Animal & Plant Health Agency

Bovine tuberculosis in England in 2024

Epidemiological analysis of the 2024 surveillance data and historical trends in cattle

November 2025

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1.0 Executive summary

Bovine tuberculosis (TB) is a chronic infectious disease caused by the bacterium Mycobacterium bovis (M. bovis). In England, it is subject to a statutory eradication programme based on the government's strategy, published in April 2014 and then independently reviewed in 2018 and 2025, which aims to achieve officially TB free (OTF) status for the whole country by 2038. Within the strategy, England is divided into 3 bovine TB "risk areas" as determined by the level of disease.

Eradication of bovine TB in England requires control of infection in both cattle and the main wildlife reservoir, the European badger (Meles meles). In cattle, this includes:

- Systematic active surveillance through both routine and targeted, ad hoc tuberculin skin testing of herds. The default frequency of routine skin testing varies across England according to risk area, which is described in Figure 2.1.
- Mandatory tuberculin skin testing of cattle moved between herds (pre- and post-movement TB testing)
- Routine (passive) slaughterhouse surveillance.
- Additional measures aiming to reduce the risk of disease occurrence and persistence and enable herds to regain OTF status, including movement restrictions and more sensitive testing of infected cattle herds. More detail is described in Chapter 2 – Preface.

M. bovis infection in the badger population is controlled through licensed badger culling and vaccination.

New TB incidents

In 2024, the number of new TB incidents recorded across England increased by 2% compared to 2023. The High Risk Area (HRA), spanning the west and south-west, accounted for 76% of those incidents (Table 1.1). New incident numbers in the HRA rose by 3% compared to 2023. The Edge Area, which lies between the HRA and LRA and contains annual and 6-monthly testing areas, generated 19% of new TB incidents in 2024, 63% of which were observed in the 6-monthly testing portion. New incident numbers in the Edge Area rose by 3% compared to 2023. As in previous years, the Low Risk Area (LRA) spanning the north, east and south-east of England had very few TB incidents in 2024, representing 5% of new TB incidents occurring in England. Of these, 30% were TB lesion or culture or PCR (polymerase chain reaction) test-positive (OTF status withdrawn (OTF-W)) incidents (Table 1.1).

TB herd incidence rate

Trends in the TB incidence rate (number of new TB incidents per 100 herd years at risk; HYR) are discussed in detail in Chapter 3.4. In 2024, there was a slight increase in incidence rate compared to 2023 (Table 1.1). Incidence rate in the HRA and the

Edge Area followed a similar trend to England overall, slightly increasing in 2023 (Table 1.1). In the LRA, the incidence rate remained very low (Table 1.1).

Herd prevalence of TB
Average monthly TB prevalence in England remained the same in 2024 as in 2023 (Table 1.1). The HRA saw a decrease in average monthly TB prevalence, whereas prevalence increased in the Edge Area and remained consistently very low in the LRA.

Endemic area of TB
Between 2023 and 2024, there was a net retraction of 1,092.60 km2 in the size of the overall area considered to harbour endemic M. bovis infection in England. Although the HRA and parts of the Edge Area (particularly along the HRA border) continued to be a stable endemic area, there were also portions of the HRA and Edge Area that experienced considerable retraction.

Recurrent TB incidents
Over half of new TB incidents occurring in 2024 in England, and nearly 60% of those in the HRA, were disclosed in herds that had previously experienced a TB incident in the preceding 3 years (recurrent herd incidents). Therefore, recurrent infection of cattle herds remains an important driver of the epidemic in these risk areas (Table 1.1).

Risk factors for new TB incidents
In 2023, as in previous years, herds located in the HRA, herds with over 300 cattle (which are more common in the HRA than elsewhere) and herds that had a history of previous TB incidents, were at the highest risk of experiencing a new TB incident. Dairy herds were also found to have an additional risk of infection that could not be fully explained by their herd size, testing history or location.

Source of TB infection in herds
A data-driven method to quantify the likelihood of specific risk pathways for TB infection, which was developed by APHA and first applied to surveillance data in 2022, has continued to be applied to the 2024 data.

Whole Genome Sequencing (WGS) data was available for 888 OTF-W incidents in England in 2024 (36% of all new TB incidents). WGS identified a local reservoir of infection event, with no cattle movements associated with a high likelihood of infection, for 40% of OTF-W incidents with WGS in the HRA, 38% in the Edge Area and 27% in the LRA in 2023. Amongst the 888 incidents with WGS data in England, 13% had cattle movements associated with a high likelihood of infection, with no evidence of local transmission of infection. This represented 10%, 11% and 22% of incidents with WGS data in the HRA, Edge Area and LRA, respectively. A breakdown

of the source of infection data with all new TB incidents in England is presented in Appendix 1.

For the remaining incidents without WGS data available to explore evidence of any local transmission of infection, the majority had no evidence of cattle movements associated with a high likelihood of infection. Therefore, there was insufficient evidence for these herds to determine a likely infection pathway.

Table 1.1 Key bovine TB epidemiological parameters for all TB incidents (OTF-W and OTF-S) in 2024, with selected 2023 values in parentheses

	HRA	Edge Area	LRA	England
Number of new TB herd incidents detected (2023)	1,903 (1,855)	462 (447)	123 (133)	2,488 (2,435)
Number of new OTF-W TB incidents (2023)	805 (805)	223 (199)	37 (42)	1,066 (1,046)
Number of TB incidents ongoing at the end of the year (2023)	1,291 (1,319)	309 (288)	65 (62)	1,665 (1,669)
Herd incidence rate per 100 herd-years at risk (2023)	13.6 (13.2)	7.3 (7.2)	1.0 (1.0)	7.6 (7.3)
Average monthly herd prevalence (%) (2023)	7.7 (8.0)	4.5 (4.1)	0.4 (0.4)	4.1 (4.1)
Number of skin test reactors (2023)	11,064 (10,624)	2,635 (2,207)	298 (359)	13,997 (13,190)
Number of IFN-γ test reactors (2023)	4,456 (4,437)	1,362 (935)	262 (306)	6,080 (5,678)
Laboratory positive slaughterhouse incidents (2023)	1,189 (895)	114 (232)	54 (70)	1,357 (1,197)
Incident duration (in days)				
Median duration of restrictions for incidents that ended in 2024 (25^{th}, 75^{th} percentiles)	190 (161-272)	186 (159-260)	155 (96-202)	187 (160-266)
Median duration of restrictions for incidents that ended in 2023 (25^{th}, 75^{th} percentiles)	203 (166-293)	188 (159-265)	149 (103-191)	197 (163-283)
Percentage of incidents that ended in the year that were persistent, i.e. lasted more than 550 days (2023)	4.7 (5.5)	2.5 (3.4)	1.7 (1.5)	4.1 (4.9)
Number of persistent incidents ongoing at the end of the year (2023)	87 (93)	17 (13)	6 (2)	110 (108)
Recurrence (%)				
Percentage of new TB incidents in the year in that occurred in herds that experienced another TB incident in the preceding 36 months of the disclosing test (2023)	60.1 (59.0)	47.2 (53.9)	21.1 (21.1)	55.8 (56.0)

2.0 Preface

Bovine TB (TB) is a chronic infectious and contagious disease caused by the bacterium Mycobacterium bovis (M. bovis). In England, it is subject to a statutory eradication programme based on the government's strategy, published in April 2014, independently reviewed in 2018, and updated in 2025 (Bovine TB strategy review update) which aims to achieve officially TB free (OTF) status for the whole country by 2038. Officially TB Free country (or regional) status is achieved by having 99.8% of herds retaining OTF status for 3 consecutive years, as defined in the WOAH Terrestrial Code Article 8.12.4.

Within the strategy, England is divided into 3 bovine TB "risk areas" as determined by the level and epidemiology of the disease: the High Risk Area (HRA), Edge Area, and Low Risk Area (LRA), as shown in Figure 2.1.

The HRA extends from the western areas of the Midlands to the south and west of England (excluding the Isles of Scilly). From July 2021, default 6-monthly herd testing was rolled out across the HRA, having been first introduced in Staffordshire and Shropshire in 2020 (with the first additional tests taking place in January 2022), replacing the annual testing regime.

The Edge Area was established in 2013 to form a buffer zone separating the HRA and LRA. East Sussex is the only county of the Edge Area that is surrounded by the LRA. In 2018 the boundaries of the HRA and Edge Area were redrawn, with some counties previously split between the 2 areas becoming fully incorporated into the Edge Area. Additionally, a portion of the redefined Edge Area, including that which was previously part of the HRA, was put on 6-monthly TB surveillance testing, except those herds that could meet specific criteria under the Earned Recognition Scheme. Herds under this scheme, along with the remainder of herds in the Edge Area, are subject to annual TB surveillance testing. Figures within this report show the data for the Edge Area overall, although specific details on trends within the 6-monthly and annual surveillance testing parts of the Edge Area are described and compared within the text.

The LRA was also established in 2013 and extends to the north and east of the Edge Area, excluding East Sussex, but including the Isles of Scilly. Most cattle herds in the LRA are routinely tested for TB every 4 years, unless they are within a TB Hotspot, a radial surveillance zone, or have been identified as requiring annual testing for specific public health or TB risk reasons.

A TB Hotspot (HS) is an area in the LRA of England established by APHA where enhanced TB control measures are carried out following detection of lesion- or culture-positive (OTF-W) TB herd incidents of uncertain origin. Enhanced measures include, but are not limited to, more frequent cattle surveillance testing and a survey of TB in 'found dead' wildlife (badgers and deer). Although set up in the LRA, some

hotspots can extend into the adjoining counties of the Edge Area. Hotspots are categorised into 5 stages depending on their management. Further information on Hotspots can be found here.

2.1 Purpose

The primary purpose of this report is to provide data on the frequency and distribution of bovine TB in cattle in England. Where possible, it also provides an interpretation of the trends in epidemiological measures to support effective disease management and policy decisions.

2.2 Intended Audience

The intended primary audience is policy makers and advisors, who require technical scientific detail to underpin their decision making, as well as official veterinarians delivering the bovine TB eradication programme in England. For this reason, a degree of prior understanding of technical terminology is assumed. A glossary of terms and abbreviations can be found in the Explanatory Supplement. The data, scientific approach and interpretation may also be of value to those in the scientific community who work in the field of bovine TB epidemiology. The report findings may also be of interest to the wider farming and private veterinarian community who are affected by bovine TB and the disease control measures.

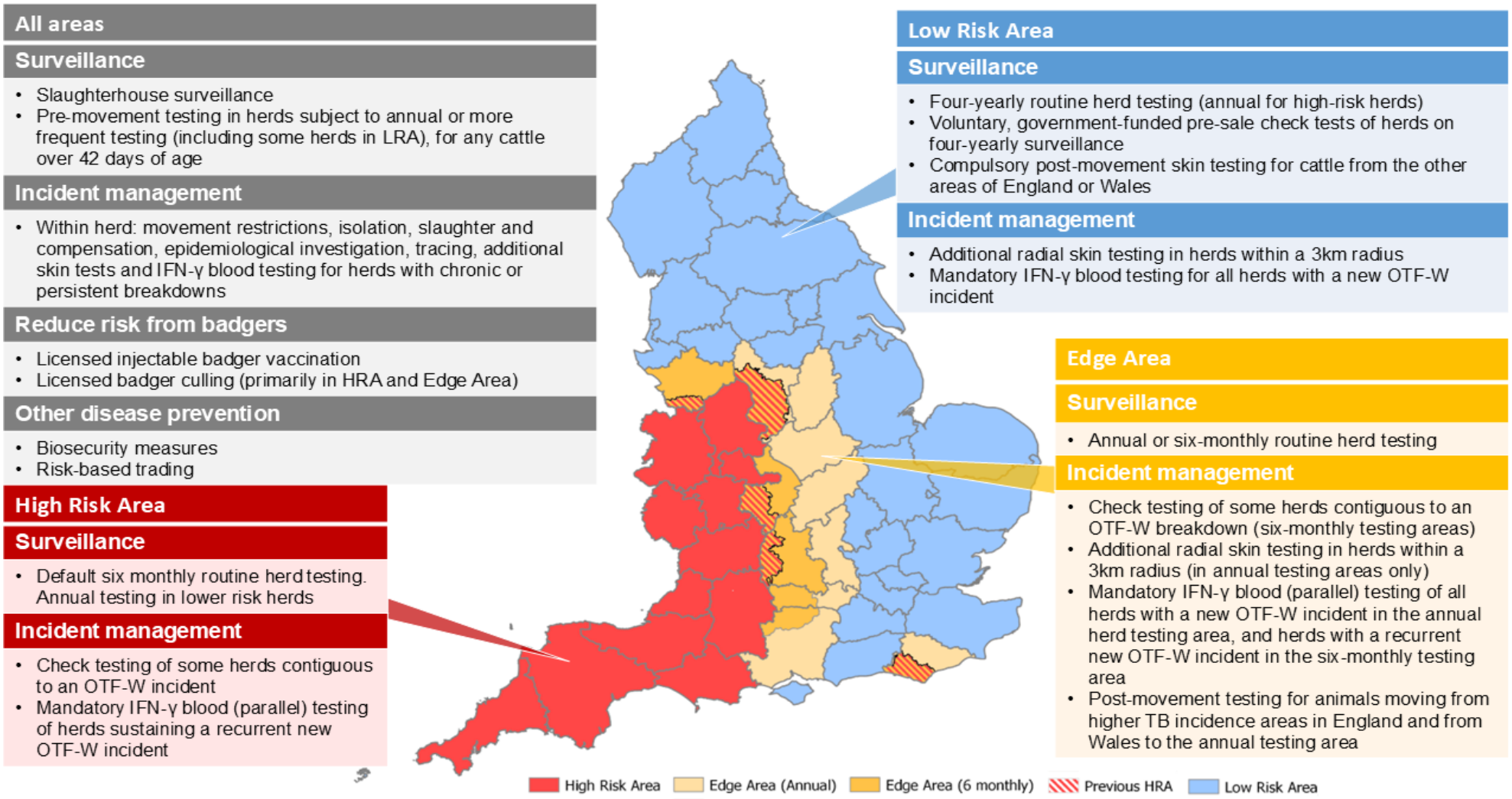

Figure 2.1 Current TB surveillance, incident management and disease prevention strategies by risk area in England.

Figure 2.1 description:

There are numerous TB disease prevention strategies in place across England as a whole, including slaughterhouse surveillance and pre-movement testing in herds subject to annual or more frequent testing for any cattle over 42 days of age. During a TB incident, disease prevention measures include movement restrictions, isolation, slaughter and compensation, epidemiological investigation, tracing and additional skin and IFN-γ blood testing for herds with chronic (more than 100 days) or persistent (more than 550 days) incidents. Herds are also subject to mandatory IFN-γ blood testing (in parallel) if they sustain a recurrent OTF-W incident in the HRA or 6-monthly testing Edge Area, or any herds experiencing a new OTF-W incident in the LRA or annual testing Edge Area. To reduce the risk from badgers, badger vaccination and licenced badger culling (currently being phased out), also takes place. Other disease prevention strategies include biosecurity and risk-based trading. Incident management in the HRA and 6-monthly Edge Area also includes check testing of herds contiguous to an OTF-W incident. Additional incident management practices in the Edge Area include post-movement testing for animals moving from higher TB incidence areas in England, and from Wales to the annual testing area. In the LRA and annual testing Edge Area, radial testing of herds is also carried out within a 3km radius of another OTF-W incident. Information on routine surveillance testing in the 3 risk areas can be found in Chapter 2.0.

2.3 Data sources and processing

Data on herds, animals, bovine TB incidents and tests applied to cattle in England were downloaded from the APHA SAM and RADAR databases on 24 April 2025. References to ‘cattle’ include domestic cattle (Bos taurus), farmed water buffalo (Bubalus bubalis) and farmed bison (Bison spp.).

Data are downloaded at least 3 months after the end of the reporting year to capture as much information on TB incidents as possible. In addition, considerable effort is made to correct data inconsistencies. However, there may be small differences between the data presented in this report and the accredited official statistics on TB in cattle that are published on a quarterly basis (National TB Statistics).

Of note in 2024, one TB incident in Devon was ‘unclassified’ (neither OTF-W or OTF-S) and as such does not appear in the maps or figures presented in this report. This incident was triggered by the disclosure of inconclusive reactors (IRs) at a 6-monthly whole herd test and the whole herd was depopulated due to non-TB reasons.

Approved finishing units (AFUs) with and without grazing are biosecure holdings with approval from the APHA to provide a route for rearing, fattening or finishing negative-testing cattle from TB-restricted or unrestricted (OTF) herds. Licenced finishing units (LFUs) are another type of biosecure holding approved by the APHA to provide a route for finishing of negative-testing cattle from OTF herds. In 2024 there were 131

active AFUs, and 10 active LFUs. Both AFUs and LFUs are under TB movement restrictions at all times and have therefore been excluded from Sections 3.6 (Duration) and 3.7 (Persistence) of this report.

Further information on data sources and processing can be found in the Explanatory Supplement to the annual reports for 2024.

2.4 Other bovine tuberculosis epidemiology reports

This report for England is part of a suite of regular reports produced by APHA to provide surveillance information and epidemiological analysis of TB in cattle in Great Britain (GB). Other publicly available reports in the series are:

1. Bovine tuberculosis in Great Britain: annual surveillance data and historical trends (referred to hereafter as the 'GB TB data report'). This report is published as an ODS file and provides supporting material in the form of detailed data tables and additional graphics. It presents data separately for England, Scotland and Wales.
2. Year End Descriptive Epidemiology Reports for counties in the Edge Area and LRA of England. These reports provide a detailed epidemiological assessment of TB at a local level.
3. Bovine tuberculosis in Great Britain: Explanatory Supplement to the annual reports. This document provides in-depth explanations about data handling methodologies, terminology, surveillance approaches, and control measures used in GB. It also describes relevant policy changes over time in England and Great Britain and provides a glossary of terms.
4. Analysis of bovine tuberculosis surveillance at routine slaughter of cattle in Great Britain, 2019 to 2022. This triannual report explores the role of slaughterhouse surveillance in the detection of TB cases in GB.

3.0 Headline epidemiological parameters

3.1 Herd demographics

In 2024, there were 4,984,855 cattle kept in 44,555 active cattle herds in England, of which 34,925 were beef herds (77.0%) and 8,241 (18.5%) were dairy. Most registered, active cattle herds in 2024 were within the HRA and LRA (41% of all herds in each), with the remaining 18% registered in the Edge Area, a distribution very similar to that of 2023.

Table 3.1.1 Number of active cattle herds in England, by risk area, during 2023 and 2024. Active cattle herds are those registered on APHA's SAM database on 31/12/2024.

	HRA	Edge Area	LRA	England
Number of active cattle herds in 2024[1]	**18,274**	**7,928**	**18,353**	**44,555**
Number of active cattle herds in 2023	18,249	7,952	18,470	44,671
Percentage change in number of active cattle herds from 2023 to 2024	**+0.14%**	**-0.30%**	**-0.63%**	**-0.26%**
Number of beef herds in 2024 (Percentage of total for risk area)	**13,603 (74%)**	**6,289 (79%)**	**15,033 (82%)**	**34,925**
Number of beef herds in 2023 (Percentage of total for risk area)	13,506 (74%)	6,300 (79%)	15,053 (82%)	34,859
Number of dairy herds in 2024 (Percentage of total for risk area)	**4,067 (22%)**	**1,410 (18%)**	**2,764 (15%)**	**8,241**
Number of dairy herds in 2023 (Percentage of total for risk area)	4,168 (23%)	1,430 (18%)	2,807 (15%)	8,405
Number of other herds in 2024 (Percentage of total for risk area)	**604 (3%)**	**229 (3%)**	**556 (3%)**	**1,389**
Number of other herds in 2023 (Percentage of total for risk area)	575 (3%)	222 (3%)	610 (3%)	1,407
Median herd size in 2024 - beef	**40**	**35**	**33**	**36**
Median herd size in 2023 - beef	42	36	34	37
Median herd size in 2024 - dairy	**221**	**218**	**187**	**210**
Median herd size in 2023 - dairy	220	218	195	210
Median herd size in 2024 - other	**14**	**7**	**3**	**7**
Median herd size in 2023 - other	14	7	5	8

The distribution of herds, by size and production type, within each risk area of England has remained similar over recent years. The HRA had proportionally more herds with over 300 cattle (12%) compared to the Edge Area (10%) and LRA (8%) (Figure 3.1.1). Most herds in the LRA were relatively small, with fewer than 50 cattle (55%).

Herds with between 1-200 cattle were mainly beef herds (87%). Of those holding between 201-300, 57% were dairy herds. Of the largest herds holding over 300 cattle, 65% were dairy. This trend was very similar across the 3 risk areas, with 71% of the largest herds (>300) in the HRA, 64% in the Edge Area and 57% in the LRA registered as dairy herds. As herd size decreased, the proportion of beef herds increased. ‘Other’ herds tended to be small, with 81% holding between 1 and 50 cattle. A description of these herds can be found in the Explanatory supplement.

The HRA had the largest proportion of dairy herds (22%) in comparison to the Edge Area (18%) and LRA (15%).

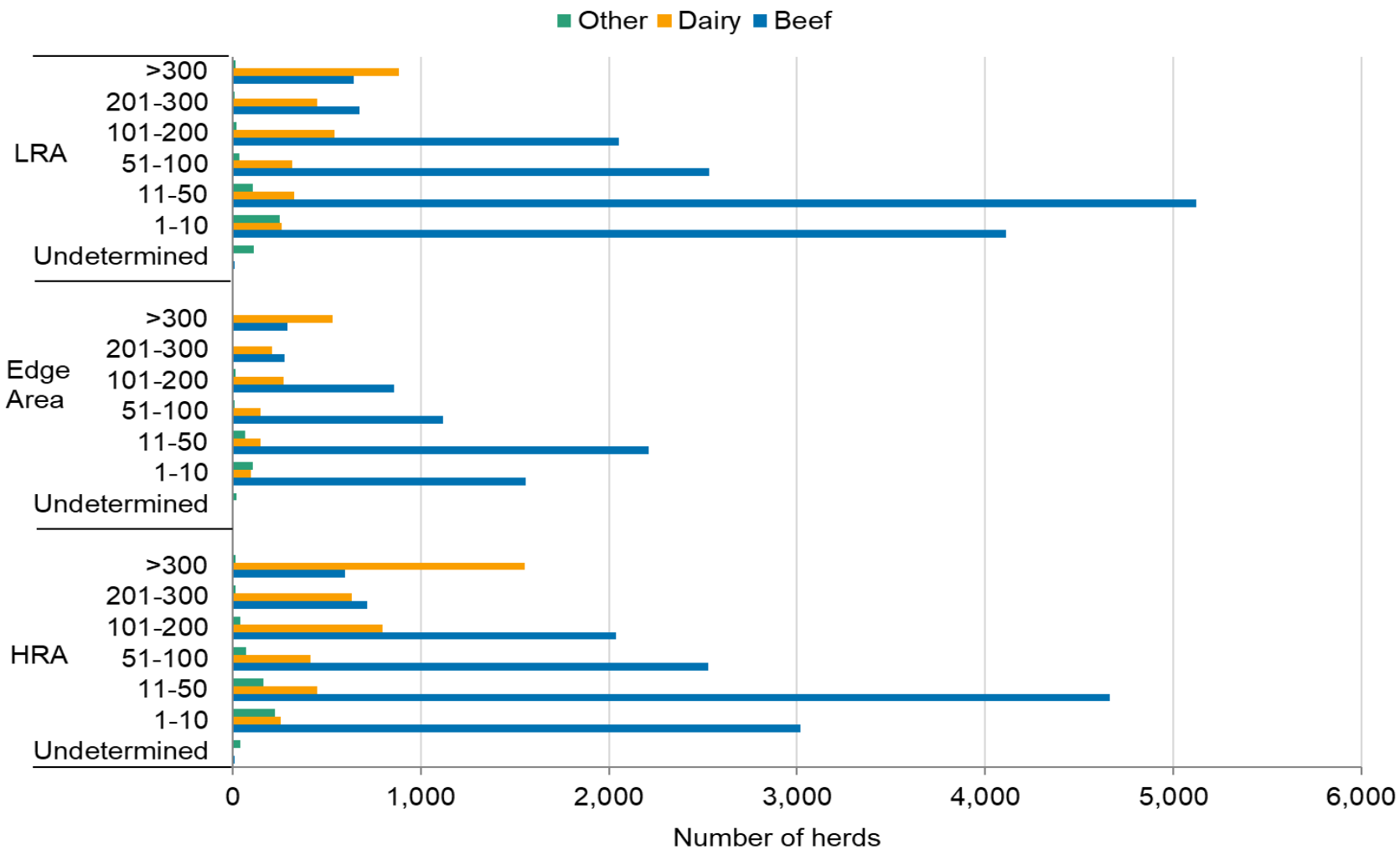

Figure 3.1.1 Number of herds by herd size and type in each risk area of England in 2024.

3.2 Number of new TB incidents

The number of Officially Tuberculosis Free (OTF) herds in which TB was detected in 2024 is referred to as the number of new TB incidents.

In 2024, the total number of new TB incidents detected in England, i.e. with OTF herd status suspended (OTF-S) or withdrawn (OTF-W) (2,488), increased by 2% compared with 2023 (2,435) (Table 3.2.1). The highest proportion of new TB incidents in England occurred, as expected, in the HRA (76%). This was the same as in 2023. This was followed by the Edge Area (19% in 2024 vs 18% in 2023). The LRA had just 5% of all new TB incidents in England, compared to 6% in 2023.

The number of new OTF-W TB incidents in 2024 (1,065) increased by 2% compared with 2023 (1,046). Again, the highest proportion of OTF-W incidents occurred in the HRA (76%), followed by the Edge Area (21%) and LRA (3%). The percentage of new TB incidents classified as OTF-W decreased slightly in the HRA (43% in 2023 versus 42% in 2024) and LRA (32% in 2023 versus 30% in 2024) but increased slightly in the Edge Area (45% in 2023 versus 48% in 2024) compared to 2023, however none of these changes were statistically significant.

Table 3.2.1 Number of new TB incidents in England, by risk area, during 2023 and 2024.

	HRA	Edge Area	LRA	England
All new TB incidents in 2024 (Percentage of total for England)	**1,903 (76%)**	**462 (19%)**	**123 (5%)**	**2,488**
All new TB incidents in 2023 (Percentage of total for England)	1,855 (76%)	447 (18%)	133 (6%)	2,435
Percentage change in all new TB incidents from 2023 to 2024	**+3%**	**+3%**	**-8%**	**+2%**
New TB incidents in 2024 that were OTF-W	**805 (42%)**	**223 (48%)**	**37 (30%)**	**1,065 (43%)**
New TB incidents in 2023 that were OTF-W (Percentage of total incidents for risk area)	805 (43%)	199 (45%)	42 (32%)	1,046 (43%)
Percentage change in new OTF-W TB incidents from 2023 to 2024	**0%**	**+12%**	**-12%**	**+2%**

3.2.1 Long term trends in the number of new TB incidents

From 1986 to 2000, before the foot and mouth disease (FMD) outbreak in 2001, the annual total number of new TB incidents increased by around 14% each year. The interval for the epidemic to double in size over that period was estimated at 5.3 years (see Figure 3.1.1a in Bovine tuberculosis in England in 2018).

Surveillance testing, control measures and movement patterns in cattle herds across GB were disrupted during and immediately after the FMD epidemic in 2001. The number of new TB incidents increased rapidly with a 25% annual rate of increase in 2001 and 2002.

The rate of increase in all new TB incidents reduced once TB controls were re-established after the FMD epidemic. From 2003 to 2010 the epidemic continued a steady but significant upward trend, with an annual rate of increase in the number of TB incidents of 6% and a doubling time of 12.8 years ($p=0.005$). Between 2011 and 2016 the epidemic in England reached a plateau (Figure 3.2.1).

There is now evidence that the epidemic has been decreasing steadily since 2017. Between 2017 and 2024, the halving time for the quarterly number of TB incidents was 10.6 years ($p<0.001$), and the average annual rate of decrease was 6%. Although this is encouraging, the quarterly number of incidents in 2024 was still more than double that from before the FMD epidemic.

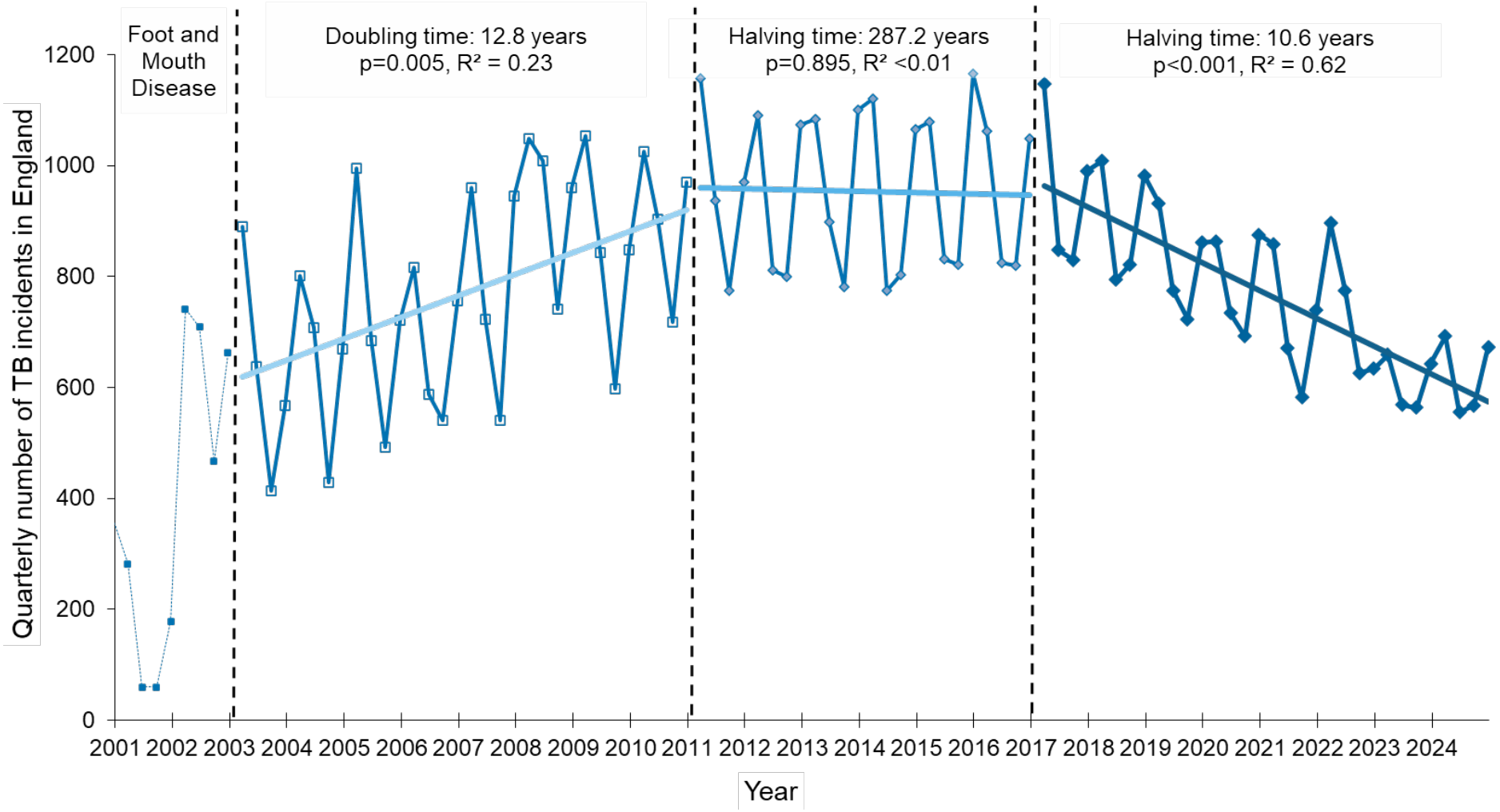

Figure 3.2.1 Quarterly total numbers of new TB incidents detected in England between January 2001 and December 2024.

As stated above, across England in 2024 there were a total of 2,488 new TB incidents, which was a slight increase (2.2%) compared to 2023 (2,435). Prior to this, the trend had been decreasing since 2017 (3,816) except for 2022 (2,929), which saw a slight increase (2.8%) on the previous year. The increase in 2022 was due to a change in the default testing interval for herds in the HRA from annual to 6-monthly testing, implemented in late 2020 and 2021 (Figure 3.2.2).

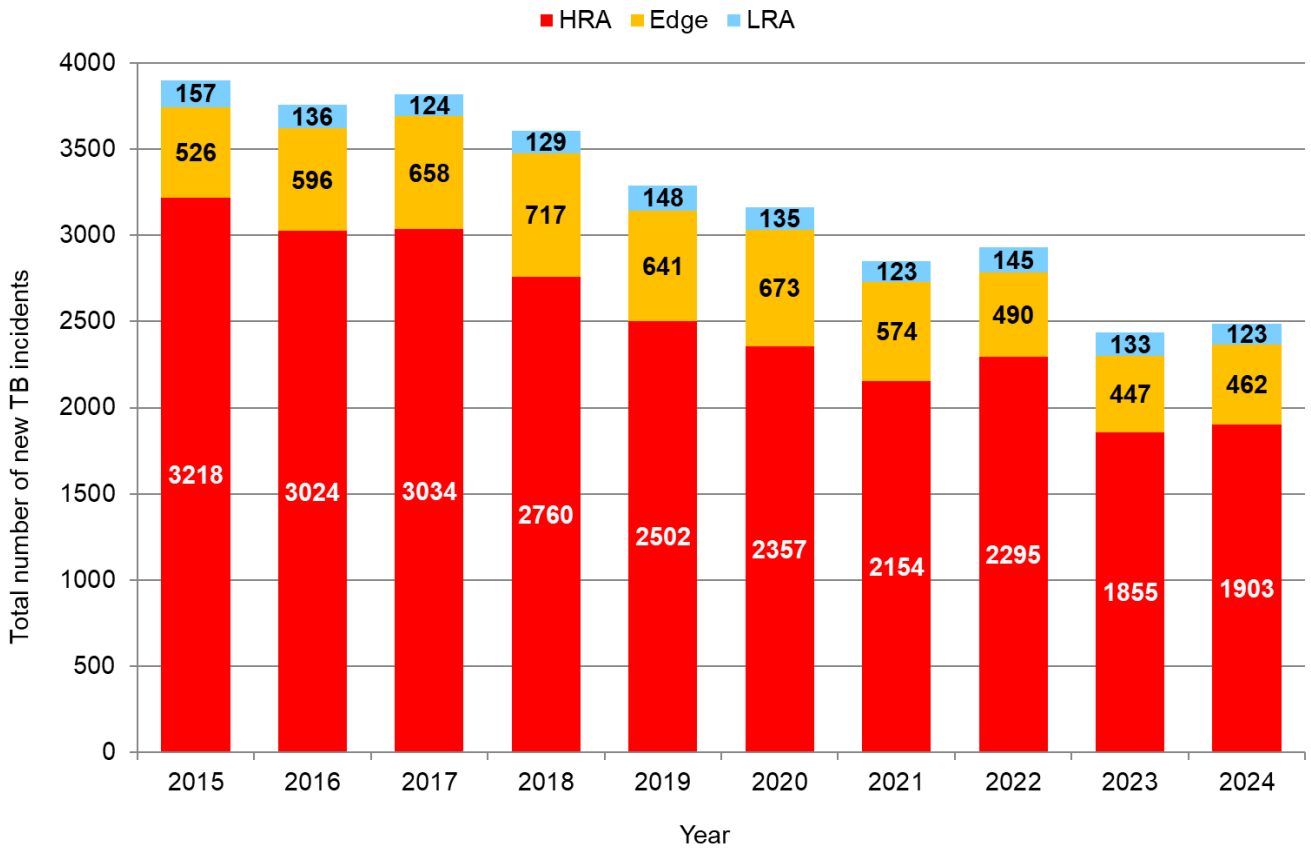

Figure 3.2.2 Total annual number of new TB incidents in England, by risk area.

3.2.2 Number of TB incidents in the HRA

In the HRA in 2024 there were 1,903 new TB incidents, of which 805 were OTF-W, 1,097 were OTF-S, and one was unclassified. The total number of new TB incidents has seen an overall downward trend over the past 10 years (3,218 in 2015 versus 1,903 in 2024). A downward trend was also observed in the percentage of new TB incidents with OTF-W status (63% in 2020 versus 42% in 2024). There were 4 new TB incidents in AFUs in the HRA in 2024.

Although incidents were spread throughout the HRA, areas such as the northwest of Shopshire, south Avon and the east of Devon and east Cornwall appeared to have a higher number of incidents (Figure 3.2.3).

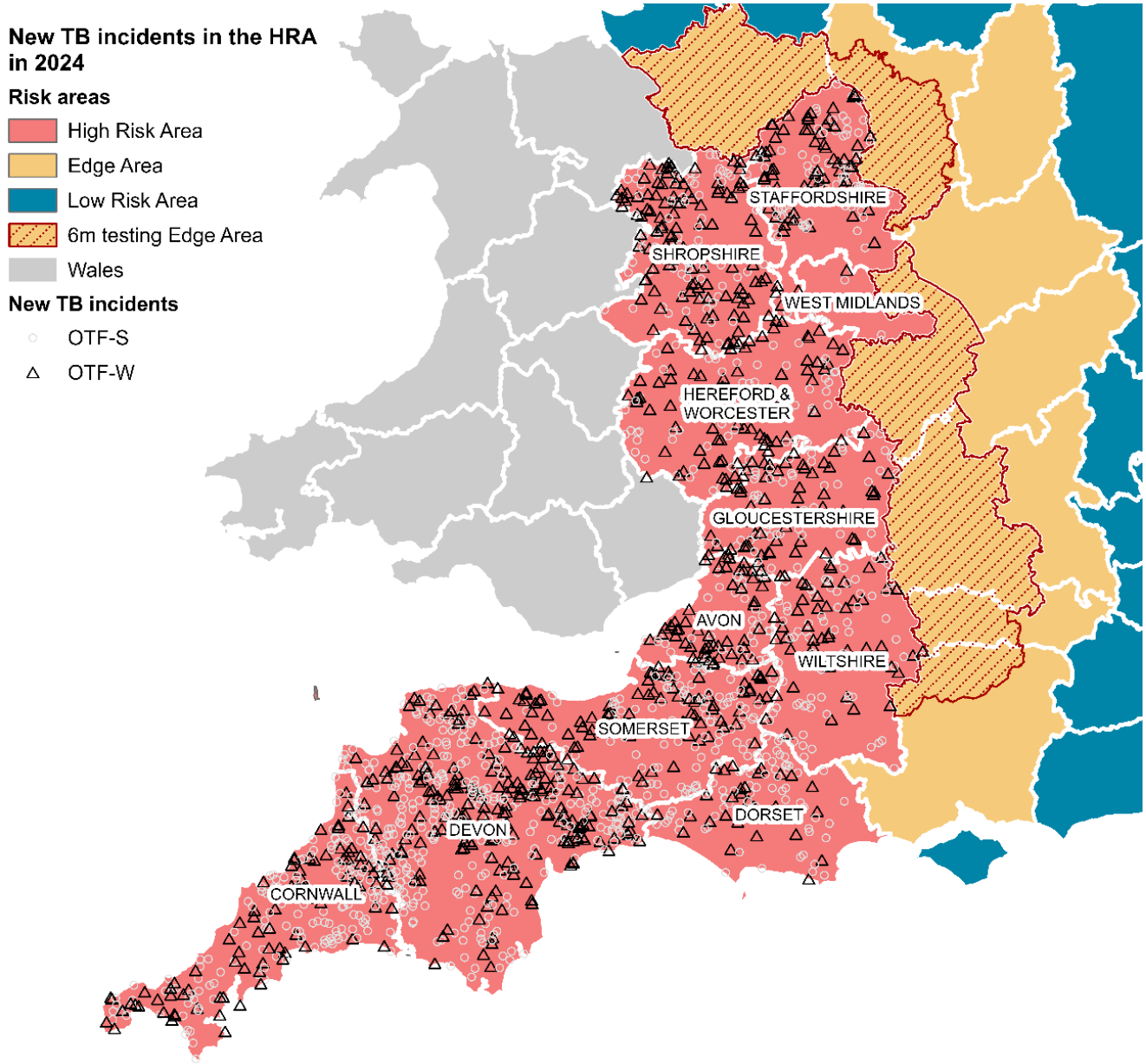

Figure 3.2.3 HRA county map, showing the locations of new TB incidents detected in the HRA in 2024.

Figure 3.2.3 map description: Map of HRA counties in 2024, and locations of new TB incidents detected in the HRA in 2024. The incidents are spread throughout the HRA.

The highest number of new TB incidents disclosed in 2024 was in Devon (524), followed by Cornwall (247), and Shropshire (200). The lowest number of incidents in the HRA was recorded from the West Midlands (4), Avon (91) and Dorset (97) (Figure 3.2.4). The number of new TB incidents decreased in only 3 of the 11 HRA counties in 2024 compared to 2023, however none of these decreases were

statistically significant (p>0.05). The rest of the HRA counties experienced non-significant increases on 2023.

Despite some fluctuations over time, all counties saw decreases in the number of new TB incidents in 2024 compared to 5 years before (2020), except for the West Midlands (4 incidents in both 2020 and 2024) (Figure 3.2.4). However, the West Midlands contains very few herds and cattle compared to the other counties and is therefore more prone to fluctuation of TB measures. Reductions were observed in all other counties. Their magnitude ranged from small declines of 2% (Gloucestershire), 3% (Devon) and 5% (Avon) to more substantial declines of 47% (Staffordshire), 35% (Hereford and Worcester) and 33% (Shropshire).

Compared to 2023, there was a reduction in the percentage of new TB incidents in 2024 classified as OTF-W in all HRA counties except Shropshire (52% in 2023 versus 58% in 2024) and Dorset (18% in 2023 versus 29% in 2024). The counties with the highest percentage of OTF-W incidents in 2024 were Shropshire (58%), Avon (53%), Gloucester (50%), and Hereford and Worcester (50%). The counties with the lowest percentage of OTF-W incidents in 2024 were the West Midlands (25%) and Dorset (29%).

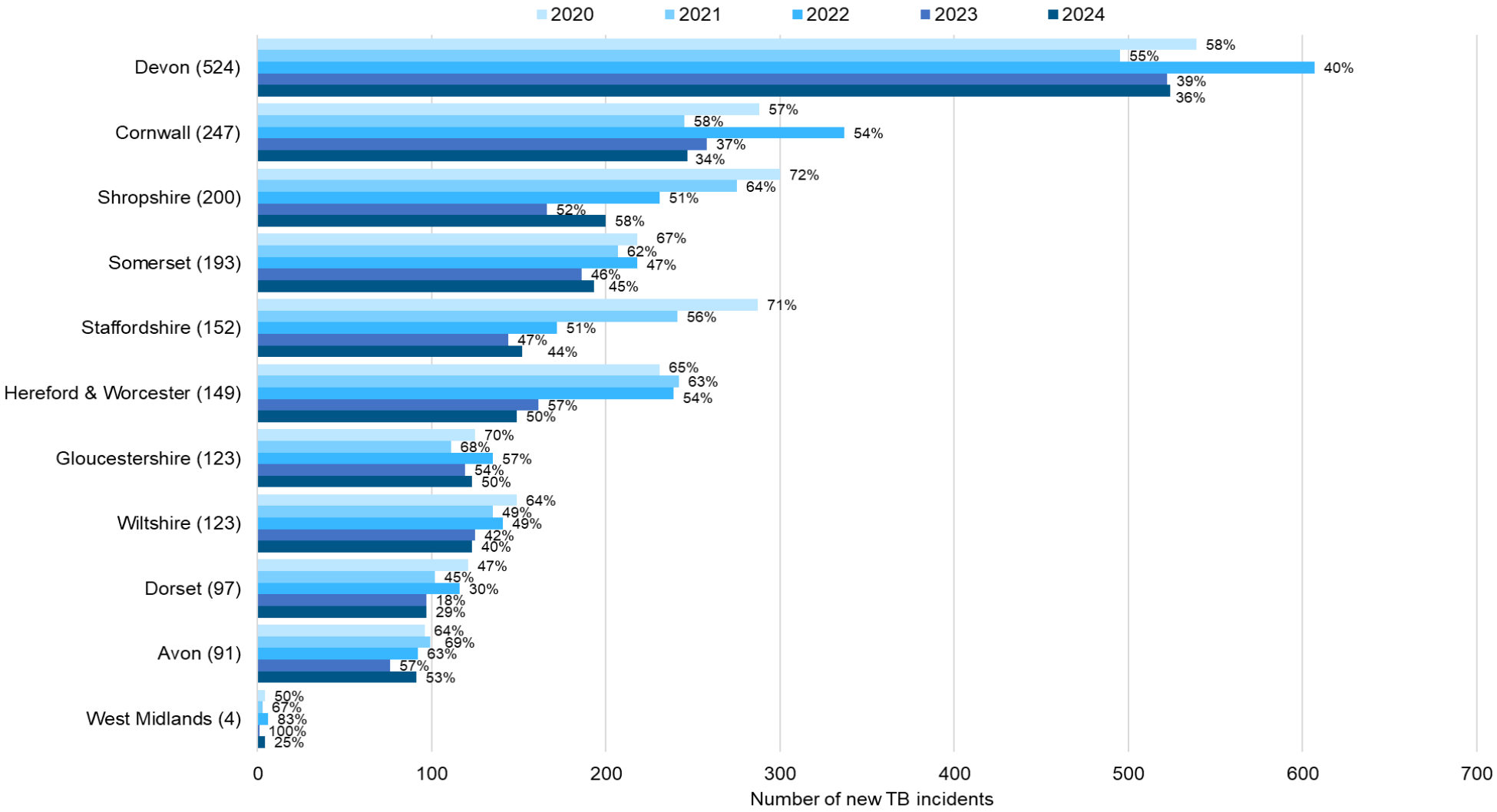

Figure 3.2.4 Annual total number of new TB incidents between 2020 and 2024, by HRA county. Data labels represent the percentage of new TB incidents with OTF-W status by year. Counties are presented in descending order of number of new TB incidents in 2024 (number given in parentheses)

3.2.3 Number of TB incidents in the Edge Area

In the Edge Area in 2024 there were 462 new TB incidents, of which 223 were OTF-W and 239 were OTF-S. The total number of new TB incidents has been steadily declining in this part of England, from 672 in 2020 to 462 in 2024.

