# Report Title: The Effect of Arnold's Field Fires on the Respiratory Health of the Surrounding Population – Short Report

## *Purpose of the Report:*

- This report is one of several looking at the possible health impacts of recurrent fires at Launders Lane.

- This report focuses on exploring and interpreting healthcare data to identify any temporal relationship between occurrence of fires at the site and use of health care services for respiratory symptoms/illness amongst residents living close to the Arnold's Field site.


## *Summary of findings:*

1. We report a statistically significant association of fires attended by London Fire Brigade at Arnold's Field, Launders Lane with an increased risk of GP attendance by those with existing long-term respiratory conditions (such as asthma or COPD) on the day of a fire.

2. The impact of this increased risk was modest; equivalent to one extra GP appointment every five fire days, compared to days without a fire (or 0.2 extra appointments per day), amongst the local resident population of 23,656 people.

3. There was no statistically significant increased risk of GP visits found amongst the general population. This was the case on the day of the fire as well as the cumulative three and seven day periods following a fire event.

4. No statistically significant impact of "fire days" on prescriptions issued for the treatment of respiratory conditions, A&E attendance or hospital admissions for respiratory illness/symptoms was found amongst the local population. This was the case on the day of the fire as well as the cumulative three and seven day periods following a fire event.



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# Executive Summary

This report explores the potential impact of fire incidents at the Arnold's Field site, Launder's Lane on the respiratory health of local residents by analysing their use of healthcare services (primary and secondary care) for the period January 2018 to September 2023. The population at risk was defined as people living in lower super output areas (LSOA) with at least part of the geography within a 2 mile radius from Arnold's Field. Fourteen Havering LSOAs were included with an estimated resident population of 23,656 people. Fire incidents attended by the London Fire Brigade from January 2018 until September 2023 were included as the exposure variable (n=99 days).

Findings of epidemiological time series analysis performed with Environmental Epidemiology experts from Imperial College London are detailed. Use of health care services, air quality, and meteorological data were used to inform statistical models necessary to explore the relationship between days when London Fire Brigade attend to fires at the site and the use of health care services by local residents as a result of respiratory symptoms.

We report a statistically significant association of fires attended by London Fire Brigade at Arnold's Field, Launders Lane with an increased risk of GP attendance by those with existing long-term respiratory conditions (such as asthma or COPD) on the day of a fire. The impact of this increased risk was modest; equivalent to one extra GP appointment every five fire days, compared to days without a fire (or 0.2 extra appointments per day), amongst a population of 23,656 people. The significant increased risk of GP visits was not demonstrated amongst the general population. This association was not seen when considering the cumulative three and seven day periods following a fire event.

No statistically significant impact of "fire days" on prescriptions issued for the treatment of respiratory conditions, A&E attendance or hospital admissions for respiratory illness/symptoms was found amongst the local population. This was the case on the day of the fire as well as the cumulative three and seven day periods following a fire event.

These findings should be interpreted with consideration given to a number of limitations to the data available: residential address was the best possible marker of exposure amongst local residents and does not take into account daily whereabouts or behaviours; fire days were used as the exposure variable and are defined as days when the London Fire Brigade were in attendance, however the site is known to smoulder outside of these attendances; only one air quality monitoring node was installed throughout the entire study period (2018 – 2023); healthcare activity data is not 100% complete and the GP data set for those with long-term respiratory conditions did not include symptoms on the day of presentation to general practice. Additionally, it is potentially difficult for people to access same-day GP appointments, however A&E data was also analysed with a view that should a person in need of urgent care not be able to access general practice, A&E would be an option 24/7.

Whilst we have demonstrated a statistically significant increased risk of attending a GP practice amongst those with increased sensitivity to poor air quality on the day of a fire, and recognise that this impact may be substantial to an individual affected, the resulting population level impact of a fire day on health care service use is relatively modest (1 extra GP appointment every 5 fire days for a population of over 23,500).

