



UK Health
Security
Agency

Environmental Public Health Surveillance System (EPHSS)

Report for 2020 to 2021

Version 1.0

March 2022

Contents

Executive summary.....	3
Environmental Events Surveillance	3
Lead Exposure in Children Surveillance System (LEICSS).....	3
Met Office Data Interface (MODI).....	4
Background.....	5
Environmental public health tracking	5
Purpose of this report	5
System description.....	6
Environmental Public Health Surveillance System	6
EPHSS modules and structure	6
Environmental events.....	7
Case definition and population	7
Description	7
Recent developments.....	8
Summary of environmental incidents 2015 to 2020.....	8
Lead exposure module.....	21
Case definition and population	21
Description	21
Recent developments.....	22
Summary of lead exposures in children 2015 to 2020 inclusive	22
Met Office Dataset Interface	25
Description	25
Recent developments.....	25
Coverage.....	26
EPHSS rollout and usage	28
EPHSS case study.....	29
Minimum daily temperature and carbon monoxide incidents.....	29
Future direction	31
Planned future work.....	31
Training roll out.....	31
Acknowledgements	32
Abbreviations	33
Appendix 1. Environmental events tables	34

Executive summary

Environmental factors are a leading cause of non-communicable diseases, impact the effect and transmission of infectious diseases, and can have wide-reaching social and economic impacts. The UK Health Security Agency (UKHSA) has developed a web-based surveillance system for environmental exposures called the Environmental Public Health Surveillance System (EPHSS). It is an information tool that supports surveillance and monitoring of environmental risk factors

EPHSS was officially launched in the summer of 2020 to Public Health England (PHE) staff and is currently being used internally. Further developments are being made to make it available externally later in 2022. It currently contains 3 modules: Environmental Events Surveillance, Lead Exposure in Children Surveillance System, and Met Office Data Interface. Additional interfaces with other data systems will be developed in the future.

This first report provides an introduction to the surveillance system and data flows in EPHSS, showcases its functions, and summarises data from 2015 to 2020 inclusive.

Environmental Events Surveillance

This module provides surveillance of environmental events and incidents with the potential to impact health, occurring from 1 January 2015 onwards, affecting the population in England. Organisations will be able to use this module to feed in data on environmental events and incidents and produce surveillance reports on trends and summaries. Currently data is imported from UKHSA's Chemical Incident Response and Information System (CIRIS), used for incident management by UKHSA's Environmental Hazards and Emergencies Department.

There were between 700 and 1000 environmental incidents per year in England between 2015 and 2020 inclusive. London was the region which reported the most incidents annually. The most common incident type was fire, and the most common setting for incidents was within households. The most common agents in incidents were lead and carbon monoxide, though both of these are also subject to active surveillance.

Lead Exposure in Children Surveillance System (LEICSS)

LEICSS is a sentinel, passive, laboratory-based surveillance system. Cases are defined as children less than 16 years and resident in England with a blood lead concentration of greater than or equal to 0.24 µmol/L (greater than or equal to 5 µg/dL), with surveillance data available from 2014 onwards. LEICSS can be interrogated to produce reports on the number of cases, demographics, and blood lead concentrations recorded over different time periods.

From 2015 to 2020, there were between 33 and 50 lead exposure cases reported annually across England. Yorkshire and Humber detected the most cases by count and by rate per 1 million children aged 0 to 14. There were more lead exposure cases in males than in females across all age groups.

The public health intervention level for lead surveillance in children was lowered from greater than or equal to 0.48µmol/L to greater than or equal to 0.24µmol/L (greater than or equal to 10µg/dl to greater than or equal to 5µg/dl) on 5 July 2021. The surveillance data summarised in this report was collected before this date and used the higher intervention level.

A comprehensive [surveillance report](#) is produced and published annually by the LEICSS working group.

Met Office Data Interface (MODI)

MODI allows access to Met Office Integrated Data Archive System (MIDAS) data sets which are derived from observational records, measured and quality-controlled from hundreds of weather stations in the UK. This data stream has been built to provide data for the public health community.

MIDAS covers all of the UK. Data can be prepared by single point site (that is, longitude and latitude coordinates), multiple point sites, or rectangular grid area. Indicators can be processed over time at point sites, or at a given time over a grid area. Data includes multiple meteorological variables, for example temperature, rainfall, wind speed, and pollen count.

Background

Environmental public health tracking

Environmental factors are a leading cause of non-communicable diseases (NCDs) and also impact the effect and transmission of infectious diseases. Surveillance of environmental hazards and exposures is a crucial step to understanding the burden of acute and chronic environmental effects on health.

UKHSA's Environmental Public Health Tracking (EPHT) programme has led the development of a new web-based surveillance system for environmental exposures called the Environmental Public Health Surveillance System (EPHSS).

EPHT work is [reported publicly](#).

Purpose of this report

This first report on EPHSS is to introduce the system, provide descriptions of the data flows, and gives summaries of the data from 1 January 2015 to 31 December 2020 inclusive. Subsequent reports may include data over shorter time periods. It is our intention to produce routine reports summarising the data and upgrades of the system.

Where relevant, this report refers to Public Health England (PHE), which owned and managed EPHSS in the reporting period covered. EPHSS is now an asset of PHE's successor, the UK Health Security Agency (UKHSA).

This report has 2 aims:

1. To introduce and showcase EPHSS as a new surveillance system.
2. To summarise surveillance data collated in EPHSS to date, to inform action.

System description

Environmental Public Health Surveillance System

EPHSS aims to provide a comprehensive surveillance capability that allows the public health community to interrogate data and intelligence gathered on environmental hazards, exposures, and related health outcomes from a variety of data sources. It is an information tool that supports surveillance and monitoring of environmental risk factors.

This system has been developed by UKHSA's Environmental Public Health Tracking (EPHT) programme led by the Environmental Epidemiology Group (EEG) in the Radiation, Chemical and Environmental Hazards directorate (RCE). This is governed by the EPHT programme board. It has been developed in partnership with the Software Development Unit (National Infections Service (NIS)), with collaboration from UKHSA Centres, Field Services, Geographic Information Systems (GIS) team, and ICT department.

EPHSS modules and structure

EPHSS is a modular system in development. Data linkages with several critical databases have been completed to provide a surveillance function. Additional interfaces with other target systems for enhanced data capture from other partnering agencies will be developed in the future.

The current version of EPHSS contains 3 modules:

- the Environmental Events Surveillance module
- the Lead Exposure in Children Surveillance System (LEICSS) module
- the Met Office Data Interface (MODI)

Environmental events

Case definition and population

The Environmental Events Module includes environmental events and incidents with the potential to impact health, occurring from 1 January 2015 onwards, affecting the population in England.

Data is available at individual event level and also aggregated at UKHSA Centre, health protection team (HPT), and upper and lower tier local authority levels.

Description

The aim of this module is to provide surveillance of environmental events or incidents that have the potential to impact on public health. There is potential to capture information about acute or chronic environmental events and incidents from several sources and link these together.

At present the majority of data on environmental events imported to EPHSS is collected primarily for incident management use. UKHSA RCE's Environmental Hazards and Emergencies Department (EHED) is notified of environmental events and incidents in order to provide public health input and advice. Incident management records for acute and chronic exposures, including flooding and extreme events, are logged on the Chemical Incident Response and Information System (CIRIS).

Headline information on these events are imported into EPHSS daily so that data can be queried, and surveillance reports generated. Surveillance reports can be produced as either:

- basic reports that consist of summary statistics, bar charts and pie charts showing the number of incidents and types for user selected dates and geography, as well as location type, route of exposure and type of exposure
- data for these reports can also be exported
- customised surveillance reports that enable a user to customise a line list report based on the user's selection of criteria (including dates, location, incident type, agent and so on)
- raw data can also be downloaded for these reports which can be used for manipulation and analysis in excel or a statistical package

More specifically CIRIS reports can be generated that show:

- preformatted standardised reports and line lists formatted to meet the needs of UKHSA (previously PHE) Centres

- bar charts showing the incident type and number of incidents per HPT for user selected dates
- line lists of incidents per UKHSA Centre for user selected dates (includes incident type, agent and geography)

Recent developments

The environmental events module receives data updates overnight; data is up to date as of the last 24 hours.

Summary of environmental incidents 2015 to 2020

Incidents per region per year

Between 700 to 1,000 incidents per year were reported in England from 2015 to 2020 (see figure 1). London consistently reported the greatest number of annual incidents (see figure 2). London and the South West typically reported the most incidents per population (see figure 3). Overall, incident reporting increased between 2016 and 2019, and fell in 2020 (see figures 1 and 2).

