 15b: Number of TB incidents (OTF-W and OTF-S) in East Sussex, 2011 to 2020 disclosed by different surveillance methods by year.

As shown in Figure 16, 34% of OTF-S and 45% of OTF-W incidents had experienced an OTF-W incident within the previous three years. This represents a relatively high recurrence rate and is related to a combination of movements of undetected infected cattle,endemically infected wildlife in certain areas of the county, and residual cattle infection from previous incidents.

Figure 16 shows the number of new OTF-W and OTF-S incidents in 2020, that had experienced an OTF-W incident in the previous three years. It excludes new incidents that were also on restrictions in the first four or more months of 2020 due to an incident that started before 2020. The Explanatory Supplement (see Section 4.3) provides more details on the reporting of recurrent TB incidents.

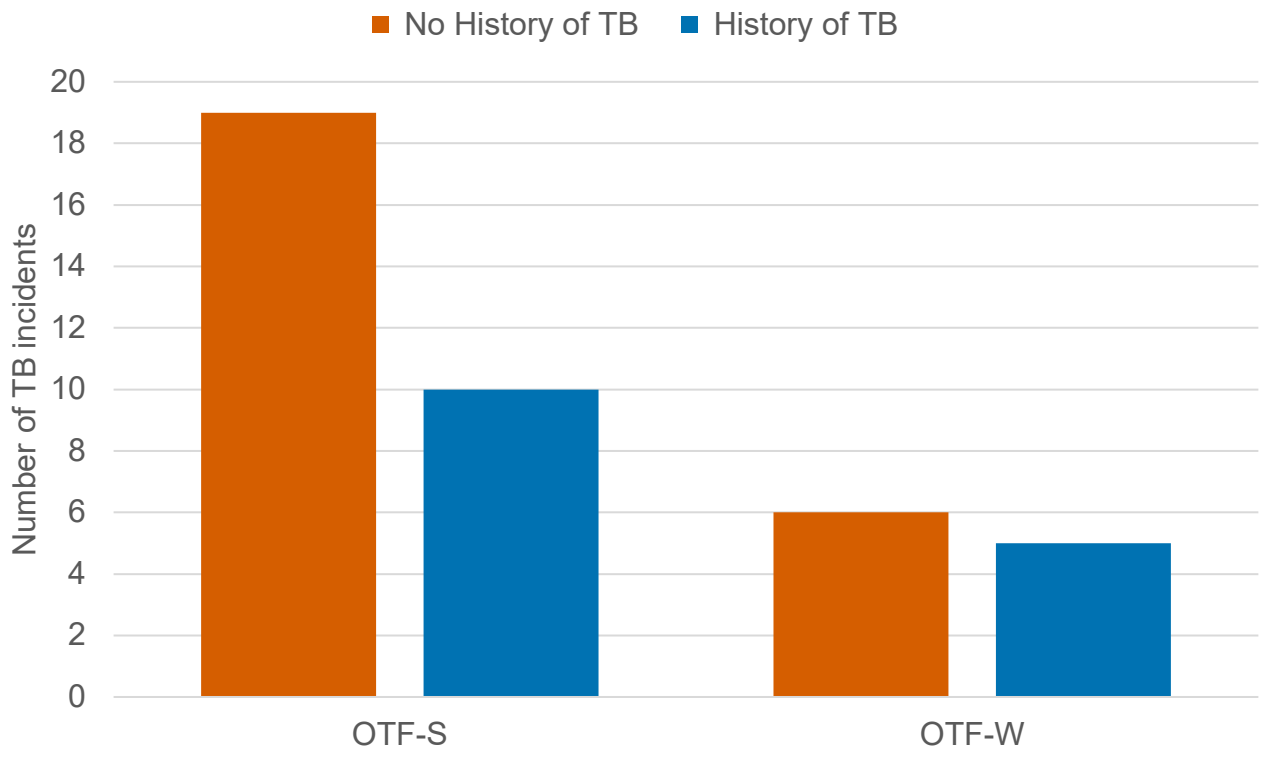


Figure 16: Number of herds with a TB incident (OTF-W and OTF-S) in East Sussex in 2020, with a history of TB (herds that experienced an OTF-W incident in the previous three years), and holdings without a history of TB in the previous three years.