There were 5 new TB incidents in AFUs in the Edge area in 2024.

Most TB incidents were identified close to the Edge Area border with the HRA. The southwest of Derbyshire and the southeast and southwest of Cheshire showed comparatively high numbers of TB incidents (Figure 3.2.5). There were also high numbers of TB incidents in Leicestershire, within Hotspot (HS) 23, along the Warwickshire-Northamptonshire border and in central and northwest Buckinghamshire.

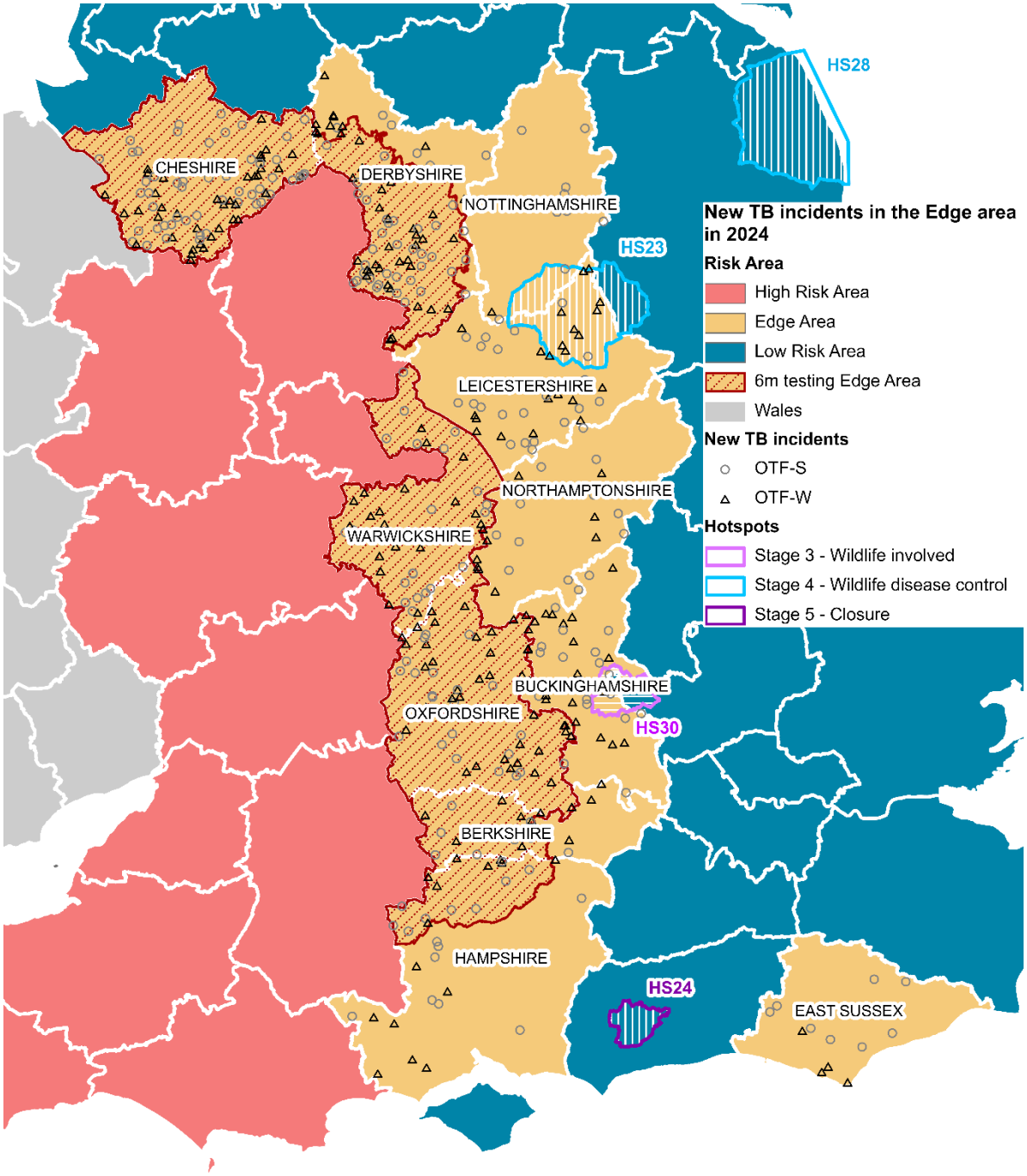

Figure 3.2.5 Edge Area county map, showing the areas under 6-monthly and annual routine herd testing, along with the location of holdings experiencing a new TB incident in 2024.

Figure 3.2.5 map description: Map of Edge Area counties in 2024, showing the 6-monthly testing area within the Edge Area counties, and locations of new TB incidents detected in Edge Area in 2024. The incidents were spread mostly along the western border of the Edge Area with the HRA, and throughout East Sussex.

The number of new TB incidents disclosed in 2024 was highest in Cheshire (90), followed by Derbyshire (85) and Oxfordshire (61), whilst the lowest number of incidents was recorded in Nottinghamshire (10), East Sussex (12) and Berkshire (19) (Figure 3.2.6). Despite Cheshire and Oxfordshire being among the counties with the highest number of new TB incidents, they saw a decrease compared to 2023. Three further counties saw decreases in the number of new TB incidents starting in 2024 compared to 2023, however this decrease was only statistically significant in East Sussex (27 in 2023 versus 12 in 2024, p=0.015). Of the 6 Edge Area counties that sustained increases in the number of incidents, only Buckinghamshire was statistically significant (19 in 2023 versus 42 in 2024, p=0.021).

Reductions in the number of new TB incidents in 2024 compared to 5 years ago were observed in all Edge Area counties except Berkshire and Buckinghamshire. Whilst there was only a slight increase in Berkshire (16 in 2020 versus 19 in 2024) the number of new TB incidents doubled in Buckinghamshire (21 in 2020 versus 42 in 2024). Despite Cheshire disclosing the highest number of new incidents of all counties of the Edge Area in 2024, this county has experienced a steady decline over the previous 5 years, from 160 incidents in 2020 (Figure 3.2.6).

The percentage of new OTF-W TB incidents in the Edge area decreased between 2020 (53%) and 2023 (45%) but increased slightly to 48% in 2024. There were reductions in the percentage of new TB incidents in 2024 with OTF-W status in 5 of the 11 Edge Area counties. The counties with the highest increases were Leicestershire (20% in 2023 versus 51% in 2024) and Hampshire (28% in 2023 versus 45% in 2024). The counties with the highest percentage of OTF-W incidents in 2024 were Oxfordshire (61%), Berkshire (58%) and Buckinghamshire (52%). By contrast, there was a marked reduction in percentage of OTF-W incidents in Buckinghamshire, from 68% in 2023 to 52% in 2024. The counties of the Edge Area with the lowest percentage of OTF-W incidents in 2024 were Nottinghamshire (10%) and East Sussex (33%).

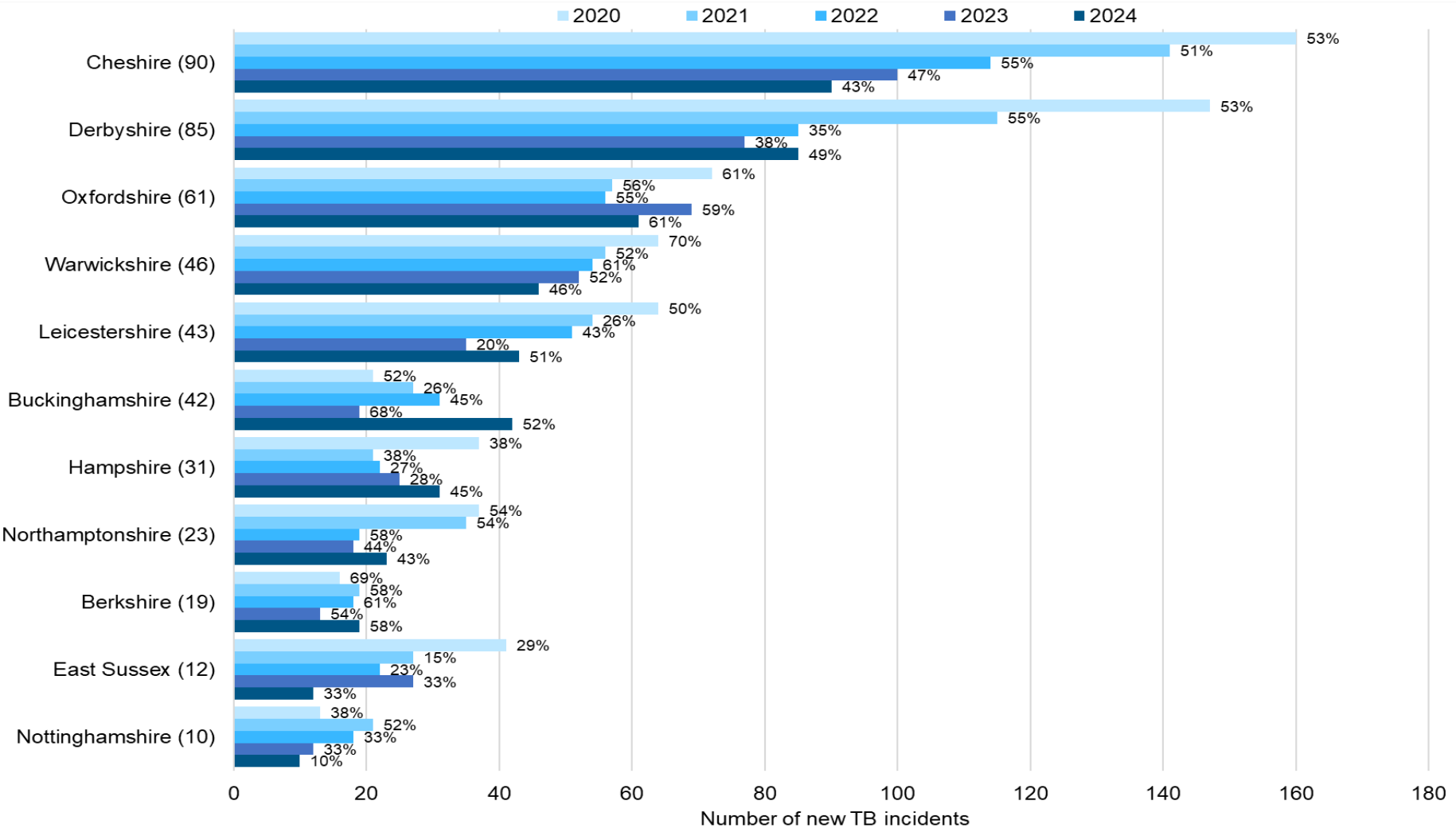

Figure 3.2.6 Annual total number of new TB incidents between 2020 and 2024, by Edge Area county. Data labels represent the percentage of new TB incidents with OTF-W status by year. Counties are presented in descending order of number of new TB incidents in 2024.

3.2.4 Number of TB incidents in the LRA

There were 123 new TB incidents in the LRA in 2024, of which 37 were OTF-W and 86 were OTF-S. There were 0 new TB incidents in LFUs in 2024.

New TB incidents were spread throughout the counties of the LRA, with clusters of TB incidents occurring mostly within and around active TB hotspots (Figure 3.2.7). During 2024 there were 8 active hotspots in the LRA, of which 3 (HS24, HS26 and HS27) closed during the reporting year due to the absence of, or marked reduction in, new TB incidents in recent years.

For ease of reporting in the LRA and due to low numbers of TB incidents, some of the counties are grouped into subregions: North East, North West, South East, Yorkshire and Humberside, and are shown in Figure 3.2.7. Cumbria and Lincolnshire are reported separately as counties alone.

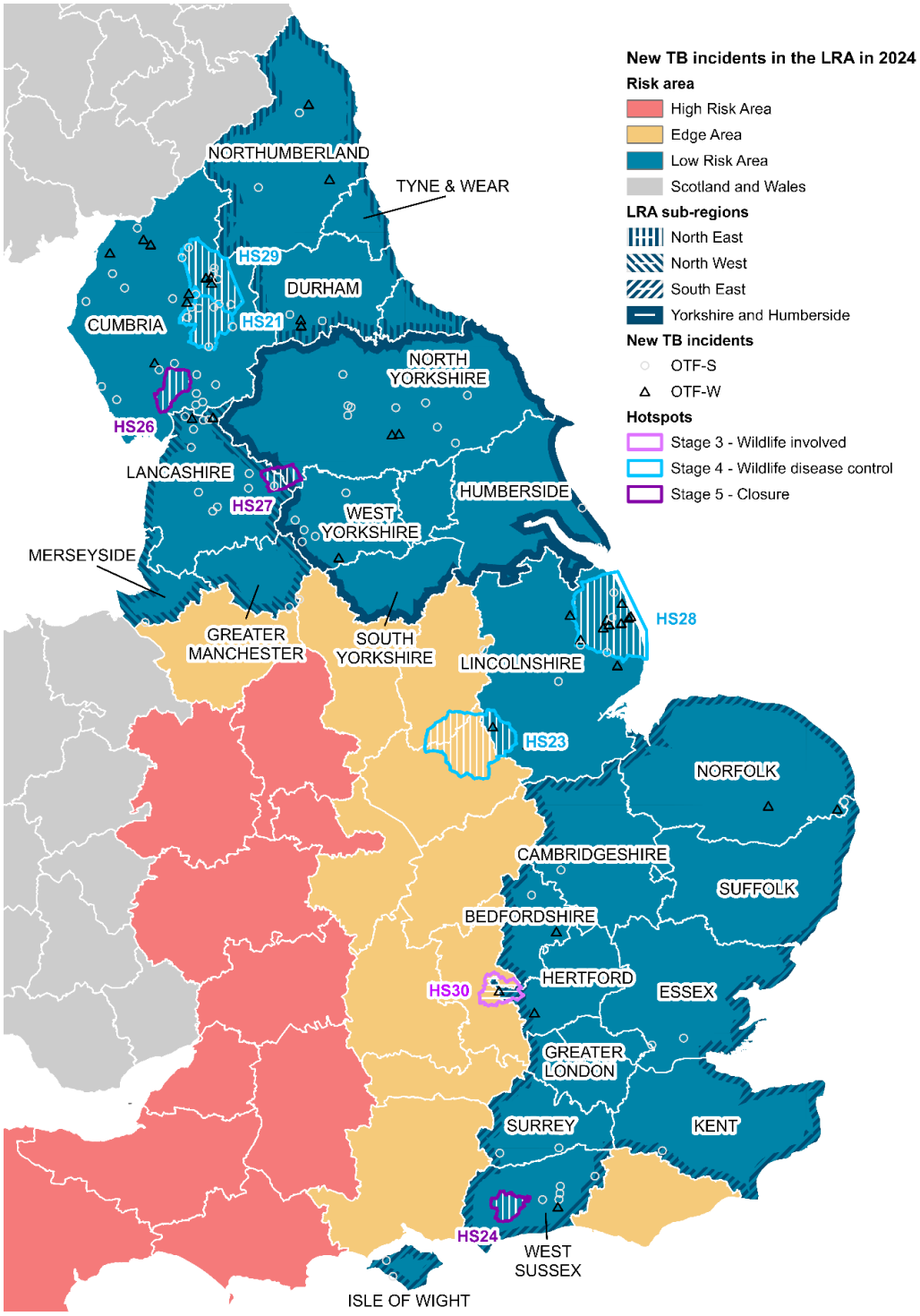

Figure 3.2.7 LRA county map, showing the location of incidents in 2024 (OTF-W and OTF-S), as well as hotspots that were active in 2024 (HS21, HS23, HS24, HS26, HS27, HS28, HS29, and HS30). NB Isles of Scilly not shown due to scale and the absence of any TB incidents there.

Figure 3.2.7 map description: Map of LRA counties and sub-regions in 2024, showing the locations of TB hotspots in England that were active at some point in 2024. The incidents were spread throughout the LRA and 2 hotspots (HS23 and HS30) also straddled the eastern border of the Edge Area.

In the LRA, the total number of new TB incidents has been somewhat stable in recent years, fluctuating between 123 to 145 from 2020 to 2024 (Figure 3.2.8). This was also true for the percentage of new TB incidents with OTF-W status in the LRA, between 28% and 32% from 2020 to 2024.

The number of new TB incidents disclosed in 2024 was highest in Cumbria (39) followed by the South East of the LRA (23). Fluctuations in the number of new TB incidents between 2020 and 2024 has been observed in all LRA counties and sub-regions. Reductions in the number of new TB incidents in 2024 compared to 5 years ago were observed in all LRA counties and subregions except Cumbria (23 in 2020 versus 39 in 2024) and the North West of the LRA (13 in 2020 versus 15 in 2024). However, the South East of the LRA did see a significant decrease in the number of new TB incidents (41 in 2023 versus 23 in 2024, p=0.044). A significant reduction was seen in Yorkshire and Humberside (36 in 2023 versus 19 in 2024, p=0.048) and a non-significant reduction in the North West of the LRA (17 in 2023 versus 15 in 2024, p>0.05). The lowest recorded number of incidents were disclosed in the North East of the LRA (9) and the Isles of Scilly, which disclosed no new TB incidents in 2024, or indeed the previous 20 years.

There was a statistically significant increase in the number of new TB incidents in Cumbria (17 in 2023 versus 39 in 2024, p=0.028). This increase was related to a greater number of incidents in HS29, and a cluster in the south of the county.

There were reductions in the percentage of new OTF-W TB incidents in 3 of the 6 LRA counties and subregions that experienced new incidents in 2024: the North West of the LRA (24% in 2023 versus 7% in 2024), Yorkshire and Humberside (39% in 2023 versus 16% in 2024) and Cumbria (47% in 2023 versus 28% in 2024). Increases were seen in Lincolnshire (32% in 2023 versus 67% in 2024), the North East of the LRA (33% in 2023 versus 44% in 2024) and the South East of the LRA (22% in 2023 versus 26% in 2024).

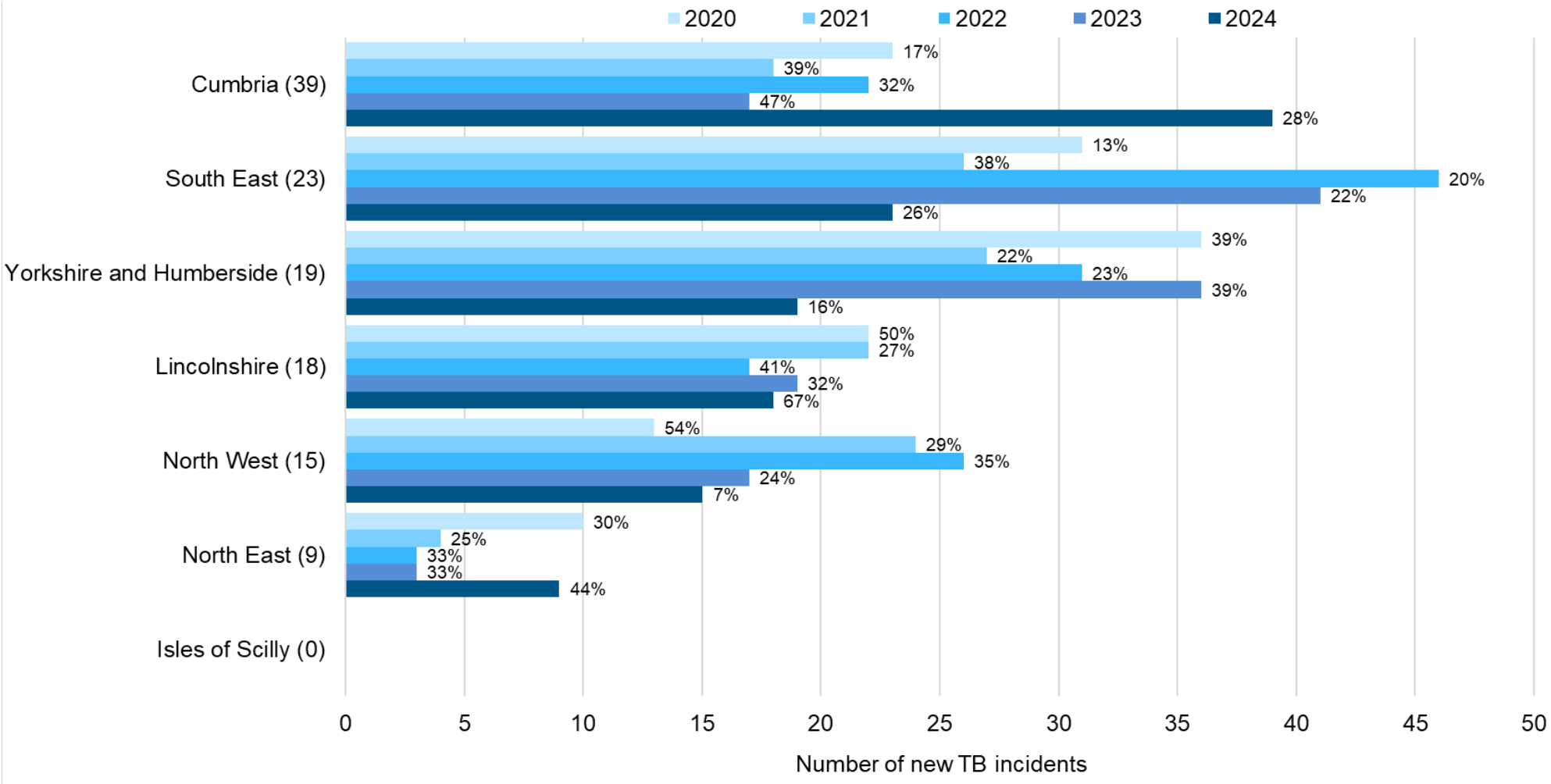

Figure 3.2.8 Annual total number of new TB incidents between 2020 and 2024, by LRA sub-region or individual county. Data labels represent the percentage of new TB incidents with OTF-W status by year. LRA counties and sub-regions are presented in descending order of number of new TB incidents in 2024.

3.3 Number of reactors and inconclusive reactors

3.3.1 Reactors

The single intradermal comparative cervical tuberculin test (SICCT) is the skin test used for TB testing in GB. When read at the standard interpretation (ST), a positive bovine reaction more than 4mm greater than a positive avian reaction is used to identify positive animals. At the severe interpretation (SEV), used to increase the sensitivity of the test, animals are considered positive if there is a 2mm greater bovine than avian reaction, or a positive bovine reaction and concurrent negative avian reaction depending on the circumstances in which the test is being performed. SEV interpretation is used for most short interval tests (SITs) carried out in TB incident herds in England and is also retrospectively applied to the results of the test that disclosed the TB incident. It entails the re-classification of some ST SICCT inconclusive reactors (IRs) as positive skin test reactors. It is therefore designed to increase the diagnostic sensitivity of the SICCT test, thus reducing the risk of leaving undisclosed infected animals in the herd.

In 2024, 13,997 SICCT reactors were removed from TB incidents in England, of which 29.5% were read at the severe interpretation (Table 3.3.1). The majority (78.2%) of these were in the HRA. There were 6,080 interferon gamma blood test positive (IFN-γ) reactors removed, a 7.1% increase from 2023, and 263 antibody reactors removed, over double the number removed in 2023 (102.9% increase). There was a total of 20,340 reactors removed from TB incident herds in 2024, a 4.8% increase since 2023.

Table 3.3.1 Number of reactors removed following the skin test at standard and severe interpretation, IFN-γ testing and antibody testing in England, by risk area, during 2023 and 2024.

	HRA	Edge Area	LRA	England
Number of SICCT reactors in 2024	**11,064**	**2,635**	**298**	**13,997**
Number of SICCT reactors in 2023	10,624	2,207	359	13,190
Number of ST SICCT reactors in 2024	**7,821**	**1,813**	**220**	**9,854**
Number of ST SICCT reactors in 2023	7,589	1,581	287	9,457
Number of SEV SICCT reactors in 2024	**3,243**	**822**	**78**	**4,143**
Number of SEV SICCT reactors in 2023	3,035	626	72	3,733
Number of IFN-γ reactors in 2024	**4,456**	**1,362**	**262**	**6,080**
Number of IFN-γ reactors in 2023	4,437	935	306	5,678
Number of Antibody reactors in 2024	**100**	**108**	**55**	**263**
Number of Antibody reactors in 2023	104	25	0	129
Total 2024	**15,620**	**4,105**	**615**	**20,340**
Total 2023	15,165	3,570	665	19,400

Overall, 15,620 cattle were slaughtered following the disclosure of reactors in the HRA in 2024, a 3% increase compared to 2023 (15,165). These comprised of 11,064 SICCT test reactors (71% of all reactors removed), 4,456 IFN-γ blood test-positive (29%) and 100 antibody test positive animals (1%). Compared to 2023, the number of SICCT test reactors rose by 4%, with the number of IFN-γ blood test-positive animals observing a smaller increase (0.4%). Conversely, the number of TB antibody test-positive animals decreased by 4% compared to 2023, although the numbers were small (100 versus 104 in 2023). The total number of animals removed, and the percentage detected by each test type, varied by HRA county (Figure 3.3.1).

The HRA county with the greatest number of cattle removed in 2024 for TB control reasons was Devon (4,308 animals), where 22% of the animals removed were detected by IFN-γ testing. Cornwall had the next highest number of cattle removed in total (2,434 animals), of which 29% were removed as IFN-γ test positives. The county with the highest proportion of cattle removed as IFN-γ test positives was Avon (38%), followed by Shropshire, Wiltshire and Dorset (all 35%; Figure 3.3.1). In these counties, compared to 2023, the percentage of cattle removed as IFN-γ test positives increased by 9%, 13%, 15% and 4%, respectively. No IFN-γ test positives were detected in the West Midlands in 2024, however this county only had 4 new TB incidents.

Decreases in the number of IFN-γ positive animals removed in 2024 compared to 2023 were observed in Cornwall, Devon, Gloucestershire and Somerset, where the percentage fell by 9%, 8%, 3% and 1%, respectively. IDEXX antibody test positives

were only observed in Devon (98), Somerset (1) and Avon (1). More information on blood testing can be found on the TB hub.

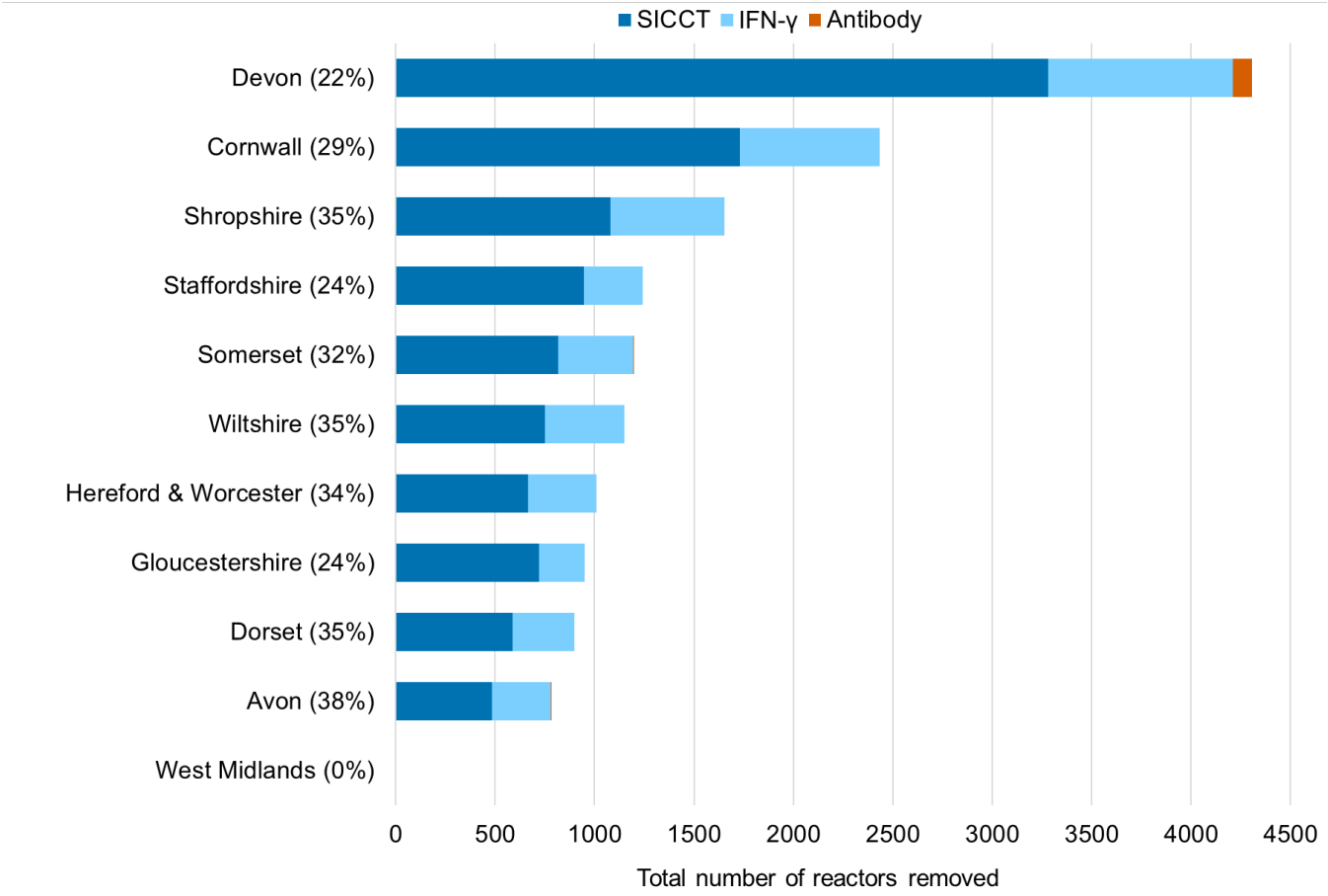

Figure 3.3.1 Number of cattle removed in the HRA in 2024 as SICCT test reactors, IFN-γ or IDEXX antibody test positives, by HRA county. Counties are ranked by total number of animals removed for TB control reasons (percentage of animals removed per county due to positive IFN-γ test results are shown in parentheses).

The number of reactors removed in the HRA over the past 10 years has been steadily declining since a peak in 2017 (25,057). However, there was a slight increase of 3% in 2024 compared to 2023 (15,164 in 2023 versus 15,620 in 2024) (Figure 3.3.2).

Substantial numbers of cattle in the HRA were also removed as 1xIRs (cattle which have an inconclusive SICCT test result on the first test) before re-testing or as DCs (direct contacts) (741, 75% of England total), or as 2xIRs (cattle which have an inconclusive SICCT test result on 2 consecutive tests) (481, 73% of England total). The number of 2xIRs has been decreasing in the HRA since 2022 (614) and reached the lowest numbers seen in more than 10 years in 2024 (481).

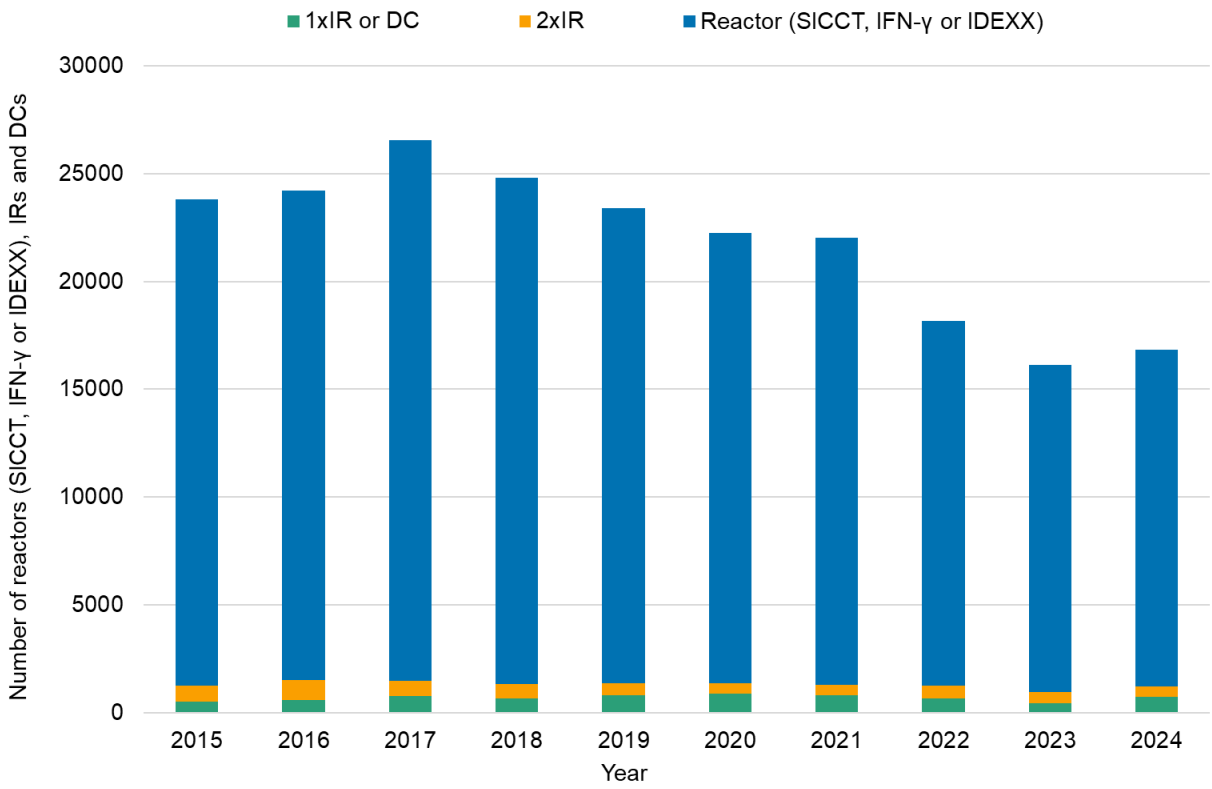

Figure 3.3.2 Number of reactors (SICCT test reactors, IFN-γ or IDEXX antibody test positives), inconclusive reactors and direct contacts removed from herds in the HRA between 2015 and 2024. IR = inconclusive reactor; DC = direct contact.

The Edge Area saw an increase of 33% in the number of reactors in 2024 (4,105) compared to 2023 (Figure 3.3.3). In the past decade there was a steep increase in the number of reactors removed between 2015 (3,450) and 2018 (7,254). This was followed by a gradual decline to 3,067 in 2023. The numbers of animals removed as 1xIRs or DCs and 2xIRs in the Edge Area has fluctuated slightly over the last 10 years. The number of 1xIRs or DCs decreased in the Edge Area from 380 in 2023 to 205 in 2024, whereas the number of 2xIRs increased (123 versus 134).

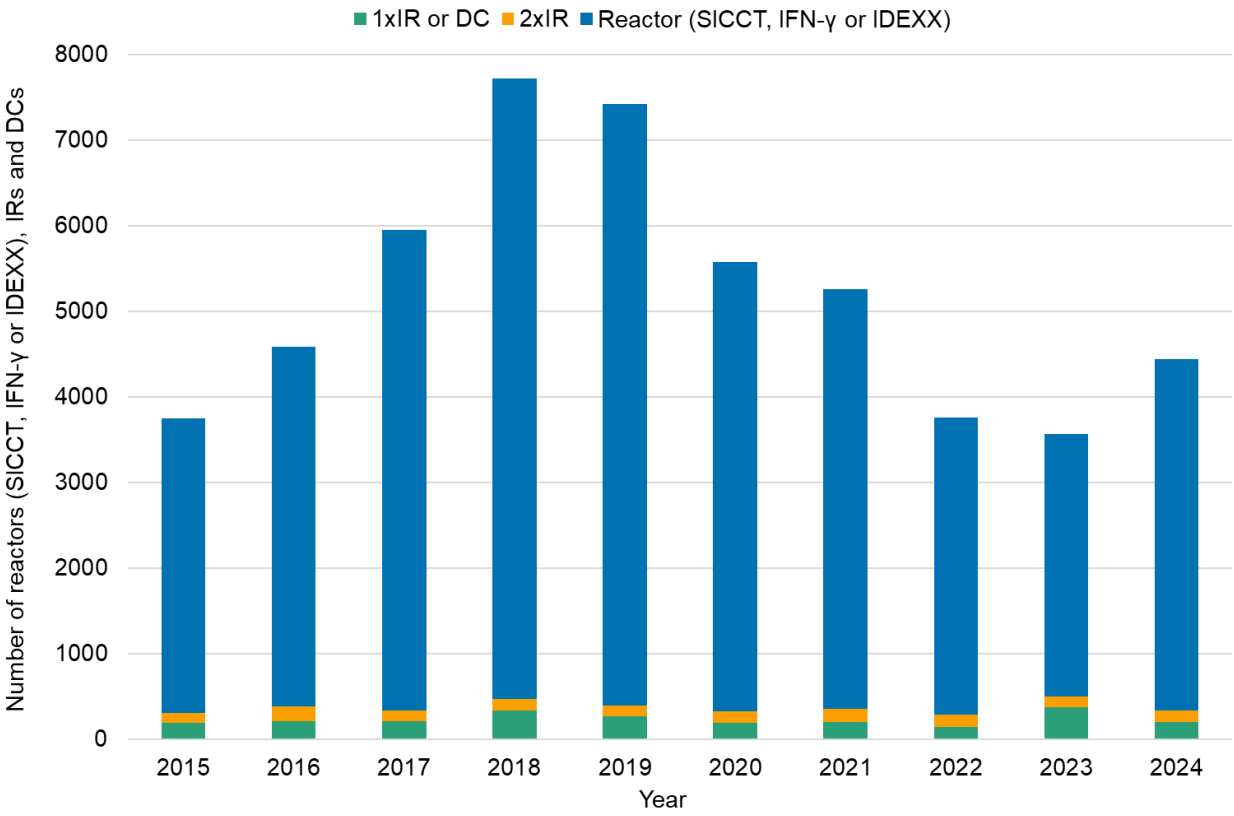

Figure 3.3.3 Number of Reactors (SICCT test reactors, IFN-γ or IDEXX antibody test positives), inconclusive reactors and direct contacts removed from herds in the Edge Area between 2015 and 2024. IR = inconclusive reactor; DC = direct contact.

In the LRA, the number of reactors reached a peak in 2017 (850) dropping by 66% to 287 in 2020, the lowest in 10 years (Figure 3.3.4). It has since increased to 615 in 2024 but remains lower than its peak in 2017. The number of 1xIR or DCs and 2xIRs has remained stable in the LRA with less than 60 and 80 removed per year since 2015, respectively.

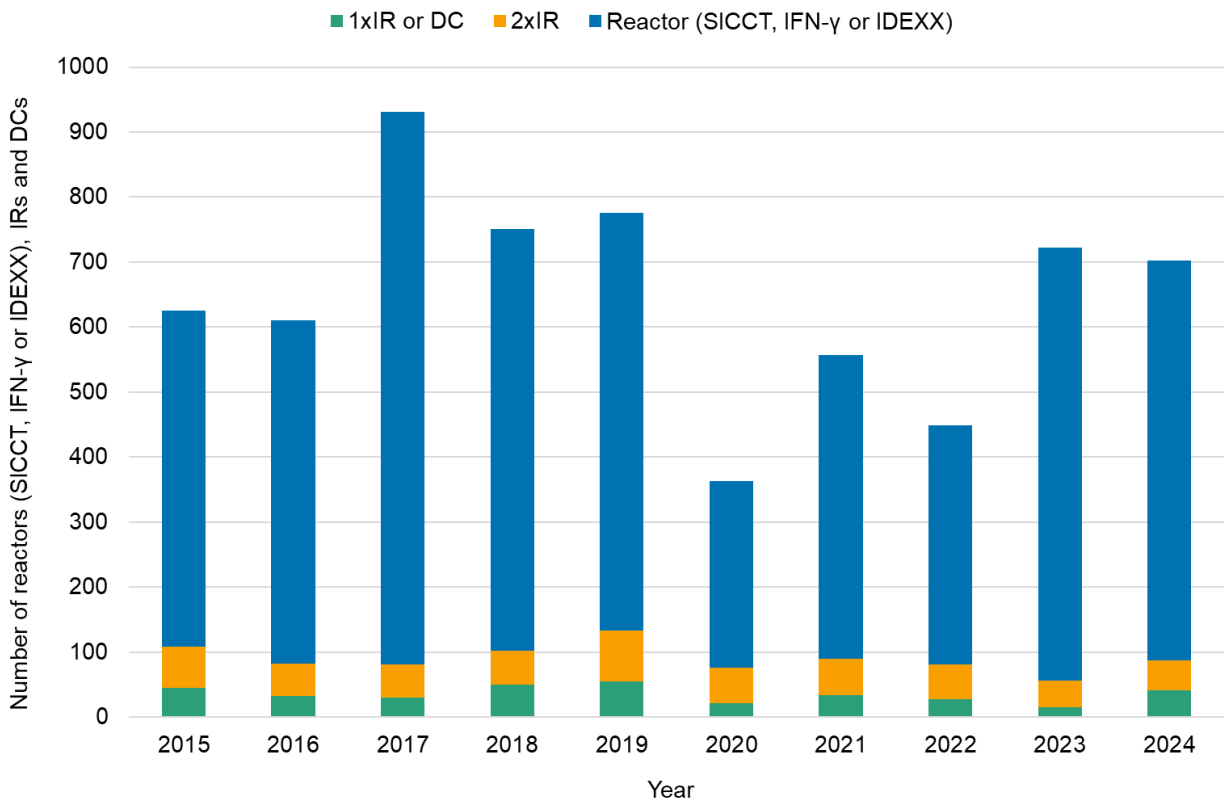

Figure 3.3.4 Number of reactors (SICCT test reactors, IFN-γ or IDEXX antibody test positives), inconclusive reactors and direct contacts removed from herds in the LRA between 2015 and 2024. IR = inconclusive reactor; DC = direct contact.

The average (mean) number of test reactors removed per TB incident in the HRA was reasonably stable between 2015 and 2018, with an increase observed between 2018 and 2020. The trend subsequently declined at a steady rate until 2024 when it began to rise again (Figure 3.3.5). A similar pattern was observed in the Edge Area, however an increase was observed earlier, between 2017 and 2019. There was a subsequent decline until the beginning of 2024, when the mean number of reactors increased again.

In the LRA a decrease was observed between 2015 and the beginning of 2016, following which the mean number of reactors increased up to 2018. Since this time there has been a steady decline until a plateau observed in 2021 and 2022. Then in 2023 the average number of reactors in the LRA started to increase again until mid-2024.

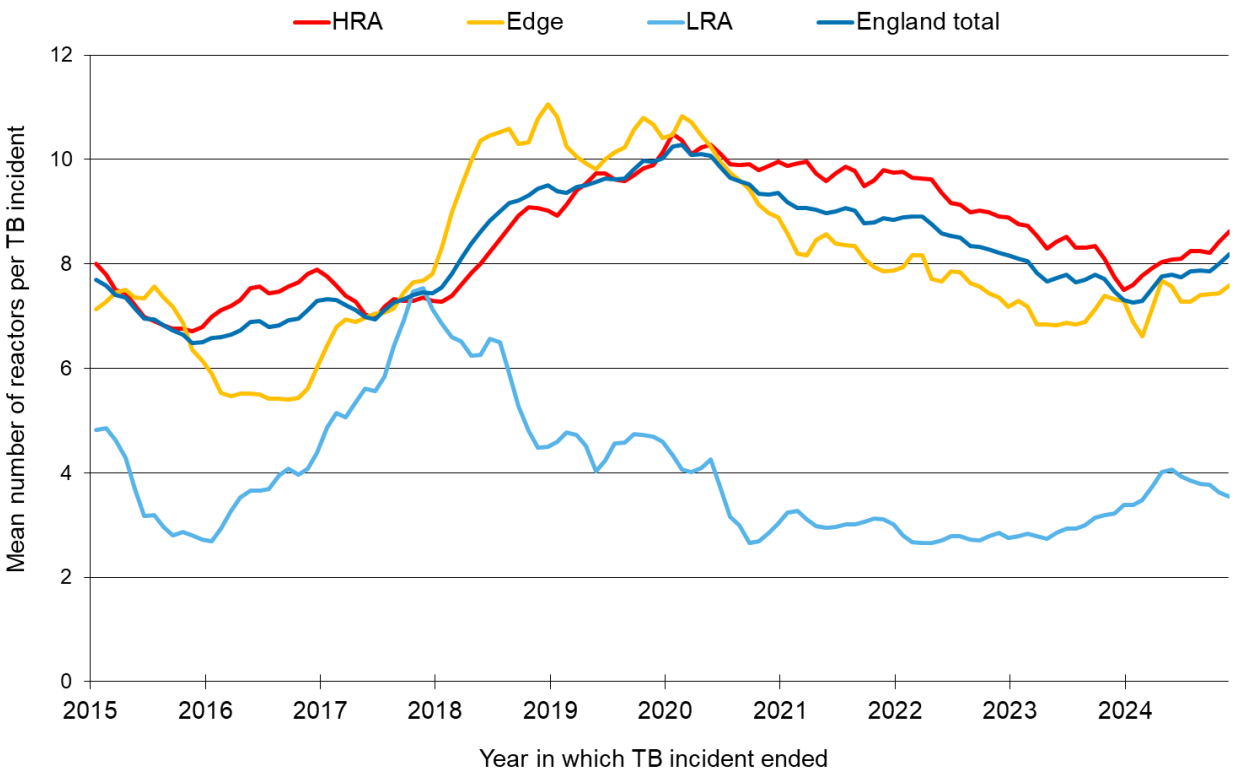

Figure 3.3.5 Monthly rolling mean total number of test reactors taken per TB incident that closed between January 2015 and December 2024, by risk area (12-month moving average). Test reactors includes SICCT and IFN-γ test positive animals only.

The overall distribution for the number of reactors removed per incident was very similar in the HRA and Edge Area (Figure 3.3.6). Sixty-four percent of TB incidents in England had 2 or more reactors, largely driven by the HRA and Edge Area (66% and 64%, respectively, whereas the equivalent percentage for the LRA was 44%).

