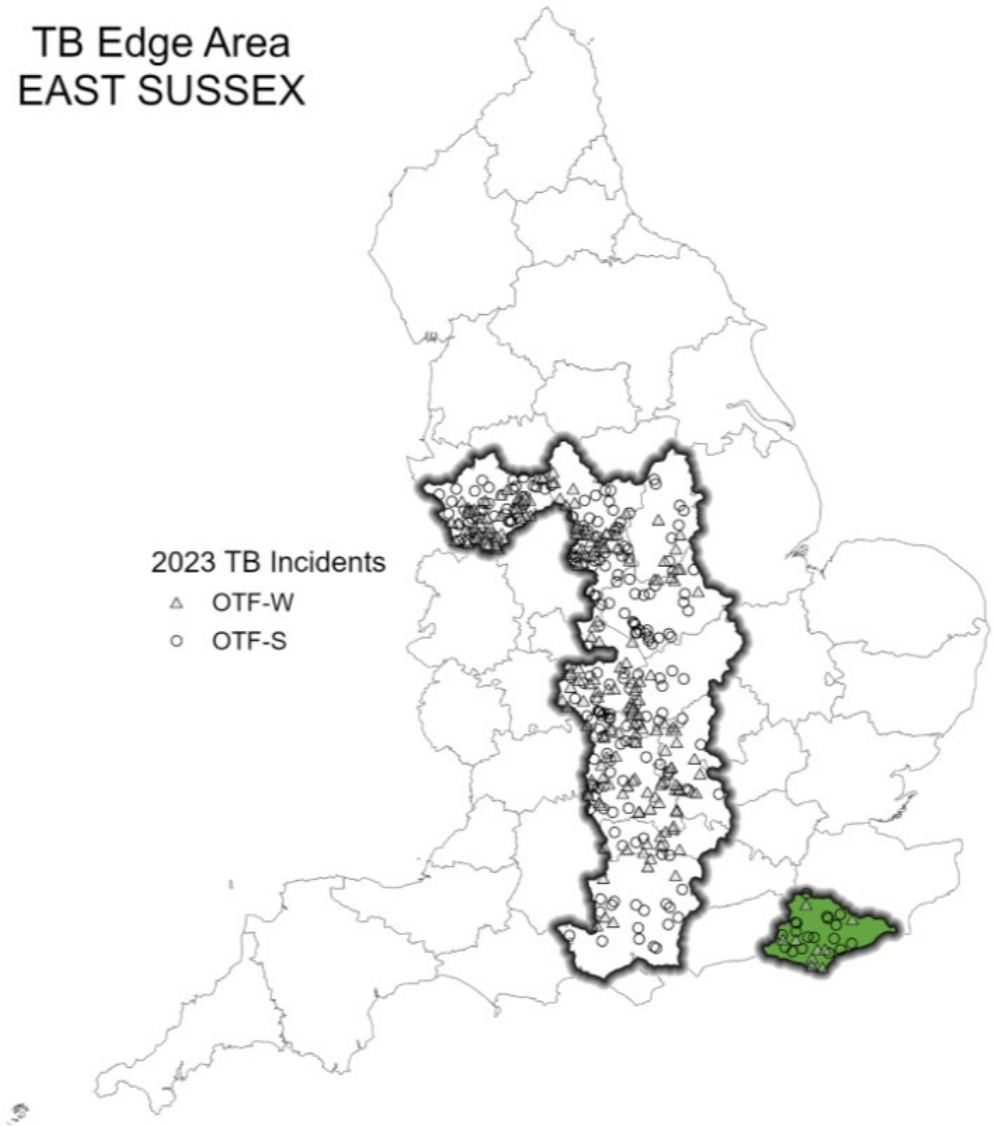
Animal &
Plant Health
Agency

Year End Descriptive Epidemiology Report: Bovine TB in the Edge Area of England 2023 County: East Sussex



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Introduction

The Edge Area was originally established in 2013, along with the Low Risk Area (LRA) and High Risk Area (HRA) of England. In 2014, the three bovine tuberculosis (TB) risk areas were incorporated into the UK government's 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 adjust the approaches to TB surveillance and control in each risk area accordingly. The current aim is to obtain OTF status for the Edge Area as soon as possible.

This report describes the frequency and geographical distribution of TB in cattle herds in East Sussex, an Edge Area county, in 2023. It examines what factors are likely to be driving TB in this area, and the risks the disease in this county may pose to neighbouring areas.

TB in cattle and other mammals is primarily caused by the bacterium *Mycobacterium bovis* (*M. bovis*), and the disease is subsequently referred to in this report as TB. Although other sources may refer to TB 'breakdowns', this report will use the term 'incidents' throughout.

This report is intended for those involved in the control of TB, both locally and nationally. This includes, but it is not limited to, cattle farmers, government and private veterinarians, policy makers and the scientific community.

Details of the data handling methodology used in this report, a glossary of terms, and the TB control measures adopted in the Edge Area, can be found in the explanatory supplement to the annual reports 2023.

Types of TB incidents

Unless otherwise specified, this report includes all new TB incidents detected during the reporting period (1 January to 31 December 2023). This includes both 'Officially Tuberculosis-Free Status Withdrawn' (OTF-W) and 'Officially Tuberculosis-Free Status Suspended' (OTF-S) incidents.

OTF-W incidents are those involving at least one skin test reactor (an animal positive to the Single Intradermal Comparative Cervical Tuberculin [SICCT] test), with either:

- typical lesions of TB identified at post-mortem (PM) meat inspection
- at least one animal with *M. bovis*-positive polymerase chain reaction (PCR) test (or bacteriological culture) results in tissue samples collected from carcasses during the PM inspection.

OTF-S incidents are triggered by reactors to the skin test, but without subsequent detection of TB lesions or positive PCR test (or culture) results in any of those animals.

TB incidents in Approved Finishing Units (AFUs) without grazing are not included in the prevalence and incidence calculations in this report due to the limited epidemiological impact of these incidents.

Furthermore, the number of TB incidents and designation of those incidents as OTF-W or OTF-S may differ in this report compared to other official TB statistics, due to differences in the information available at the time datasets are accessed.

Cattle industry

Appendix 1 provides cattle industry demographics in East Sussex, which has a relatively low density of cattle farms. In 2023, 70% of cattle in the county were beef animals, 26% were dairy, and 3% were dual purpose. The mean number of cattle per holding was 86, similar to that of 2022 and 2021. Most herds in the county have more than 50 cattle (282, 58%), with only 13 herds (3%) holding over 500 cattle in 2023.

The total number of herds in the region dropped slightly in 2023 (483) compared to 2022 (498) and 2021 (504).

There are 2 low-volume livestock markets providing an outlet for cattle from East Sussex, Hailsham market in East Sussex and Ashford market in the neighbouring LRA county of Kent. Larger dairy and beef finishing herds source their cattle for restocking from further afield. This poses a risk of introducing TB infection into East Sussex from the HRA and from parts of Wales, where both cattle density and the prevalence of TB are much higher. There were no AFUs operating, and one Exempt Finishing Unit (EFU) in operation in East Sussex in 2023. The last AFU (without grazing) in East Sussex ceased operating in December 2022.

The number of cattle markets in operation in 2023 is captured and maintained centrally by the Animal and Plant Health Agency (APHA) TB Customer Service Centre. Where possible, this data is then subject to further validation by APHA veterinarians subject to their best knowledge of the local area. Some small discrepancies may therefore exist where changes to markets were not captured in time for this report.

East Sussex was originally divided between 2 TB risk areas. The HRA in the south and west and the Edge Area in the north and east of the county. The whole of East Sussex was fully incorporated into the Edge Area in January 2018.

All herds in East Sussex were eligible for annual testing in 2023.

New TB incidents

Figure 1 shows there were 27 new TB incidents in East Sussex in 2023, 9 (33%) of which were OTF-W incidents and 18 (67%) OTF-S incidents. Overall, this is a 23% increase on the number of TB incidents detected in 2022 (22 incidents). This is the first increase in number of TB incidents seen in the county since 2020.

OTF-W incident numbers increased by 3 from 6 in 2022 to 9 in 2023, 7 of these incidents were located in the original HRA portion of the county. The number of OTF-S incidents also increased from 16 in 2022 to 18 in 2023.

From 2014 to 2019, the number of new TB incidents fluctuated between 20-27, with a sudden rise in 2020 peaking at 41. However, the total number of new incidents has since dropped back to levels similar to those seen before 2020 (Figure 1).

In 2023, 6 OTF-W TB incidents were in beef herds, of which 4 were beef suckler herds, and 2 were beef finisher herds. The remaining 3 OTF-W incidents were in dairy herds. Of the 13 herds in East Sussex with over 500 cattle, 3 became new OTF-W incidents, and 4 became new OTF-S incidents, illustrating the significance of larger herd size as a risk factor for a TB incident.