Skin test reactors and interferon gamma test positive animals removed

The 78% increase in TB incidents in 2020 compared to 2019 has translated into a corresponding increase in skin test reactors (64% increase from 78 in 2019 to 128 in 2020). However, the number of IFN-y test positive cattle has declined by 30% (from 133 in 2019 to 94 in 2020) despite there being eight more OTF-W incidents in 2020 than 2019 and hence more herd IFN-y tests performed.

The number of skin test reactors disclosed per incident has declined from 9.2 to 5.4 but interestingly the number of reactors disclosed per 1,000 animals tested in 2019 and 2020 has remained the same at 2.8.

The majority of incidents (26, 63%) only disclosed one to three reactors. In one OTF-W incident and 19 OTF-S incidents, the disclosing test was where the retest result of an inconclusive reactor remained inconclusive.

These incidents resolved quickly with minimal amount of testing and were the main cause of the increase in incidents in 2020 compared to 2019 (see Appendix 4 and Figure 11).

The reduced number of skin test reactors per incident is encouraging as it would suggest that TB infection was being detected at an earlier point before cattle-to-cattle transmission occurs within herds.

The burden on the taxpayer for TB reactor compensation increased slightly in 2020 when compared to 2019 but far less than in 2018 when record numbers of skin test reactors and IFN-y test-positives were removed. The costs for TB testing increased slightly in 2020 as more tests (skin and IFN-y) were performed and were on a par with 2018 levels.

The length of TB incidents has declined over the last three years, potentially reducing the impact on affected farms. The mean incident duration in 2020 for OTF-W incidents was 290 days compared to 214 days and 401 days in 2018 and 2019, respectively. For OTF-S incidents the mean duration was 193 days, which was reduced from 2018 (216 days) and 2019 (209 days).