Figure 1. Environmental incidents recorded per year 2015 to 2020 in England

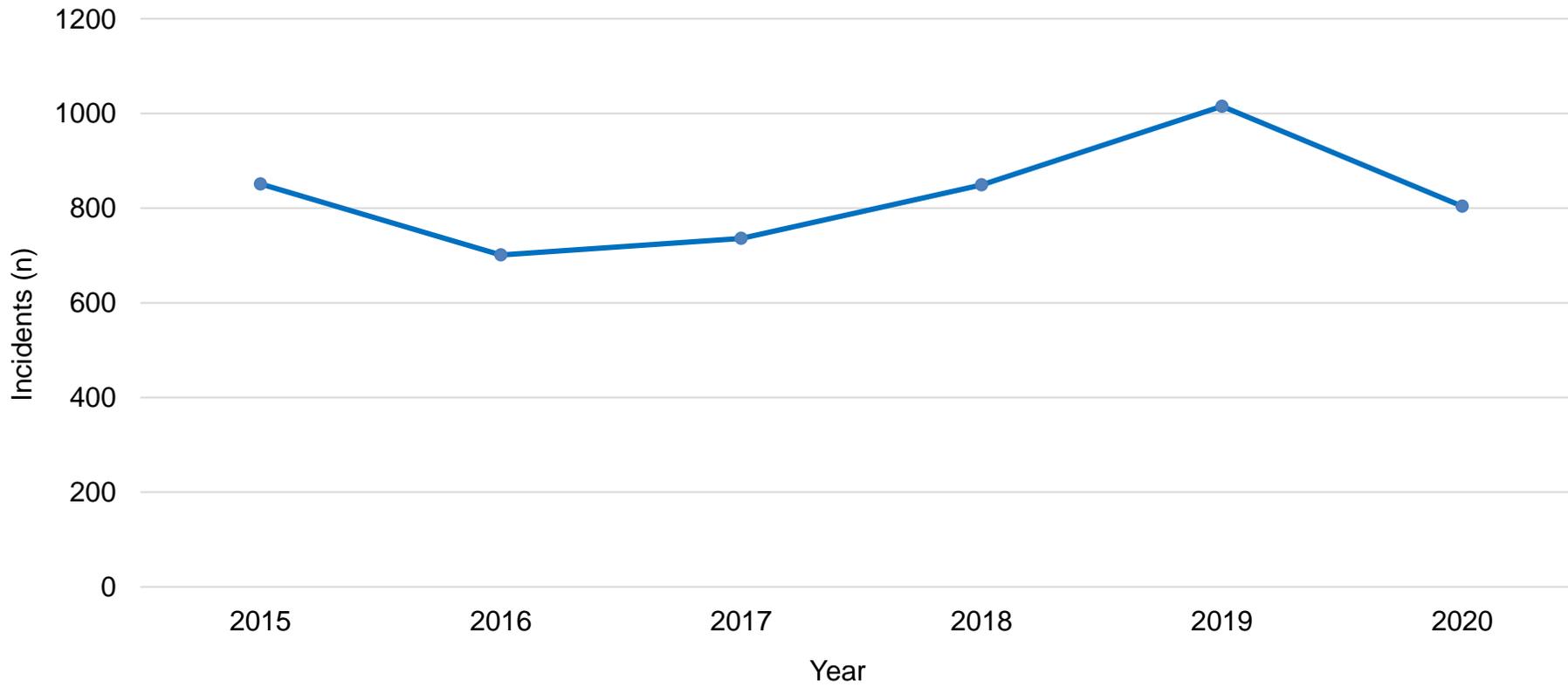


Figure 2. Environmental incidents recorded per year 2015 to 2020 by PHE centre

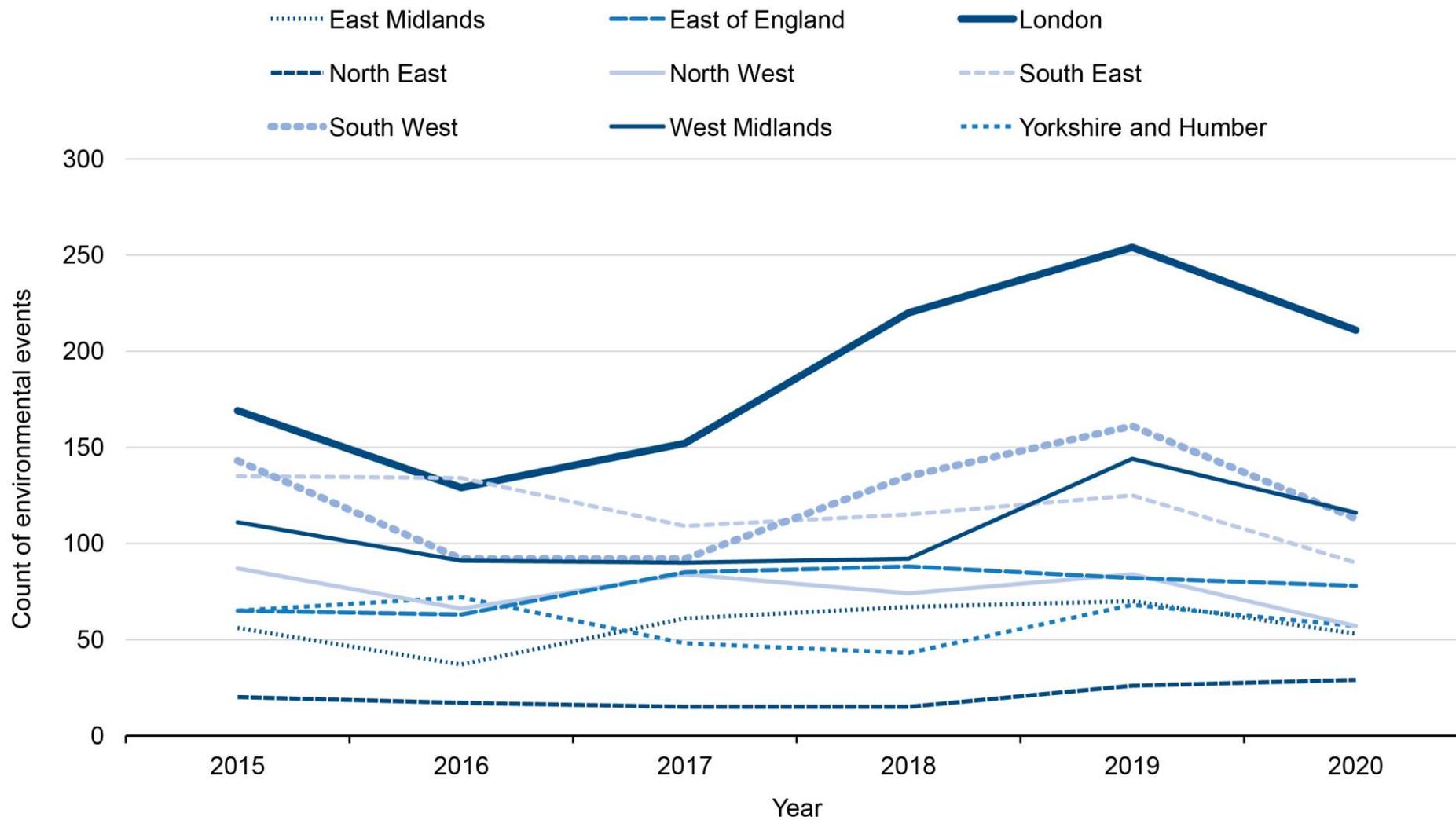


Figure 3. Environmental events per 100,000 population (2019 ONS mid-year population estimates) per year 2015 to 2020 by PHE centre

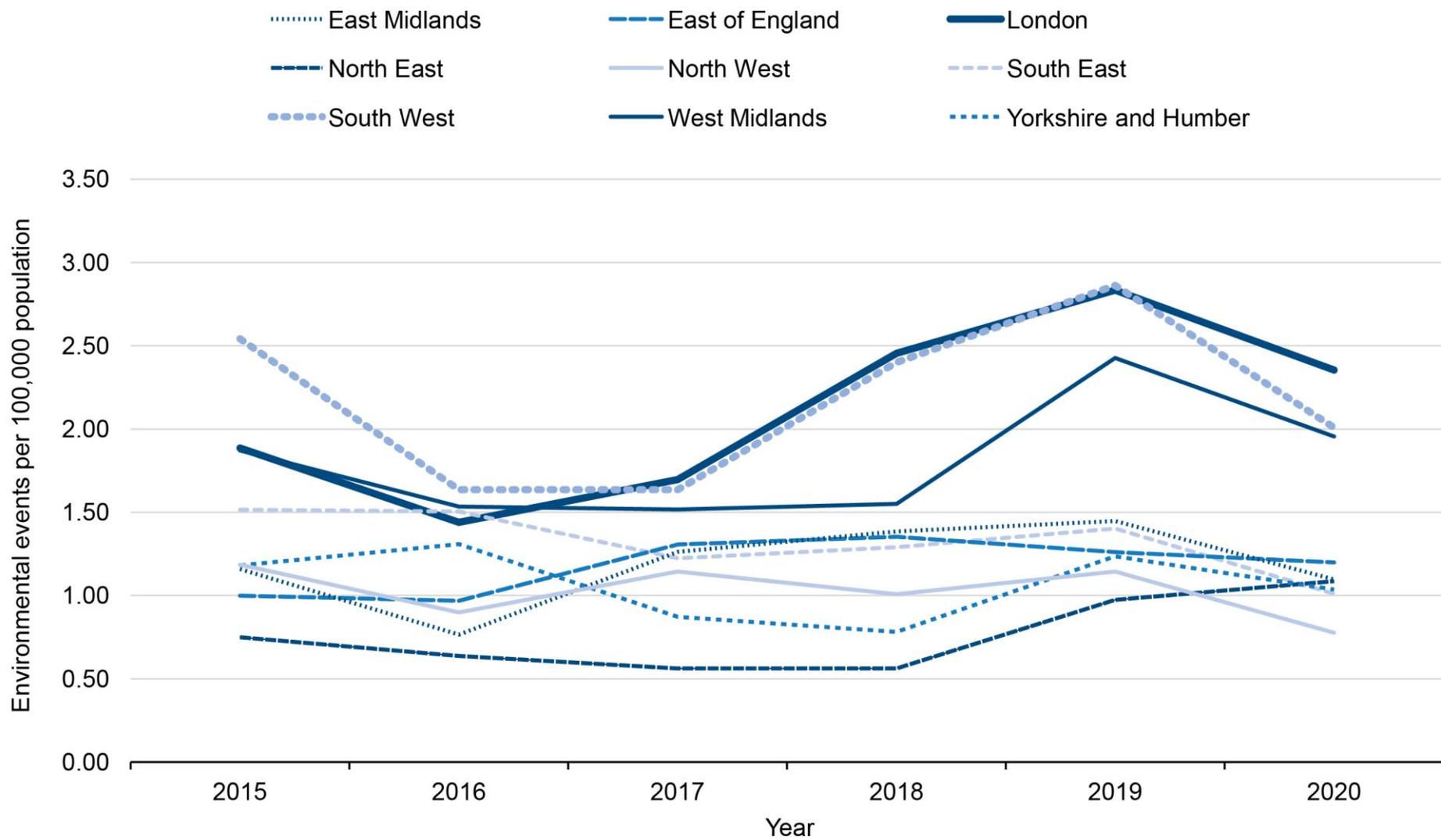
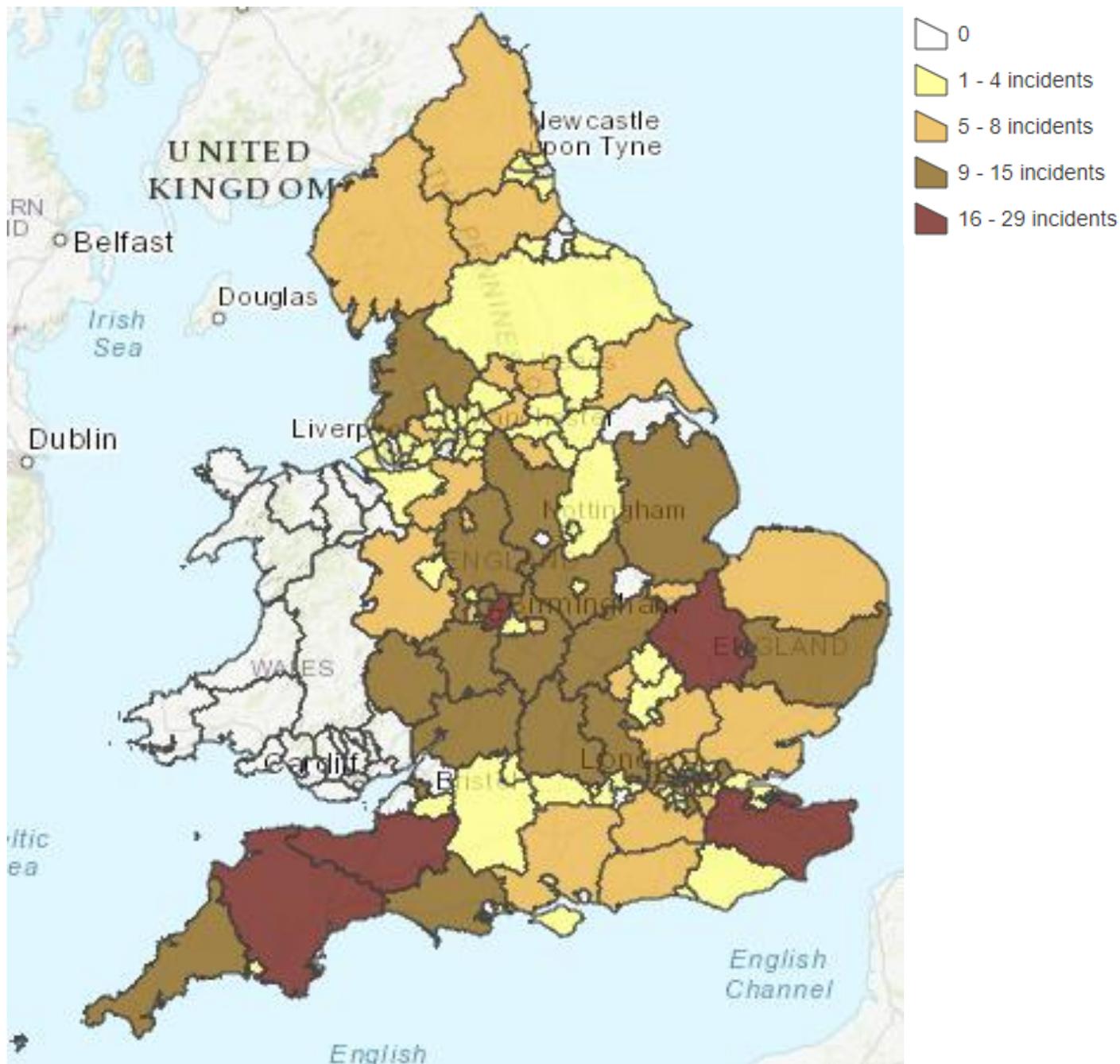