# Introduction

Arnold's Field is a 16.94 hectare area of privately owned land off Launders Lane, Rainham in the South of the London Borough of Havering (Figure 1). The site was formerly a sand and gravel quarry, subsequently registered as a landfill licensed to accept inert, commercial, industrial, household and solid sludge waste. The last waste was recorded as being accepted in 1965, however significant volumes of waste were subsequently deposited there without appropriate authorisation[1]. The site now catches fire, especially during hot weather. Residents complain about the nuisance caused by smoke, dust and odour from the fires and are concerned about potential health impacts. Local Councillors and Local Authority Officers have received concerns from residents relating to poor respiratory health amongst the local community. Havering Council has commissioned soil sampling and comprehensive air quality monitoring, and has undertaken investigations of potential health risks to residents through contract with Environmental Epidemiology experts from Imperial College London and data requests to NEL Integrated Care System (ICS), NHS and National Disease Registration Service, NHS England.

This report details the findings of epidemiological time series analysis performed with Environmental Epidemiology experts from Imperial College London. Use of health care services, air quality, and meteorological data were used to inform statistical models necessary to explore the relationship between days when London Fire Brigade attend to fires at the site and the use of health care services by local residents as a result of respiratory symptoms.

Epidemiological time series analysis is a statistical modelling methodology applied to explore any potential relationship between daily variations in the occurrence of fires and use of health care services taking into account potential confounding factors[2] that may influence healthcare usage on any given day. For example, warmer weather may influence severity of respiratory symptoms experienced by the population, but may also be associated with the occurrence of a fire at the site. An influence diagram is shown in Figure 2, detailing the variables (measured and unmeasured) that may contribute to a person's use of health care services for respiratory symptoms. Investigation over longer time periods strengthen such analyses, providing as much data as possible to explore temporal patterns.

A list of variables considered in the analysis, and the associated data sources, is fully described in the full technical report published alongside this short report.

# Aim

The aim of this analysis was to explore whether fires occurring at the Arnold's Field site are associated with an increase in use of health care services by people residing close to the site.

[1] Ground investigation report for the land at Arnold's Field, Launders Lane, Rainham RM13 9FL. Geo-Environmental 2023. https://issuu.com/haveringcouncil/docs/launders_lane_arnold_s_field_-_soil_investigatio?fr=xKAE9_zU1NQ

[2] Confounding factors/variables are those that may compete with the exposure of interest (e.g. fires) in explaining the outcome (e.g. GP visits) of a study.