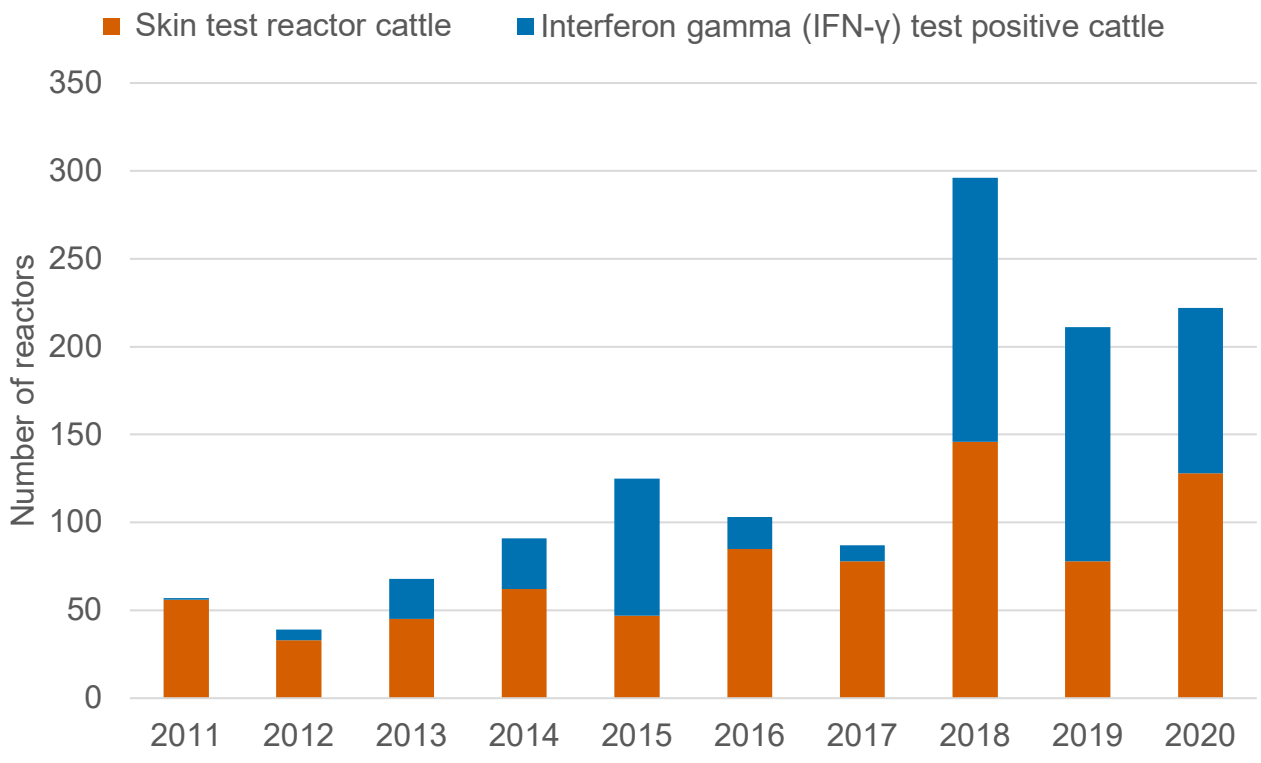


Figure 17: Number of skin test reactors and interferon gamma (IFN-γ) test positive cattle removed by APHA for TB control reasons in East Sussex, 2011 to 2020.

Summary of risks to East Sussex

There are no HRA counties adjacent to East Sussex now that the whole county is part of the Edge Area since January 2018. There are risks from movements of undetected infected cattle from the HRA and higher incidence parts of the Edge Area.

Informed purchasing of cattle must be encouraged, and on-farm biosecurity measures implemented to mitigate against these risks. Long distance movements of cattle will continue as there are a limited number of cattle available locally to supply the beef fattening units in the county.

Summary of risks from East Sussex to surrounding areas

East Sussex is unique in that it is surrounded by LRA counties and so could pose a risk to the bordering counties of West Sussex, Surrey, and Kent. In West Sussex in 2020, there were five OTF-S incidents and no OTF-W incidents. Two of these incidents were located near the border with East Sussex and one other incident was attributed to movements of undetected infected cattle.

Compared to the previous two years, the number of new OTF-S and OTF-W TB incidents in the adjacent LRA counties has declined in 2020, suggesting that the risk posed by the large increase in incidents in East Sussex has not impacted neighbouring counties.

The area with endemically infected wildlife (*M. bovis* genotypes 13:a, 13:c and 13:d) remained stable, and there were no incidents in East Sussex in 2019 or 2020 with genotype 9:l, previously identified as being a genotype found in this area.

Therefore, the risks to the LRA counties surrounding East Sussex related to movements of infected wildlife are probably minimal. However, geographic spread of wildlife reservoirs may be missed because of the lower cattle density in the areas around the borders of the county providing less cattle sentinels for monitoring of endemic infection.

The area of endemically infected wildlife in East Sussex near to the border with West Sussex is separated by the city of Brighton making local spread of infection by wildlife movements less likely.

Post-movement testing of cattle moved into the LRA from East Sussex helps to mitigate against introduction of TB through movements of undetected infected cattle, although the imperfections of testing mean that this is not a guarantee.

Herds that straddle different TB risk areas take on the more frequent surveillance testing of the higher risk area mitigating the risk posed by straddling a higher incidence area.

Assessment of effectiveness of controls and forward look

Effectiveness of controls

The area of endemically infected wildlife in East Sussex remains relatively stable and there is no conclusive evidence to suggest that it has expanded during 2020 remaining confined to the south of the county where there is a relatively low density of cattle. This is supported by *M. bovis* genotype information.

There are no recent data for TB prevalence in wildlife in the area therefore this report is reliant on cattle data as an indicator of the likelihood of the endemic *M. bovis* genotypes 13:a, 13:c and 13:d becoming more established outside their homerange in herds where cattle movements are not considered to be a source of the incident.

There were nine cattle isolates of *M. bovis* genotypes 13:a in 2020 and eight were within the former HRA portion of the county. One of the farms was just north of the A27 road, which was traditionally regarded as a barrier for the spread of wildlife infection.

Unfortunately, WGS information was not available to help discern between movements of undetected infected cattle and infection from local wildlife, but data from 2019 suggests that the homerange for 13:a had expanded north of the A27 road.

This is slightly concerning as there is no physical barrier to prevent further northward and eastward spread. However, apart from this one incident, there has been no evidence to confirm further spread during 2020.

The incident rate has increased during 2020, the number of OTF-W incidents has returned to similar levels found in 2018 and there was a large rise in OTF-S incidents. The OTF-S incidents are spread evenly throughout the county, which is consistent with movements of undetected infected cattle as the source of infection.

As the demographic of the cattle herds changes from many small farms to fewer but larger herds, it is to be expected that the likelihood of a TB incident will increase.

A large proportion of OTF-S incidents did not have obvious epidemiological links with purchased cattle, nor was there conclusive evidence of a wildlife source hence 25% of the risk pathways for these OTF-S incidents were inconclusive. There is high uncertainty associated with conclusions made for OTF-S incidents because of the lack of *M. bovis* genotype or WGS information.