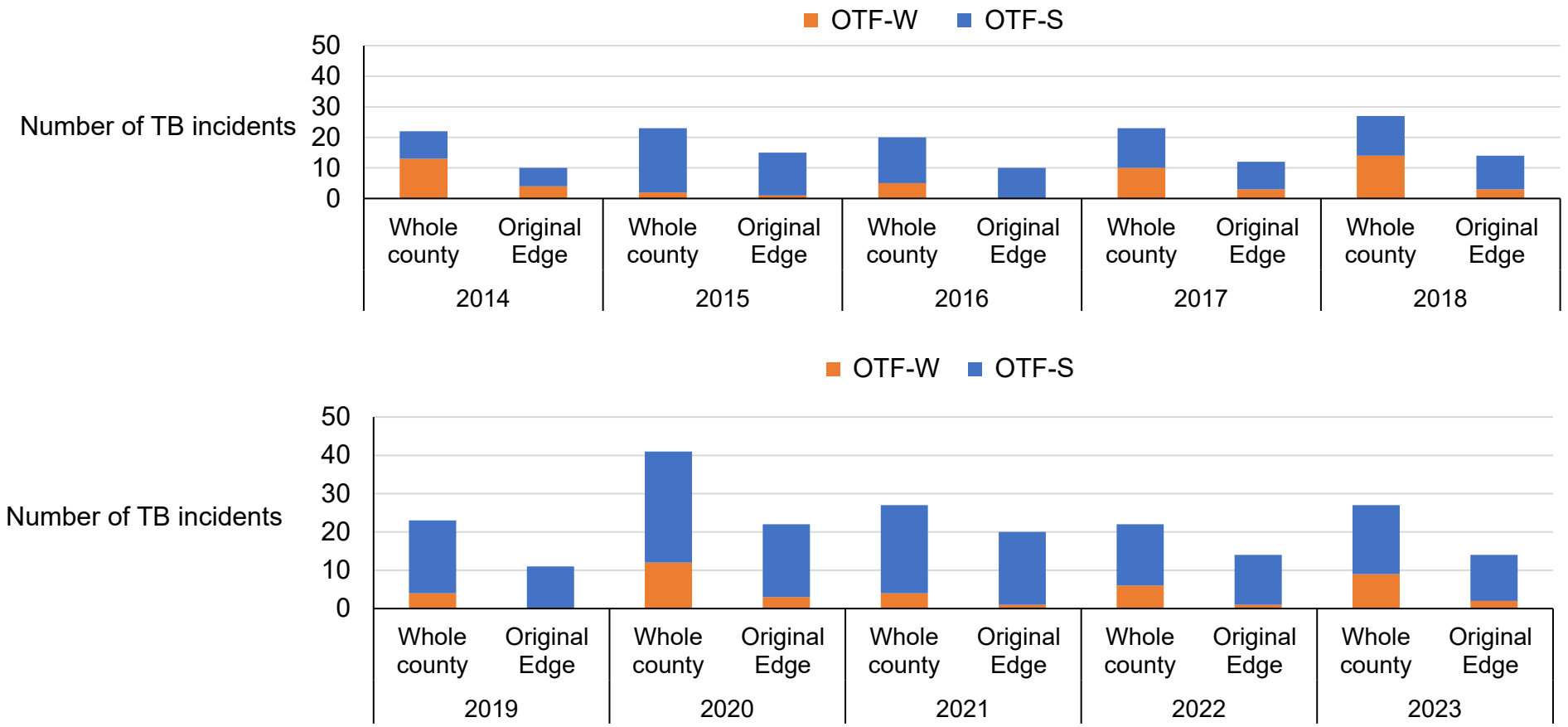

Figure 1: Annual number of new TB incidents in East Sussex, from 2014 to 2023.

Figure 1 description: Bar chart showing the number of confirmed TB incidents (OTF-W, in orange) and suspected (OTF-S, in blue) in the whole of East Sussex and the original Edge part of East Sussex (prior to the incorporation of the HRA part in 2018) between 2014 and 2023. In 2023, there were 27 TB incidents in the whole county, 9 OTF-W and 18 OTF-S. Out of those 27, 12 OTF-S and 2 OTF-W were in the original Edge Area of East Sussex.

Disclosing test types

As in previous years, whole herd testing continued to detect the most incidents of TB in East Sussex in 2023 (16). This was followed by 6-monthly post-incident (6M) testing, detecting 3 incidents, and 12-monthly post-incident (12M) testing and pre-movement testing both detecting 2 incidents, as shown in Figure 2. This demonstrates how active surveillance has been an essential tool in identifying the new TB incidents in East Sussex.

Risk based radial and contiguous testing disclosed one OTF-W and one OTF-S respectively. The number of incidents disclosed by radial testing dropped in comparison to previous years, where it disclosed between 5-8 incidents per year from 2018-2022, and there was also the first incident disclosed by a contiguous test since 2017. This reduction can be partly explained by a temporary policy change where radial testing was replaced by contiguous testing in the Edge Area during the highly pathogenic avian influenza outbreak in 2022 to 2023.

One OTF-W incident was disclosed by visible lesions being identified at post-mortem in passive slaughterhouse (SLH) surveillance.

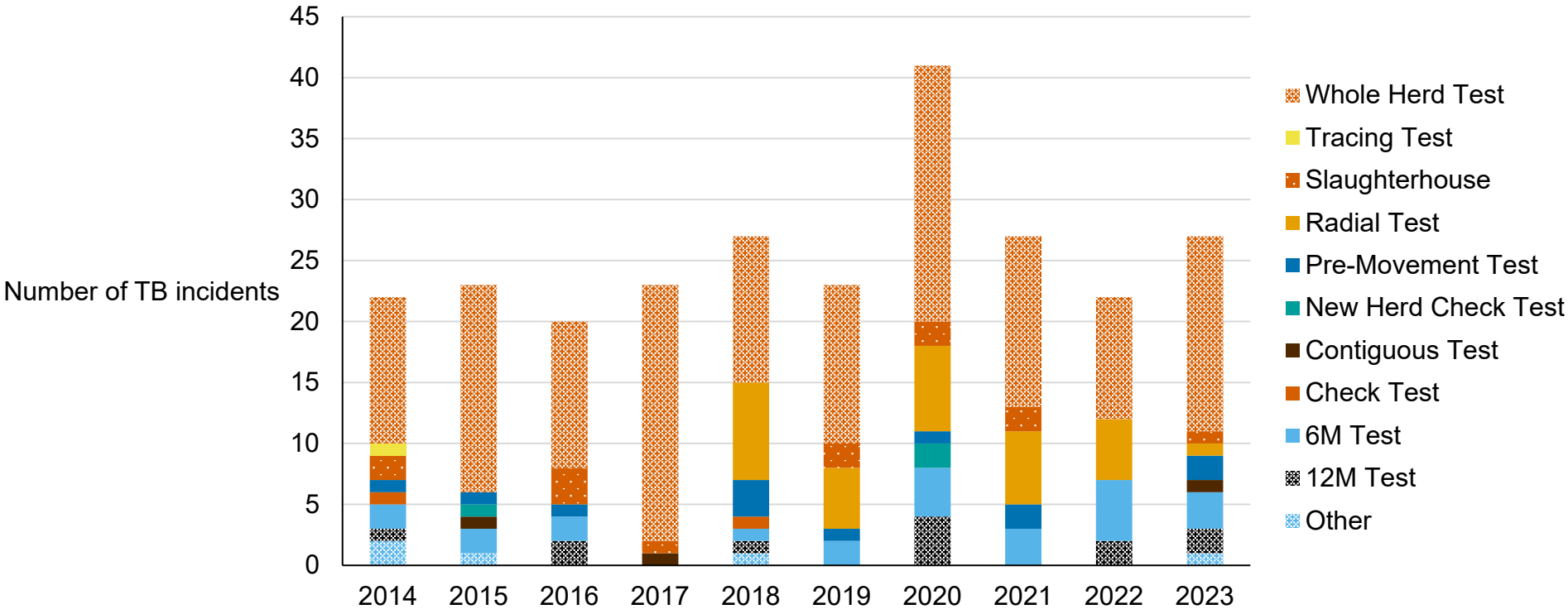

Figure 2: Number of new TB incidents (OTF-W and OTF-S) in East Sussex in 2023, according to the surveillance methods that detected them.

Figure 2 description: A bar chart showing the number of new TB incidents disclosed by test type in East Sussex between 2014 and 2023. Test types are grouped by colour in the chart and stacked. In 2023, most incidents were disclosed by whole herd tests (16), followed by a 6-month post-incident test (6M test, 3), 12 montrh post-incident and pre-movement tests (2 each), and one each for contiguous testing, radial testing, slaughterhouse testing and “Other” test type.

Duration of TB incidents

A total of 15 TB incidents were resolved in East Sussex during 2023. Of these, 9 were new TB incidents that started in 2023, and 6 started in 2022.

The median duration for OTF-W incidents that ended in 2023 was 278 days, interquartile range (IQR) 253 to 416. Most OTF-W incidents that ended in 2023 took over 240 days to resolve (3 took between 241-550 days and one took more than 550 days), with one being resolved in a shorter duration, between 101-150 days.

Most OTF-S incidents that ended in 2023 had a shorter duration, with 90% resolved between 151-240 days, and one being resolved between 241-550 days. The median duration was 176 days (IQR 154 to 210).

The median duration for all incidents that ended in 2023 was 200 days (IQR 154 to 260). This is longer than the duration of incidents that ended in 2022, which was 186 days (IQR 153 to 298). For the whole Edge Area, the median duration of TB incidents that ended in 2023 was 188 days (IQR 159 to 265), slightly lower than the overall figure for East Sussex.

There were 22 TB incidents still open at the end of the reporting year on 31 December 2023. This included one OTF-W and one OTF-S incident which were considered persistent (more than 550 days under movement restrictions).