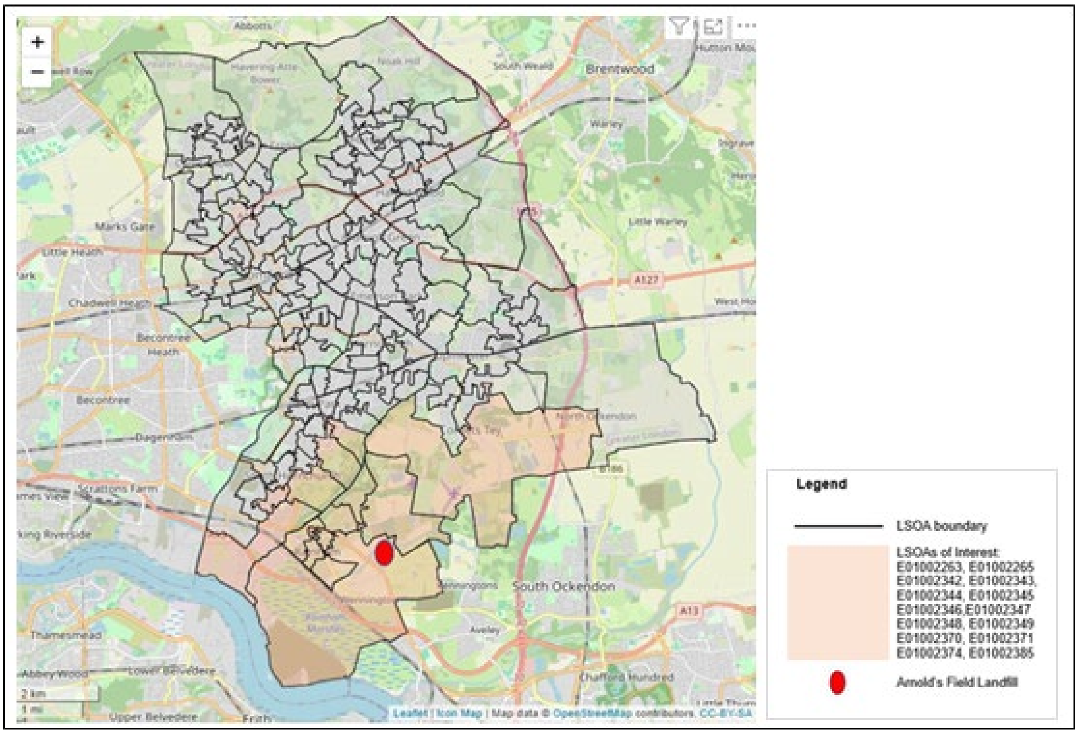


**Figure 1 Map of the London Borough of Havering with lower super output area (LSOA) boundaries marked. Arnold's Field is marked with a red circle. The Havering LSOAs of interest that have at least part of their geography within a 2 mile radius of Arnold's Field, Launders Lane are highlighted.**

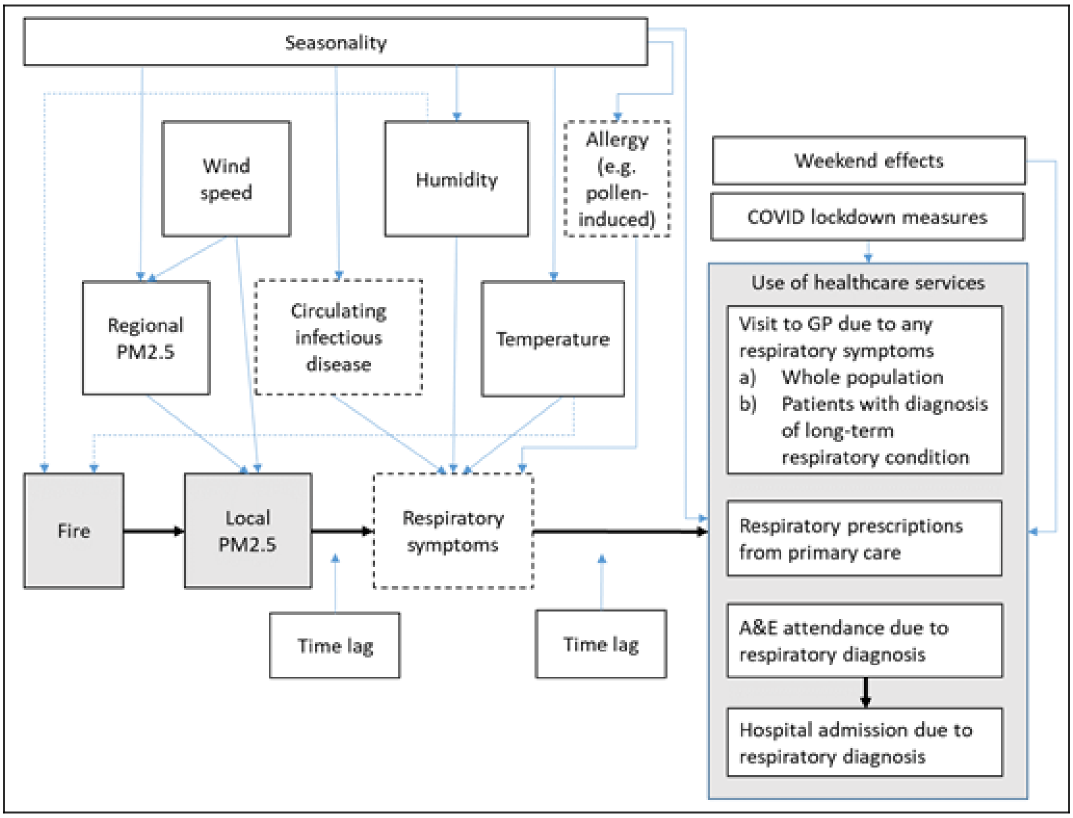

**Figure 2 Influence diagram of the causal pathway from fire to a person's use of healthcare services. Variables bordered with a solid line represent variables for which measured data is available. Variables bordered with a dashed line are not measured, but may contribute some variation to statistical models.**