However, these associated geographical areas should continue to be monitored for any long-term trends that might suggest endemicity.

The primary purpose for the establishment of radial testing zones around OTF-W incidents is to detect source and spread from them, but they can also detect unrelated infections at an earlier stage compared to the annual routine herd test.

However, as radial zones are not established and tracings not undertaken for OTF-S incidents, any associated infection can remain undetected. The use of severe interpretation of the tuberculin skin test and requirement for a minimum of two short interval skin tests before releasing movement restrictions from OTF-S incidents in the Edge Area helps to remove infection from the herd.

It was a challenging in 2020 to deliver the cattle TB testing programme due to the impacts of the COVID-19 outbreak and the requirement to perform the TB test in a COVID-19 secure manner. As a result, two out of six herds overdue at the end of 2020 were so for COVID-19 related reasons.

Since movement of cattle with undetected infection is an important source of TB incidents in East Sussex, informed purchasing and use of tools available such as the interactive mapping tool ibTB can support decision making. Increasing awareness of these tools through promotional campaigns would be beneficial.

The employment of effective on-farm biosecurity measures to reduce cattle-to-badger interactions and the uptake of badger vaccination schemes are to be encouraged. The availability to farmers of free advice on prevention and management of TB in their herd is also welcomed.

Forward look

The overall incidence rate and the total number of incidents increased substantially in 2020 in East Sussex, but this was largely due to OTF-S incidents disclosed by inconclusive reactors remaining inconclusive at retest, and many of these herds returned to OTF status with the minimum two short interval skin tests. Therefore, it is likely that the increase will not be sustained.

With this deterioration in the TB statistics for East Sussex in 2020 it seems unlikely that the short and long term objectives set out in Appendix 1 will be met. Despite a decline in prevalence and incidence seen in 2019, the overall trend over the last decade is for an increase in these parameters, possibly due to the lack of TB infection control in wildlife.

Appendices

Appendix 1: Overview of risk and surveillance areas of England and Edge Area objectives and controls