Unusual TB incidents

The TB incident with the largest number of reactors for 2023 in East Sussex has had 15 skin test reactor animals removed to date. Along with the skin test reactors, also a total of 68 interferon gamma (IFN-γ) blood test-positive animals have been disclosed in the current TB incident. The affected holding had already experienced one OTF-W incident in 2018 and another one in 2021. In both TB incidents a total of 3 visible lesion reactors were found, but they were all negative for *M. bovis* on bacteriological culture. This ongoing OTF-W incident was disclosed at an inconclusive reactor re-test. A total of 2 out of the 15 reactors had visible lesions at post-mortem, but no Whole Genome Sequence (WGS) clade of *M. bovis* could be identified since all the cultures failed to isolate the bacterium. The reactors were homebred; there is a possibility of residual infection within the herd from a previous incident, but re-infection from local wildlife cannot be ruled out. The lack of *M. bovis* WGS data for this incident has complicated the identification of the source of infection. Therefore, both residual infection within the herd and local wildlife look to be possible risk pathways.

An exotic strain of TB (*M. caprae*) was isolated in 2 TB incidents of 2023. The index incident was in a beef suckler herd. As result of contiguous TB check testing, another TB incident associated with *M. caprae* was also disclosed in a large commercial herd of

farmed deer. One third of the animals in this deer herd returned a positive result on follow-up TB skin and antibody testing. The skin test reactors and seropositive deer disclosed in this explosive incident were culled, along with some direct contacts. WGS analysis results provide some support for the hypothesis that the introduction of this unusual mycobacterium species in the area was connected to the importation onto the affected deer farm of breeding stock from Eastern Europe, where *M. caprae* infections in domestic and wild ungulates are more commonly recorded than in the UK.

One OTF-W dairy herd with a series of recurrent incidents over the previous 7 years contributed disproportionately to the total number of gamma removals in 2023. A total of 68 positive animals were identified on IFN-γ testing, representing 12% of the herd, and 54% of the total number of gamma removals in the county during the year.

TB in other species

There is no statutory routine TB surveillance of non-bovine species, apart from post-mortem examination (PME) of animals slaughtered for human consumption, or carcasses submitted to veterinary laboratories for diagnostic investigation. Targeted TB testing takes place in non-bovine herds under TB movement restrictions due to laboratory-confirmed incidents of *M. bovis* infection, and in specific herds of camelids, goats and captive deer at an elevated risk of infection.

There were no incidents of TB reported in other non-bovine species in East Sussex in 2023.

APHA, in collaboration with the University of Nottingham, conducted a project to detect the presence and location of TB infection in badgers in Buckinghamshire, Oxfordshire, Berkshire, Hampshire and East Sussex - collectively known as the ‘Southern Edge Area’. Volunteers were recruited in each county to help with the safe and timely retrieval of badger carcasses. They were delivered to the University of Nottingham, where they underwent post-mortem examination and testing for the presence of TB infection by culture. Those that tested positive were sent for further WGS and clade identification (genetic strain). The project aimed to collect 100 carcasses of badgers found dead per county, most likely those killed in road traffic accidents (RTAs). Once 100 carcasses of a sufficient quality were examined per county, collection ceased in that county. Once county targets were achieved, all stakeholders were informed. The survey ended in April 2023 and its results will be communicated to all stakeholders once all the bacteriological cultures and WGS analysis have been completed. Its results will help develop a picture of the disease situation in the Southern Edge Area.

Incidence of TB

As shown in Figure 3, TB incidence in 2023 increased to 6.1 TB incidents per 100 herd-years at risk (HYR) from 4.6 in 2022, the third highest incidence rate observed in the past

10 years. This increase was mainly driven by a rise in incidence in the original HRA part of the county, as incidence remained almost unchanged in the county's original Edge Area (3.9 and 4.0 incidents per 100 HYR in 2022 and 2023 respectively). TB incidence gradually increased between 2012 and 2018, there was a small decline in 2019 but a sharp rise in 2020 from 4.6 to 8.1. Incidence then declined over 2021-2022. This decline was reversed in 2023, with the first increase seen since 2020.

East Sussex had the fifth highest incidence rate in all 11 Edge Area counties in 2023. The overall incidence rate for the Edge Area was 7.2 incidents per 100 HYR in 2023, slightly higher than that observed in East Sussex.

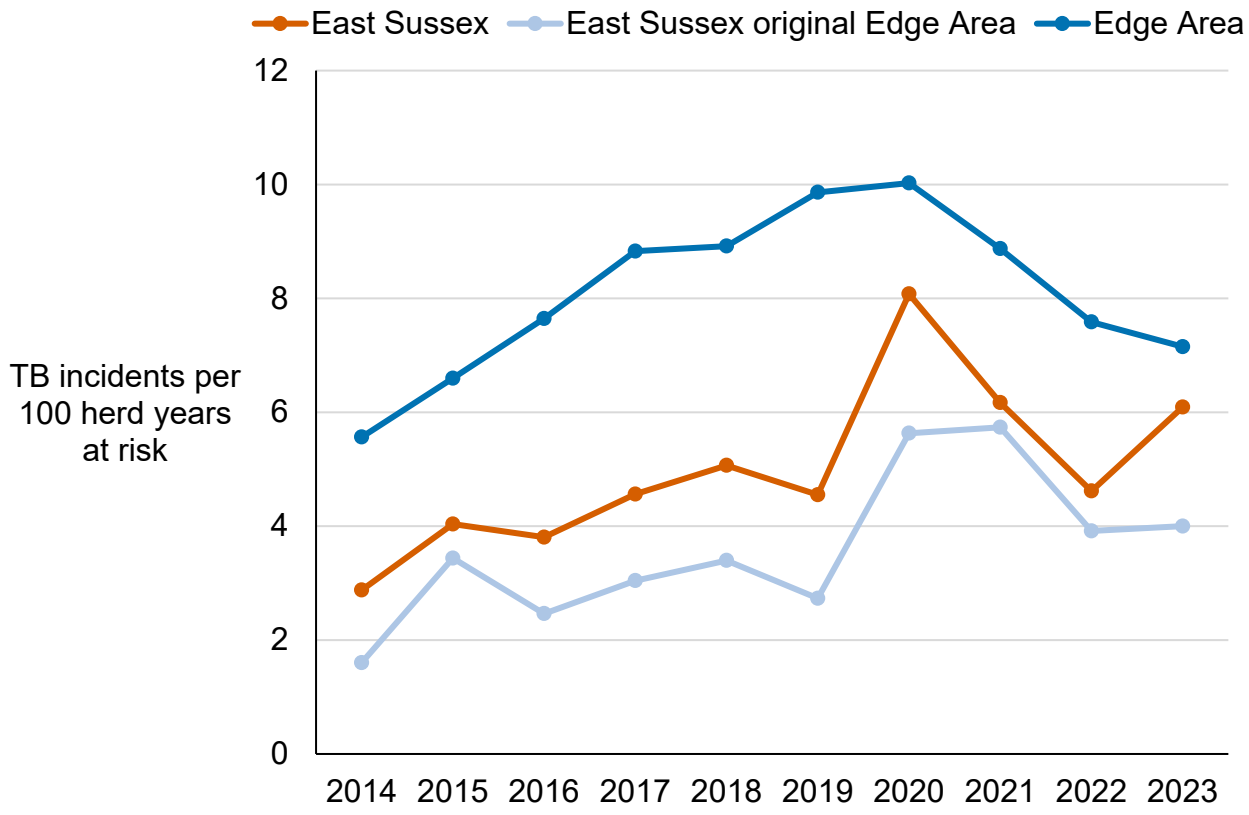

Figure 3: Annual incidence rate (per 100 herd-years at risk) for all new incidents (OTF-W and OTF-S) in East Sussex, from 2014 to 2023.

Figure 3 description: Line chart showing the incidence rate of new TB incidents per 100 herd years at risk (100 HYR) in East Sussex, the original Edge Area of East Sussex, and the overall Edge Area between 2014 and 2023. Incidence in East Sussex and in the original Edge part of East Sussex has been declining consistently since 2020. In 2023 however, the incidence rate per 100 HYR increased in East Sussex to 6.0 incidents per 100 HYR and stagnated at 4.0 incident per 100 HYR in the original Edge part of East Sussex. Further detail provided in the text.

Prevalence of TB

Prevalence of TB in East Sussex at the end of 2023 was 3.9%. This is more than double the prevalence reported at the end of 2022 (1.7%), and is the highest prevalence observed in the county in the last 10 years (Figure 4). This is the first increase in end of year prevalence in the last 5 years, reversing the slight downward trend seen between 2018 and 2022 (Figure 4). For the first time in the last 10 years, end of year prevalence in East Sussex is also slightly higher than that seen for the Edge Area overall in 2023 (3.7%). East Sussex had the fifth highest end of year prevalence out of the 11 counties in the Edge Area.

The 23% rise in new TB incidents in 2023 compared to 2022 contributed to the overall increase in prevalence observed.

End-of-year prevalence for the original Edge Area of East Sussex increased from 1.3% in 2022 to 2.7% in 2023. This can be partly explained by the fact that in 2023, 13 out of the 27 TB incidents were disclosed during the second half of the year. If the incident is disclosed at the beginning of the year, it is more likely to have been resolved by end of December and therefore does not contribute to herd prevalence data which is calculated at the end of each year.

Two of the OTF-W incidents that resolved in 2023 were disclosed in 2022. Five of the OTF-S incidents that were resolved in 2023 were disclosed in 2022. Nine unresolved OTF-S (out of 18) incidents were disclosed in 2023 and 6 of the 9 OTF-W incidents disclosed in 2023 were unresolved at the end of the year. If the number of OTF-W incidents increases, this tends to have a greater impact on the end of year prevalence as OTF-W incidents take longer to resolve due to the necessity for more rounds of TB tests before TB restrictions are lifted.