Of the TB incidents that ended in 2024, 239 generated no reactors (179 in the HRA, 41 in the Edge area, and 19 in the LRA). These were either incidents initiated by a slaughterhouse case, or by 2xIRs where subsequent herd testing revealed no reactors. This was a reduction compared to 288 TB incidents in 2023.

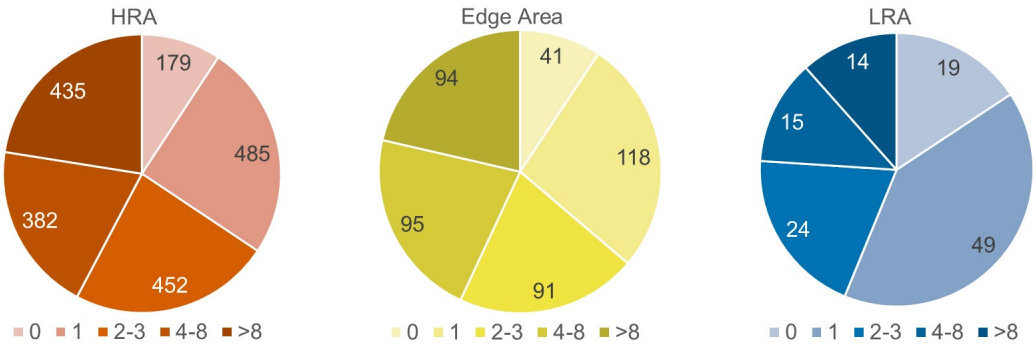

Figure 3.3.6 Distribution of the number of TB incidents that ended in 2024, by total number of reactors removed per incident, for each risk area of England.

3.3.2 Inconclusive reactors

Inconclusive reactors (IRs) are cattle displaying a positive skin reaction to bovine tuberculin that is greater than a concurrent avian tuberculin reaction, but not strong enough to classify them as reactors to the SICCT test. These animals must remain isolated from their herd pending another skin test 60 days later. IRs that do not give a negative result at the retest are removed as either skin test reactors or 2xIRs, thus triggering a new incident if their herd was OTF.

An IR-only herd is defined as an OTF herd which only had IRs at the initial test, with no concurrent reactors. Most IR-only herds (71%) and IRs disclosed in such herds (73%) in 2024 were detected in the HRA (Table 3.3.2).

Between 2023 and 2024, there was a fall in the number of IR-only herds (and the number of IRs in those herds) disclosed in the HRA and LRA. In contrast, the Edge Area also saw a fall in the number of IR-only herds, but a rise in the number of IRs disclosed within IR-only herds. This continues a trend observed in the Edge Area in the previous year, but opposite to that seen in the HRA and LRA where the numbers of IR-only herds and IRs disclosed rose between 2022 and 2023.

Table 3.3.2 Number (and percentage) of IR-only herds in 2024, and IR animals in these herds by risk area, and percentage change between 2023 and 2024.

	HRA	Edge Area	LRA	England
Number of IR-only herds (% of all IR-only herds in England)	1,565 (71%)	440 (20%)	205 (9%)	2,210
(% change 2023-24)	(-10%)	(-1%)	(-7%)	(-8%)
Number of IRs disclosed in IR-only herds (% of all IRs disclosed in IR-only herds in England)	3,203 (73%)	798 (18%)	362 (8%)	4,363
(% change 2023-24)	(-12%)	(4%)	(-7%)	(-9%)

A multivariable analysis (Brunton et al. (2018)) showed that the risk posed by IRs in the HRA and Edge Area was substantially reduced if those animals became reactors or 2xIRs at the 60-day retest and removed from herds. However, IRs that pass the retest can pose a significantly increased risk of being identified as TB test reactors or slaughterhouse cases for around 2.5 years from first disclosure. This indicates that IRs are an important predictor of the presence of infection. Retesting IRs after 60 days mitigates much of the risk posed by those animals. In England, all resolved IRs (i.e. those with a negative result at the 60-day retest) in the HRA and Edge Area (including those from IR-only herds) and resolved IRs from TB incident herds in the LRA, are permanently restricted to the herd in which they are disclosed, which aims to reduces the risk further.

In 2024, 39% of IR-only herds in the HRA went on to have a TB incident within the following 15 months, compared to 32% in the Edge Area and 21% in the LRA (Figure 3.3.7). For the HRA and Edge Area this remained unchanged compared to 2023, but there was a slight decrease in the LRA (23% in 2023).

For IR-only herds in the HRA that went on to have a TB incident within the following 15 months, a similar proportion were detected by subsequent tests and retests (21.1% vs 18.3%, respectively). Of these, there was a higher proportion of OTF-S incidents compared to OTF-W incidents for both subsequent tests (13.0% vs 8.1%) and retests (14.1% vs 4.2%).

This was similar in the Edge Area, with subsequent tests detecting 14.1% of TB incidents in IR-only herds and retests detecting 17.5% of TB incidents. Of these, there was a higher proportion of OTF-S incidents compared to OTF-W incidents for both subsequent tests (10.7% vs 3.9%) and retests (11.4% vs 6.1%).

In comparison, the LRA had a much higher proportion of TB incidents detected by retests compared to subsequent tests (15.1% vs 5.8%, respectively). Of these, there was a higher proportion of OTF-S incidents compared to OTF-W incidents for retests (12.2% vs 2.9%), but a higher proportion of OTF-W incidents compared to OTF-S incidents for subsequent tests (3.4% vs 2.4%). Of note, the large percentage of IR-only herds in the LRA with fate unknown is due no subsequent whole herd test following herd depopulations.

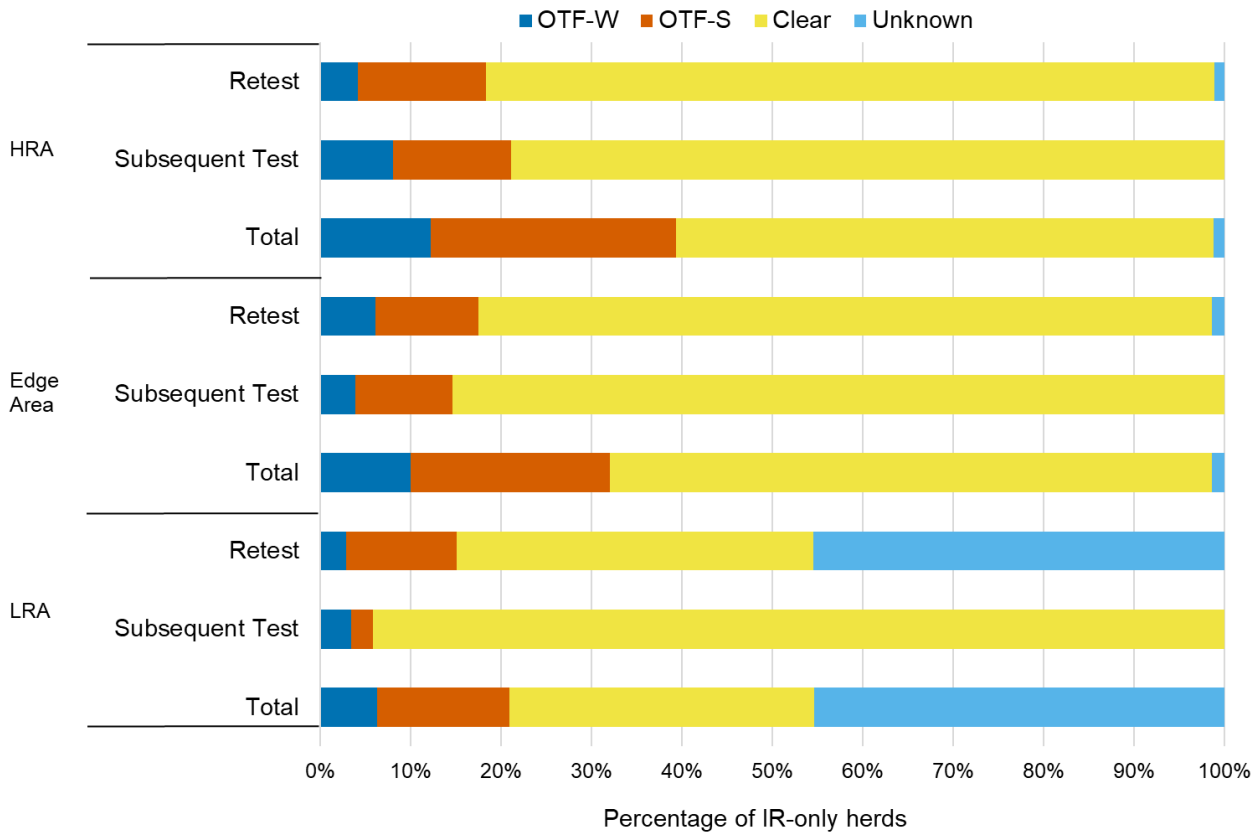

Figure 3.3.7 Fate of IR-only herds in the 15 months following disclosure of IRs in 2024, by risk area and timing of the next test(s).

In the HRA, a slightly larger proportion of IR-only herds that went on to have a new TB incident in 2024 (OTF-S or OTF-W) were detected at a subsequent test compared to the immediate (60-day) IR retest (21.1% vs 18.3%, respectively) (Figure 3.3.8). In contrast, the Edge area and LRA saw a higher proportion of IR-only herds that went on to have a new TB incident in 2024 (OTF-S or OTF-W) were detected at the immediate (60-day) IR retest compared to a subsequent test (17.5% vs 14.5% in the Edge Area and 15.1% vs 5.9% in the LRA).

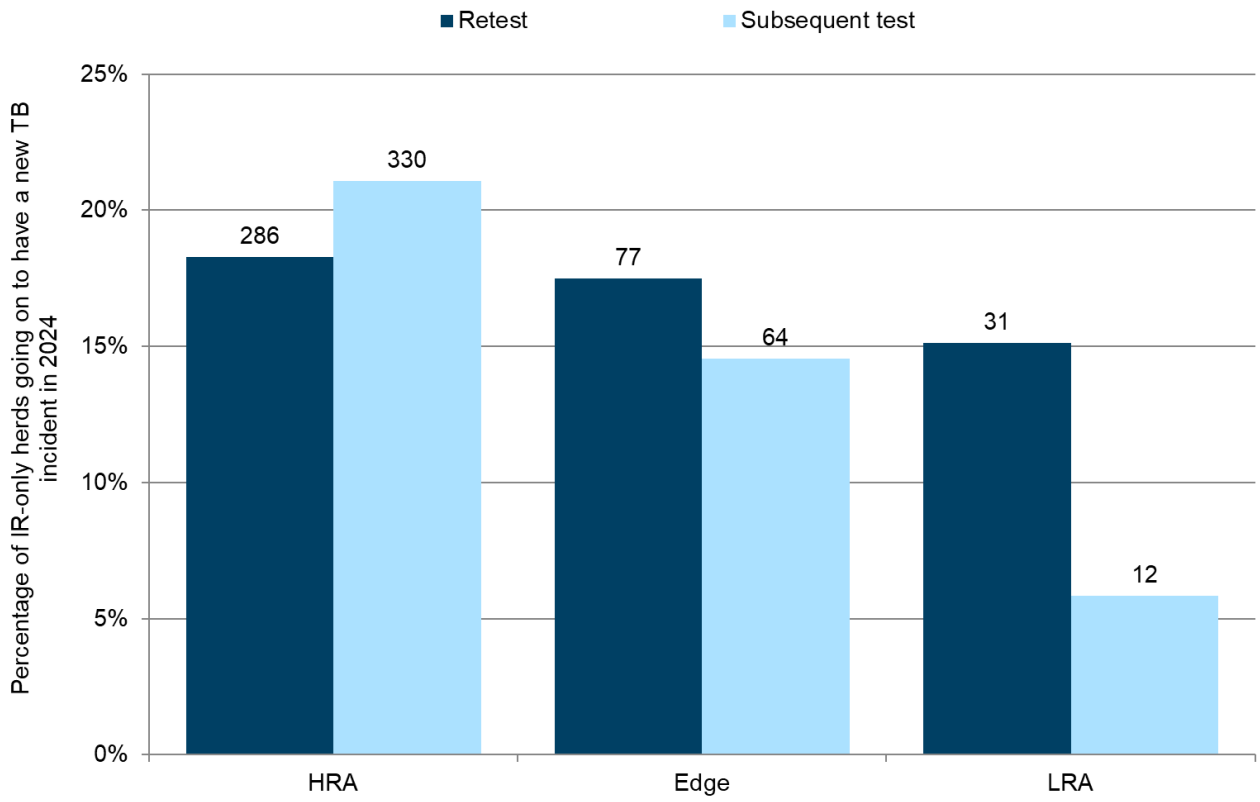

Figure 3.3.8 Proportion of IR-only herds that had a new TB incident in 2024 at either the immediate IR retest 60 days after first detection, or a subsequent skin test (within 15 months after the IR test), by surveillance risk area. The denominator is the number of IR only herds and totals above each column represent the number of herds with a TB incident.

3.3.3 Post-mortem findings in cattle slaughtered for TB control purposes

In 2024, a total of 21,989 cattle were slaughtered for TB disease control purposes in England, an 8% increase compared to 2023 (n=20,428). Most cattle slaughtered were skin and/or IFN-γ blood test reactors (92.5%). The remaining 7.5% were removed as 1xIRs before re-testing, either voluntarily by the keeper (4.1%), or by APHA as direct contacts (3.4%, Figure 3.3.9).

Almost all cattle slaughtered for TB control purposes are subjected to post-mortem meat inspection (PMMI) in the slaughterhouse, but not every TB-affected animal is sampled at slaughter for confirmatory lab testing and whole-genome sequencing (WGS) of M. bovis. For incident control purposes, confirmation of infection with M. bovis entails the detection of typical visible lesions of TB at PMMI in at least one slaughtered test reactor ('VL reactors'), or the identification of M. bovis by bacteriological culture or PCR testing in at least one animal in the affected herd.

The results of the SICCT test can be read at standard (ST) or severe (SEV) interpretation, as explained above in Section 3.3.1.

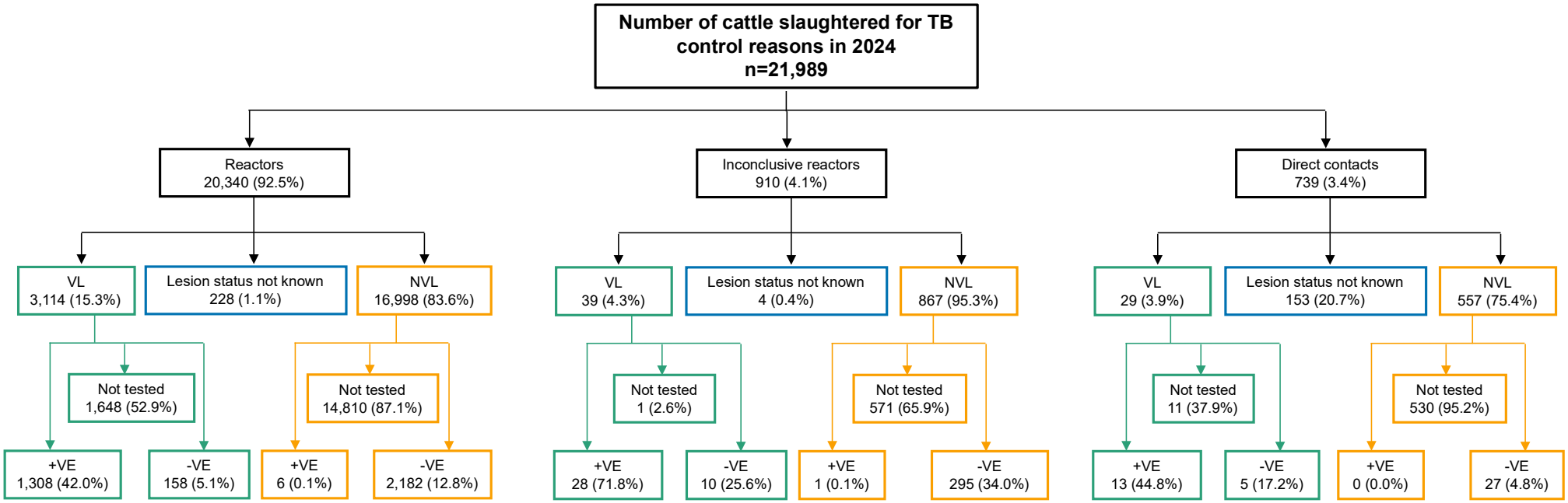

Figure 3.3.9 Diagram showing the number of cattle slaughtered for TB control reasons in 2024 by the reason for slaughter, the lesion status (visible lesions (VL), lesion status not known and non-visible lesions (NVL)) and the number (and percentage) of those where the presence of M. bovis was (+VE) and was not (-VE) detected by confirmatory laboratory tests (PCR or culture) post-mortem. Atypical lesions are categorised as non-visible lesions, however there were no atypical lesions detected in 2024.

In England, 20,080 cattle were removed following the disclosure of skin test and IFN-γ blood test reactors in 2024. Of the 9,854 animals removed due to a positive ST SICCT test, 21% had visible lesions (VLs) present at slaughter, or evidence of M. bovis presence from further confirmatory tests (PCR or culture). Of the 4,143 animals removed due to a positive SEV SICCT test, 6% had VLs or further evidence of M. bovis presence (Figure 3.3.10). A total of 6,080 animals were removed due to a positive supplementary IFN-γ blood test, of which 7% had VLs or evidence of M. bovis presence.

The HRA had the smallest proportion (21%) of ST SICCT reactors with VLs or further evidence of M. bovis presence, of all the risk areas. The proportion of IFN-γ and SEV SICCT reactors which had VLs or further evidence of M. bovis presence in the HRA was 7% and 6%, respectively.

In the Edge Area, over a third of ST SICCT positive animals had VLs or further evidence of M. bovis presence, which was higher than in the HRA. A higher proportion of IFN-γ and SEV SICCT reactors had VLs or further evidence of M. bovis presence in comparison to the HRA (13% and 9% respectively).

In the LRA, a similar proportion (36%) of ST SICCT reactors had VLs or further evidence of M. bovis presence compared to those in the Edge Area (35%), which was higher than the 21% in the HRA.

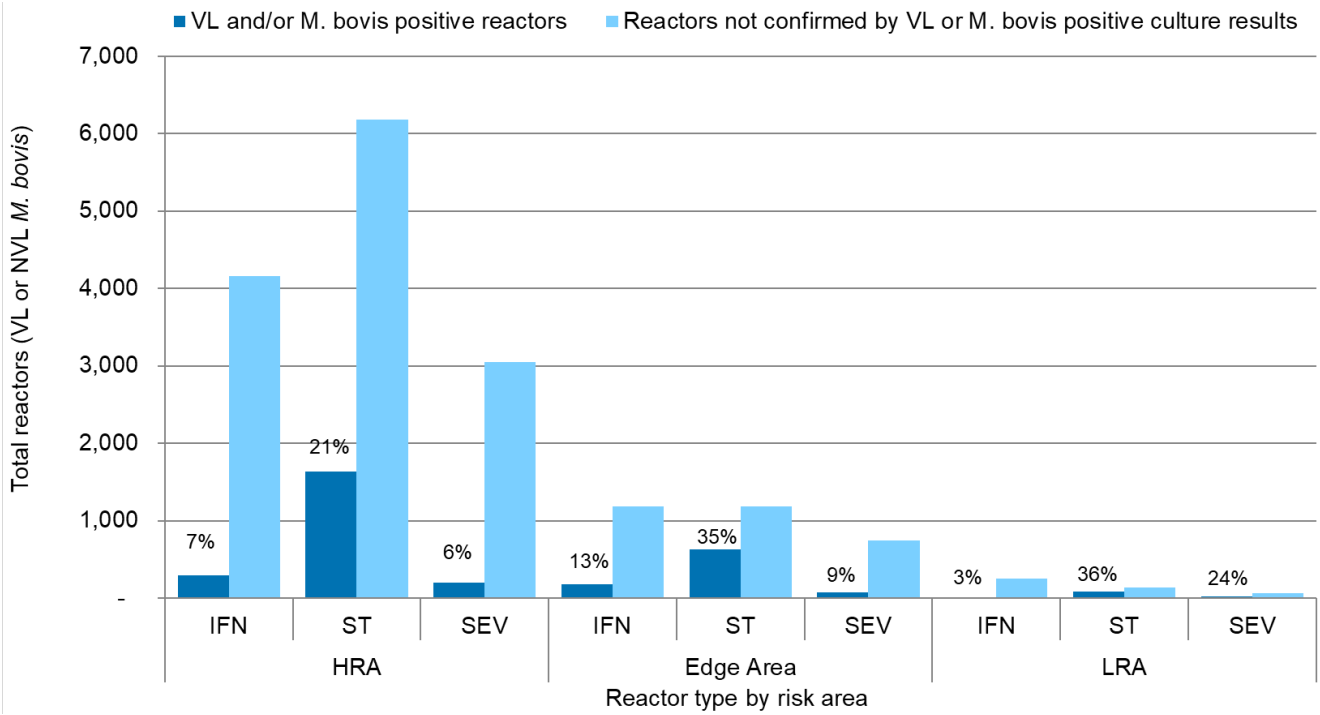

Figure 3.3.10 Number of test reactors (SICCT or IFN-γ) removed from herds in England in 2024 with post-mortem evidence of M. bovis infection (reactors with visible lesions and/or M. bovis-positive PCR or culture results), by reactor type (IFN-γ test positives, ST and SEV interpretation reactors to the skin test) and risk area. Dark blue bars labelled with the percentage of reactors that had visible lesions of TB (VL) and/or positive confirmatory test (PCR or culture) results. ST = standard interpretation SICCT test, SEV = severe interpretation SICCT test.

3.4 TB incidence rate

3.4.1 Temporal variation in incidence rate within risk areas

The annual incidence rate measures the number of new TB incidents detected over the 12-month reporting period of interest (2024) in herds at risk of TB infection, divided by their time at risk of infection (i.e. new cases per 100 herd-years at risk (HYR)). Herds contributed time at risk if they were at risk of a new TB incident, which must satisfy the following criteria: they were active in the reporting year, they were not under TB movement restrictions, and they received a TB test in the reporting year. All incidence rates in this report are reported as the number of new TB incidents per 100 HYR. Further information on the calculation of incidence rates can be found in the Explanatory supplement.

Overall, the incidence rate of TB in England rose non-significantly by 5% in 2024, from 7.3 in 2023 to 7.6 incidents per 100 HYR in 2024 (IRR=1.05, p<0.121). The level and trend in TB incidence rate varied between risk areas in England (Figure 3.4.1). There were 9 new incidents in AFUs in 2024, and 0 in LFUs, which

contributed to the incidence rate for England. Of these, 4 were in the HRA and 5 were in the Edge area.

The incidence rate in the HRA in 2024 was 13.6 incidents per 100 HYR. This represented a non-statistically significant increase of 3% compared to 2023 (13.2, IRR=1.03, p=0.340). This reversed the downward trend observed since 2017.

In the Edge Area overall (including the annual and 6-monthly testing regions), an increase was also observed, ending the fourth consecutive year decrease, to 7.3 TB incidents per 100 HYR in 2024, from 7.2 in 2023. This increase was not statistically significant (IRR=1.01, p=0.882). Prior to this an increasing trend had been observed between 2015 and 2020 (6.7 and 10.1 incidents per 100 HYR, respectively).

In the 6-monthly testing part of the Edge Area, a decreasing trend has been observed, following a peak of 16.6 incidents per 100 HYR in 2019 (12.8 in 2018), due to the introduction of 6-monthly testing in 2018. There was a non-significant decrease in 2024 compared to 2023 (9.7 versus 9.9 incidents per 100 HYR, respectively; IRR=0.99, p=0.865).

Within the 12-monthly testing part of the Edge Area the trend has been more variable over the last 10 years. The incidence rate increased from 3.7 incidents per 100 HYR in 2015 to 6.3 in 2020, then dropped to 4.6 in 2023. There was a non-significant increase in 2024 (5.1 incidents per 100 HYR) compared to 2023 (IRR=1.11, p=0.371).

The incidence rate in the LRA has remained stable over the last decade and in 2024 the rate was the same as in 2023 (both 1.0 incidents per 100HYR). There was a non-significant reduction in the OTF-W incidence rate in the LRA (0.30 in 2024 compared to 0.32 in 2023, IRR=0.94, p=0.783).

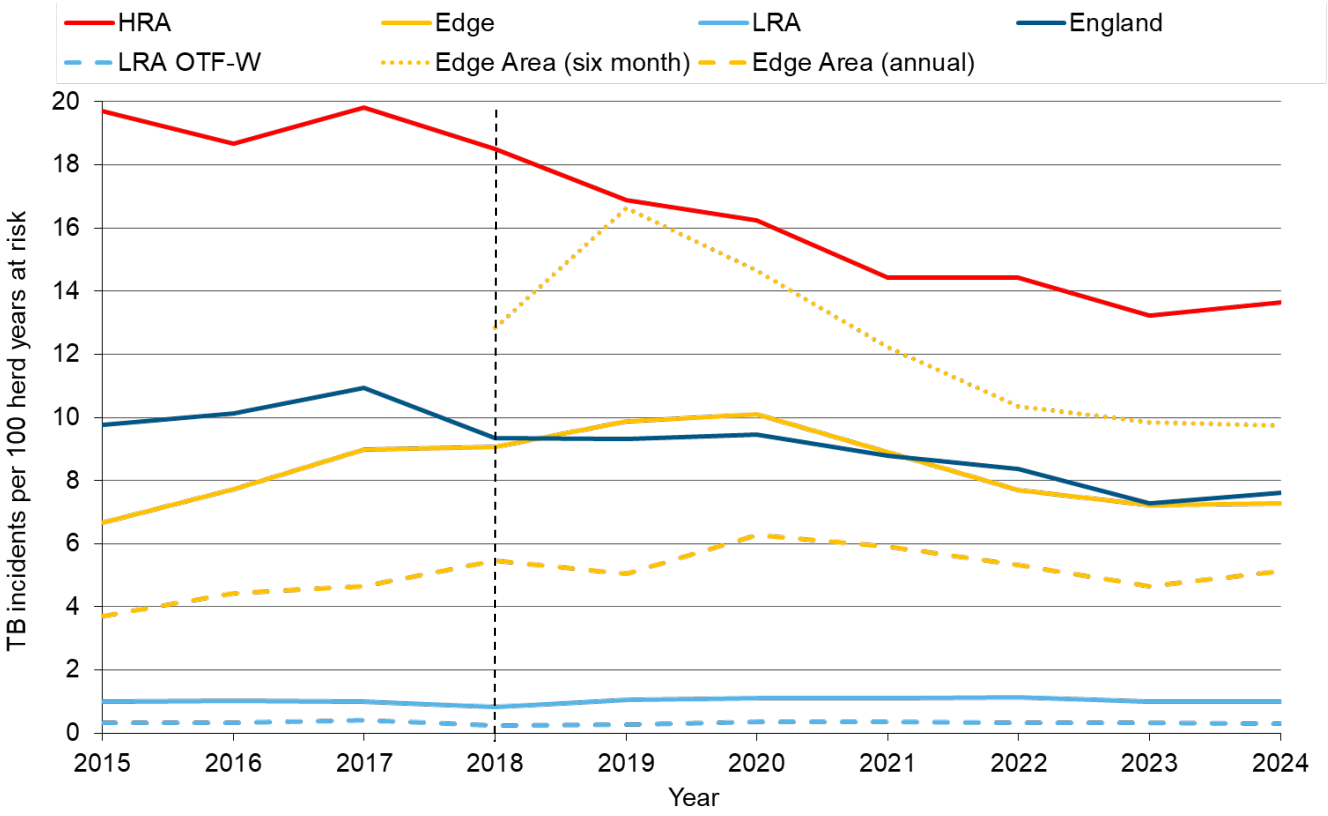

Figure 3.4.1 Annual incidence rate (per 100 herd years at risk) for England and by risk area, including OTF-W incidence rate for the LRA and separate 6-monthly and annual testing portions of the Edge area, between 2015 and 2024.

Figure 3.4.1 description: A line graph displaying the annual herd incidence rate for England and by risk area, from 2015 to 2024. Annual rates are presented separately for the 6-monthly and annual testing portions of the Edge Area (according to parish testing status in 2024) from 2018 onwards, and for total and OTF-W new incidents detected in the LRA. The vertical dashed line represents the year in which counties straddling the HRA and Edge Area were moved fully into Edge Area and subjected to 6-monthly routine testing.

3.4.2 Spatial variation in incidence rate within risk areas

The incidence rate of TB varied between and within risk areas, with some Edge Area counties having a higher incidence rate than counties in the HRA (Figure 3.4.2). The highest incidence rate in 2024 was observed in Gloucestershire (17.42 per 100 HYR) and Avon (17.28 per 100 HYR), both in the HRA. Both counties saw an increase in incidence rate compared to 2023 (16.89 and 15.13 in Gloucestershire and Avon, respectively). The lowest incidence rate (except for those counties with no incidents in 2024) was in Kent in the LRA (0.21 per 100 HYR).

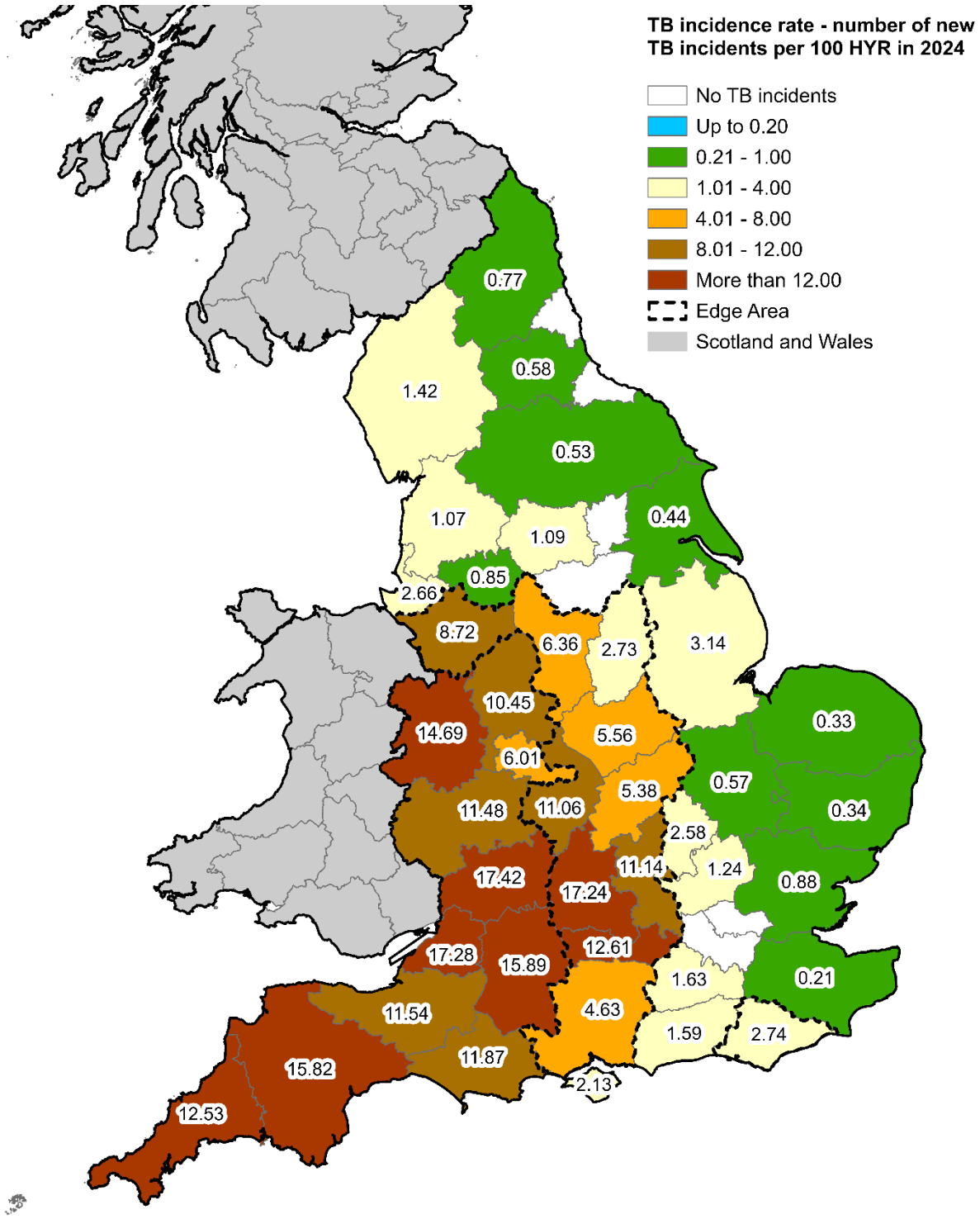

Figure 3.4.2 County herd incidence rate (all new TB incidents per 100 HYR) in England in 2024.

Figure 3.4.2 description: Map of England showing the incidence rate for each county, with the colour of the county based on the incidence rate within. There continues to be wide variation in incidence rates by county and risk area, ranging from 0.00 in areas such as Greater London, to 17.42 incidents per 100 HYR in Gloucestershire.

The highest cattle and herd densities in 2024, as in previous years, were primarily in the HRA and parts of the Edge Area (Figure 3.4.3a). The lowest densities were found in the eastern portion the LRA. Herd size and local density are closely associated with the risk of a particular herd becoming infected with TB. These factors make a strong contribution to the spatial pattern of the TB epidemic in England (Figures 3.4.3a and b), as demonstrated by the similar patterns of darker areas for both herd density and herd level incidence. However, cattle demographics alone do not explain the geographic distribution of TB, as there are high cattle and herd densities in parts of Northern England where TB incidence is low.

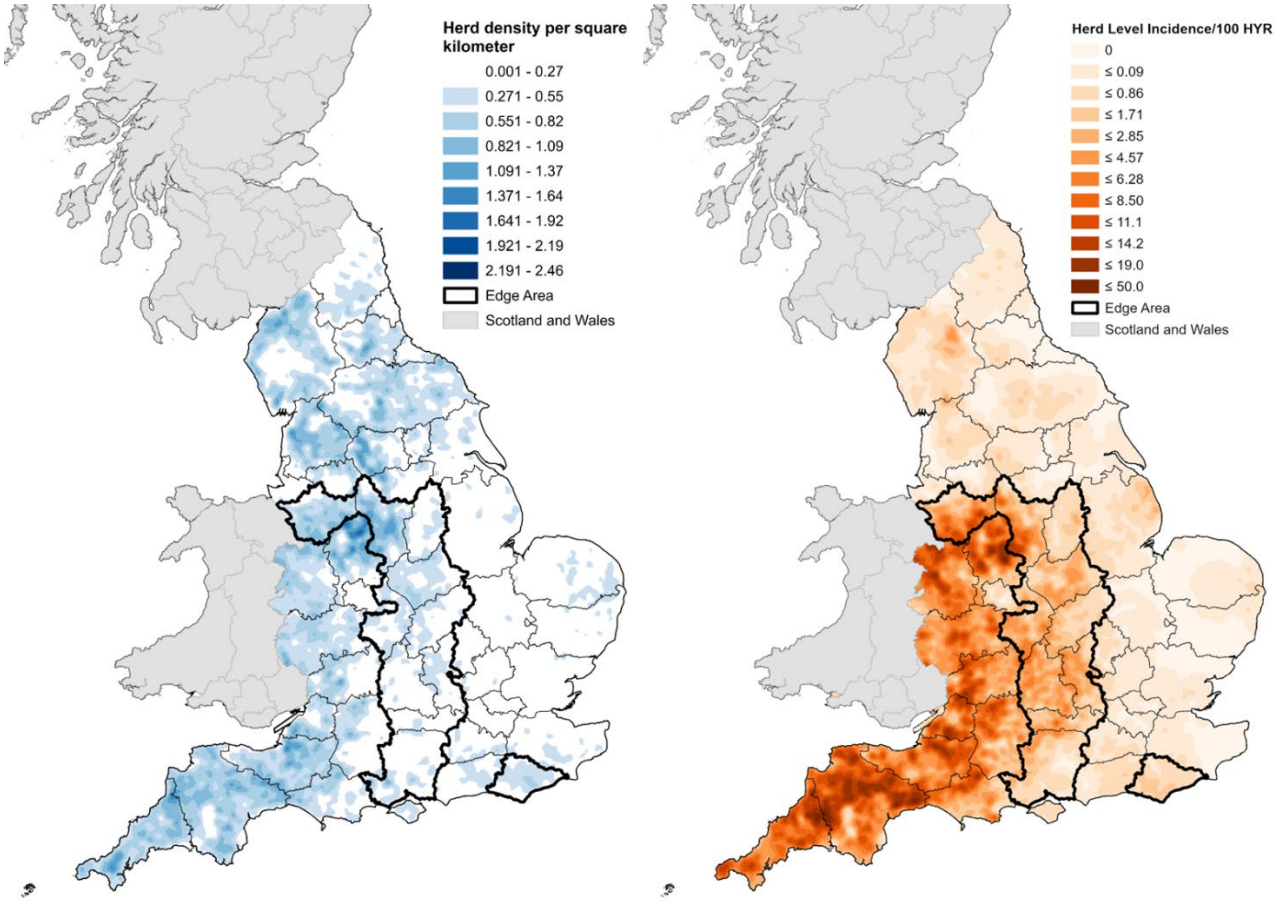

Figure 3.4.3 (a) Herd density and **(b)** herd-level incidence rate of TB in England in 2024.

Figure 3.4.3a and b description: Two maps of England, showing the herd density per square kilometre on the left, and a kernel density map of herd level incidence per 100 HYR on the right. Herd density is measured as the number of herds per square kilometre; herd incidence is the average incidence per 100 herd years at risk in the 100 closest herds to each herd location, which ‘smooths’ the effect of administrative boundaries.

The highest county-level incidence rates in the HRA in 2024 were observed in Gloucestershire (17.4), Avon (17.3) and Wiltshire (15.9), and the lowest in the West Midlands (6.0) and Staffordshire (10.5).

TB incidence rate decreased in 2024 compared to 2023 in Hereford and Worcester, Cornwall, and Wiltshire, however, none of these reductions were significant. The TB incidence rate fell for the third consecutive year in Hereford and Worcester (17.8 in 2021 versus 11.5 in 2024) and Cornwall (11.7 in 2021 versus 12.5 in 2024) (Figure 3.4.4).

By contrast, the TB incidence rate rose in 2024 compared to 2023 in 8 of the HRA counties, however none of these increases were statistically significant. Although the West Midlands saw a large increase in the incidence rate in 2024 (6.0) compared to 2023 (1.6), there were only 3 more incidents in 2024 than 2023 (4 TB incidents in 2024 versus 1 TB incident in 2023) in a county with a small number of herds resulting in few herd-years at risk.

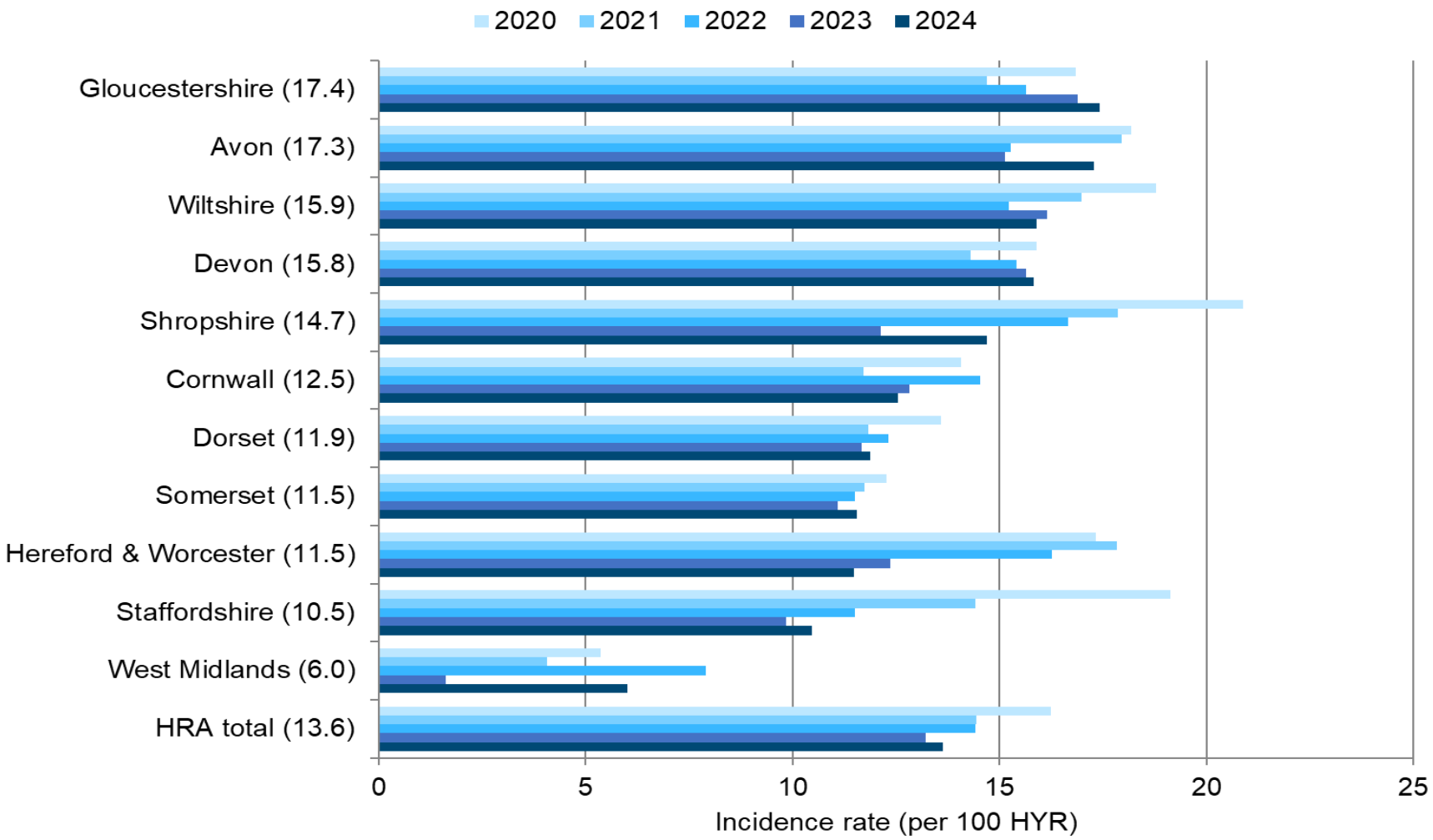

Figure 3.4.4 Annual herd incidence rate of TB (new TB incidents per 100 HYR) for the HRA overall and each HRA county, between 2020 and 2024. Counties are ranked by decreasing order of incidence rate in 2024 (given in parentheses next to county names).

In the Edge Area, the highest county-level incidence rates in 2024 were observed in Oxfordshire (17.2), Berkshire (12.6) and Buckinghamshire (11.1), and the lowest in Nottinghamshire (2.7), East Sussex (2.7) and Hampshire (4.6) (Figure 3.4.5). Of note, the incidence rate reported in Oxfordshire was the third highest in England in 2024, including the 11 counties of the HRA.

The TB incidence rate decreased in 2024 compared to 2023 in 5 out of the 11 Edge Area counties however, the decrease was only significant in East Sussex (6.1 in 2023 to 2.7 in 2024, IRR=0.45, p=0.019). Incidence rate fell for the fourth consecutive year in Warwickshire (14.8 in 2020 versus 11.1 in 2024) and Cheshire (14.8 in 2020 versus 8.7 in 2024).

By contrast, the TB incidence rate rose in 6 out of the 11 Edge Area counties in 2024 compared to 2023. The largest increases were observed Buckinghamshire (5.9 in 2023 versus 11.1 in 2024), in Berkshire (9.0 in 2023 versus 12.6 in 2024) and Northamptonshire (4.4 in 2023 versus 5.4 in 2024). The only statistically significant increase was in Buckinghamshire (IRR=1.90, p=0.018). The incidence rate in Hampshire almost doubled between 2019 (5.7) and 2020 (10.1), then fell to 3.3 in 2021 and has since increased for 4 consecutive years.

