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Agency

Bovine TB in cattle: badger control areas monitoring report

For the period 2013 to 2020

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APHA is an Executive Agency of the Department for Environment, Food and Rural Affairs and also works on behalf of the Scottish Government, Welsh Government and Food Standards Agency to safeguard animal and plant health for the benefit of people, the environment and the economy.

Contents

Purpose of this report

This report provides the annual bovine tuberculosis (TB) monitoring data for cattle herds in licensed badger control areas that have been exposed to at least one period of badger culling and have had at least one year of follow-up ending during 2020. The report shows changes over time in TB in cattle in areas subject to badger control but the data presented are insufficient by themselves to demonstrate whether the badger control policy is effective or not in reducing bovine TB in cattle. Evaluation of the effect of the badger control policy requires consideration of other factors that could affect cattle TB incidence in addition to culling and has been subject to separate analytical studies (Brunton et al., 2017; Downs et al., 2019).

Please note that all of the data presented in this report are available in an accessible format in the accompanying OpenDocument Spreadsheet (ODS).

Introduction

The badger control policy was implemented in England to reduce the population of badgers where bovine tuberculosis (TB) is endemic. The aim of the policy is to reduce the potential for transmission of *Mycobacterium bovis*, the bacterium that causes TB, between badgers and cattle, and hence reduce the incidence of TB in cattle. The policy is based upon evidence generated by the Randomised Badger Culling Trial (RBCT) conducted in England between 1998 and 2005. The incidence of confirmed cattle herd TB incidents was overall, around 29% (95%CI 21 to 36%) lower in areas where proactive culling was conducted relative to non-intervention areas (Donnelly et al., 2007; Jenkins et al., 2010). Increased risks of TB were observed in cattle herds on land adjoining land where culling was conducted although the increased risk did not persist once culling had halted.

The current badger control policy includes licensing of industry-led badger culling (Defra, 2021) from 2013 and provision of biosecurity advice to farmers in licensed areas since 2014. From April 2017 where badger control operations have been conducted for a minimum of 2 years, interferon-gamma testing of cattle has been introduced in addition to tuberculin skin testing to detect and remove infected cattle during TB incidents.

In 2013, 2 licences were issued under the Protection of Badgers Act 1992 by Natural England (NE), to groups of farmers and landowners in Gloucestershire and Somerset in the High Risk Area (HRA) for TB in England. A further licence was issued in Dorset, also in the HRA, in 2015. 7 licences were issued in 2016 and 11 in each of 2017, 2018 and 2019. The majority of areas are located in the HRA, but 8 straddle the HRA and Edge Area and one, in Cumbria, is located entirely in the Low Risk Area (LRA) for TB in England.

APHA is commissioned by Defra to monitor the incidence of TB in cattle in the areas that have been issued licences for badger control. To address this requirement APHA

publishes monitoring results showing the incidence and prevalence of TB in cattle herds in the badger control areas that have been exposed to at least one period of culling and for which there is at least one year of follow-up since culling was started. The monitoring data are from TB tests conducted during routine surveillance and control of TB in cattle. Monitoring results are reported for the areas where culling is conducted and for 2 km wide buffer areas surrounding each central cull area. Culling is initiated in the autumn and generally continues for a period of around 6 weeks until badger removal targets are met.

In addition, APHA has undertaken analytical studies to assess whether there is any association between badger control and cattle TB incidence. To date these have been conducted using multivariable analyses comparing TB incidence rates in areas subject to badger control to TB incidence rates in areas not subject to the badger control whilst controlling for differences between the areas that could be related to TB risk and badger culling (Brunton et al., 2017; Downs et al., 2019). After 4 years of culling there were reductions in TB incidence rates of 66% (95% CI 61 to 71%) in Gloucestershire and 37% (95% CI 31 to 42%) in Somerset relative to comparison areas. TB incidence rates in the buffer areas surrounding cull areas were lower after 4 years in Gloucestershire and after 2 years in Dorset relative to comparison area buffer areas (Downs et al., 2019). Further evaluation of effects requires a different design because of the loss of potential comparison area land to new cull areas. The loss of buffer land to new cull areas has also considerably reduced the utility of data from these areas for measuring effects.

Changes from the 2019 monitoring report

1. The number of antibody test reactors in each area has been included in the incidence tables.
2. Values for cells based on data from areas with a total of 10 or fewer herds have been supressed to ensure the confidentiality of individual herd owners. This cut-off value is used by the Office for National Statistics (ONS) for England and has subsequently been adopted by a number of other Safe Settings and government departments (Office for National Statistics, n.d.; Welpton, 2019). Safe Settings refer to secure facilities with access to sensitive data, who work to ensure the confidentiality of data subjects.
3. TB incidents are no longer referred to as breakdowns in contrast to previous reports where the terms incident and breakdown have been used interchangeably.
4. Herds recorded as having cattle during a reporting period are no longer referred to as being “live” and instead only the term “active” is used.

Changes to TB testing frequency that can affect TB incidence and prevalence

Reported incidence and prevalence of TB reflects the background force of infection but also surveillance and control policies, which affect the detection of disease. Surveillance and control policies, including TB testing frequency differ across the TB risk areas. Additionally new policies are introduced from time to time to address new and/or emerging issues, for example:

1. During 2020, the public health measures adopted by the government to contain the Covid 19 outbreak impacted the ability to safely carry out some TB testing, due to social distancing and self-isolation guidelines affecting both veterinarians and farmers. From 23 March 2020, skin testing for select purposes were not mandatory for cattle under 180 days old if the official veterinarian conducting the test felt it was unsafe to carry out the testing while maintaining social distancing. Short interval tests, which are required to restore a herd's official TB free (OTF) status, were not originally included in this derogation. However, herds were considered on a case by case basis with extensions granted to time windows to perform short interval tests, and also for tests to maintain OTF status. These easements were in place until beyond the period covered in this report.
2. Cattle herds in counties in the HRA and Edge Area are subject to annual routine TB surveillance testing. However in January 2018, cattle herds located in Edge Area counties with higher TB incidence rates were subject to routine 6-monthly surveillance testing. Since May 2019, some herds in these counties have been eligible to revert back to annual testing if they met certain criteria (TBhub, 2020). This may affect recent trends in TB incidence rates and prevalence in cull areas in Cheshire.

As with all monitoring reports published since 2018, no data from potential comparison areas are included because of the loss of land (to culling) which might be used to compare TB incidence rates in cattle to rates in cull areas.

Monitoring Methods

Data source and quality

TB data for the report are extracted from Sam, the APHA database, which records the results from TB tests conducted in cattle herds throughout Great Britain.

These data are continually compiled and updated over time. Corrections may include removal of a herd that has become inactive, inclusion of a herd that has become active, revision to a herd geographical location or change of a herd TB incident designation from unconfirmed (OTF-S) infection to confirmed (OTF-W) because of new confirmatory

information about the presence of *M. bovis* infection. Data corrections and routine validation can affect the counts of incidents and the calculated time at risk and are revealed in minor differences in statistics between annual reports, particularly in the year prior to the most recent year in the report. The most recently published report contains the most accurate current and historical data known to the project team. Where areas have changed size, this is indicated above the figures and tables for the relevant areas.

Badger control areas

Central areas

These are the areas which are licensed by NE for badger culling. The boundaries of these areas are defined and provided by NE to APHA each year. They remain broadly stable over time. However, there have been small changes to some boundaries over time made by NE. The APHA has no control over the location of boundaries and reports levels of TB for the population of Herds in Existence (HIE) based on the most up-to-date information available for boundaries at the time of each annual report. The population of cohort herds is established in the year culling starts in an area and only changes with changes in activity of the herd e.g. loss of herds from farms that are no longer operating.

Buffer areas

Buffer areas are 2 km wide areas that immediately surround the central area. They are identified by the APHA project team using the central area boundary information provided by NE. The size of buffer areas varies between areas at the baseline date, due to various factors such as central area size, existence of physical boundaries such as a coastline and proximity of pre-existing central areas (see Table 1). Additionally, the proportion of existing buffer areas that can be included in the analyses for the monitoring report has decreased over time as new central areas have been licensed for badger culling and have been extended over buffer areas. Due to the way new central areas have been licensed, reduced buffer areas may not be contiguous pieces of land, they may constitute smaller, segmented areas of land.

Only those herds which remain as buffer area herds in the current time period are included in the current and retrospective monitoring data provided. This means that, for some areas, successive annual reports report a reducing number of herds in the buffer over time and TB frequency data are not always comparable between years. TB frequency data in the buffer areas are provided in the supporting OpenDocument Spreadsheet.

Each badger control area (central area and buffer area) is identified by a unique number which relates to when the area was licensed for badger culling and the county in which it is located.

Time period

The baseline date

Each area has its own associated baseline date. This is the start date of the first cull in that area. A “cull year”, as referred to in this report, is the period of 12 months starting from the same day and month of the baseline date for each year in the reporting period, and is defined separately for each area.

Monitoring herd groups

Cohort

Cohort herds are herds recorded as active in either central areas or buffer areas on the baseline date. The central cohort are herds identified, using map reference data, as being located within the cull areas originally licensed by NE. The buffer cohort are herds identified, using map reference data, as being located within the surrounding buffer area on the baseline date. TB data from herds originally in the buffer area but now in an area subjected to culling are no longer included within the buffer area data.

TB data for cohort herds always relates to the original cohort of herds located within the areas defined by the original NE licence, even if map reference data show that a herd is not in the area in non-baseline years. Over time some of the herds in a cohort may become inactive and are lost to follow-up. This means that the number of herds in the cohort can decrease between years. The number of herds in the cohort cannot, by definition, ever be larger than the number that existed on the baseline date.

Cohort herds were all in existence on the baseline date and should be exposed to badger control operations for the full follow-up period whilst they remain active.

Herds in Existence (HIE)

HIE provides an annual snapshot of active herds that are located within central areas based on the area boundaries licensed by NE at the time data are compiled for the annual monitoring report. This group of herds will include herds recorded as active within the area before and after the baseline date, based on current herd location map reference data.

The annual count of HIE for the central areas acknowledges that there are new herds that come into existence after the baseline date or herds that were active prior to the baseline date. Inclusion of the HIE population should help address any bias due to the natural loss of herds from the cohort due to changes in business activity. However, it is important to note that herds reported on in this group were not all in existence on the baseline date when culling started and therefore may not been exposed to badger control operations for the entire follow-up period.

HIE includes any herds located within a central cull area following extension of the cull area after it was originally licensed. In the current report, HIE for the current and all previous years for each area are defined by the area boundaries of the current year. For example, the central area for Area 32 in Cumbria (first licensed in 2018) was extended in January 2019 to include some of the buffer area, following the discovery of *M. bovis* infected badgers in the buffer area. The TB data for HIE in the current report is for areas subject to culling up to and including the cull year commencing in 2019.

HIE are not compiled for the buffer areas.

Individual area monitoring data

The figures in this report plot TB incidence rates and TB prevalence by cull year in the central areas subject to at least one period of culling and one year of follow-up. The figures show TB incidence rates and prevalence for both cohort herds and HIE for the periods before and after the baseline date when culling started in each area. Data for buffer areas have not been plotted but are available in an Open Document Spreadsheet data supplement. The supplement contains data for TB incidents, herds, herd years at risk and numbers of reactors by cull and calendar year for both central and buffer areas.

Glossary of definitions for tables and figures

All incidents (incidence tables)

The total number of incidents, as shown in the incidence tables, is the sum of Officially Tuberculosis Free- Withdrawn (OTF-W) and Officially Tuberculosis Free- Suspended (OTF-S) incidents detected throughout the reporting period (cull year or calendar year). Both OTF-W and OTF-S are new incidents of TB in a herd that have been disclosed through TB surveillance tests. However, in OTF-W incidents, *M. bovis* infection has been confirmed through post-mortem tests in at least one animal from the herd.

TB incidents have been referred to as breakdowns in previous reports.

OTF-W incidents (incidence tables)

The number of OTF-W incidents detected throughout the reporting period (cull year or calendar year).

All incidents (prevalence tables)

Incidents, as shown in the prevalence tables, refers to the number of herds under TB-related trading restrictions as a result of any TB incident. The count of herds is taken at the last day of the reporting period (cull year or calendar year).

OTF-W incidents (prevalence tables)

OTF-W incidents refers to the number of herds under trading restrictions specifically due to an OTF-W incident. The count is taken at the last day of the reporting period (cull year or calendar year).

Number of herds (incidence tables)

The number of herds shown in the incidence tables refers to the number of active herds in the area for each group (cohort or HIE) at the start of each reporting period (cull year or calendar year).

Number of herds (prevalence tables)

The number of herds displayed in the prevalence tables is the number active in the area at the end of each reporting period (cull year or calendar year).

Time at risk (TAR)

The TAR is the total period of time the herds in an area were considered at risk of TB infection (Defra, 2015; Downs et al., 2013). Herds are considered to be at risk of infection when they are not under trading restrictions because of TB infection (i.e. an incident) in the herd. The TAR is reported in years, and is calculated from day one to the final day of the reporting period.

OTF-W incidence rate

The OTF-W incidence rate is the rate of occurrence of new OTF-W incidents. The rate is calculated as the number of OTF-W incidents per 100 herd years at risk (Defra, 2015; Downs et al., 2013). This is the number of new OTF-W incidents detected in the area during the time period of interest divided by the total number of years that herds in the area were at risk of infection, multiplied by 100. OTF-W incidence is used as the primary outcome for monitoring rather than total TB incidence because stronger associations have been shown between OTF-W incidence and culling than with total TB incidence (Donnelly et al., 2007).

OTF-W prevalence

The OTF-W prevalence is a point prevalence estimate indicating the proportion of herds with an OTF-W incident on a particular date, which is the last day of each reporting period. It provides an indication of the burden of disease in an area. The OTF-W prevalence can also be described as the number of herds under trading restrictions on the last date of each period due to an OTF-W incident per 100 herds on the same date.

95% Confidence interval

The lower and upper limits of a 95% confidence interval for the OTF-W incidence rate and OTF-W prevalence are given. The confidence interval gives an indication of the range of uncertainty around the reported estimate of rate or prevalence. If data were collected and the 95% confidence interval were calculated independently multiple times, we would expect the true incidence rate to be found within 95% of these confidence intervals. A wider confidence interval indicates greater uncertainty about the true underlying incidence rate or prevalence.

Skin test reactors

Skin test reactors are cattle that reacted to the Single Intradermal Comparative Cervical Tuberculin (SICCT) test, which is a diagnostic test for TB. The test measures an animal's reaction to injection(s) of tuberculin carried out in line with Council Directive 64/432/EEC. Reactors are detected in both OTF-W and OTF-S incidents. This group includes cattle with one or 2 inconclusive tests removed by APHA for TB control and found to have visible lesions at slaughter or have a positive culture for *M. bovis*. Inconclusive reactors are cattle, which have a smaller reaction to the SICCT test than standard reactors. The yearly count of reactors relates to the date the reactors were detected, not necessarily the year the incident started. Therefore, the count can include reactors from incidents which started in previous years.

The data do not include any cattle removed as "Direct Contacts (DC)". These are non-reactor animals in an OTF-W incident herd which are slaughtered, due to being considered at high risk of being infected, normally as a result of contact with infected cattle.

IFN gamma reactors

IFN gamma reactors are cattle that tested positive to the Interferon (IFN) gamma assay, which is a rapid (24-hour) whole blood in-vitro assay to detect immune response to *M. bovis* infection for the diagnosis of bovine TB. Any reactors to both the SICCT test and the IFN gamma assay are included within the skin test reactors group but are not included within the IFN gamma reactors group. Mandatory IFN gamma testing was introduced in 2017 for herds with a TB incident in areas that had been subject to 2 or more years of culling.

Antibody test reactors

Antibody test reactors are cattle that tested positive to the antibody detection assay, which detects whether the animal is generating an immune response to a current *M. bovis* infection. Antibody testing in TB incidents may be used as a third line diagnostic method following IFN gamma testing following approval by the relevant TB policy team (Defra, Scottish Government or Welsh Government).

Baseline date

The baseline date is the start date of the cull in the central area named, and is indicated by a black dashed line in each figure.

TB incidence and prevalence figures

Areas where the cull commenced in 2013

Area 1 - Gloucestershire central

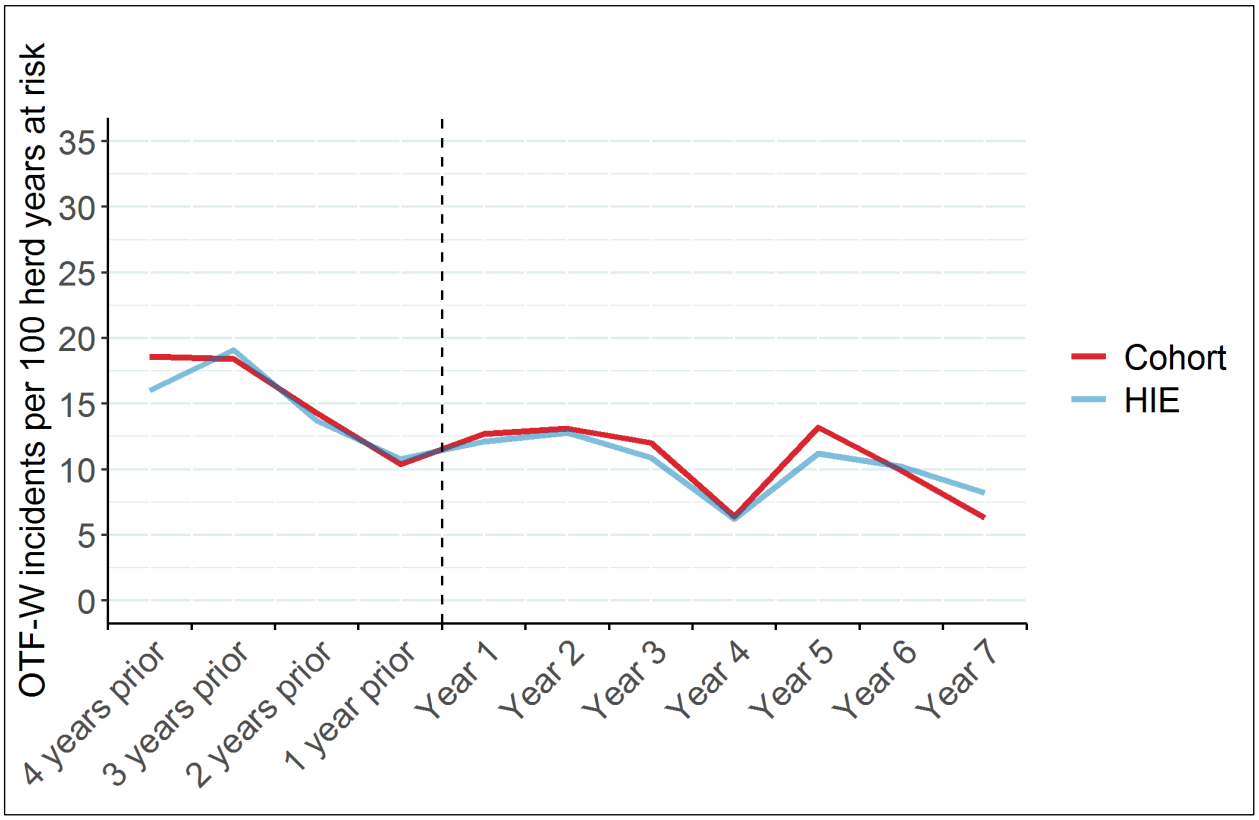

Figure 1 OTF-W incidents per 100 herd years at risk by year in Area 1, Gloucestershire central, for cohort herds and herds in existence (HIE). The cull started in area 1 in 2013, indicated by the dashed line

Figure 2 OTF-W prevalence per 100 active herds by year in Area 1, Gloucestershire central, for cohort herds and herds in existence (HIE). The cull started in Area 1 in 2013, indicated by the dashed line

Area 2 - Somerset central

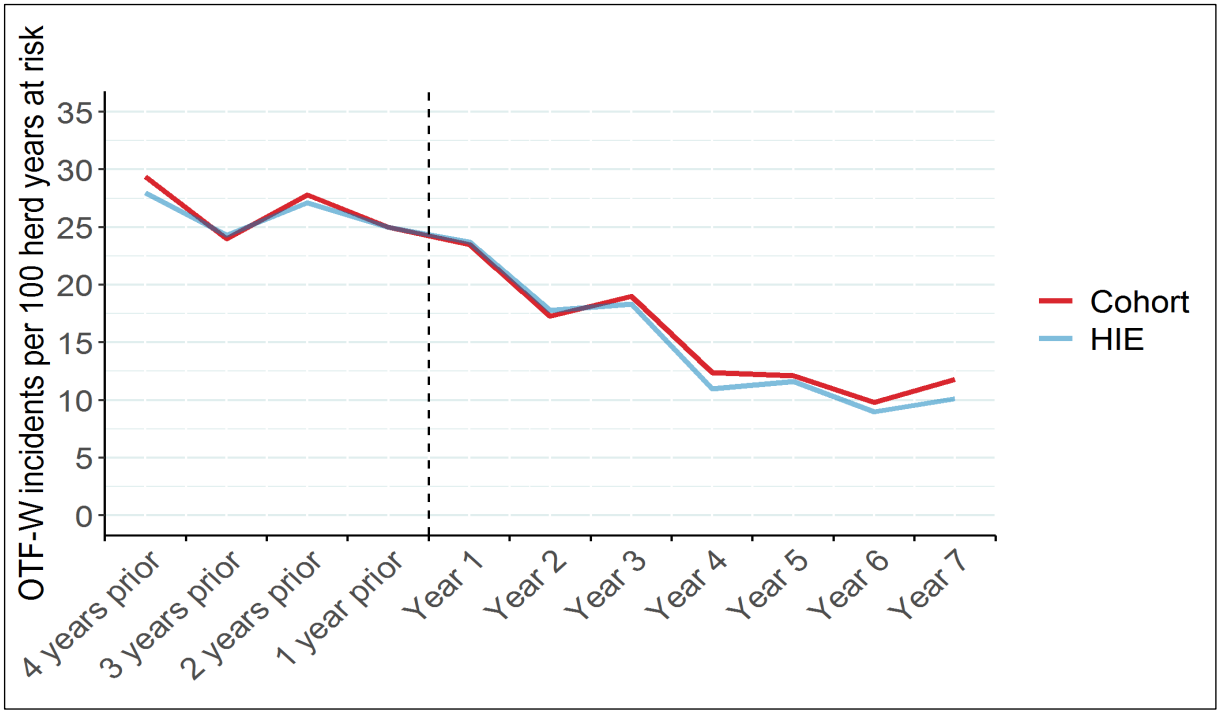

Figure 3 OTF-W incidents per 100 herd years at risk by year in Area 2, Somerset central, for cohort herds and herds in existence (HIE). The cull started in Area 2 in 2013, indicated by the dashed line

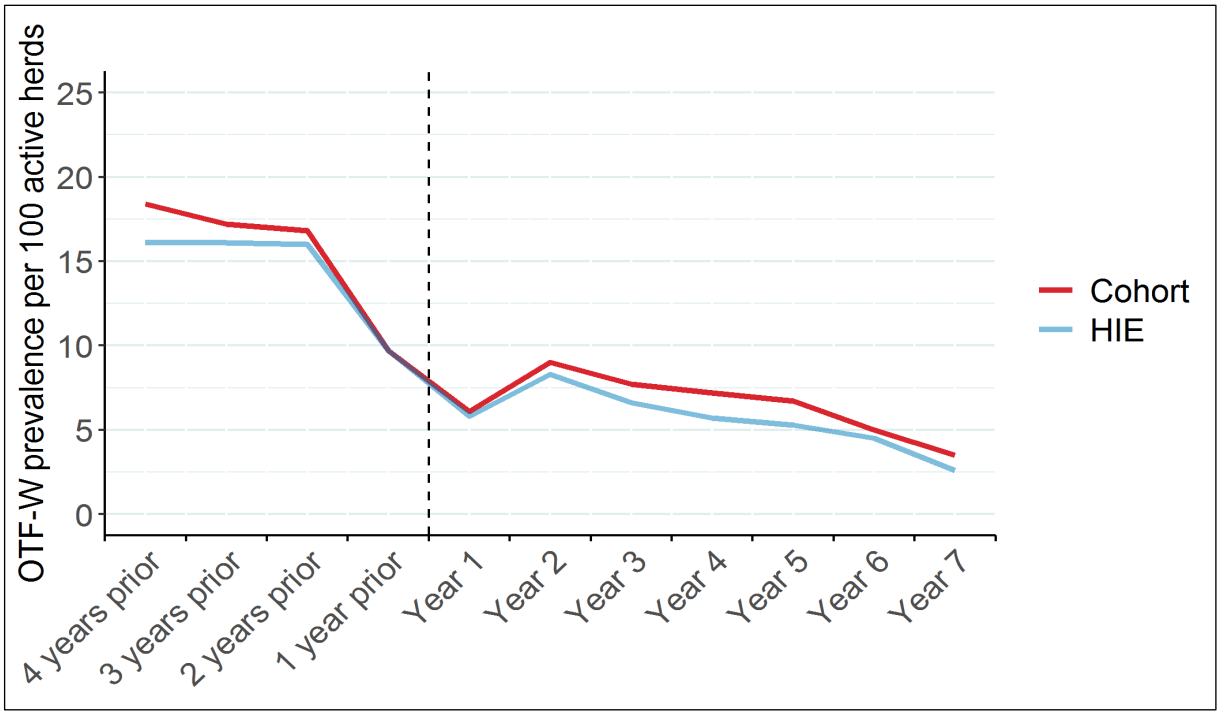

Figure 4 OTF-W prevalence per 100 active herds by year in Area 2, Somerset central, for cohort herds and herds in existence (HIE). The cull started in Area 2 in 2013, indicated by the dashed line

Areas where the cull commenced in 2015

Area 3 - Dorset central

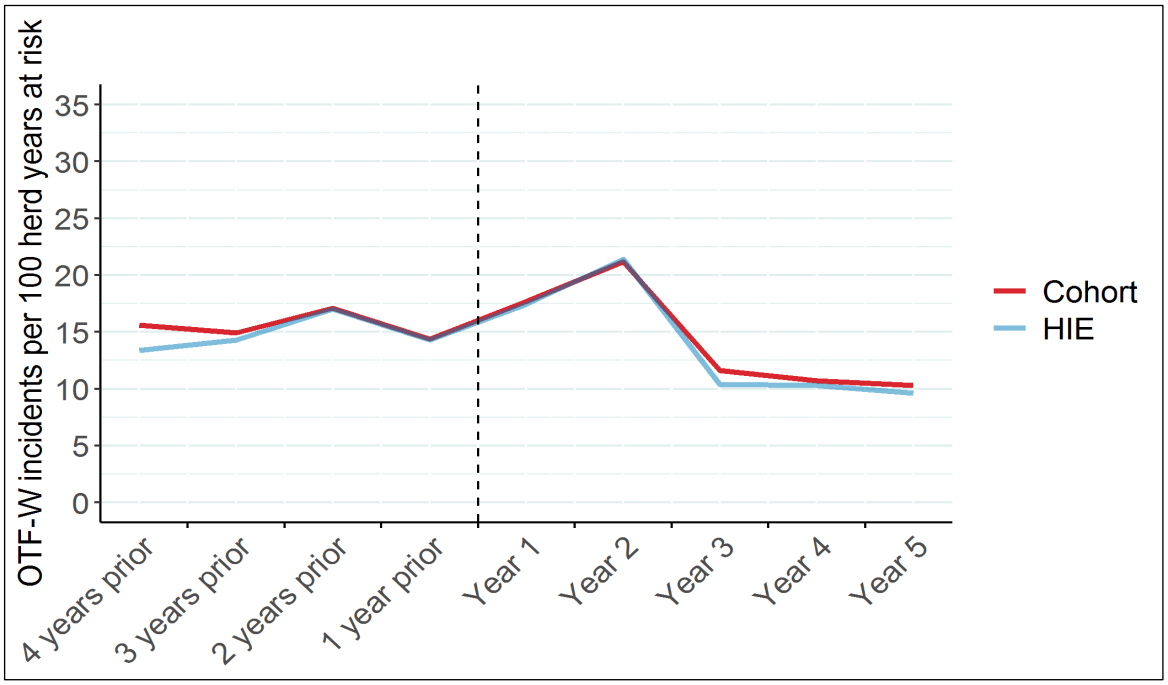

Figure 5 OTF-W incidents per 100 herd years at risk by year in Area 3, Dorset central, for cohort herds and herds in existence (HIE). The cull started in Area 3 in 2015, indicated by the dashed line

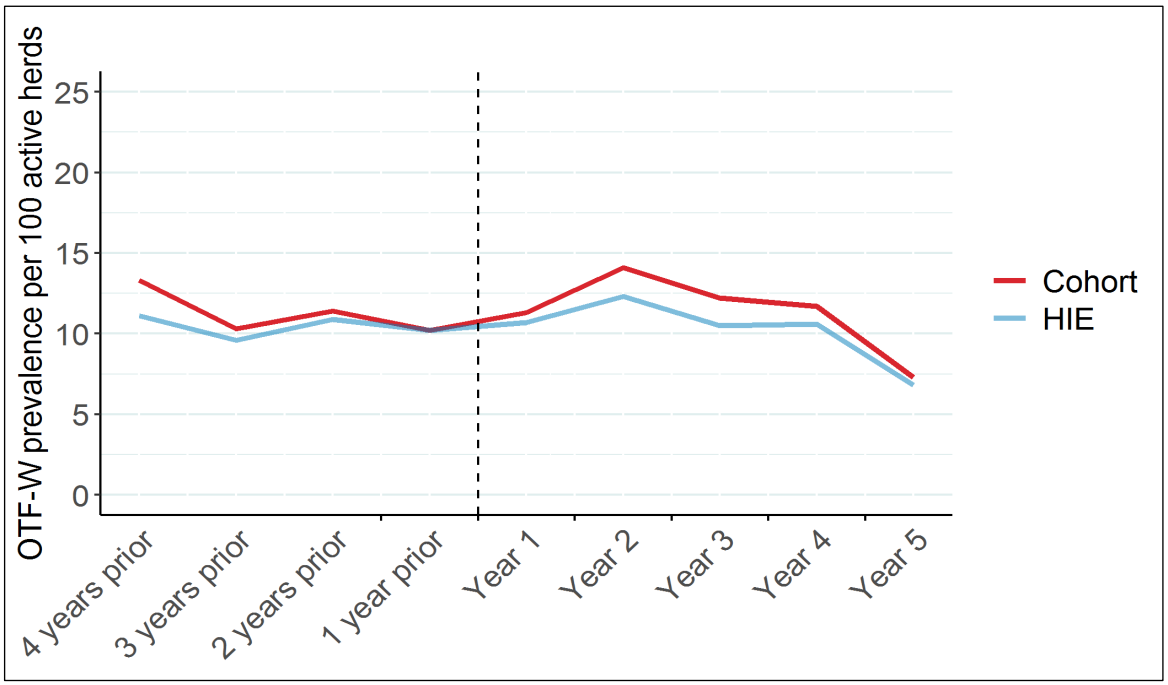

Figure 6 OTF-W prevalence per 100 active herds by year in Area 3, Dorset central, for cohort herds and herds in existence (HIE). The cull started in Area 3 in 2015, indicated by the dashed line