The delays in IFN-γ processes due to re-deployment of field staff resources during the spring of 2023 for the avian influenza outbreak also caused an extension of the restriction period in 4 OTF-W incidents disclosed in 2023 with additional testing required in order to lift restrictions for these cattle herds.

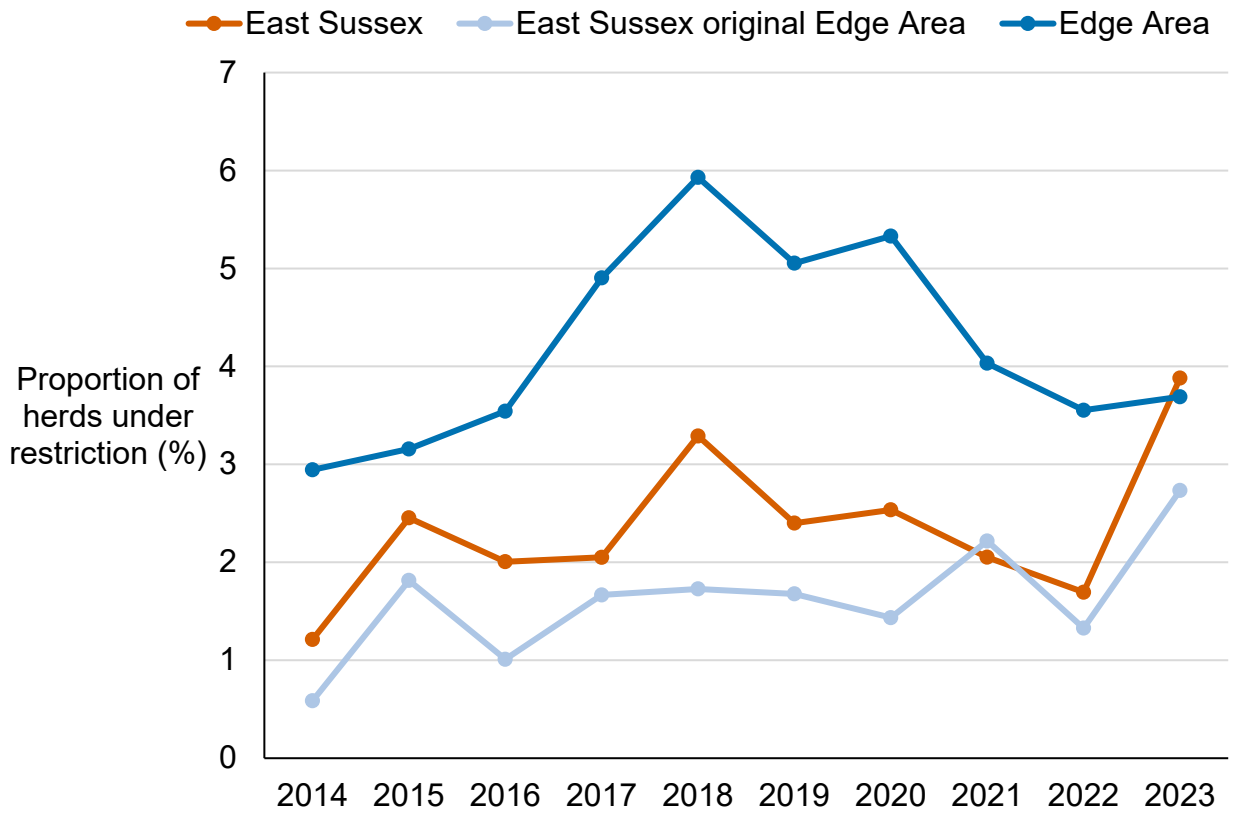

Figure 4: Annual end of year prevalence in East Sussex, from 2014 to 2023.

Figure 4 description: Line chart showing the annual end of year prevalence in East Sussex County overall, in the original Edge Area of the East Sussex County, and within the overall Edge Area, between 2014 and 2023. Prevalence has been variable over the last decade in East Sussex, however it has been consistently below the prevalence rate for the Edge Area overall. In 2023, there was an increase in East Sussex prevalence, rising to above the prevalence rate for the Edge Area overall for the first time to 3.88% (1.69 % in 2022) and increasing in the original Edge part of East Sussex as well to 2.73% (from 1.33% in 2022). Further detail provided in the text.

Recurring TB incidents

Three-year recurrence

In East Sussex, 10 (37%) new TB incidents in 2023 occurred in herds that had another TB incident in the past 3 years, as shown in Figure 5. There was a higher percentage of OTF-S herds with another TB incident in the previous 3 years compared to OTF-W herds (39% and 33% respectively).

In the Edge Area as a whole, 54% of TB incidents had a history of TB in the past 3 years, with East Sussex and neighbouring county Hampshire having the lowest percentage (37% and 36% respectively) of all Edge counties.

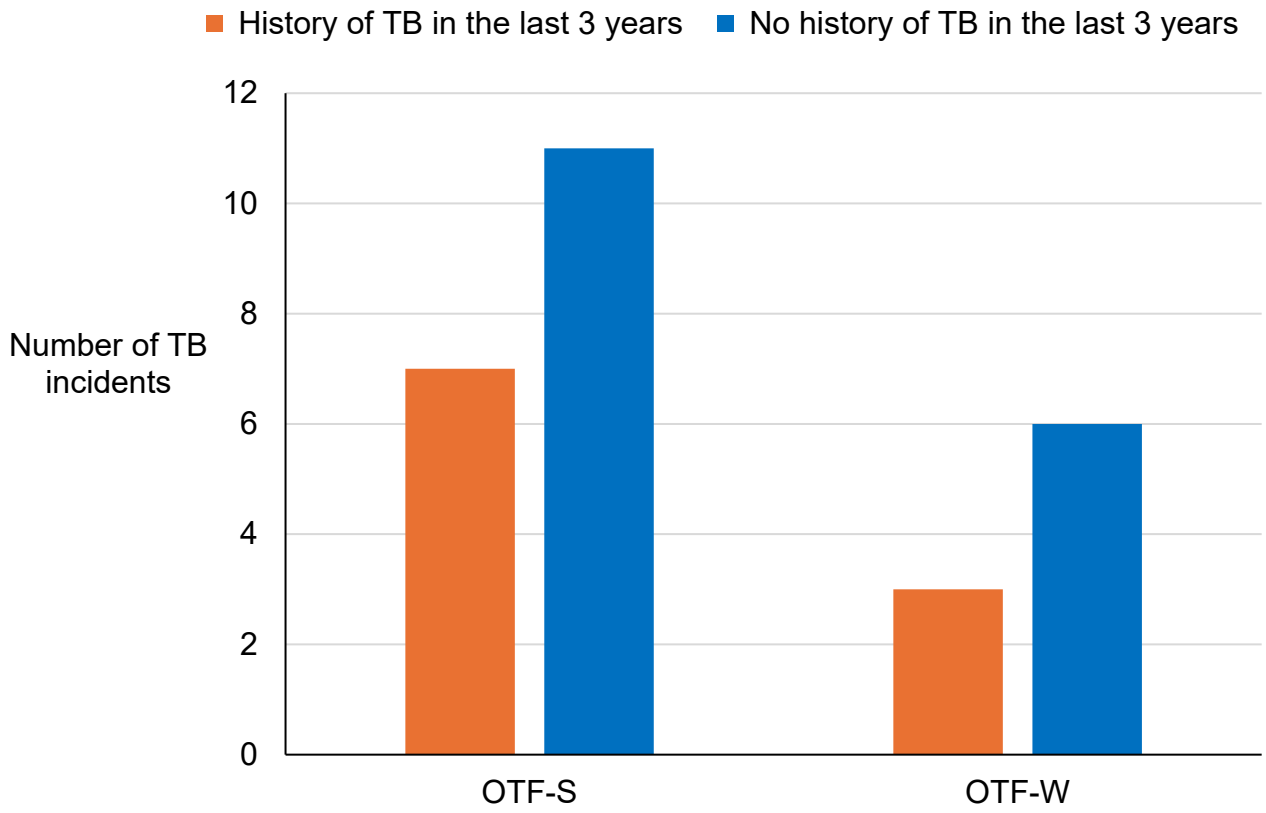

Figure 5: Number of herds with a TB incident (by OTF-W and OTF-S) in East Sussex in 2023, with and without a history of any TB incident in the previous three years.

Figure 5 description: Bar chart showing the number of herds with (in orange) and without (in blue) a history of a TB incident in the last 3 years in 2023, for OTF-S and OTF-W herds. A description of the data is provided in the text.

Overall recurrence

In 2023, 63% of incidents reported in across the region were in herds with a history of TB at any time, including more than 3 years previously (13 out of 18 OTF-S and 4 out of 9 OTF-W), as shown in Figure 6.

Overall recurrence of TB decreased slightly compared to 2022 (67%, 8 out of 15 OTF-S and 6 out of 6 OTF-W).