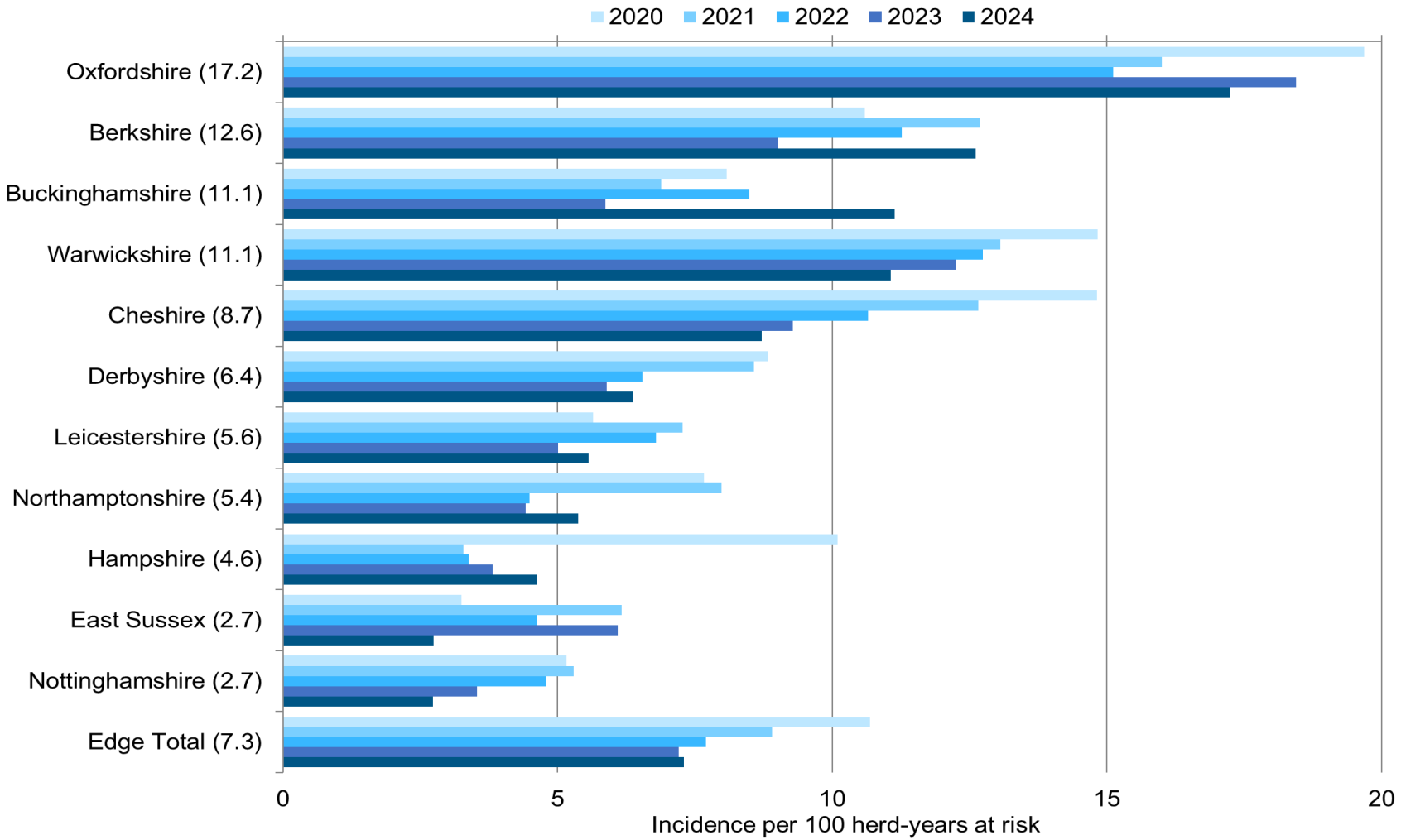

Figure 3.4.5 Annual herd incidence rate of TB (new TB incidents per 100 HYR) for the Edge Area overall and each Edge Area county, between 2020 and 2024. Counties are ranked by decreasing order of incidence rate in 2024 (given in parentheses next to county names).

In the LRA, the highest county-level incidence rates in 2024 were observed in Lincolnshire (3.1) and Cumbria (1.4) and the lowest in Yorkshire and Humberside and the North East region of the LRA (both 0.6 incidents per 100 HYR; Figure 3.4.6).

The TB incidence rate decreased in 2024 compared to 2023 in the South East region of the LRA (0.9 in 2023 versus 0.8 in 2024), however this was not statistically significant. The incidence rate remained stable in Yorkshire and Humberside (0.6 in both 2023 and 2024).

By contrast, the TB incidence rate increased in 2024 compared to 2023 in 4 of the LRA counties and sub-regions. Increases were statistically significant in Cumbria (0.5 in 2023 versus 1.4 in 2024, IRR=2.95, $p<0.005$) and the North East region (0.1 in 2023 versus 0.6 incidents per 100HYR in 2024, IRR=4.92, $p=0.012$). It is worth noting that there were low numbers of TB incidents in the North East region (3 in 2023 vs 9 in 2024).

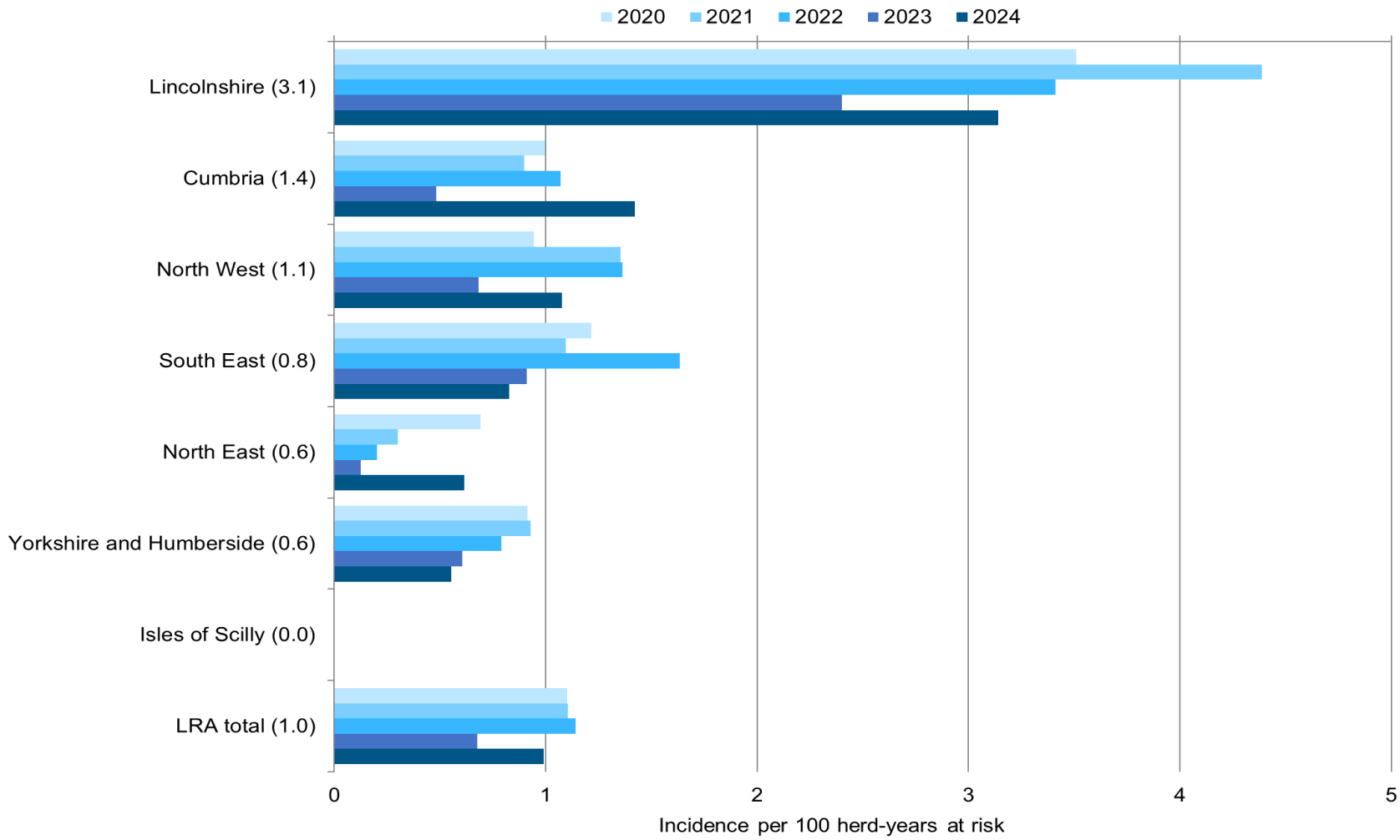

Figure 3.4.6 Annual herd incidence rate of TB (new TB incidents per 100 HYR) for the LRA overall and each LRA county and sub-region, between 2020 and 2024. Counties and sub-regions are ranked by decreasing order of incidence rate in 2024 (given in parentheses).

3.5 Prevalence

During 2024, an average of 4.1% of herds (approximately 1,817 herds) were under movement restrictions each month due to a TB incident at any one time in England (prevalence) (Figure 3.5.1). This was similar to 2023 (4.1%, 1,886 herds). However, this overall figure masks substantial differences between risk areas and seasonal herd prevalence cycles, which are likely related to the time of year when most TB surveillance testing is undertaken in OTF herds in GB (i.e. October to April).

Average monthly herd prevalence in the HRA was similar in 2024 (7.7%) as in 2023 (8.0%), the lowest level seen in the last 10 years and continued the decreasing trend that started in 2018.

In the Edge Area overall, average monthly herd prevalence rose steadily from 2015 (3.2%) and peaked at 5.9% between 2018 and 2019. Since then, it has fluctuated but showed an overall decrease, plateauing at around 4.0% between 2022 and 2024. The 6-monthly testing part of the Edge Area followed a similar trend to the Edge Area overall, decreasing from a peak of 8.9% (2019) to between 5.5% and 6.0% since 2022. Conversely, in the annual testing part of the Edge Area, average monthly herd prevalence has remained more stable, increasing slightly from 1.5% in 2015 to 3.6% in 2021. Since then, it has plateaued at around 3.0% between 2022 and 2024.

In the LRA, average monthly prevalence has remained consistently low (not exceeding 0.5%) for the past 10 years.

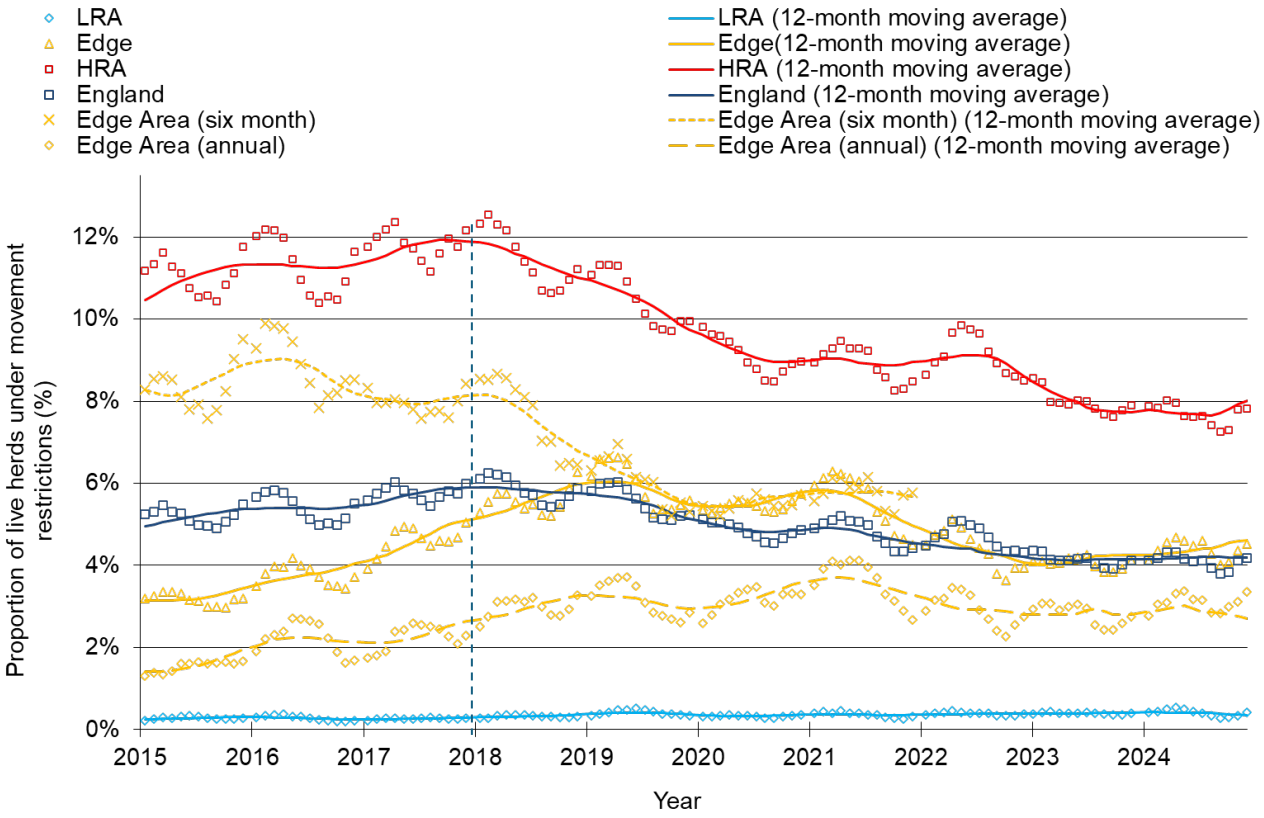

Figure 3.5.1 Monthly percentage of active cattle herds in England under TB movement restrictions as a result of any TB incident (herd prevalence), by month and risk area, between January 2015 and December 2024.

Figure 3.5.1 description: Line chart displaying the 12-month moving average of herd prevalence (lines) and the monthly herd prevalence (dots) from 2015 to 2024 for the HRA, Edge Area (overall), 6-monthly and annual testing sections of Edge Area, LRA, and England overall. The 6-monthly and annual testing portions of the Edge Area (according to parish testing status in 2024) from 2018 onwards. The vertical dashed line represents the year in which counties straddling the HRA and Edge Area were moved fully into Edge Area, and the affected herds were placed on 6-monthly routine testing by default. Monthly herd prevalence was calculated by dividing the number of active herds under restriction due to a TB incident at the mid-point of each month, by the number of active cattle herds on the same day. The 12-month moving average is the average of the values for the current month and the previous 11 months.

End-of-year herd prevalence is the proportion of herds under movement restrictions on 31 December 2024 due to an ongoing TB incident. In 2024, the end of year prevalence in England was 4.1%, the same as in 2023. In the HRA overall, the end of year TB prevalence in 2024 was 7.7%, a non-significant decrease compared to 2023 (7.9%, p=0.476) and represents the seventh consecutive year of decline (Figure 3.5.2). There were 143 ongoing incidents in AFUs, and 10 ongoing incidents in LFUs in 2024 which contributed to the prevalence estimate.

At the county level, Avon had the highest end of year prevalence of all HRA counties in 2024 (11.0%), whereas the lowest prevalence was seen in the West Midlands (4.0%) (Figure 3.5.2). In line with the overall trend in the HRA, the end of year prevalence decreased from 2023 to 2024 in 7 HRA counties. However, none of these year-on-year reductions were statistically significant.

For most counties the end of year prevalence has fluctuated since 2020, however, Staffordshire saw end of year prevalence decrease for the fourth consecutive year (8.9% in 2020 versus 5.3% in 2024) and for the third consecutive year in Hereford and Worcester (10.4% in 2021 versus 6.7% in 2024). These changes in Staffordshire and Hereford and Worcester were statistically significant ($p<0.001$).

Non-significant increases in end of year prevalence relative to 2023 were seen in Avon (9.2% in 2023 versus 11.0% in 2024), Shropshire (7.8% in 2023 versus to 8.6% in 2024), Somerset (5.6% in 2023 versus 6.4% in 2024) and the West Midlands (1.3% in 2023 versus 4.0% in 2024).

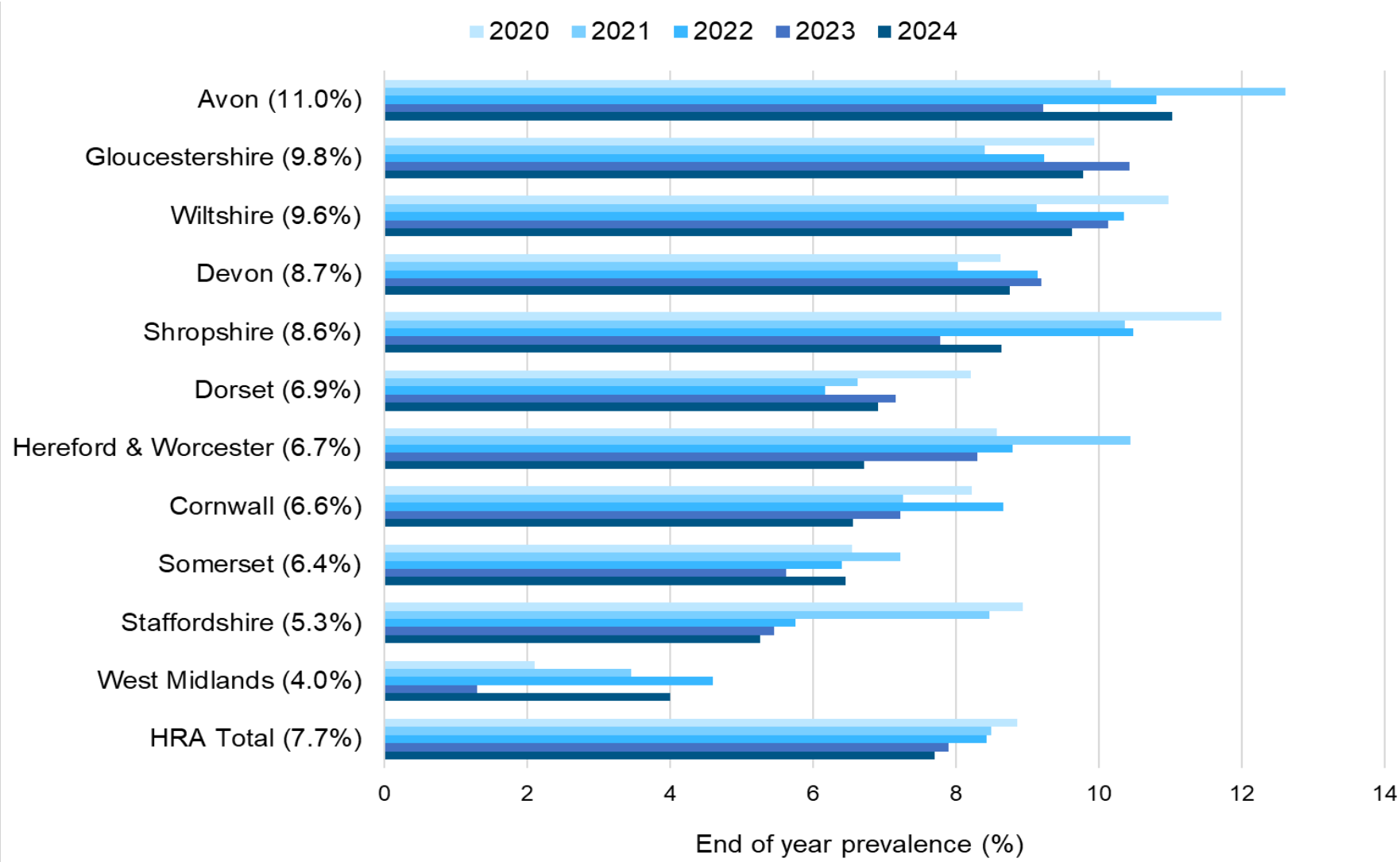

Figure 3.5.2 End of year herd TB prevalence for the HRA overall and for each HRA county, between 2020 and 2024. Counties are ranked by decreasing order of prevalence in 2024 (given in parentheses next to county names)

In the Edge Area, the end of year TB prevalence in 2024 was 4.5%, a non-significant increase compared to 2023 (4.2%, p=0.354) and represents the second consecutive year of increase following a decline between 2020 (5.7%) and 2022 (4.0%) (Figure 3.5.3).

At the county level, Oxfordshire had the highest end of year herd prevalence of all Edge Area counties in 2024 (10.5%), and the second highest in England, whereas the lowest prevalence was seen in East Sussex (2.1%) (Figure 3.5.3). End of year prevalence decreased from 2023 to 2024 in only 3 Edge Area counties, Oxfordshire (11.5% in 2023 versus 10.5% in 2024), Cheshire (5.3% in 2023 versus 4.9% in 2024) and East Sussex (3.9% in 2023 versus 2.1% in 2024). However, the decrease was only statistically significant in Oxfordshire (p<0.001).

End of year prevalence, relative to 2023, increased in 8 of the Edge Area counties. Most of these county level year-on-year increases were not statistically significant, but there was a significant rise in Buckinghamshire (4.0% in 2023 versus 8.1% in 2024, p=0.012). Prior to increases in 2024, a decline in end of year prevalence had been observed in Derbyshire (6.0% in 2020 versus 2.9% in 2023) and Northamptonshire (4.7% in 2020 versus 2.5% in 2023) since 2020. However, the increases in 2024 were small (2.9 in 2023 versus 3.0% in 2024 for Derbyshire and 2.5% in 2023 versus 2.9% in 2024 for Northamptonshire).

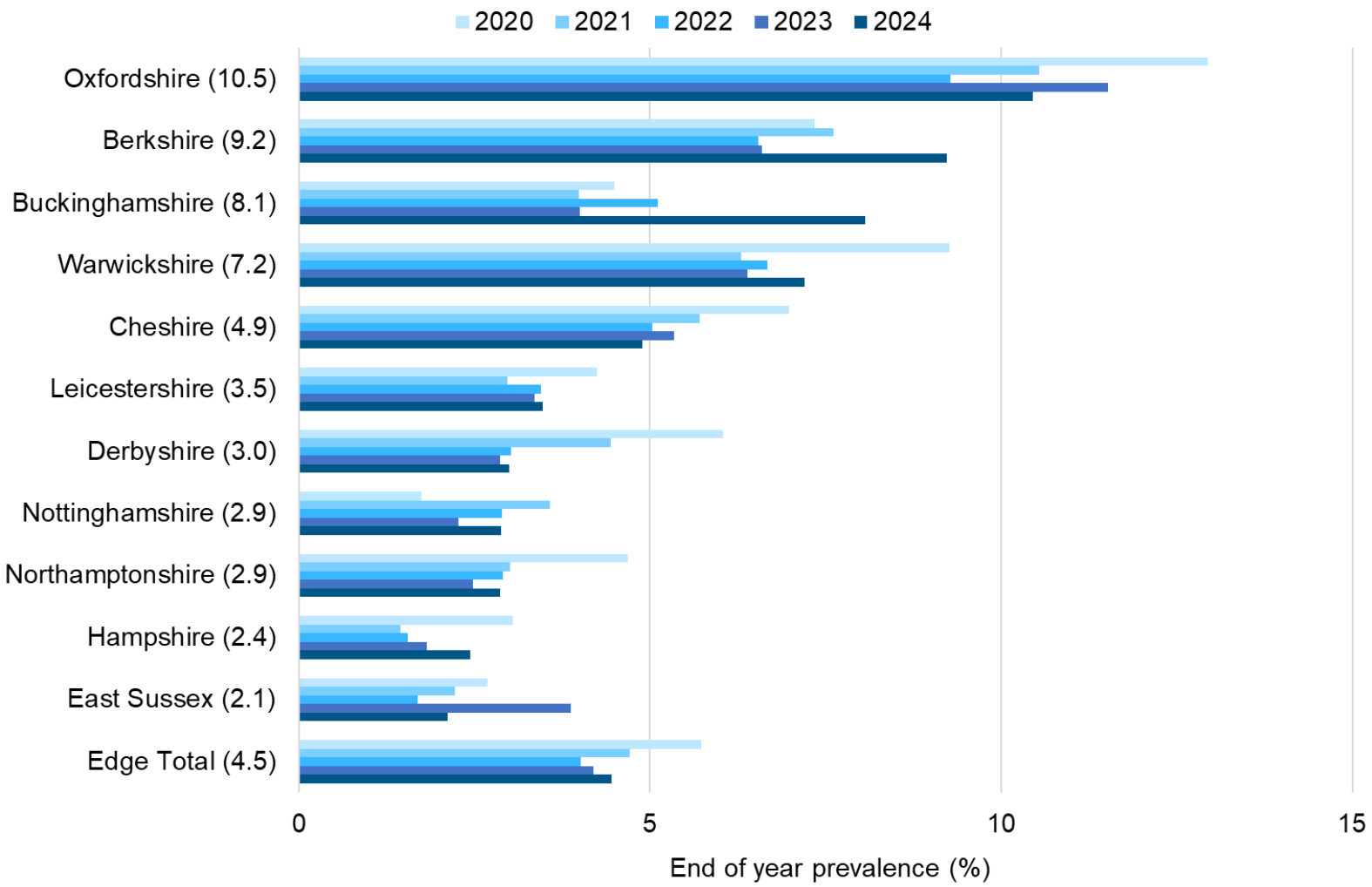

Figure 3.5.3 End of year herd TB prevalence for the Edge Area overall and for each Edge Area county, between 2020 and 2024. Counties are ranked by decreasing order of prevalence in 2024 (given in parentheses next to county names).

In the LRA, the end of year herd TB prevalence in 2024 remained low at 0.4%, similar to 2023 and 2022 (Figure 3.5.4).

At the county and sub-region level, Lincolnshire had the highest end of year prevalence in the LRA in 2024 (2.2%), whereas the lowest prevalence was seen in the Isles of Scilly (0.0%) and the North East (0.1%) (Figure 3.5.4). The end of year prevalence declined from 2023 to 2024 in 2 LRA counties and sub-regions, the South East (0.6% in 2023 versus 0.4% in 2024) and Yorkshire and Humberside (0.4% in 2023 versus 0.2% in 2024). However, neither decrease was statistically significant ($p>0.05$).

The end of year prevalence, relative to 2023, increased in 3 of the LRA counties and sub-regions. Most of these county level rises were non-significant, but there was a significant increase in Lincolnshire (1.3% in 2023 versus 2.2% in 2024, $p <0.0001$), mainly within the 2 active hotspots (more information on hotspots can be found in the LRA reports). Prior to this increase, end of year prevalence had been declining since 2020 (1.8%).

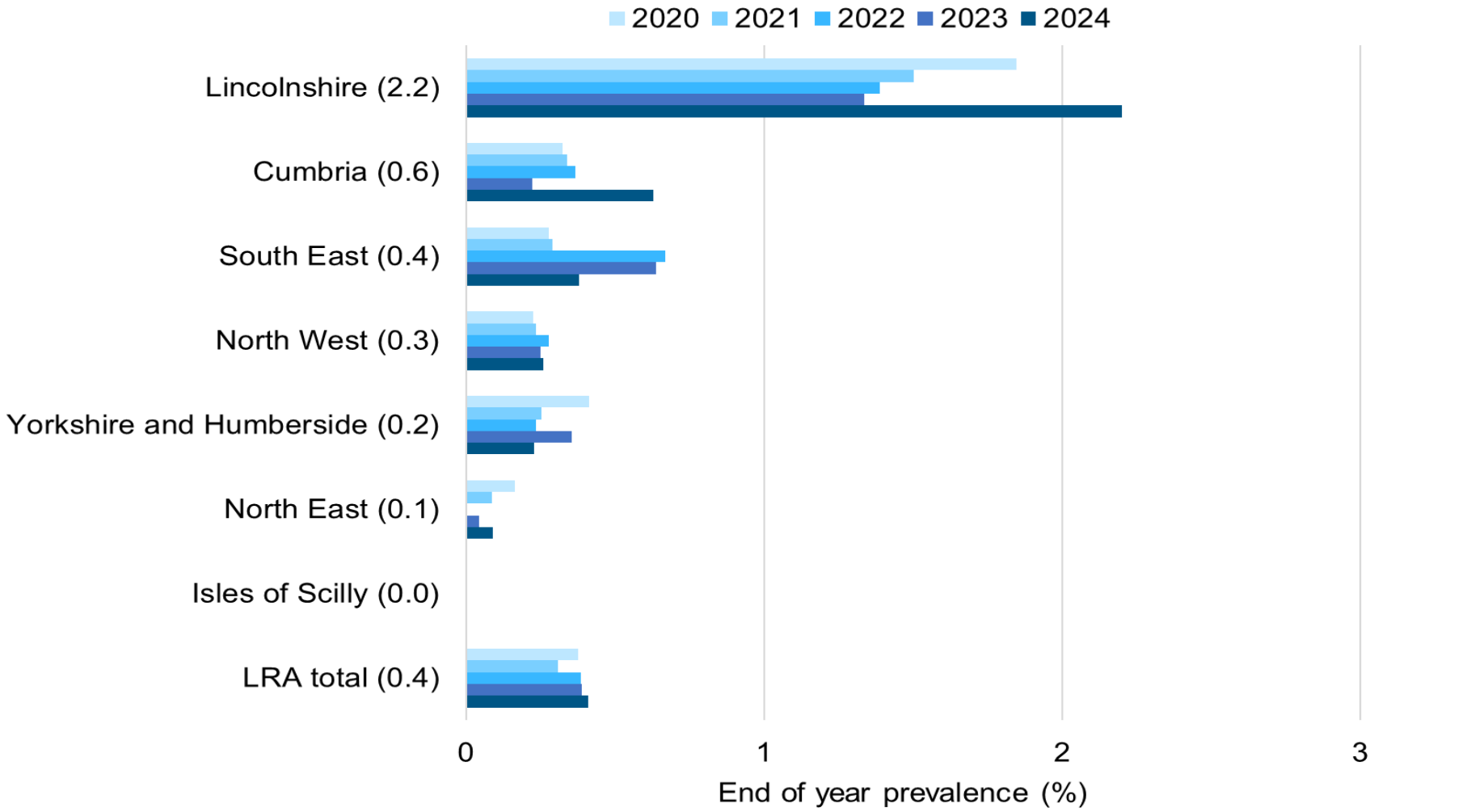

Figure 3.5.4 End of year herd TB prevalence for the LRA overall and for each LRA county or sub-region, between 2020 and 2024. Counties and sub-regions are ranked by decreasing order of prevalence in 2024 (given in parentheses next to county and sub-region names).

3.6 Duration of TB herd incidents

The number of TB incidents in England that closed in 2024 was 2,482. Of these, 1,924 were in the HRA, 438 were in the Edge Area and 120 in the LRA. In 2024, 9 incidents in AFUs and 1 incident in an LFU were closed in 2024. These have been excluded from Section 3.6.

In England, the median duration of TB incidents that ended in 2024 was 187 days, a reduction compared to 2023 (197 days). The median duration in the HRA was higher than for England overall at 190 days (203 days in 2023). In the Edge Area, median duration was very similar to that for England and was comparable to 2023 (188 days in 2023 versus 186 days in 2024). The LRA saw a small increase in the median duration in 2024 (155 days) compared to 2023 (149 days).

Since 2015, TB incident herds with more than one reactor have consistently been under movement restrictions for longer than those with only one reactor, across all risk areas (Figure 3.6.1).

Additionally, as in previous years, the median duration of TB incidents in 2024 with more than one reactor in the HRA (232 days) was higher than in the Edge Area (222 days) and LRA (196 days) (K-sample equality of medians test, $p=0.195$ and $p<0.001$, respectively). However, the median duration of TB incidents with more than one reactor in the HRA in 2024 was lower than in 2023 (250 days) and the shortest median duration observed in the HRA since 2008 (224 days).

The median duration of TB incidents with 0-1 reactors was the same in the HRA and Edge Area in 2024 (both 167 days). The duration of TB incidents in both areas has been generally similar since 2014, increasing steadily each year, except for a spike during 2022 in the HRA (223 days). This peak may be related to resource constraints and delays in closing incidents due to the large avian influenza outbreak in GB in 2022.

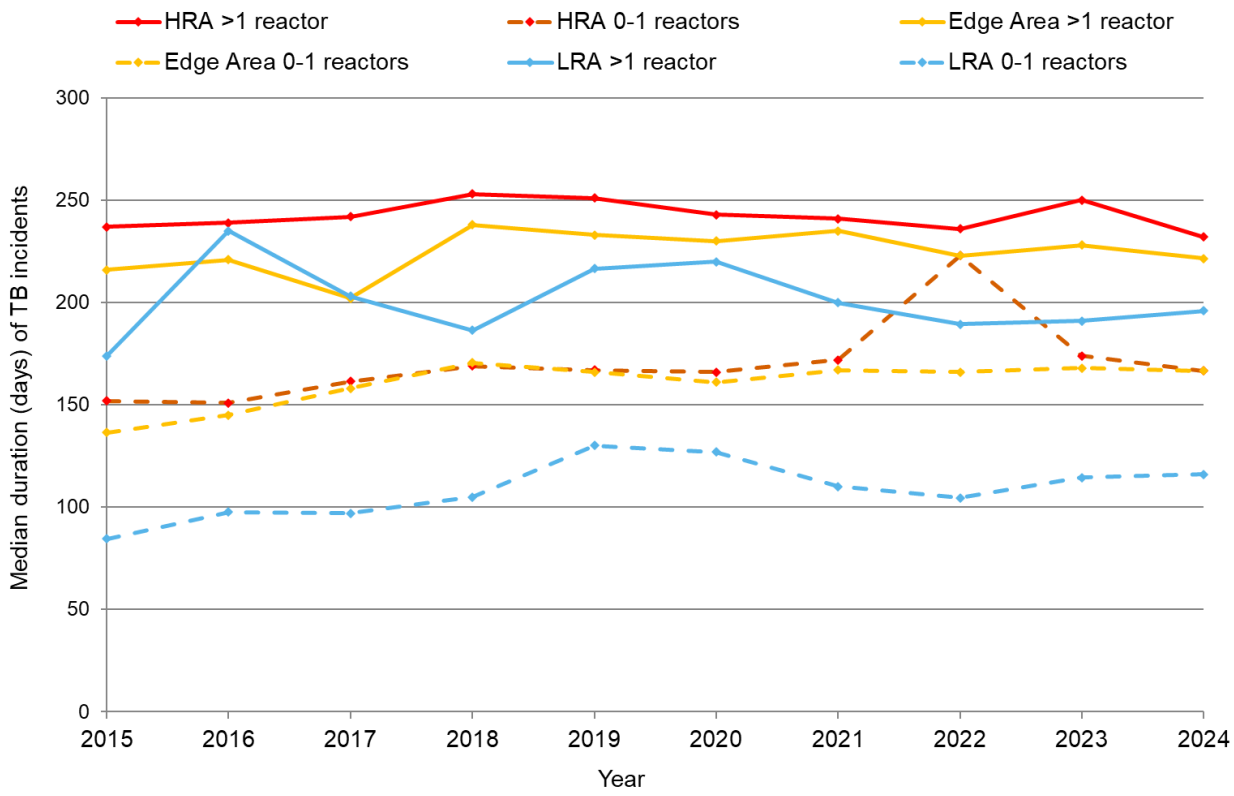

Figure 3.6.1 Median duration of TB incidents that ended in each year, between 2015 and 2024. Note: TB incidents with no reactors were TB incidents initiated by a slaughterhouse case, or by 2 or more IRs per TB incident, where subsequent testing of the affected herd revealed no reactors.

In the HRA, the median incident duration has fluctuated since 2020. In 2024, it fell overall by 3% compared to 2023 (204 days in 2023 versus 192 days in 2024, $p<0.05$) (Figure 3.6.2). At a county level, median incident duration was broadly the same except for the West Midlands. However, this was due to only one persistent TB incident (lasting >550 days) that ended in 2024.

Most counties (7 out of 11) saw overall decreases in median duration between 2020 and 2024. The largest decreases observed were in Avon (17%), Gloucestershire (10%), and Wiltshire (9%), all of which of borderline statistical significance (K-sample equality of medians test, $p=0.053$, $p=0.046$ and $p=0.420$, respectively).

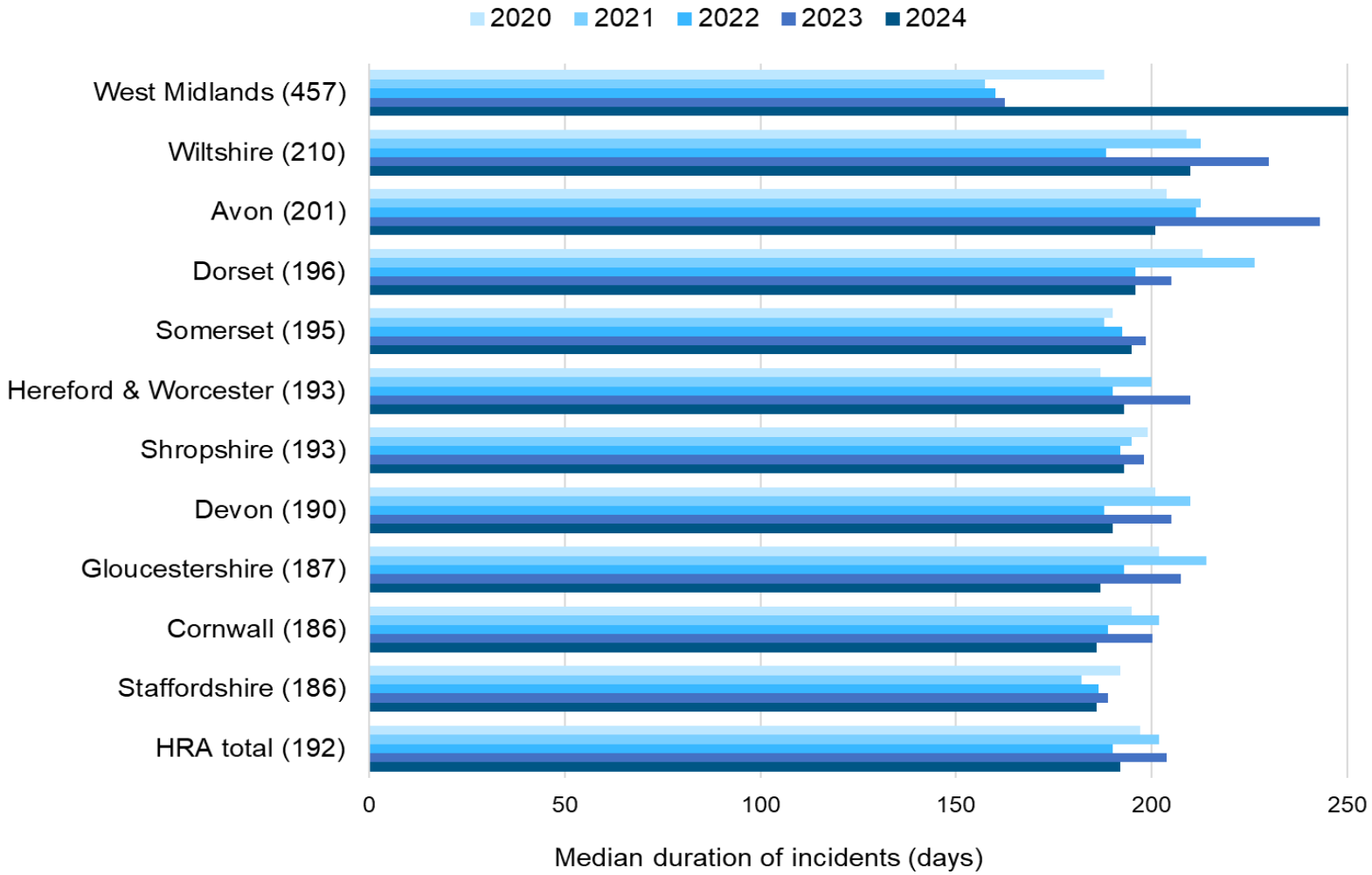

Figure 3.6.2 Median duration (in days) of all TB incidents (excluding AFUs and LFUs) that ended in each year between 2020 and 2024, by HRA county. Counties are ranked by median duration in 2024 (shown in parentheses next to county names). Note: The high median duration in the West Midlands in 2024 (456.5 days) is truncated at 250 days and was due to only one persistent (>550 days) TB incident in that year.

In the Edge Area, the median incident duration has fluctuated since 2020. In 2024, it fell overall by 1% compared to 2023 (188 days in 2023 versus 186 days in 2024, p=0.521) (Figure 3.6.3). Most counties (6 out of 11) saw overall decreases in median duration between 2020 and 2024.

The county experiencing the highest increase was Nottinghamshire, where median duration increased by 18% (217 days in 2023 versus 255 days in 2024). Median duration in Nottinghamshire in 2024 was higher than 10 of the 11 HRA counties. The largest decreases observed in 2024 compared to 2023 were in Buckinghamshire (24%), Northamptonshire (16%) and Oxfordshire (both 8%) (K-sample equality of medians test, p=0.661, p=0.217 and p=0.790, respectively).

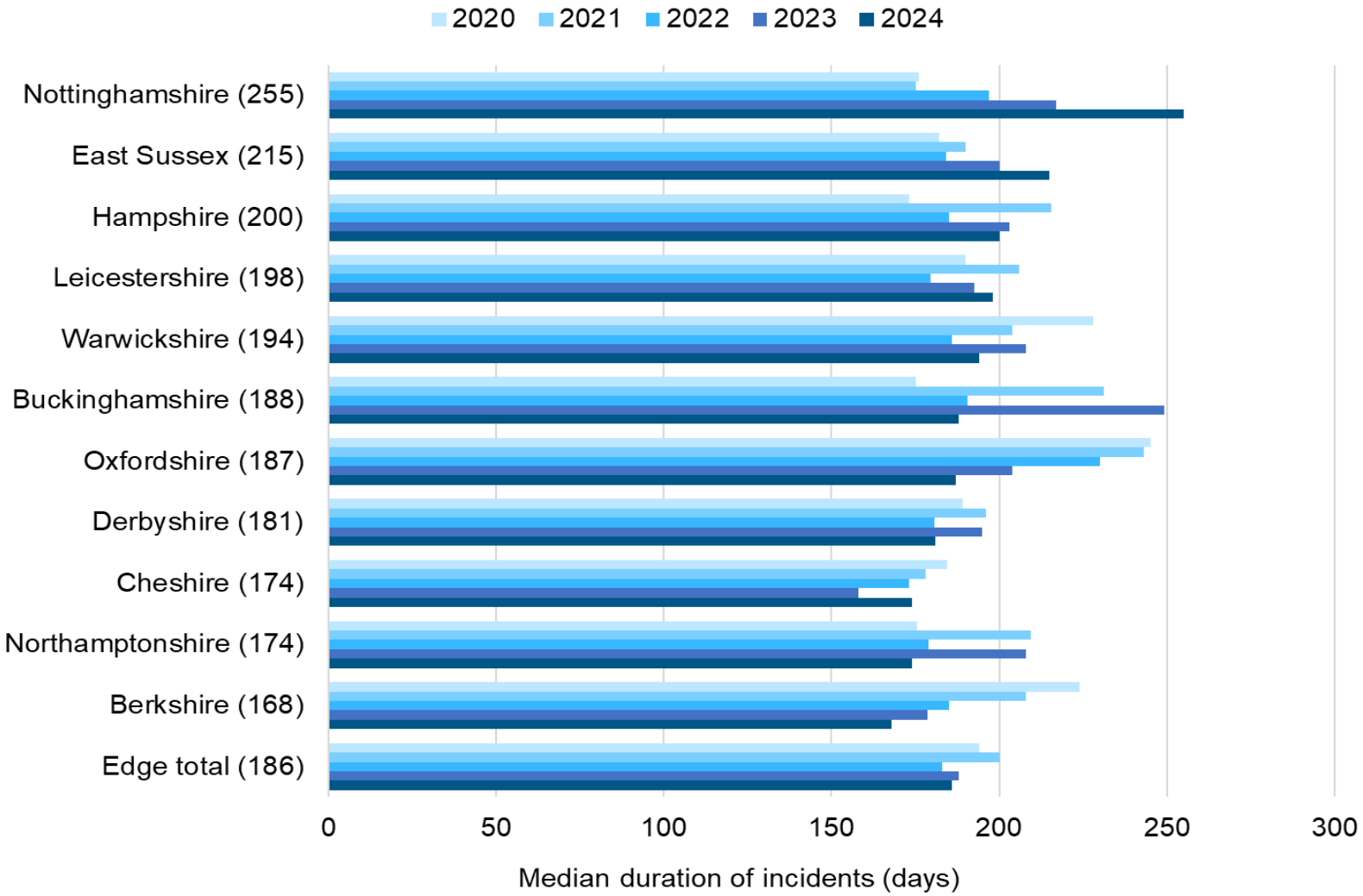

Figure 3.6.3 Median duration (in days) of all TB incidents (excluding AFUs and LFUs) that ended in each year between 2020 and 2024, by Edge Area county. Counties are ranked by median duration in 2024 (shown in parentheses next to county names).

In the LRA, the median incident duration has fluctuated since 2020. In 2024, it rose overall by 4% compared to 2023 (149 days in 2023 versus 155 days in 2024, p=0.466) (Figure 3.6.4).

Most counties and sub-regions (4 out of 7) saw overall decreases in median duration between 2020 and 2024. Whereas only 3 areas observed decreases in duration in 2024 compared to 2023. The largest decreases in 2024 compared to 2023 were seen in Lincolnshire and the North West (both 23%) (K-sample equality of medians test, p=0.537 and p=0.215, respectively).

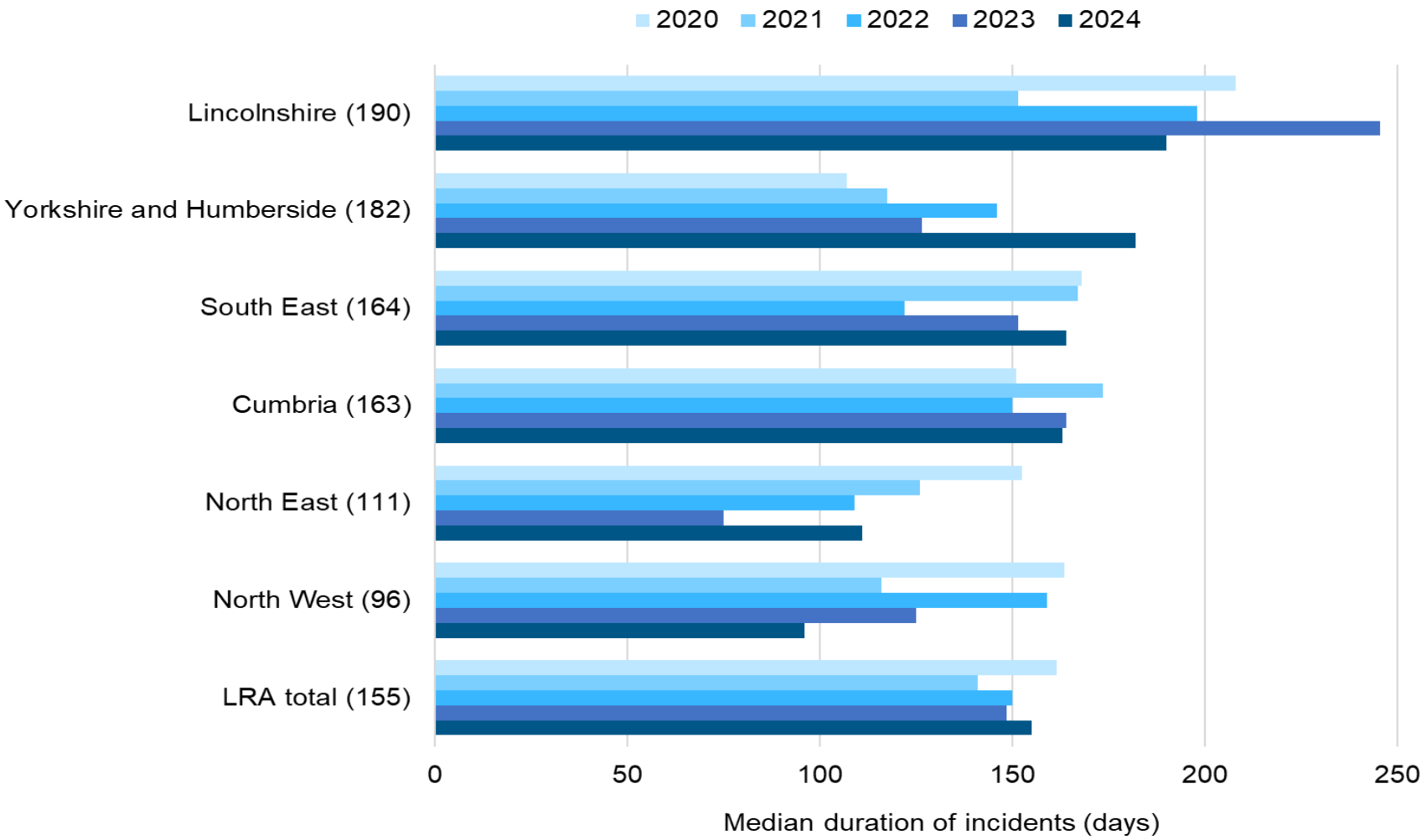

Figure 3.6.4 Median duration (in days) of all TB incidents (excluding AFUs and LFUs) that ended in each year between 2020 and 2024, by LRA county and sub-regions. Counties and sub-regions are ranked by median duration in 2024 (shown in parentheses next to county and sub-region names).