## Results

Following univariate analysis epidemiological time series statistical modelling was performed to consider the complex interplay of different factors that can influence the outcomes (Figure 2). Such statistical modelling, estimates the level of influence one variable has over another and takes potential confounding variables into account. Time series analysis seeks to account for the influence of other known variables which vary over time in order to identify whether or not the exposure variable of interest (e.g. fires) has an impact on the outcome of interest (e.g. GP visits) irrespective of the contribution from other known variables (e.g. temperature).

### *Resident population of interest*

The population at risk of any potential impact of fires on health care use for respiratory symptoms was defined as people living in lower super output areas[3] (LSOA) that have at least part of the geography within a 2 mile radius from Arnold's Field. Fourteen LSOAs were included, referred to in this report as "LSOAs of interest" and had an estimated resident population of 23,656 people (Table 1).

It should be noted that during the time period explored as part of this study individuals may move residential location, and the physical location of each individual at the exact time of a fire occurring cannot be known. Whilst it is recognised that we are not able to precisely account for the exact location of individuals it is necessary to define the total population living in the area of interest as accurately as possible to provide a denominator population, and hence LSOA of residence represents the best possible definition.

**Table 1 Resident population of the 14 LSOAs of interest within 4 miles of the Arnold's Field, Launders Lane site.**

| LSOA Code | LSOA Name | Age <65 years | Age 65+ years | Total |
|---|---|---|---|---|
| E01002263 | Havering 026D | 1310 | 341 | 1651 |
| E01002265 | Havering 025A | 1095 | 281 | 1376 |
| E01002342 | Havering 030A | 1512 | 235 | 1747 |
| E01002343 | Havering 029A | 1276 | 397 | 1673 |
| E01002344 | Havering 029B | 1537 | 330 | 1867 |
| E01002345 | Havering 030B | 1763 | 187 | 1950 |
| E01002346 | Havering 030C | 1355 | 189 | 1544 |
| E01002347 | Havering 030D | 1370 | 270 | 1640 |
| E01002348* | Havering 029C | 1068 | 397 | 1465 |
| E01002349 | Havering 029D | 1147 | 351 | 1498 |
| E01002370 | Havering 028C | 1990 | 276 | 2266 |
| E01002371 | Havering 028D | 1359 | 338 | 1697 |
| E01002374 | Havering 027E | 1387 | 253 | 1640 |
| E01002385 | Havering 024A | 1235 | 407 | 1642 |
| **Total** | | **19404** | **4252** | **23656** |

### *Fire incidents*

Fires attended by the London Fire Brigade occurring on Arnold's field, off Launders Lane from 01 January 2018 until 30 September 2023 were included as the

[3] An LSOA is a geographical area comprised of between 400 and 1,200 households and have a usually resident population between 1,000 and 3,000 persons. [Statistical geographies - Office for National Statistics (ons.gov.uk)]

independent exposure variable in our analysis. Some fires burnt for more than one day, and on some days there was more than one fire burning on the field (i.e. at a different location on the site). As such a binary variable “fire day” was used, where a fire day was a calendar date with at least one fire occurring on the site in that 24 hour period. A monthly summary of fire days is shown in Table 2.