Figure 4 shows the number of incidents per upper tier local authority (UTLA) in 2020. Areas in the South West, South East, and East of England reported the most incidents (16 to 29 incidents per UTLA in 2020). Areas in the Midlands, South West, and North West reported 9 to 15 incidents per UTLA. Areas in the North, West Midlands, East of England and South East reported 5 to 8 incidents per UTLA. Areas in the North East and South reported the fewest incidents (1 to 4 per UTLA). The number of incidents has not been adjusted for population size.

Figure 4. EPHSS-generated map showing incidents reported per UTLAs in 2020



Types of incident per year

Incidents are described by type, as classified for incident management purposes. The most common incident type is fire, contributing to 30% of incidents over the 6 year period.

Table 1. Five most common incident types reported per year in England 2015 to 2020. Full data in Appendix 1, table 5.

Incident type	2015	2016	2017	2018	2019	2020	Total	Total %
Fire	344	266	291	375	398	415	2,089	30
Airborne	239	199	187	213	180	122	1,140	17
Person	123	124	135	184	155	128	849	12
Drinking water	113	129	112	82	110	53	599	9
Indoor air	106	107	92	122	110	72	609	9
Others (listed in appendix)	327	281	287	278	245	183	1,601	23
Total	1,252	1,106	1,104	1,254	1,198	973	6,887	-

Setting of incidents per year

The most common setting for incidents was households (34%) followed by industrial or agricultural settings (collectively 22%).

Table 2. Incidents by most common location type in England per year 2015 to 2020. Full data in Appendix 1, table 6.

Location type	2015	2016	2017	2018	2019	2020	Total	Total %
House or flat	311	297	318	340	344	303	1,913	34
Factory	148	89	69	79	92	57	534	10
Waste processing site	63	78	60	61	61	72	395	7
Agricultural	55	40	50	58	66	58	327	6
Healthcare (aggregate)	53	41	44	47	62	35	282	5
Warehouse	51	47	30	52	36	46	262	5
Others (listed in appendix)	369	305	313	338	312	233	1,870	33
Total	1,050	897	884	975	973	804	5,583	

Agent types

Agent types are recorded by REACH¹ classification. Between 2015 and 2020, 2,431 chemical incidents were reported, with 363 different agents. Note that one incident may involve more than one agent. The most common agents from 2015 to 2020, were lead and carbon monoxide, though this may be due to these agents being subject to active surveillance and therefore more likely to be recorded (table 3).

Table 3. Number of incidents 2015 to 2020 inclusive related to the 5 most common agent types. Full data in Appendix 1, table 7.

Agent Type	Incidents, n	Incidents, %
Lead	313	13
Carbon monoxide	232	10
Chlorine	120	5
Mercury	83	3
Ammonia, anhydrous	55	2
Others (listed in appendix)	1,628	67
Total	2,431	

Example extract: fires in the South East of England in 2019

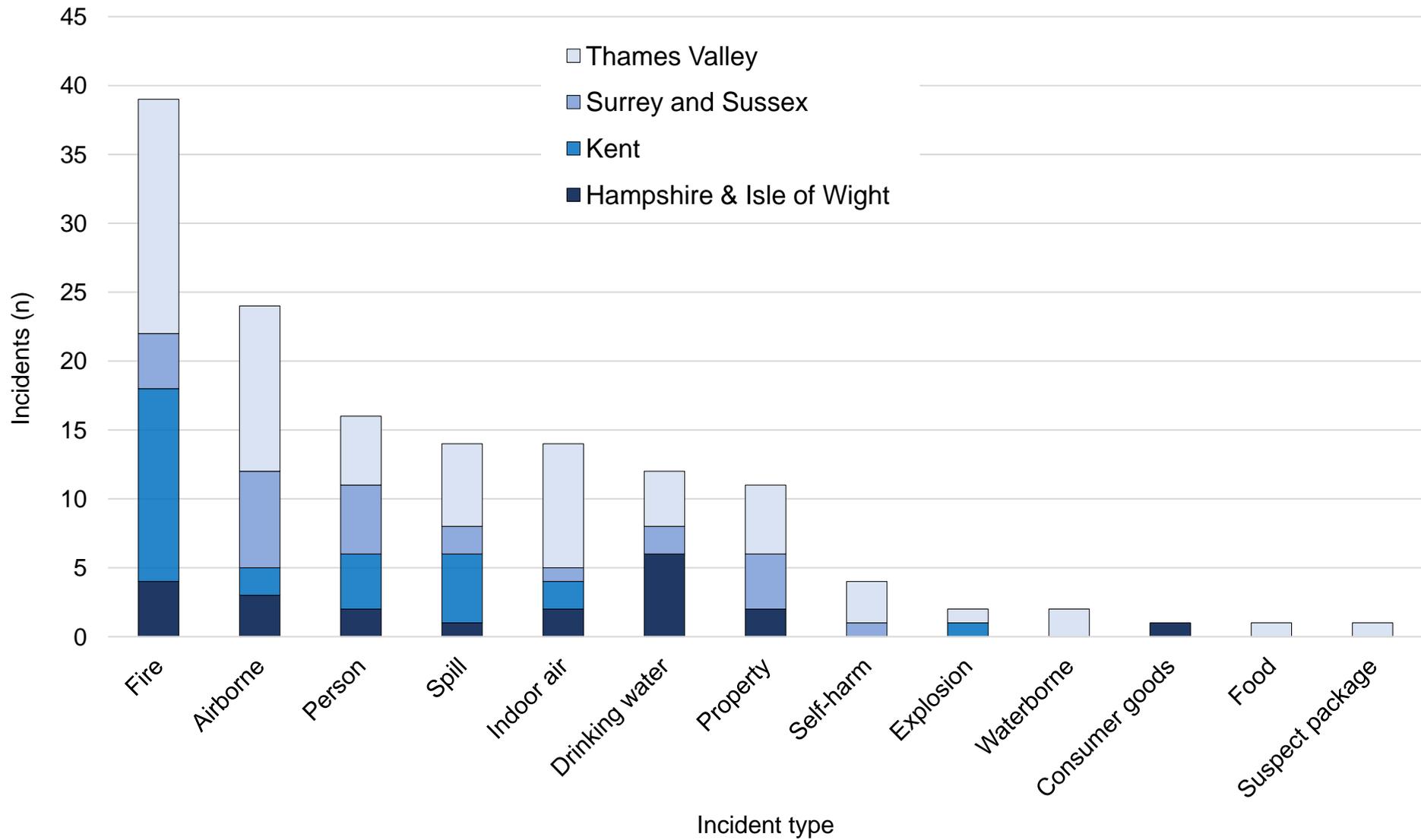
EPHSS allows for more detailed investigation into individual incident types and geographies. This example demonstrates how data can be extracted and visualised in different ways using the various systems with the environmental events module.

CIRIS standardised reports

A CIRIS standardised report displays a bar chart for incident types by UKHSA Centre. A report was run to include incidents occurring between 1 January 2019 and 31 December 2019 inclusive, in the South East PHE Centre. The report shows that fires were the most common incident, and that the majority of these occurred in Thames Valley and Kent Health Protection Teams (HPTs) areas (figure 5).

¹ Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulation.