3.7 Persistence

TB incidents lasting more than 550 days (about 18 months) are classified by APHA as ‘persistent’ for management and reporting purposes. The affected herds are then eligible for enhanced management procedures, based on a series of prioritisation criteria. Ongoing incidents in AFUs and LFUs have been excluded in Section 3.7.

The number of persistent incidents still open at the end of 2024 in England (110) was similar to 2023 (108, 2% increase). This represented 7% of all the TB incidents ongoing in England at the end of the year (n=1,665) compared to 7% of (n=1,668) open incidents at the end of 2023. In England, the number of persistent TB incidents decreased by 29% compared to 5 years before (n=155) and halved compared to 2015 (n=220).

The trend in the HRA is similar to England, with the number of persistent TB incidents increasing by 18% between 2015 (205) and 2018 (242) and subsequently falling by 64% between 2018 and 2024 (87). In 2024, there were 6 fewer persistent TB incidents in the HRA compared to 2023 (Figure 3.7.1).

There has been more fluctuation in the number of persistent TB incidents in the Edge Area over the last 10 years. The number of persistent TB incidents peaked at 29 in 2019. In 2024, there were 4 more persistent TB incidents in the Edge Area (17) compared to 2023 (13) (Figure 3.7.2).

The LRA had no persistent TB incidents between 2015 and 2018. They have since increased from one in 2019 to 6 persistent incidents remaining unresolved in the LRA at the end of 2024 (Figure 3.7.3). These ongoing persistent incidents were located in Bedfordshire, Cambridgeshire, Cumbria, Lincolnshire, Suffolk and Surrey (all had one persistent incident).

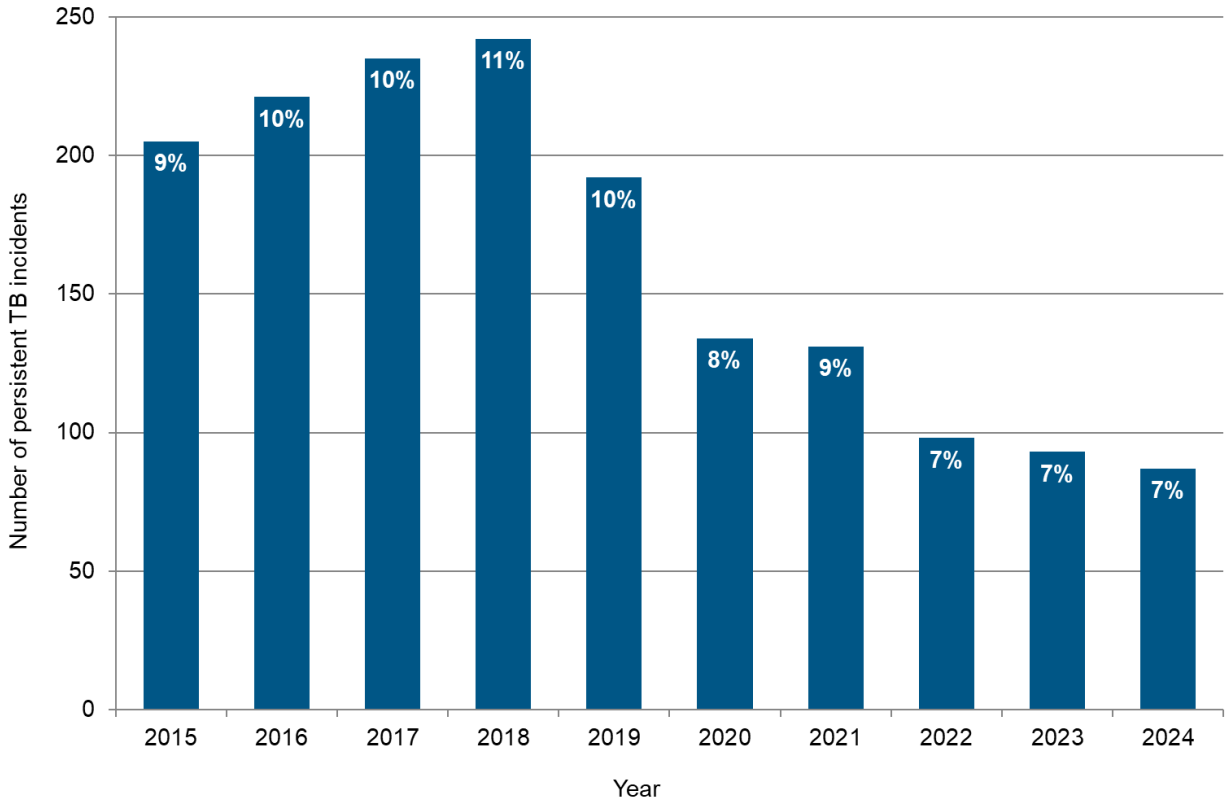

Figure 3.7.1 Number of TB incidents that had lasted more than 550 days (persistent) and were still open at the end of each year in the HRA. The percentage of ongoing incidents open at the end of each reporting year which were classed as persistent are given at the top of each column.

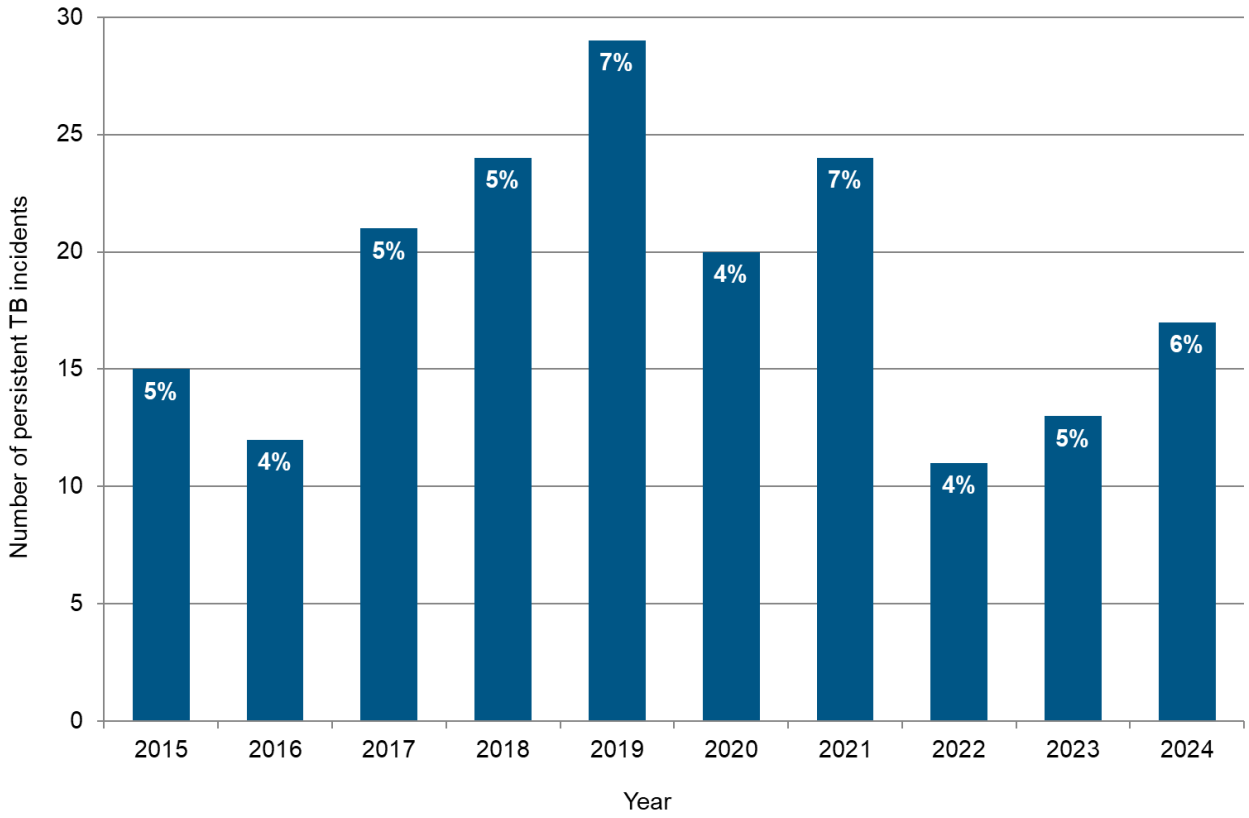

Figure 3.7.2 Number of TB incidents that had lasted more than 550 days (persistent) and were still open at the end of each year in the Edge Area. The percentage of ongoing incidents open at the end of each reporting year which were classed as persistent are given at the top of each column.

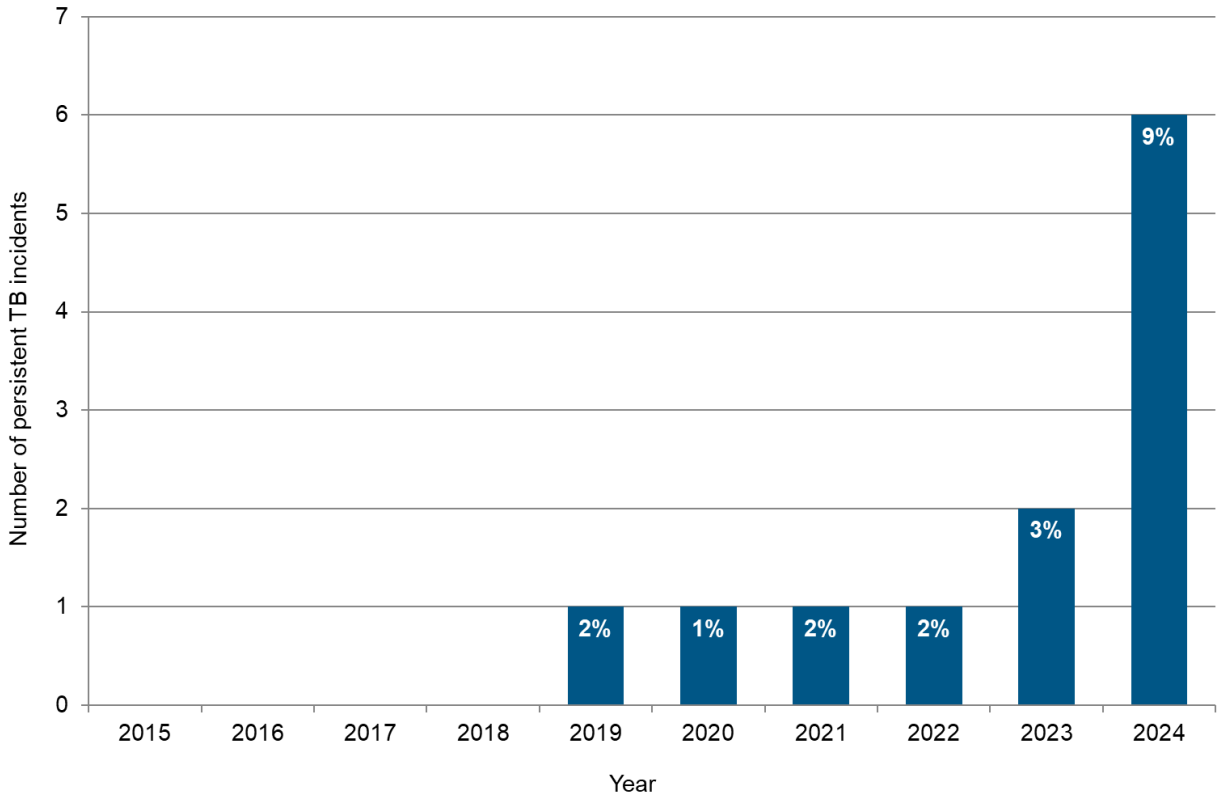

Figure 3.7.3 Number of TB incidents that had lasted more than 550 days (persistent) and were still open at the end of each year in the LRA. The percentage of ongoing incidents open at the end of each reporting year which were classed as persistent are given at the top of each column.

In the HRA overall, 87 (6.7%) of the 1,291 TB incidents ongoing at the end of 2024 were classed as persistent. This was a small decrease compared to 2023 (7.1%). In general, there has been a declining trend in the percentage of persistent incidents in the HRA since 2019, when the percentage exceeded 10% (Figure 3.7.4).

The HRA counties with the highest percentage of persistent TB incidents still open at the end of 2024 were Wiltshire (10.5%), Dorset (9.6%) and Avon (8.5%). Avon had the second highest percentage of persistent TB incidents in 2023 (13.8%). The counties with the lowest percentage of persistent incidents in 2024 were the West Midlands (0%), Somerset (3.9%), and Staffordshire (4.3%).

The percentage of persistent TB incidents decreased in Wiltshire, Avon, Shropshire, Staffordshire and the West Midlands compared to 2023. The percentage of persistent TB incidents has declined for the third consecutive year in Staffordshire. In the West Midlands, apart from 2023 where there was a single incident which remained open at the end of 2023 and was persistent, the percentage of persistent TB incidents has been 0% since 2020.

Somerset saw a small increase in the percentage of persistent TB incidents (3.6% in 2023 versus 3.9% in 2024). Greater increases were seen in Dorset and Cornwall,

which experienced a 3.0% and 2.2% rise in the percentage of persistent TB incidents in 2024 compared to 2023, respectively.

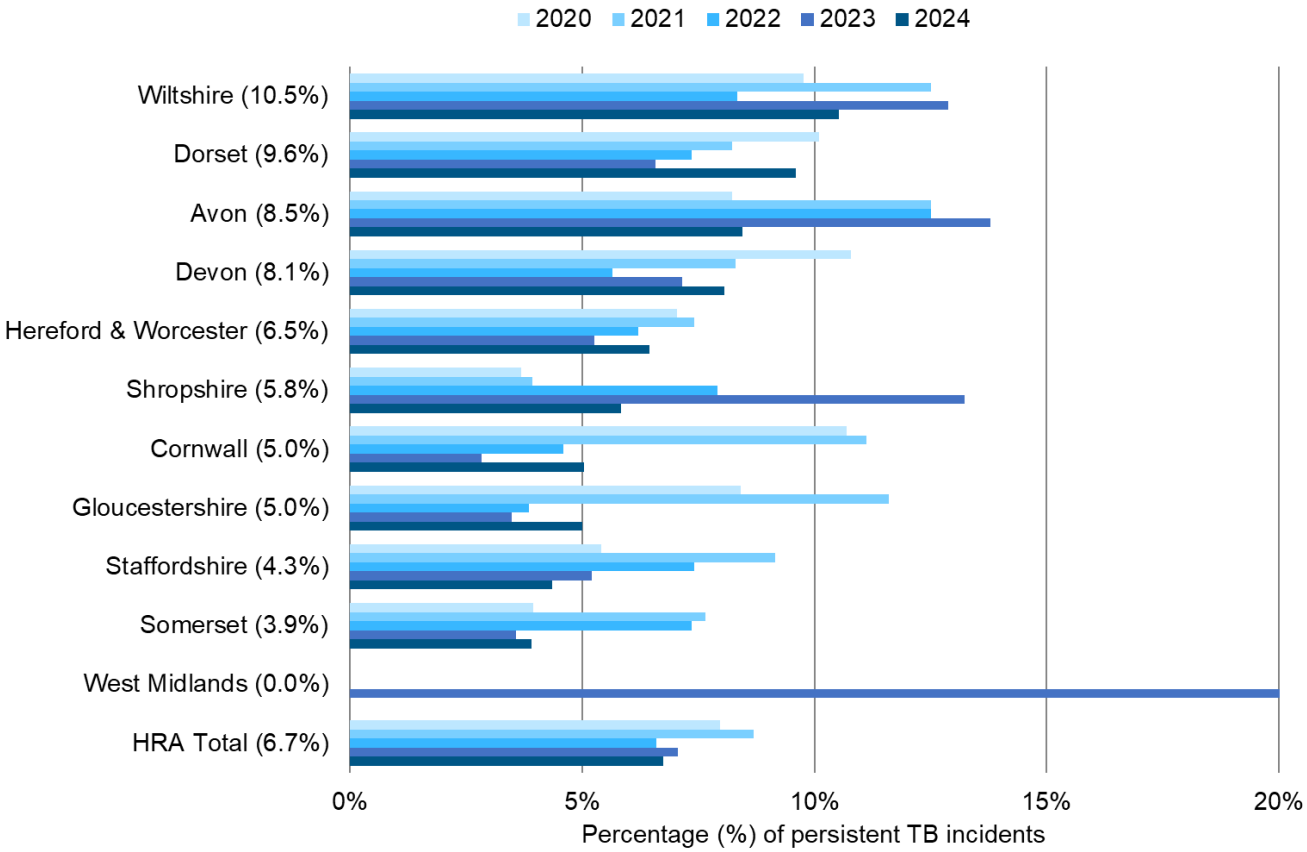

Figure 3.7.4 Percentage of all TB incidents still ongoing at the end of the year, between 2020 and 2024, that were persistent (duration over 550 days) in each county of the HRA and in the HRA overall. Counties are ranked by decreasing percentage of persistent incidents in 2024 (shown in parentheses). Note: The high percentage of persistent TB incidents in the West Midlands in 2023 (100%) is truncated at 20% and was due to a single TB incident still open at the end of the year, which was classified as persistent.

3.8 Recurrent TB incidents

3.8.1 3-year backwards recurrence

A recurrent incident in England is defined in this report as a new TB incident in a herd that had sustained another TB incident in the 3 years prior to the disclosing test (Figure 3.8.1). This is referred to as backward-looking recurrence – checking the previous TB history of herds that had a new incident in the reporting year. A shorter timespan was also investigated, looking at the TB history of herds within the 18 months before the disclosing test (Figure 3.8.5).

The percentage of new herd incidents in England in 2024 which were recurrent was the same compared to 2023 (56%). The percentage of recurrent incidents increased slightly in the HRA compared to 2023 (59% in 2023 versus 60% in 2024) but has generally been stable over the last 5 years. In contrast, recurrence has fluctuated in the Edge Area over the last 5 years but has shown an overall increasing trend from 43% in 2020 to a high of 54% in 2023. It then decreased to 47% in 2024. Although recurrence in the LRA was much lower than in the other TB risk areas (21%), it has nearly doubled since 2021 (11%) (Figure 3.8.1). Recurrence is further explored in Chapter 9.3 of this report.

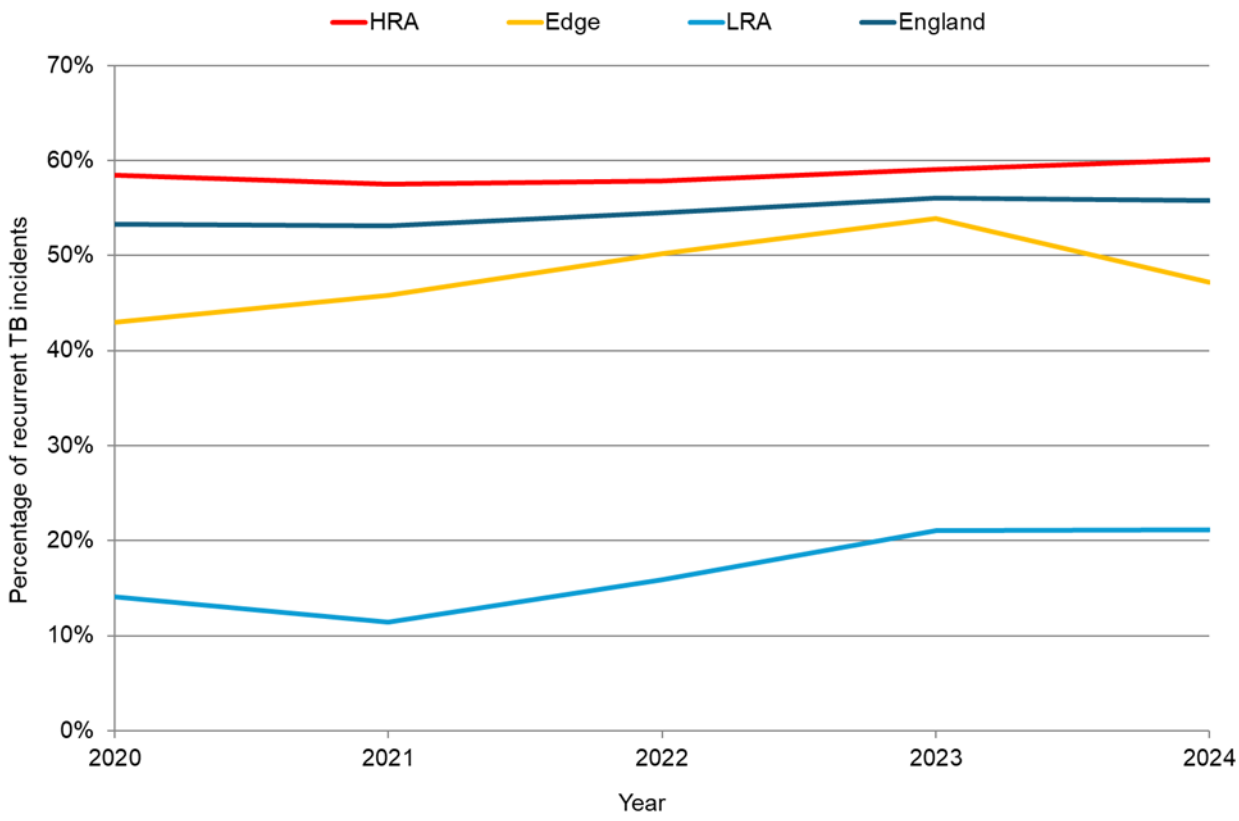

Figure 3.8.1 Annual percentage of new TB incidents that occurred in herds with a history of TB in the previous 3 years, by risk area, between 2020 and 2024.

The number of recurrent herds in the HRA in 2024 (1,144 herds) rose compared to 2023 (1,095 herds). At a county level, the percentage of recurrent incidents in 2024 was highest in Avon (69%) and Gloucestershire (64%) and lowest in the West Midlands (0%), Somerset (55%) and Dorset (56%) (Figure 3.8.2).

Five counties in the HRA saw an increase in the percentage of recurrent TB incidents in 2024 relative to 2023. The greatest increases were in Avon (absolute percentage increase 15%), Cornwall (9%) and Gloucestershire (9%).

Five counties experienced decreases in the percentage of recurrent incidents in 2024 compared to 2023. The largest decline was seen in Dorset (absolute percentage decrease 9%), followed by Staffordshire (9%) and Shropshire (4%).

The West Midlands has had no recurrent TB incidents since 2021.

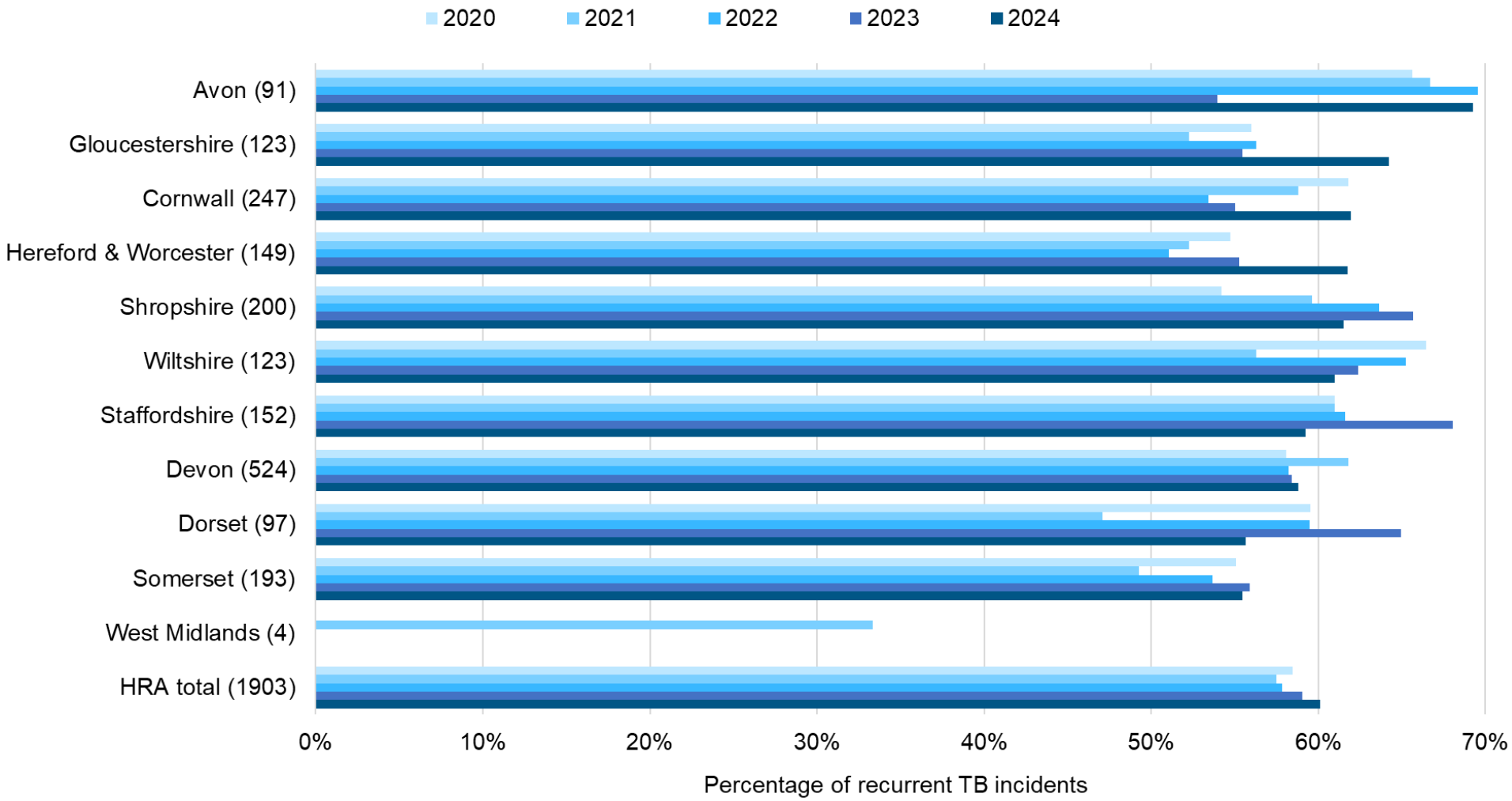

Figure 3.8.2 Annual percentage of recurrent TB incidents (incidents in herds which had a TB incident in the last 3 years), per HRA county, between 2020 and 2024. Counties are ranked by decreasing percentage recurrent incidents in 2024 (Total TB incidents are shown in parentheses).

In 2024, 47% of new TB incidents in the Edge Area occurred in herds that had experienced at least one TB incident in the previous 3 years, a slight decrease compared to 2023 (54%). The number of recurrent herds in 2024 (218 herds) fell slightly in the Edge Area compared to 2023 (241 herds).

At a county level, the percentage of recurrent incidents was highest in Oxfordshire (59%), Berkshire (58%) and Cheshire (58%), and lowest in East Sussex (8%), and Northamptonshire (17%) (Figure 3.8.3).

Three counties in the Edge Area saw an increase in the percentage of recurrent TB incidents in 2024 relative to 2023. The greatest increase was in Derbyshire (absolute percentage increase 10%), followed by Oxfordshire (7%) and Hampshire (6%).

The remaining 8 counties experienced decreases in 2024 compared to 2023. The largest decline was seen in Nottinghamshire (absolute percentage increase 38%) followed by Northamptonshire (29%) and East Sussex (29%).

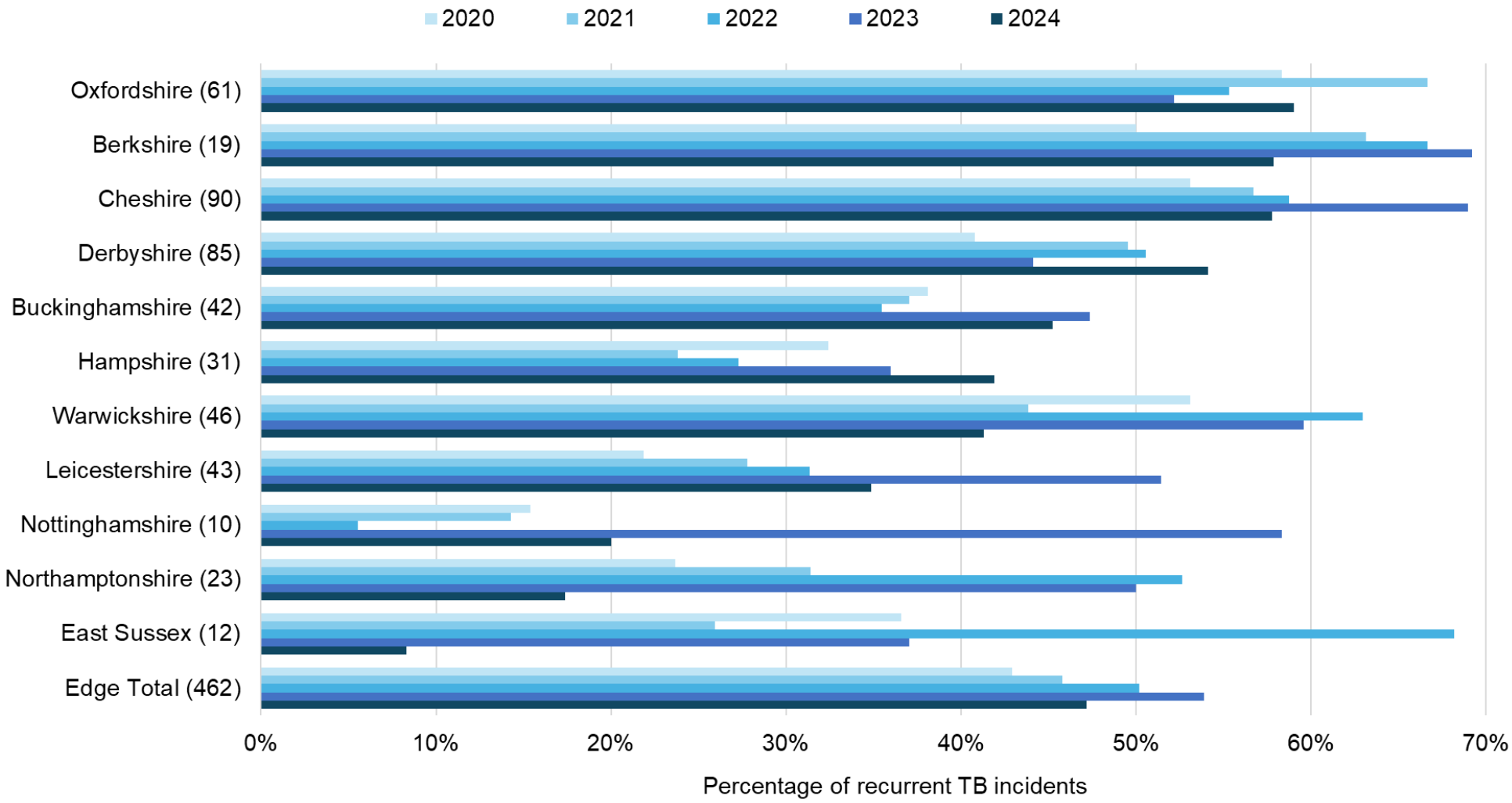

Figure 3.8.3 Annual percentage of recurrent TB incidents (incidents in herds which had a TB incident in the last 3 years), per Edge area county, between 2020 and 2024. Counties are ranked by decreasing percentage recurrent incidents in 2024 (Total TB incidents are shown in parentheses).

In 2024, 21% of new TB incidents in the LRA occurred in herds that had experienced at least one TB incident in the previous 3 years, the same compared to 2023 (21%). The number of recurrent herds in 2024 (26 herds) remained similar in the LRA compared to 2023 (28 herds).

At a county or sub-region-level in the LRA, the percentage of recurrent incidents was highest in Lincolnshire (44%) and Cumbria (21%) and lowest in the North East and Isles of Scilly (both 0%) (Figure 3.8.4).

Two counties in the LRA saw an increase in the percentage of recurrent TB incidents in 2024 relative to 2023: Lincolnshire (absolute percentage increase 17%) and Cumbria (9%). The percentage of recurrent TB incidents in these counties fluctuated between 2020 and 2023.

Three LRA sub-regions experienced decreases in 2024 compared to 2023. The largest decline was seen in the North East (absolute percentage increase 33%) followed by the North West (9%) and the South East (2%).

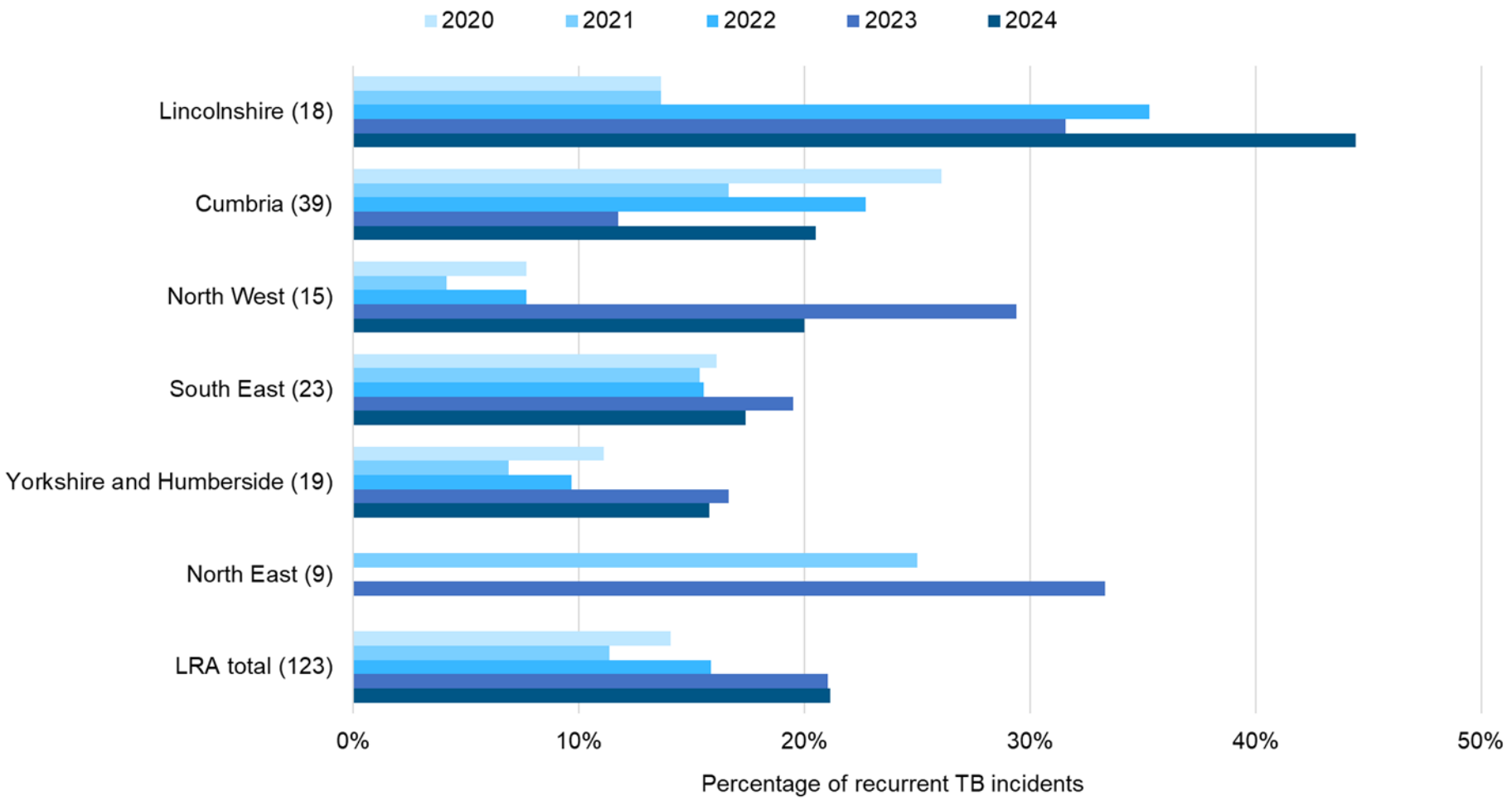

Figure 3.8.4 Annual percentage of recurrent TB incidents (incidents in herds which had a TB incident in the last 3 years), per LRA county and sub-region, between 2020 and 2024. Counties and sub-regions are ranked by decreasing percentage recurrent incidents in 2024 (Total TB incidents are shown in parentheses).

3.8.2 18-month backwards recurrence

Looking at trends over a shorter period of recurrence can give additional insight, especially when interpreted alongside patterns of longer-term recurrence.

The percentage of new herd incidents in England in 2024 which had a TB incident in the previous 18 months was 39%.

The percentage of recurrent TB incidents in the HRA with a TB history in the previous 18 months has increased steadily between 2021 (34%) and 2024 (43%) (Figure 3.8.5). The percentage of 18-month recurrent TB incidents also decreased in the Edge Area (36% in 2023 versus 31% in 2024), following a 3-year increase from 2020 (29%). The percentage has remained relatively stable in the LRA, however it increased from 10% in 2022 to 14% in 2023 before decreasing to 9% in 2024.

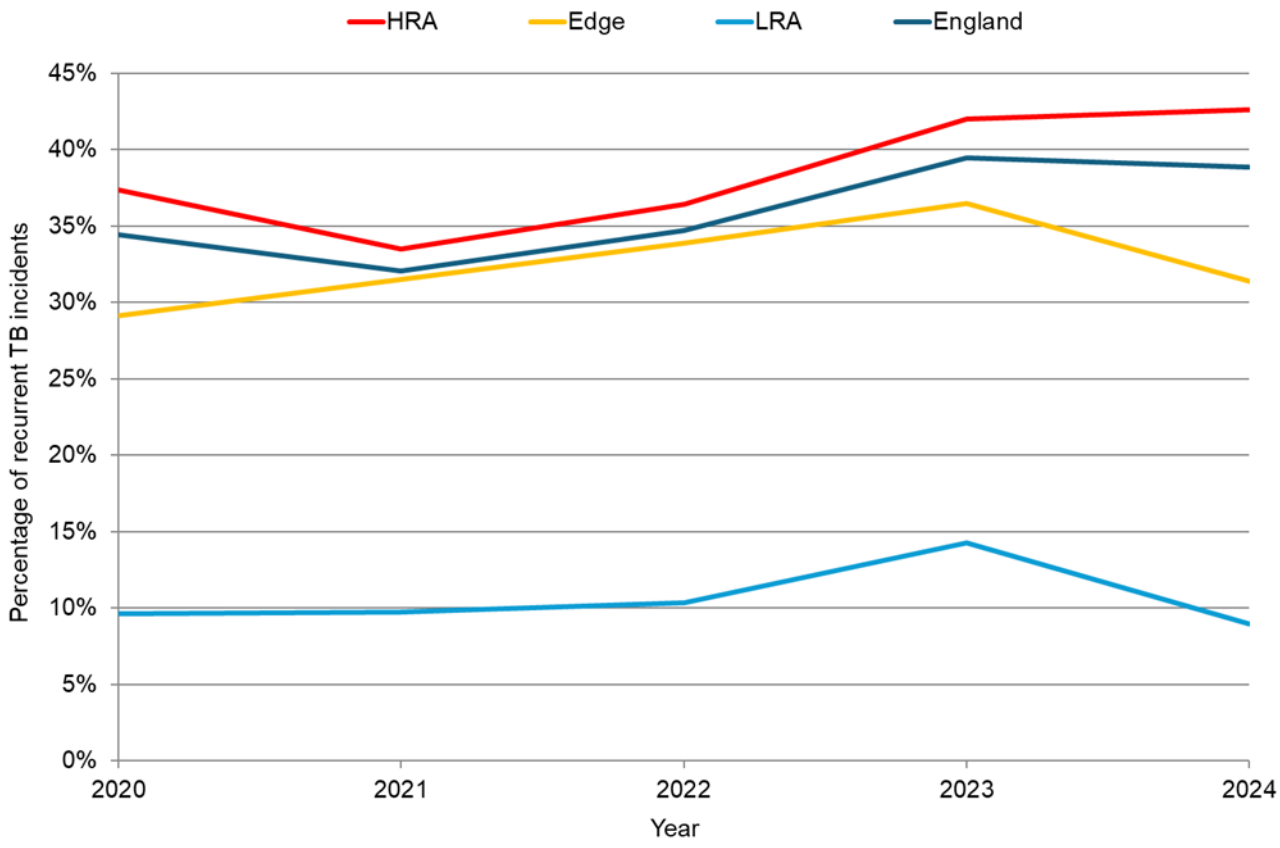

Figure 3.8.5 Annual percentage of TB incidents with a history of TB in the previous 18 months, by risk area, between 2020 and 2024.

4.0 Detection of infected cattle in OTF herds: TB surveillance streams

4.1 Overview

The TB surveillance programme involves both active surveillance (TB testing of live farm animals) and passive surveillance (post-mortem meat inspection for TB and other conditions during commercial slaughter of cattle in abattoirs).

TB surveillance activities in England can be categorised into 4 different streams:

- **Routine:** active surveillance through systematic herd level skin testing of most animals in OTF herds at a pre-defined interval of 6, 12 (all cattle over 6 weeks of age) or 48 months (all the breeding cattle plus replacements).
- **Area and Herd Risk:** more targeted, active surveillance with additional skin testing of OTF herds, or individual cattle that are deemed to be at an increased risk of infection; including contiguous herd, radial, hotspot and tracing tests, permanently restricted herds (AFUs) and check tests conducted a few months after the conclusion of a TB incident.
- **Trade and Other:** active targeted surveillance through tuberculin skin testing of individual animals moved between OTF herds: compulsory pre- and post-movement skin testing, other private TB tests requested and funded by farmers, and tests at artificial insemination centres.
- **Slaughterhouse:** passive surveillance via post-mortem meat inspection (PMMI) of all cattle commercially slaughtered for human consumption in abattoirs, as well as cattle that die on farm and are disposed of at an animal by-product processing facility.

For a full description of the tests and test codes carried out under each surveillance stream please see the Explanatory Supplement.

For the purposes of this report, testing events are reported at the herd level. Multiple animal-level tests occurring in the same herd at the same time (tracing tests or pre-movement tests) are counted once.

A total of 5,275,043 individual TB skin tests were carried out on live animals in OTF herds in 2024, a 1.3% increase compared to 2023 and a 5.5% increase on 2022.

In total, 1,581,841 cattle from holdings in England underwent PMMI at commercial slaughter in 2024. This figure has remained stable for the past 5 years.

The majority of TB herd tests in England in 2024 were carried out under the routine surveillance stream (43.8%), followed by trade and other testing (39.8%) and area and herd risk testing (16.4%) (Figure 4.1.1). The distribution of herd tests by surveillance stream has been very similar since 2022, following the introduction of 6-

monthly routine testing in all counties of the HRA in July 2021. Prior to 2022, a greater percentage of the herd tests in England were carried out under the area and herd risk surveillance stream. Similarly, the majority of individual cattle tests in 2024 were carried out under the routine surveillance stream (66.8%), which also disclosed the greatest percentage of all the new incidents (61.0%) in 2024 (OTF-W and OTF-S) and the greatest percentage of all the reactors (64.5%) in 2024. Note that the number of reactors shown in Figure 4.1.1 only includes skin test reactors detected in OTF herds at the disclosing test of a new TB incident in 2024. This therefore does not include those reactors removed on a subsequent test undertaken whilst a herd was within a TB incident.