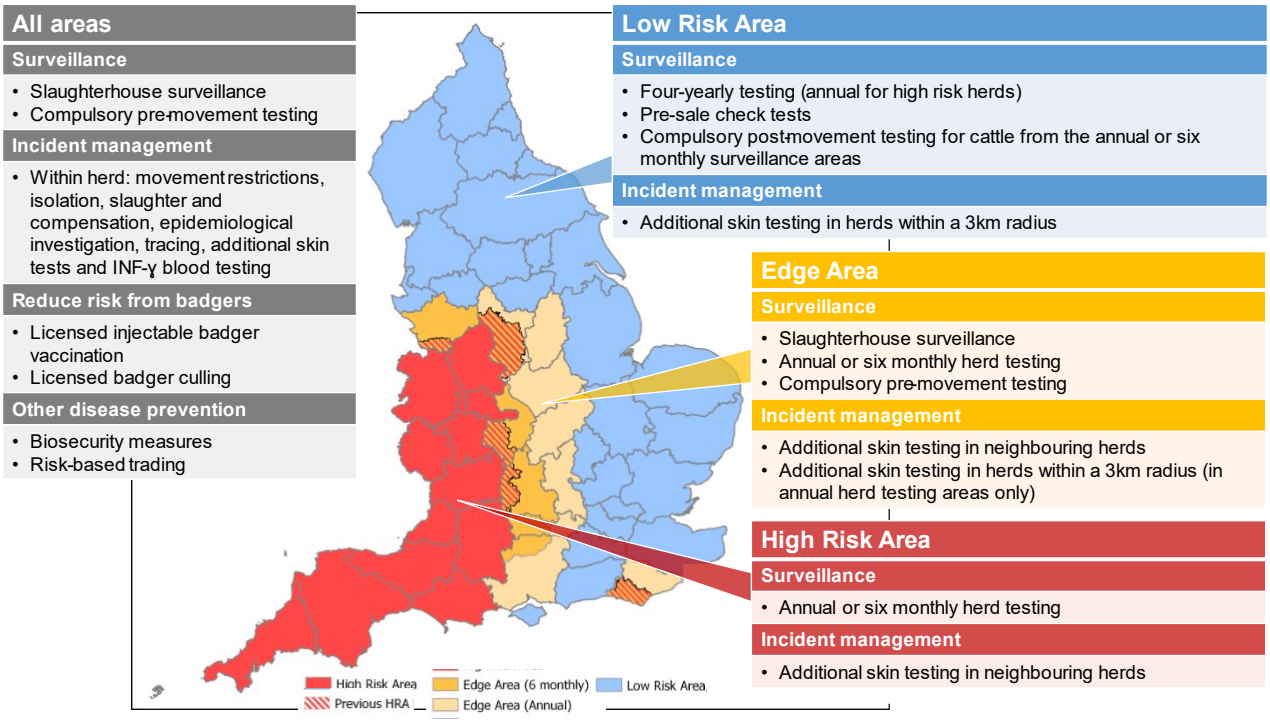


Figure A1: TB risk and surveillance areas of England effective since January 2018, as set out in the Government's Strategy for Achieving Officially Tuberculosis-Free Status for England. The map is described in more detail in the Explanatory Supplement for England 2020.

Short to medium term:

- slow down geographic spread of endemic infection
- maintain crude herd incidence of OTF-W incidents less than 2% overall by 2019
- begin to reduce the incidence rate

Longer term:

- reduce geographic spread of TB and push the Edge Area boundaries westward
- reduce OTF-W herd incidence to less than 1% by 2025
- attain OTF status (crude incidence of indigenous OTF-W herd incidents less than 0.1%) for the lowest incidence counties in the Edge Area

For more information about the governments approach to controlling TB, visit the strategy for achieving Officially Bovine Tuberculosis Free status for England, published in 2014 and independently reviewed in 2018, see:

- A strategy for achieving officially bovine tuberculosis free status for England
- Government sets out next phase of strategy to combat bovine tuberculosis

Key Control Measures

Surveillance:

- six monthly or annual routine whole herd testing
- additional targeted surveillance of cattle herds located within a 3km radius of new OTF-W incidents in annual testing sections of the Edge Area (radial testing)
- slaughterhouse (SLH) surveillance

Management of cases ('incidents'):

- increased sensitivity of incident herd testing:
- all incident herds must pass two consecutive short interval skin tests at severe interpretation to regain OTF status, irrespective of PM and bacteriological findings
- mandatory IFN-γ parallel testing of herds with OTF-W incidents
- enhanced management of herds with persistent incidents
- enhanced epidemiological investigation and data analysis
- information sharing - location of incident herds publicly available (using ibTB online interactive mapping tool)
- restriction for life of all inconclusive reactors (IRs) that give a negative result on a re-test was introduced in November 2017 ('resolved IRs' policy). The only permitted movements of these animals are to slaughter or an Approved Finishing Unit, or after being subjected to a private IFN- γ test with negative results.

TB controls in the wildlife reservoir (badgers):

- licensed badger culling in high incidence sections of the Edge Area
- Government grants for licensed voluntary badger vaccination projects using injectable badger BCG (Badger Edge Vaccination Scheme (BEVS))

Other measures:

- compulsory pre-movement skin testing of cattle moved between herds
- promotion of herd biosecurity measures to reduce the risk of new incidents

Summary of enhanced TB control measures in East Sussex

Edge Area testing policy

- No discretionary IFN-y testing was employed in OTF-S incidents in 2020.
- No exemptions were given to deployment of IFN-y testing in OTF-W incidents in 2020.
- Ten radial zones were set up in 2020 and disclosed a total of eight reactors and 39 inconclusive reactors. Three zones have outstanding tests.

- There were only two TB incidents lasting over 551 days. One incident concluded in 2020 without extra measures being implemented, and the other was still ongoing at the end of the reporting period.

Other testing measures

- No discretionary TB testing exemptions were given to fattener herds.
- No contiguous tests were set up in response to wildlife or non-bovine incidents in 2020.
- Only six tests were overdue at end of 2020. Only two of these were delayed for COVID-19 reasons. During 2020, 14 herds were overdue by more than 30 days and only one herd for more than 6 months, which was a small herd and would have limited disease significance.

Other control measures

- No farmers meetings were held in 2020 due to the ongoing COVID-19 epidemic.
- Biosecurity advice continued to be delivered to individual farmers by TB Advisory Service (TBAS).