Areas where the cull commenced in 2016

Area 4 - Cornwall central

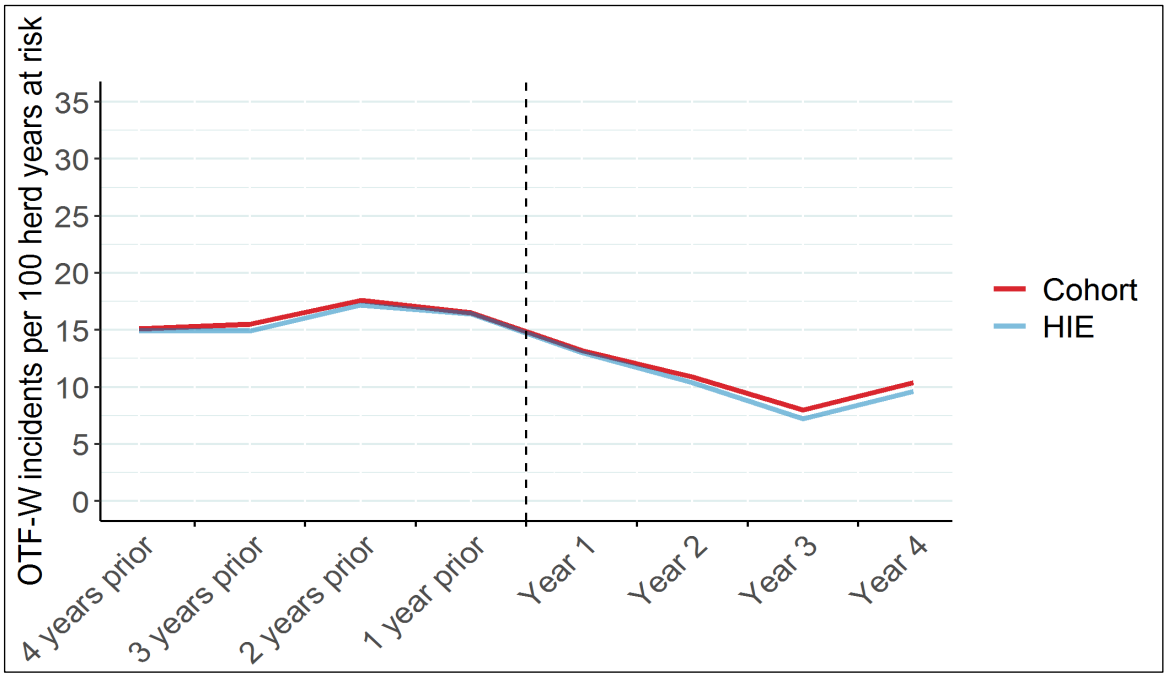

Figure 7 OTF-W incidents per 100 herd years at risk by year in Area 4, Cornwall central, for cohort herds and herds in existence (HIE). The cull started in Area 4 in 2016, indicated by the dashed line

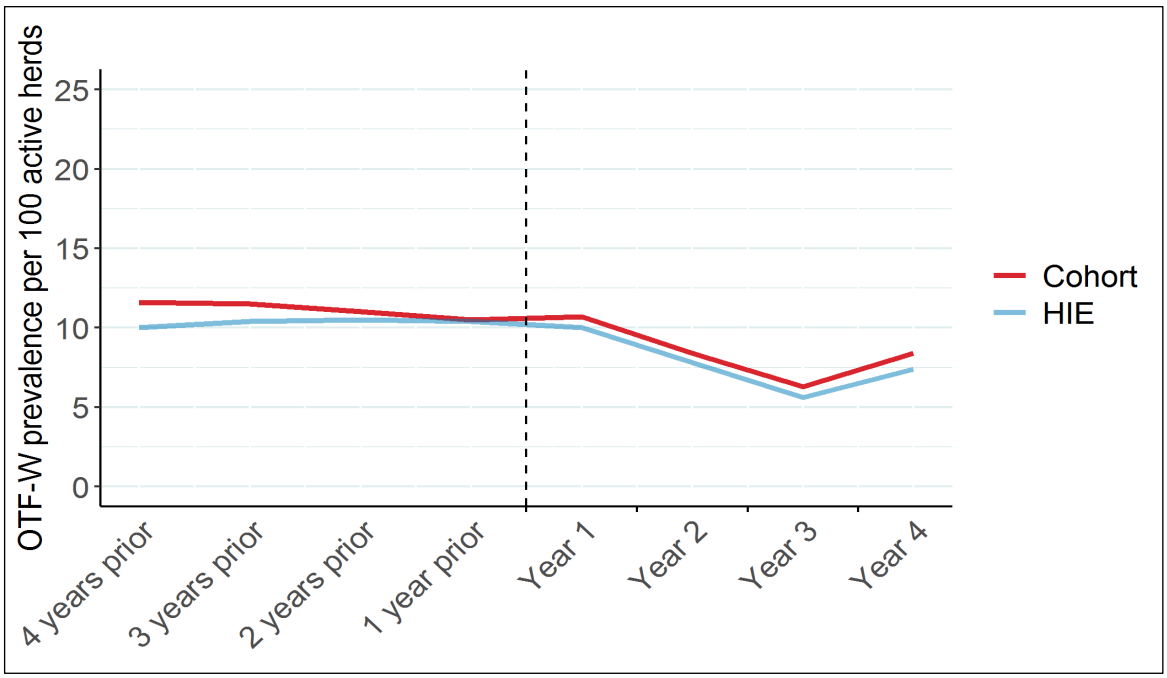

Figure 8 OTF-W prevalence per 100 active herds by year in Area 4, Cornwall central, for cohort herds and herds in existence (HIE). The cull started in Area 4 in 2016, indicated by the dashed line

Area 5 - Cornwall central

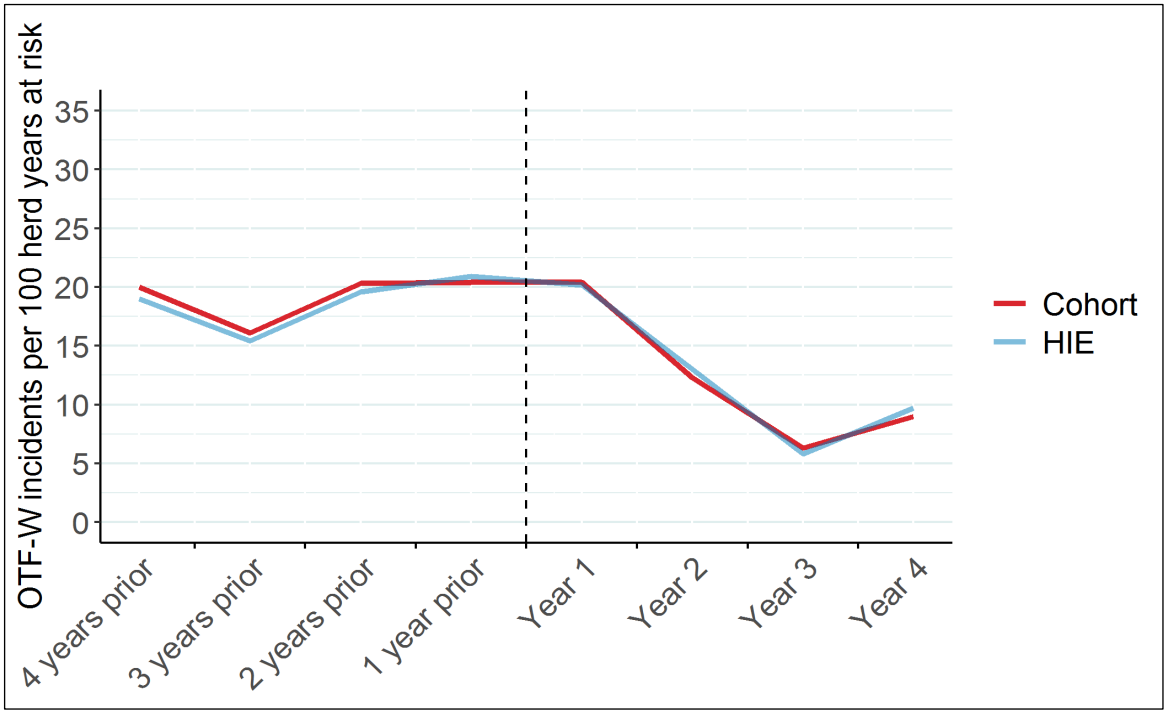

Figure 9 OTF-W incidents per 100 herd years at risk by year in Area 5, Cornwall central, for cohort herds and herds in existence (HIE). The cull started in Area 5 in 2016, indicated by the dashed line

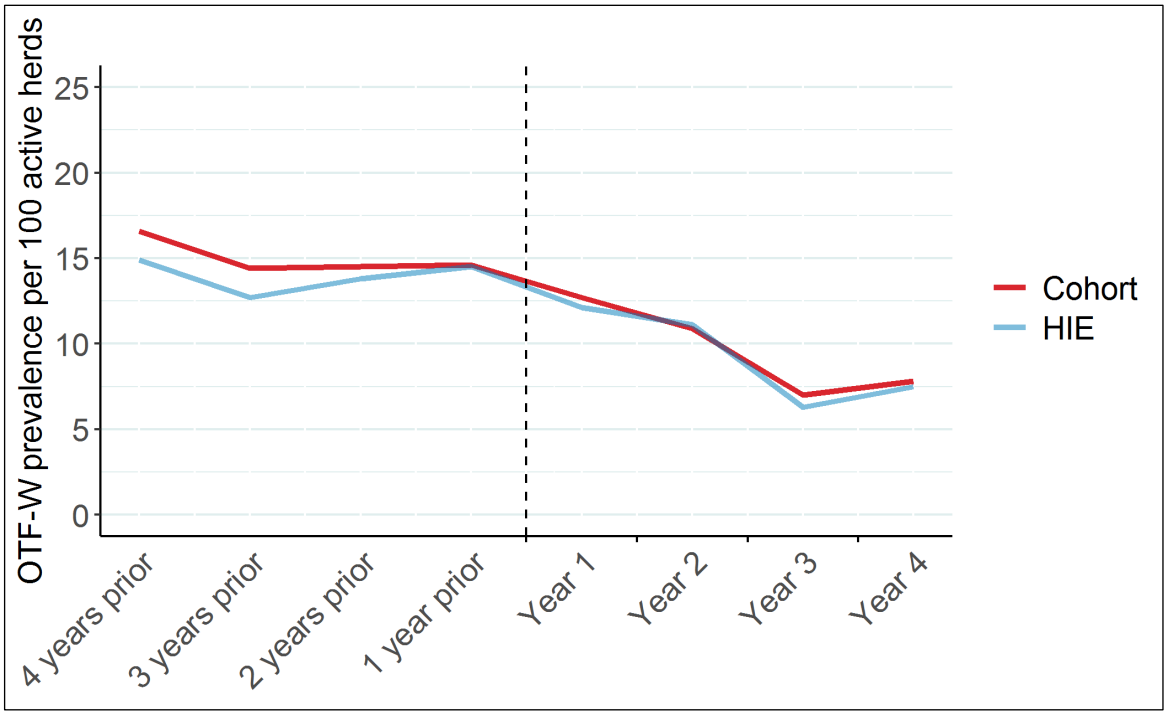

Figure 10 OTF-W prevalence per 100 active herds by year in Area 5, Cornwall central, for cohort herds and herds in existence (HIE). The cull started in Area 5 in 2016, indicated by the dashed line

Area 6 - Devon central

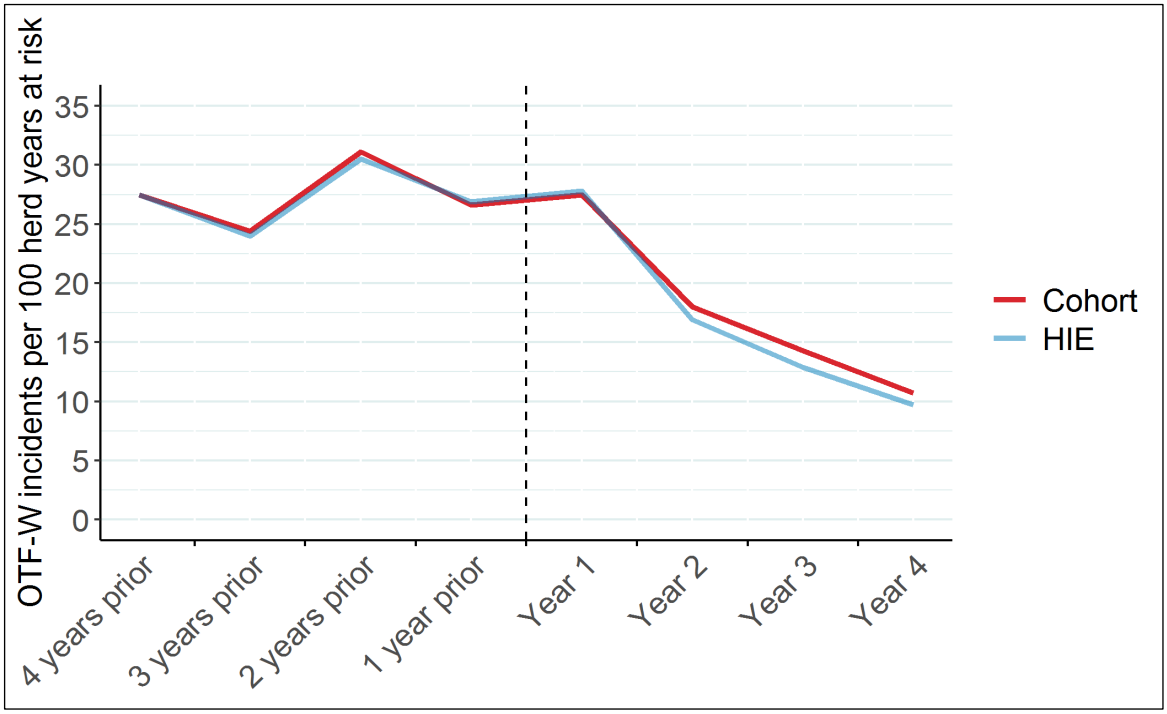

Figure 11 OTF-W incidents per 100 herd years at risk by year in Area 6, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 6 in 2016, indicated by the dashed line

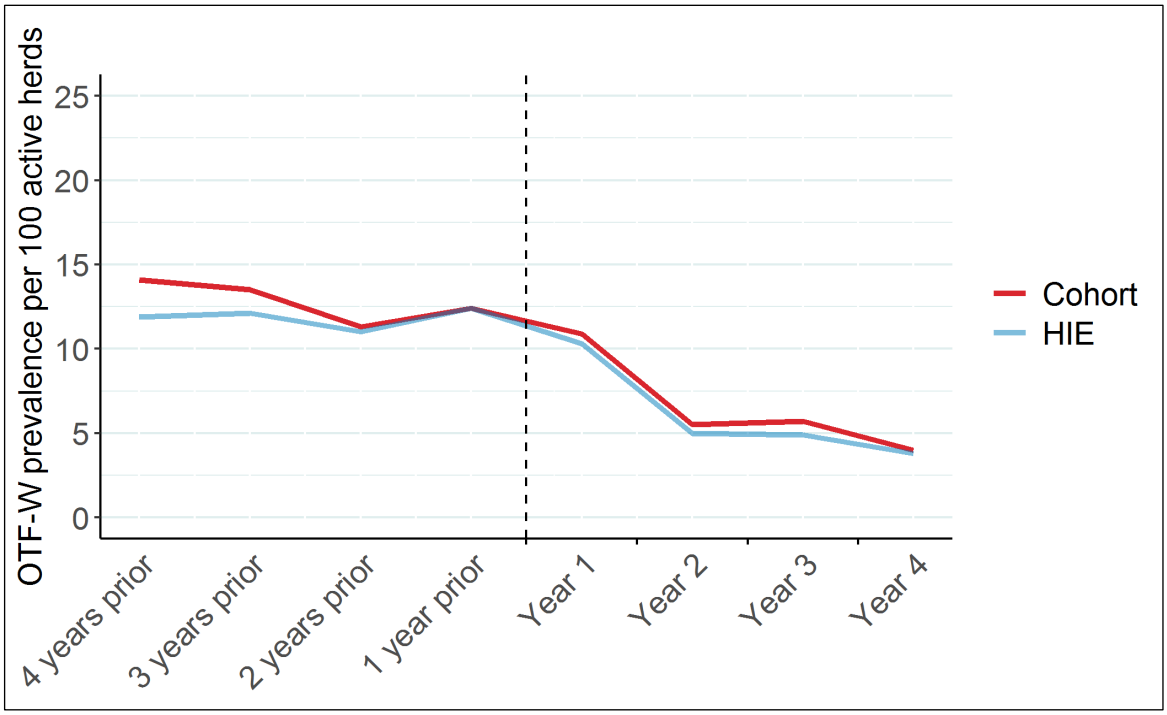

Figure 12 OTF-W prevalence per 100 active herds by year in Area 6, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 6 in 2016, indicated by the dashed line

Area 7 - Devon central

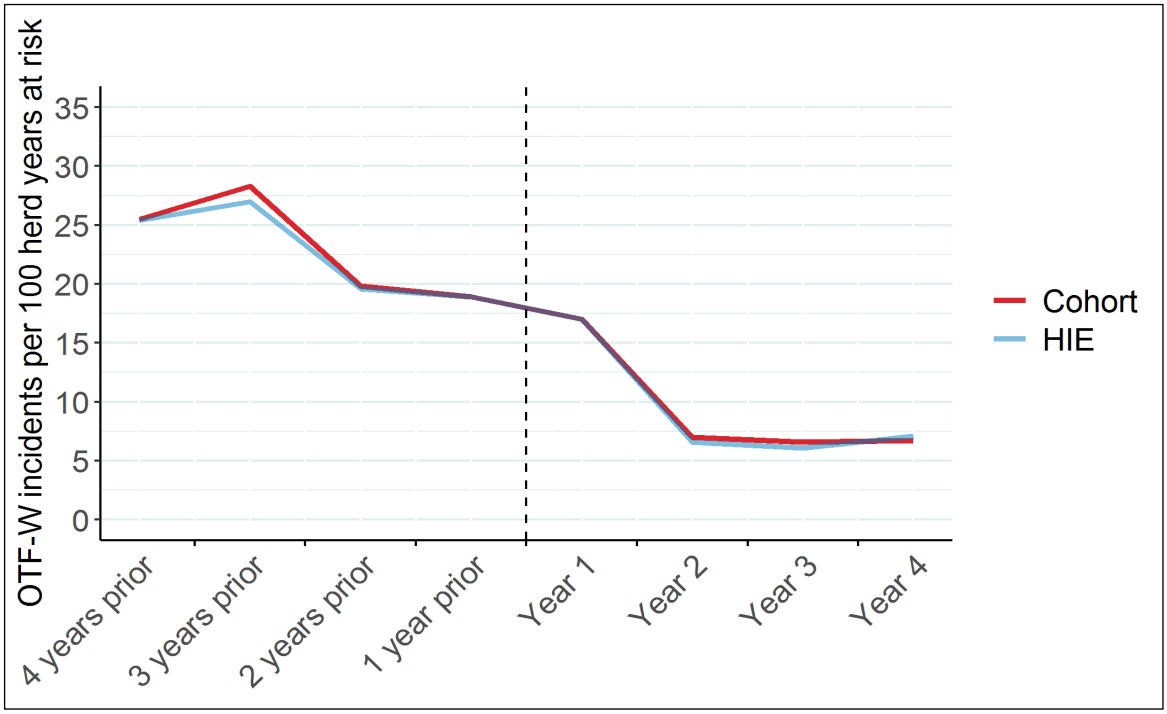

Figure 13 OTF-W incidents per 100 herd years at risk by year in Area 7, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 7 in 2016, indicated by the dashed line

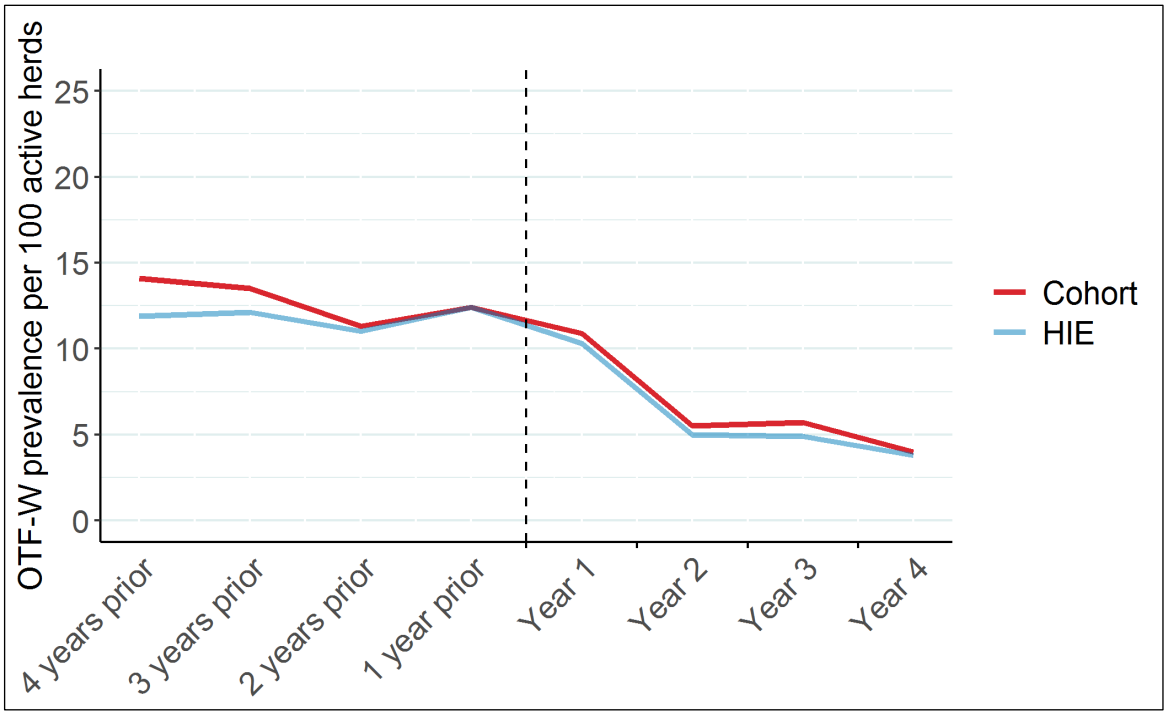

Figure 14 OTF-W prevalence per 100 active herds by year in Area 7, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 7 in 2016, indicated by the dashed line

Area 8 - Dorset central

Central area increased in size by 3.1% in April 2017

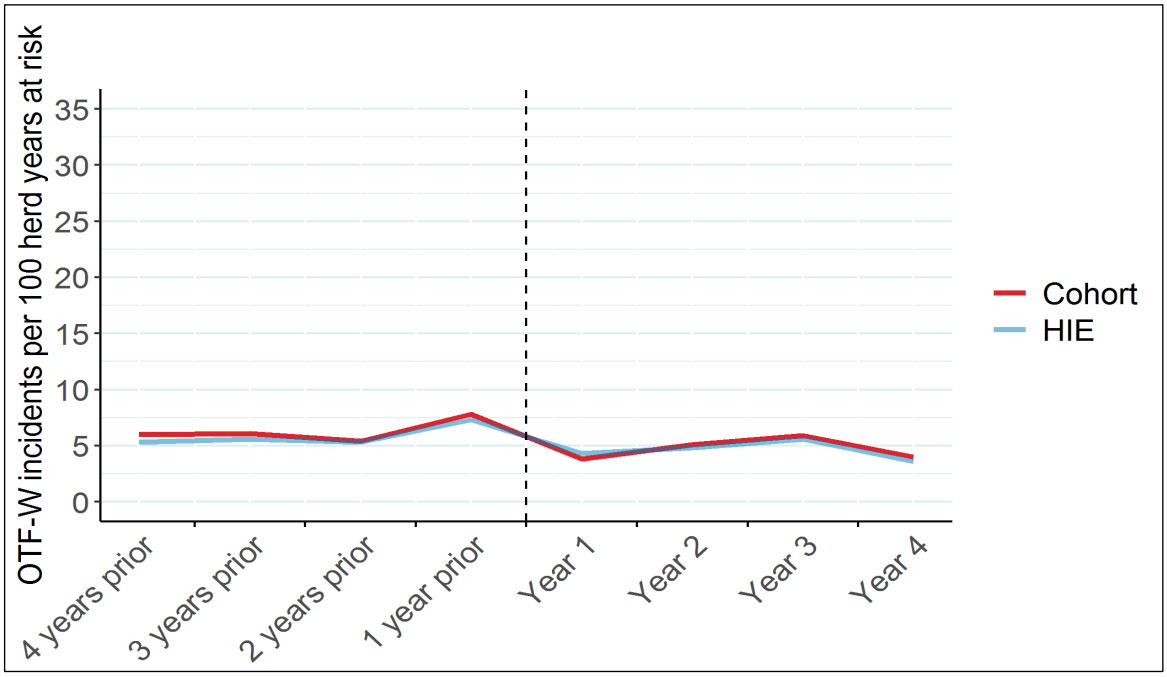

Figure 15 OTF-W incidents per 100 herd years at risk by year in Area 8, Dorset central, for cohort herds and herds in existence (HIE). The cull started in Area 8 in 2016, indicated by the dashed line

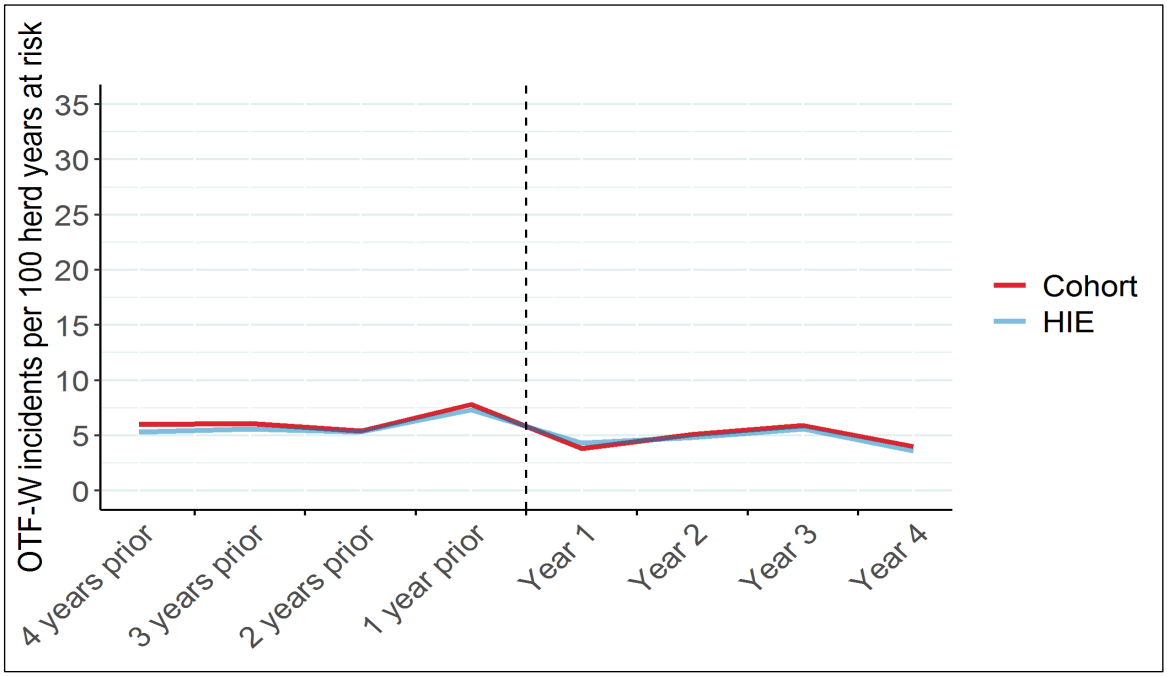

Figure 16 OTF-W prevalence per 100 active herds by year in Area 8, Dorset central, for cohort herds and herds in existence (HIE). The cull started in Area 8 in 2016, indicated by the dashed line

Area 9 - Gloucestershire central

Figure 17 OTF-W incidents per 100 herd years at risk by year in Area 9, Gloucestershire central, for cohort herds and herds in existence (HIE). The cull started in Area 9 in 2016, indicated by the dashed line

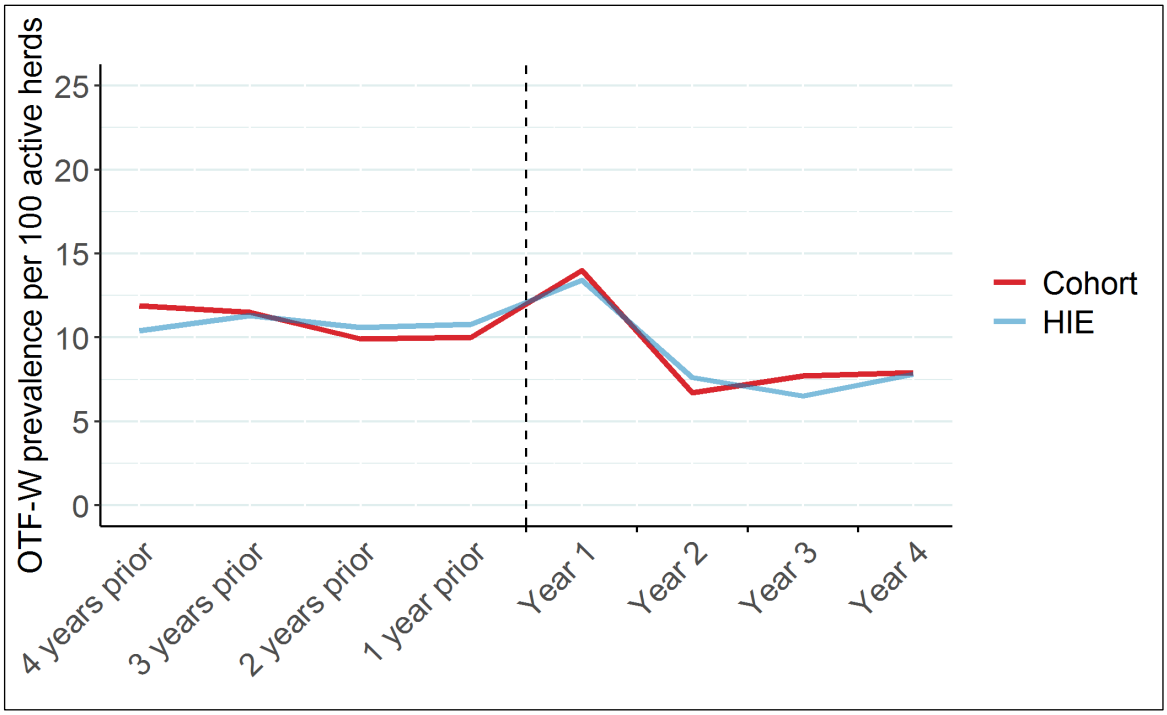

Figure 18 OTF-W prevalence per 100 active herds by year in Area 9, Gloucestershire central, for cohort herds and herds in existence (HIE). The cull started in Area 9 in 2016, indicated by the dashed line

Area 10 - Herefordshire central

Figure 19 OTF-W incidents per 100 herd years at risk by year in Area 10, Herefordshire central, for cohort herds and herds in existence (HIE). The cull started in Area 10 in 2016, indicated by the dashed line