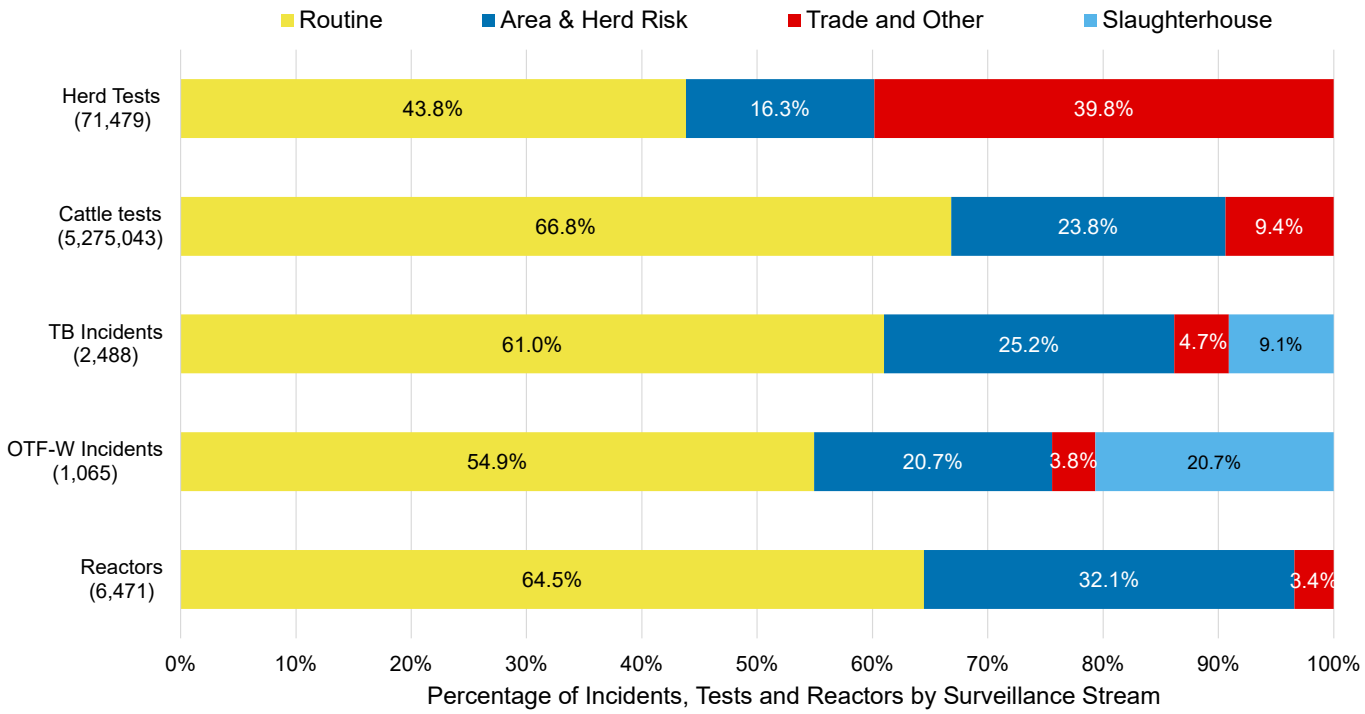

Figure 4.1.1 Percentage of herd tests, individual cattle tests, TB incidents, OTF-W incidents and skin test reactors detected by surveillance stream in 2024 in England. The total numbers are indicated in parentheses. TB herd tests, cattle tests and reactors detected do not apply to the slaughterhouse surveillance stream. The number of reactors refers to skin test reactors detected in OTF herds at the disclosing test of a new TB incident in 2024 and therefore does not include IFN-γ or antibody test positive animals or those reactors removed on a subsequent skin test undertaken whilst a herd was within a TB incident.

Routine surveillance was responsible for 50.5% of total herd tests carried out in the HRA in 2024, compared to 39.8% in the Edge area and 26.2% in the LRA (Tables 4.1.1 a, b and c, respectively). A smaller proportion of tests were carried out under the Area and Herd Risk surveillance stream in the HRA and Edge Area (12.8% and 15.3% respectively). In comparison, almost a third of tests in the LRA (30.5%) were conducted under this surveillance stream. A relatively large proportion of herds were

tested across all risk areas under the Trade and Other surveillance stream (36.7% to 44.9%). These tests very rarely involve the whole herd and only a specific cohort of animals are tested. For example, those animals selected for sale will undergo a pre-movement skin test. Similarly, those animals that have moved into the LRA or the annual surveillance part of the Edge Area from higher risk areas of GB will undergo a post movement skin test if they are not going to be slaughtered within 120 days.

In the HRA and Edge Area, the greatest percentage of the total new TB incidents in 2024 were disclosed by herd tests under the routine surveillance stream (64.7% and 55.8%, respectively). In the LRA, the greatest percentage of the total TB incidents were disclosed by herd tests under the Area and Herd Risk surveillance stream (60.2%). Despite a large percentage of all the herd tests carried out under the Trade and Other surveillance stream across the 3 risk areas (36.7 to 44.9%), this stream disclosed a relatively small percentage of the total TB incidents (4.0 to 10.6%). This is not surprising given that pre- and post-movement tests generally involve a small fraction of all the animals in the herds in question, as stated above.

In the HRA, 9.3% of all incidents, and 21.4% of OTF-W TB incidents, were disclosed by slaughterhouse surveillance (i.e. identification of M. bovis in tuberculous lesions reported by meat inspectors during commercial slaughter of cattle). This was similar in the Edge area (9.1% and 18.8% of total and OTF-W incidents, respectively). A smaller proportion of all incidents and OTF-W incidents in the LRA were detected at the slaughterhouse in 2024 (5.7% and 16.7%, respectively).

Table 4.1.1a. Total number of herd tests, TB incidents and reactors disclosed in OTF cattle herds by surveillance stream in 2024 in the HRA. Percentage of HRA total shown in parentheses. Herd tests in the Trade and Other stream are not whole herd tests, they are test events on a cohort of the herd. NA is not applicable.

Surveillance Stream	Total Herd Tests N (%)	Total TB Incidents N (%)	OTF-W Incidents N (%)	TB Incidents per 100 herd tests	Reactors per 1,000 cattle tested
Routine	21,180 (50.5)	1,231 (64.7)	466 (58.0)	5.8	1.4
Area and Herd Risk	5,382 (12.8)	418 (22.0)	140 (17.3)	7.8	2.5
Trade and Other	15,410 (36.7)	77 (4.0)	27 (3.4)	0.5	0.6
Slaughterhouse	NA	177 (9.3)	172 (21.4)	NA	NA
HRA Total (% of England total)	41,972 (58.7)	1,903 (76.5)	805 (75.6)	3.5	1.1

Table 4.1.1b. Total number of herd tests, TB incidents and reactors disclosed in OTF cattle herds by surveillance stream in 2024 in the Edge Area. Percentage of Edge Area total shown in parentheses. The herd tests in the Trade and Other stream are not whole herd tests, they are test events on a cohort of the herd. NA is not applicable.

Surveillance Stream	Total Herd Tests N (%)	Total TB Incidents N (%)	OTF-W Incidents N (%)	TB Incidents per 100 herd tests	Reactors per 1,000 cattle tested
Routine	7,073 (39.8)	258 (55.8)	115 (51.6)	3.6	0.9
Area and Herd Risk	2,724 (15.3)	134 (29.0)	56 (25.1)	4.9	1.9
Trade and Other	7,993 (44.9)	28 (6.1)	10 (4.5)	0.4	0.3
Slaughterhouse	NA	42 (9.1)	42 (18.8)	NA	NA
Edge Area Total (% of England total)	17,790 (24.9)	462 (18.6)	223 (20.9)	2.2	0.8

Table 4.1.1c Total number of herd tests, TB incidents and reactors disclosed in OTF cattle herds by surveillance stream in 2024 in the LRA. Percentage of LRA total shown in parentheses. Herd tests in the Trade and Other stream are not whole herd tests, they are test events on a cohort of the herd. NA is not applicable.

Surveillance Stream	Total Herd Tests N (%)	Total TB Incidents N (%)	OTF-W Incidents N (%)	TB Incidents per 100 herd tests	Reactors per 1,000 cattle tested
Routine	3,066 (26.2)	29 (23.6)	4 (10.8)	0.9	0.1
Area and Herd Risk	3,578 (30.5)	74 (60.2)	24 (64.9)	2.1	0.4
Trade and Other	5,073 (43.3)	13 (10.6)	3 (8.1)	0.3	0.1
Slaughterhouse	NA	7 (5.7)	6 (16.2)	NA	NA
LRA Total (% of England total)	11,717 (16.4)	123 (4.9)	37 (3.5)	0.8	0.2

4.1.1 Trends over time in surveillance streams by risk area

Routine surveillance detected the highest proportion of new TB incidents in the HRA over the past 4 years (42.0 to 65.0%, Figure 4.1.2). There was a gradual increase observed from 2020 onwards, likely due to the introduction of 6-monthly herd testing as the default routine surveillance frequency in the HRA from July 2021, having been first introduced in Staffordshire and Shropshire in 2020. Concurrently, the relative contribution of Area and Herd Risk surveillance has decreased over time from 41.7% of new TB incidents in 2020 to 21.0% in 2024. A similar trend was observed in Slaughterhouse surveillance (13.2% in 2020 versus 9.3% in 2024) in the HRA. This may indicate an increasing rate of detection of TB infected herds through ante-mortem testing of cattle on farms.

In the Edge Area, the distribution of TB incidents disclosed by each surveillance stream was broadly similar to that observed in the HRA but has remained more stable over the past 5 years.

In the LRA, Area and Herd risk surveillance disclosed the highest proportion of incidents across each of the previous 5 years (45.0 to 60.0%). Routine surveillance disclosed comparatively fewer incidents than in the HRA and Edge Area (23.0 to 37.0%). Possible reasons for this include the lower (4-yearly) routine herd testing frequency in the LRA, coupled with the fact that usually only adult breeding cattle and those destined to be replacements are tested under the Routine surveillance stream in the LRA. Secondly, Area and Herd risk surveillance in the LRA includes

test types that are targeted at higher risk herds and areas, for example radial and hotspot testing, and therefore may be expected to disclose more incidents. A greater proportion of incidents were detected via Trade and Other surveillance (6.0% to 18.0%) in the LRA in comparison to the other risk areas. There appears to be greater annual variability in the distribution of incidents disclosed by the different surveillance streams in the LRA. This is likely in part due to the lower number of TB incidents in this risk area in addition to fluctuations in number and type of test carried out.

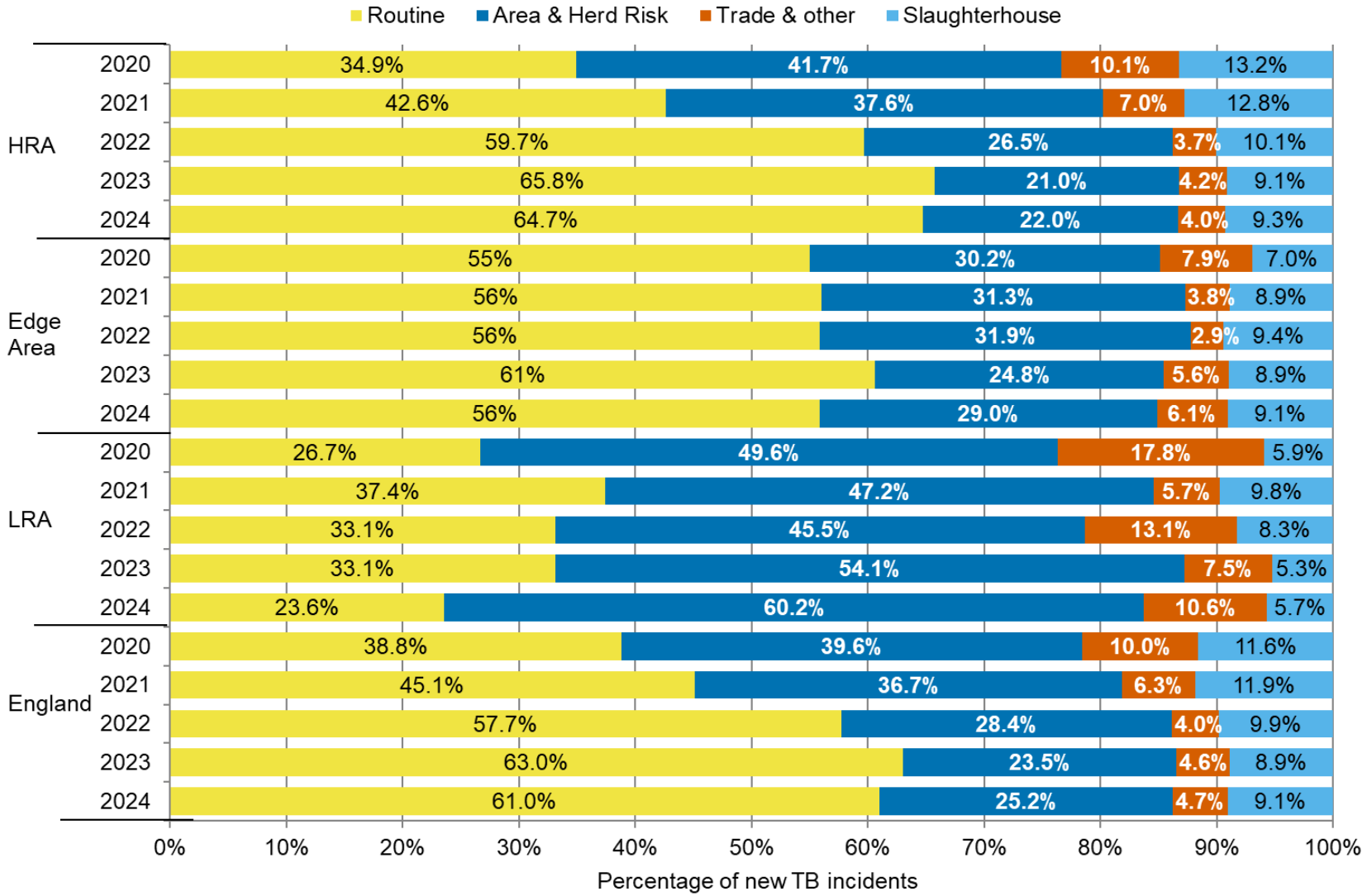

Figure 4.1.2 Annual percentages of new TB incidents detected by different surveillance streams within each risk area from 2020 to 2024.

4.2 Routine surveillance

Routine surveillance includes Whole Herd Tests (WHTs), Routine Herd Tests (RHTs) and New Herd Tests (NHTs). WHTs involve testing every animal over 6 weeks of age in a herd at once, at predetermined intervals (annually or every 6 months), to assess the infection status of the entire herd. In 2024 this was the predominant test type within this TB surveillance stream in the HRA and Edge Area (Table 4.2.1a and b), accounting for 99.5% and 96.5% of herd tests, respectively. Unsurprisingly, WHTs under the routine surveillance stream disclosed the greatest number of TB incidents and reactors in the HRA and Edge Area in 2024.

RHTs are also part of a scheduled TB surveillance programme but are only carried out in the LRA, where herds are routinely tested every 4 years by default. These tests normally only include breeding bulls and cows, along with any young bovines in the herd that will be used for breeding (except calves under 42 days old). RHTs were the predominant test type of the routine surveillance stream in the LRA in 2024 and consequently disclosed the greatest number of TB incidents and reactors in that part of England. This has also been the case historically. RHTs are not carried out in the HRA or the Edge Area, where the emphasis is on testing herds frequently to reduce the relatively high incidence and prevalence of bovine TB, rather than on preventing disease incursions into a historically very low TB incidence area.

New herd tests (NHTs) involve testing every eligible animal in the herd as soon as possible after it is registered with APHA. NHTs made up a relatively larger proportion of the tests carried out under the routine surveillance stream in the LRA in 2024, compared to the HRA and Edge Area. However, this test type detected only a small percentage of the TB incidents and reactors, disclosed by the routine surveillance stream in the LRA. Although NHTs were only a small proportion of the tests in the HRA and Edge Area, they performed comparatively well against WHTs, as indicated by TB incidents per 100 herd tests and reactors per 1,000 cattle tested (Tables 4.2.1a-c). This has been the case historically and is likely explained by the greater force of infection in these risk areas.

Table 4.2.1a Performance of the different test types within the Routine surveillance stream in the HRA in 2024. NA is not applicable.

Test type	Total Herd Tests N (%)	Total TB Incidents N (%)	OTF-W Incidents N (%)	Reactors N (%)	TB Incidents per 100 herd tests	Reactors per 1,000 cattle tested
New Herd Tests	536 (2.5)	11 (0.9)	6 (1.3)	43 (1.2)	2.1	2.5
Whole Herd Tests	20,644 (97.5)	1,220 (99.1)	460 (98.7)	3,409 (98.8)	5.9	1.4
Routine Herd Tests	NA	NA	NA	NA	NA	NA
HRA Total	21,180	1,231	466	3,452	5.8	1.4

Table 4.2.1b Performance of the different test types within the Routine surveillance stream in the Edge Area in 2024. NA is not applicable.

Test type	Total Herd Tests N (%)	Total TB Incidents N (%)	OTF-W Incidents N (%)	Reactors N (%)	TB Incidents per 100 herd tests	Reactors per 1,000 cattle tested
New Herd Tests	248 (3.5)	3 (1.2)	2 (1.7)	14 (2.0)	1.2	1.9
Whole Herd Tests	6,825 (96.5)	255 (98.8)	113 (98.0)	679 (98.0)	3.7	0.9
Routine Herd Tests	NA	NA	NA	NA	NA	NA
Edge Area Total	7,073	258	115	693	3.6	0.9

Table 4.2.1c Performance of the different test types within the Routine surveillance stream in the LRA in 2024.

Test type	Total Herd Tests N (%)	Total TB Incidents N (%)	OTF-W Incidents N (%)	Reactors N (%)	TB Incidents per 100 herd tests	Reactors per 1,000 cattle tested
New Herd Tests	415 (13.5)	1 (3.4)	0 (0.0)	1 (3.7)	0.2	0.1
Whole Herd Tests	240 (7.8)	2 (6.9)	1 (25.0)	3 (11.1)	0.8	0.1
Routine Herd Tests	2,411 (78.6)	26 (89.7)	3 (75.0)	23 (85.2)	1.1	0.1
LRA Total	3,066	29	4	27	0.9	0.1

4.3 Area and herd risk testing

The Area and Herd Risk surveillance stream (AHR) targets herds that are at a temporary heightened risk of infection due to factors such as a recent TB incident, geographical proximity to another TB incident, the purchase or sale of an animal which subsequently becomes a reactor, the presence of laboratory-positive slaughterhouse case(s) in cattle from the holding.

In the HRA in 2024, post-incident tests accounted for the largest proportion of tests carried out under the AHR (37.2%, Table 4.3.1a). The majority of total TB incidents (87.7%) and reactors (90.4%) disclosed in the HRA in 2024 under this surveillance stream were the result of post-incident tests (Table 4.3.1a), which are carried out 6 and 12 months after a previous incident. These incidents are likely either the result of a new introduction of infection, or residual infection remaining in the herd from the previous incident. This indicates a high level of recurrent herd incidents in the HRA, which is consistent with findings described in Chapter 3.8.1, where 60% of herds with a new TB incident in the HRA in 2024 had experienced another TB incident in the previous 3 years.

Spread tracing tests are not whole herd tests, they are tests on individual animals that were moved out of an OTF-W TB incident herd, to another herd, before the detection of TB and loss of OTF herd status in the herd of origin. Spread tracing tests accounted for almost a quarter of tests carried out in the HRA under this surveillance stream (22.6%) but disclosed just one TB incident and one reactor in 2024.

Source tracing tests are carried out when the herd to which a reactor animal belongs at the time of disclosure is not believed to be the source of infection. These tests will usually involve the entire source herd. Source tracing tests were only a small proportion of the AHR herd tests carried out in the HRA in 2024 (0.7%). Nonetheless, as in previous years, source tracing tests detected a relatively large number of new TB incidents per 100 herd tests completed (17.5 per 100 herd tests), which is on par with post incident check tests.

Contiguous herd testing disclosed the majority of the remaining TB incidents (6.2%) and reactors (5.9%), even though these tests contributed a relatively small proportion of the overall number of tests carried out in the HRA under this surveillance stream (5.2%).

Approved Finishing Units enhanced with grazing (AFUE) are mandated to carry out a skin test on every animal in the unit, every 90 days. There were 5 of these tests carried out in 2024, but these did not disclose any new TB incidents.

The AHR surveillance stream has the greatest number of test types. Only the test types that disclosed the most incidents are displayed in Tables 4.3.1a-c. There are

several test types in the AHR surveillance stream that are represented by the category ‘Other’; details of the test types included are given in the table titles.

Table 4.3.1a Performance of main test types within the Area and Herd Risk surveillance stream in the HRA in 2024**.** ‘Other’ includes: VE-ASG (TB isolation units), VE-IR (inconclusive reactor re-tests), VE-SI (short interval tests on herds with an epidemiological link to a TB incident) and VE-IFN (IFN-γ blood test).

Test type	Total Herd Tests N (%)	Total TB Incidents N (%)	OTF-W Incidents N (%)	Reactors N (%)	TB Incidents per 100 herd tests	Reactors per 1,000 cattle tested
Contiguous herd tests	281 (5.2)	26 (6.2)	12 (8.6)	87 (5.9)	9.3	3.1
Spread tracing tests	1,219 (22.6)	1 (0.2)	0 (0.0)	1 (0.06)	0.1	0.2
Source tracing tests	40 (0.7)	7 (1.7)	4 (2.9)	21 (1.4)	17.5	2.8
Post-incident tests	2,005 (37.2)	367 (87.7)	121 (86.4)	1,338 (90.4)	18.3	2.7
Check tests	54 (1.0)	9 (2.2)	2 (1.4)	18 (1.2)	16.7	1.3
AFU tests	5 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0.0	0.0
Other	1778 (33.0)	8 (1.9)	1 (0.7)	15 (1.0)	0.4	0.4
HRA Total	5,382	418	140	1,480	7.8	2.5

In the Edge Area in 2024, the largest proportion of tests carried out under AHR were spread tracing tests (32.9%). However, these tests only disclosed 4 TB incidents (2.9%), and 5 reactors (1.1%; Table 4.3.1b). As is the case in the HRA, these tests are only carried out on a cohort of animals, not the whole herd. Post incident tests represented a smaller proportion of the tests carried out under the AHR surveillance stream, however, these tests disclosed over half of the TB incidents (53.7%) and reactors (64.5%). This differs from 2023, where a greater proportion of the TB and OTF-W incidents were disclosed by post incident tests (84.5% and 83.7% respectively). This is likely related to an increase in radial tests carried out in 2024 compared to 2023 (662 versus 156 herd tests, respectively). Radial tests disclosed almost a quarter of new TB incidents (24.3%) and approximately 20% of the OTF-W incidents (21.2%) in 2024.

Contiguous herd tests, source tracing tests and check tests represented a very small proportion of AHR tests carried out in the Edge Area in 2024. However, these tests disclosed the largest number of TB incidents per 100 herd tests, suggesting that they were correctly targeted to higher risk herds.

Table 4.3.1b Performance of the main test types within the Area and Herd Risk surveillance stream in the Edge Area in 2024. 'Other' includes: VE-ASG (TB isolation units), VE-IR (inconclusive reactor re-tests), VE-SI (short interval tests on herds with an epidemiological link to a TB incident); and VE-IFN (Interferon-gamma).

Test type	Total Herd Tests N (%)	Total TB Incidents N (%)	OTF-W Incidents N (%)	Reactors N (%)	TB Incidents per 100 herd tests	Reactors per 1,000 cattle tested
Contiguous herd tests	23 (0.8)	4 (3.0)	1 (1.8)	33 (7.4)	17.4	18.5
Radial tests	662 (24.3)	37 (27.6)	19 (33.9)	95 (21.2)	5.6	1.2
Hotspot tests	196 (7.2)	10 (7.5)	5 (8.9)	20 (4.5)	5.1	0.8
Spread tracing tests	897 (32.9)	4 (2.9)	2 (3.6)	5 (1.1)	0.4	1.1
Source tracing tests	15 (0.5)	3 (2.2)	2 (3.6)	3 (0.7)	20.0	1.1
Post-incident tests	489 (17.9)	72 (53.7)	27 (48.2)	289 (64.5)	14.7	2.5
Check tests	23 (0.8)	3 (2.2)	0 (0.0)	2 (0.4)	13.0	0.4
Other	419 (15.4)	1 (0.7)	0 (0.0)	1 (0.2)	0.2	0.2
Edge Area Total	2,724	134	56	448	4.9	1.9

Approximately half of the herd tests carried out under AHR in the LRA in 2024 were radial tests (48.4%), which also disclosed the greatest proportion of the total TB incidents (60.8%, Table 4.3.1c). Hotspot tests contributed about a fifth of the total herd tests (19.3%) and disclosed 21.6% of total TB incidents under this surveillance stream. Check tests, although a small percentage of the overall number of tests,

performed well in terms of TB incidents disclosed per 100 herd tests, suggesting that it is still an important testing strategy in the LRA. Spread tracing tests accounted for 22% of the test types under this surveillance stream in the LRA and although they are counted in the herd tests column, they are not herd tests, but tests on a cohort of animals whose herd of origin have since lost OTF status. The percentage of TB incidents disclosed by spread tracing tests was low (5.4%).

Table 4.3.1c Performance of main test types within the Area and Herd Risk surveillance stream in the LRA in 2024. 'Other' includes: VE-IR (inconclusive reactor re-tests), VE-SI (short interval tests on herds with an epidemiological link to a TB incident) and VE-IFN (Interferon-γ).

Test type	Total Herd Tests N (%)	Total TB Incidents N (%)	OTF-W Incidents N (%)	Reactors N (%)	TB Incidents per 100 herd tests	Reactors per 1,000 cattle tested
Radial tests	1,732 (48.4)	45 (60.8)	16 (60.7)	103 (68.2)	2.6	0.4
Hotspot tests	692 (19.3)	16 (21.6)	5 (20.8)	33 (21.9)	2.3	0.3
Spread tracing tests	788 (22.0)	4 (5.4)	2 (8.3)	5 (3.3)	0.5	1.4
Source tracing tests	22 (0.6)	1 (1.4)	0 (0.0)	0 (0.0)	4.5	0.0
Post-incident tests	127 (3.5)	6 (8.1)	1 (4.2)	9 (6.0)	4.7	0.4
Check tests	20 (0.6)	2 (2.7)	0 (0.0)	1 (0.7)	10.0	0.2
Other	197 (5.5)	0 (0.0)	0 (0.0)	0 (0.0)	0.0	0.0
LRA Total	3,578	74	24	151	2.1	0.4

4.4 Trade and Other Testing

Some of the test types within this surveillance stream involve the testing of single animals or a batch of animals from within a herd; these are therefore referred to as ‘animal’ tests rather than herd tests. Multiple animal-level tests occurring in the same herd at the same time (tracing tests or pre-movement tests) are counted once.

Most Trade and Other surveillance stream tests in all 3 risk areas in 2024 were pre-movement tests. Other statutory TB herd tests completed with negative results within the required timeframe can also qualify as a pre- or post-movement test. Therefore, the figures provided in tables 4.4.1a-c below only represent bespoke TB movement tests funded and arranged by herd keepers.

In the HRA, pre-movement tests accounted for 99.3% of the Trade and Other surveillance stream tests carried out in 2024 (Table 4.4.1a). Consequently, this test type detected the greatest percentage of the incidents disclosed. Post-movement testing is not mandatory in the HRA as it is in the LRA and the annual TB surveillance portion of the Edge Area, hence this test type accounts for only a small percentage of the tests carried out under this surveillance stream.

Table 4.4.1a Performance of main test types within the Trade and other surveillance stream in the HRA in 2024.

Test type	Test events N (%)	TB Incidents N (%)	OTF-W Incidents N (%)	Reactors N (%)	TB Incidents per 100 test events	Reactors per 1,000 cattle tested
Pre-export	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.0	0.0
Post-import	32 (0.2)	1 (1.3)	0 (0.0)	1 (0.0)	3.1	0.0
Post-movement	58 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0.0	0.0
Pre-movement	15,303 (99.3)	76 (98.7)	27 (100.0)	171 (100.0)	0.5	0.7
Private	17 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0.0	0.0
Total	15,410	77	27	172	0.5	0.6

In the Edge Area, pre-movement tests accounted for 85.0% of the Trade and Other surveillance stream tests carried out in 2024 (Table 4.4.1b). This was a decrease compared to 2023 (96.5%), however, the number of reactors per 1,000 cattle tested

stayed constant between the years (0.3). In August 2023, a policy change required that cattle moved to the annual TB testing parts of the Edge Area from higher TB incidence areas of GB to undergo a post-movement TB test if not slaughtered within 120 days of arrival. For this reason, there was a 462% increase in the number of post-movement tests carried out in the Edge Area in 2024 compared to 2023 (206 test events, 2.8% of the total tests in the Edge Area).

Table 4.4.1b Performance of main test types within the Trade and other surveillance stream in the Edge Area in 2024.

Test type	Test events N (%)	TB Incidents N (%)	OTF-W Incidents N (%)	Reactors N (%)	TB Incidents per 100 test events	Reactors per 1,000 cattle tested
Pre-export	NA	NA	NA	NA	NA	NA
Post-import	21 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)	0.0	0.0
Post-movement	1,158 (14.5)	3 (10.7)	2 (20.0)	9 (24.3)	0.3	0.4
Pre-movement	6,794 (85.0)	25 (89.3)	8 (80.0)	28 (75.7)	0.4	0.3
Private	20 (0.3)	0 (0.0)	0 (0.0)	0 (0.0)	0.0	0.0
Total	7,993	28	10	37	0.4	0.3

Post movement tests made up a larger percentage of the tests in the LRA compared to the HRA and Edge Area (Tables 4.4.1a-c). Post movement testing of cattle moved into the LRA from higher risk areas of GB, if not slaughtered within 120 days of arrival, has been compulsory since April 2016.

Table 4.4.1c Performance of main test types within the Trade and other surveillance stream in the LRA in 2024

Test type	Test events N (%)	TB Incidents N (%)	OTF-W Incidents N (%)	Reactors N (%)	TB Incidents per 100 test events	Reactors per 1,000 cattle tested
Pre-export	5 (0.1)	0 (0.0)	0 (0.0)	0 (0.0)	0.0	0.0
Post-import	46 (0.9)	1 (7.7)	0 (0.0)	1 (8.3)	2.2	1.1
Post-movement	1,712 (33.7)	6 (46.2)	3 (100)	7 (58.3)	0.4	0.1
Pre-movement	3,185 (62.8)	5 (38.5)	0 (0.0)	2 (16.7)	0.2	0.0
Pre-sale check	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.0	0.0
Private	125 (2.5)	1 (7.7)	0 (0.0)	2 (16.7)	0.8	1.3
Total	5,073	13	3	12	0.3	0.1

Of the international trade test events (pre-export and post-import) and private tests carried out in the HRA in 2024, only one incident with one reactor was disclosed in 2024 by a post-import test in the HRA. No incidents were disclosed by these test types in the Edge Area in 2024. In the LRA in 2024, one TB incident was disclosed by a post-import test and one TB incident was disclosed by a private test. Historically these test types have accounted for a very small proportion of TB incidents disclosed by the Trade and Other surveillance stream across England.

4.4.1 Historical trends in the percentage of incidents disclosed by pre-movement testing

The percentage of TB incidents disclosed by pre-movement tests in England has fallen sharply over the last decade. Between 2015 and 2019 the trend was stable at between 7.0 to 8.0%, followed by a small increase to 9.0% in 2020. Subsequently there was a large decrease to 3.5% in 2022, which plateaued at 4.0% in 2023 and 2024. This decrease is partly due to the rollout of 6-monthly testing in the HRA in 2021, and the ability for a government-funded, statutory TB herd test to qualify as a pre-movement test, providing it was carried out within the appropriate timeframe with negative results and the herd remained OTF. However, the percentage of incidents disclosed by pre-movement testing in all the risk areas began decreasing before 2021, despite the number of pre-movement tests remaining similar between 2020 and 2021. This may suggest that a decreasing disease burden has resulted in a

lower proportion of TB incidents detected by pre-movement testing. The majority of pre-movement tests were carried out in the HRA, and therefore the 10-year trend closely follows that of England overall.

The percentage of incidents disclosed by pre-movement testing in the Edge Area in the last decade has fluctuated with a general downward trend, largely following that observed in England and the HRA. Between 2016 and 2019 this decreased from 7.9% to 4.8%, followed by a sharp increase back to levels observed in 2016 (7.7%). In 2021 and 2022 the percentage of incidents disclosed by pre-movement testing fell to 4.0% and 2.9% respectively. This was followed by an an increase to 5.4% in 2023 and 2024.

In the LRA the 10-year trend differs from that of the other risk areas. From 2015 to 2019 there was a general increasing trend in the percentage of incidents disclosed by pre-movement testing from 2.5% to 6.1%. There was a marked reduction in 2020 (1.5%) and 2021 (1.6%). Since 2022 less variation has been observed, with the percentage of TB incidents disclosed by pre-movement testing between 3.0% and 4.1%. The greater variability in the LRA is likely due to the relatively much smaller number of pre-movement tests carried out and fewer TB incidents compared to the HRA and Edge Area.

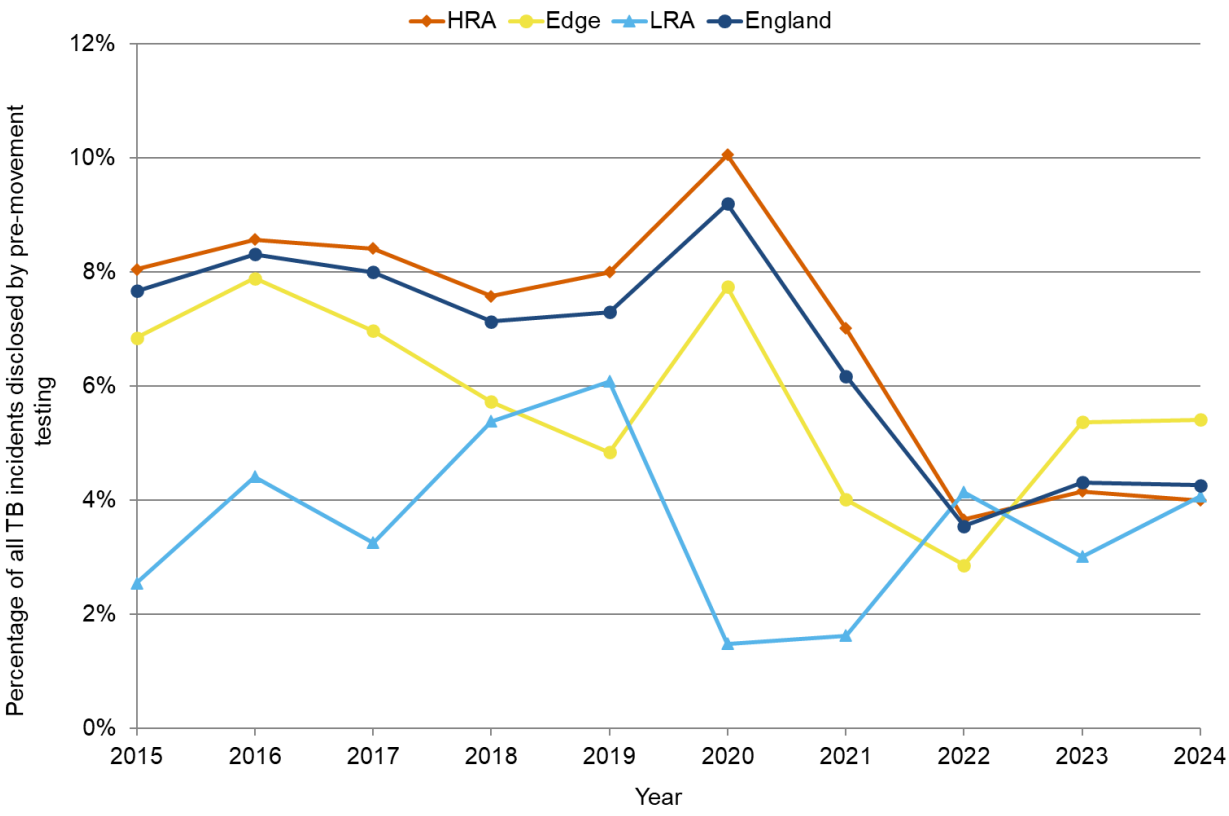

Figure 4.4.1 Annual percentage of total TB incidents disclosed by pre-movement testing between 2014 and 2024, by risk area. The data refers to tests categorised as

(bespoke) pre-movement and does not include other (government-funded) tests that can qualify as a pre-movement test.

4.5 Slaughterhouse surveillance

Slaughterhouse surveillance is a supplementary TB surveillance stream that helps detect infected cattle missed by active surveillance or that became infected since their last skin test. The probability of detecting TB incidents by slaughterhouse surveillance depends, among other variables, on the background prevalence of infection, and the frequency and efficacy of active surveillance testing in cattle herds.

Over the past decade, the percentage of total incidents (OTF-S and OTF-W) disclosed in the slaughterhouse in the HRA has decreased from 16.4% in 2015 to 9.3% in 2024. This may be due to ante-mortem tests in the active surveillance streams identifying a greater proportion of infected animals before they are discovered passively during PMMI at slaughter.

In the Edge Area the total number of incidents has also decreased over the same period. However, unlike the HRA, the percentage of the total incidents detected by slaughterhouse surveillance has not followed a consistent declining trend. After a slight decline from 11.4% in 2015 to 7.0% in 2020, the percentage has since increased to 9.1% in 2024.

Unlike the HRA and Edge area, the number of new TB incidents in the LRA has remained relatively stable over the last decade. In contrast, there has been a general downward trend from 16.6% of total TB incidents disclosed in the slaughterhouse in 2015 to 5.7% in 2024.

Due to the nature of slaughterhouse surveillance relying on the identification (by PCR or bacteriological culture) of M. bovis from visible lesions of TB found at PMMI, almost all incidents detected at the SLH in 2024 were OTF-W. There were 6 unconfirmed slaughterhouse cases in 2024, 5 in the HRA and one in the LRA. Tissue samples collected during PMMI of these cases did not identify the presence of M. bovis. However, subsequent skin tests conducted at the herd of origin disclosed reactors without VLs at slaughter, resulting in OTF-S incidents in these herds.

Of the OTF-W incidents in the HRA and England overall, the percentage detected by slaughterhouse surveillance has remained relatively stable at around 20% over the past decade (Figure 4.5.1).

In the Edge Area, between 2015 and 2018 there was a decrease in the percentage of OTF-W incidents disclosed in the slaughterhouse from 18.8% to 10.8%. Between 2018 and 2021 there has been a general increase, returning to similar levels observed in 2015, and has remained at around 20% between 2021 and 2024.

There has also been a general downward trend in the percentage of OTF-W incidents initiated by slaughterhouse surveillance in the LRA, from 47.2% in 2015 to

16.2% in 2024, although the trend has fluctuated between years. Historically the percentage of OTF-W incidents detected at the slaughterhouse was greatest in LRA compared to the other risk areas. This is to be expected, as herds are subjected to more frequent TB testing in the Edge Area and HRA than in the LRA. Therefore, a higher proportion (but lower number) of TB-infected herds is expected to be detected at routine slaughter of cattle in the LRA. However, since 2023, the LRA has been exceeded by the HRA and Edge. This may be due to an increasing proportion of new incidents in the LRA being located within hotspots, where herds are subject to 6- or 12-monthly skin testing, and therefore infection could be identified earlier, as opposed to at slaughter as previously.

Further analysis of the efficacy and contribution of slaughterhouse surveillance and monitoring performance may be found in the latest Slaughterhouse surveillance report for GB (2019 to 2022).

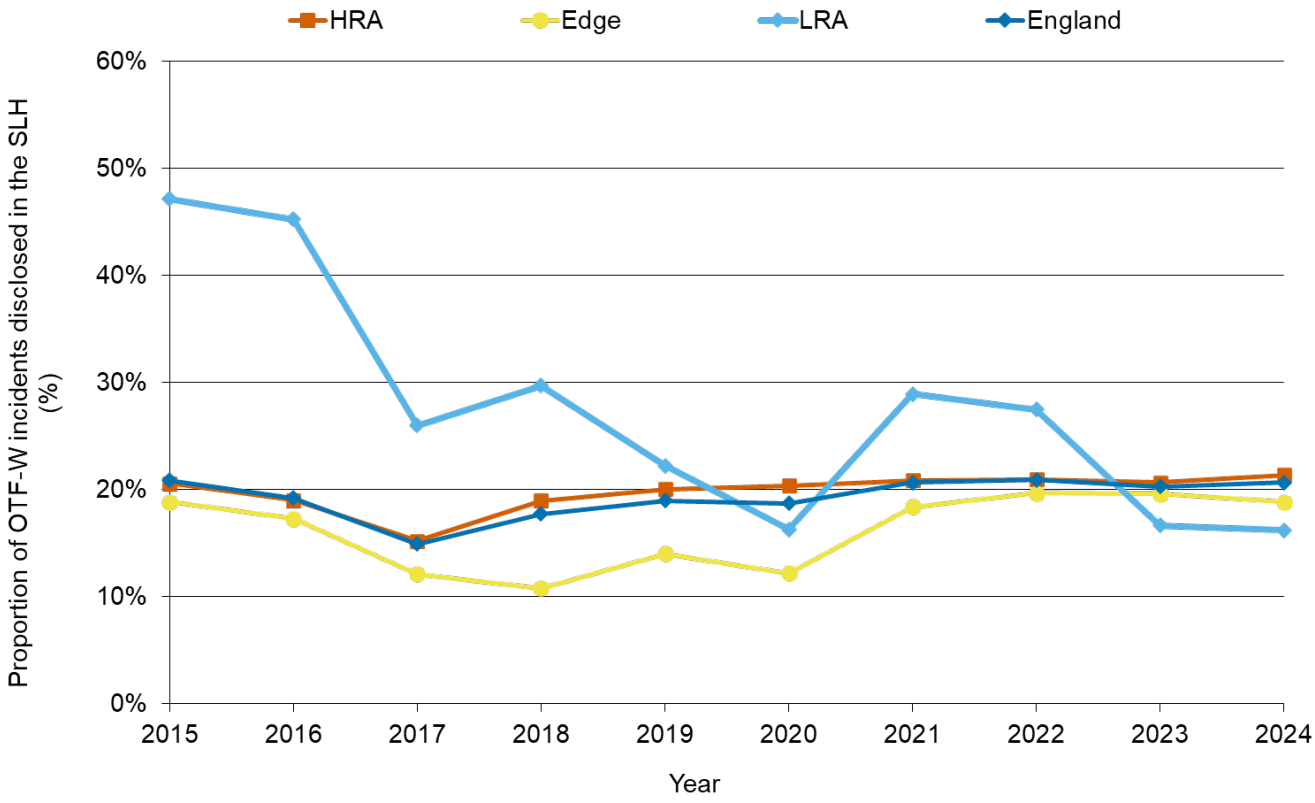

Figure 4.5.1 Annual proportion of new OTF-W incidents in each risk area that were disclosed by slaughterhouse surveillance from 2015 to 2024.

Overall, slaughterhouse surveillance detected between 5.0 and 25.0% of the annual total TB incidents per HRA county in 2024. However, slaughterhouse surveillance was important in the detection of OTF-W incidents, with between 10.7% (Dorset) and 100.0% (West Midlands) of HRA county OTF-W incidents in 2024 detected in the

slaughterhouse (Figure 4.5.2). It is worth noting that there was only one OTF-W incident in the West Midlands in 2024 and this incident was disclosed in the slaughterhouse. In Devon, of the 190 OTF-W incidents in 2024, 20.5% were detected in the slaughterhouse.

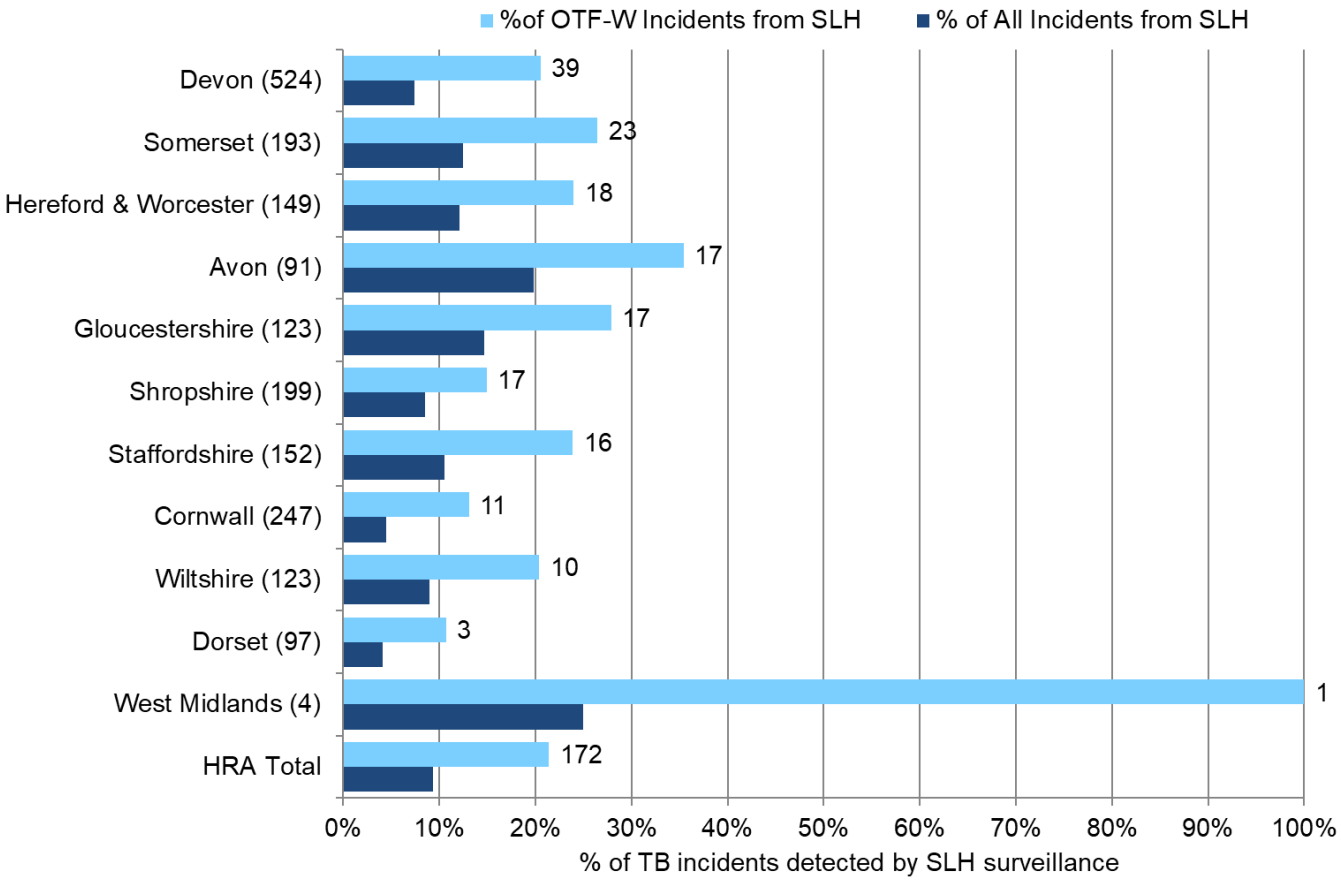

Figure 4.5.2 Percentage of TB incidents disclosed by SLH surveillance (routine post-mortem meat inspection) in each county of the HRA in 2024, for all TB incidents and OTF-W incidents. HRA counties are ranked by decreasing number of OTF-W TB incidents disclosed by SLH surveillance (data label on the light blue bar). The total number of TB incidents in each county in 2024 are displayed in parentheses.