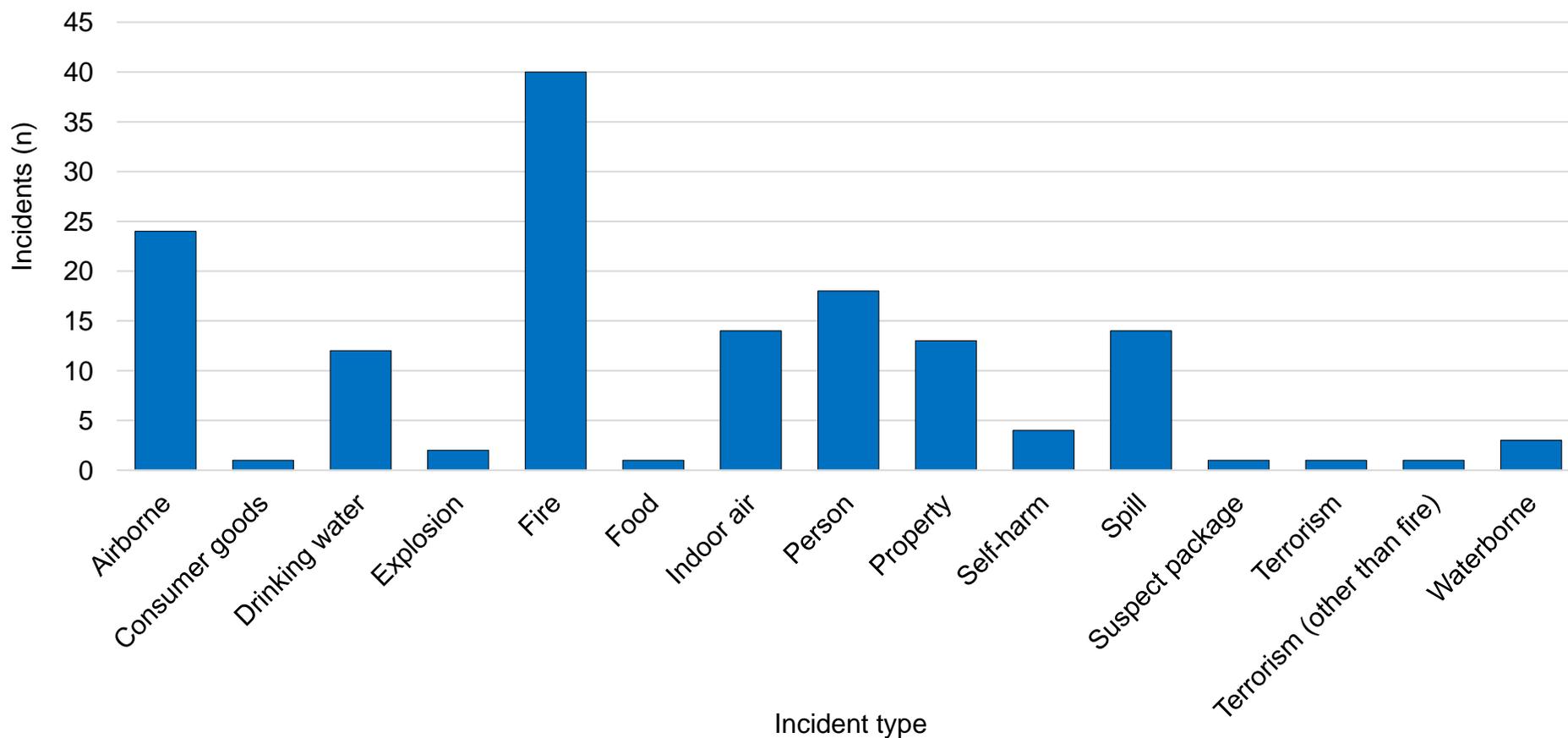
Figure 5. EPHSS-generated column chart showing number of incidents by type and HPT in 2019



Basic surveillance report

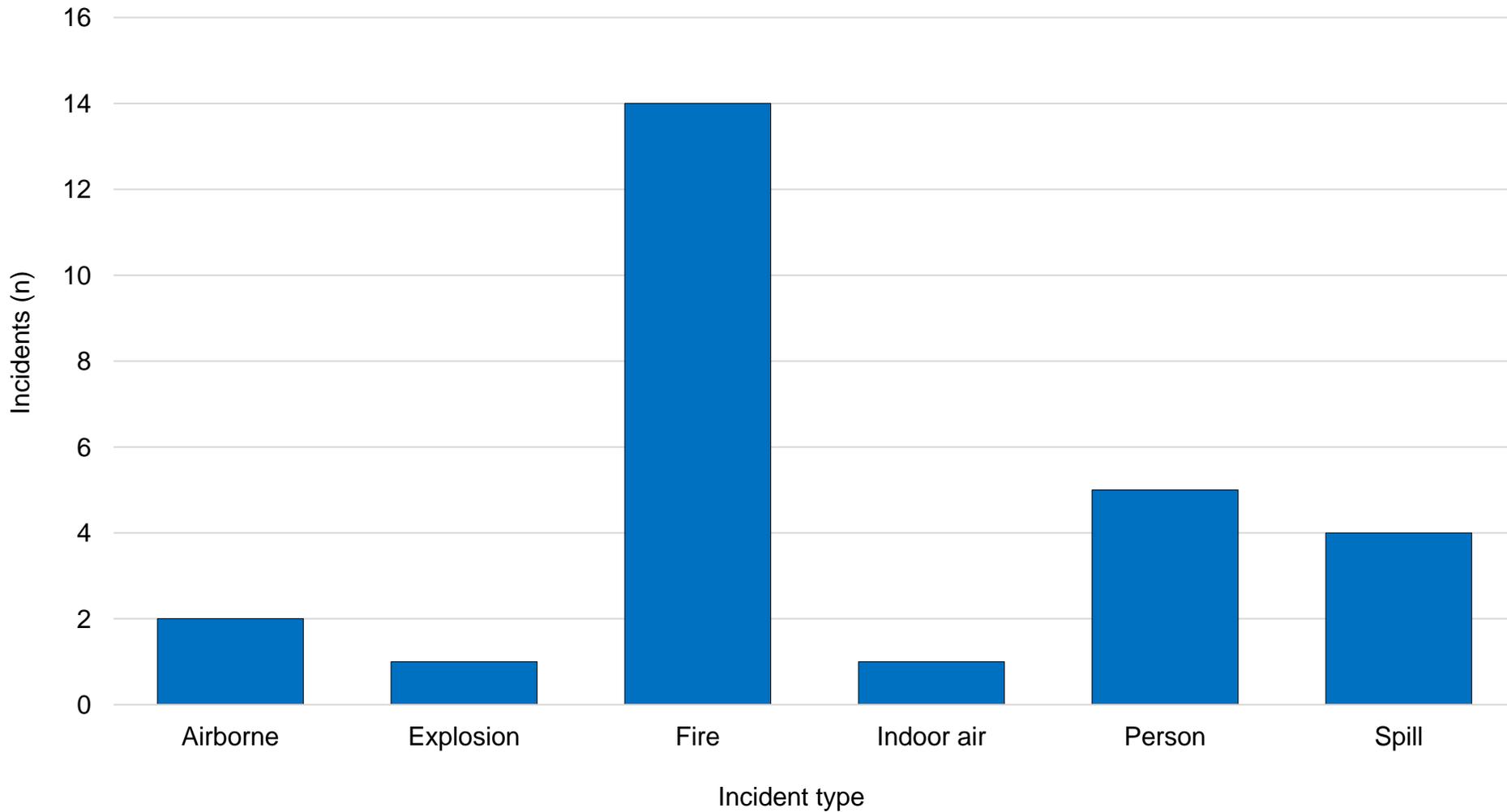
A basic surveillance report generates bar or pie charts of the surveillance data. A report was run for incident type, in the South East, between 1 January 2019 and 31 December 2019 inclusive. Fire was the most common incident type in the South East in 2019 (see figure 6).

Figure 6. EPHSS-generated bar chart showing incident types in the South East in 2019



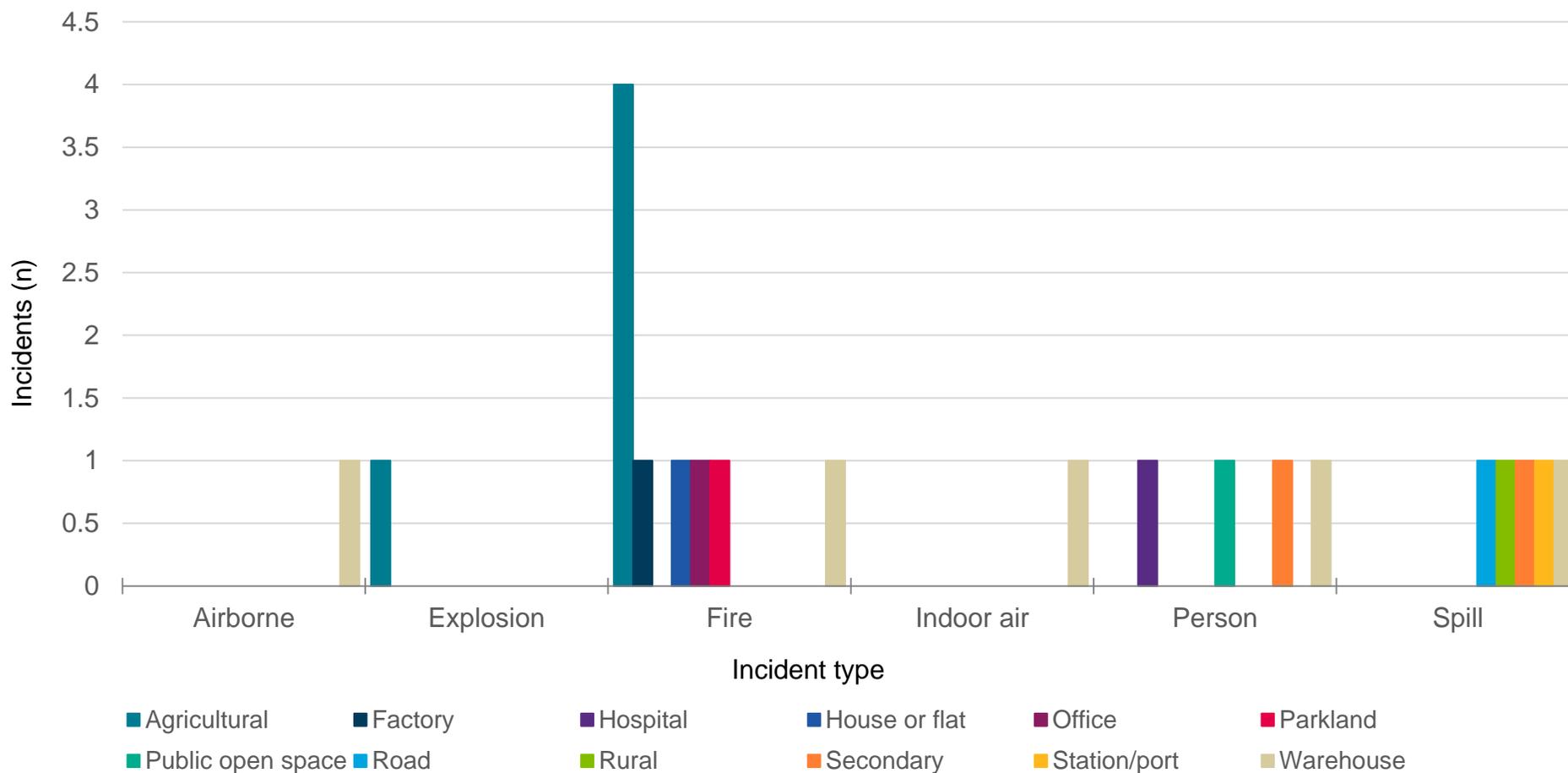
The report was run again, to show only incidents in Kent. Fewer types of incident occurred. Fire was still the most common type (see figure 7).