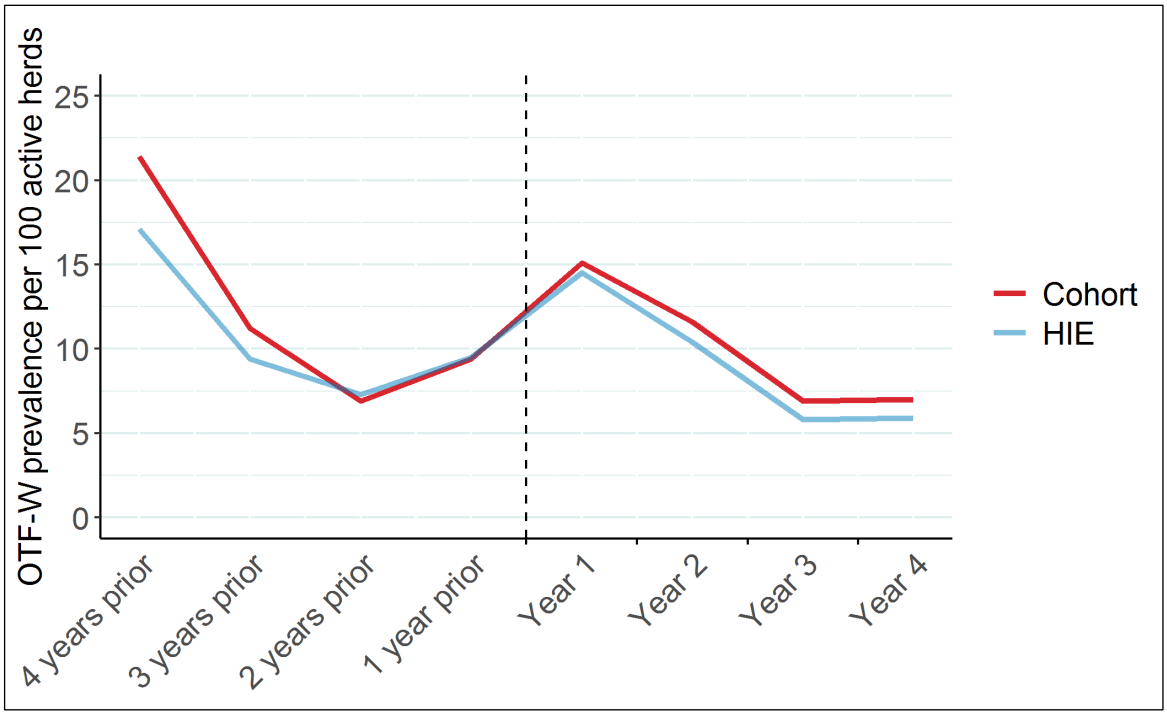

Figure 20 OTF-W prevalence per 100 active herds by year in Area 10, Herefordshire central, for cohort herds and herds in existence (HIE). The cull started in Area 10 in 2016, indicated by the dashed line

Areas where the cull commenced in 2017

Area 11 - Cheshire central

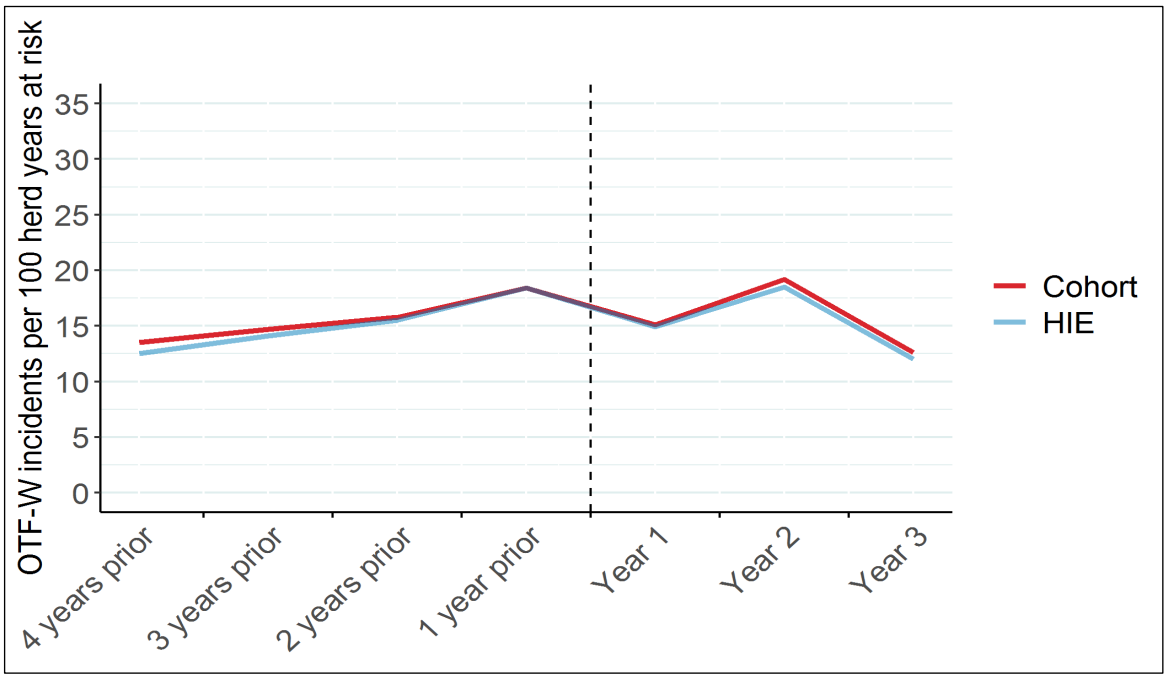

Figure 21 OTF-W incidents per 100 herd years at risk by year in Area 11, Cheshire central, for cohort herds and herds in existence (HIE). The cull started in Area 11 in 2017, indicated by the dashed line

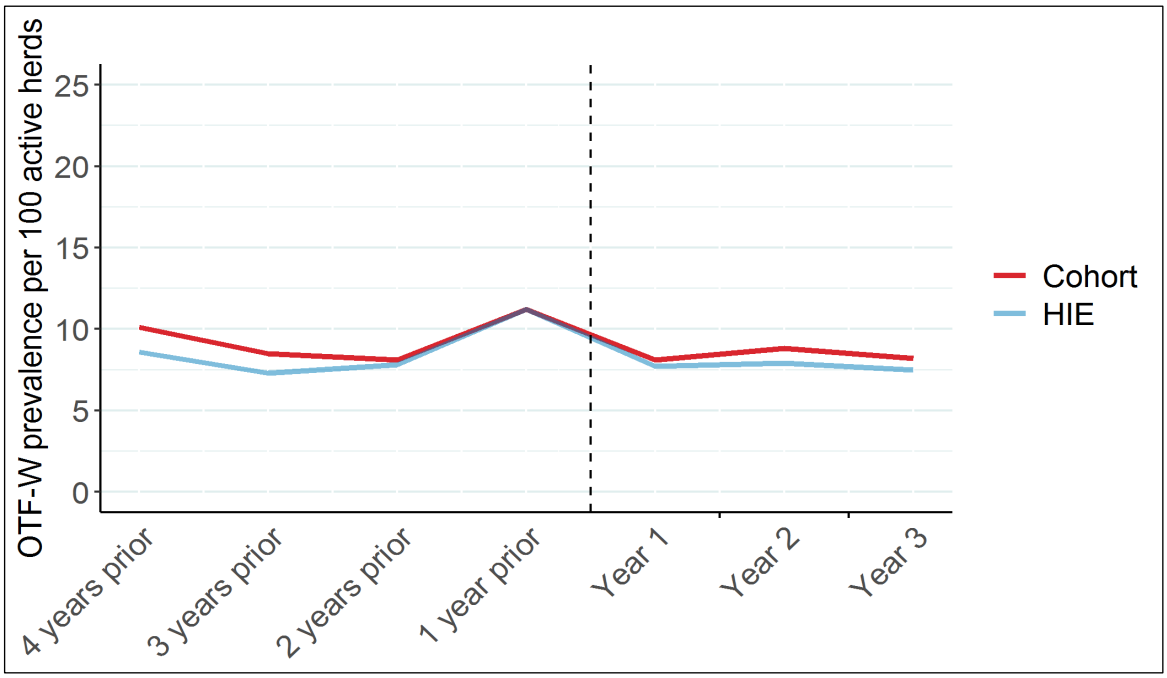

Figure 22 OTF-W prevalence per 100 active herds by year in Area 11, Cheshire central, for cohort herds and herds in existence (HIE). The cull started in Area 11 in 2017, indicated by the dashed line

Area 12 - Devon central

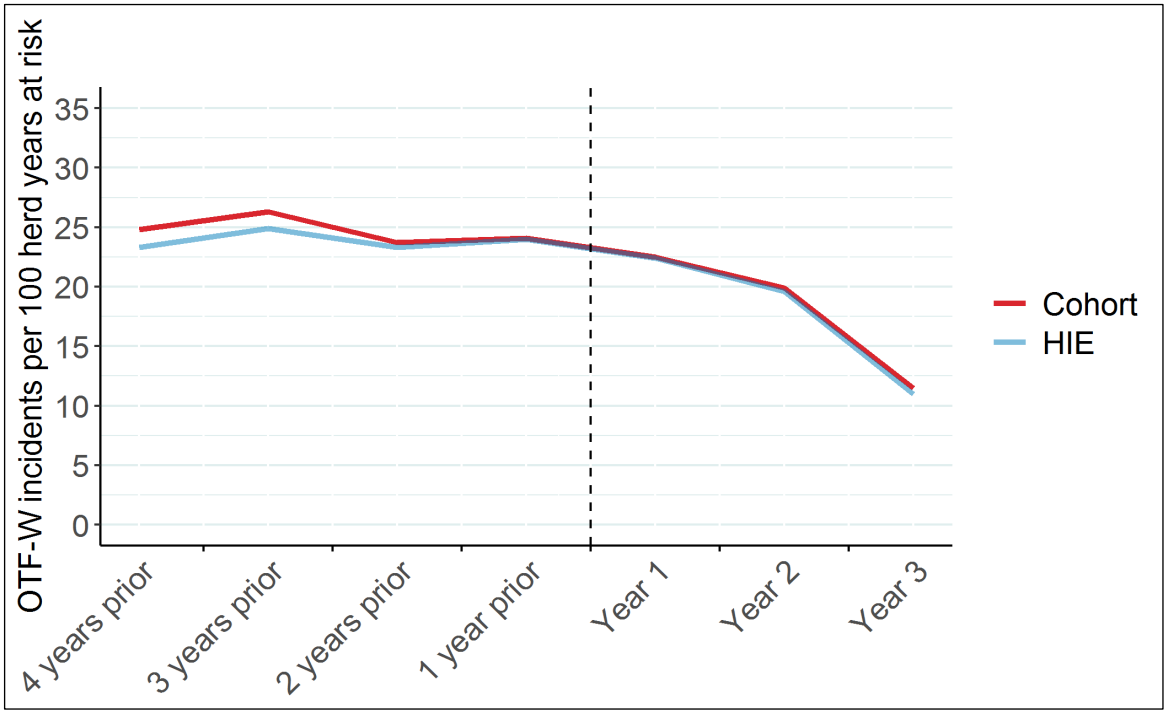

Figure 23 OTF-W incidents per 100 herd years at risk by year in Area 12, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 12 in 2017, indicated by the dashed line

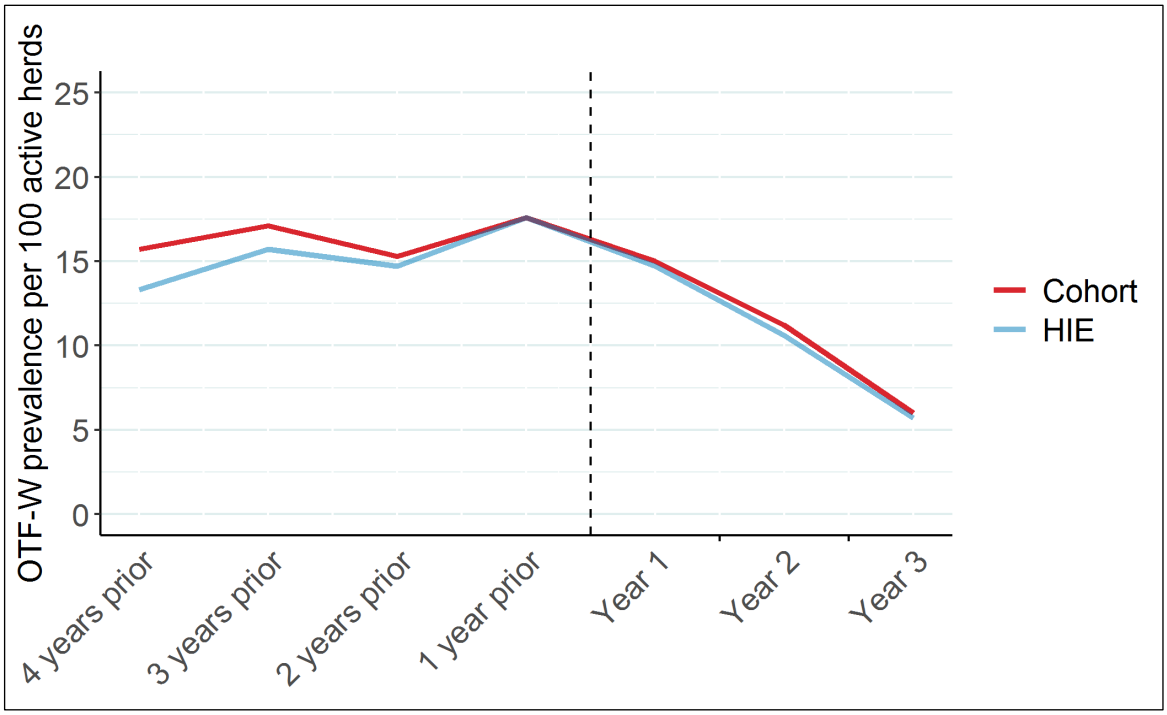

Figure 24 OTF-W prevalence per 100 active herds by year in Area 12, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 12 in 2017, indicated by the dashed line

Area 13 - Devon central

Central area increased in size by 3.1% in May 2018

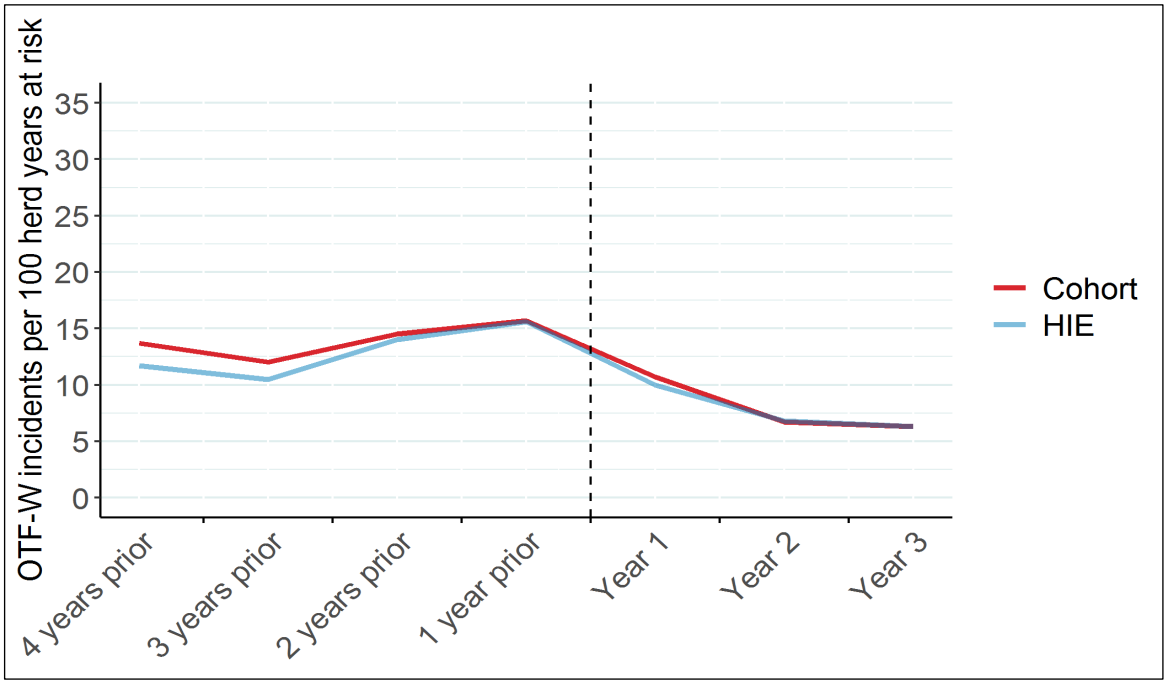

Figure 25 OTF-W incidents per 100 herd years at risk by year in Area 13, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 13 in 2017, indicated by the dashed line

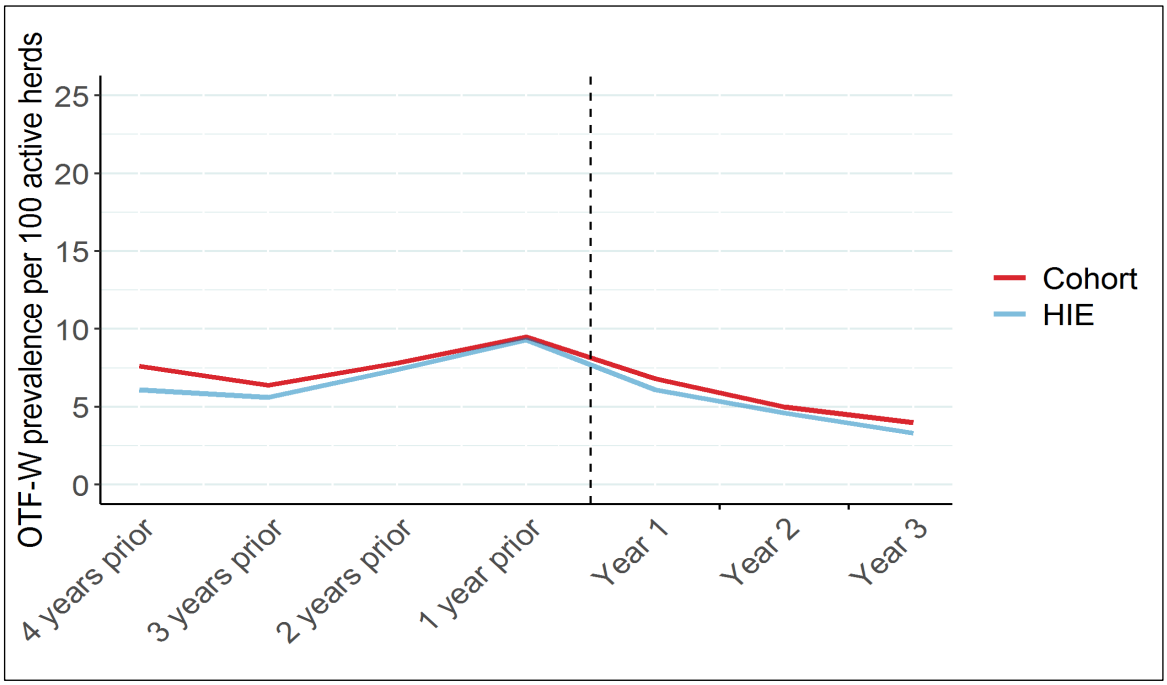

Figure 26 OTF-W prevalence per 100 active herds by year in Area 13, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 13 in 2017, indicated by the dashed line

Area 14 - Devon central

Figure 27 OTF-W incidents per 100 herd years at risk by year in Area 14, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 14 in 2017, indicated by the dashed line

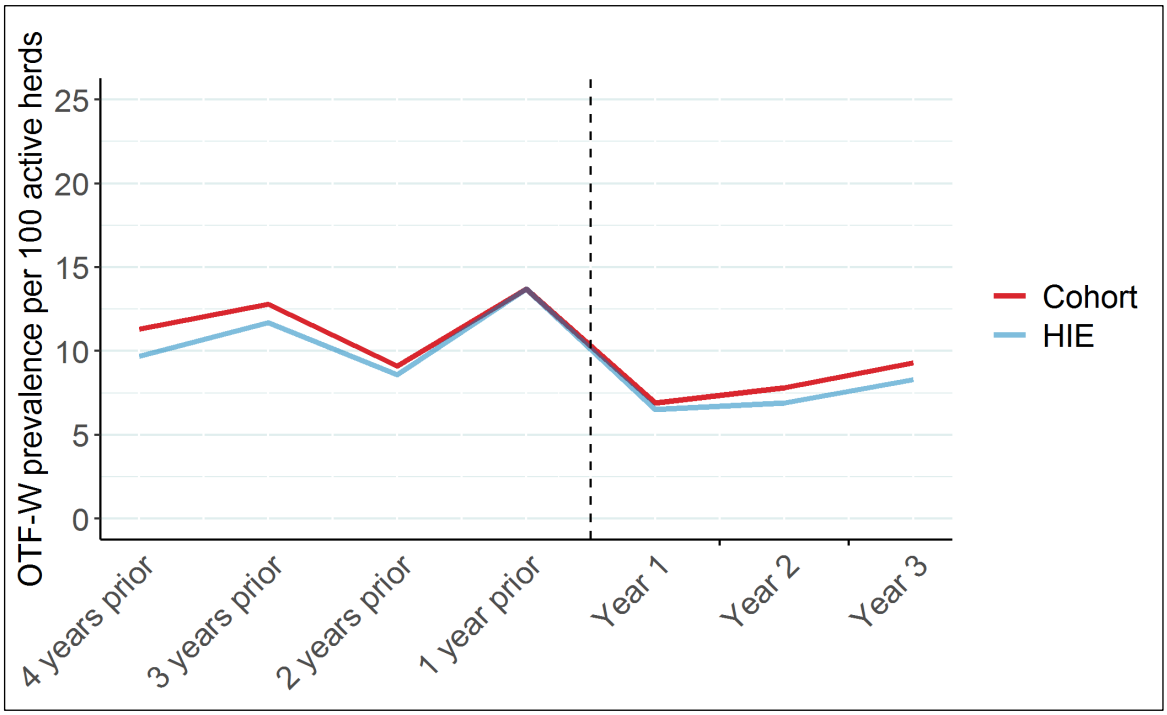

Figure 28 OTF-W prevalence per 100 active herds by year in Area 14, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 14 in 2017, indicated by the dashed line

Area 15 - Devon central

Central area increased in size by 0.6% in May 2018

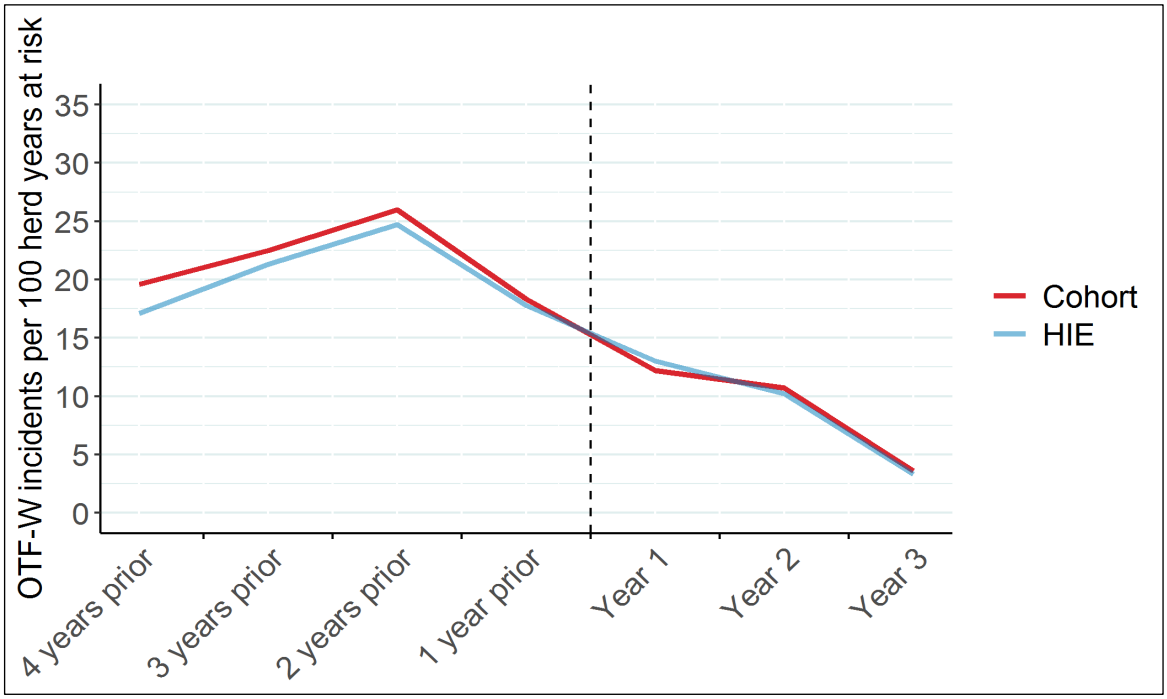

Figure 29 OTF-W incidents per 100 herd years at risk by year in Area 15, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 15 in 2017, indicated by the dashed line

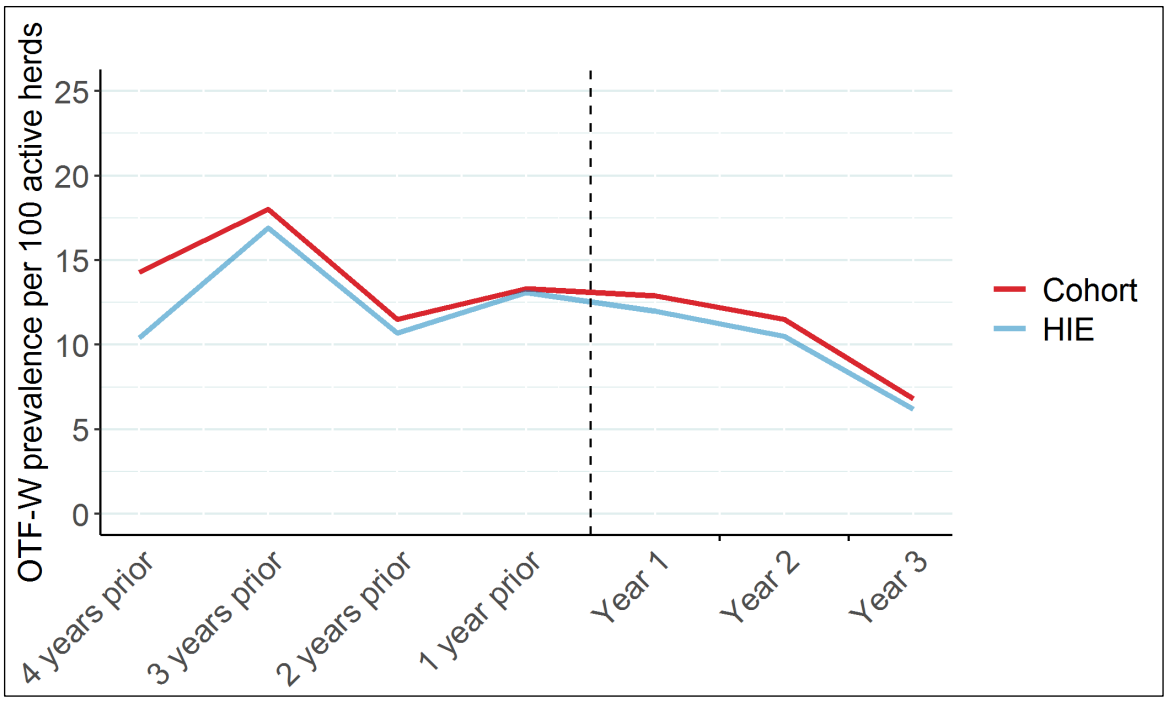

Figure 30 OTF-W prevalence per 100 active herds by year in Area 15, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 15 in 2017, indicated by the dashed line

Area 16 - Dorset central

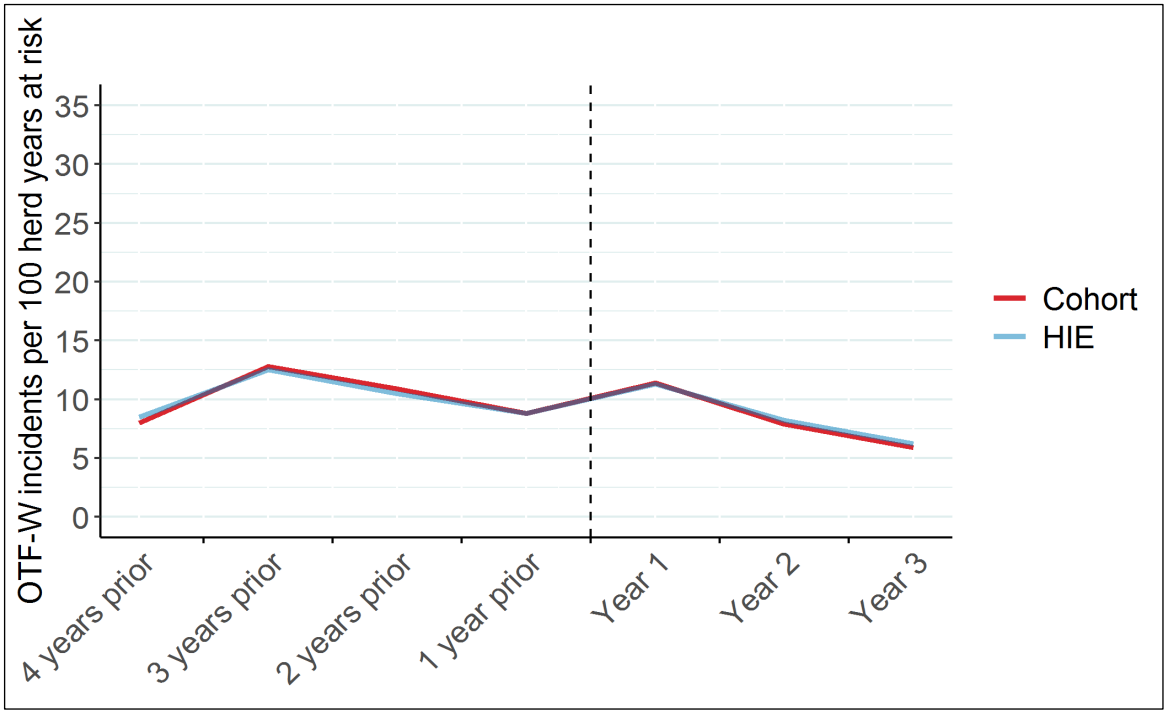

Figure 31 OTF-W incidents per 100 herd years at risk by year in Area 16, Dorset central, for cohort herds and herds in existence (HIE). The cull started in Area 16 in 2017, indicated by the dashed line