5.0 Detection of infected cattle during TB incidents: Supplementary interferon gamma testing

The IFN-γ blood test is a supplementary diagnostic test used in conjunction with the skin test to enhance the sensitivity of TB testing in specific (mostly OTF-W) TB incident herds.

A total of 128,214 cattle received a supplementary IFN-γ blood test in England in 2024 (Table 5.1), of which 6,080 were positive (4.7%). This was a relative decrease of 6.0% in the number of IFN-γ tests carried out compared to 2023, but an increase compared to the 4.2% of tests positive in 2023 (136,353 cattle tested, 5,678 positive).

Table 5.1 Number of animals and herds receiving an IFN-γ test in 2024, by risk area and testing reason. Number of herds in which the test was deployed are given in parentheses.

Reason for testing	HRA	Edge Area	LRA	England
Miscellaneous	7,469 (96)	4,324 (43)	603 (15)	12,396 (154)
New OTF-W incident outside HRA	0 (0)	16,287 (157)	8,486 (72)	24,773 (229)
Persistent OTF-W incident	13,417 (93)	1,854 (12)	135 (3)	15,406 (108)
Chronic OTF-W incident management	2,169 (24)	760 (9)	0 (0)	2,929 (33)
Recurrent OTF-W incident	62,682 (447)	10,028 (79)	0 (0)	72,710 (526)
Total number of IFN-γ tests carried out in animals (Number carried out in herds)	85,737 (660)	33,253 (300)	9,224 (90)	128,214 (1,050)

Historically (prior to 2018) there were notable differences between risk areas in the numbers of IFN-γ tests deployed and the percentage of positive IFN-γ tests, with the percentage of positive tests in the HRA far exceeding that of the LRA and Edge Area (Figure 5.1). Prior to 2018, the IFN-γ test was largely only deployed in OTF-W incidents in the LRA and Edge Area. From 2018, the IFN-γ test was deployed alongside the SICCT test in the HRA to resolve chronic and persistent OTF-W

incidents, and OTF-W incidents in badger control policy areas that had successfully completed at least 2 rounds of licensed culling. This resulted in a sharp increase in the number of tests carried out in the HRA from 18,206 in 2017 to 144,621 in 2021.

The number of IFN-γ tests deployed in the Edge Area also increased in 2018 and 2019 due to rises in the number of OTF-W incidents detected in those 2 years. However, the number of IFN-γ tests completed in the Edge Area began to decrease from 2020, in line with a declining number of OTF-W incidents.

From 2022 the number of IFN-γ tests carried out in the HRA and the Edge Area started to fall due to a change in IFN-γ testing policy in the HRA and 6-monthly testing Edge Area adopted in July 2021. Mandatory IFN-γ testing shifted away from herds in badger control areas and instead focused on all herds experiencing recurrent OTF-W incidents (incident herds experiencing a new TB incident within 18 months of regaining OTF status following a previous OTF-W incident). The test deployment policy was unchanged in the LRA and the annual surveillance testing part of the Edge Area, where all new OTF-W incidents continued to be subjected to mandatory IFN-γ testing. Any chronic and persistent OTF-W incidents across the HRA and Edge Area also continued to be eligible for a mandatory IFN-γ test. Outside these scenarios, the deployment of the IFN-γ blood test was at APHA case veterinarians discretion. This policy continued in 2024.

The number of IFN-γ tests deployed in the LRA has remained comparatively stable with a median of 10,244 per year (interquartile range 1,954) over the last 10 years. The percentage of positive tests showed greater variation, peaking at 4.3% in 2018 and again at 3.6% in 2021. There was a subsequent decrease to 2.0% in 2022, before stabilising at 3.0% in 2023 to 2024.

Historically, the percentage of positive IFN-γ tests in the HRA declined as the total number of tests deployed increased. A similar trend can be observed in the Edge Area between 2018 and 2020. However, since 2022, despite a decreasing number of IFN-γ tests completed in the HRA and a stable number in the Edge Area, the percentage of positive IFN-γ tests has increased. Notably, although the HRA represents the greatest number of IFN-γ tests conducted in England, the percentage of positive tests remains higher than the other risk areas. This may be indicative of good targeting of IFN-γ testing in the HRA and the greater force of infection, relative to the other risk areas.

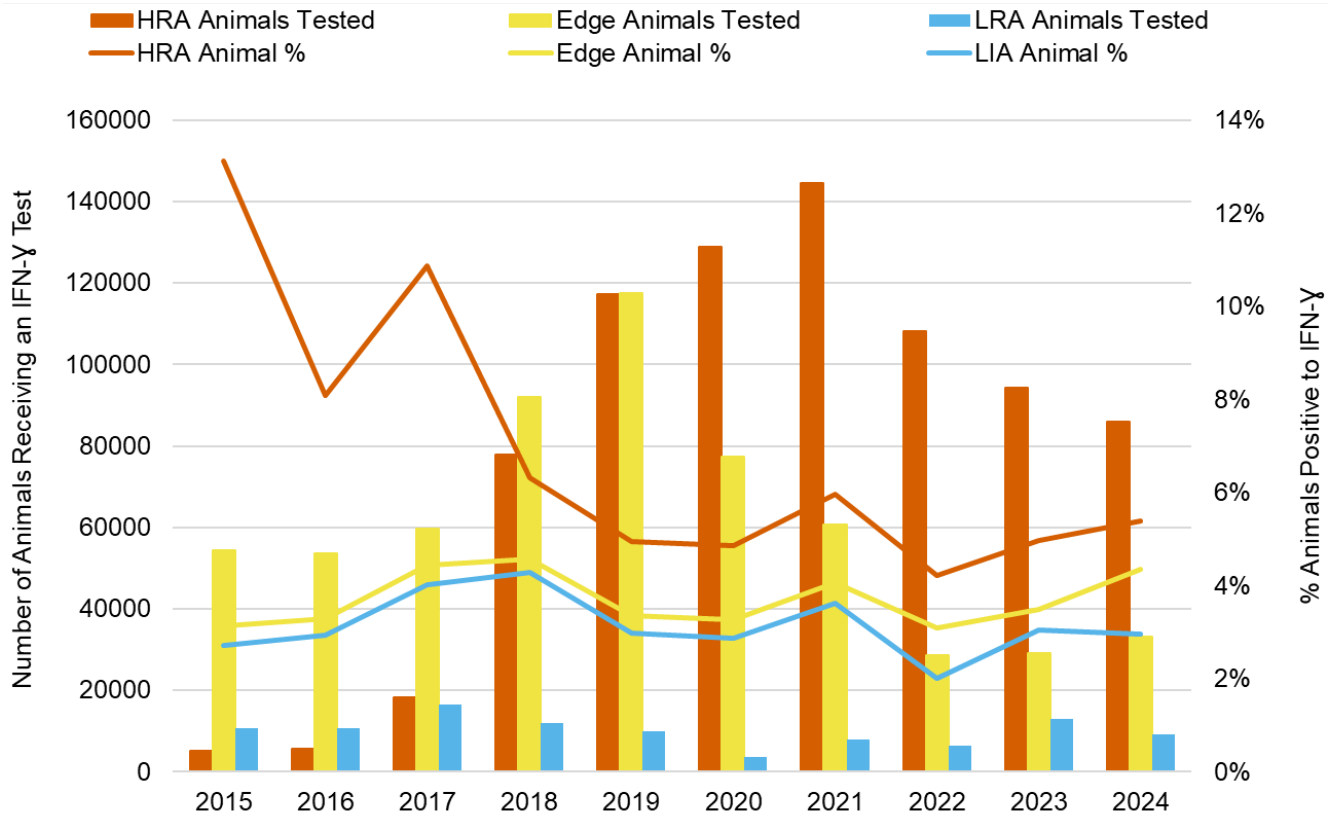

Figure 5.1 Annual number of animals subjected to IFN-γ testing and percentage of test positive animals by risk area, 2015 to 2024.

Figure 5.1 description: A bar chart displaying the number of individual IFN-γ tests deployed, and the percentage of those tests that were positive in each risk area over the last 10 years. The red bars represent the number of animals receiving a test in the HRA per year, the yellow bars represent the Edge Area and the blue bars represent the LRA. The axis for the number of IFN-γ tests deployed is on the left hand side of the chart. The bar chart is superimposed with a line chart displaying the percentage of the IFN-γ tests deployed that were positive each year. The red line represents the percentage of positive tests in the HRA, the yellow is for the Edge area and the blue for the LRA. The corresponding axis with the percentage of positive animals is on the right hand side of the chart.

A total of 1,050 herds in England contained at least one animal that underwent IFN-γ testing in 2024 (Table 5.1). Of these, 731 (69%) disclosed at least one IFN-γ test positive animal. Compared to 2023, this represented an increase in the number of herds tested (1,010 herds), but the same proportion of herds containing at least one IFN-γ test positive animal (694 herds, 69%).

The annual number of herds receiving an IFN-γ test in the HRA and Edge Area over the past decade (Figure 5.2) followed a similar trend to that observed in the number of IFN-γ tested animals (Figure 5.1).

The annual percentage of herds which disclosed at least one IFN-γ test positive animal in the HRA peaked in 2018 at 75%, before declining and stabilising at around 65% in subsequent years. This trend continued until 2021 when mandatory IFN-γ testing was introduced for recurrent OTF-W incidents in this part of England, as previously described, and the percentage of positive herds increased and has remained between 69% and 73% up to 2024.

In the Edge Area the annual number of herds tested has also declined since 2019 due to a contemporaneous reduction of OTF-W incidents, and the impact of the change in the mandatory test deployment policy. However, in 2024 there was a slight increase in the number of herds tested in the Edge Area (300 in 2024, 254 in 2023). But there was only a very slight decrease in the percentage of herds disclosing at least one IFN-γ test positive animal (67% in 2024, 68.5% in 2023). In both the HRA and Edge Area the improved targeting of high risk herds under the new IFN-γ testing policy has led to an increase in the percentage of herds disclosing at least one positive animal.

The number of herds subjected to IFN-γ testing in the LRA has stayed consistently low compared to the HRA and Edge Area, between 60 and 90 per year. The percentage of herds disclosing at least one positive animal peaked in 2017 at 87%. From 2018 to 2023, the percentage of herds disclosing at least one IFN-γ test-positive animal, generally followed a similar trend to that observed in the HRA and Edge Area: largely staying between 55 and 65%. In 2024, there was a decrease to 50%.

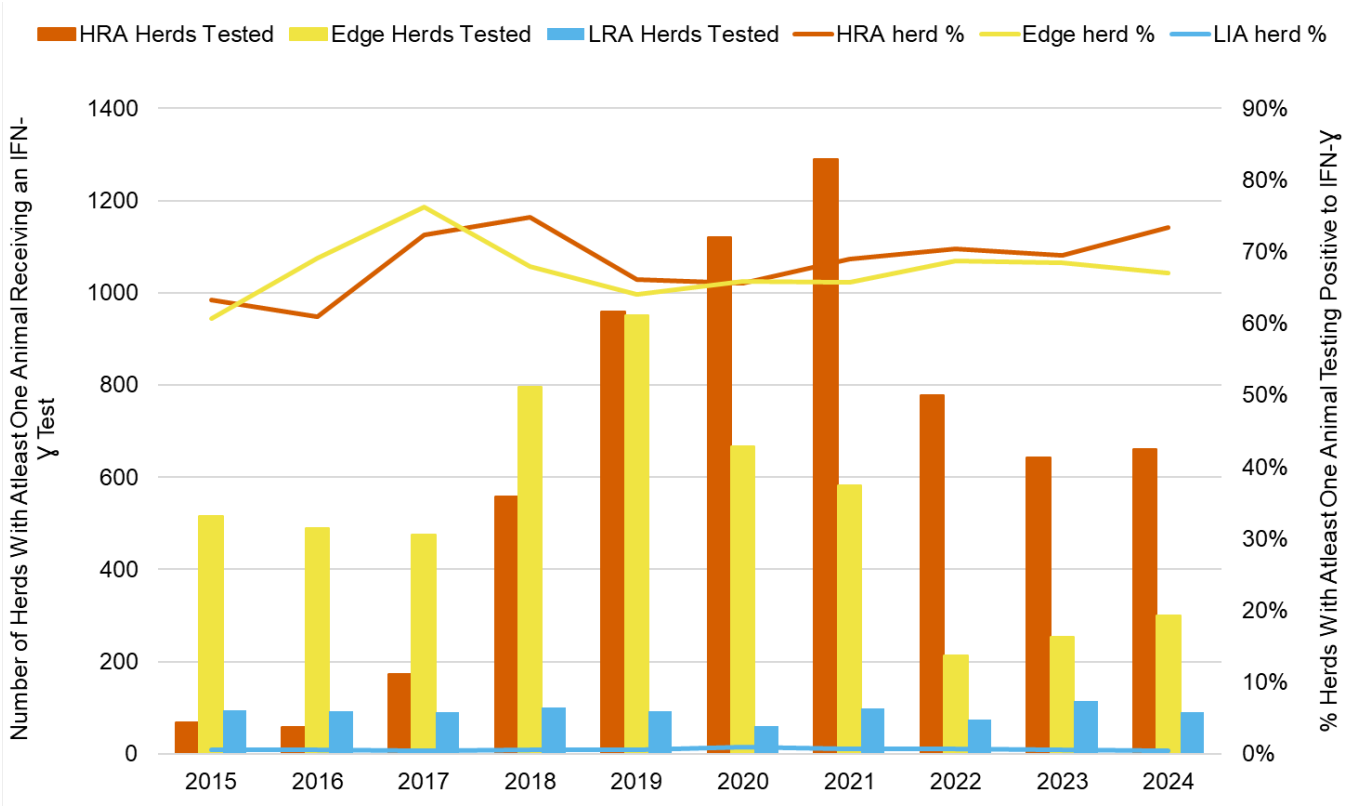

Figure 5.2 Annual number of herds subjected to IFN-γ testing and proportion of these herds with at least one test-positive animal by risk area of England, 2015 to 2024.

Figure 5.2 description: A bar chart displaying the number of herds with at least one animal receiving an IFN-γ test in each risk area for the last 10 years. The red bars represent the number of herd-level IFN-γ tests deployed in HRA, the yellow bars represent the Edge Area, and the blue bars represent the LRA. The Y axis for the number of herds tested is on the left hand side of the chart. The bar chart is superimposed with a line chart displaying the percentage of the herds tested with IFN-γ which disclosed at least one test positive animal. The red line represents the percentage of positive tests in the HRA, the yellow is for the Edge area and the blue for the LRA. The corresponding axis with the percentage of positive herds is on the right hand side of the chart.

The percentage of IFN-γ positive animals in the HRA in 2024 was 5.4%, a slight increase from 2023 (Figure 5.1). The trend in the individual counties of the HRA largely resembles the trend seen in the HRA overall: since the policy change in 2021, fewer IFN-γ tests were completed each year, but the annual percentage of positive tests has generally fluctuated between 4% and 7% (Figure 5.3). The exceptions are the HRA counties of Shropshire, Hereford and Worcester and Avon, where the number of IFN-γ tests deployed in 2022 was an increase compared to 2021. These counties had the highest percentage of OTF-W incidents and the highest percentage

of recurrent incidents and were therefore more affected by the 2021 policy change. However, from 2022 to 2024, the counties of Shropshire and Hereford and Worcester seem to be following a downward trend in the number of IFN-γ tests deployed, in line with the rest of the HRA.

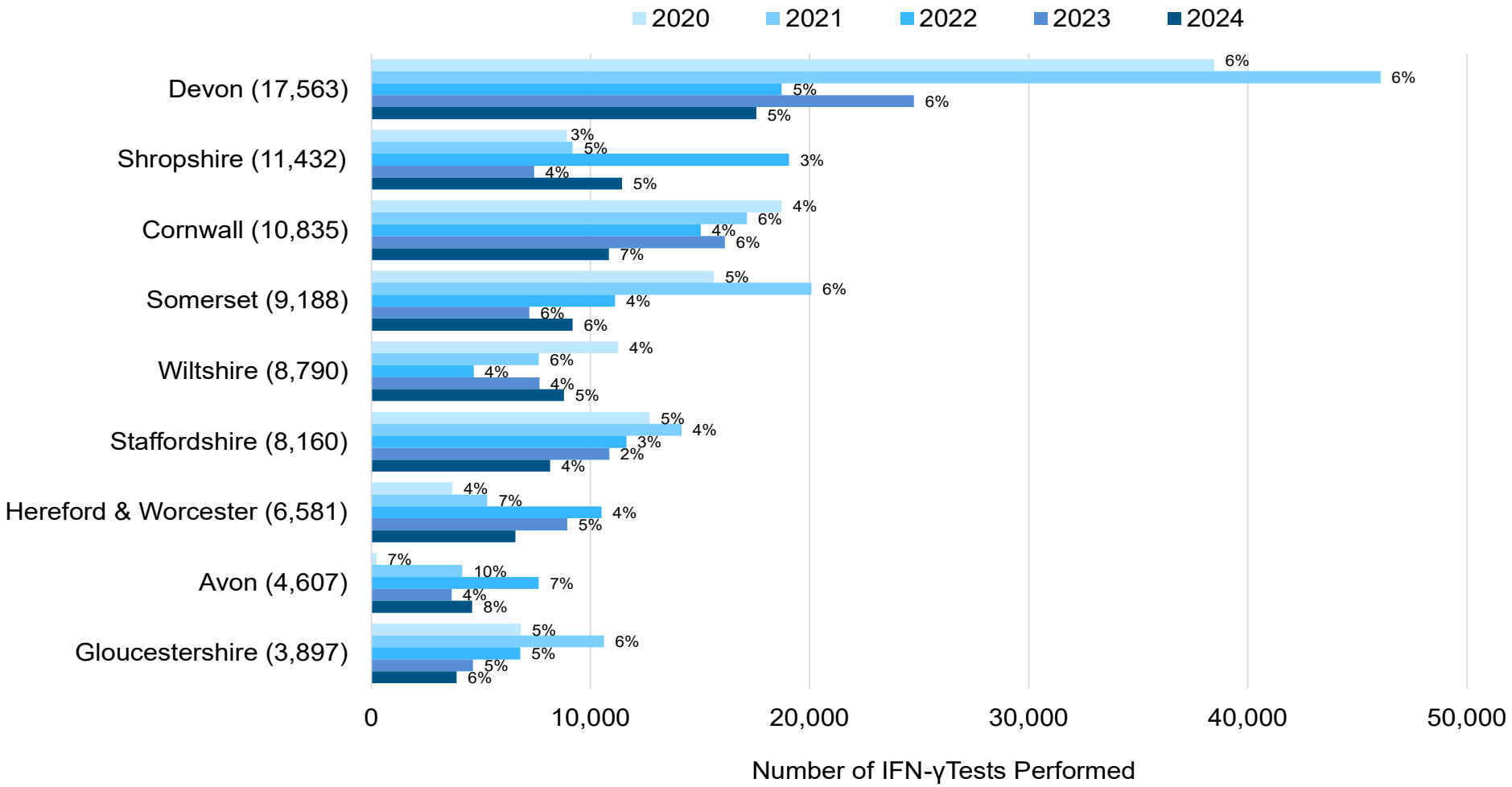

Figure 5.3 Number of IFN-γ animal tests performed per year in each HRA county between 2020 to 2024. The percentages of tests with a positive result are labelled on the chart at the end of each bar. West Midlands did not have any gamma tests between 2020 and 2024 and is not shown on the chart. The HRA counties are arranged by decreasing number of IFN-γ tests conducted in 2024 (number of IFN-γ tests in parentheses).

6.0 Spatial Epidemiology

6.1 Spatial changes in the TB epidemic

This chapter assesses the changes in the spatial distribution of endemic TB areas in England that were observed in 2024 compared to 2023 (see the Explanatory Supplement for the definition of endemic TB area and the methodology used to track its expansion and retraction over time).

All new OTF-W incidents detected over a 3-year period (2022 to 2024) were compared by overlapping pairs of years. New OTF-W incidents from 2022 and 2023 were grouped and compared to new OTF-W incidents from 2023 and 2024, to identify changes in each area. Figure 6.1.1 provides a visual depiction of changes to the endemic TB area in 2024.

Overall, the majority of the HRA remained ‘endemically’ infected in 2024, along with parts of the Edge Area, particularly where it borders the HRA, and edging further eastwards towards the LRA at 2 separate locations (HS23 in Southwest Lincolnshire, and HS30 in West Hertfordshire). There were 3 isolated endemic areas within the LRA, located in the north-east of Cumbria (HS29), central North Yorkshire and east Lincolnshire (HS28).

In the HRA, there were large areas of retraction towards the west and south Somerset, south Devon, south-east Cornwall, south-east Worcestershire, east Wiltshire and around west Herefordshire, bordering Wales, and in the south of Herefordshire into north-west Gloucestershire. By contrast, the endemic TB area expanded in south-east Somerset, east Gloucestershire and west Dorset. Smaller areas of spread were observed in north-west and central Herefordshire, north Somerset, north and south-west Cornwall and in the north and south of Devon on the edge of the endemic part of the county.

In the Edge Area, the endemic TB front retracted in parts of Cheshire, Nottinghamshire, Leicestershire, Northamptonshire and in the small endemic area in the south of East Sussex (where spread had been observed in the 2021-2022 period). However, areas of spread were seen in the north-west of Hampshire adjoining Wiltshire, eastwards within Berkshire towards the annual testing portion of the county, into the south of Oxfordshire towards the Berkshire border, to the north of Oxfordshire, north-east of Warwickshire and south-west Leicestershire. Several other areas of spread were observed within Leicestershire. Spread was seen in and around the endemic part of Leicestershire, south of HS23, and eastwards into Lincolnshire (also part of HS23).

As seen in previous years, most of the rest of England, particularly the LRA, remained free of endemic infection. Small areas of retraction were seen within the

LRA in Lancashire, on the southern end of the small endemic area in North Yorkshire, and the area of endemic TB infection in East Sussex.

In the LRA, the area of endemic TB infection in Cumbria expanded slightly around Hotspot 29 in the east of the county, in addition to a new area in the north of the county. Other areas of spread within the LRA were in Lincolnshire, to the west of Hotspot 28 in the east of the county, and to the west of the county, bordering Leicestershire (Hotspot 23). Further details on spread of the endemic TB areas can be found in the LRA and Edge Area County Reports.

In England as a whole, the area considered endemically infected had spread by approximately 2,572.24 km² in some parts, but contracted by 3,664.84 km² in other parts, resulting in a net overall retraction of 1,092.60 km^2 since 2022-2023. The net change refers to the area for which the rate of spread could be calculated, which does not include a few isolated pockets of endemic TB infection that have appeared but have not yet joined up with previous endemic areas.

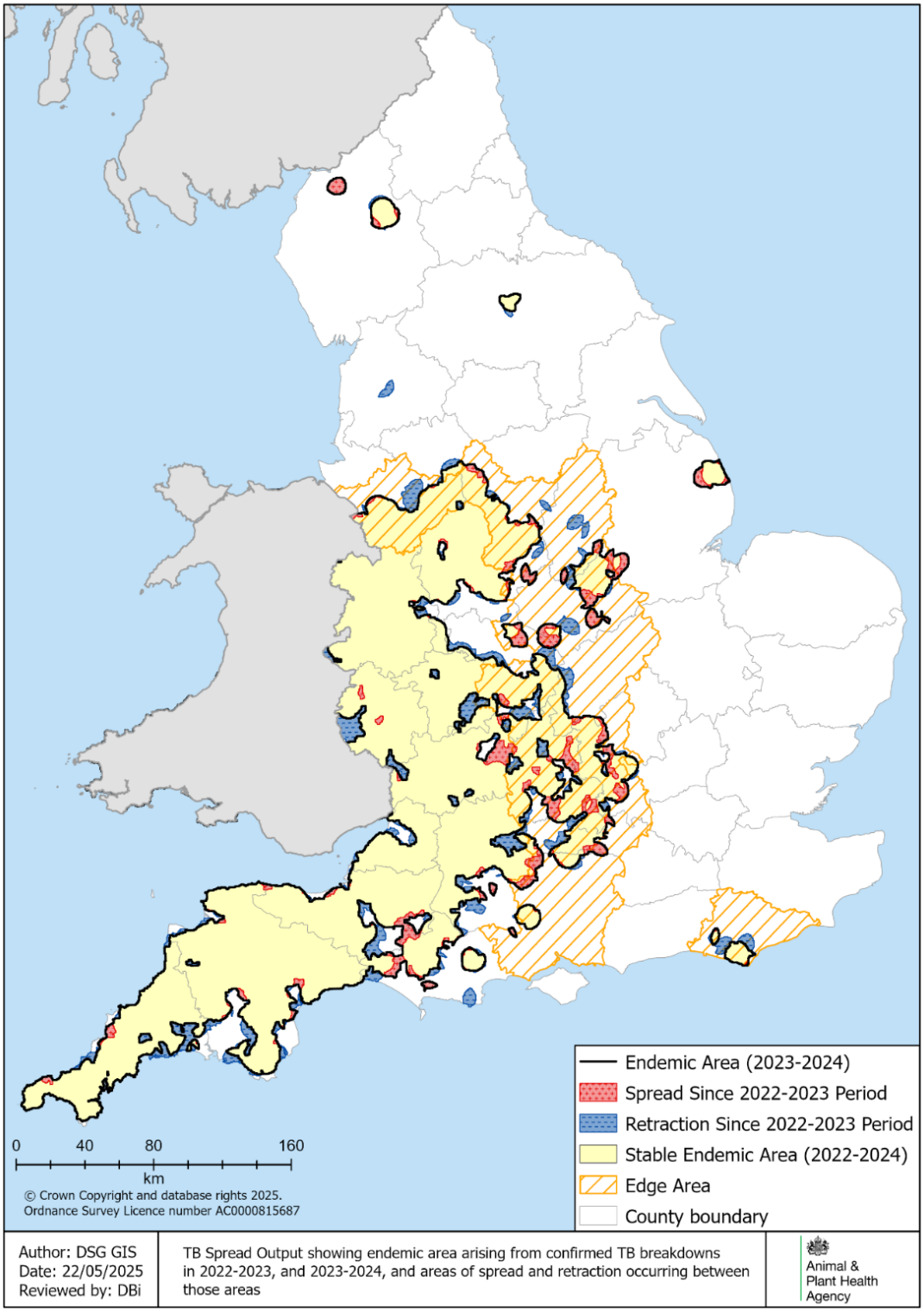

Figure 6.1.1 Spread and retraction of endemic TB areas of England in 2024 compared to 2023. A geographical unit (500 by 500 metre grid cell) was considered endemic if there were at least 3 new OTF-W incidents within a 7 km radius within a 2-year period.

6.2 New areas of endemic infection and new emerging clusters of bovine TB in the Edge Area

The Edge Area is strategically located along the front of endemic TB infection in England and as such, spread and retraction of this front often occurs within Edge Area counties. Areas of developing significance are also discussed in the Edge Area Descriptive Epidemiology Reports for 2024, which provide a greater depth of discussion at the local level. Some of those epidemiologically significant areas included:

- Berkshire: Clusters of TB incidents continued to be detected across the county. The eastern half of Berkshire, where cattle herds are tested annually, saw the highest number of new TB incidents since 2019.
- Cheshire: Clusters of TB incidents were observed in several locations across the county, which had been largely stable over the last 3 years. There was evidence of recurrent infection in one of those clusters, with WGS analysis showing close phylogenetic relationships between M. bovis isolates.
- Derbyshire: new areas of concern were identified South of Derby, and another North of Buxton on the Cheshire border.
- Oxfordshire: There were several persistent clusters of incidents in 2024, where more than one source of infection was likely to be occurring at the same time. Most new TB incidents across the county in 2024 were caused by infection with the WGS clade B6-62 of M. bovis.
- Buckinghamshire: There was a cluster of TB incidents in this county associated with clade B6-62. WGS analysis found close genetic relationships between the M. bovis isolates from those TB incidents. This cluster included TB incidents detected since 2018. This county experienced a 121% increase in new TB incidents in 2024, and the end of year prevalence doubled.
- Leicestershire: This county experienced an increase in the number of new TB incidents in 2024, reversing a general downward trend since 2020.
- Hampshire: There was a 24% increase in the number of new TB incidents in 2024 (31 versus 25 in 2023). The herd incidence rate and prevalence of TB have been increasing steadily since 2021, although remains below the average for the Edge Area overall. There is growing evidence of a new endemic area of WGS clade B6-85, with 4 incidents of this clade identified within a 4.5km radius between 2020-2024, with no known epidemiological links between incidents.

6.3 Improved epidemiological indicators of bovine TB in the Edge Area

- Cheshire: the number of new TB incidents continued to decline in 2024, for the fourth consecutive year. The percentage of OTF-W incidents decreased in 2024 compared to 2023 and remained lower than in 2018.
- Warwickshire: the number of new TB incidents continued to fall in 2024, for the fourth consecutive year.
- East Sussex: following a peak of OTF-S incidents in 2023, a 56% reduction in the total number of new TB incidents was recorded in 2024.
- Nottinghamshire: the number of new TB incidents decreased by 17% in 2024 compared to 2023, and the incidence rate was the joint lowest of the Edge area counties alongside East Sussex.
- Oxfordshire: this county observed a 12% reduction in new TB incidents in 2024 compared to 2023, and incidence also decreased to 17.2 incidents per 100 HYR. However, this was the highest incidence rate of the 11 Edge Area counties, and higher than the HRA overall (13.6 incidents per 100 HYR).

6.4 New areas of endemic infection and new emerging clusters of bovine TB in the LRA

Areas of developing epidemiological significance in the LRA are also discussed in the LRA Descriptive Epidemiology Reports for 2024, which provide a greater depth of discussion at the local level. Some of the highlighted areas of significance include:

- Lincolnshire: The main concern in Lincolnshire continued to be the 2 active hotspots (HS23 and HS28), with HS28 showing a worsening disease picture in 2024. The geographic area of endemic M. bovis infection associated with this hotspot expanded in 2023-2024 relative to 2022-2023.
- Cumbria: The total number of incidents in Cumbria increased by 129% compared to the previous year, driven by a marked increase in OTF-S incidents, which more than tripled from 9 to 28. There were 7 more incidents in HS29 and 9 more incidents in the south of the county in 2024 compared to 2023. Areas of spread were observed to the West of Carlisle and to the east and south-west of the endemic part of the county.
- Lancashire: There was a cluster of one OTF-W (but M. bovis culture-negative) and 4 OTF-S incidents in the north of Lancashire towards the border with Cumbria. This could be an extension of the area of concern in south Cumbria where there was one new OTF-W incident and 5 new OTF-S incidents in 2024.

6.5 Improved epidemiological indicators of bovine TB in the LRA

- South East: Overall, disease incidence remained low within the South East region of the LRA, with a reduction of 44% in new TB incidents observed in 2024 compared to 2023.
- Yorkshire and Humberside observed a 51% decrease in new TB incidents from 39 to 19 in 2024, the lowest number in the last 10 years. There were however a cluster of 7 ongoing OTF-W and 3 new OTF-S incidents in Central North Yorkshire, an area under high infection pressure from purchased cattle.
- Hotspots 24, 26 and 27 in West Sussex, South Cumbria and the Lancashire-North Yorkshire border, respectively, were all closed in 2024 due to the absence of, or a marked reduction in, new TB incidents in these areas

7.0 Whole genome sequencing clades

APHA attempts to recover M. bovis from all new TB incidents and to submit at least one isolate per PCR and culture-positive incident for WGS. In 2024, 401 isolates were the result of additional WGS testing, where multiple isolates from a single incident had WGS data available.

A clade is a group of genetically related isolates, based on similarities between their whole genome sequences. The combination of infected herd location and clade detection frequency can be used to describe areas where particular clades are commonly isolated (or endemic), known as ‘homeranges’. The homeranges of WGS clades can be found in the GB Data Report.

From incidents which began in 2024, there were 1,318 isolates with a WGS clade across 889 incidents, accounting for 28 different WGS clades. Of the 1,302 isolates with a clade which has a calculated homerange, 80.0% (1,041) were within homerange.

The most frequently detected clades were B6-11, B6-85 and B3-11, of which a large percentage (greater than 85%) were detected within the usual homerange for these clades (Table 7.1). WGS clade B6-62 also had a high number of isolates detected, but a lower proportion of these (65.2%) were within homerange, suggesting potential geographical spread of this clade. Notably, clades B6-52, B6-14, B6-16 and B6-22 had a low proportion of isolates identified within homerange (less than or equal to 50%), however the number of isolates per clade was small (fewer or equal to 15 isolates).

Seven clades (16 isolates) were detected which did not have a homerange in England, these included: B6-12, B6-41, B6-84, B6-31, B6-21, B6-23, B5-11 and B6-86, all of which had between one and 5 isolates detected.

Table 7.1 Whole genome sequence (WGS) clades of M. bovis detected in incidents which were disclosed in 2024. Please note this includes 28 isolates for which the WGS clade was identified in 2025.

WGS clade	No. of samples	No. of samples in homerange	No of samples outside of homerange	Percentage of samples within homerange
B6-11	274	233	41	85.0
B6-85	247	214	33	86.6
B3-11	230	198	32	86.1
B6-62	204	133	71	65.2
B4-11	50	44	6	88.0
B6-83	42	36	6	85.7
B6-51	42	34	8	81.0
B1-11	36	29	7	80.6
B6-13	27	22	5	81.5
B6-42	24	22	2	91.7
B2-11	21	17	4	81.0
B6-87	19	15	4	78.9
B6-15	17	9	8	52.9
B6-91	15	11	4	73.3
B6-52	15	6	9	40.0
B6-14	14	0	14	0.0
B6-82	11	8	3	72.7
B6-71	6	6	0	100.0
B6-16	4	1	3	25.0
B6-22	2	1	1	50.0
B6-12	2	2	0	100.0
Other (clades without a homerange)	16	-	-	-
Total	1,318	1,041	277	-

8.0 Source attribution

8.1 Disease Report Forms in the HRA

In 2024, 363 out of 1,903 new TB incidents in the HRA (19%) received a preliminary or final APHA veterinary investigation (Disease Report Form or 'DRF') to identify the source of infection (Table 8.1).

Up to 3 hazards and risk pathways were selected for each incident investigated. Each of these potential sources were given a score that reflects the likelihood of that pathway bringing TB into the herd, based on the available evidence (possible, likely, most likely or definite). Details of the protocol used for these investigations, and the subsequent methodology used to calculate the weighted contribution of the different suspected sources of M. bovis infection can be found in the Explanatory supplement.

It is important to note that not all incidents in 2024 received a veterinary investigation, and therefore these results may not be representative of all incidents in each county, particularly in those counties with a low proportion of DRFs completed.

The main risk pathway identified across all HRA counties during veterinary investigations was via potential exposure to infected badgers, accounting for a weighted contribution of between 37.1% (Devon) and 67.2% (Shropshire).

Infection from other infected wildlife (mostly wild deer) also featured consistently in veterinary investigations, although this ranged widely from 4.8% (Staffordshire) to 23.8% (Devon).

The movement of undetected, infected cattle had a high weighted contribution in Staffordshire (24.1%) and Dorset (19.6%), compared to just 2.4% in Wiltshire.

Residual cattle infection had a relatively high weighted contribution of above 10% for 8 of the 11 counties, with the highest in Somerset (23.5%). In contrast, residual cattle infection had a low weighted contribution in Cornwall, at just 2.5%. Interestingly, Cornwall had a higher percentage of recurrent herd incidents (incident herds in 2024 which also experienced a previous incident in the last 3 years) than Somerset (62% versus 55% respectively), although recurrence was high in both counties. Recurrent herd incidents can occur due to a number of factors which includes residual infection, exposure to infected wildlife, poor biosecurity and high risk trading practices, amongst others.

Contiguous cattle infection had a very low weighted contribution across all HRA counties, with a maximum weighted contribution of 1.9% (Staffordshire). Very few veterinary investigations in 2024 identified exposure to fomites or domestic animals as possible infection pathways. Other or unknown sources had a weighted contribution of between 1.9% (Staffordshire) and 23.6% (Hereford and Worcester). Other or unknown sources can be added to those incidents in which there was high uncertainty around the selected pathways.

Table 8.1 The weighted contributed of suspected sources of M. bovis infection for new TB incidents in the HRA in 2024 from Disease Report Forms completed during veterinary investigations. West Midlands did not have any veterinary investigations carried out in 2024 and is therefore not featured.

County	Badgers	Cattle movement	Contiguous	Residual cattle infection	Domestic animals	Non-specific reactor	Fomites	Other wildlife	Other or unknown source	No. of DRFs completed (% of all new incidents in 2024)
Avon	51.2%	6.9%	0.0%	7.9%	0.0%	0.9%	0.0%	14.6%	18.5%	18 (20%)
Cornwall	62.3%	7.6%	0.2%	2.5%	0.0%	0.0%	0.0%	11.3%	16.2%	74 (30%)
Devon	37.1%	12.2%	1.5%	13.9%	0.0%	0.0%	0.5%	23.8%	11.0%	70 (13%)
Dorset	40.6%	19.6%	0.0%	18.8%	0.0%	0.0%	0.0%	15.3%	5.8%	23 (24%)
Gloucestershire	47.6%	10.8%	0.0%	18.4%	0.0%	1.5%	0.0%	13.3%	8.3%	20 (16%)
Hereford and Worcester	39.8%	8.3%	0.8%	11.8%	0.0%	0.0%	0.0%	15.6%	23.6%	12 (8%)
Shropshire	67.2%	6.5%	0.4%	10.9%	0.0%	1.9%	0.3%	5.9%	6.8%	27 (14%)
Somerset	38.5%	13.4%	0.8%	23.5%	0.0%	0.3%	0.0%	11.4%	12.0%	36 (19%)
Staffordshire	54.1%	24.1%	1.9%	11.2%	0.3%	1.6%	0.0%	4.8%	1.9%	51 (34%)
Wiltshire	51.7%	2.4%	0.0%	15.4%	0.0%	1.0%	0.0%	15.5%	14.1%	32 (26%)

8.2 Data driven methods

8.2.1 Methodology

Data-driven methods to quantify the likelihood of different risk pathways for M. bovis infection in each TB incident herd have been developed by APHA to provide insights into the drivers for TB at the county and risk area level. These methods include:

- The Cattle Movement Algorithm (CMA), which scores cattle movements into TB incident herds from negligible to very high likelihood of carrying infection, based on movement origin, frequency, animal, and herd TB histories. Movements are classified as local (less than or equal to 25km) or non-local (greater than 25km).
- The WGS Local Transmission Indicator, which identifies local transmission events using M. bovis whole genome sequencing (WGS) data, when available. A 'local' transmission event is defined by the presence of another M. bovis isolate with less than or equal to 3 SNP differences, within 4 years before or 6 months after the incident, on another holding within 9km of the incident herd of interest.

Whilst cattle movement data can be extracted for every herd from the Cattle Tracing System, WGS data are only available for OTF-W incidents (and in rare instances OTF-S incidents) where M. bovis has successfully been isolated in bacteriological culture and the resulting genetic sequence was of a sufficient quality for analysis (888 of the 1065 OTF-W incidents newly detected in England in 2024). Therefore, the attribution of likely infection pathways for OTF-S incidents, and for OTF-W incidents without WGS data, were analysed using the CMA alone.

A full description of the methodology can be found in the Explanatory Supplement to the annual reports 2024. There was a minor update to the methodology for the CMA in 2024. A visual representation of the process is displayed in Figure 8.2.1.

There is always a variable degree of uncertainty about the estimated true routes of TB infection into a herd. The absence of a local transmission of infection event or cattle movements associated with a high likelihood of infection does not completely negate these pathways. Nonetheless, the combined evidence from cattle movement and WGS data can provide valuable insights into the possible risk pathways at a county and risk area level, as well as to the investigating APHA veterinarian at herd level.

Tables 10.1.1 to 10.1.3 in Appendix 1 display the source attribution results, derived using one or both of the data-driven methods described above, for each new TB incident in England in 2024, by risk area and county.

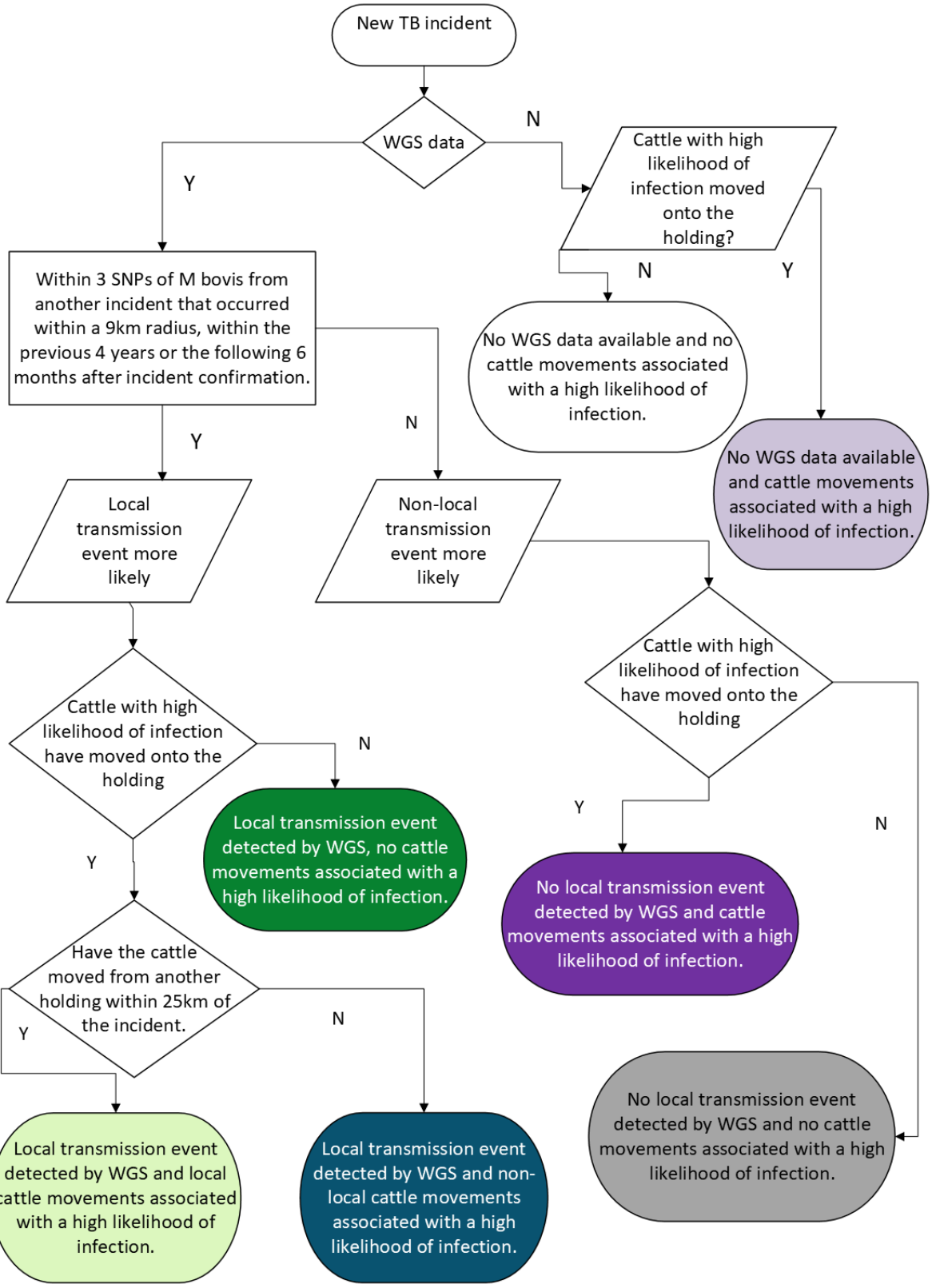

Figure 8.2.1: Diagram detailing the steps involved in source attribution for each new TB incident. The 7 possible outcomes of the analysis (source attribution categories) are displayed within ‘capsule’ shapes. The colours correspond to those in the pie charts of figure 8.2.2.

8.2.2 Results of OTF-W incidents

Of the 2,488 new TB incidents in England in 2024, 1065 (43%) were OTF-W, of which 888 (83.3%) had WGS data available. This applied to 674 new TB incidents in the HRA (35.4% of all HRA incidents), 185 in the Edge Area (40.0% of all Edge area incidents) and 29 in the LRA (23.6% of all LRA incidents).

The largest proportion of new TB incidents in the HRA (40.1%) and Edge Area (37.9%), and the joint-largest proportion in the LRA (27.0%) in 2024 had a local transmission event detected by WGS, and no cattle movements associated with a high likelihood of infection (Figure 8.2.2, dark green segments). This would suggest that for these incidents there was a local source of M. bovis infection which was not cattle movement related, for example:

- contiguous herds via nose-to-nose contact
- residual infection in the herd from a previous TB incident
- contact with infected wildlife
- fomites from shared equipment
- or some combination of these events.

The absence of high-risk cattle movements, however, does not completely negate this pathway of infection.

The second largest proportion of the incidents in the HRA (28.1%) and Edge Area (22.8%) and the joint-largest proportion of incidents in the LRA (27.0%) had no local transmission event detected by WGS, and no cattle movements associated with a high likelihood of infection (Figure 8.2.2, grey segment). For these incidents, there is no evidence to suggest that a local transmission event has taken place, and given that no cattle movements were associated with a high likelihood of infection, the source of infection remains unclear.

The third largest proportion of incidents with WGS data in all 3 risk areas in 2024 (10.2% of OTF-W incidents in the HRA, 11.2% in the Edge Area and 21.6% in the LRA) represented those in which no local transmission event was detected by WGS, and both local and non-local cattle movements associated with a high likelihood of infection were identified (Figure 8.2.2 dark purple segment). For these incidents, the movement of undetected infected cattle from outside the local area was considered the most likely source of infection, however local cattle movements cannot be ruled out.