**Table 2 Summary of the number of days with fires (“fire days”) occurring at Arnold’s Field, Launders Lane that required attendance by the London Fire Brigade (LFB) from 2018 - 2023.**

| Year | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2018** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **2019** | 0 | 0 | 0 | 1 | 0 | 1 | 8 | 1 | 1 | 1 | 1 | 0 | 14 |
| **2020** | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 8 | 7 | 1 | 0 | 0 | 17 |
| **2021** | 0 | 0 | 0 | 0 | 3 | 3 | 0 | 0 | 0 | 5 | 5 | 0 | 16 |
| **2022** | 0 | 1 | 0 | 8 | 2 | 13 | 11 | 1 | 0 | 0 | 0 | 0 | 36 |
| **2023*** | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 12 | 1 | 0 | 0 | 0 | 15 |
| ***Total*** | ***0*** | ***1*** | ***0*** | ***10*** | ***5*** | ***17*** | ***21*** | ***22*** | ***8*** | ***7*** | ***6*** | ***1*** | ***99*** |

*until 30 September 2023

## *$PM_{2.5}$*

Smoke from fires contains large quantities of particulate matter with a diameter of less than 2.5μm ($PM_{2.5}$) which can penetrate deep into the lungs and have previously been shown to be associated with adverse health outcomes[4]. $PM_{2.5}$ data for the entire study period was only available from the Rainham reference node. Whilst several additional air quality monitoring sites have since been installed around the area the need for data over a longer time period to inform the time series analyses necessitated the use of data from the single node from 2018 – 2023.

## *Correlation between variables*

Correlations between continuous variables (air pollution, meteorological and health outcomes) were investigated using Spearman test. In addition to correlations between a number of outcome variables, potential confounding variables were found to be correlated with one another. For example, average wind speed and daily average $NO_2$ were negatively correlated (rho = -0.190; $p<0.001$); when wind speed was higher, daily average $NO_2$ was lower.

## *Use of healthcare services (health outcomes)*

Total occurrences of the five health outcomes measures investigated are summarised in Table 3. The seasonality of each of the health outcome measures and the seasonality of fires does not appear to follow the same pattern, as such epidemiological time series analysis was deemed necessary to adjust for this seasonality and interpret the remaining relationship between the exposure (fire days) and each of the health outcome variables. The other variables included in the model are described in Table 4.

[4] https://www.who.int/europe/news/item/17-10-2013-outdoor-air-pollution-a-leading-environmental-cause-of-cancer-deaths

**Table 3 Summary of the numbers of each health outcome measure included in the epidemiological time series analysis.**

| Health outcome | Total number for residents of the LSOAs of interest between January 2018 and September 2023 |
|---|---|
| Visits to general practice made due to respiratory symptoms (all residents) | 3,537 |
| Visits to general practice by those with long-term respiratory conditions recorded | 1,231 |
| Prescriptions issued for treatment of respiratory symptoms | 108,182 |
| Attendances at A&E due to respiratory symptoms | 1,530 |
| Admissions to hospital due to respiratory symptoms | 2,482 |

**Table 4 Descriptive statistics of explanatory variables included in the multi-variable time series models.**

| Variable (units) | Type | Mean (min-max) | Median (IQR) | Included in adjusted time series model (yes/no) |
|---|---|---|---|---|
| Daily average temperature (ºF) | Continuous | 55.1 (26.6 – 86.8) | 54.4 (47.3 – 63.2) | Yes |
| Daily average humidity (%) | Continuous | 45.6 (14.6 – 64.8) | 45.6 (39.6 – 52.3) | Yes |
| Daily average wind speed (mph) | Continuous | 7.9 (1.7 – 21.3) | 7.4 (5.8 – 9.7) | Yes |
| Weekdays | Categorical | N/A | N/A | Yes |
| Public holidays | Binary | N/A | N/A | Yes |
| COVID lockdown measures | Binary | N/A | N/A | No* |
| Seasonality | Spline function | N/A | N/A | Yes |

*Variable was explored and not included in the final time series model as it did not add explanatory value.

## *Time series models*

Models for the effects of the two exposure variables fire day and $PM_{2.5}$ are shown on the day of the fire incident (Table 5 and Table 6 respectively), the effect of fire day for the cumulative three days following a fire day (Table 7) and the cumulative seven days following a fire day (Table 8). Average daily $PM_{2.5}$ recorded at the Rainham reference co-location node was not found to be a significant explanatory factor for health care use on the day of a fire in any of the models tested (Table 6), and as such was not investigated for lagged effects (cumulative 3 and 7 days post fire day).