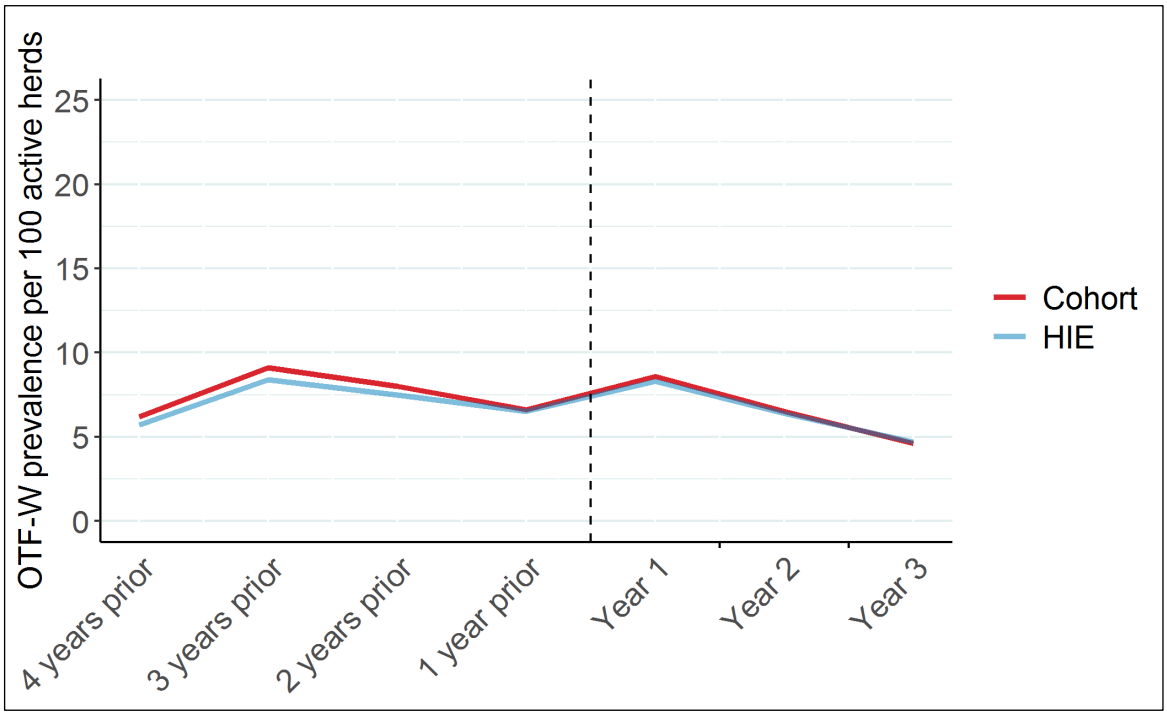

Figure 32 OTF-W prevalence per 100 active herds by year in Area 16, Dorset central, for cohort herds and herds in existence (HIE). The cull started in Area 16 in 2017, indicated by the dashed line

Area 17 - Somerset central

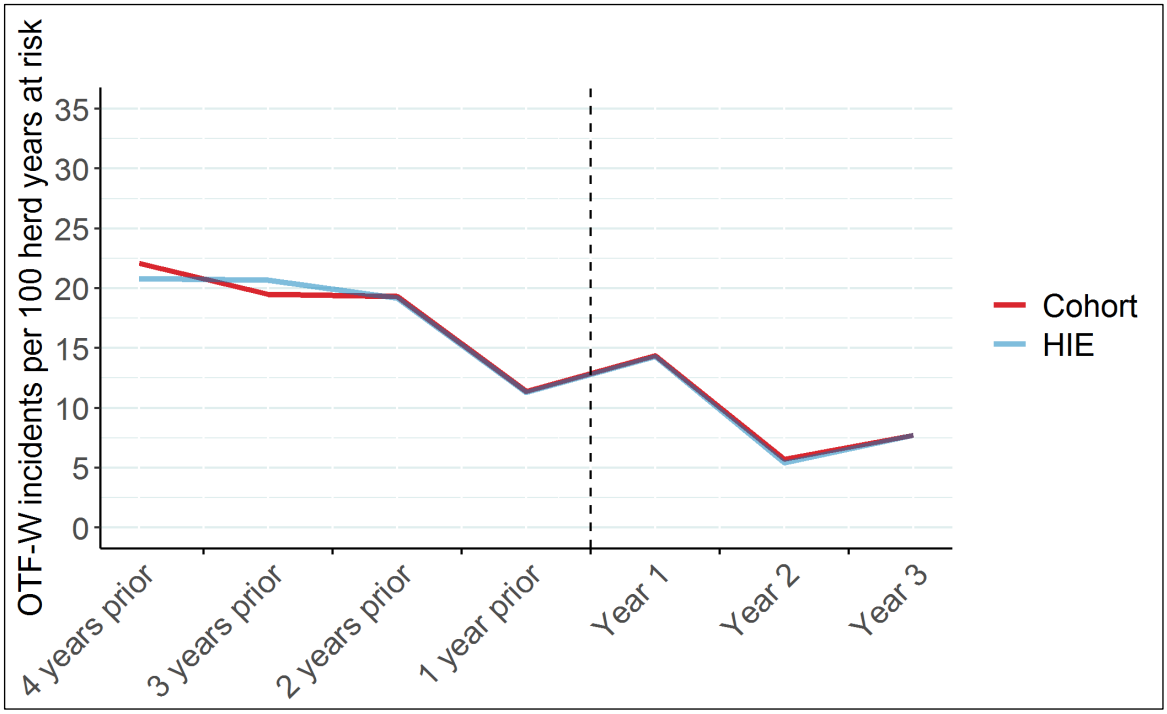

Figure 33 OTF-W incidents per 100 herd years at risk by year in Area 17, Somerset central, for cohort herds and herds in existence (HIE). The cull started in Area 17 in 2017, indicated by the dashed line

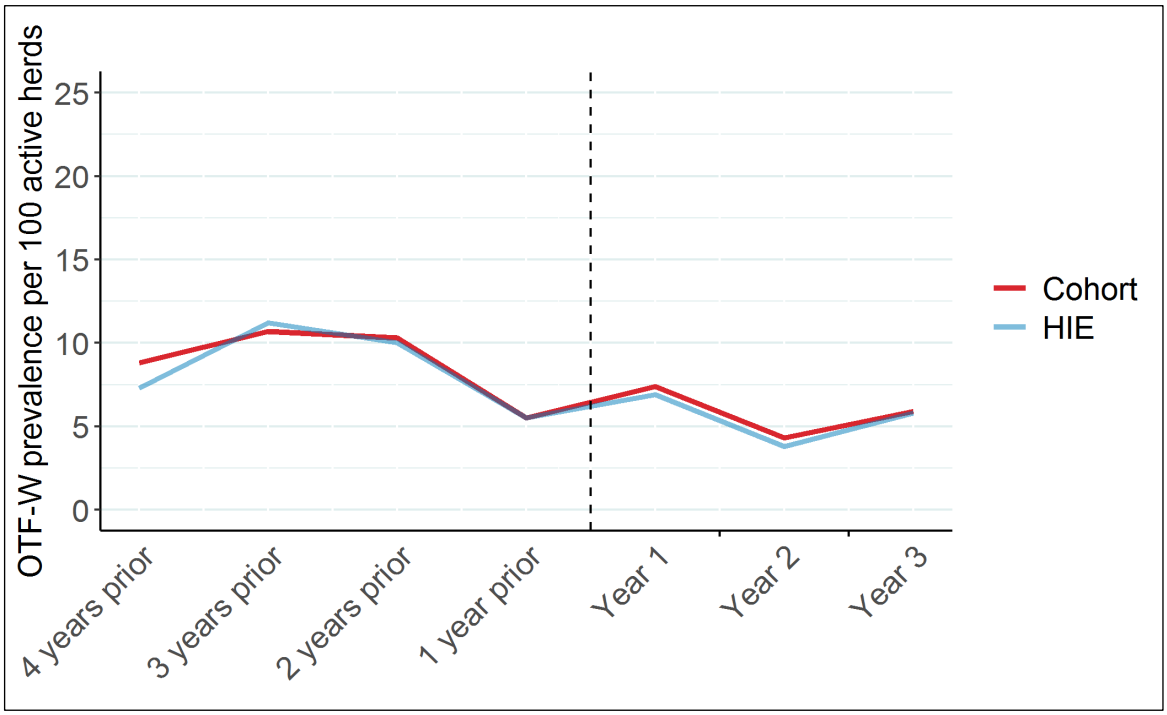

Figure 34 OTF-W prevalence per 100 active herds by year in Area 17, Somerset central, for cohort herds and herds in existence (HIE). The cull started in Area 17 in 2017, indicated by the dashed line

Area 18 - Somerset central

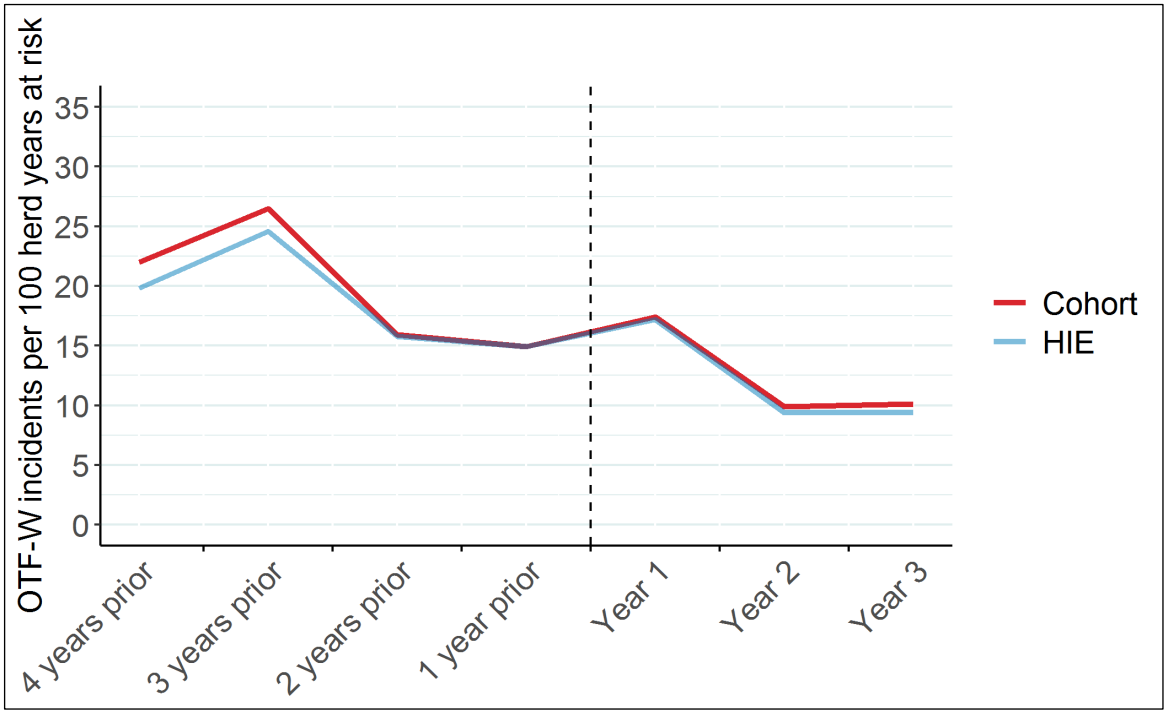

Figure 35 OTF-W incidents per 100 herd years at risk by year in Area 18, Somerset central, for cohort herds and herds in existence (HIE). The cull started in Area 18 in 2017, indicated by the dashed line

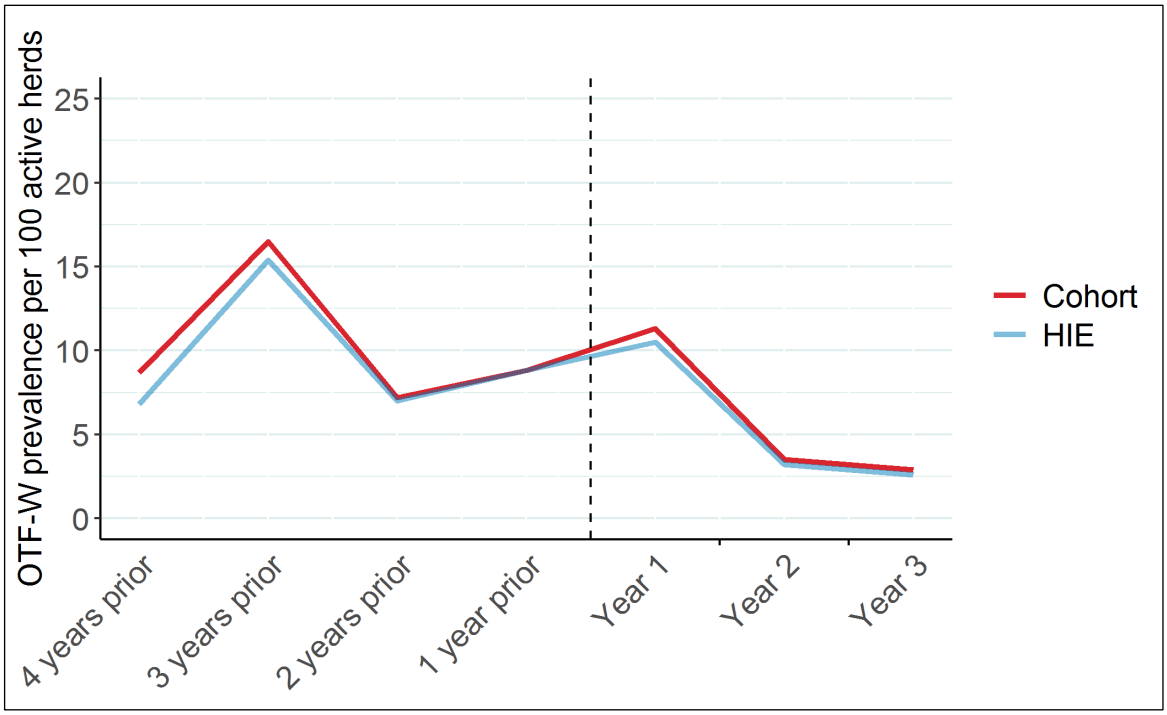

Figure 36 OTF-W prevalence per 100 active herds by year in Area 18, Somerset central, for cohort herds and herds in existence (HIE). The cull started in Area 18 in 2017, indicated by the dashed line

Area 19 - Wiltshire central

Central area increased in size by 3.4% in May 2018

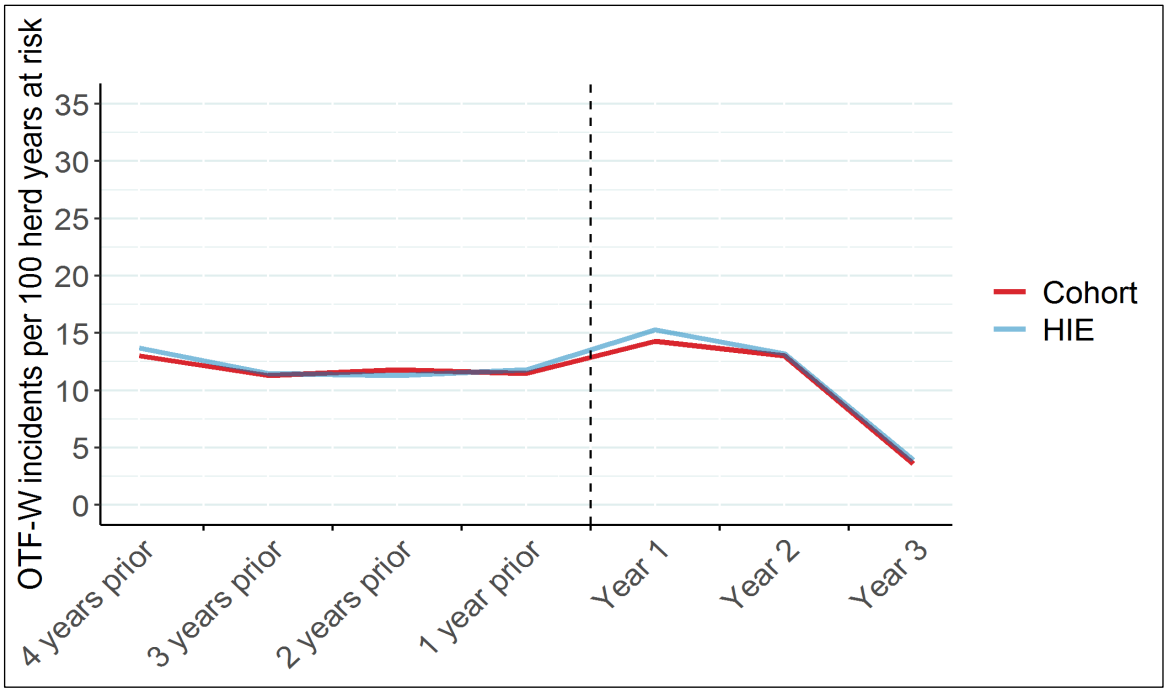

Figure 37 OTF-W incidents per 100 herd years at risk by year in Area 19, Wiltshire central, for cohort herds and herds in existence (HIE). The cull started in Area 19 in 2017, indicated by the dashed line

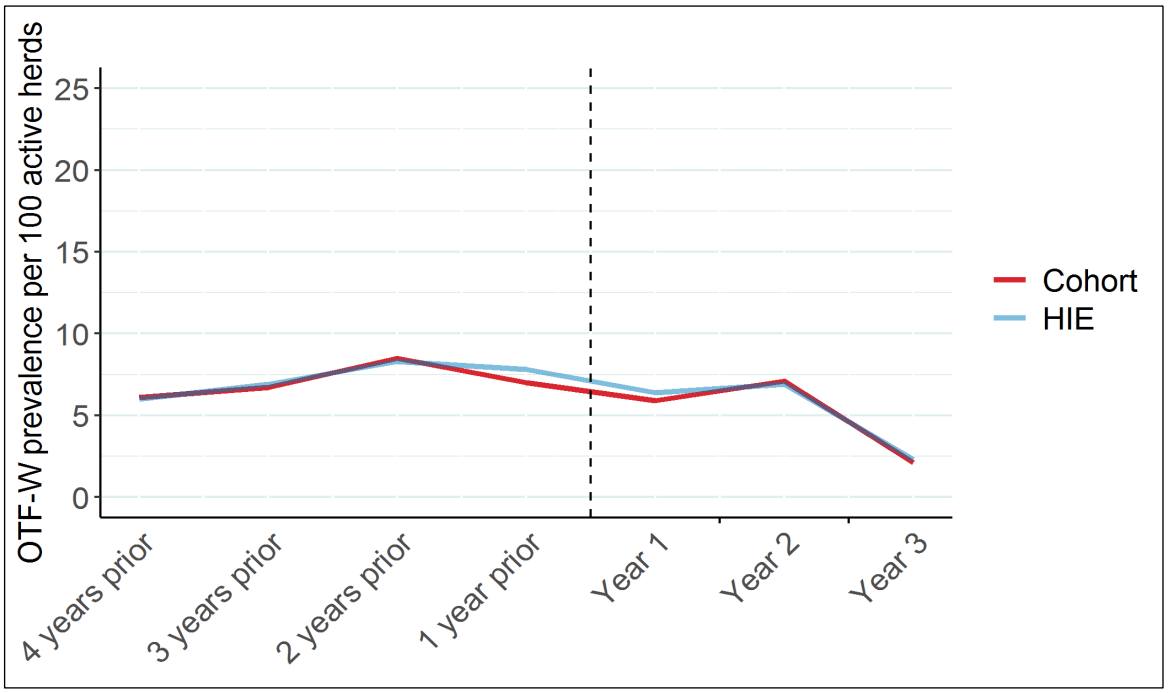

Figure 38 OTF-W prevalence per 100 active herds by year in Area 19, Wiltshire central, for cohort herds and herds in existence (HIE). The cull started in Area 19 in 2017, indicated by the dashed line

Area 20 - Wiltshire central

Central area increased in size by 1.3% in May 2018

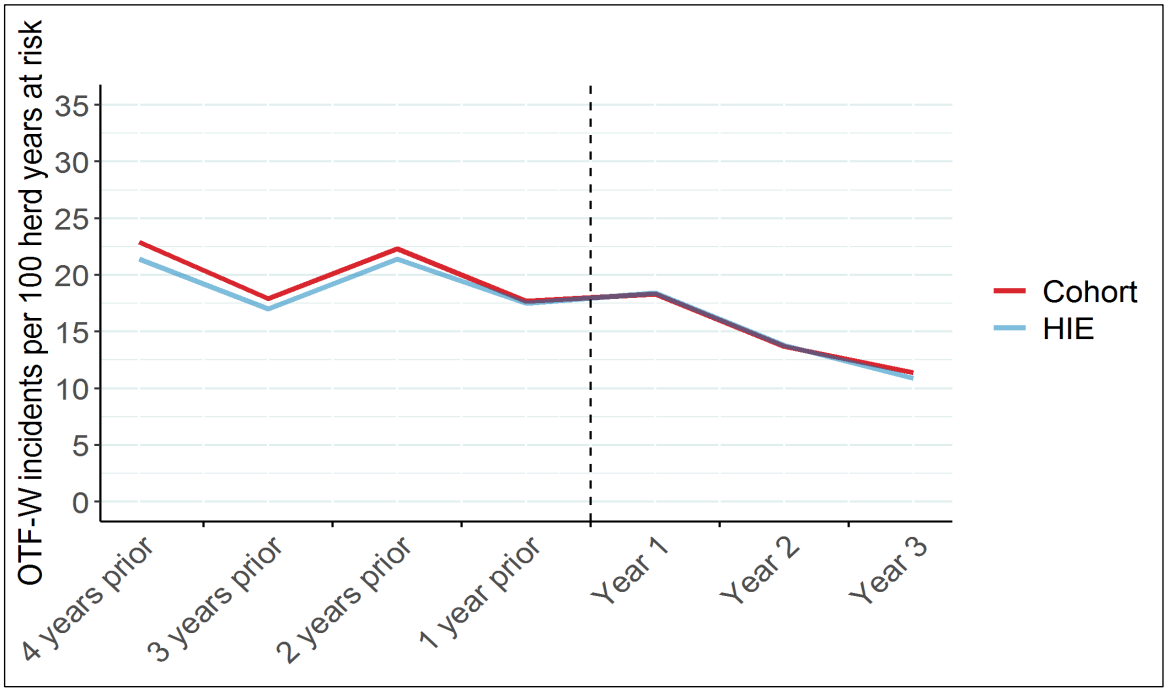

Figure 39 OTF-W incidents per 100 herd years at risk by year in Area 20, Wiltshire central, for cohort herds and herds in existence (HIE). The cull started in Area 20 in 2017, indicated by the dashed line

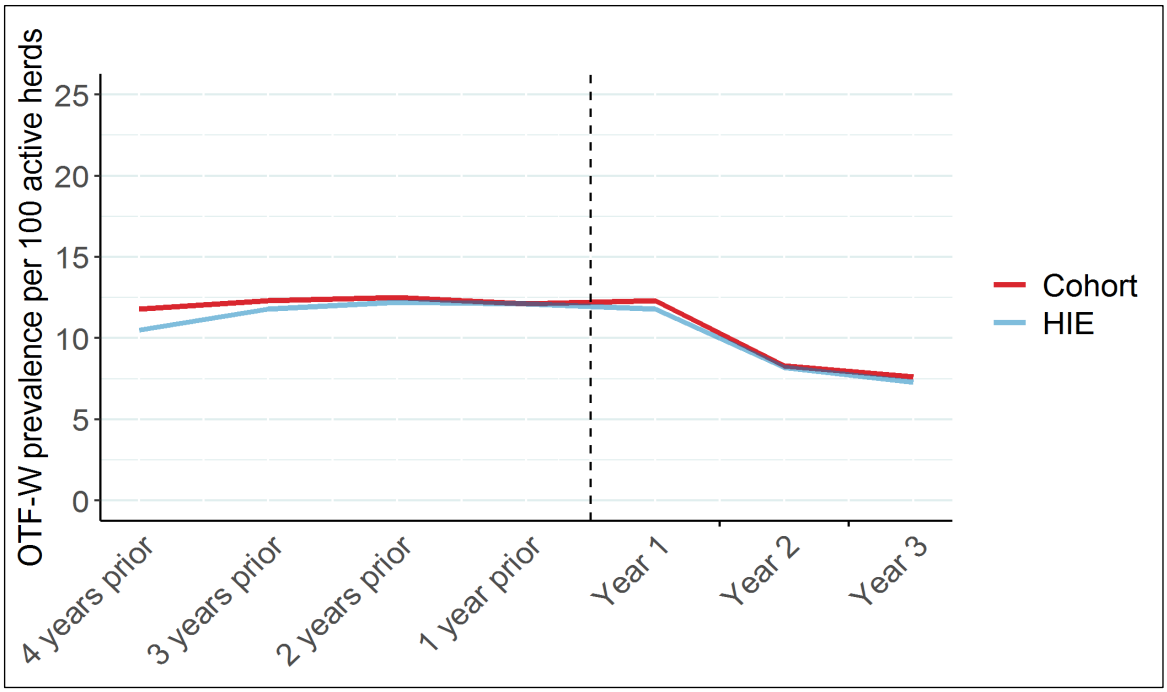

Figure 40 OTF-W prevalence per 100 active herds by year in Area 20, Wiltshire central, for cohort herds and herds in existence (HIE). The cull started in Area 20 in 2017, indicated by the dashed line

Area 21 - Wiltshire central

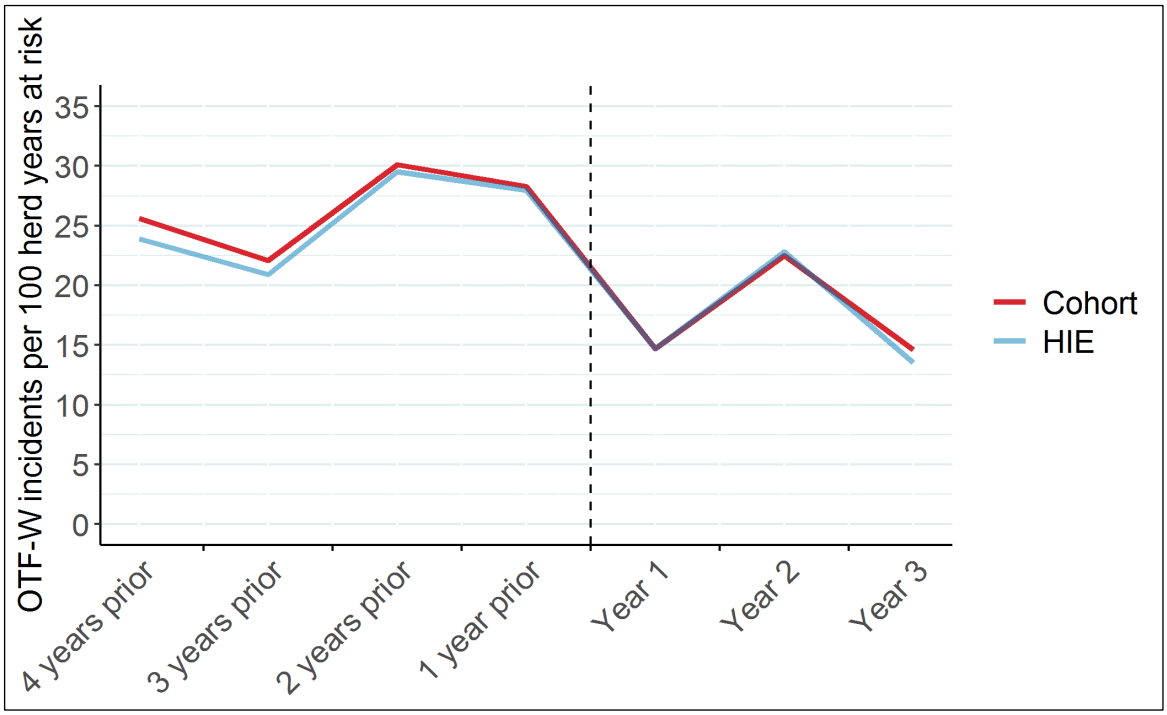

Figure 41 OTF-W incidents per 100 herd years at risk by year in Area 21, Wiltshire central, for cohort herds and herds in existence (HIE). The cull started in Area 21 in 2017, indicated by the dashed line

Figure 42 OTF-W prevalence per 100 active herds by year in Area 21, Wiltshire central, for cohort herds and herds in existence (HIE). The cull started in Area 21 in 2017, indicated by the dashed line

Areas where the cull commenced in 2018

Area 22 - Cornwall central

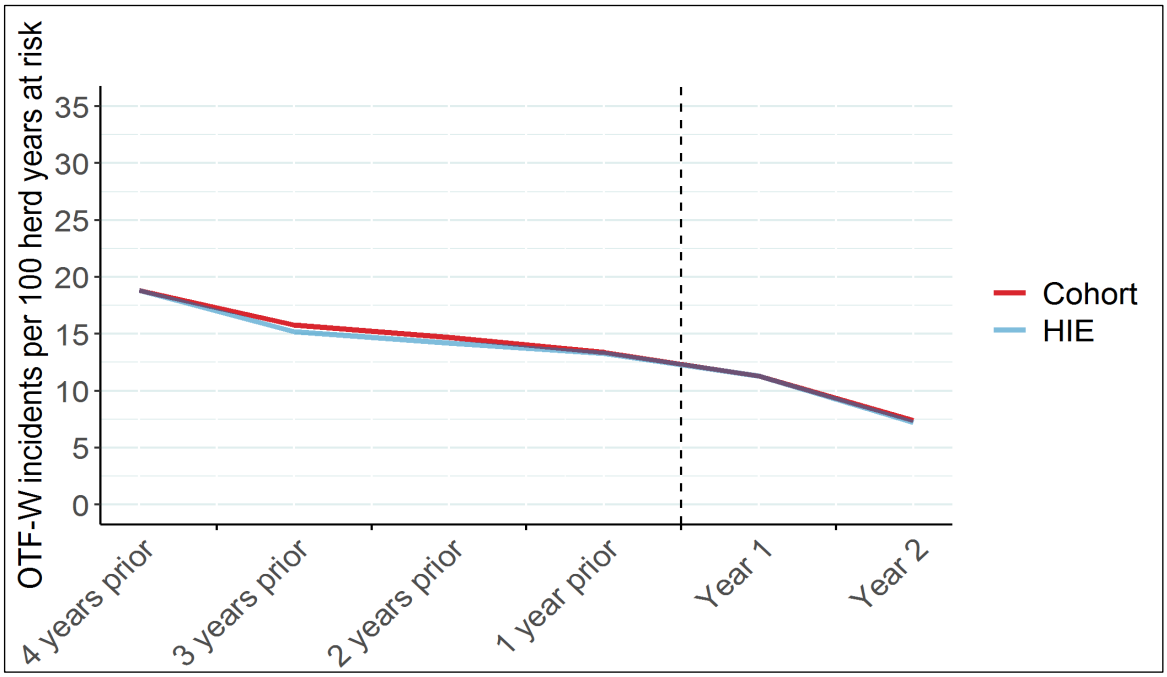

Figure 43 OTF-W incidents per 100 herd years at risk by year in Area 22, Cornwall central, for cohort herds and herds in existence (HIE). The cull started in Area 22 in 2018, indicated by the dashed line