A smaller proportion of incidents (5.4% of OTF-W incidents in the HRA, 9.4% in the Edge Area 9.4% and 2.7% in the LRA) had a local transmission event detected by WGS, in addition to cattle movements associated with a high likelihood of infection (Figure 8.2.2, light green segment). For these incidents there is strong evidence of a local transmission event, either via the movement of undetected, infected animals, or potentially another local source as described above.

The smallest proportion of incidents with WGS data in all 3 risk areas in 2024 (0.1% in the HRA, 1.3% in the Edge Area and 0% in the LRA) had a local transmission event detected by WGS, and non-local cattle movements associated with a high likelihood of infection (Figure 8.2.2, dark blue segment). For these incidents a local source of infection is indicated, however non-local movements of undetected, infected cattle cannot be ruled out.

The remaining OTF-W incidents did not have any WGS data available to assess the evidence of M. bovis transmission from a local reservoir of infection. However, information from the CMA could be used to determine the cattle movement history of the incident herd.

The third highest proportion of incidents in the HRA (13.9%) and Edge Area (15.2%), and the fourth highest proportion in the LRA (16.2%) had no WGS available, and the CMA identified no cattle movements associated with a high likelihood of infection (Figure 8.2.2, white segment). The source of infection for these incidents is therefore unknown.

On the other hand, a small proportion of OTF-W incidents in the HRA (2.1%), Edge Area (1.8%) and LRA (5.4%) had no WGS data available, but the CMA identified cattle movements with a high likelihood of infection (Figure 8.2.2, lilac segment). For these incidents, the source of infection is likely due to the movement of undetected, infected cattle from either within or outside the local area.

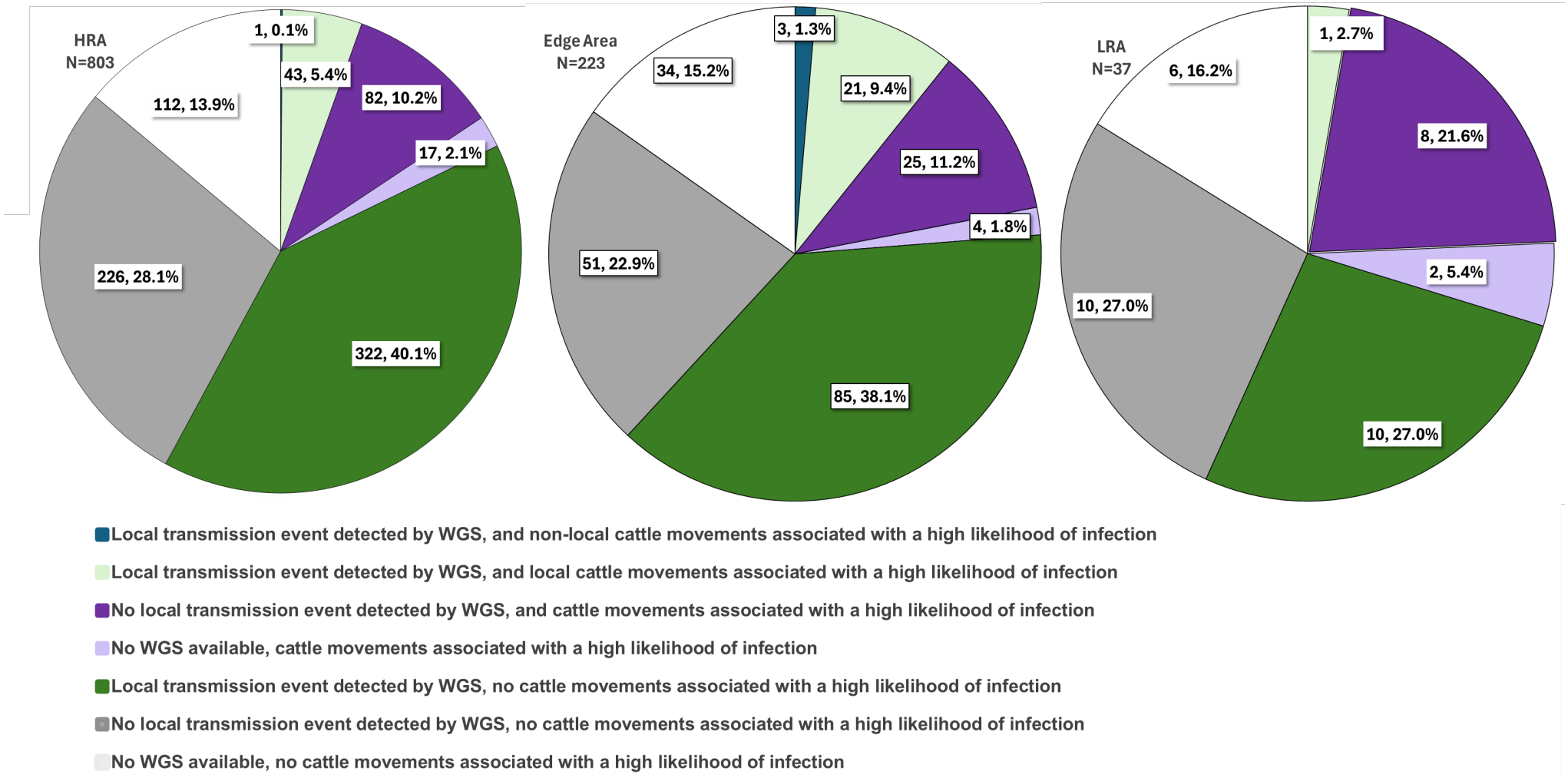

Figure 8.2.2 Pie charts showing the risk pathway combinations identified by the WGS local transmission event indicator and cattle movement algorithm for all new OTF-W TB incidents in 2024. Segments are labelled with the number of incidents per category and the percentage of the total number of incidents per risk area.

8.2.3 Results of OTF-S incidents

Over half of the new TB incidents disclosed in England in 2024 were OTF-S (1,421 incidents, 57%). Of these, 1,097 (77%) were in the HRA, 238 (17%) were in the Edge Area and 86 (6%) were in the LRA. In the absence of WGS data, the cattle movement history of these incident herds was assessed using the CMA to determine the likelihood of cattle movements being the source of TB infection.

Across the 3 risk areas the proportion of OTF-S incidents that had cattle movements associated with a high likelihood of infection was low. In the HRA, 114 OTF-S incidents (10%) had cattle movements associated with a high likelihood of infection, which was similar to the Edge Area (24 incidents, 10%). The proportion was also similar in the LRA (11 incidents, 13%). For these incidents, the source of infection is likely due to the movement of undetected, infected cattle from either within or outside the local area.

A larger proportion of OTF-S incidents had no cattle movements associated with a high likelihood of infection, ranging from 90% in the HRA and Edge Area, to 87% in the LRA. For these incidents in the source of infection is unknown.

9.0 Risk factors for TB herd incidents

Four key factors (herd size, herd type, risk area and TB history) were explored for their association with the risk of a herd having a new TB incident in England in 2024, the duration of incidents ending in 2024, and the risk of a herd experiencing a recurrent incident.

9.1 Risk factors associated with the duration of TB incidents

In the HRA and Edge Area, as duration of TB incidents (which ended in 2024) increased, the proportion of larger herds within the longer duration incident categories also increased (Figure 9.1.1). In the LRA, the association between longer incident duration and larger herd size was not as linear; the small and medium-sized cattle herds were the most dominant in the first 3 duration categories (up to 240 days). However, it is worth noting the overall small number of incidents in the LRA relative to the HRA and Edge Area.

Notably, in 2023 there were no herds with greater than 200 cattle in the HRA or Edge Area with a TB incident that was resolved in under 100 days. By contrast in 2024, approximately 10% of incidents in the HRA and 15% of incidents in the Edge Area with a duration of up to 100 days were herds with greater than 200 animals.

Persistent herd incidents are defined as those lasting more than 550 days. As shown in Figure 9.1.1, the predominant herd size in this category were those with more than 200 cattle across all risk areas.

The effect of herd size on incident duration could be explained by difficulties in removing all the infected animals in larger herds due to limitations in the sensitivity of antemortem diagnostic tests, the increased opportunity for cattle to cattle transmission in large herds, as well as the potential for more cattle contacts with local sources of infection on the farm or in neighbouring herds.

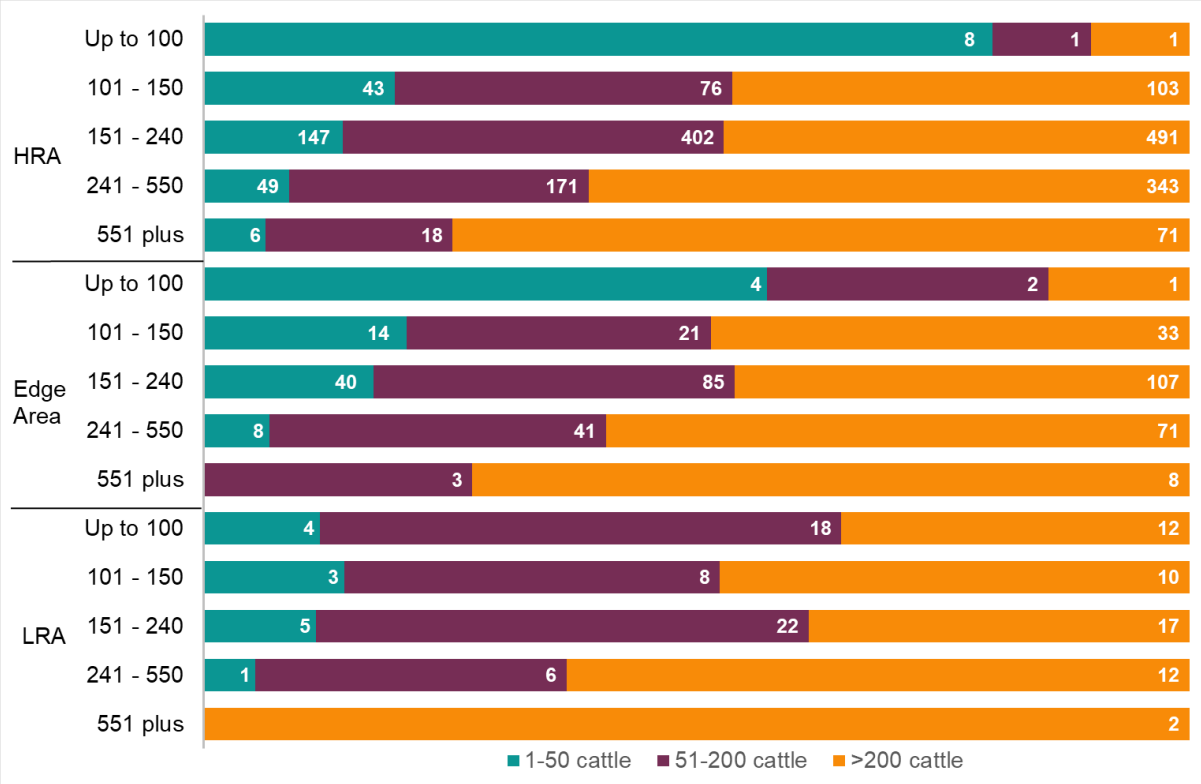

Figure 9.1.1 Comparative duration of TB incidents (in days) that ended in 2024, by risk area and herd size.

Figure 9.1.1 description: A stacked bar chart showing the duration of TB incidents that ended in 2024 by risk area and herd size. Small herds of one to 50 cattle are represented by the light green bars; medium size herds of 51 to 200 cattle are represented by the purple bars and large herds of greater than 200 cattle are represented by the orange bars. The labels within each bar represent the number of TB incidents which ended in 2024 in each herd size category per risk area, and the length of each bar is proportional to the percentage of herds in each size category for each combination of incident duration range and bovine TB risk area. Ten incidents which closed in 2024 in AFUs and LFUs were excluded.

9.2 Risk factors associated with incidence rate

Similarly to the duration of TB incidents, as herd size increased, the incidence rate of a new TB incident in 2024 also increased. The largest herds, with over 300 cattle, had an incidence rate of 23.9 new TB incidents per 100 HYR in 2024. In comparison, for herds with fewer than 50 cattle, the incidence rate was between 1.2 and 2.8 new TB incidents per 100 HYR. Herds in the HRA experienced approximately twice as many TB incidents per 100 HYR compared to those in the Edge Area (13.6 versus 7.3, respectively), and over 13 times more than those in the LRA (1.0 per 100 HYR) (Figure 9.2.1).

Dairy herds experienced a higher rate of new TB incidents in 2024 (17.0 per 100 HYR) in comparison to beef (5.2 per 100 HYR) or other herd types (2.4 per 100 HYR). Dairy herds tend to be larger than beef herds and are more often situated in the west of England, within the HRA.

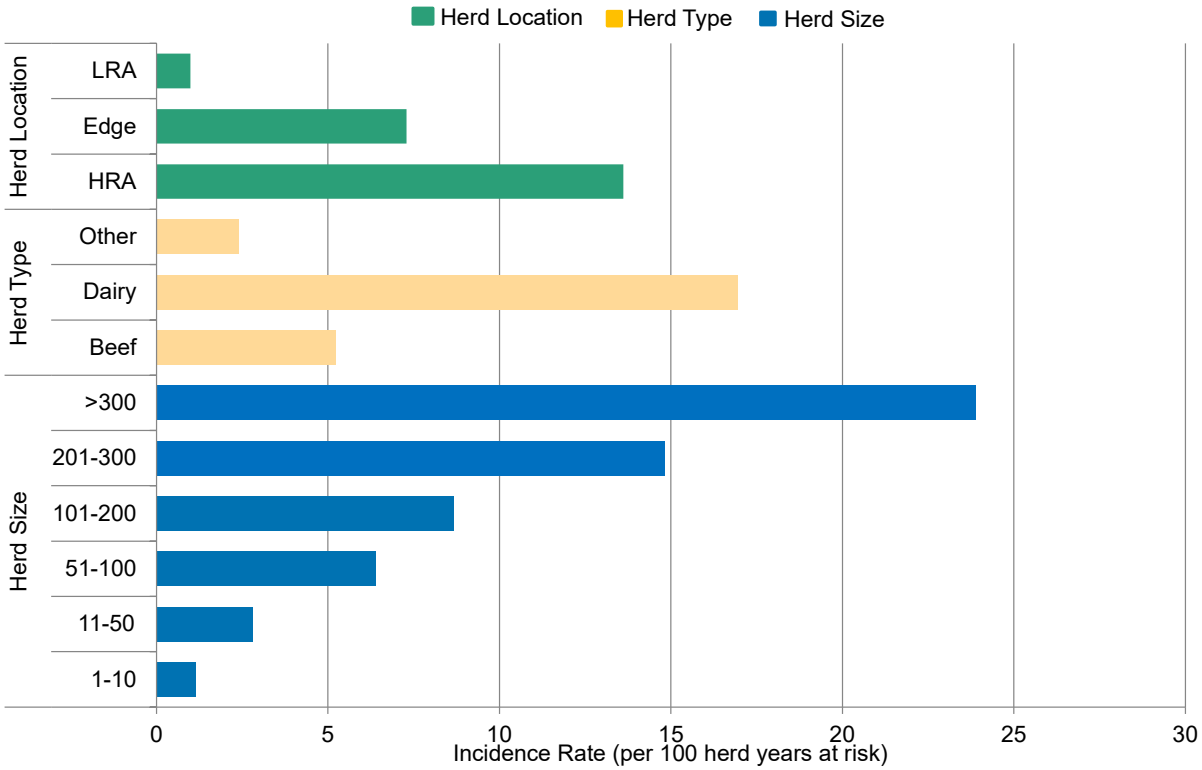

Figure 9.2.1 Incidence rates (unadjusted) for new TB incidents in herds of different size and type, in each risk area of England in 2024.

Figure 9.2.1 description: Bar chart showing the unadjusted incidence rates for new TB incidents in herds of different size and production type, in each risk area of England in 2024. As herd size increased, the incident rate also increased, suggesting that larger herds are at an increased risk of TB. As expected, herds located in the HRA had a higher incidence rate compared to the Edge Area and LRA. Dairy herds had the highest incidence rate compared to beef and 'other' herds. For a

description of the holding types included in the ‘other’ category, please see the E 2024.

The effects of herd size, type and location were further explored by comparing incident rate ratios (IRR), which describe the comparative proportion of herds in each category that experience a TB incident (Figure 9.2.2). As expected in 2024, herds in the LRA were nearly 95% less likely to experience a new TB incident in 2024 (unadjusted IRR = 0.05, 95% confidence interval (CI) 0.05 to 0.07) compared to herds in the HRA. Herds in the Edge Area were nearly 50% less likely to experience a new TB incident in 2024 (unadjusted IRR = 0.52, 95% CI 0.47 to 0.58) than herds in the HRA (Figure 9.2.2). When adjusted for herd size and herd type, there was little difference between the unadjusted and adjusted IRR, suggesting that these factors did not influence the association between incidence and herd location.

As herd size increased, the IRR also increased. Herds containing 11-50 cattle were about 90% less likely to experience a new TB incident in 2024 compared to herds with >300 cattle (unadjusted IRR = 0.12, 95% CI 0.10 to 0.13, p<0.001). Again, adjusting for herd type and risk area did not significantly alter the IRR, suggesting that these risk factors did not modify the association between herd size and TB risk.

In comparison to beef herds, dairy herds were nearly 4 times more likely to experience a new TB incident in 2024 (unadjusted IRR 3.8, 95% CI 3.5 to 4.0). By contrast, when adjusted for risk area and herd size, the IRR for dairy herds was reduced to 1.50, although it was still significantly higher than for beef herds (95% CI 1.37-1.64, p<0.001). This suggests that although dairy herds tend to be larger than beef herds, and are more commonly found in the HRA, there are other characteristics of dairy herds which place them at a higher risk of a new TB incident. Herds categorised as Other were approximately 50% less likely to experience a new TB incident in 2024, compared to beef herds (unadjusted IRR 0.47, 95% CI 0.29-0.78, p<0.001).

There was also a substantial population of cattle in the north of England that remained largely uninfected. Other factors, not explored in this report, are important in the epidemiology of TB in cattle herds, such as the existing prevalence of infection in the local cattle population, the presence of a local reservoir of M. bovis infection in wildlife (particularly badgers), the extent of shared farm boundaries and the potential for the herd to be infected by fomites (Broughan et al. 2016).

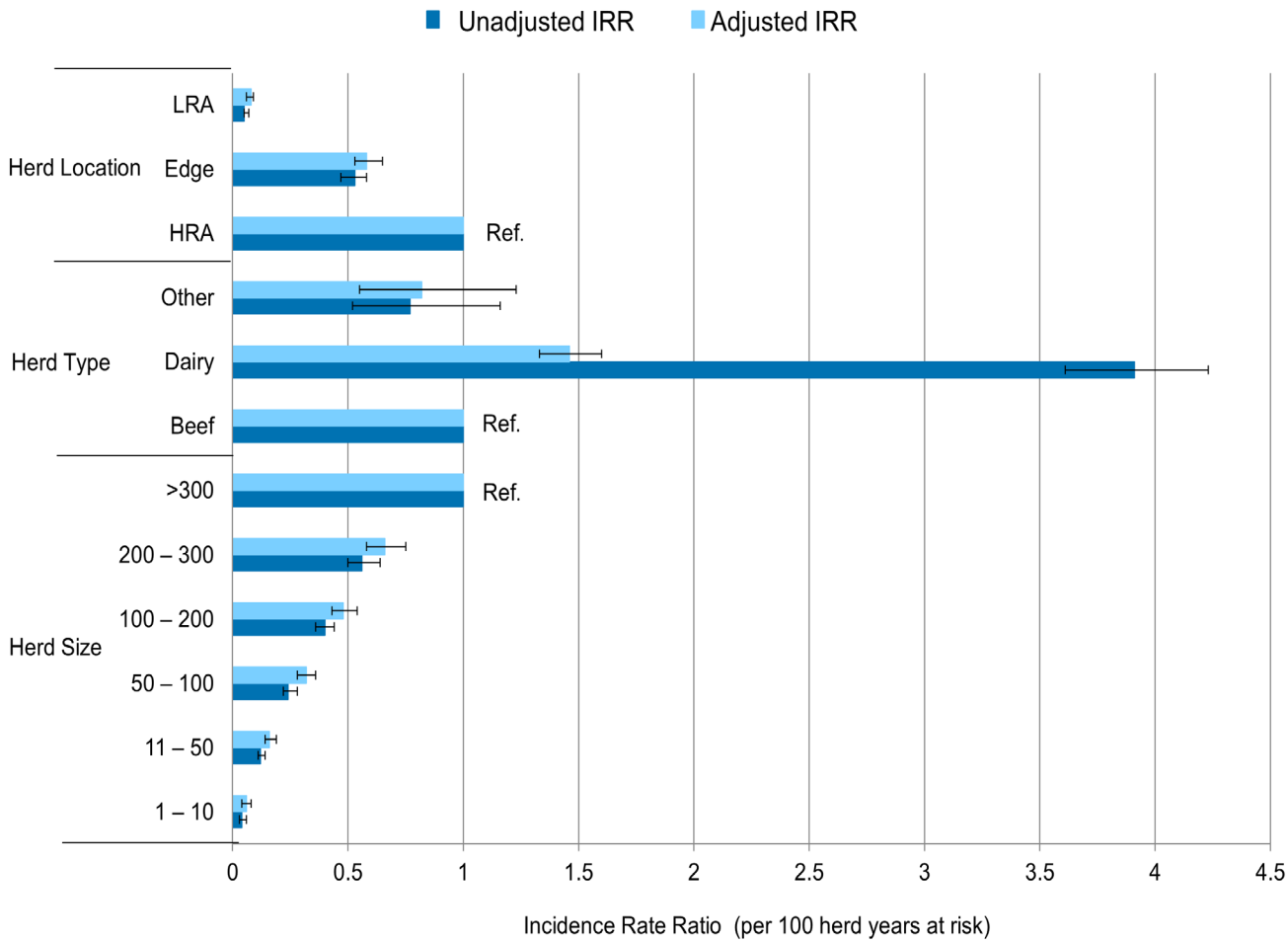

Figure 9.2.2 Incident Rate Ratios (IRR; Unadjusted and Adjusted) for new TB incidents (OTF-W and OTF-S) in herds of different size and type, by risk area of England in 2024. The “Ref” acronym refers to the reference category used when calculating the IRR. Error bars shown represent the 95% confidence interval for the IRR.

Figure 9.2.2 description: Bar chart displaying the results of a Poisson regression model, where the Incidence rate ratio (IRR) is calculated relative to a reference category. This output of the model is unadjusted and is represented by the dark blue bars. The results of the adjusted model are represented by the light blue bars. The adjusted model shows that even after taking account of herd size and location, dairy herds in England are 49% more likely to have a TB incident compared to beef herds (adjusted IRR= 1.49, 95% CI 1.37-1.64, p<0.001). The Poisson regression analysis used to calculate the IRRs used aggregated time-at-risk data which aggregates the risk for herds that have had multiple whole herd tests in each year. The time at risk (denominator) is slightly higher overall for the aggregated dataset (Figure 9.2.2) than the non-aggregated dataset (Figure 9.2.1). This results in slightly lower incidence rates. For more details about the Poisson analysis, see the Explanatory supplement. Tabulated data can be found in the GB Data Report.

9.3 Risk factors associated with the recurrence of TB incidents

History of TB infection in a herd was also an important risk factor for a new TB incident in 2024, in all risk areas. Herds with a new TB incident starting in 2024 were examined to determine what proportion had sustained another TB incident in the 3 years prior to the disclosing test, categorised by herd production type (referred to as 'backward looking' recurrence) (Figure 9.3.1).

For beef and 'other' herds across the 3 risk areas of the herds experiencing a new TB incident in 2024, a larger proportion did not have a history of TB in the previous 3 years. On the other hand, a greater proportion of dairy herds with new incidents in the HRA and Edge Area had experienced another TB incident in the previous 3 years (classified as recurrent), compared to those which did not. In contrast, in the LRA a smaller proportion of dairy herds with a new TB incident in 2024 were recurrent.

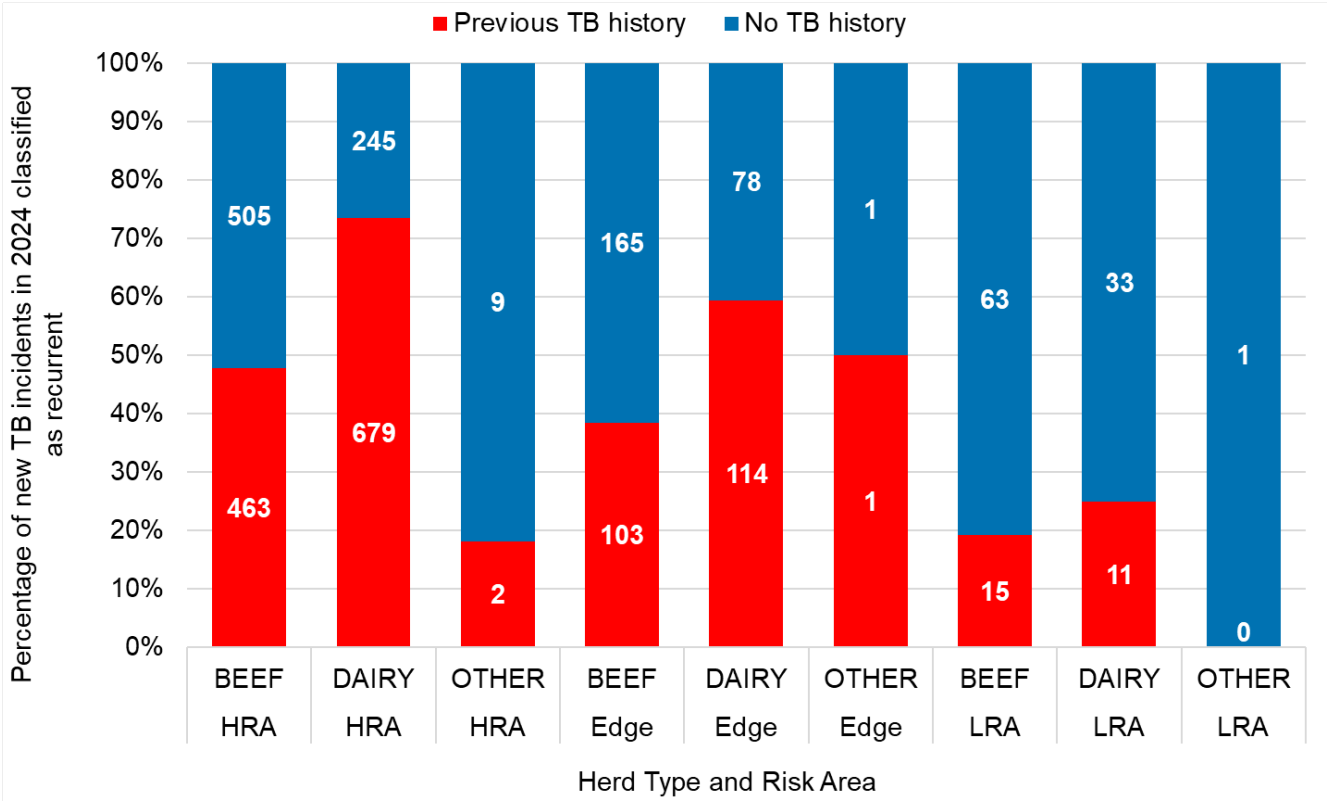

Figure 9.3.1 Percentage of herds that sustained a new TB incident in 2024 with and without a history of TB in the previous 3 years of the disclosing test, by risk area and herd type in England.

Multivariable logistic regression models were used to determine if previous TB incidents increased the odds of a herd experiencing a new TB incident in 2024 (referred to as ‘forward looking’ recurrence). Each regression model was adjusted for 3 risk factors (herd size, type and risk area location) (Figure 9.3.2). An interaction term was included between the risk factor (risk area, herd type or herd size) and whether the herd, which previously experienced a TB incident, had a new incident in 2024. The interaction term was used to understand the relationship between each risk factor and recurrence. The model outputs from each interaction term are shown in Figure 9.3.2.

In 2024, herds in the HRA with a history of TB in the previous 3 years had odds of a new TB incident 2.4 times higher than herds with no history of TB (odds ratio (OR) 2.4, 95% CI: 2.1-2.6, $p<0.001$). Similarly, herds with a history of TB in the Edge Area had odds of a new TB incident in 2024 nearly 3 times (OR 2.8, 95% CI 2.3-3.5, $p<0.001$) higher compared to those without a history of TB in the previous 3 years.

In the LRA this relationship was more pronounced. Herds with a history of TB in the previous 3 years had odds of a new TB incident in 2024 nearly 9 times (OR 8.7, 95% CI: 5.5-13.7, $p<0.001$) higher compared to herds without a history of TB in the previous 3 years. This may be partially explained by the presence of several TB hotspots declared in the LRA with evidence of infected wildlife involvement.

Enhanced TB surveillance in these areas and in other high-risk herds, for example large beef finishing units regularly purchasing cattle from TB endemic areas, means that a relatively small proportion of LRA herds were tested more frequently, due to their greater risk of TB infection. These herds generated most of the TB incidents in the LRA and, due to a more frequent testing regime, had naturally higher odds of a recurrent incident. Most other herds outside of these designated hotspot areas in the LRA would not have been exposed to the same force of infection from local cattle herds and wildlife reservoirs (badgers or deer) as those in the hotspot areas. Also, most of the herds outside of the hotspot areas would have had less opportunity for the detection of TB infection due to the 4-yearly testing policy and so recurrent incidents are less likely to occur in these herds.

The odds of a recurrent herd incident in the HRA have been stable over the last 4 reporting years, increasing only slightly from 1.7 (95% CI: 1.6-2.0) in 2021. In the Edge Area, the odds of recurrence in 2024 decreased compared to 2023 (OR 3.2, 95% CI: 2.6-3.9). The odds of recurrence in the LRA in 2024 was similar to 2023 (8.7 in 2023, 95% CI: 5.6-13.6) but has been steadily increasing since 2021.

The odds ratio for recurrence in herds with a TB history in the previous 3 years compared to herds without a TB history in the previous 3 years was similar between herd size categories, herd type and the HRA and Edge Area. The 95% confidence intervals for all categories of herd size, herd type and the HRA and Edge Area

overlap, suggesting that in 2024 the odds of a recurrent incident in herds with a history of TB in the previous 3 years was similar for all herds regardless of size, type and being located in either the HRA or the Edge Area. Therefore, only herds in the LRA with a history of TB had a significantly increased odds of a recurrent incident in 2024.

The effect of history of a previous OTF-W incident in the preceding 3 years on recurrence of a new incident in 2024 was also examined using logistic regression (results shown in Appendix 2 Table 10.1.4). The interaction of previous OTF-W history, with herd location, herd type and herd size on the odds of recurrence, remained broadly the same as the analysis including all incidents, which is described above and presented in Figure 9.3.2 below. This was also the case in previous years. However, in the multivariable logistic regression model using OTF-W data only, herds with a history of an OTF-W incident in the previous 3 years in the smallest herd size category (1-10 animals), had nearly 9 times the odds of a new OTF-W incident in 2024, compared to herds without a history of an OTF-W incident (OR 8.6, 95% CI: 4.0-18.1, p<0.001). Readers should note the wide 95% confidence interval and the small number of herds in this herd size category, in Appendix Table 10.1.4).

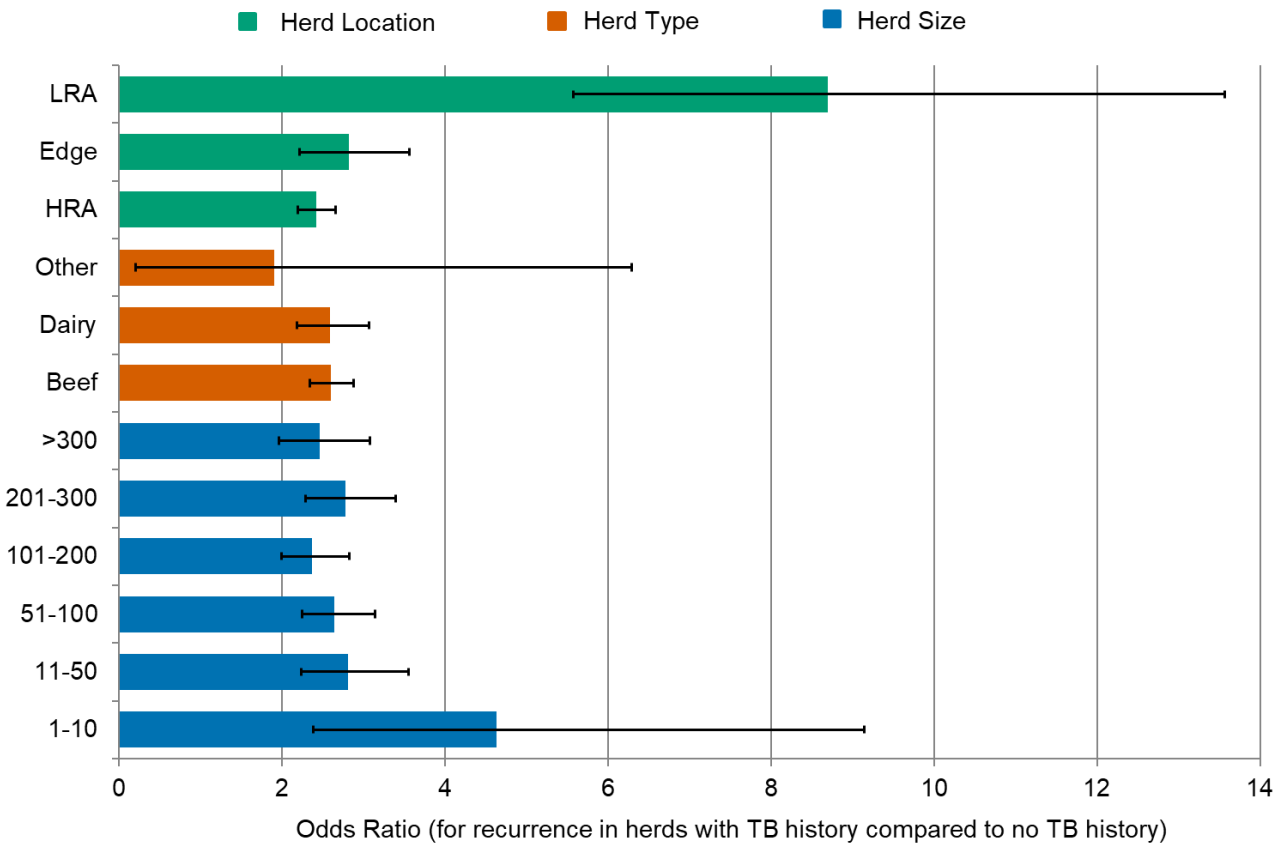

Figure 9.3.2 Combined odds ratios that include the interaction term, displaying how the effect of risk area, herd type and herd size on recurrent incidents in herds in 2024, is modified by history of a TB incident in the previous 3 years.

Figure 9.3.2 description: The results shown are from 3 separate logistic regression models which included herd location (risk area), herd type and herd size category as fixed effects, and the odds ratios shown are an interaction term between whether a herd experienced a previous TB incident and each risk factor explored. The error bars display the 95% confidence interval.

Recurrent incidents can occur for multiple reasons: residual infection in the cattle herd remaining from a previous TB incident, repeated exposure to a local source of M. bovis infection in wildlife reservoirs or cattle herds, or introductions of undetected infected cattle to a herd.

In summary, a large herd size increases the herd risk of a new TB incident, as well as incident duration. Herds in the HRA are at increased risk of a new TB incident compared to herds in the Edge Area, which in turn are at an increased risk of a new TB incident compared to herds in the LRA. Dairy herds are at a 4 times higher risk of a new TB incident compared to beef and ‘other’ herds. However, when herd size and location factors are adjusted for in a multivariable Poisson regression model, the risk is reduced to approximately 1.5 times that of beef and ‘other’ herds. A herd with a history of TB in the previous 3 years had approximately double the odds of experiencing a new TB incident in 2024 compared to a herd that had no history. When herd size, type and location were adjusted for in a multivariable logistic regression model, herds in the LRA with a history of TB had approximately 9 times the odds of a new TB incident in 2024, compared to those herds that had no history of TB.

Appendix 1

Table 10.1.1 Number and percentage of new TB incidents by source attribution category derived from both the Cattle Movement Algorithm and the WGS Local Transmission of Infection Indicator (where WGS data were available) for the HRA. Two OTF-W incidents in Approved Finishing Units were not included in the source attribution analysis in the HRA.

County	Local transmission event identified by WGS and non-local cattle movements associated with a high likelihood of infection	Local Transmission event identified from WGS and local cattle movements associated with a high likelihood of infection	Local Transmission event not identified from WGS and cattle movements associated with a high likelihood of infection	No WGS available, cattle movements associated with a high likelihood of infection	Local Transmission event identified from WGS, no cattle movements associated with a high likelihood of infection	Local Transmission event not identified from WGS, no cattle movements associated with a high likelihood of infection	No WGS available, no cattle movements associated with a high likelihood of infection
Avon	0 (0%)	2 (2.0%)	7 (7.7%)	6 (6.6%)	17 (18.7%)	16 (17.6%)	43 (47.3%)
Cornwall	0 (0%)	7 (2.8%)	9 (3.6%)	27 (10.9%)	32 (12.6%)	18 (7.3%)	154 (62.3%)
Devon	0 (0%)	13 (2.5%)	12 (2.3%)	46 (8.8%)	86 (16.4%)	49 (9.4%)	318 (60.7%)
Dorset	0 (0%)	0 (0%)	3 (3.1%)	4 (4.1%)	9 (9.2%)	10 (10.2%)	72 (73.5%)
Gloucestershire	1 (0.8%)	1 (0.8%)	9 (7.3%)	7 (5.7%)	17 (13.8%)	25 (20.3%)	63 (51.2%)
Hereford and Worcester	0 (0%)	4 (2.7%)	12 (8.1%)	9 (5.8%)	29 (19.5%)	26 (17.4%)	69 (46.3%)
Shropshire	0 (0%)	10 (5.0%)	9 (4.5%)	12 (6.0%)	50 (25.0%)	23 (11.5%)	96 (48.0%)
Somerset	0 (0%)	1 (0.5%)	11 (5.8%)	6 (3.1%)	40 (20.9%)	25 (13.1%)	108 (56.5%)
Staffordshire	0 (0%)	3 (2.0%)	8 (5.3%)	10 (6.6%)	29 (19.2%)	12 (7.9%)	89 (58.9%)
West Midlands	0 (0%)	0 (0%)	0 (0%)	1 (25%)	0 (0%)	0 (0%)	3 (75%)
Wiltshire	0 (0%)	2 (1.6%)	2 (1.6%)	3 (2.4%)	13 (10.6%)	22 (17.9%)	81 (65.9%)
HRA total	**1 (0.1%)**	**43 (2.3%)**	**82 (4.3%)**	**131 (6.9%)**	**322 (16.9%)**	**226 (11.9%)**	**1,096 (57.7%)**
England Total	**4 (0.2%)**	**65 (2.6%)**	**115 (4.6%)**	**172 (6.9%)**	**417 (16.8%)**	**287 (11.5%)**	**1,427 (57.4%)**

Table 10.1.2 Number and percentage of new TB incidents by source attribution category derived from both the Cattle Movement Algorithm and the WGS Local Transmission of Infection Indicator (where WGS data were available) for the Edge Area.

County	Local transmission event identified by WGS and non-local cattle movements associated with a high likelihood of infection	Local Transmission event identified from WGS and local cattle movements associated with a high likelihood of infection	Local Transmission event not identified from WGS and cattle movements associated with a high likelihood of infection	No WGS available, cattle movements associated with a high likelihood of infection	Local Transmission event identified from WGS, no cattle movements associated with a high likelihood of infection	Local Transmission event not identified from WGS, no cattle movements associated with a high likelihood of infection	No WGS available, no cattle movements associated with a high likelihood of infection
Berkshire	0 (0%)	1 (5.3%)	1 (5.3%)	2 (10.5%)	4 (21.1%)	2 (10.5%)	9 (47.4%)
Buckinghamshire	1 (2.4%)	4 (9.5%)	2 (4.8%)	4 (9.5%)	7 (16.7%)	5 (11.9%)	19 (45.2%)
Cheshire	0 (0%)	3 (3.3%)	5 (5.6%)	2 (2.2%)	17 (18.9%)	10 (11.1%)	53 (58.9%)
Derbyshire	0 (0%)	2 (2.4%)	4 (4.7%)	2 (2.4%)	16 (18.8%)	11 (12.9%)	49 (58.8%)
East Sussex	0 (0%)	1 (8.3%)	0 (0%)	0 (0%)	2 (16.7%)	1 (8.3%)	8 (66.7%)
Hampshire	0 (0%)	1 (3.2%)	0 (0%)	2 (6.5%)	5 (16.1%)	5 (16.1%)	18 (58.1%)
Leicestershire	0 (0%)	3 (6.8%)	5 (11.4%)	5 (11.4%)	5 (11.4%)	6 (13.6%)	20 (45.5%)
Northamptonshire	0 (0%)	2 (8.7%)	1 (4.3%)	4 (17.4%)	6 (26.1%)	0 (0%)	10 (43.5%)
Nottinghamshire	0 (0%)	0 (0%)	1 (10%)	1 (10%)	0 (0%)	0 (0%)	8 (80%)
Oxfordshire	2 (3.3%)	3 (4.9%)	5 (8.2%)	2 (3.3%)	13 (21.3%)	7 (11.5%)	29 (47.5%)
Warwickshire	0 (0%)	1 (2.2%)	1 (2.2%)	4 (8.7%)	10 (21.7%)	4 (8.7%)	26 (56.5%)
Edge Area total	**3 (0.6%)**	**21 (4.5%)**	**25 (5.4%)**	**28 (6.0%)**	**85 (18.4%)**	**51 (11.0%)**	**249 (54.0%)**
England Total	**4 (0.2%)**	**65 (2.6%)**	**115 (4.6%)**	**172 (6.9%)**	**417 (16.8%)**	**287 (11.5%)**	**1,427(57.4%)**

Table 10.1.3 Number and percentage of new TB incidents by source attribution category derived from both the Cattle Movement Algorithm and the WGS Local Transmission of Infection Indicator (where WGS data were available) for the LRA.

LRA County or Sub-region	Local Transmission event identified from WGS and non-local cattle movements associated with a high likelihood of infection	Local Transmission event identified from WGS and local cattle movements associated with a high likelihood of infection	Local Transmission event not identified from WGS and cattle movements associated with a high likelihood of infection	No WGS available cattle movements associated with a high likelihood of infection	Local Transmission event not identified from WGS, no cattle movements associated with a high likelihood of infection	Local Transmission event not identified from WGS, no cattle movements associated with a high likelihood of infection	No WGS available, no cattle movements associated with a high likelihood of infection
South East	0 (0%)	0 (0%)	2 (8.7%)	2 (8.7%)	1 (4.3%)	3 (13%)	15 (65.2%)
North West	0 (0%)	0 (0%)	0 (0%)	1 (7.1%)	0 (0%)	0 (0%)	13 (92.9%)
North East	0 (0%)	0 (0%)	2 (22.2%)	1 (11.1%)	0 (0%)	1 (11.1%)	5 (55.6%)
Cumbria	0 (0%)	0 (0%)	0 (0%)	5 (12.8%)	4 (10.3%)	5 (12.8%)	25 (64.1%)
Yorkshire and Humberside	0 (0%)	0 (0%)	2 (10.5%)	2 (10.5%)	0 (0%)	0 (0%)	15 (78.9%)
Lincolnshire	0 (0%)	1 (5.6%)	2 (11.1%)	2 (11.1%)	5 (27.8%)	1 (5.6%)	7 (38.9%)
LRA Total	**0 (0%)**	**1 (0.8%)**	**8 (6.5%)**	**13 (10.6%)**	**10 (8.1%)**	**10 (8.1%)**	**81 (65.9%)**
England Total	**4 (0.2%)**	**65 (2.6%)**	**115 (4.6%)**	**172 (6.9%)**	**417 (16.8%)**	**287 (11.5%)**	**1427 (57.4%)**

Appendix 2

Table 10.1.4 The odds ratio for recurrence in herds with a history of an OTF-W incident in the previous 3 years compared to herds without an OTF-W TB history in the previous 3 years. The results shown are from 3 separate logistic regression models which included herd location (risk area), herd type and herd size category as fixed covariates, and an interaction term between whether a herd experienced a previous TB incident and each risk factor explored. (n= number of new incidents in 2024 with a previous OTF-W incident in the last 3 years. N= number of new incidents in 2024 without a previous OTF-W incident in the last 3 years). The outcomes displayed are the output of the interaction term from each model between the herd recurrence status (Y/N), and the risk factor (herd size, herd type or risk area).

Risk Factor	Category	n/N	Odds Ratio	Standard Error	z	P value	95% Confidence Interval (lower bound)	95% Confidence Interval (upper bound)
Herd Size	1-10	9/42	8.62	3.276	5.67	<0.01	4.095	18.158
	11-50	50/255	2.88	0.467	6.51	<0.01	2.093	3.957
	51-100	75/314	2.00	0.279	4.98	<0.01	1.523	2.633
	101-200	140/341	2.06	0.229	6.49	<0.01	1.656	2.564
	201-300	128/238	1.92	0.246	5.11	<0.01	1.496	2.472
	>300	346/410	1.72	0.152	6.09	<0.01	1.442	2.042
Herd Type	Beef	334/931	2.31	0.168	11.55	<0.01	2.006	2.668
	Dairy	411/658	1.69	0.129	6.87	<0.01	1.456	1.965
	Other	3/11	3.74	2.618	1.89	0.059	0.949	14.74
Risk Area	HRA	623/1,163	1.85	0.110	10.45	<0.01	1.655	2.089
	Edge	110/330	2.29	0.286	6.67	<0.01	1.799	2.933
	LRA	15/107	15.50	4.689	9.06	<0.01	8.568	28.04