Figure 7 EPHSS-generated bar chart showing incident types in Kent in 2019



Finally, the report was run again to show incidents in Kent in 2019 by incident type and incident setting (figure 8). Fires were most commonly reported on agricultural sites (4 of the 9 fire incidents took place on agricultural sites). However, this does not show fires where the setting type was not recorded. Other incident types were reported across a range of settings. For example, of the 5 spills reported, one occurred in each of road, rural, secondary, station or port, and warehouse settings.

Figure 8. EPHSS-generated bar chart showing incident types and settings in Kent in 2019



Customised surveillance report

A customised surveillance report generates a line list of incidents. This is available in different formats depending on whether its purpose is for analysis or for viewing individual records. A report was run for incident type, in the South East, between 1 January 2019 and 31 December 2019 inclusive and the line list downloaded. Forty fires were found in this period, with 14 in Kent. Incident management details, such as what action was taken and by which responding organisation, can be viewed (see table 4).

Table 4. Sample extract from EPHSS-generated line list of fires in the South East in 2019, filtered by UTLA, showing incident description, action taken, and responding organisation.

Date	Description	Reporting organisation	UTLA	LTLA	Action taken	Responding organisation
12/01/2019	Barn Fire, Kent	Public Health England	Kent	Medway	Fire fighting	Environment Agency (from CIRIS); Fire and Rescue Service (from CIRIS)
19/02/2019	Barn Fire, Marden, Kent	Public Health England	Kent	Maidstone	[information not available]	Fire and Rescue Service (from CIRIS); Other
24/03/2019	Fire at workshop with possible cylinders, Kent	Public Health England	Kent	Maidstone	Cordon; Fire fighting	Fire and Rescue Service (from CIRIS)
26/05/2019	Timber yard fire, Kent	Public Health England	Kent	Sevenoaks	Fire fighting	Fire and Rescue Service (from CIRIS); Other

Lead exposure module

Case definition and population

The case definition captured by Lead Exposure in Children Surveillance System (LEICSS) in EPHSS is: children less than 16 years and resident in England with a blood lead concentration of greater than or equal to 0.48µmol/L (greater than or equal to 10µg/dL), from 2014 onwards.

Description

EPHSS delivers LEICSS as a separate module. A comprehensive [surveillance report](#) is produced and published annually by the LEICSS working group.

LEICSS is a sentinel, passive, laboratory-based surveillance system. Clinical biochemical trace element laboratories in England report cases of lead exposure in children that meet the case definition to UKHSA directly. Most cases are asymptomatic and are identified opportunistically. Cases are logged onto the system and the local HPTs are notified of cases using UKHSA's HPZone Case Management System. HPTs manage the public health interventions by liaising with clinicians, parents, UKHSA RCE, local authority environmental health officers, social services and/or housing colleagues. For surveillance purposes, additional cases are also picked up retrospectively via a systematic search of HPZone.

The LEICSS module in EPHSS can be interrogated to produce reports on the number of cases, demographics, and blood lead concentrations recorded over different time periods.

Recent developments

Data from 2020 cases has been uploaded into EPHSS so that user-generated reports can use the latest surveillance data.

The public health intervention level for lead surveillance for children was lowered from 0.48umol/L to 0.24umol/L on 5 July 2021. The system and case definition changed to incorporate reporting at the lower level. Future surveillance reports will report on the impact of this change.

Summary of lead exposures in children 2015 to 2020 inclusive

EPHSS can produce on demand reports and charts on the following statistics:

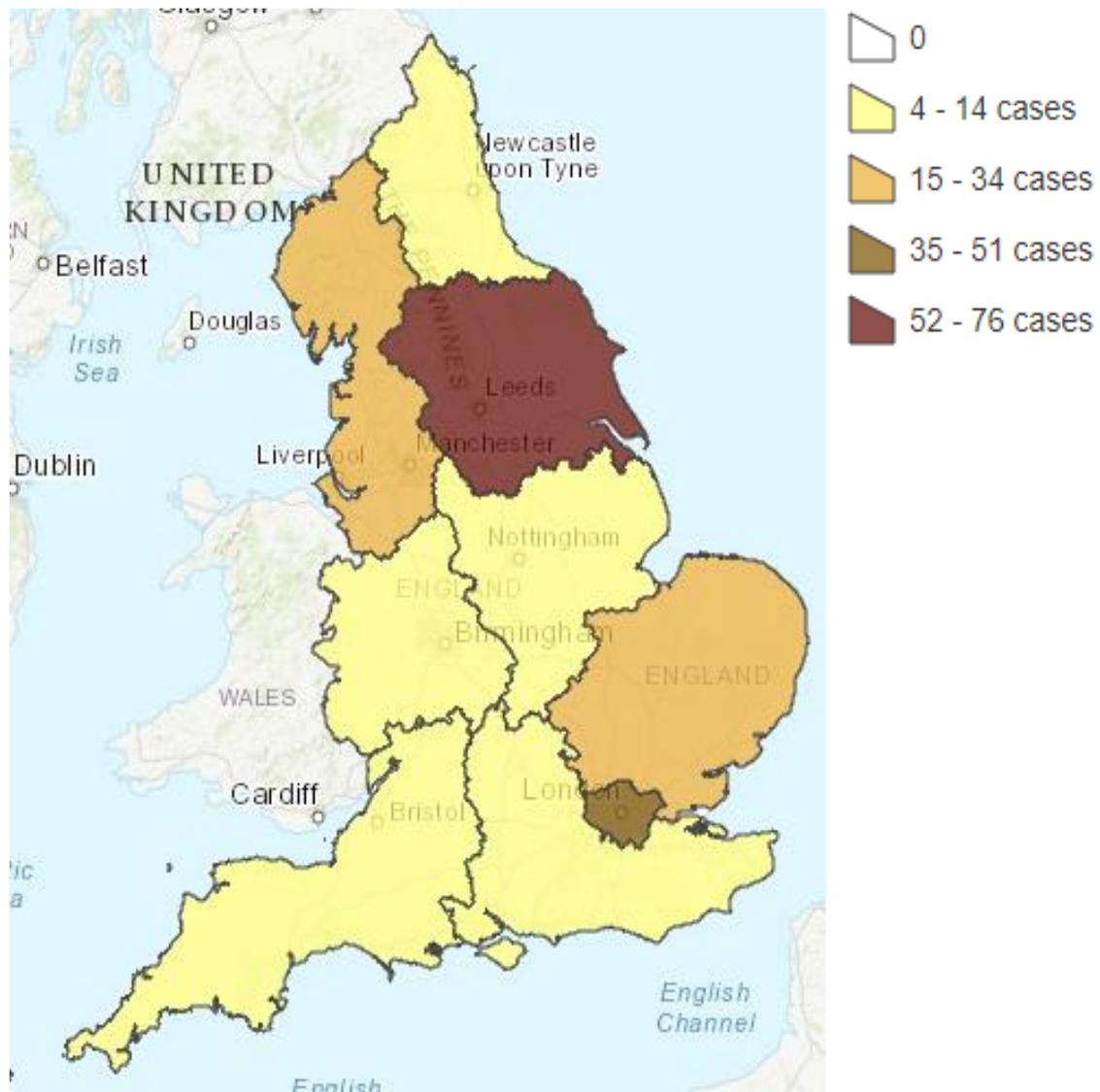
Lead exposure cases per year

From 2015 to 2020, there were between 33 and 50 lead exposure cases reported annually across England. The majority of these cases (80%) were reported to LEICSS directly from laboratories.

Lead exposures by PHE centre

Figure 9 shows the rate of lead exposure cases per 1 million children by PHE centres between 2015 and 2020. Yorkshire and Humber detected the most cases by count and by rate per 1 million children aged 0 to 14 (52 to 76 cases per 1 million children). There is a lab reporting system in this area which proactively prompts clinicians to consider testing blood lead concentration for children with pica and iron deficiency. The North West, East of England and London detected 15 to 51 cases per 1 million children. The North East, Midlands, and South reported 4 to 14 cases per 1 million children.

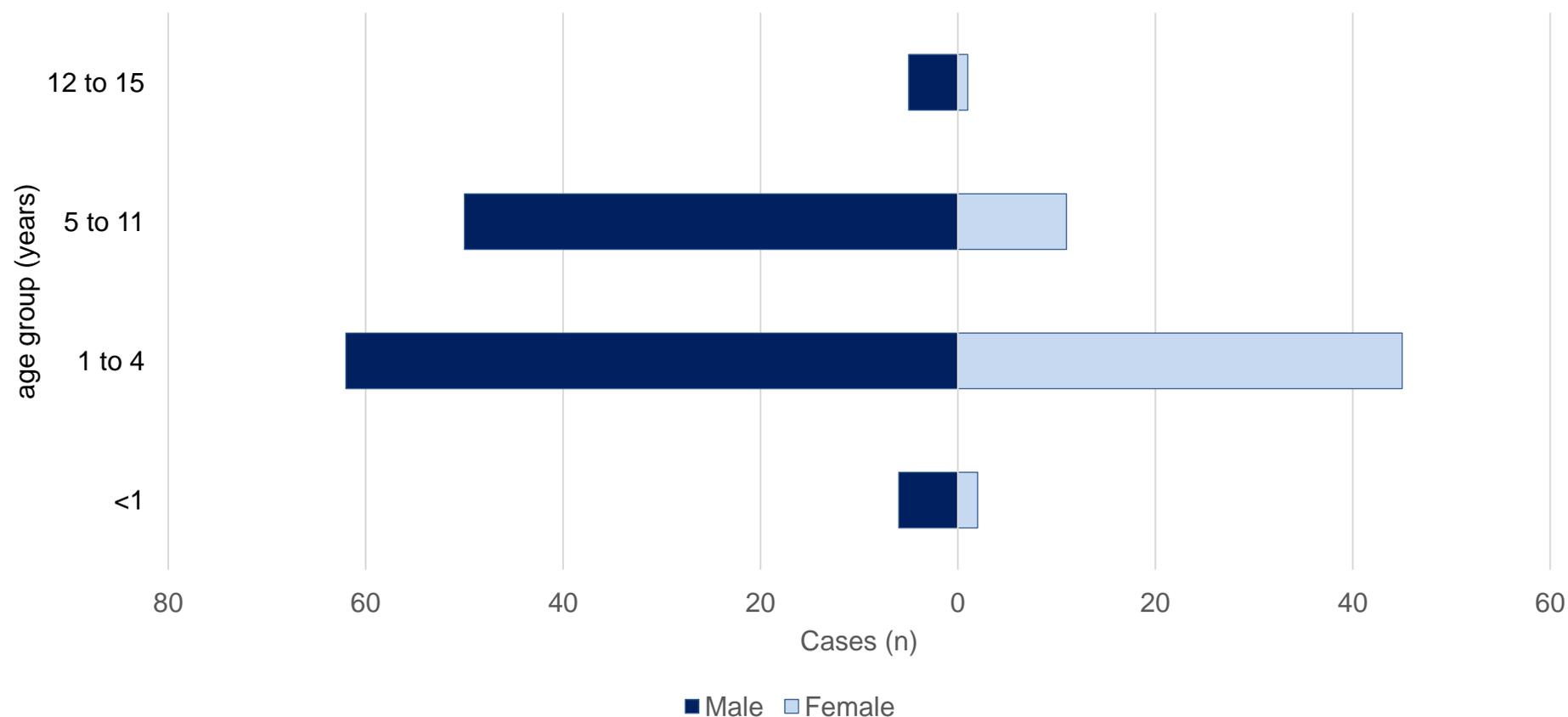
Figure 9. EPHSS-generated map showing lead exposure cases per 1 million children aged 0 to14, 2015 to 2020, by region



Lead exposures by age and gender

Between 2015 and 2020 inclusive, there were more lead exposure cases in males than in females. This is true in all age groups, but the relative difference is most pronounced among 5 to 12 year olds (see figure 10).