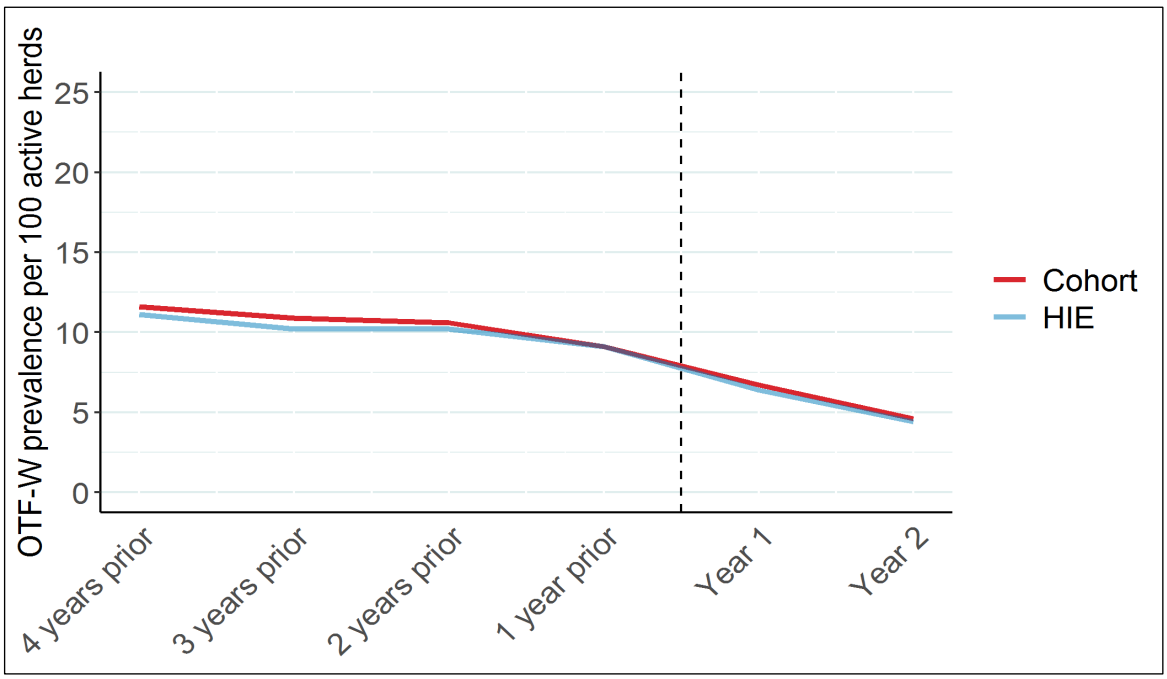

Figure 44 OTF-W prevalence per 100 active herds by year in Area 22, Cornwall central, for cohort herds and herds in existence (HIE). The cull started in Area 22 in 2018, indicated by the dashed line

Area 23 - Devon central

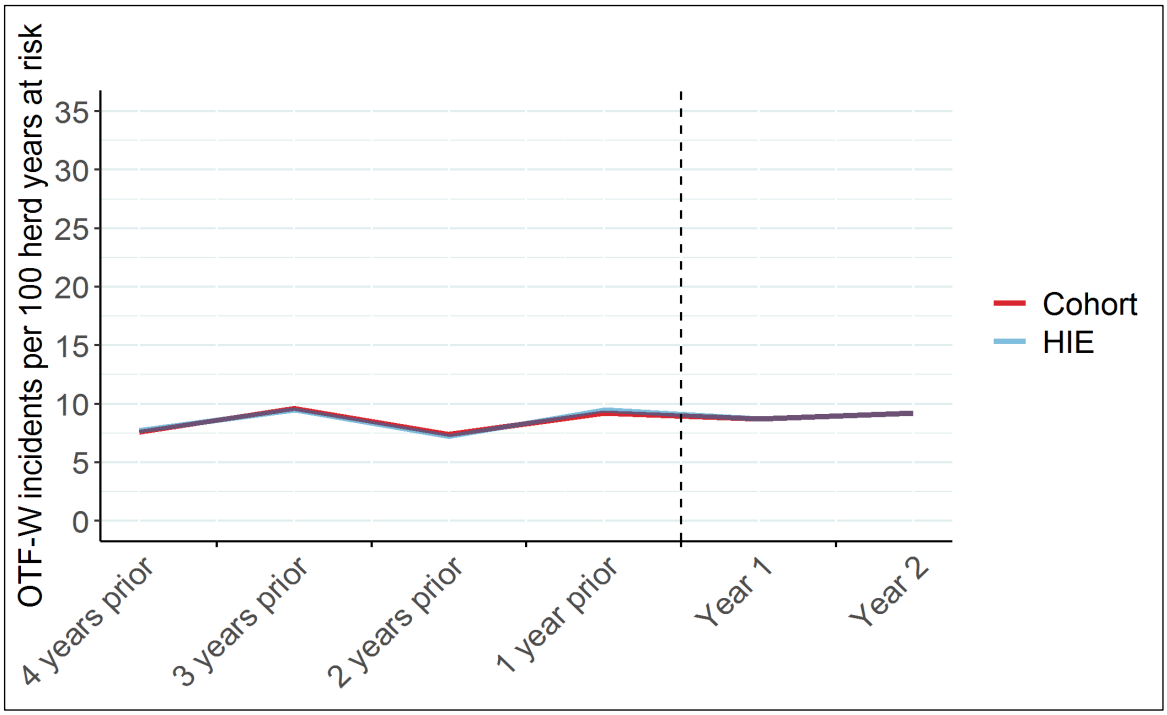

Figure 45 OTF-W incidents per 100 herd years at risk by year in Area 23, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 23 in 2018, indicated by the dashed line

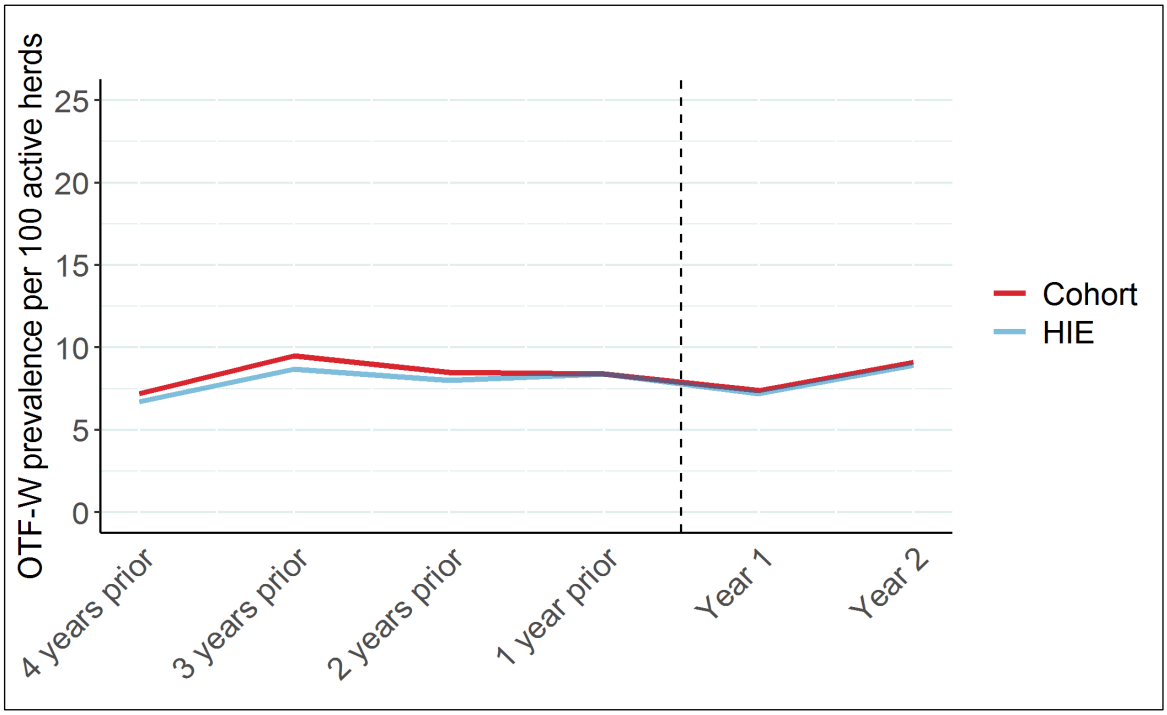

Figure 46 OTF-W prevalence per 100 active herds by year in Area 23, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 23 in 2018, indicated by the dashed line

Area 24 - Devon central

Central area increased in size by 6.1% in February 2019

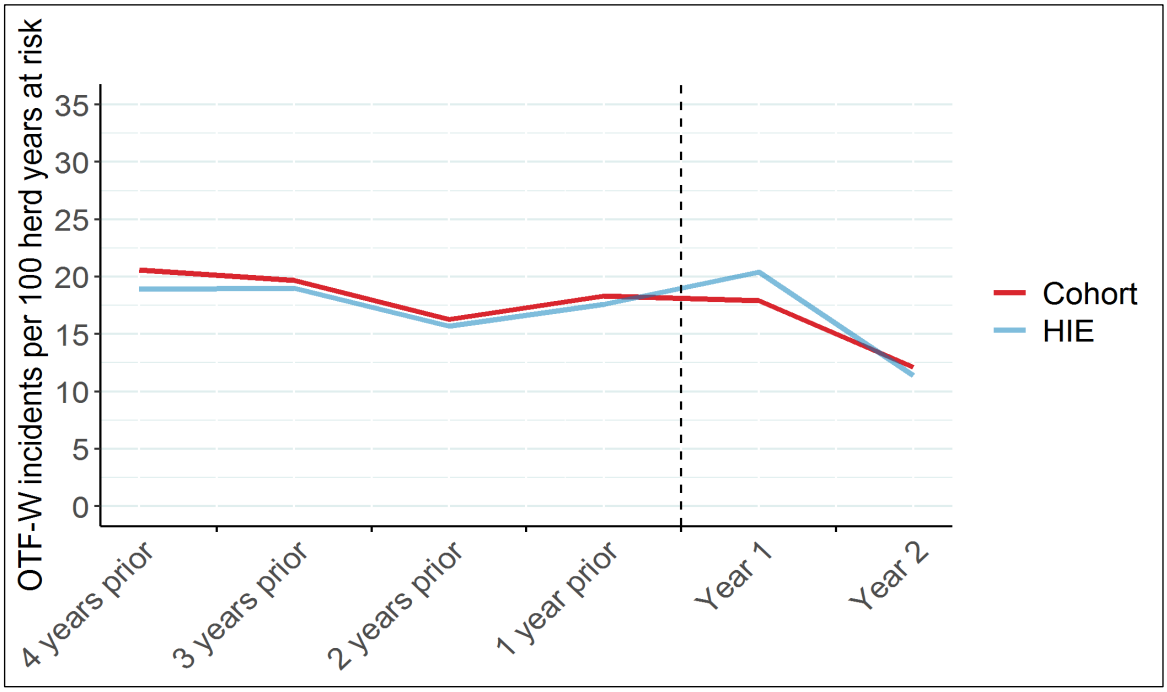

Figure 47 OTF-W incidents per 100 herd years at risk by year in Area 24, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 24 in 2018, indicated by the dashed line

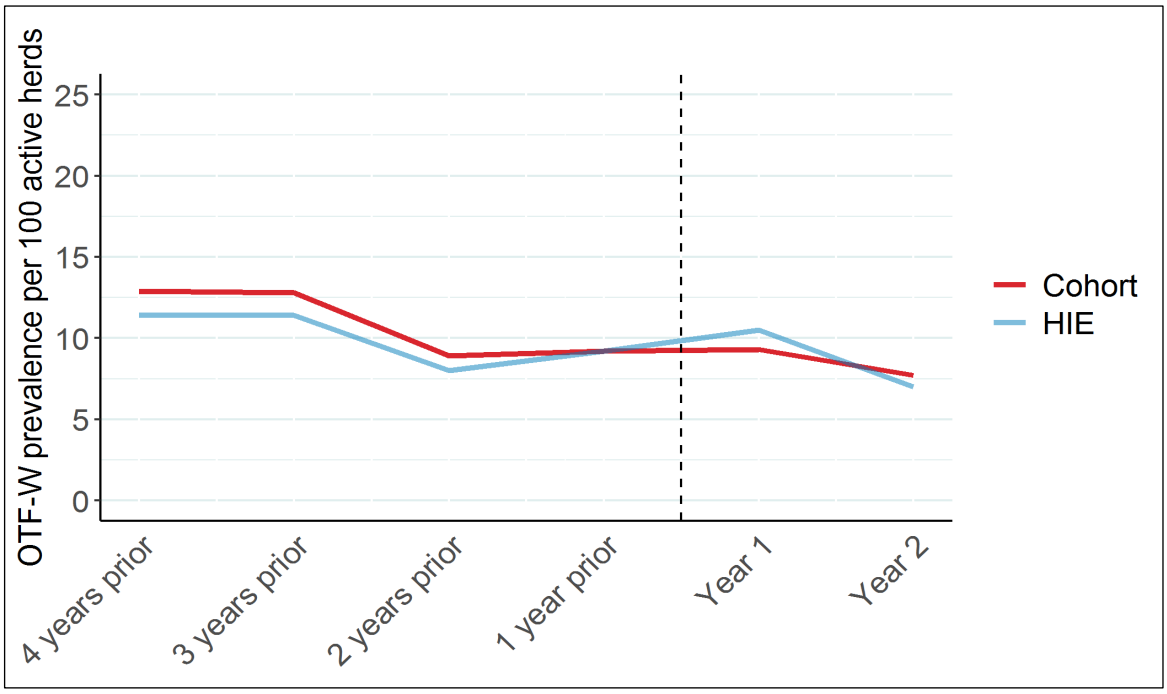

Figure 48 OTF-W prevalence per 100 active herds by year in Area 24, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 24 in 2018, indicated by the dashed line

Area 25 - Devon central

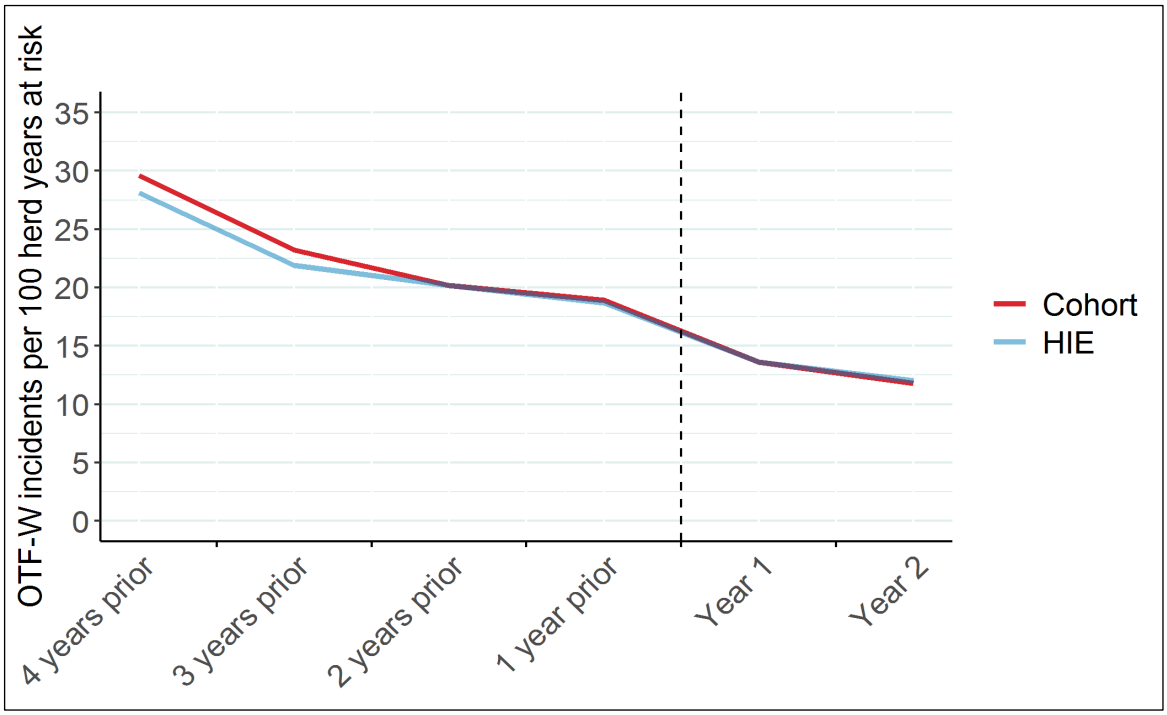

Figure 49 OTF-W incidents per 100 herd years at risk by year in Area 25, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 25 in 2018, indicated by the dashed line

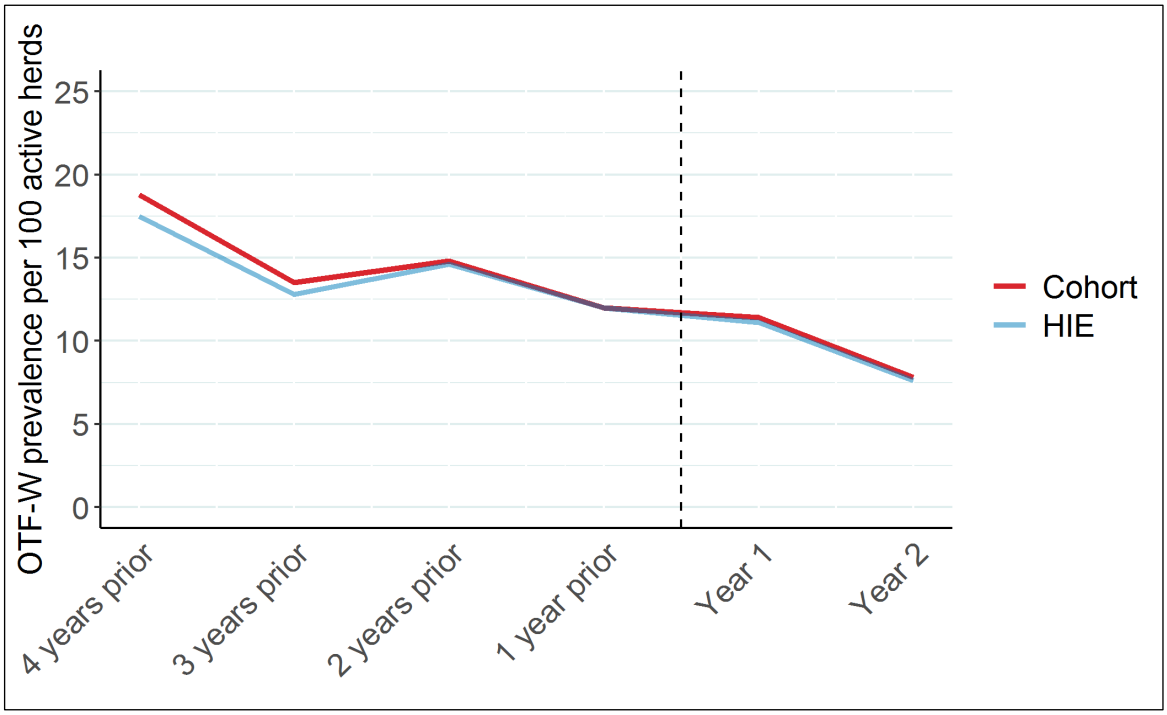

Figure 50 OTF-W prevalence per 100 active herds by year in Area 25, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 25 in 2018, indicated by the dashed line

Area 26 - Devon central

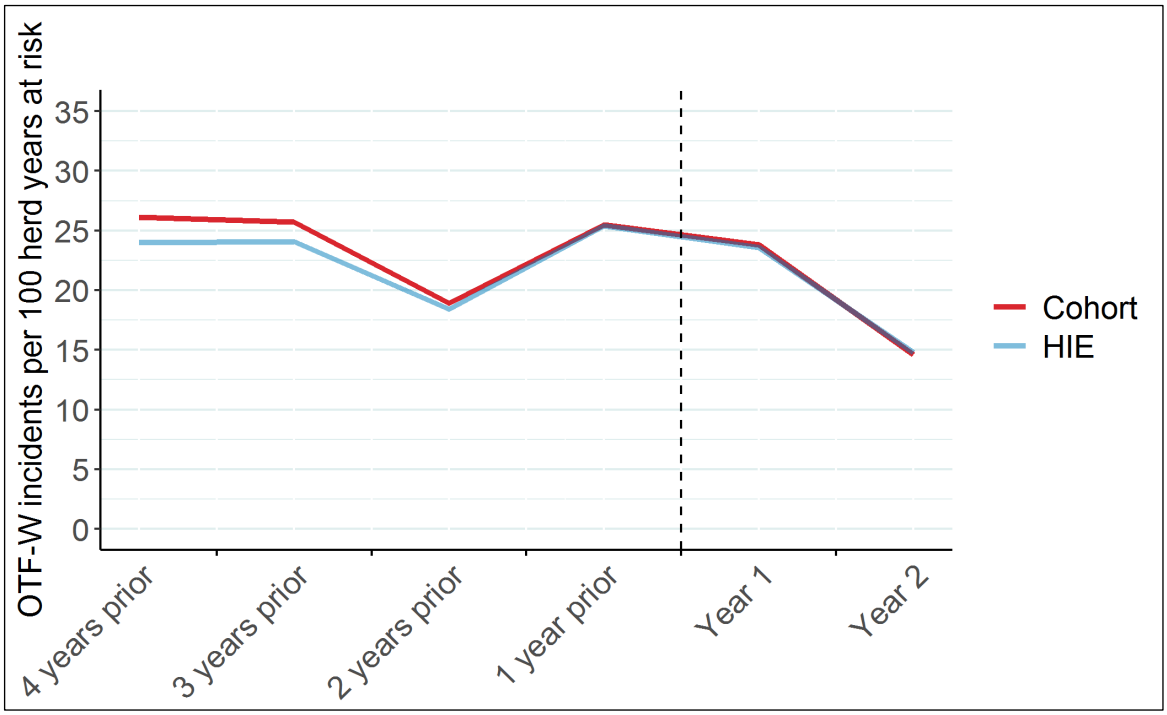

Figure 51 OTF-W incidents per 100 herd years at risk by year in Area 26, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 26 in 2018, indicated by the dashed line

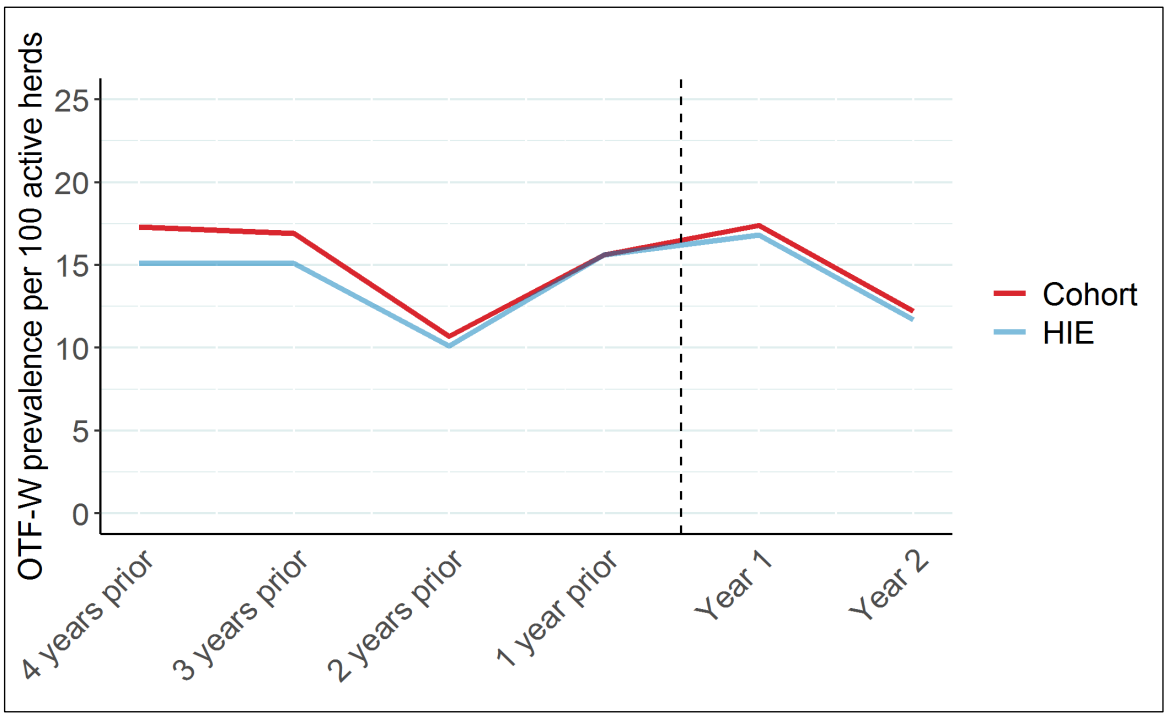

Figure 52 OTF-W prevalence per 100 active herds by year in Area 26, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 26 in 2018, indicated by the dashed line

Area 27 - Devon central

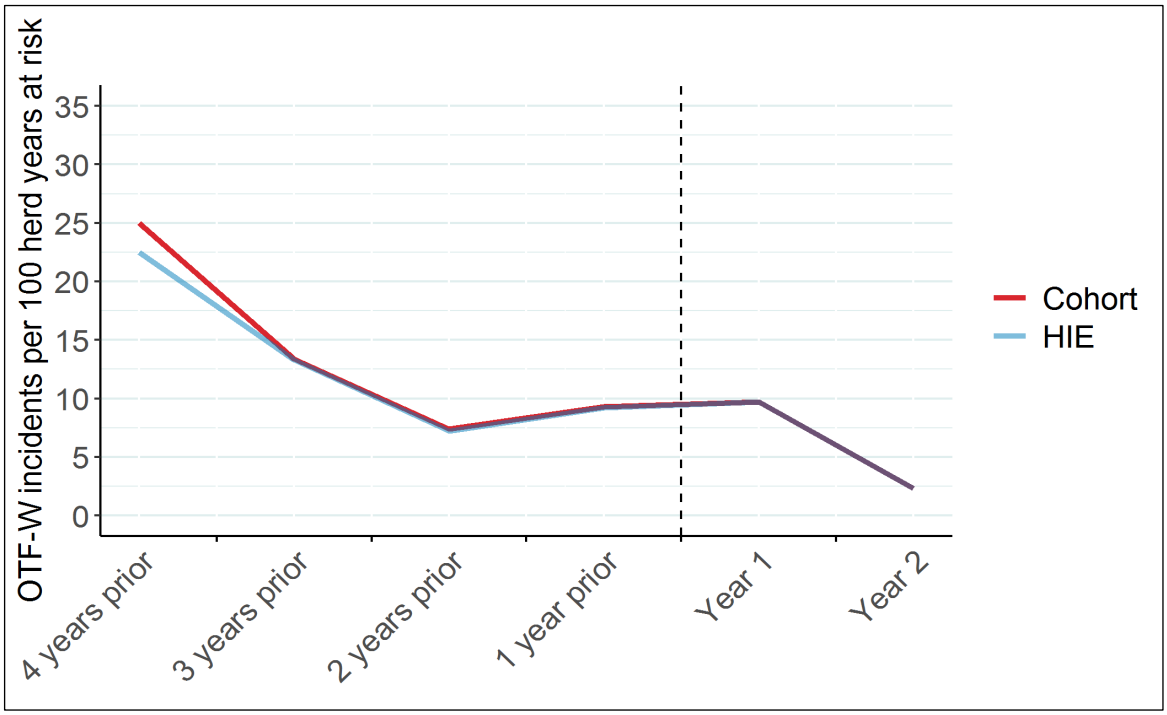

Figure 53 OTF-W incidents per 100 herd years at risk by year in Area 27, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 27 in 2018, indicated by the dashed line

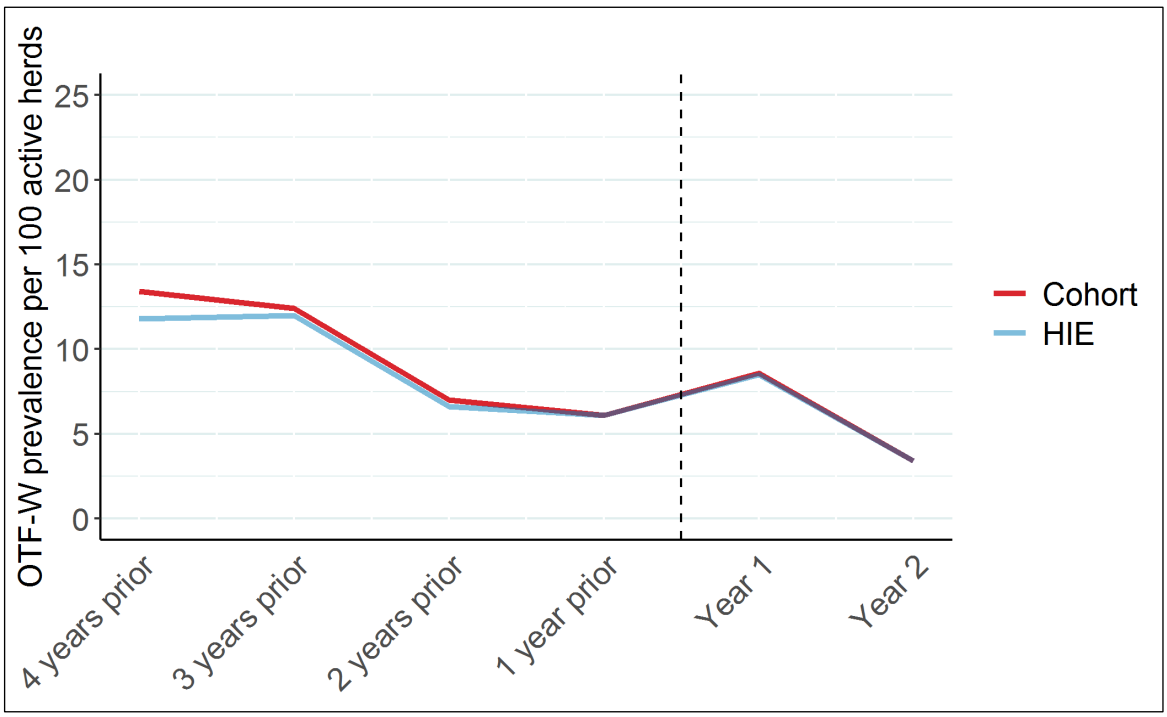

Figure 54 OTF-W prevalence per 100 active herds by year in Area 27, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 27 in 2018, indicated by the dashed line