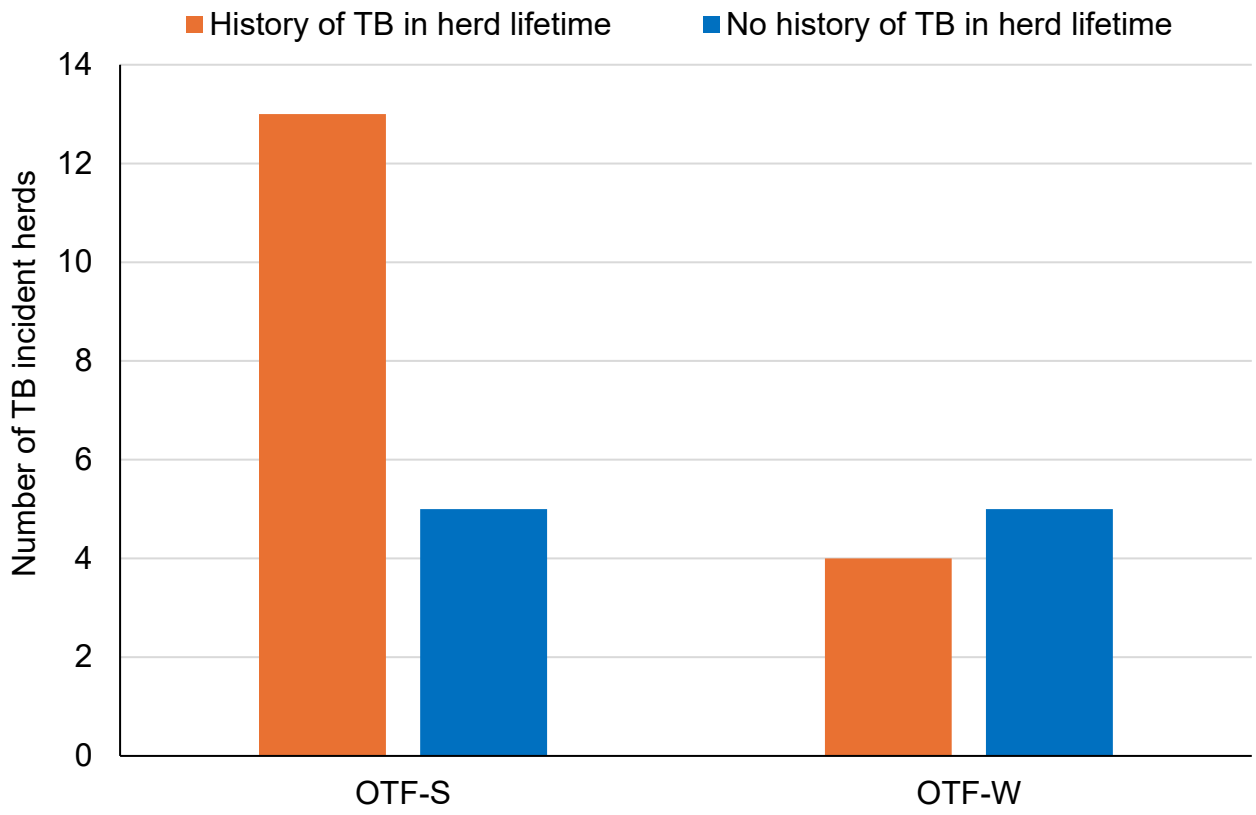

Figure 6: Number of herds with a TB incident (by OTF-W and OTF-S) in East Sussex in 2023, with and without a history of any TB incident during the herd's lifetime.

Figure 6 description: Bar chart showing the number of herds with (in orange) and without (in blue) a history of a TB incident in the herd's lifetime in 2023, for OTF-S and OTF-W herds. A description of the data is provided in the text.

Geographical distribution of TB incidents

Figure 7 shows the distribution of new OTF-S and OTF-W TB incidents in 2023 throughout East Sussex. Most OTF-W incidents occurred towards the south-west of East Sussex, distributed fairly evenly through the area previously designated as the HRA, similar to previous years. There were 2 isolated OTF-W incidents towards the north of the county. Conversely, OTF-S incidents were spread more evenly throughout the county, similar to previous years.

As in previous years, the majority of OTF-W incidents were caused by WGS clade B6-71, except 2 that were caused by clade B6-62 and 3 where no WGS clade was assigned. One isolation of B6-71 has a low or negligible cattle movement level, 2 had medium cattle movement level and one had a high or very high cattle movement level associated with the incident. All other OTF-W incidents had a low/negligible cattle movement level.

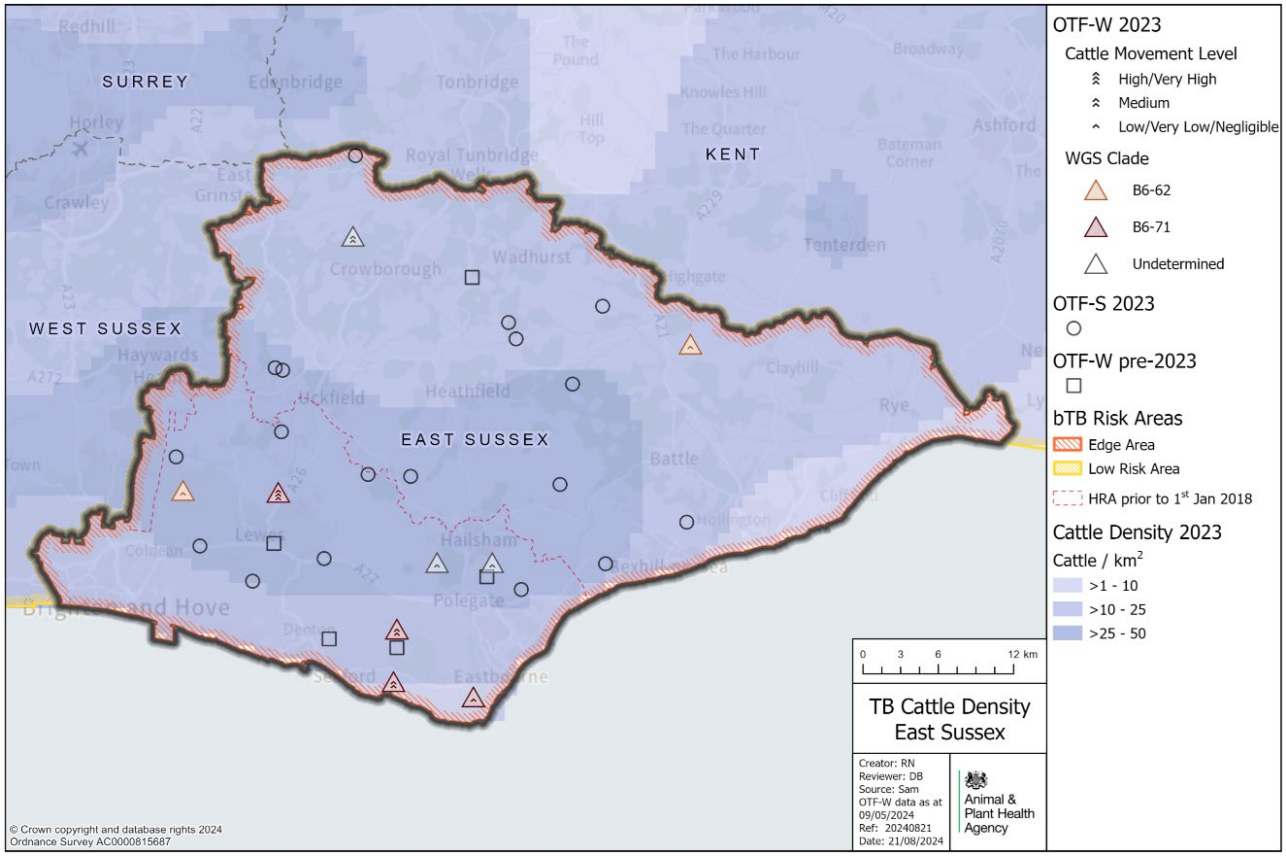

Figure 7: Location of cattle holdings in East Sussex with new TB incidents (OTF-W and OTF-S) in 2023 and cattle holdings with pre-2023 OTF-W incidents still ongoing at the beginning of 2023, overlaid on a cattle density map. The movement score for each farm is symbolised with 3 chevrons for cattle movements associated with a high likelihood of infection, 2 chevrons for a medium likelihood and one chevron for a low likelihood.

Figure 7 description: Map of the East Sussex County showing the locations of cattle holdings in East Sussex with new TB incidents (OTF-S and OTF-W) in 2023 and pre-2023 OTF-W incidents on the map. The 2023 OTF-W incidents are shown as triangles, 2023 OTF-S as circles and pre-2023 OTF-W as squares. The 2023 OTF-W incidents are also coloured by WGS clade and contain chevrons to show the cattle movement algorithm score allocated to the incident (low/medium/high risk of cattle movements). Most incidents are in the south-west and north-east of the county – more detail provided in the text.

Skin test reactors and interferon gamma test positive animals removed

Appendix 2 provides a summary of headline cattle TB statistics in East Sussex. A total of 216 cattle were removed from TB incidents in East Sussex during 2023, as shown in Figure 8. The tuberculin skin test detected 101 infected animals and 115 were detected through IFN-γ. This is an overall increase of 104 cattle since 2022 and is the highest number of positive animals removed since 2020. The number of positive animals removed in East Sussex has fluctuated over the last 10 years, peaking in 2018 at 295.

The proportion of skin (47%) to IFN-γ blood (53%) test reactors differed from that of 2022. This was due to the number of positive animals removed through IFN-γ testing increasing from 10 in 2022 to 115 in 2023, and the number of skin test reactors removed only dropping by one (Figure 8). Diversion of staff resources into the avian influenza outbreak during 2022 resulted in a slight delay in 3 herds having IFN-γ testing in spring 2023 rather than autumn 2022, which could partially account for the difference between 2022 and 2023.