Figure 10. EPHSS-generated age-gender pyramid of cases of lead exposure in children reported in England from 1 January 2015 to 31 December 2020



Met Office Dataset Interface

Description

Weather conditions affect public health: extreme weather events can lead to short- and long-term adverse health outcomes, and climate change is affecting the distribution of vector-borne diseases. EPHSS Met Office Dataset Interface (MODI) allows access to meteorological data which can then be linked to health data to investigate these effects. This data stream has been built to provide data for the public health community.

MODI provides access to Met Office Integrated Data Archive System (MIDAS). MIDAS data sets are derived from observational records, measured and quality-controlled from hundreds of weather stations in the UK. Data includes multiple meteorological variables, for example temperature, rainfall, wind speed, and pollen count. The data is added daily and can be retrieved through a user friendly (graphical) user interface on the web based EPHSS portal.

Data can be obtained in a time series for a specific location, or as a single snapshot in time for a gridded area. Spatial-temporal processing of data (such as interpolation or downscaling) is available. It is also possible to download raw station data. The data is made available through spreadsheets in CSV format.

MIDAS data sets are also held on Medical Environmental Data Mash-Up Infrastructure (MEDMI)² servers. The MEDMI project explored different ways to link and interrogate databases and lay the foundations for a shared resource for medical, environmental and public health researchers in the UK.

By bringing together several complex data sets, MEDMI aimed to improve research into the links between climate, weather, the environment and health. Once EPHSS becomes externally accessible, the MEDMI servers will be retired and external existing users will be moved onto the EPHSS system to access the same data sets.

Recent developments

These are along the lines as follows:

- a user help document has been produced to help users in defining better data requests
- the user interface has been improved following stakeholder feedback
- following stakeholder feedback, data requests submitted in this module are processed hourly to speed up retrieval of the data

² [MEDMI \(Medical & Environmental Data Mash-up Infrastructure\)](#) was a pilot project funded by MRC.

Coverage

Geography

MIDAS covers all of the UK. Data can be prepared by single point site (that is, longitude and latitude coordinates), multiple point sites, or rectangular grid area. Indicators can be processed over time at point sites, or at a given time over a grid area.

Time

MIDAS includes observational records, that is, past measurements rather than forecasts. The time period which Met Office data covers varies by indicator: for example, daily rainfall was recorded from 1853, daily temperatures from 1921, thunder from 1974, and pollen counts from 2010. MODI allows data to be extracted from 1971 onwards.

Indicators

Indicators are available in the following categories:

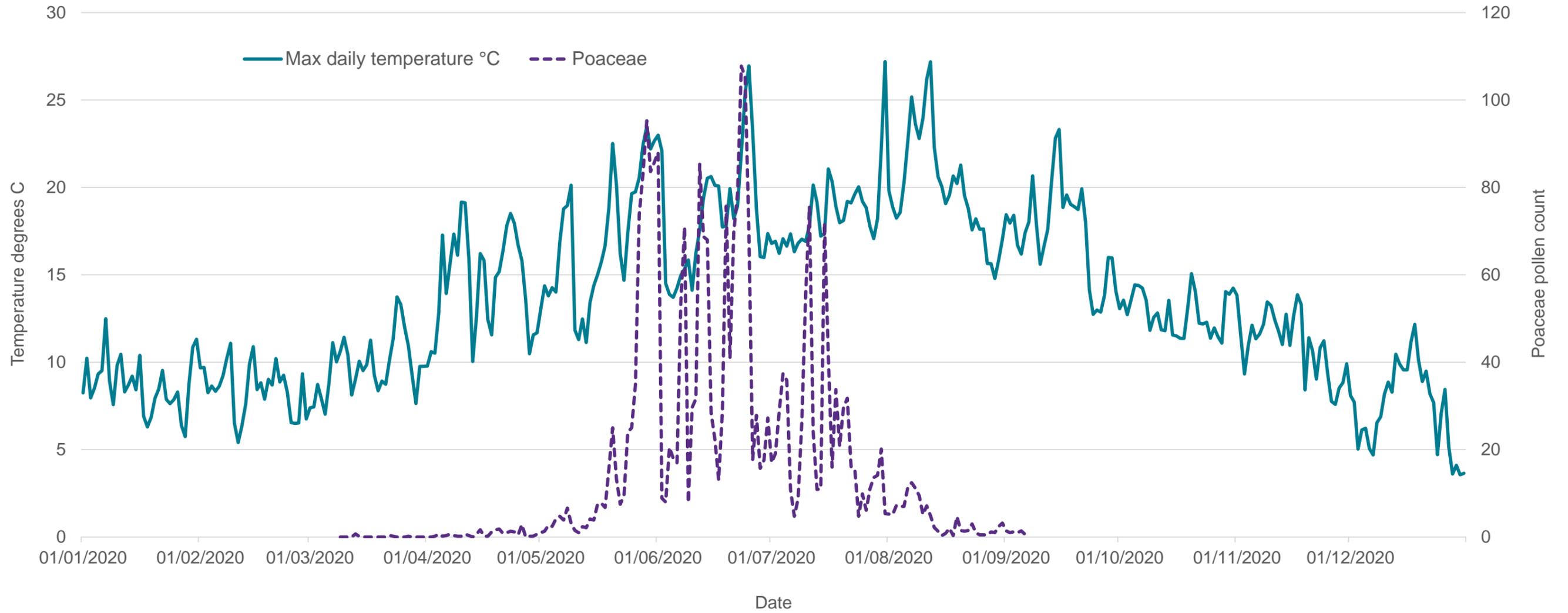
- temperature
- precipitation
- air pressure
- humidity
- solar irradiation
- visibility
- thunder
- wind speed or direction
- pollen counts

Example extract: pollen and daily temperature in Oxfordshire, 2020

MODI can be used to look at multiple meteorological indicators over the same time period. This function could be used to chart meteorological events and health outcomes over a given period.

The example below charts data from 2 reports run in MODI, for the maximum daily air temperature in 2020, and poaceae (grass) pollen count for March to September of that year, in postcode area OX11, Oxfordshire (see figure 11).

Figure 11. Maximum daily temperature and poaceae pollen count 1 January 2020 to 31 December 2020, in Oxfordshire, OX11. Data downloaded from MODI, EPHSS.



EPHSS rollout and usage

Currently EPHSS is available to all UKHSA staff. Staff need to register and complete the [application form](#). More detail about the system is available to UKHSA staff on the [intranet](#).

The EPHSS launch event to PHE CRCE staff took place on 25 June 2020 and since then the team have been working on delivering the roll out training across UKHSA. The team have produced a training video which is available via the system's help page and [EPHSS webpages](#).

Current users in UKHSA include staff in RCE, Field Service and HPTs. EPHSS could also be used by Data and Analytics colleagues, Local Intelligence and Knowledge Service and others involved in providing services and response to environmental issues affecting health.

When the system is available to external users, the Environment Agency and local authorities will be encouraged to make use of the available data and can also add data sets for surveillance purposes.

EPHSS outputs and resources are also available on the UKHSA Knowledge Hub Community of Practice (CoP). These can be accessed by signing up to the CoP [via the KHub website](#), and joining the group 'Environmental Public Health Tracking'.

EPHSS case study

Data from more than one module in EPHSS can be extracted and combined, as demonstrated below. EPHSS data could also be used alongside data from other surveillance systems, for example infectious disease data from UKHSA's second generation surveillance system (SGSS).

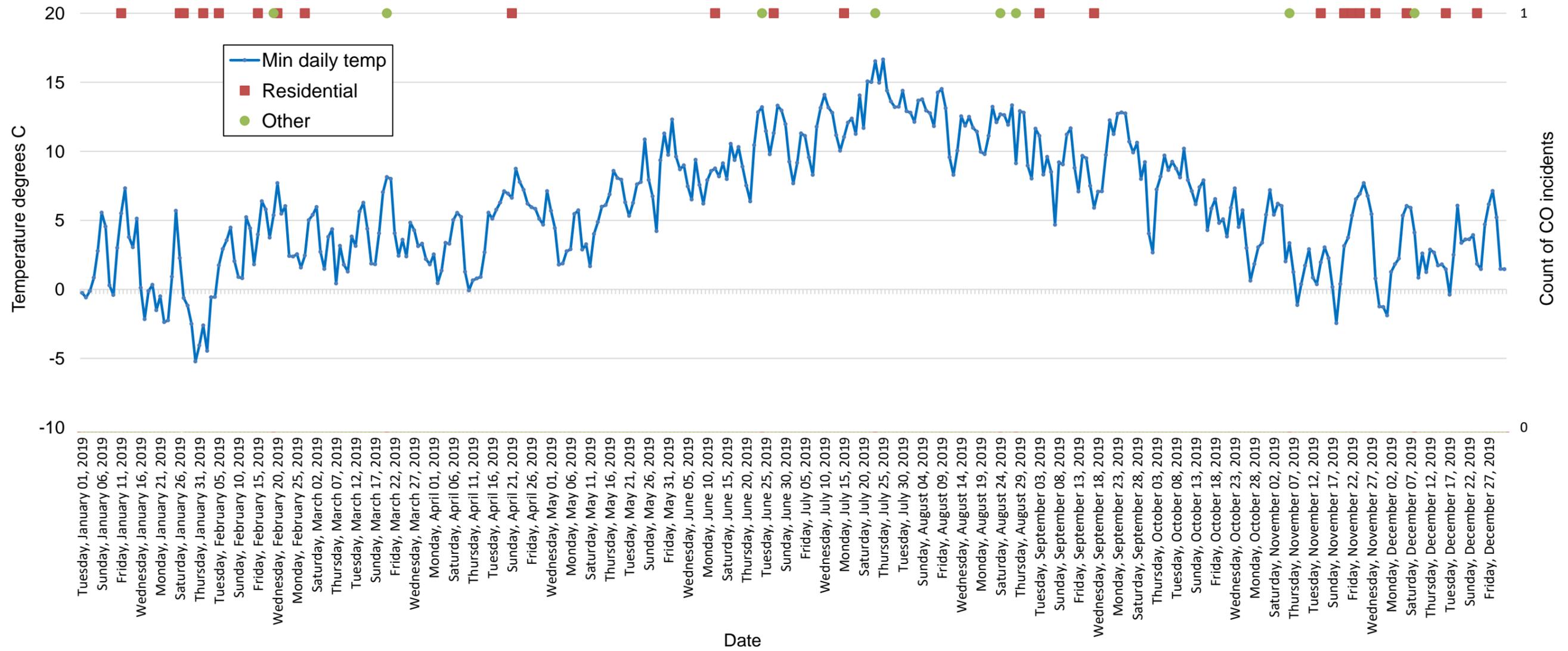
Minimum daily temperature and carbon monoxide incidents