Area 28 - Devon central

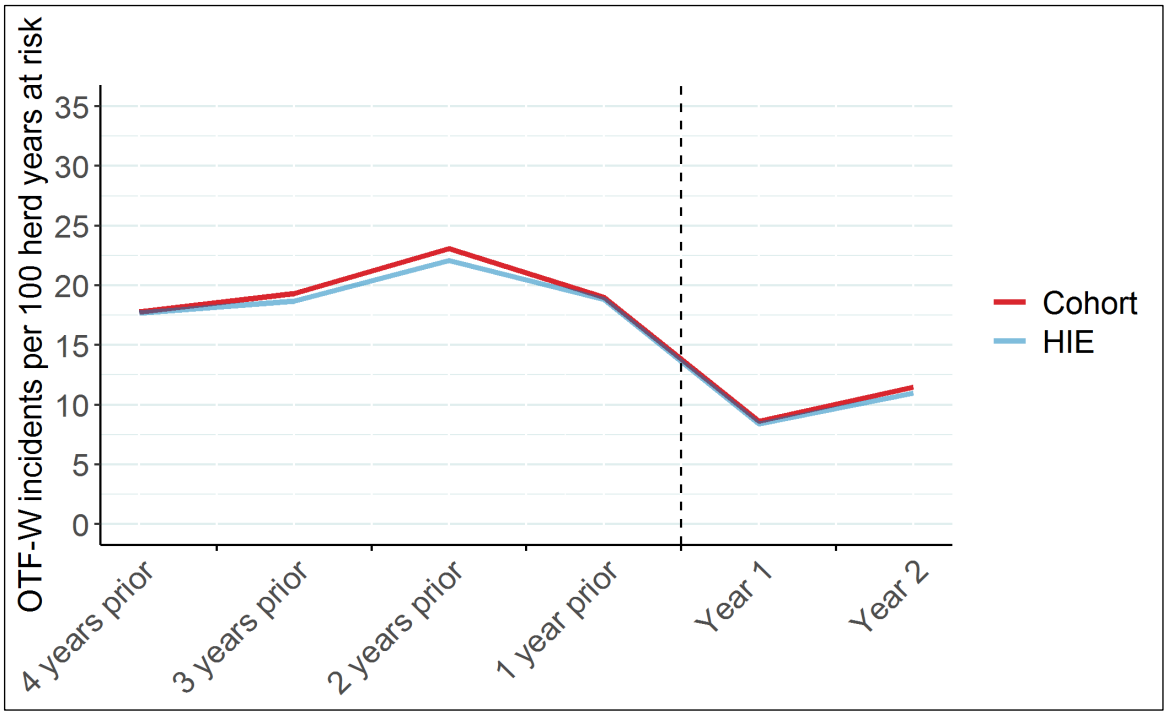

Figure 55 OTF-W incidents per 100 herd years at risk by year in Area 28, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 28 in 2018, indicated by the dashed line

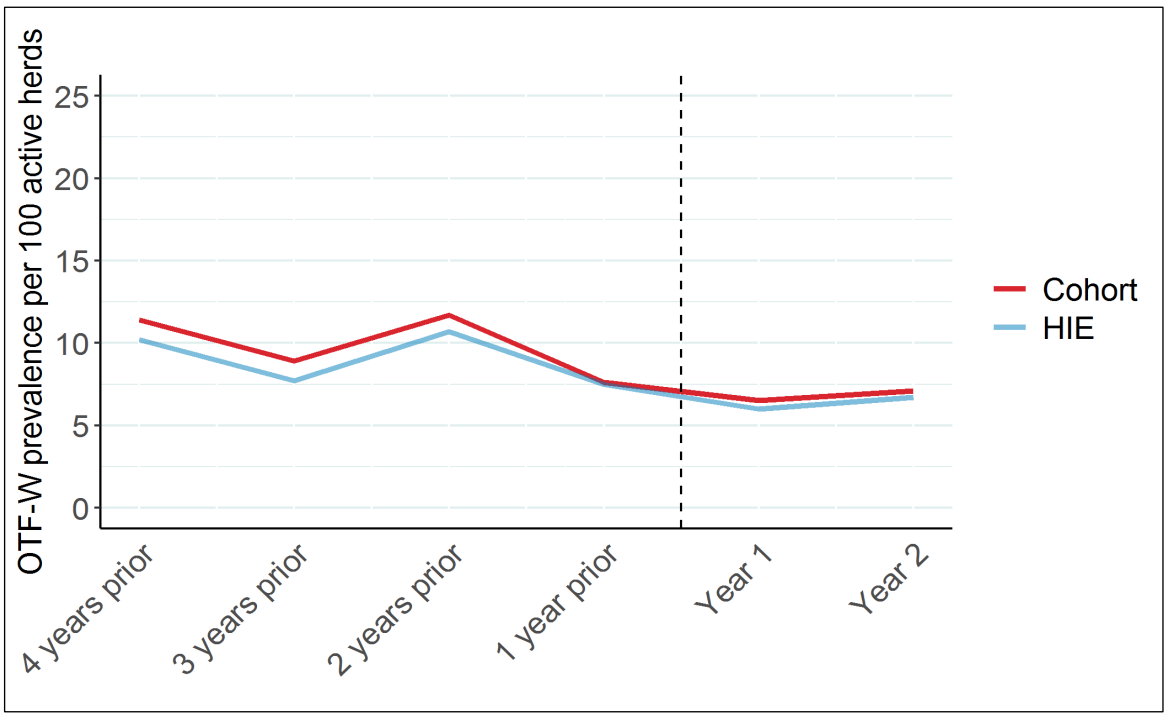

Figure 56 OTF-W prevalence per 100 active herds by year in Area 28, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 28 in 2018, indicated by the dashed line

Area 29 - Gloucestershire central

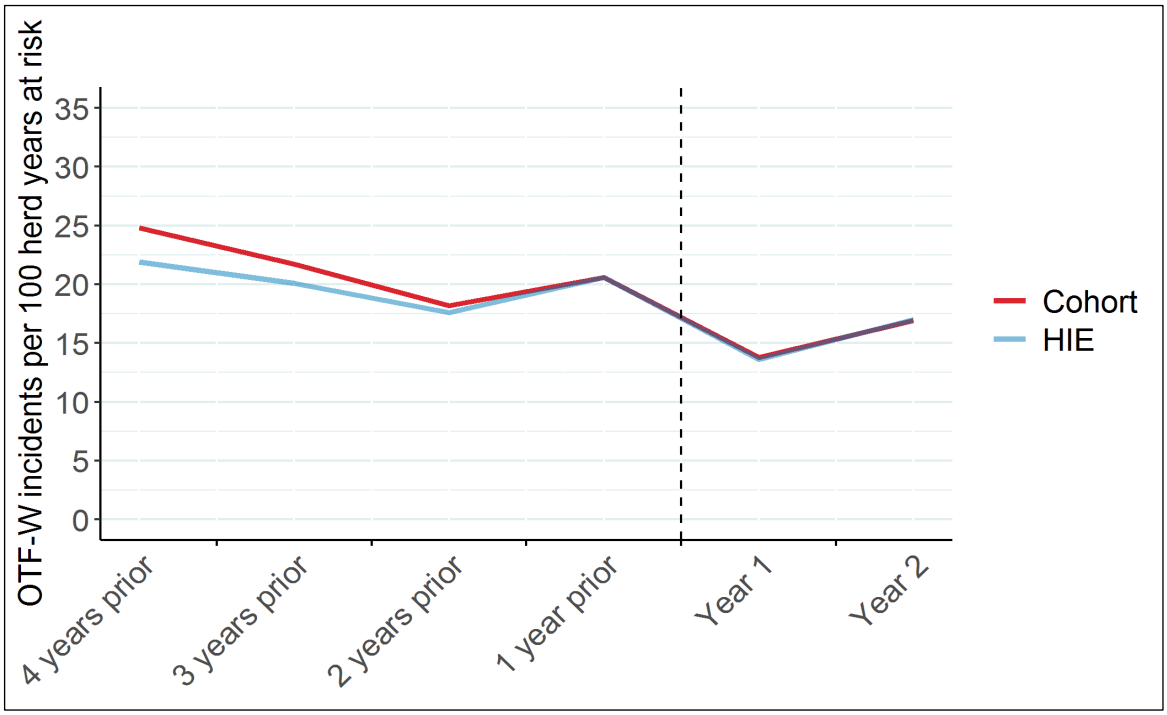

Figure 57 OTF-W incidents per 100 herd years at risk by year in Area 29, Gloucestershire central, for cohort herds and herds in existence (HIE). The cull started in Area 29 in 2018, indicated by the dashed line

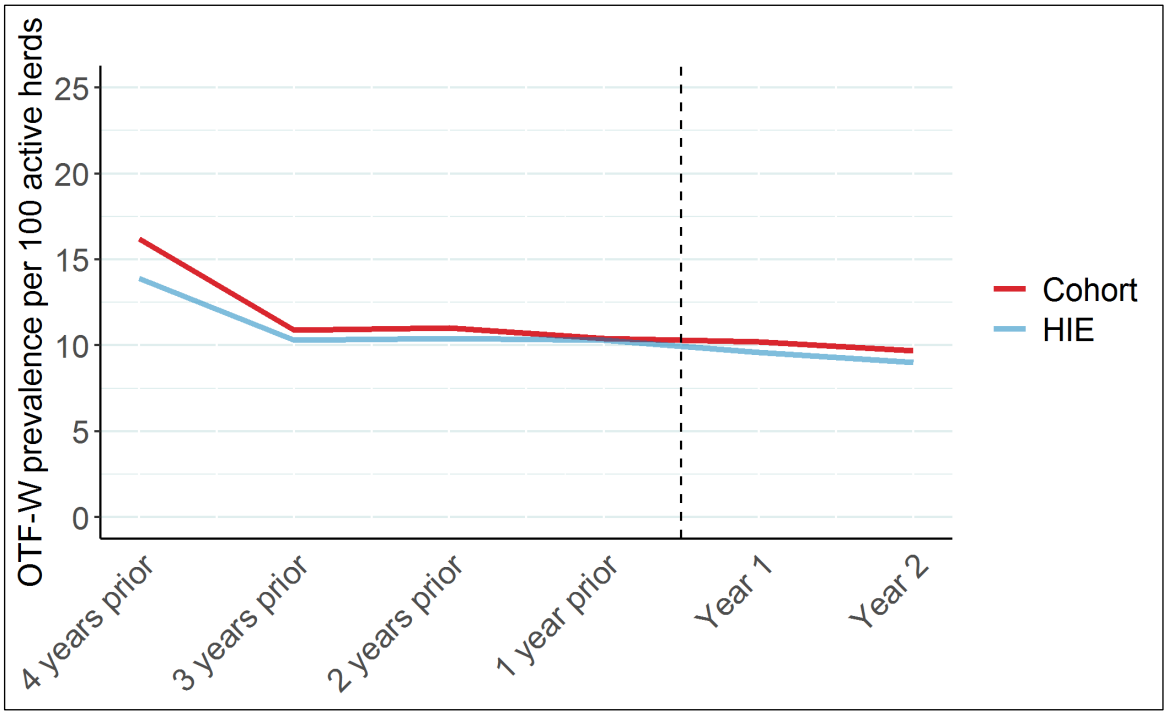

Figure 58 OTF-W prevalence per 100 active herds by year in Area 29, Gloucestershire central, for cohort herds and herds in existence (HIE). The cull started in Area 29 in 2018, indicated by the dashed line

Area 30 - Somerset central

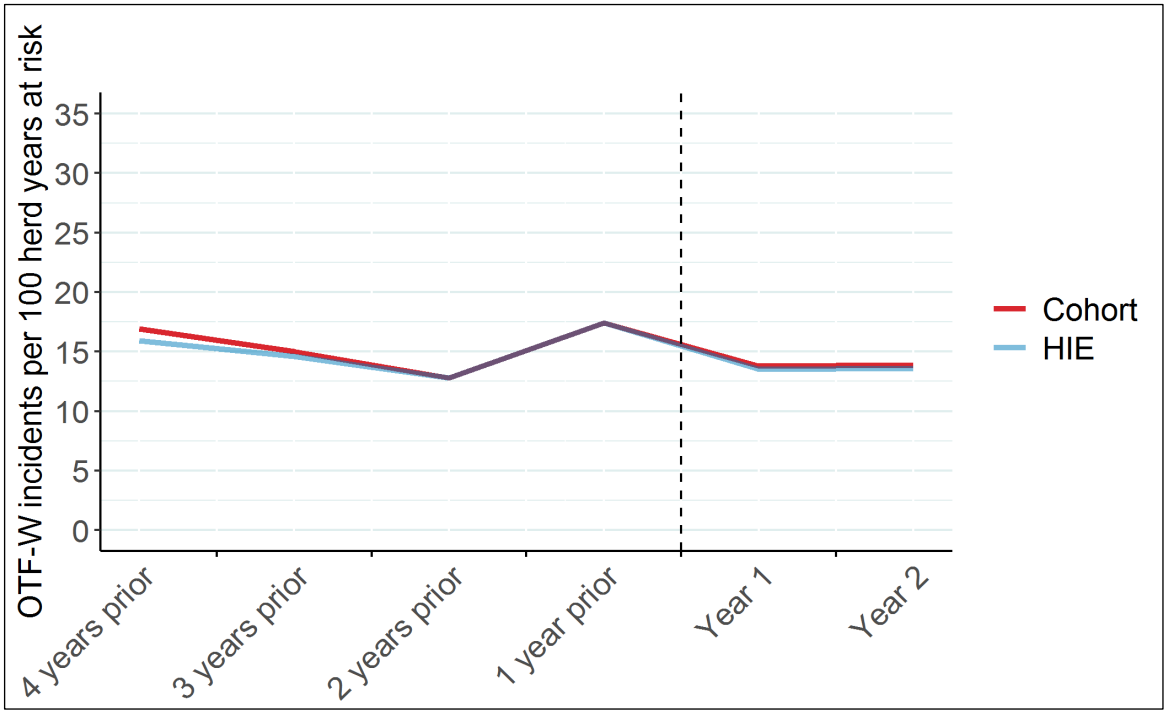

Figure 59 OTF-W incidents per 100 herd years at risk by year in Area 30, Somerset central, for cohort herds and herds in existence (HIE). The cull started in Area 30 in 2018, indicated by the dashed line

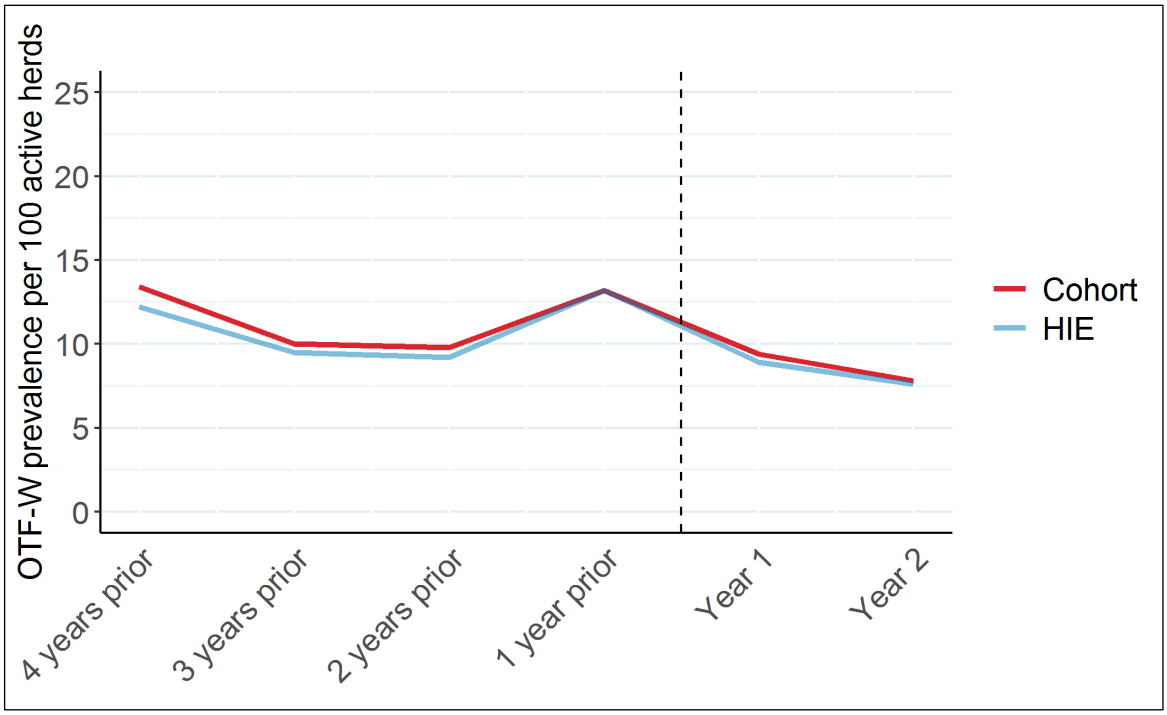

Figure 60 OTF-W prevalence per 100 active herds by year in Area 30, Somerset central, for cohort herds and herds in existence (HIE). The cull started in Area 30 in 2018, indicated by the dashed line

Area 31 - Staffordshire central

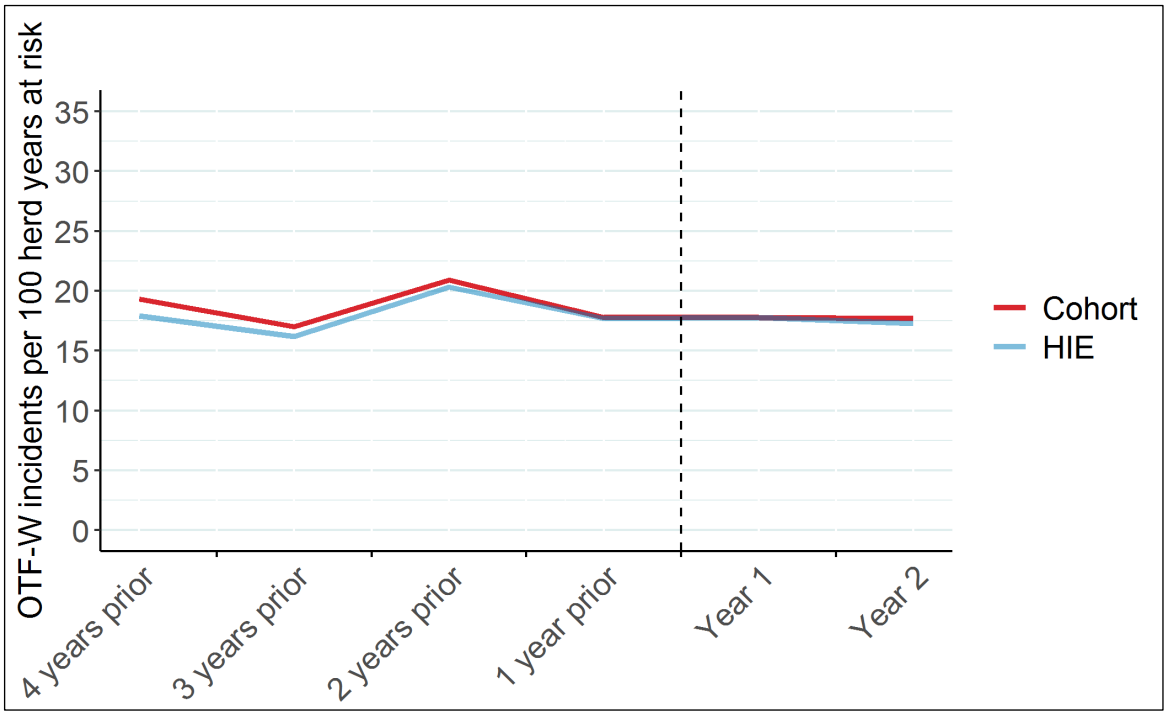

Figure 61 OTF-W incidents per 100 herd years at risk by year in Area 31, Staffordshire central, for cohort herds and herds in existence (HIE). The cull started in Area 31 in 2018, indicated by the dashed line

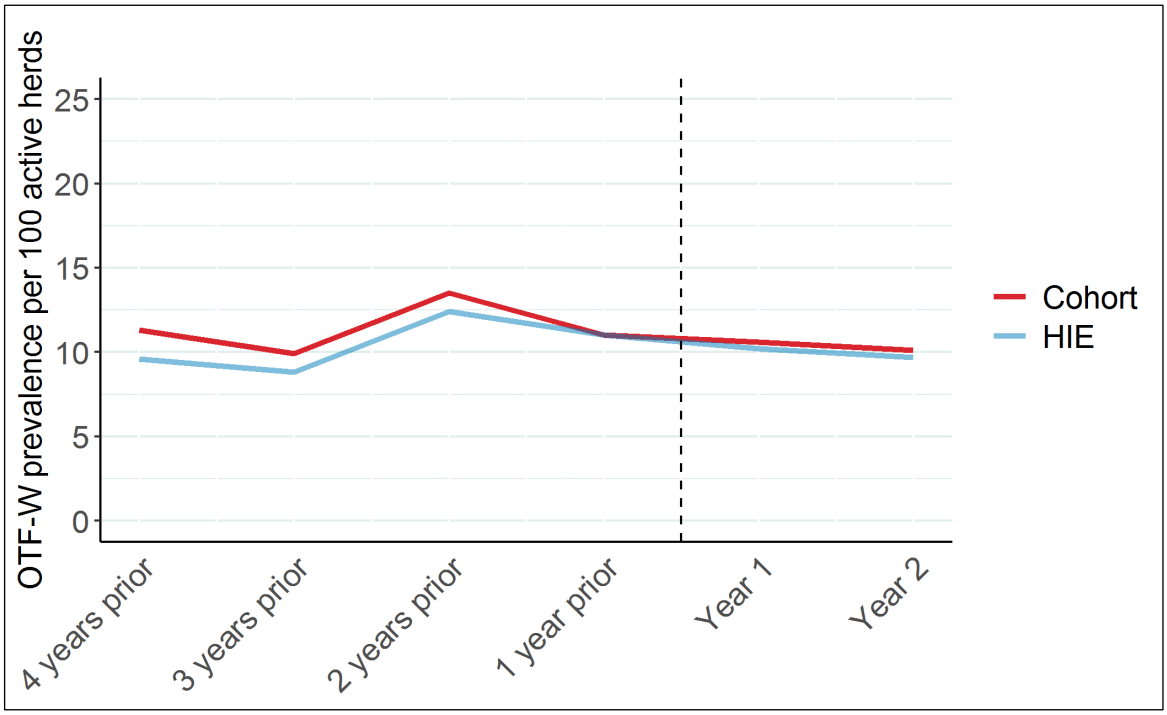

Figure 62 OTF-W prevalence per 100 active herds by year in Area 31, Staffordshire central, for cohort herds and herds in existence (HIE). The cull started in Area 31 in 2018, indicated by the dashed line

Area 32 - Cumbria central

Central area increased in size by 12.7% in January 2019

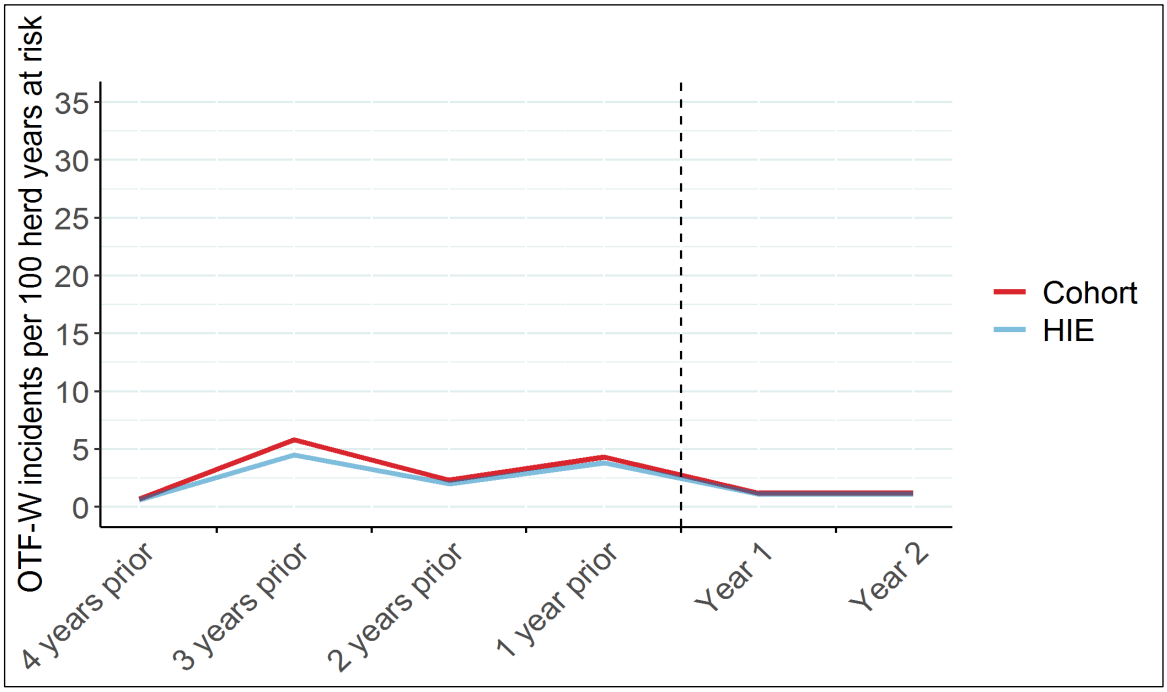

Figure 63 OTF-W incidents per 100 herd years at risk by year in Area 32, Cumbria central, for cohort herds and herds in existence (HIE). The cull started in Area 32 in 2018, indicated by the dashed line

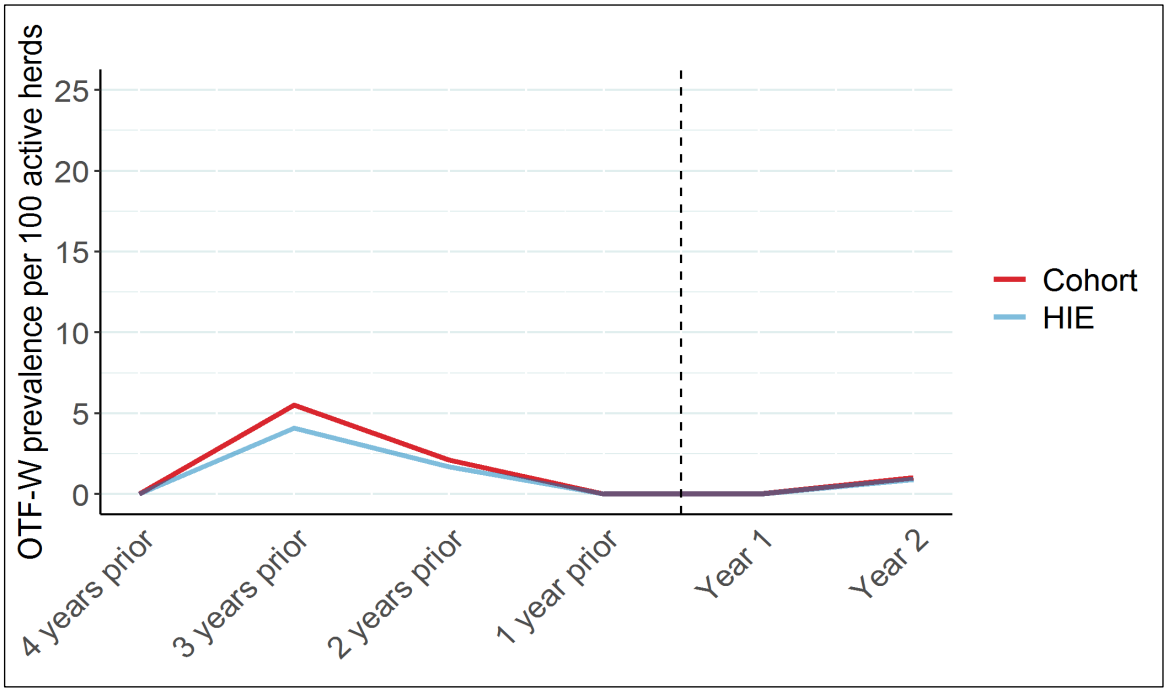

Figure 64 OTF-W prevalence per 100 active herds by year in Area 32, Cumbria central, for cohort herds and herds in existence (HIE). The cull started in Area 32 in 2018, indicated by the dashed line

Areas where the cull commenced in 2019

Area 33 – Avon central

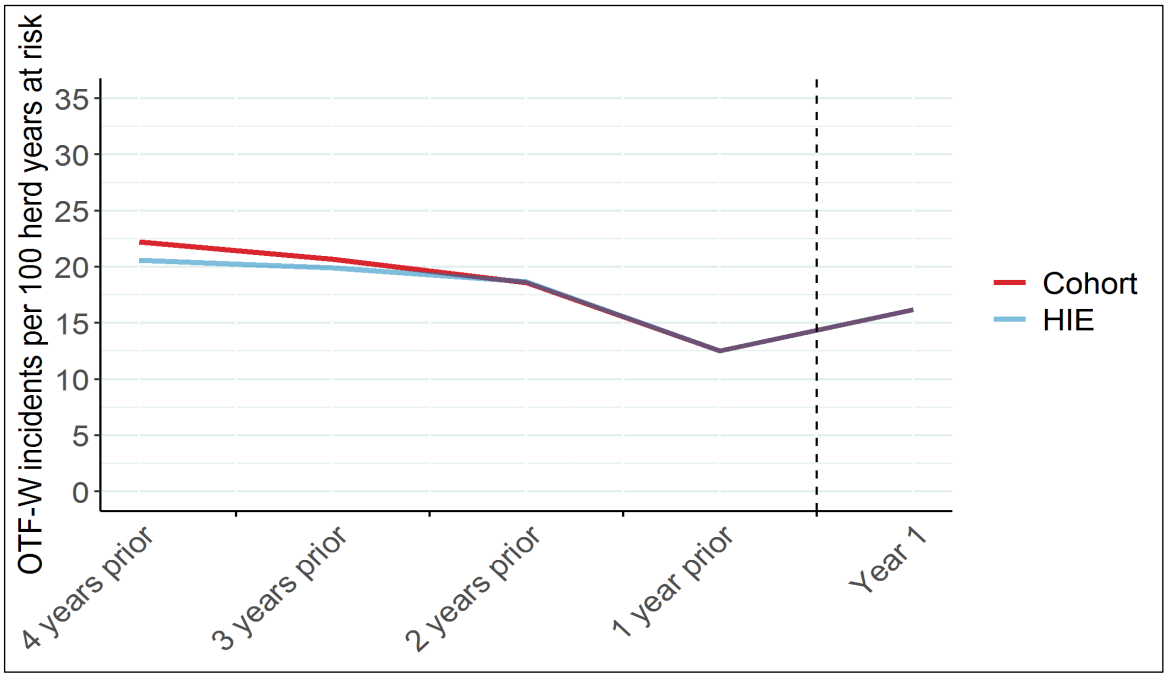

Figure 65 OTF-W incidents per 100 herd years at risk by year in Area 33, Avon central, for cohort herds and herds in existence (HIE). The cull started in Area 33 in 2019, indicated by the dashed line