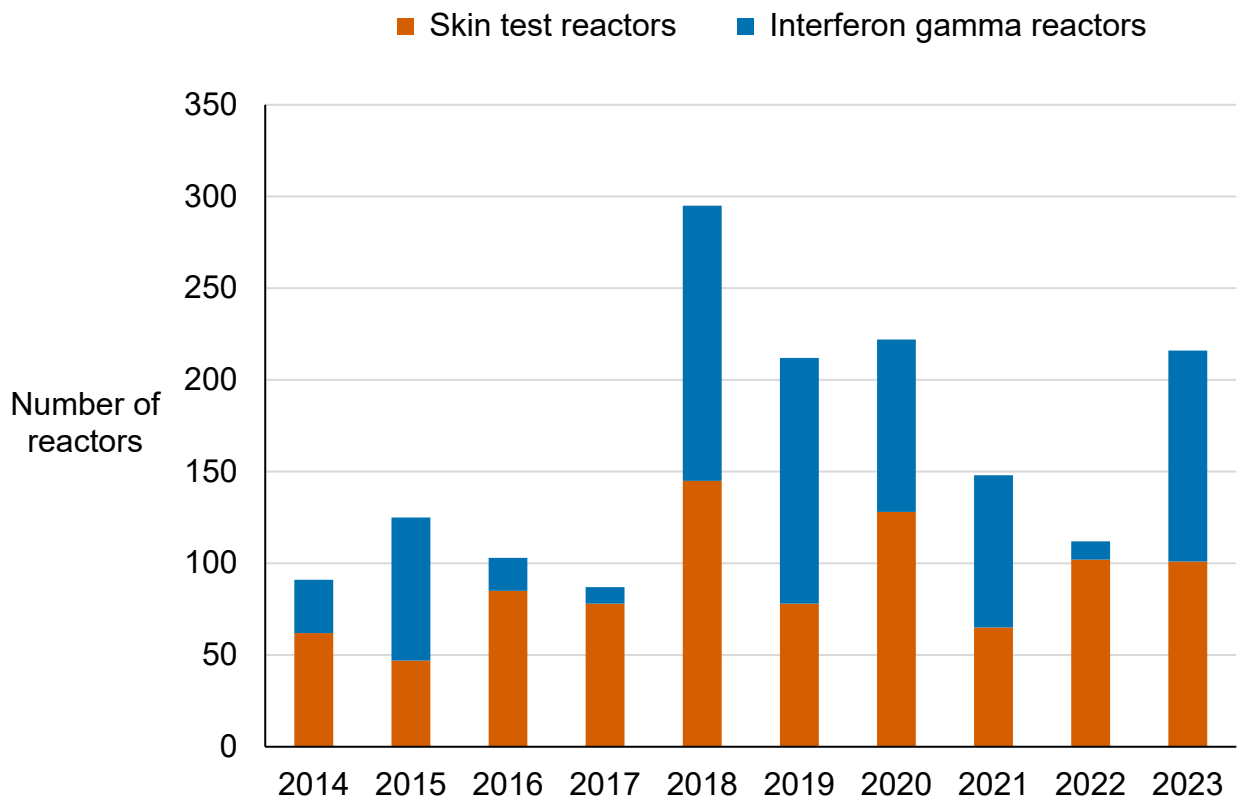

Figure 8: Number of skin test reactors and IFN-γ test positive cattle removed by APHA for TB control reasons in East Sussex, from 2014 to 2023.

Figure 8 description: Bar chart showing the number of skin test reactors and IFN-γ test reactors removed for TB control reasons in East Sussex between 2014 and 2023. In 2023, 101 skin test reactor cattle and 115 IFN-γ reactors were removed in East Sussex, the highest number since 2020.

Main risk pathways and key drivers for TB infection

It is important to try to understand the risk pathways and key drivers that are likely to have introduced TB infection into a herd. This information can help identify biosecurity measures that may reduce the TB risk for individual businesses.

Implementing practical measures can help to reduce the risk of TB incursion into a herd that is TB free (biosecurity), as well slowing disease spread within a herd where TB is present (biocontainment).

Furthermore, the ibTB online mapping tool can be used to inform purchasing choices, reducing the risk of introducing undetected infection when moving cattle into a herd.

In 2023, 21 out of 27 (78%) new TB incidents in East Sussex received a preliminary or final APHA veterinary investigation to identify the source of infection. The findings from this investigation are reported in Appendix 3. Not all investigations were carried out in 2023. This was due to the continued impact and diversion of field resource as part of the 2022 to 2023 avian influenza outbreak which continued into spring 2023, in addition to the bluetongue virus outbreak from summer 2023 onwards.

New data-driven methods to quantify the likelihood of risk pathways for TB infected herds have been developed by APHA. These include the:

- cattle movement algorithm
- WGS local transmission of infection indicator

The cattle movement algorithm uses cattle movement data to identify individual animals that were moved into a TB incident herd as having a negligible, very low, low, medium, high or very high likelihood of being the source of the TB infection. At the herd level, the cattle movement score is dictated by the animal with the highest ranked movement into that herd. Herds are classified as having either:

- cattle movements associated with a high likelihood of infection (a herd with any movements scored as a high or very high likelihood)
- no cattle movements with a high likelihood of infection (the highest likelihood score was negligible, very low, low or medium)

The WGS local transmission of infection indicator uses WGS data from cattle *M. bovis* isolates to identify TB incidents that are linked by genetics, time and space. A TB incident where at least one other TB incident is identified that satisfies all the following 3 criteria is considered to have evidence of a local transmission event:

- it has a WGS with no more than 3 single nucleotide polymorphism (SNP) differences relative to the TB incident of interest
- it is within 4 years before or 6 months after the start date of the incident of interest

- it is within a 9km radius of the incident of interest

Further details about the methodology used can be found in the explanatory supplement to the annual reports 2023.

There is always a degree of uncertainty about the estimated true routes of TB infection into a herd. The absence of a local transmission event, or cattle movements associated with a high likelihood of infection does not completely negate these pathways. Nonetheless, the evidence provided by the cattle movement and WGS data, when combined, can provide valuable insights into the possible risk pathways. Figure 9 provides the percentage of herds where each risk pathway combination was identified. The spatial distribution of these categories is presented in Figure 10. Each category is described in greater detail in the following text.

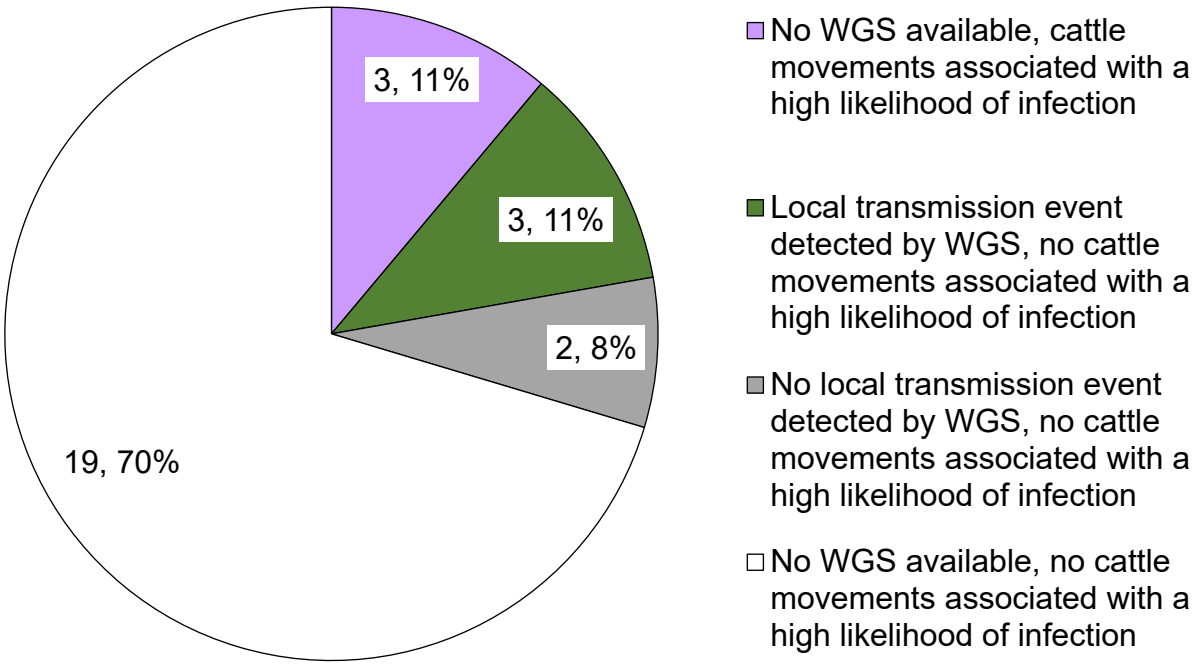

Figure 9: Risk pathway combinations identified by the WGS local transmission of infection indicator and cattle movement algorithm for all 27 new TB incidents starting in East Sussex in 2023.

Figure 9 description: Pie chart showing the risk pathway combinations identified by the WGS local transmission of infection indicator and cattle movement algorithm for all 27 new TB incidents in East Sussex in 2023. Most (19, 70%) did not have any WGS, and no cattle movements were identified with a high likelihood of infection. Further description provided in the text.

WGS data was available for 5 (19%) of all new TB incidents in East Sussex. Of the 5 TB incidents with WGS data available, 3 had a local transmission event identified without strong evidence of cattle movements (dark green symbols, Figure 10).