Carbon monoxide (CO) is a transparent, odourless, and colourless gas. It is produced through incomplete combustion of fossil fuels, for example via faulty boilers or poorly maintained cooking stoves, or through using an appliance such as a generator or gas heater in an enclosed space. CO poisoning causes and contributes to a number of fatalities annually, either through accidental exposure or as a method of self-harm or suicide. A correlation between low temperatures and CO incidents might be expected, as people are more likely to use carbon-based fuel sources for heating in the winter. Two data sets generated within EPHSS were linked to visualise CO incidents and temperature in England in 2019.

A MODI data request was run to obtain data on minimum daily temperature at 52.567 latitude and -1.482 longitude (approximate centre point of England), between 1 January 2019 and 31 December 2019. An environmental events module customised surveillance report was run to obtain data on incidents with CO as the REACH agent, in England, between 1 January 2019 and 31 December 2019. In figure 12, incidents are categorised by the setting of the affected population group ('residential' or 'other'), using the free text notes for each incident record.

The 2 data sets are plotted on the graph below (figure 12). This shows the occurrence of CO incidents and the minimum daily temperature over the course of 2019. It does not give sufficient information to infer an association between CO incidents and temperature. However, it appears that 'residential' CO incidents are more common in winter months – this reflects what is reported in peer-reviewed literature. This data can be exported from EPHSS and downloaded for further statistical analysis.

Figure 12. Minimum daily temperature at the approximate centre of England and CO incidents in England (one point per incident), categorised into ‘residential’ and ‘other’ settings. 1 January 2019 to 31 December 2019, using data downloaded from the environmental events and MODI modules in EPHSS



Future direction

Planned future work

Current work is focusing on making EPHSS available to external users. We are overcoming IT security issues to open up data sets and surveillance functions to external users. This will particularly be of interest to local authorities, the Environment Agency and other resource planning agencies. It is expected that external access will be ready later on in 2022. Please contact us at ephss@phe.gov.uk if you are interested in testing the system for this purpose.

There are plans to see if it is feasible to include other environmental exposure data from other sources, including from the Food Standards Agency, the Local Government Association, Environment Agency, Emergency Responders and local authorities.

PHE transitioned to the UKHSA in October 2021. EPHSS will continue as a surveillance function in UKHSA.

Training roll out

The team will continue to roll out training and offer continued professional development (CPD) events across UKHSA. Please contact ephss@phe.gov.uk to discuss your requirements.

Acknowledgements

The EPHSS team would like to thank Health Protection Teams for reporting environmental incidents, the Environmental Hazards and Emergencies Department for incident data, and trace element biochemical laboratories for reporting to LEICSS.

Acknowledgments are also due to the members of the UKHSA Environmental Events Surveillance working group, LEICSS working group, and Weather Data for Public Health Surveillance working group for their comments on draft versions and improving the report.

Abbreviations

Acronym	Title
CIRIS	Chemical Incident Response and Information System
CRCE	Centre for Radiation, Chemical, and Environmental Hazards (PHE department)
EHED	Environmental Hazards and Emergencies Department (CRCE department)
EPHSS	Environmental Public Health Surveillance System
EPHT	Environmental Public Health Tracking
GIS	Geographical Information System
HPT	Health Protection Team
HPZone	case and incident management system used by HPTs
ICT	Information and Communication Technology
LEICSS	Lead Exposure in Children Surveillance System
LTLA	Lower tier local authority
MEDMI	Medical Environmental Data Mash-Up Infrastructure
MIDAS	Met Office Integrated Data Archive System
MODI	Met Office Dataset Interface
NCD	Non-communicable disease
NIS	National Infection Service (PHE directorate)
ONS	Office for National Statistics
PHE	Public Health England
RCE	Radiation, Chemicals, and Environmental Hazards (UKHSA directorate, successor to CRCE)
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals regulation
SGSS	Second Generation Surveillance System
UKHSA	UK Health Security Agency
UTLA	Upper tier local authority

Appendix 1. Environmental events tables

Table 5. Incidents reported by type per year in England and Wales 2015 to 2020. A single incident may have more than one type assigned to it.

Incident Type	2015	2016	2017	2018	2019	2020	Total	Total %
Fire	344	266	291	375	398	415	2,089	30
Airborne	239	199	187	213	180	122	1,140	17
Person	123	124	135	184	155	128	849	12
Drinking water	113	129	112	82	110	53	599	9
Indoor air	106	107	92	122	110	72	609	9
Spill	93	76	65	69	59	54	416	6
Property	60	50	56	61	66	41	334	5
Waterborne	34	27	34	23	22	21	161	2
Self-harm	24	24	17	22	19	12	118	2
Soil	24	22	24	20	9	11	110	2
Explosion	16	17	28	19	20	10	110	2
Suspect package	16	15	16	17	12	7	83	1
Consumer goods	11	8	9	6	4	2	40	1
Radiological exposure	11	5	5	6	4	6	37	1
Flooding	9	6	2	4	11	4	36	1
Food	8	7	9	9	7	3	43	1
Theft	8	0	0	2	0	0	10	0

Incident Type	2015	2016	2017	2018	2019	2020	Total	Total %
Other natural event	7	9	6	7	3	3	35	1
Algal toxins	4	4	6	1	2	4	21	0
Terrorism	1	1	2	2	3	1	10	0
Terrorism (other than fire)	1	1	2	2	3	1	10	0
BLEVE or fireball	0	0	0	0	0	1	1	0
Cold spell	0	7	4	2	1	1	15	0
Heatwave	0	2	2	6	0	0	10	0
Severe storm	0	0	0	0	0	1	1	0
Total	1,252	1,106	1,104	1,254	1,198	973	6,887	

Table 6. Incidents reported by location type per year in England and Wales 2015 to 2020. A single incident may have more than one location assigned to it.

Location Type	2015	2016	2017	2018	2019	2020	Total	Total %
House or flat	311	297	318	340	344	303	1,913	34
Factory	148	89	69	79	92	57	534	10
Waste processing site	63	78	60	61	61	72	395	7
Agricultural	55	40	50	58	66	58	327	6
Healthcare (aggregate)	53	41	44	47	62	35	282	5
Warehouse	51	47	30	52	36	46	262	5
Education (aggregate)	68	42	45	36	32	28	251	4
Public open space	26	25	40	53	50	45	239	4

Location Type	2015	2016	2017	2018	2019	2020	Total	Total %
Road	33	36	18	24	29	25	165	3
Office	35	20	20	24	31	11	141	3
Restaurant	24	20	19	30	29	8	130	2
Dispersed (for example, flooding, pollution)	23	32	29	20	10	11	125	2
Hotel, hostel or BB	25	19	11	24	25	14	118	2
Leisure centre	16	11	18	24	15	10	94	2
Rivers or canals	10	12	21	10	13	14	80	1
Entertainment venue	16	14	10	14	9	4	67	1
Parkland	7	8	4	7	11	16	53	1
Coastal or ocean	6	6	14	6	6	5	43	1
Laboratory (aggregate)	11	8	8	2	5	5	39	1
Home of multiple occupancy (for example, bedsit)	9	4	6	9	8	2	38	1
COMAH site	10	5	6	6	2	8	37	1
Shopping centre	9	8	3	7	5	5	37	1
Rural	7	5	9	5	4	2	32	1
Station or port	7	5	9	5	4	2	32	1
Air	1	5	4	11	4	3	28	1
Supermarket	7	3	6	2	3	2	23	0
Rail	1	4	4	3	3	5	20	0
Residential home for elderly	5	5	2	3	2	3	20	0

Location Type	2015	2016	2017	2018	2019	2020	Total	Total %
Religious centre	6	1	1	6	4	1	19	0
Military facility	2	2	2	4	4		14	0
Prison	2	2	2	2	1	2	11	0
Nursing home or hospice		2	1		3	1	7	0
Pipeline	2	1	1	1			5	0
REPPIR site	1					1	2	0
Total	1,050	897	884	975	973	804	5,583	

Table 7. Incidents reported by agent type in England and Wales 2015 to 2020 inclusive. A single incident may have more than one agent assigned to it.