Appendix 2: Cattle industry in East Sussex

Table A2.1: Number of cattle premises by size band in East Sussex at 1 January 2020. (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	4	287	101	69	28	11	11	511	85	40

***The number of herds with an undetermined size.**

Table A2.2: Number of animals by breed purpose in East Sussex at 1 January 2020.

Breed purpose	Beef	Dairy	Dual purpose	Unknown	Total
Number of cattle	28,979 (66%)	12,984 (29%)	1,410 (3%)	8 (less than 0.1%)	43,381

Appendix 3: Summary of headline cattle TB statistics

Table A3.1: Herd-level summary statistics for TB in cattle in East Sussex between 2018 and 2020.

Herd-level statistics	2018	2019	2020
(a) Total number of cattle herds live on Sam at the end of the reporting period	609	626	632
(b) Total number of whole herd skin tests carried out at any time in the period	647	615	674
(c) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	516	524	493
(d) Total number of OTF cattle herds at the end of the report period (herds not under any type of Notice Prohibiting the Movement of Bovine Animals (TB02) restrictions)	578	597	599
(e) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period	588	610	615
(f) Total number of new TB incidents detected in cattle herds during the report period (including all FUs)	27	23	41
• OTF-S	13	19	29
• OTF-W	14	4	12
(g) Of the OTF-W herd incidents:			
• How many can be considered the result of movement, purchase or contact from or with an existing incident based on current evidence?	4	0	3

Herd-level statistics	2018	2019	2020
• New OTF-W incidents triggered by skin test Reactors or 2xIRs at routine herd tests	4	1	2
• New OTF-W incidents triggered by skin test Reactors or 2xIRs at other TB test types (such as, forward and back-tracings, contiguous, check tests)	4	1	8
• New OTF-W incidents first detected through routine slaughterhouse TB surveillance	0	0	2
(h) Number of new incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds			
• OTF-S	2	3	2
• OTF-W	6	2	6
(i) 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, but not including non-grazing Approved Finishing Units)	12	4	7
(j) New confirmed (positive *M. bovis* culture) incidents in non-bovine species detected during the report period (indicate host species involved)			1 meerkat
(k) Number and type of finishing units active at end of the period:			
• Approved Finishing Units: Grazing	0	0	0
• Approved Finishing Units: Non Grazing	1	1	1
• Exempt Finishing Units: Grazing	0	0	0
• Exempt Finishing Units: Non Grazing	2	2	2

Table A3.2: Animal-level summary statistics for TB in cattle in East Sussex between 2018 and 2020.

Animal-level statistics (cattle)	2018	2019	2020
(a) Total number of cattle tested in the period (animal tests)	79,091	75,704	79,543
(b) Reactors detected in tests during the year:			
• Tuberculin skin test	146	78	128
• Additional IFN-γ blood test reactors (skin-test negative or IR animals)	150	133	94
(c) Reactors detected during year per incidents disclosed during year	11.0	9.2	5.4
(d) Reactors per 1000 animal tests	3.7	2.8	2.8
(e) Additional animals slaughtered during the year for TB control reasons:			
• DCs, including any first-time IRs	0	10	15
• Private slaughters	3	12	8
(f) SLH cases (tuberculous carcases) reported by Food Standards Agency (FSA)	2	4	9
(g) SLH cases confirmed by culture of *M. bovis*	1	0	2

Note: (c) Reactors detected during year per incidents disclosed during year, reactors may be from incidents disclosed in earlier years, as any found through testing during the report year count here.

Note: (g) SLH cases confirmed by culture of *M. bovis*, not all cases reported are submitted for culture analysis. All cases reported are from any period prior to or during restrictions.

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

Table A4: Suspected sources of M. bovis infection for all the new OTF-W and OTF-S incidents identified in East Sussex , in 2020.

Source of infection	Possible (1)	Likely (4)	Most likely (6)	Definite (8)	Weighted contribution
Badgers	19	7	11	0	37.0%
Cattle movements	18	7	6	0	27.0%
Contiguous	8	1	0	0	3.8%
Residual infection	7	1	2	0	6.6%
Domestic animals	0	0	0	0	0.0%
Non-specific reactor	4	0	1	0	3.7%
Fomites	3	0	0	0	1.1%
Other wildlife	0	0	0	0	0.0%
Other or unknown source	5	0	0	0	20.8%

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.

Data Protection:
For information on how we handle personal data visit www.gov.uk and search Animal and Plant Health Agency Personal Information Charter.

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National.TBEpi@apha.gov.uk

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