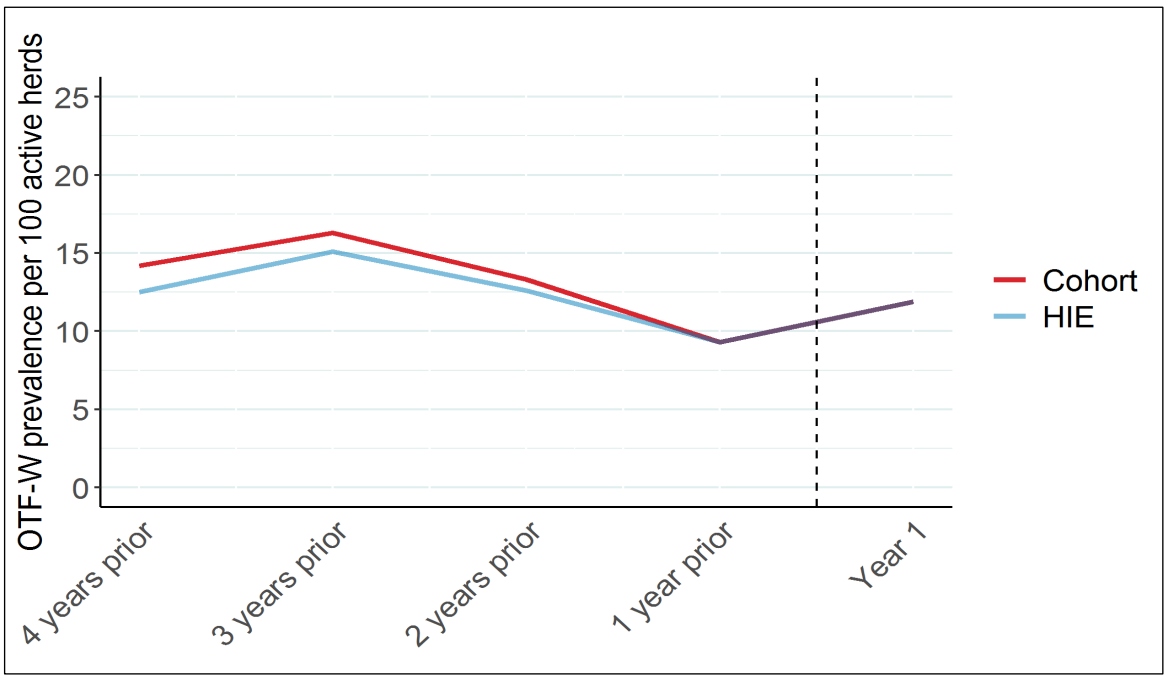

Figure 66 OTF-W prevalence per 100 active herds by year in Area 33, Avon central, for cohort herds and herds in existence (HIE). The cull started in Area 33 in 2019, indicated by the dashed line

Area 34 – Cheshire central

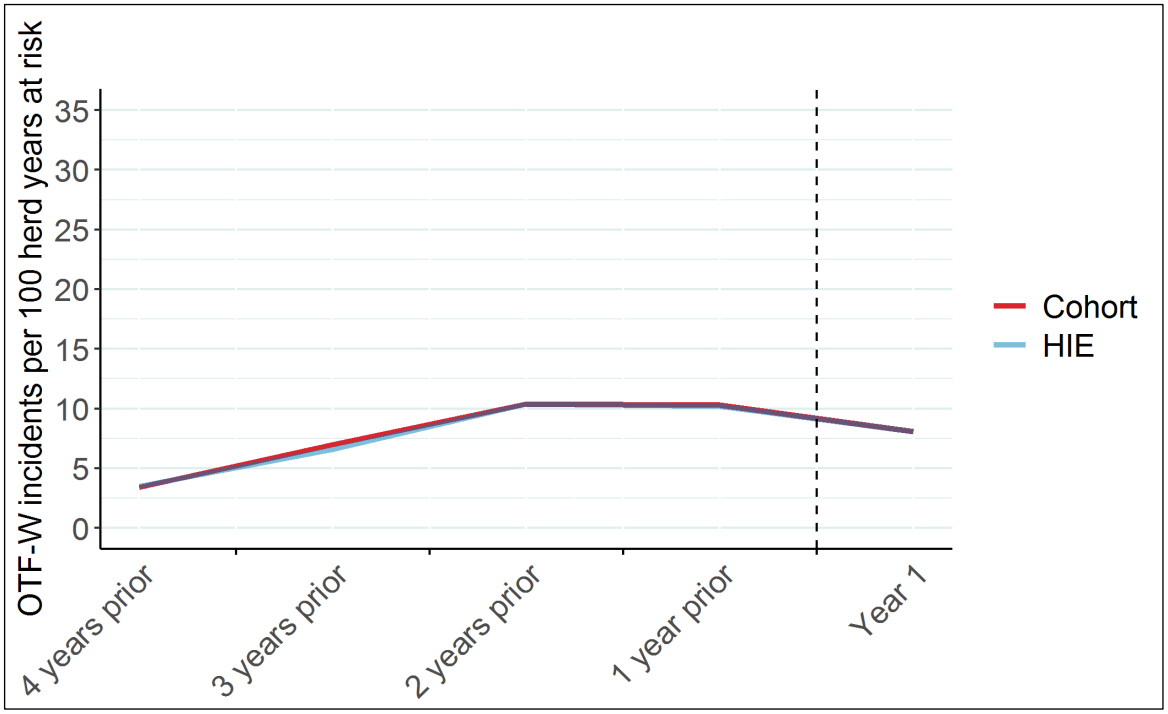

Figure 67 OTF-W incidents per 100 herd years at risk by year in Area 34, Cheshire central, for cohort herds and herds in existence (HIE). The cull started in Area 34 in 2019, indicated by the dashed line

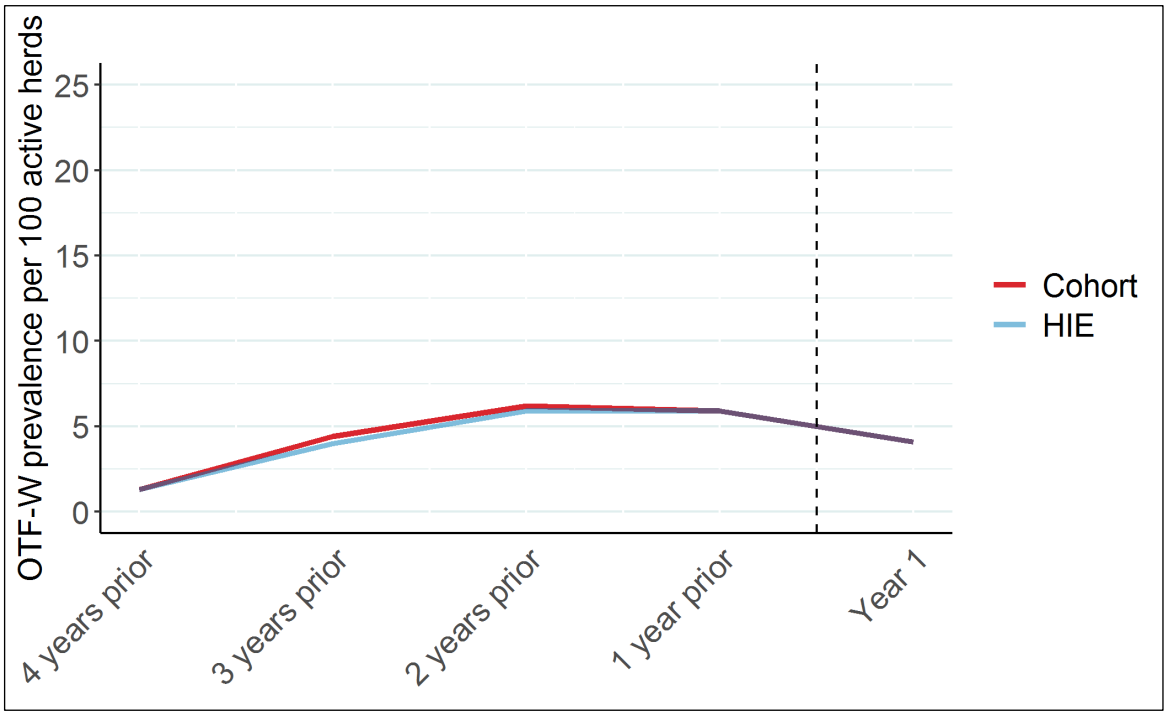

Figure 68 OTF-W prevalence per 100 active herds by year in Area 34, Cheshire central, for cohort herds and herds in existence (HIE). The cull started in Area 34 in 2019, indicated by the dashed line

Area 35 – Cornwall central

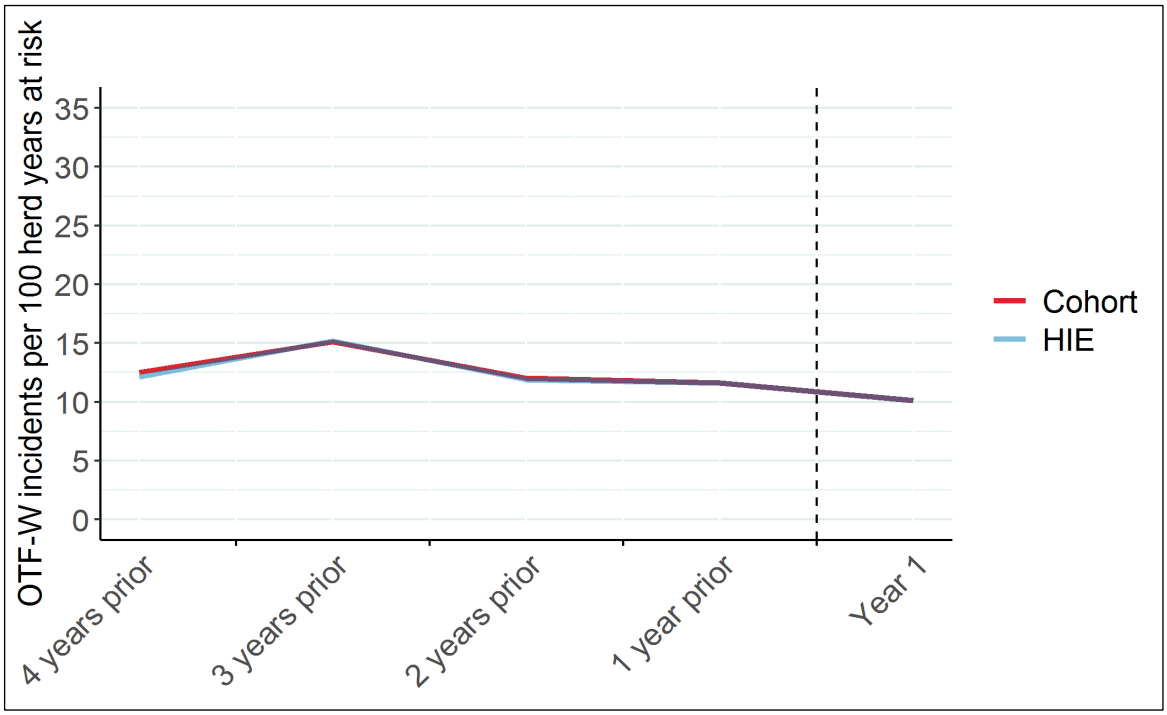

Figure 69 OTF-W incidents per 100 herd years at risk by year in Area 35, Cornwall central, for cohort herds and herds in existence (HIE). The cull started in Area 35 in 2019, indicated by the dashed line

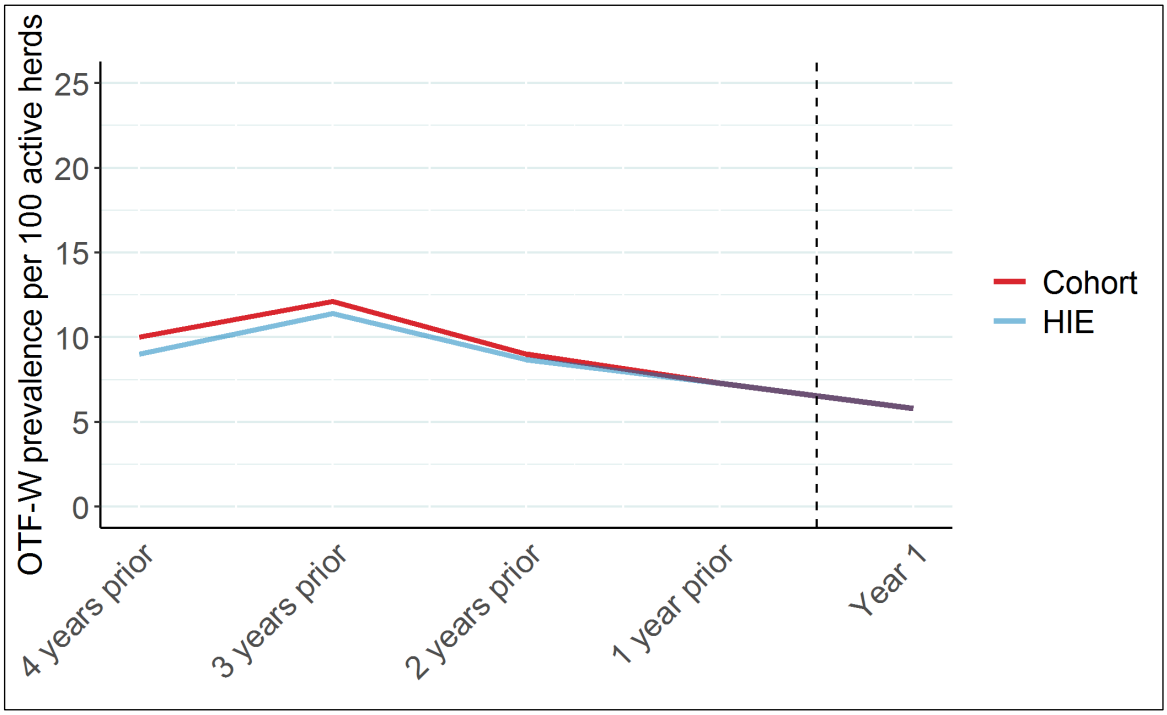

Figure 70 OTF-W prevalence per 100 active herds by year in Area 35, Cornwall central, for cohort herds and herds in existence (HIE). The cull started in Area 35 in 2019, indicated by the dashed line

Area 36 – Staffordshire central

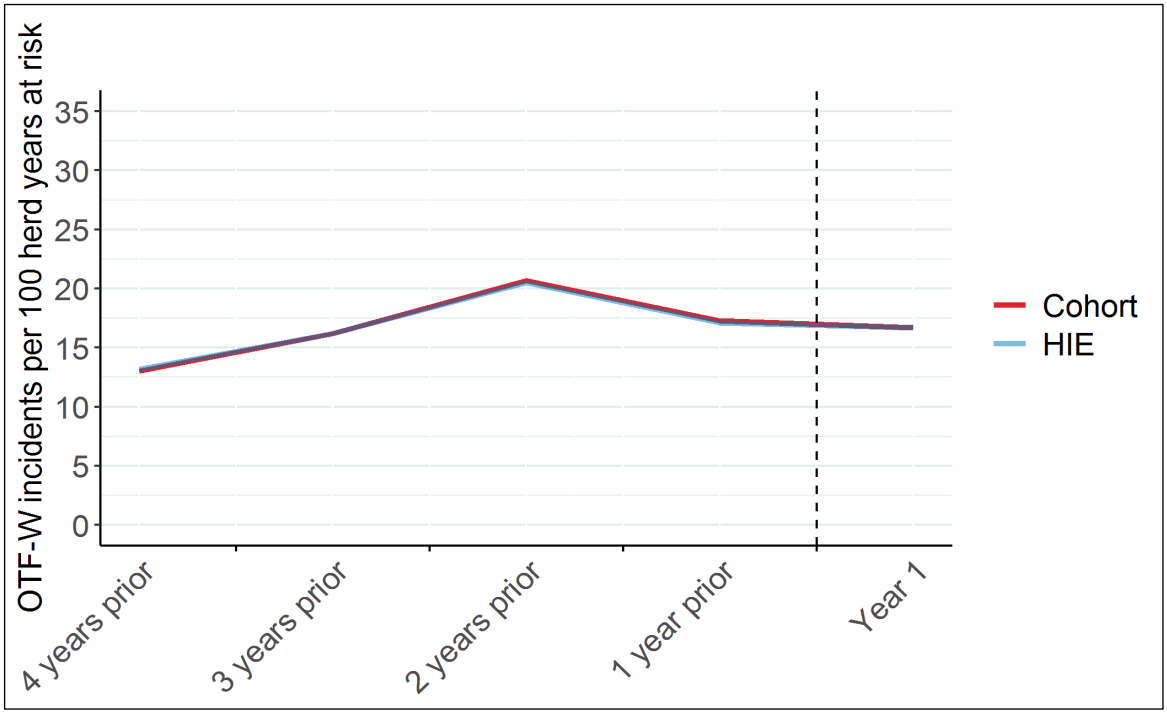

Figure 71 OTF-W incidents per 100 herd years at risk by year in Area 36, Staffordshire central, for cohort herds and herds in existence (HIE). The cull started in Area 36 in 2019, indicated by the dashed line

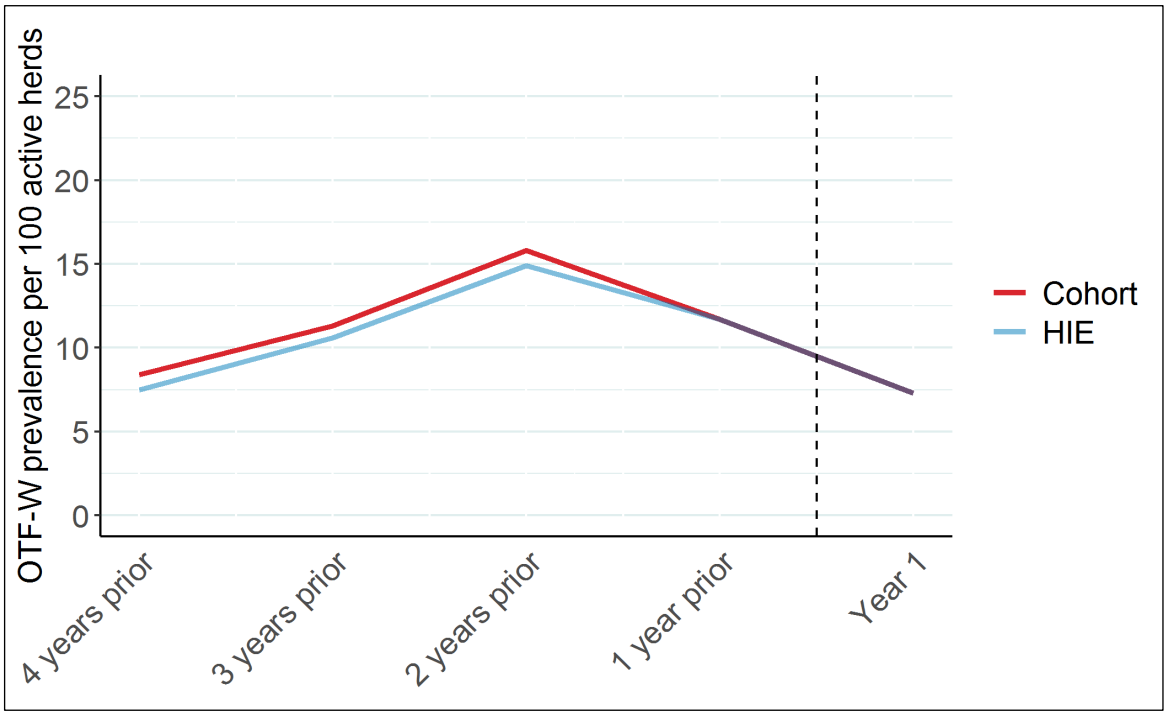

Figure 72 OTF-W prevalence per 100 active herds by year in Area 36, Staffordshire central, for cohort herds and herds in existence (HIE). The cull started in Area 36 in 2019, indicated by the dashed line

Area 37 – Devon central

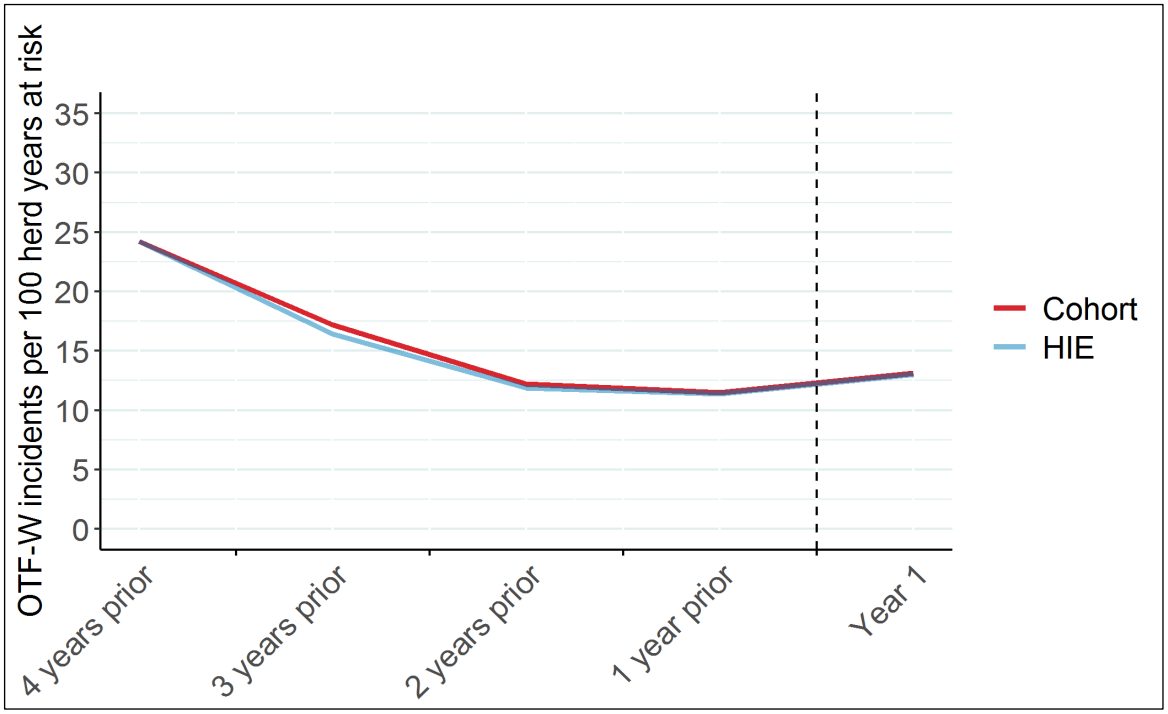

Figure 73 OTF-W incidents per 100 herd years at risk by year in Area 37, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 37 in 2019, indicated by the dashed line

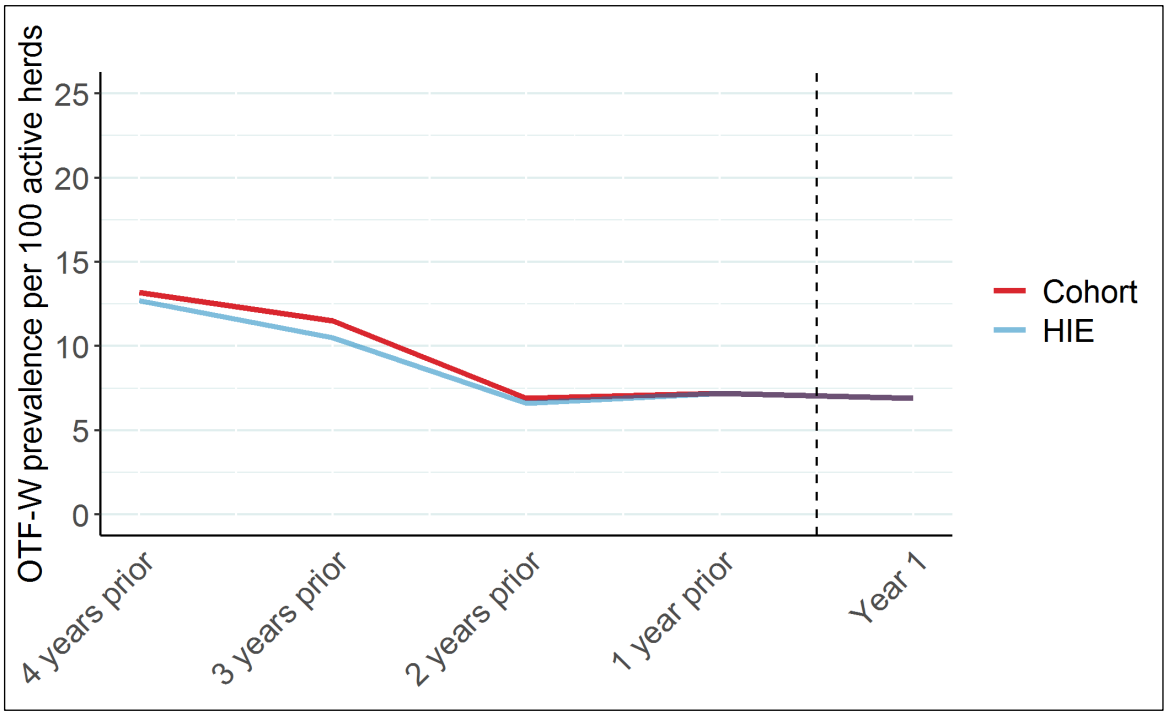

Figure 74 OTF-W prevalence per 100 active herds by year in Area 37, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 37 in 2019, indicated by the dashed line

Area 38 – Devon central

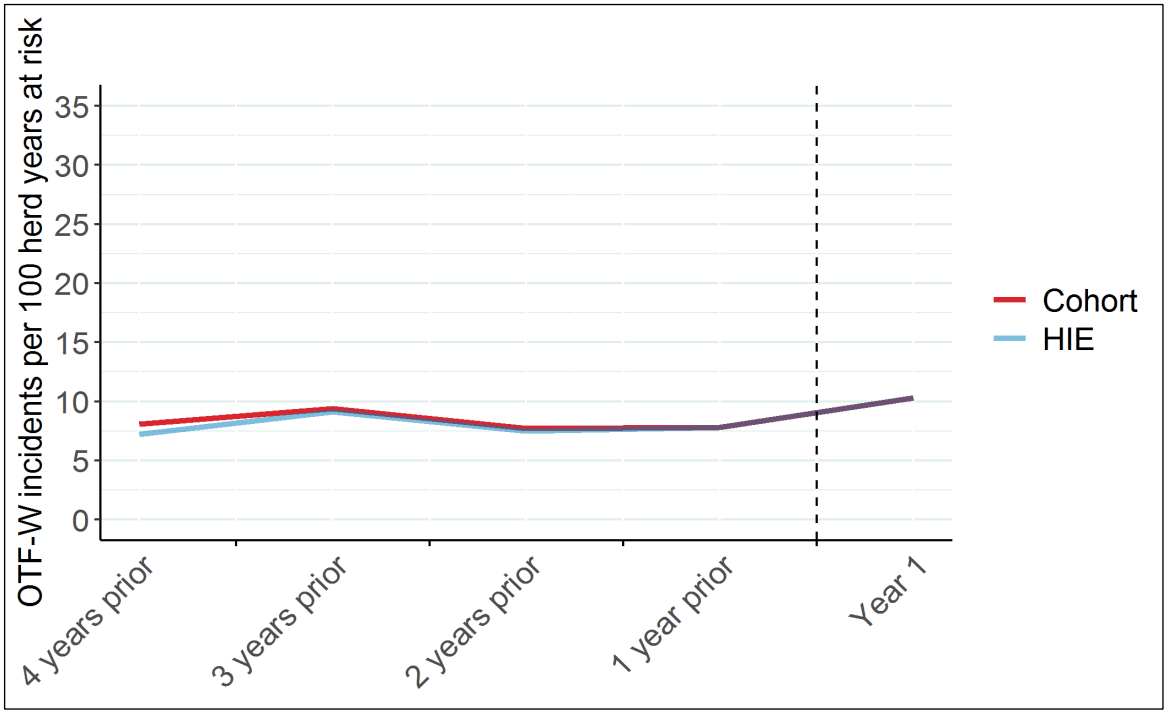

Figure 75 OTF-W incidents per 100 herd years at risk by year in Area 38, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 38 in 2019, indicated by the dashed line

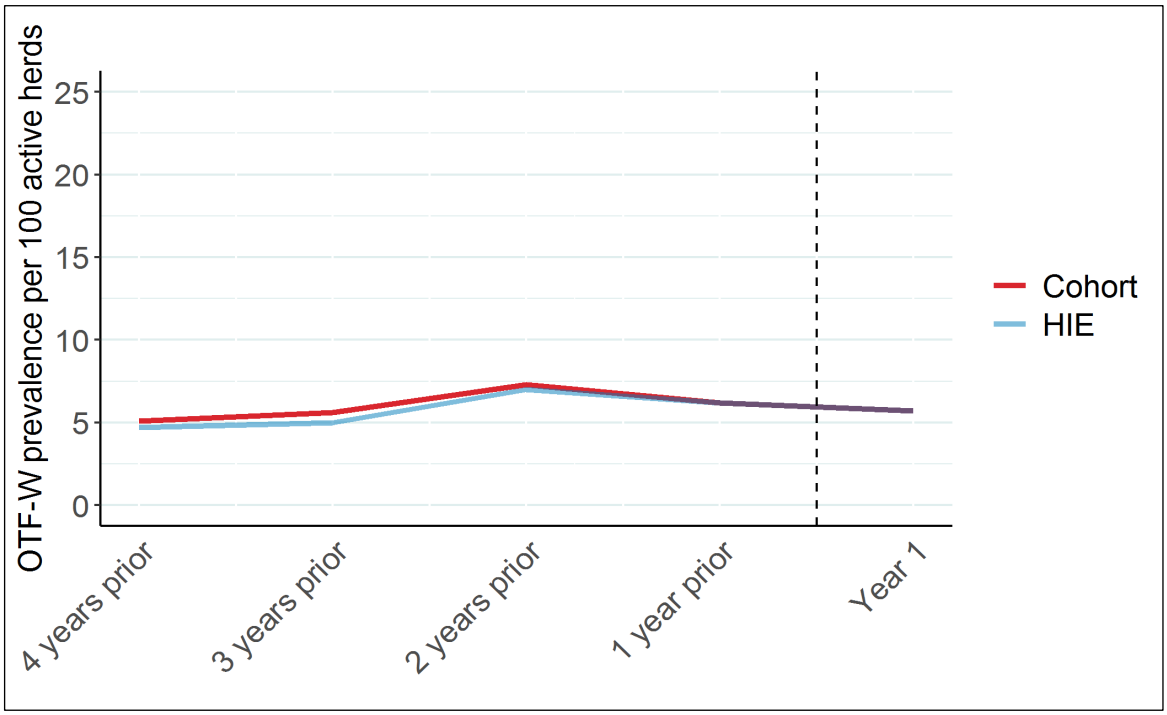

Figure 76 OTF-W prevalence per 100 active herds by year in Area 38, Devon central, for cohort herds and herds in existence (HIE). The cull started in Area 38 in 2019, indicated by the dashed line

Area 39 – Dorset central

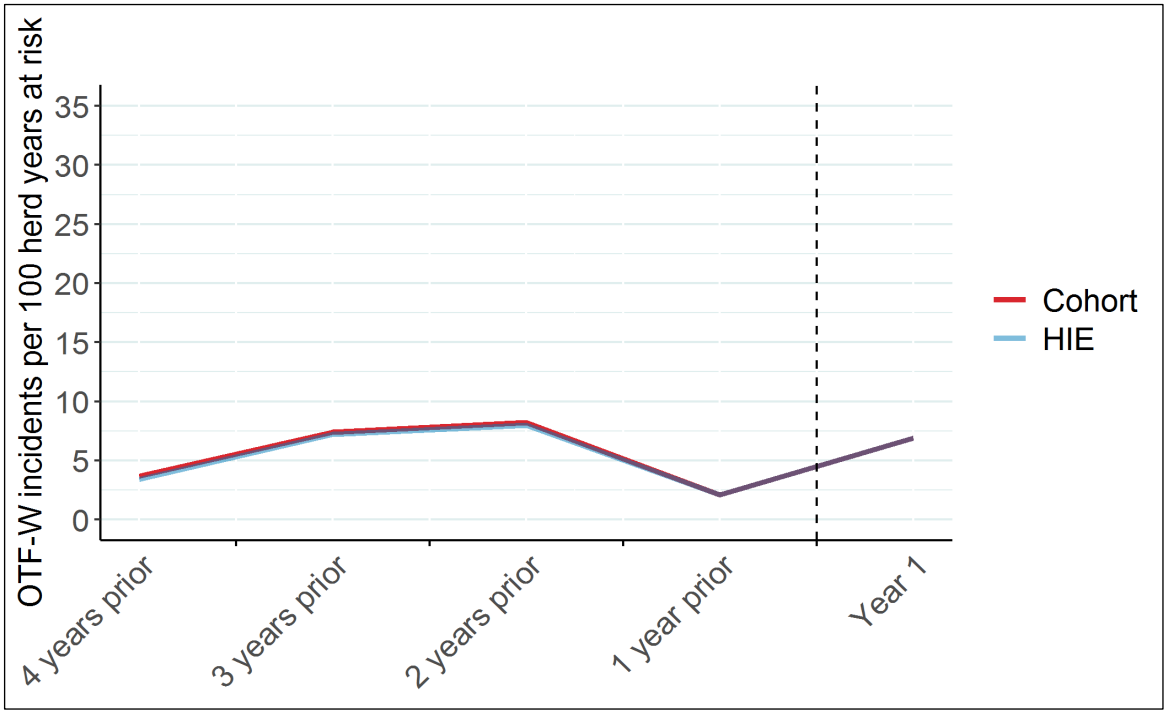

Figure 77 OTF-W incidents per 100 herd years at risk by year in Area 39, Dorset central, for cohort herds and herds in existence (HIE). The cull started in Area 39 in 2019, indicated by the dashed line