For these incidents, a broad spectrum of local pathways cannot be ruled out, including:

- residual infection in the herd
- contiguous contact with infected cattle
- direct or indirect contact with potentially infected wildlife.

There were 3 TB incidents (11%) that had cattle movements associated with a high likelihood of TB infection, but WGS data was not available to look for a local transmission event. These are depicted in light purple in Figure 10.

For 2 TB incidents the WGS local transmission of infection indicator did not find evidence of a local transmission event, nor was there any evidence of cattle movements associated with a high likelihood of TB infection (grey symbol, Figure 10). There is uncertainty about the risk pathway for these incidents.

There was no evidence of cattle movements associated with a high likelihood of TB infection and no WGS available to explore the presence of a local transmission event for 19 of the 27 (70%) TB incidents. These are shown as white dots in Figure 10, as there is insufficient evidence to determine a likely infection pathway.

It should be noted that the *M. caprae* incident mentioned earlier in this report would be counted as an incident with no WGS available, as the algorithm only considers incidents with disclosed *M. bovis* isolates.

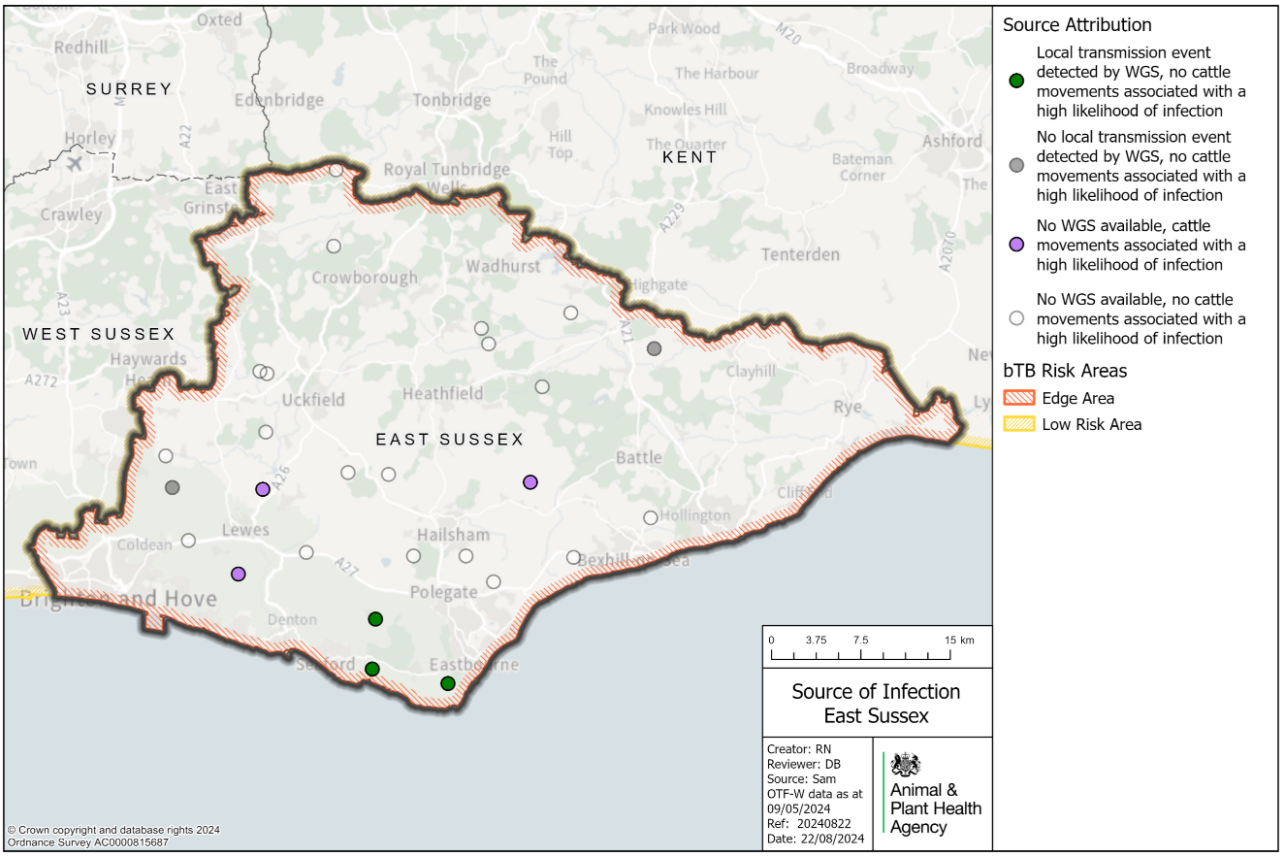

Figure 10: Map of the available evidence for risk pathways of TB infection into the herd, for all TB incidents (OTF-W and OTF-S) in East Sussex that started in 2023.

Figure 10 description: Map of the East Sussex County showing the locations of the 27 new TB incidents in East Sussex, coloured by the risk pathway identified for the incident. Dark green are herds with a local transmission event was identified from WGS and no cattle movements with a high likelihood of infection were identified in the herd. Light green represents incidents where local transmission event was identified from WGS and cattle movements with a high likelihood of infection were identified in the herd. Dark purple represents incidents where no local transmission event was identified from WGS and there were cattle movements identified with a high likelihood of infection in the herd. Light purple represents incidents with no WGS available and where there were cattle movements identified with a high likelihood of infection in the herd. Grey shows incidents where no local transmission event was identified from WGS and there were no cattle movements with a high likelihood of infection were identified in the herd either. White shows incidents with no WGS available and where there were no cattle movements with a high likelihood of infection were identified in the herd either. A breakdown of the incidents by group is provided in the text.

Genotyping was replaced with WGS of *M. bovis* isolates at APHA in 2021. Most OTF-W incidents in East Sussex in 2023 were caused by infection with WGS clade B6-71 of *M. bovis*. Figure 11 shows that new TB incidents caused by *M. bovis* clade B6-71 occurred in

the south-west (previously HRA) of East Sussex in 2023. WGS identified other closely related incidents in this area in 2022 and 2021. This suggests that the area of endemic *M. bovis* infection in wildlife has not notably expanded. However, incidents in recent years suggest that the endemic area has crossed over the A27 near Lewes. This road was previously considered a barrier to the spread of wildlife infection (Figure 11).

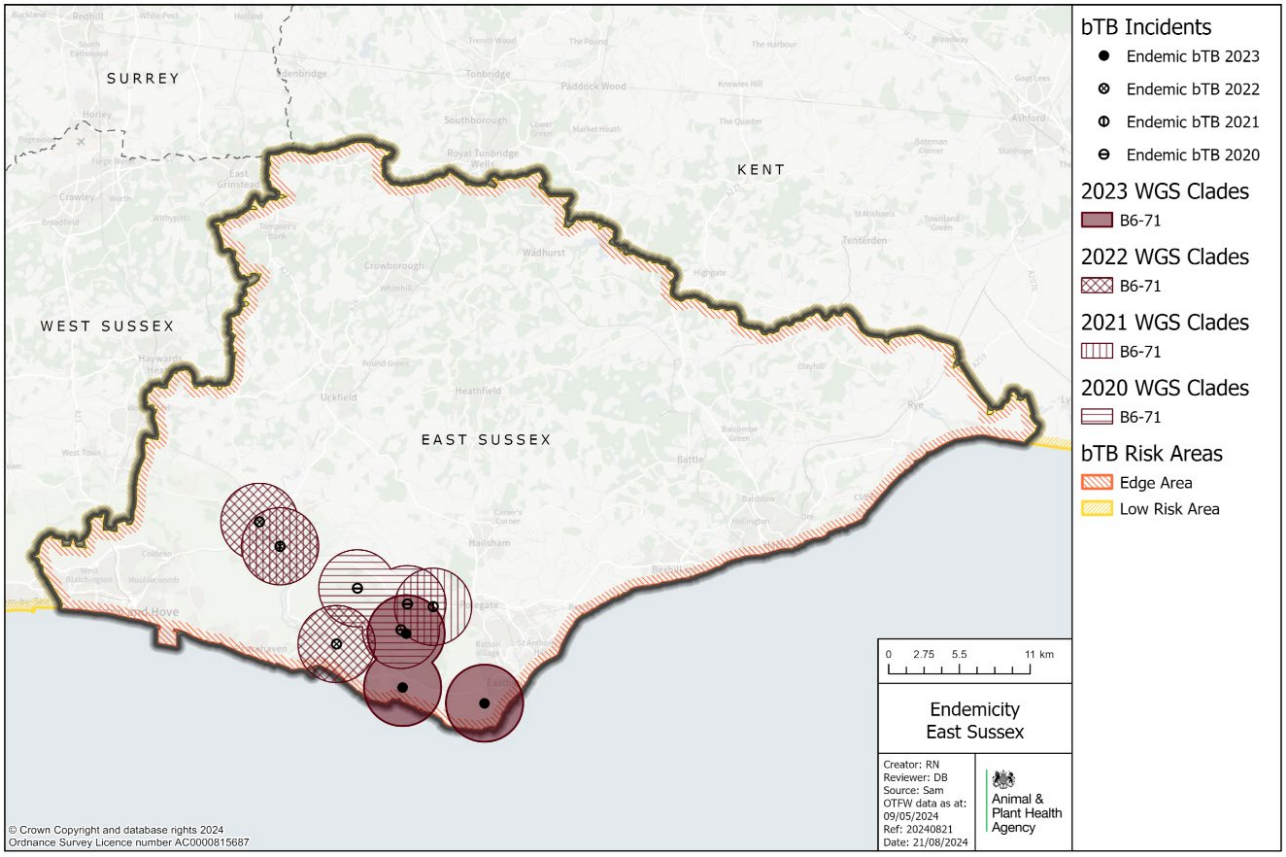

Figure 11: WGS clades of *M. bovis* detected in East Sussex between 2020 and 2023, where the WGS identified in the infected herd was within 3 SNPs of another TB incident in the past 4 years and 9km (OTF-W incidents only).