Agent type	Incidents, n	Incidents, %
lead	313	13
carbon monoxide	232	10
chlorine	120	5
mercury	83	3
ammonia, anhydrous	55	2
hydrogen sulphide	49	2
acetylene	48	2
sulphuric acid	48	2
methane	47	2
hydrogen chloride	45	2
sodium hypochlorite	45	2
formaldehyde	43	2
manganese	43	2
arsenic	40	2
Fuels, diesel	40	2
iron	40	2
Natural gas	39	2
ammonia, aqueous solution	37	2
propane	34	1
helium	32	1
nickel	26	1
nitric acid	25	1
aluminium	22	1
carbon dioxide	21	1
butane	20	1
potassium cyanide	20	1
copper	18	1
nitrogen	18	1
sodium hydroxide	18	1
sodium nitrate	17	1
argon	16	1

Agent type	Incidents, n	Incidents, %
styrene	16	1
Ammonia, manuf. purge gas	15	1
ammonium nitrate	14	1
hydrogen peroxide	14	1
hydrogen cyanide	13	1
hydrogen fluoride	13	1
dichloromethane	12	0
Fuel oil, no. 2	12	0
naphthalene	12	0
oxygen	12	0
xylene	12	0
sodium cyanide	11	0
sulphur dioxide	11	0
acetone	10	0
bromine	10	0
magnesium	10	0
CS Gas	10	0
sodium	9	0
toluene	9	0
benzene	8	0
methanol	8	0
orthophosphoric acid	8	0
acetic acid	7	0
aluminium phosphide	7	0
benzo[a]pyrene	7	0
formic acid	7	0
phosphorus	7	0
boron	6	0
ethane-1,2-diol	6	0
ozone	6	0
zinc	6	0
ricin	6	0
acetonitrile	5	0

Agent type	Incidents, n	Incidents, %
bendiocarb	5	0
calcium oxide	5	0
chlorine dioxide	5	0
ethanol	5	0
hydrogen	5	0
potassium hydroxide	5	0
sodium azide	5	0
sodium chloride	5	0
sodium nitrite	5	0
sulphur mustard	5	0
antimony	4	0
cadmium	4	0
capsaicin	4	0
chloroform	4	0
chromium	4	0
Creosote	4	0
ethylbenzene	4	0
glyphosate	4	0
methyl methacrylate	4	0
phenol	4	0
picric acid	4	0
sodium dithionite	4	0
strychnine	4	0
tetrachloroethylene	4	0
trichloroethylene	4	0
ammonium sulphate	3	0
barium	3	0
bentazone	3	0
Bleaching agents, earths, manuf. of, acid solns.	3	0
dieldrin	3	0
fentanyl	3	0
Gasoline	3	0

Agent type	Incidents, n	Incidents, %
mercury chloride	3	0
m-xylene	3	0
Naphtha	3	0
nitrogen dioxide	3	0
peracetic acid	3	0
potassium permanganate	3	0
sodium hydrogensulfite	3	0
sodium hydrogensulphate	3	0
urea	3	0
water	3	0
2,4-dinitrophenol	2	0
2,4-dinitrophenylhydrazine	2	0
2-methoxy-1-methylethyl acetate	2	0
aluminium chloride	2	0
aluminium oxide	2	0
Ammonia liquor (coal)	2	0
Aromatic hydrocarbons, C9-12, benzene distn.	2	0
asulam	2	0
benzothiazole	2	0
butanone	2	0
calcium carbonate	2	0
carbon tetrachloride	2	0
chloroethane	2	0
cyclohexanone	2	0
dinitrophenol	2	0
diphosphorus pentaoxide	2	0
ethyl methacrylate	2	0
ethylene oxide	2	0
Fuel oil, no. 4	2	0
Fuel oil, residual	2	0
iodine	2	0
Iron chloride oxide	2	0

Agent type	Incidents, n	Incidents, %
Lead oxide	2	0
Lime (chemical), hydraulic	2	0
Limestone	2	0
MCPA	2	0
nicotine	2	0
Paraffin oils	2	0
Petrolatum	2	0
phosphine	2	0
potassium	2	0
potassium bromate	2	0
potassium dichromate	2	0
propan-2-ol	2	0
pyridine	2	0
radon	2	0
sodium chlorite	2	0
sodium sulphate	2	0
trimethylbenzene	2	0
Zinc phosphide	2	0
1-(1-hydroxycyclohexyl)ethan-1-one	1	0
1-(3,5,5-trimethyl-2-cyclohexen-1-ylidene)acetone	1	0
1,4-diacetylbenzene	1	0
1-hexyl isocyanate	1	0
1-methoxypropan-2-ol	1	0
1-methylnaphthalene	1	0
1-Propanol, 2-methyl-, C4-6 dicarboxylates	1	0
2-(2-butoxyethoxy)ethyl acetate	1	0
2-(dimethylamino)ethyl acrylate	1	0
2,2,4,6,6-pentamethylheptane	1	0
2,4(or 2,6)-dinitrophenol	1	0
2,6-diethylaniline	1	0
2-aminoethanol	1	0

Agent type	Incidents, n	Incidents, %
2-Butanone, peroxide	1	0
2-butoxyethanol	1	0
2-ethylhexyl nitrate	1	0
2-naphthylamine	1	0
2-oxobornane-3-carboxylic acid	1	0
4,4-methylenediphenyl diisocyanate	1	0
acenaphthene	1	0
acetaldehyde	1	0
acetylferrocene	1	0
acrylamide	1	0
acryloyl chloride	1	0
Agar, hydrogen sulfate	1	0
aldicarb	1	0
alprazolam	1	0
aluminium sodium bis(sulphate)	1	0
aluminium sulphate	1	0
Amines, N-tallow alkyldipropylenetri-	1	0
ammonium chloride	1	0
ammonium hydrogendifluoride	1	0
Ammonium zinc chloride	1	0
aniline	1	0
azidotrimethylsilane	1	0
aziridine	1	0
barium sulphite	1	0
benzaldehyde	1	0
benzoyl chloride	1	0
biphenyl	1	0
bismuth	1	0
boron trifluoride	1	0
bromacil	1	0
bromine chloride	1	0
bromoform	1	0
bromomethane	1	0

Agent type	Incidents, n	Incidents, %
buta-1,3-diene	1	0
butan-1-ol	1	0
butane-1-thiol	1	0
butyl acrylate	1	0
butyryl chloride	1	0
cadmium carbonate	1	0
cadmium cyanide	1	0
caesium	1	0
caesium chloride	1	0
Calcines, lead-zinc ore conc.	1	0
calcium bromate	1	0
calcium dihydroxide	1	0
calcium fluoride	1	0
calcium hypochlorite	1	0
calcium sulfate	1	0
carbazole	1	0
carbetamide	1	0
carbofuran	1	0
Carbon black	1	0
carbon disulphide	1	0
chlorfenvinphos	1	0
chlorocresol	1	0
chloroethylene	1	0
chlorosilane	1	0
chlorpyrifos	1	0
chromic acid	1	0
chromium trioxide	1	0
citric acid	1	0
cobalt bis(2-ethylhexanoate)	1	0
cobalt dichloride	1	0
coke (coal tar), high-temperature pitch	1	0
copper carbonate	1	0
copper cyanide	1	0

Agent type	Incidents, n	Incidents, %
copper(II) carbonate--copper(II) hydroxide (1:1)	1	0
cyanogen chloride	1	0
cyclohexane	1	0
cyclohexanol	1	0
dibenzoyl peroxide	1	0
dicalcium lead tetraoxide	1	0
dichlorvos	1	0
diethylbenzene	1	0
difluoromethane	1	0
dilead oxide	1	0
dimethyl sulphide	1	0
dimethylnitrosoamine	1	0
dinitrogen oxide	1	0
diphenyl ether	1	0
diphenylamine	1	0
diphenylphosphine	1	0
disodium peroxodisulphate	1	0
DL-proline	1	0
docosane	1	0
Dust, ferrous metal, blast furnace	1	0
Dust, steelmaking	1	0
ephedrine	1	0
ergotamine	1	0
ethyl acetate	1	0
ethyl propionate	1	0
ferrocene	1	0
fluoranthene	1	0
Fuel oil, heavy, high-sulfur	1	0
Fuels, diesel, no. 2	1	0
gallium	1	0
Gas oils, paraffinic	1	0
Gasoline (natural gas), natural	1	0

Agent type	Incidents, n	Incidents, %
Gasoline, natural	1	0
heptachlor epoxide	1	0
hydrazine	1	0
Hydrocarbons, C<10-linear	1	0
Hydrocarbons, C>4	1	0
Hydrocarbons, C10 and C12, olefin-rich	1	0
Hydrocarbons, C1-3	1	0
Hydrocarbons, C3-12, hexene-rich	1	0
Hydrocarbons, C4, butane conc., n-butene-contg.	1	0
Hydrocarbons, C8-25	1	0
Hydrocarbons, C9-16, hydrotreated, dearomatized	1	0
hydrogen bromide	1	0
hydroxylammonium nitrate	1	0
iron chloride sulphate	1	0
iron dichloride	1	0
iron manganese trioxide	1	0
iron oxide black	1	0
iron sulphate	1	0
iron trichloride	1	0
isobutane	1	0
isopropyl acetate	1	0
isopropylamine	1	0
isovaleric acid	1	0
lactic acid	1	0
lead 12-hydroxyoctadecanoate	1	0
lead acetate	1	0
lead carbonate	1	0
Lead ores, concs., leached	1	0
Ligroine	1	0
lithium	1	0
magnesium silicate	1	0

Agent type	Incidents, n	Incidents, %
malic acid	1	0
mecoprop	1	0
mercury iodide	1	0
mercury monoxide	1	0
mesitylene	1	0
methacrylic acid	1	0
methamphetamine	1	0
methamphetamine hydrochloride	1	0
methoxyacetaldehyde	1	0
methyl acrylate	1	0
methyltetrahydrofuran	1	0
molybdenum	1	0
nickel dinitrate	1	0
nitrobenzene	1	0
nitrogen monoxide	1	0
nitromethane	1	0
octacosane	1	0
Oils, marine	1	0
o-xylene	1	0
palladium	1	0
paraquat-dichloride	1	0
pentane	1	0
perchloric acid	1	0
phenanthrene	1	0
phenoxyacetic acid	1	0
phosgene	1	0
phosphonic acid	1	0
picrotoxin	1	0
platinum	1	0
potassium bromide	1	0
potassium carbonate	1	0
potassium dicyanoargentate	1	0
propane-1,2-diol	1	0

Agent type	Incidents, n	Incidents, %
propene	1	0
propionaldehyde	1	0
pseudoephedrine	1	0
Pyrethrins and Pyrethroids	1	0
rhodium	1	0
ricinine	1	0
selenium	1	0
silicon	1	0
sodium carbonate	1	0
sodium cyanate	1	0
sodium cyanotrihydroborate	1	0
sodium dichromate	1	0
sodium dioxoarsenate	1	0
sodium fluoride	1	0
sodium hydride	1	0
sodium hydrogencarbonate	1	0
sodium selenite	1	0
Sodium sulfide (Na ₂ (S _x))	1	0
sodium thiosulphate	1	0
solanine	1	0
Storax (resin)	1	0
strontium	1	0
Sulfur dioxide, manuf. of, bisulfite liquor from	1	0
sulphur trioxide	1	0
Terphenyl, hydrogenated	1	0
tert-butyl methyl ether	1	0
tetracosane	1	0
tetrafluoroethylene	1	0
tetrahydrothiophene	1	0
thionyl dichloride	1	0
tributyl phosphate	1	0
trichloro(methyl)silane	1	0

Agent type	Incidents, n	Incidents, %
tricosane	1	0
triethylamine	1	0
trimethylphenol	1	0
trisodium nitrilotriacetate	1	0
tritium	1	0
Turpentine	1	0
valeric acid	1	0
vinyltoluene	1	0
zinc chlorate	1	0
botulinum	1	0
Total	2,431	100

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Version 1.0

Date: March 2022

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Published: March 2022

Publishing reference: GOV-11424



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