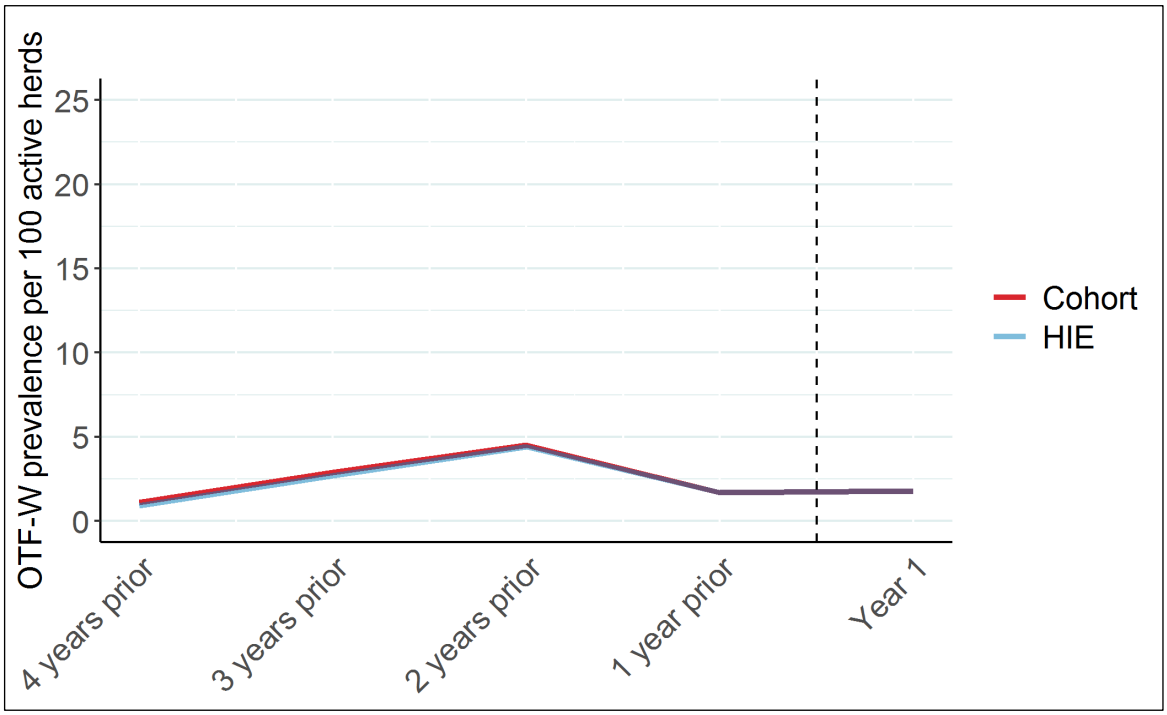

Figure 78 OTF-W prevalence per 100 active herds by year in Area 39, Dorset central, for cohort herds and herds in existence (HIE). The cull started in Area 39 in 2019, indicated by the dashed line

Area 40 – Herefordshire central

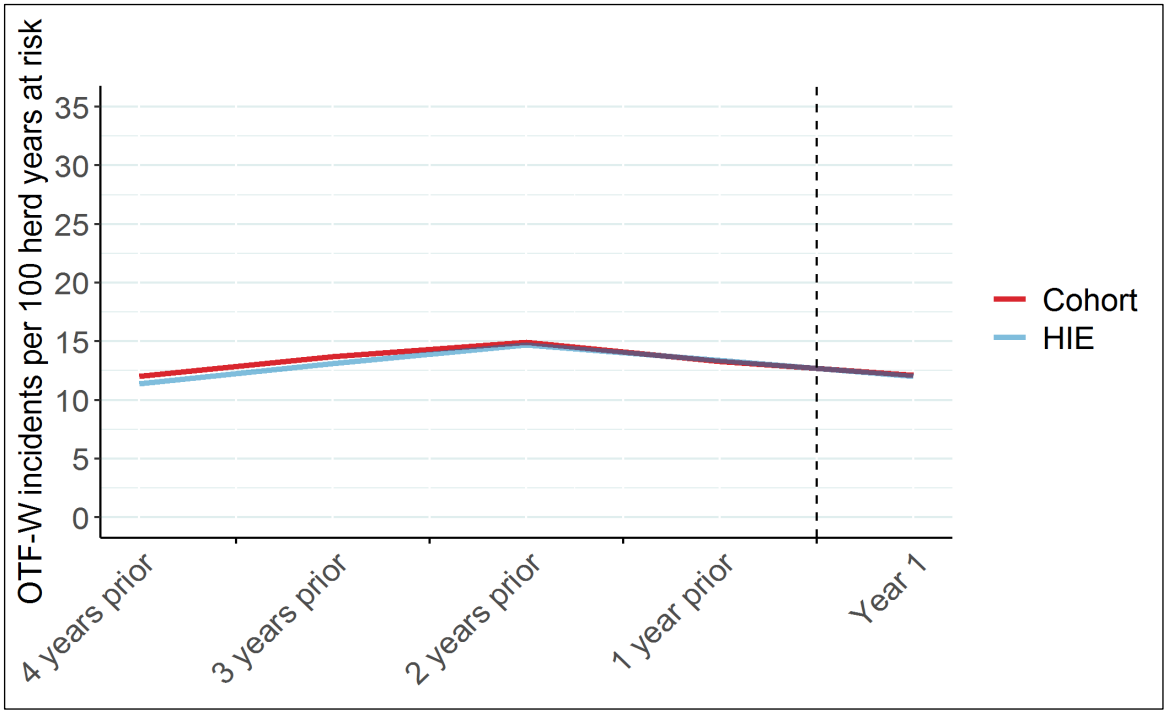

Figure 79 OTF-W incidents per 100 herd years at risk by year in Area 40, Herefordshire central, for cohort herds and herds in existence (HIE). The cull started in Area 40 in 2019, indicated by the dashed line

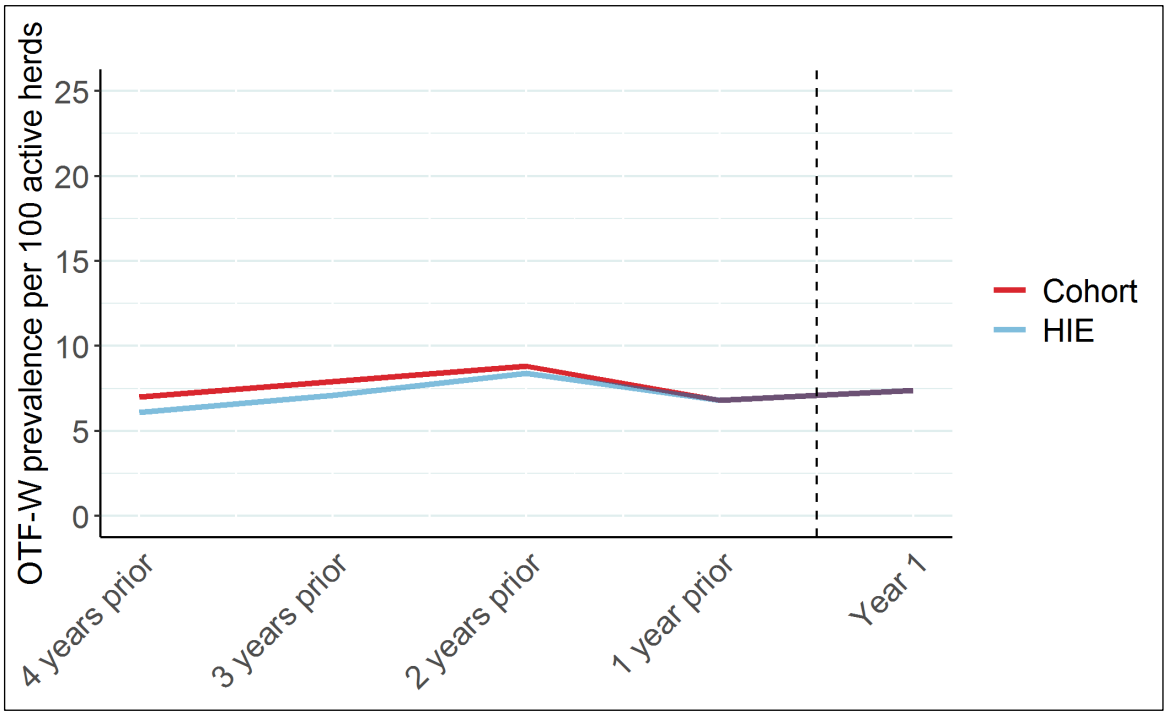

Figure 80 OTF-W prevalence per 100 active herds by year in Area 40, Herefordshire central, for cohort herds and herds in existence (HIE). The cull started in Area 40 in 2019, indicated by the dashed line

Area 41 – Staffordshire central

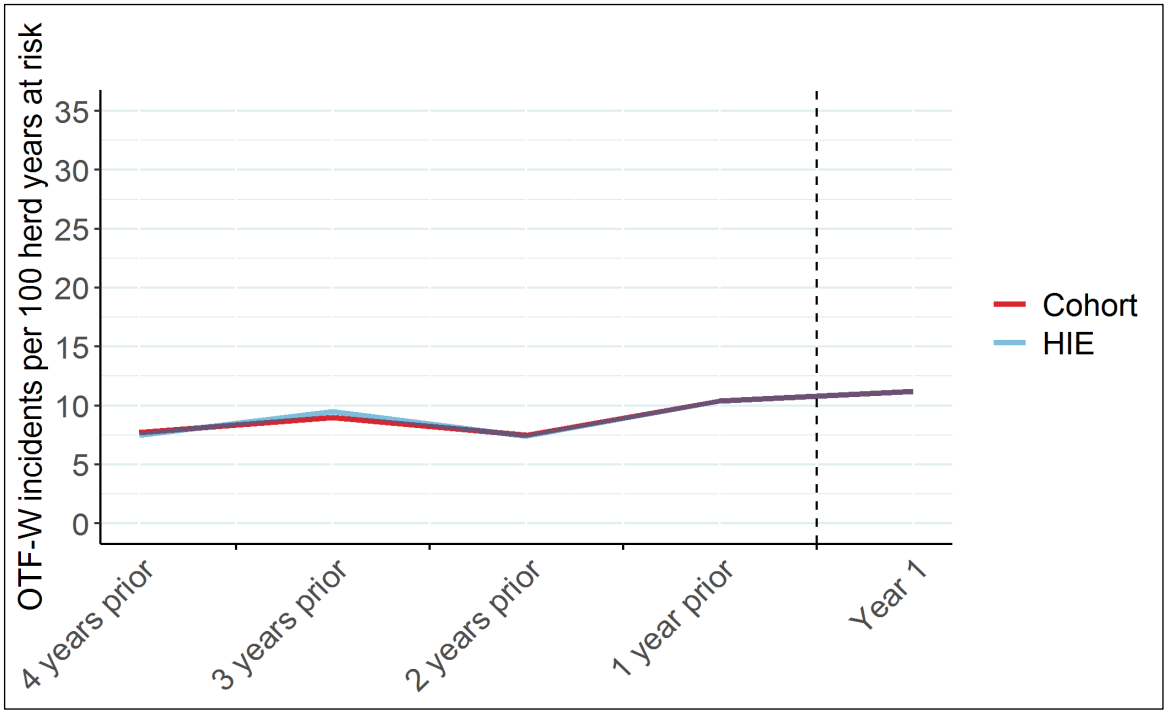

Figure 81 OTF-W incidents per 100 herd years at risk by year in Area 41, Staffordshire central, for cohort herds and herds in existence (HIE). The cull started in Area 41 in 2019, indicated by the dashed line

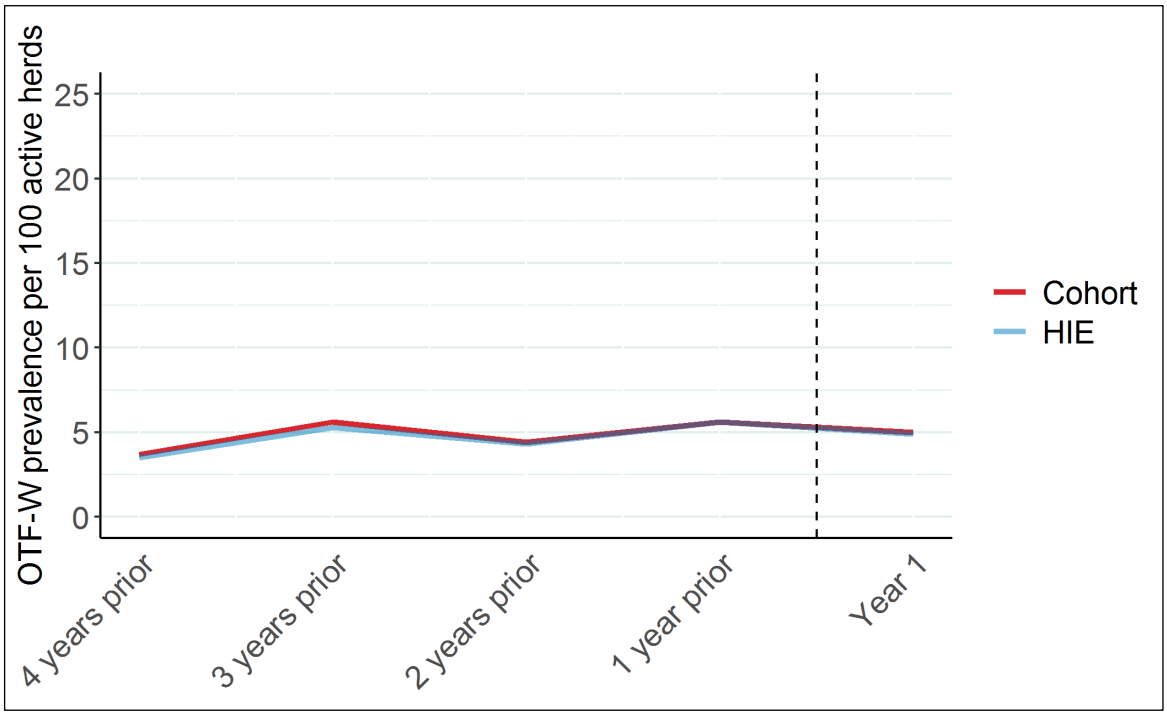

Figure 82 OTF-W prevalence per 100 active herds by year in Area 41, Staffordshire central, for cohort herds and herds in existence (HIE). The cull started in Area 41 in 2019, indicated by the dashed line

Area 42 – Wiltshire central

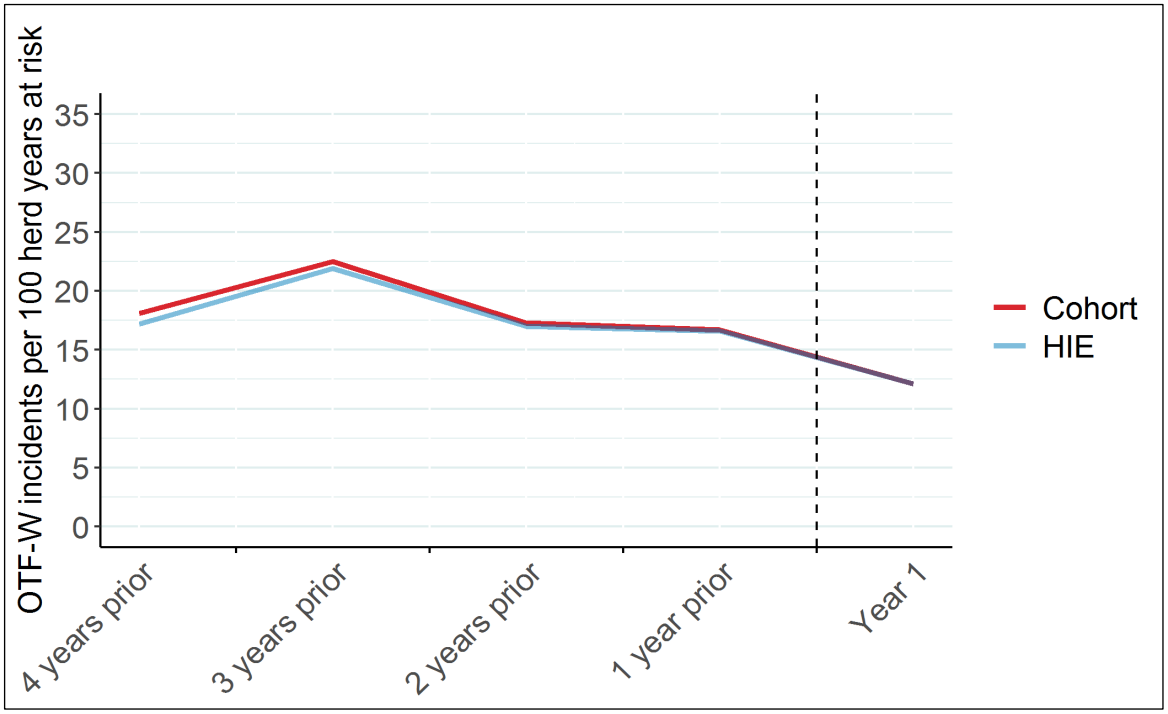

Figure 83 OTF-W incidents per 100 herd years at risk by year in area 42, Wiltshire central, for cohort herds and herds in existence (HIE). The cull started in area 42 in 2019, indicated by the dashed line

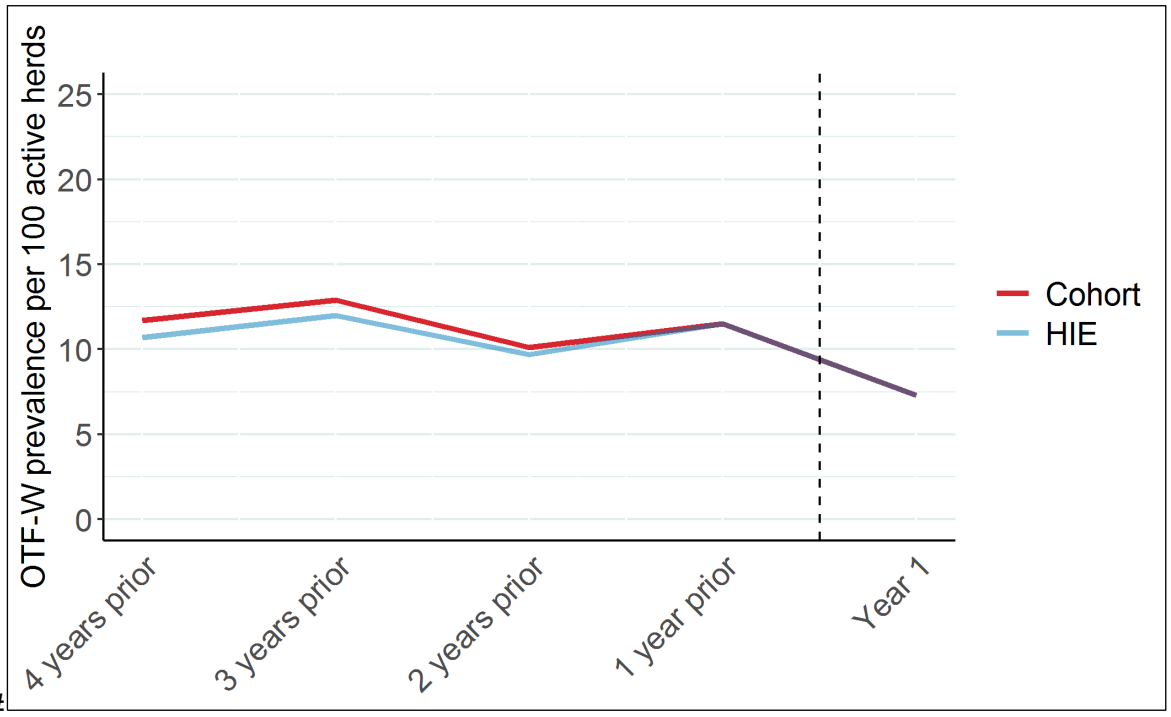

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Figure 84 OTF-W prevalence per 100 active herds by year in Area 42, Wiltshire central, for cohort herds and herds in existence (HIE). The cull started in Area 42 in 2019, indicated by the dashed line

Area 43 – Wiltshire central

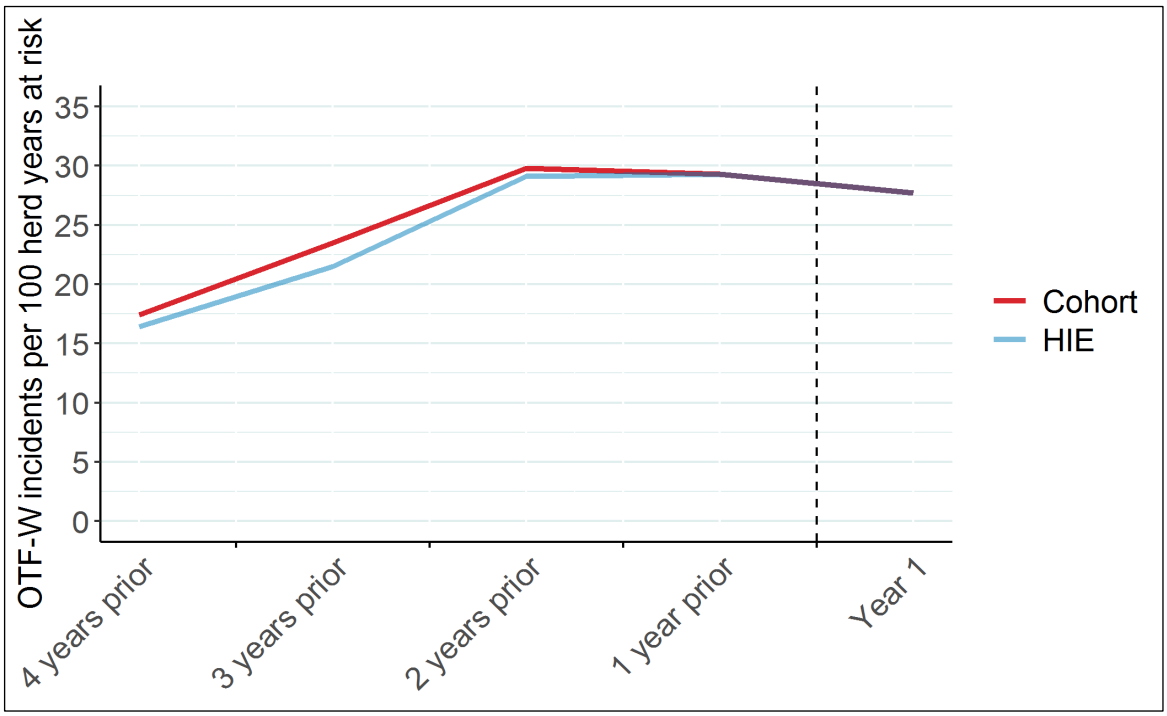

Figure 85 OTF-W incidents per 100 herd years at risk by year in Area 43, Wiltshire central, for cohort herds and herds in existence (HIE). The cull started in Area 43 in 2019, indicated by the dashed line

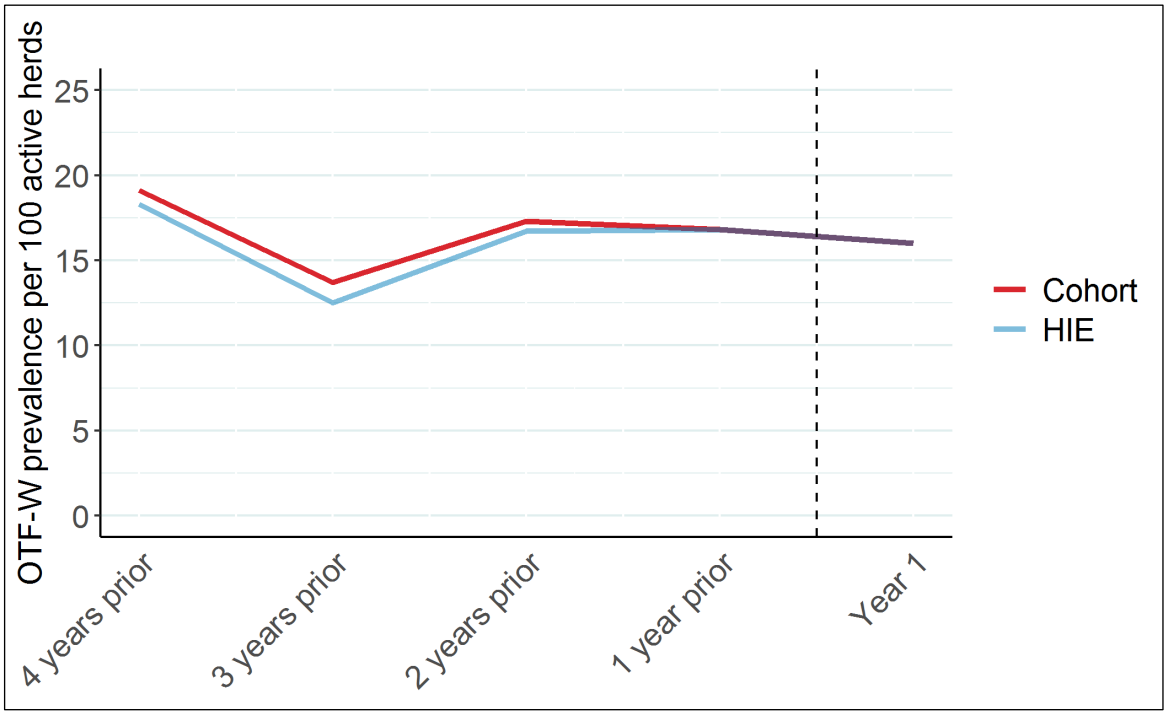

Figure 86 OTF-W prevalence per 100 active herds by year in Area 43, Wiltshire central, for cohort herds and herds in existence (HIE). The cull started in Area 43 in 2019, indicated by the dashed line

Available buffer area land and loss of buffer area land over time

Percentage of 2 km buffer area available at start of culling and subsequent years

Table 1, shows how much of a complete 2 km buffer area surrounding the central area was available on the baseline date for each area and how much remains in each subsequent cull year. This can be less than 100% for the following reasons:

1. The central areas where culling was conducted was located by the coast and only part of the 2 km buffer area surrounding the central area is on land.
2. The land identified as being in a buffer area overlaps an existing badger control area and herds in the overlap are exposed to culling and cannot remain as buffer herds.
3. Existing buffer area land was subsequently overlapped by the central area of a new badger control area or by the extension of a central area that did not previously overlap the buffer area.

Table 1 Percentage of a 2 km buffer surrounding each cull area at the start of badger culling in Year 1 and percentage of land remaining as buffer in each subsequent cull year

The dash "-" indicates that data are not yet available because this cull year has not yet occurred. Data are rounded to the nearest whole number and therefore changes less than 1% may not be apparent in the table.

Area name	% buffer area available at start (Year 1)	Year 2 %	Year 3 %	Year 4 %	Year 5 %	Year 6 %	Year 7 %
Area 01 - Gloucestershire	100	100	100	71	71	70	70
Area 02 - Somerset	92	92	92	92	64	28	19
Area 03 - Dorset	100	100	38	38	38	-	-
Area 04 - Cornwall	45	45	36	36	-	-	-
Area 05 - Cornwall	58	58	31	24	-	-	-
Area 06 - Devon	52	36	30	21	-	-	-
Area 07 - Devon	46	37	20	20	-	-	-
Area 08 - Dorset	82	47	31	29	-	-	-
Area 09 - Gloucestershire	92	92	78	78	-	-	-
Area 10 - Herefordshire	82	82	82	56	-	-	-
Area 11 - Cheshire	100	93	51	-	-	-	-
Area 12 - Devon	72	6	6	-	-	-	-
Area 13 - Devon	53	23	23	-	-	-	-
Area 14 - Devon	92	61	30	-	-	-	-

Area name	% buffer area available at start (Year 1)	Year 2 %	Year 3 %	Year 4 %	Year 5 %	Year 6 %	Year 7 %
Area 15 - Devon	65	65	48	-	-	-	-
Area 16 - Dorset	45	45	42	-	-	-	-
Area 17 - Somerset	60	59	58	-	-	-	-
Area 18 - Somerset	57	36	11	-	-	-	-
Area 19 - Wiltshire	82	75	38	-	-	-	-
Area 20 - Wiltshire	84	69	37	-	-	-	-
Area 21 - Wiltshire	77	77	21	-	-	-	-
Area 22 - Cornwall	73	63	-	-	-	-	-
Area 23 - Devon	52	39	-	-	-	-	-
Area 24 - Devon	33	32	-	-	-	-	-
Area 25 - Devon	8	8	-	-	-	-	-
Area 26 - Devon	45	25	-	-	-	-	-
Area 27 - Devon	45	45	-	-	-	-	-
Area 28 - Devon	19	9	-	-	-	-	-
Area 29 - Gloucestershire	71	53	-	-	-	-	-
Area 30 - Somerset	90	75	-	-	-	-	-
Area 31 - Staffordshire	98	81	-	-	-	-	-
Area 32 - Cumbria	100	84	-	-	-	-	-

Area name	% buffer area available at start (Year 1)	Year 2 %	Year 3 %	Year 4 %	Year 5 %	Year 6 %	Year 7 %
Area 33 - Avon	66	-	-	-	-	-	-
Area 34 - Cheshire	76	-	-	-	-	-	-
Area 35 - Cornwall	52	-	-	-	-	-	-
Area 36 - Staffordshire	92	-	-	-	-	-	-
Area 37 - Devon	67	-	-	-	-	-	-
Area 38 - Devon	37	-	-	-	-	-	-
Area 39 - Dorset	73	-	-	-	-	-	-
Area 40 - Herefordshire	88	-	-	-	-	-	-
Area 41 - Staffordshire	89	-	-	-	-	-	-
Area 42 - Wiltshire	51	-	-	-	-	-	-
Area 43 - Wiltshire	53	-	-	-	-	-	-

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