Figure 11 description: Map of East Sussex showing the WGS clades of *M. bovis* detected in East Sussex between 2020 and 2023, where the WGS identified in the infected herd was within 3 SNPs of another OTF-W incident in the past 4 years and within 9km of it. Clades are shown as circles on the map with each clade represented by a different colour. The year from which the clade was identified is shown by either having the colour be solid (2023) or different types of hash (2022 to 2020). All incidents show in the southern and eastern parts of East Sussex. Further detail is provided in the text.

Forward look

Although there has been a gradual reduction in prevalence rate from 2018, the number of new incidents in 2023 has increased slightly compared to 2022 to equal the number disclosed in 2021. A notable difference from 2021 is that the number of OTF-W incidents disclosed doubled in 2023 in East Sussex. The increase of prevalence rate from 2022 in addition to the geographical extension of the endemic area (HRA prior to 1 January 2018) suggests that East Sussex will not be able to achieve OTF status by 2025. The prevalence and incidence will need to have a considerable reduction through the next 10 years to ensure that OTF status in the county could be reached by 2038.

There are 2 projects within the county which began in 2021 focusing on TB in wildlife and its control.

As described in the “TB in other species” section, APHA and the University of Nottingham conducted a project to detect the presence and location of TB infection in badgers in Buckinghamshire, Oxfordshire, Berkshire, Hampshire and East Sussex. The project aimed to collect 100 carcasses of badgers found dead per county, most likely those killed in road traffic accidents (RTAs). The survey ended in April 2023 and the results will be communicated to all stakeholders once a report is finalised.

The Vaccinating East Sussex Badgers (VESBA) project began in 2021 and has funding for 5 years. This is a large-scale badger vaccination project undertaken from within the farming community across approximately 250km^2 in the endemic TB area in the original HRA section of East Sussex. The findings of this project over the next 5 years will help guide future control methods for deploying other vaccination schemes in the future and farmers should be encouraged to participate.

There are several measures to help address the most common risk pathways for TB infection in East Sussex. These include:

- increased uptake of badger vaccination
- improving on-farm biosecurity measures to reduce transmission This can be achieved by simple measures such as raising of water troughs, wildlife proofing feed stores and reducing nose-to-nose contact
- taking advantage of the free advice available to cattle farmers in the Edge Area from the TB Advisory Service to help evaluate and improve on-farm biosecurity measures
- stronger messaging to farmers to encourage informed purchase practices of cattle, encouraging farmers to avoid purchase of cattle from herds with a history of TB, available tools such as the interactive ibTB online mapping tool can be used by farmers to inform purchasing decisions
- continued deployment of mandatory IFN-γ testing in OTF-W incidents to reduce risk of recurrence.

- discretionary IFN-γ testing to reduce the recurrence rate in OTF-S incidents, along with contingency planning, and a higher engagement between farmers, private veterinary surgeons and APHA duty vets.

Appendix 1: cattle industry demographics

Table 1: Number of cattle herds by size category in East Sussex as of 31 December 2023 (RADAR data on number of holdings in the report year)

Size of herds	Number of herds in East Sussex
Undetermined	6
1 to 50	282
51 to 100	82
101 to 200	62
201 to 350	30
351 to 500	8
Greater than 500	13
Total number of herds	483
Mean herd size	86
Median herd size	37

Table 2: Number (and rounded percentage of total) of animals by breed purpose in East Sussex as of 31 December 2023

Breed purpose	Number (and percentage of total) cattle in East Sussex
Beef	29,149 (70%)
Dairy	10,942 (26%)
Dual purpose	1,372 (3%)
Unknown	1 (0.002%)
Total	41,464

Appendix 2: summary of headline cattle TB statistics

Table 3: Herd-level summary statistics for TB in cattle in East Sussex between 2021 and 2023 (Sam data showing the number of herds flagged as active at the end of the report year)

Herd-level statistics	2021	2022	2023
(a) Total number of cattle herds live on Sam at the end of the reporting period	586	591	567
(b) Total number of whole herd skin tests carried out at any time in the period	591	586	540
(c) Total number of OTF cattle herds having TB whole herd tests during the period for any reason	476	469	461
(d) Total number of OTF cattle herds at the end of the report period (herds not under any type of TB movement restrictions)	563	558	527
(e) Total number of cattle herds that were not under restrictions due to an ongoing TB incident at the end of the report period	573	581	545
(f.1) Total number of new OTF-S TB incidents detected in cattle herds during the report period	23	16	18
(f.2) Total number of new OTF-W TB incidents detected in cattle herds during the report period	4	6	9
(g.1) Of the new 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?	0	1	0
(g.2) Of the new OTF-W herd incidents, how many were triggered by skin test Reactors or twice-inconclusive reactors (2xIRs) at routine herd tests?	0	1	4

Herd-level statistics	2021	2022	2023
(g.3) Of the new OTF-W herd incidents, how many were triggered by skin test Reactors or 2xIRs at other TB test types (such as forward and back-tracings, contiguous or check tests)?	4	5	5
(g.4) Of the new OTF-W herd incidents, how many were first detected through routine slaughterhouse TB surveillance?	2	0	1
(h.1) Number of new OTF-W incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds	0	0	0
(h.2) Number of new OTF-S incidents revealed by enhanced TB surveillance (radial testing) conducted around those OTF-W herds	0	0	0
(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)	3	5	9
(j) New confirmed (positive *M. bovis* culture) incidents in non-bovine species detected during the report period (indicate host species involved)	0	0	0
(k.1) Number of grazing approved finishing units active at end of the period	0	0	0
(k.2) Number of non-grazing approved finishing units active at end of the period	1	1	0
(k.3) Number of grazing exempt finishing units active at end of the period	0	0	0
(k.4) Number of non-grazing exempt finishing units active at end of the period	1	1	1

Table 4: Animal-level summary statistics for TB in cattle in East Sussex between 2021 and 2023

Animal-level statistics (cattle)	**2021**	**2022**	**2023**
(a) Total number of cattle tested with tuberculin skin tests or additional IFN-γ blood tests in the period (animal tests)	65,883	72,835	70,007
(b.1) Reactors detected by tuberculin skin tests during the year	65	102	101
(b.2) Reactors detected by additional IFN-γ blood tests (skin-test negative or IR animals) during the year	83	10	115
(c) Reactors detected during year per incidents disclosed during year	5.5	5.1	8.0
(d) Reactors per 1,000 animal tests	2.2	1.5	3.1
(e.1) Additional animals slaughtered during the year for TB control reasons (dangerous contacts, including any first time IRs)	15	2	10
(e.2) Additional animals slaughtered during the year for TB control reasons (private slaughters)	7	6	8
(f) Slaughterhouse (SLH) cases (suspect tuberculous carcasses) reported by Food Standards Agency (FSA) during routine meat inspection	3	1	1
(g) SLH cases confirmed by *M. bovis* PCR testing or bacteriological culture	3	0	1

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 in the table above.

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

In 2023, 21 out of 27 (78%) new TB incidents in East Sussex received a preliminary or final APHA veterinary investigation to identify the source of infection. Not all disease report form investigations were carried out in 2023. This was due to the continued impact and diversion of field resources as part of the 2022 to 2023 avian influenza outbreak which continued into spring 2023, in addition to the bluetongue virus outbreak from summer 2023 onwards.

Each TB incident could have up to 3 potential risk pathways identified. 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)
- possible (score 1)

The sources 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 into a herd. If the overall score for a herd is less than 6, then the score is made up to 6 using the ‘Other or unknown source’ option. Buffering up to 6 in this way helps to reflect the uncertainty in assessments where only ‘likely’ or ‘possible’ sources are identified.

Table 5 combines the data from multiple herds and provides the proportion of pathways in which each source was identified, weighted by the certainty that each source caused the introduction of TB. The output does not show the proportion of herds where each pathway was identified (this is skewed by the certainty calculation). WGS of *M. bovis* isolates can be a powerful tool in identifying a likely source of infection, however WGS clades are not determined for OTF-S herds. As a result of varying levels of uncertainty, only broad generalisations should be made from these data. A more detailed description of this methodology is provided in the explanatory supplement to the annual reports 2023.

Table 5: Suspected sources of *M. bovis* infection for the 21 incidents with a preliminary or a final veterinary assessment in East Sussex, in 2023

Source of infection	Possible (1)	Likely (4)	Most likely (6)	Definite (8)	Weighted contribution
Badgers	11	8	5	0	44.6%
Cattle movements	8	3	2	0	21.6%
Contiguous	2	2	0	0	5.0%
Residual cattle infection	1	3	0	0	6.6%
Domestic animals	0	0	0	0	0.0%
Non-specific reactor	1	0	0	0	0.8%
Fomites	3	0	0	0	1.7%
Other wildlife	5	1	2	0	12.1%
Other or unknown source	0	0	0	0	7.6%

Each TB incident could have up to 3 potential pathways so totals may not equate to the number of actual incidents that have occurred.

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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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