Fire days were found to be a significant explanatory factor for attendance at GP on the day of a fire by patients with a long-term respiratory condition recorded, when the time series model accounted for seasonality, temperature, holidays, wind speed, and weekdays (Table 5). On fire days there was an approximate 35% increased risk of those with long term respiratory conditions attending GP on the day of a fire attended by London Fire Brigade compared to days without fire attended by London Fire Brigade.

This is the equivalent to each fire day being associated with 0.2 extra GP appointments per day for those with long-term respiratory conditions across the LSOAs of interest. This can be thought of as one extra GP appointment every 5 fire days compared to five days without a fire incident. In 2022, the year with the most fire days (n=36), this would have totalled just over 7 additional GP appointments that year, amongst a population of 23,656 people. To further contextualise this, there was approximately 650 GP appointments with respiratory symptoms recorded for the total local population throughout the whole of 2022.

When this relationship was further explored to see if it remained for the cumulative three and seven day periods following the fire day (giving consideration to the delay in development of respiratory symptoms and the potential difficulties with accessing same-day GP appointments), the exposure variable (fire days) was no longer associated with a difference in relative risk (Table 7 and Table 8; see also the full technical report published alongside this report for comprehensive methodology).

When the adjusted model was used to explore the other health outcomes there were no other statistically significant relationships found between exposure variable (either fire day or $PM_{2.5}$) and health outcome; either on the day of a fire incident, the cumulative three day or seven day periods following the fire day.

**Table 5 Poisson regression models for the impact of fire days on respiratory healthcare activity, on the day of the fire incident. Adjusted model incorporates seasonality, temperature, holidays, wind speed, humidity and weekdays. RR = relative risk, CI = confidence intervals[5].**

| | ***GP attendance with respiratory symptoms recorded, Fire Days RR (95% CI)*** | ***GP attendances with respiratory long term conditions recorded, Fire Days RR (95% CI)*** | ***Prescriptions issued for respiratory illness/symptoms, Fire Days RR (95% CI)*** | ***A&E attendance for respiratory illness/symptoms, Fire Days RR (95% CI)*** | ***Hospital Admissions for respiratory illness/symptoms, Fire Days RR (95% CI)*** |
|---|---|---|---|---|---|
| *Basic model* | 0.897 (0.734 – 1.096) | 1.317 (0.984 – 1.762) | 0.951 (0.921 – 0.981) | 0.947 (0.732 – 1.226) | 1.017 (0.829 – 1.247) |
| *Adjusted model* | 1.003 (0.821 – 1.226) | **1.345 (1.007 – 1.798)** | 0.997 (0.966 – 1.029) | 0.934 (0.721 – 1.210) | 1.036 (0.845 – 1.271) |

**Table 6 Poisson regression models for the impact of local population exposure to $PM_{2.5}$ levels on respiratory healthcare activity, on the day of the fire incident. Adjusted model incorporates seasonality, temperature, holidays, wind speed, humidity and weekdays. RR = relative risk, CI = confidence intervals.**

| | ***GP attendance with respiratory symptoms recorded, $PM_{2.5}$ RR (95% CI)*** | ***GP attendances with respiratory long term conditions recorded, $PM_{2.5}$ RR (95% CI)*** | ***Prescriptions issued for respiratory illness/symptoms, $PM_{2.5}$ RR (95% CI)*** | ***A&E attendance for respiratory illness/symptoms, $PM_{2.5}$ RR (95% CI)*** | ***Hospital Admissions for respiratory illness/symptoms, $PM_{2.5}$ RR (95% CI)*** |
|---|---|---|---|---|---|
| *Basic model* | 0.995 (0.990 – 1.000) | 1.000 (0.990 – 1.010) | 1.000 (0.999 – 1.001) | 1.005 (0.997 – 1.013) | 1.004 (0.998 – 1.010) |
| *Adjusted model* | 0.996 (0.989 – 1.002) | 1.003 (0.991 – 1.014) | 1.000 (0.999 – 1.001) | 1.003 (0.993 – 1.012) | 1.005 (0.998 – 1.012) |

[5]Confidence intervals are used when presenting data to indicate the variation that occurs in any dataset by chance alone. The single number presented as the “rate” of each outcome variable of interest is referred to as a “point estimate” and sits at the centre of the confidence interval.

**Table 7 Poisson regression models for the impact of fire days on respiratory healthcare activity, for the three days following a fire incident (lag=3). Adjusted model incorporates seasonality, temperature, holidays, wind speed, humidity and weekdays. RR = relative risk; CI = confidence intervals.**

| | ***GP attendance with respiratory symptoms recorded, Fire Days, RR (95% CI)*** | ***GP attendances with respiratory long term conditions recorded, Fire Days, RR (95% CI)*** | ***Prescriptions issued for respiratory illness/symptoms, Fire Days, RR (95% CI)*** | ***A&E attendance for respiratory illness/symptoms, Fire Days, RR (95% CI)*** | ***Hospital Admissions for respiratory illness/symptoms, Fire Days, RR (95% CI)*** |
|---|---|---|---|---|---|
| *Basic model* | 0.982 (0.832 – 1.159) | 1.020 (0.786 – 1.325) | 1.035 (1.008 – 1.063) | 0.992 (0.803 – 1.224) | 1.059 (0.896 – 1.250) |
| *Adjusted model* | 0.938 (0.794 – 1.108) | 1.056 (0.809 – 1.379) | 1.018 (0.991 – 1.045) | 0.987 (0.799 – 1.218) | 1.040 (0.881 – 1.228) |

**Table 8 Poisson regression models for the impact of fire days on respiratory healthcare activity, for the seven days following a fire incident (lag=7). Adjusted model incorporates seasonality, temperature, holidays, wind speed, humidity and weekdays. RR = relative risk; CI = confidence intervals.**

| | ***GP attendance with respiratory symptoms recorded, Fire Days, RR (95% CI)*** | ***GP attendances with respiratory long term conditions recorded, Fire Days, RR (95% CI)*** | ***Prescriptions issued for respiratory illness/symptoms, Fire Days, RR (95% CI)*** | ***A&E attendance for respiratory illness/symptoms, Fire Days, RR (95% CI)*** | ***Hospital Admissions for respiratory illness/symptoms, Fire Days, RR (95% CI)*** |
|---|---|---|---|---|---|
| *Basic model* | 1.040 (0.894, 1.210) | 1.191 (0.928 – 1.528) | 1.028 (1.002 – 1.055) | 1.113 (0.919 – 1.349) | 1.075 (0.923 – 1.252) |
| *Adjusted model* | 0.993 (0.852, 1.156) | 1.143 (0.888 – 1.470) | 0.980 (0.955 – 1.005) | 1.105 (0.912 – 1.340) | 1.064 (0.913 – 1.240) |

## Limitations

In this study residential address was the best possible marker of exposure amongst the population living around the site. This has a number of limitations; individuals may move residential location during the time period explored as part of this study, the physical location of each individual at the exact time of a fire occurring cannot be known, exposure is likely to vary for those of working age compared to those who are retired or at school/college owing to the proportion of the day spent away from the home address, it is not possible to account for differences in exposure resulting from individual behaviours of individuals (e.g. staying indoors, shutting windows, vigorous exercise).

The data used to inform the exposure variable “fire days” only captures dates and times when the London Fire Brigade were in attendance responding to a fire at the site. The time of the start of the incident is when the London Fire Brigade first arrive at the location, not necessarily exactly when the fire first begins and it is possible that a fire may have been burning for several days before escalating and requiring fire brigade intervention. We were also not able to incorporate fire size into our analysis, as the number of engines in attendance at the time of an incident does not only rely on the size of the fire, but also competing resource requirements for attendance at other sites. It is known that outside of a “fire incident” attended by the London Fire Brigade smouldering often occurs at the site, releasing visible smoke into the environment. In such an occurrence this would not be captured as a “fire day” in our analysis. To capture this circumstance, the $PM_{2.5}$ variable was explored, however only one air quality node was operational throughout the entire study period investigated (Rainham Reference Co-location), the additional seven being installed at a later date as part of the Launder’s Lane response (one of which is funded by Rainham Against Pollution, the other six by London Borough of Havering). Whether or not a Breathe London air quality monitoring node captures $PM_{2.5}$ is dependent on wind direction as well as wind speed, and owing to a single node being in one static position, the $PM_{2.5}$ data collected may not be an accurate representation of the exposure of residents elsewhere in the area. Additionally, average daily $PM_{2.5}$ is likely to flatten any short term peaks that result from a fire quickly extinguished.

For outcome variables we relied entirely on the NHS data. The finding of a significant increase in risk of attendance at GP by those with long-term respiratory conditions should be interpreted with consideration of a number of limitation of general practice data. Firstly, we were unable to differentiate between pre-arranged attendances, for example routine reviews, and those in response to acute respiratory illness (i.e. “emergency” same day appointments) as the dataset did not include details on specific presenting symptoms, only the main diagnosis. However, it is not expected that pre-arranged appointments would differ significantly on fire days compared to non-fire days.

We explored the suitability of using a separate dataset of GP attendance with respiratory symptoms recorded but only 55% of patients with long-term respiratory conditions were able to be linked to this dataset. In addition to this incompleteness of data, most of the dates of attendance (i.e. diagnosed long-term respiratory condition and recorded respiratory symptoms) did not match. Consequently, this dataset was not used in the analysis. We did consult with NHS colleagues and a GP representative who clarified that in most cases where reason for attendance is recorded as a specific condition (e.g. COPD), it is reasonable to assume the visit was associated with the condition, even where specific symptoms are not recorded.

We acknowledge that same-day GP appointments can be difficult to access, but through consultation with clinical colleagues are aware that for some (e.g. those with pre-existing respiratory conditions experiencing an exacerbation of symptoms), their request may be triaged and prioritised for a same day appointment, although we cannot state that this approach is universal. However, if major respiratory impacts were being seen, and residents could not access their GP we would expect to see an increase in A&E attendances, where A&E does not have the same limited number of appointments. We did not see this in the analysis.

Additionally, it is plausible that those with increased sensitivity, respiratory symptoms may have begun prior to the attendance by the Fire Brigade for a specific fire incident. Furthermore, most recorded fire incidents were observed to have occurred in clusters ranging from 2 to 6 days in a row. This may have resulted in a more sustained impact on air quality, and could have contributed to an increase in primary healthcare activity on subsequent consecutive fire days.

## Conclusion

Through the use of epidemiological time-series analysis, we report an association of fires attended by London Fire Brigade at Arnold's Field, Launders Lane with a modest but statistically significant increased risk of GP attendance by those with existing long-term respiratory conditions (such as asthma or COPD) on the day of a fire.

This significant increased risk of GP visits was not demonstrated amongst the general population, only those likely to have an increased sensitivity to poor air quality. It was also not seen in the subsequent 3 or 7 day periods following a fire day. Our findings are consistent with national air quality recommendations[6], that short periods of poor air quality can exacerbate existing respiratory problems. Whilst we recognise that the reported statistically significant impact may be substantial to an individual affected, the resulting population level impact of a fire day on health care service use is modest (1 extra GP appointment every 5 fire days).

We were unable to find a statistically significant impact of "fire days" on attendance at GP with respiratory symptoms amongst the general population of the LSOAs of interest, prescriptions issued for the treatment of respiratory conditions, A&E attendance or hospital admissions for respiratory illness/symptoms amongst the local population.

Air quality, measured by daily average $PM_{2.5}$ at the Rainham (reference co-location) node, was not shown to be associated with any of the healthcare outcomes investigated in this analysis.

[6] https://uk-air.defra.gov.uk/air-pollution/daqi