

## Visualisation Analyses of the Association Between the Cost-of-Living Crisis and Dwelling Fire Incidents in the West Midlands

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### Background and Motivation

The rising cost of living in the UK has led to increased economic strain on households, potentially influencing safety behaviors. By exploring the relationship between economic indicators and dwelling fire incidents in the West Midlands (WM), this research investigates how financial stress contributes to fire risks.

### Data and Methods

**Data Sources:** Historical dwelling fire incident data from WM Fire Service combined at the LSOA level with socioeconomic indicator data (IMD, Economic inactivity, unemployment, income, rent price) from government databases.

**Multilevel Analysis:** The analysis was performed at multiple levels in WM (LSOA, ward, borough, district) to identify the localized patterns within smaller areas and broader comparisons across districts. Results were also benchmarked against national data.

**Fire Incidents Scaling:** Frequency of incidents per 100k population (working age considered where relevant), per household, and per LSOA.

**Socioeconomic Factors Aggregation:** Population-weighted average scores, rankings, and mean scores.

**Visualization:** Various graphs and time-series analyses were used to identify patterns, trends, and comparison. Pearson correlation heatmaps illustrated associations between fire incidents and socioeconomic indicators, while choropleth maps displayed fire incidents and IMD scores by district.

### Key Findings

The study identified significant correlations between IMD scores and economic factors

such as unemployment rates, median weekly pay, rental prices, and the frequency of dwelling fire incidents across various districts in the West Midlands. The findings suggest that districts experiencing economic hardships, as reflected by higher unemployment and lower income levels, tend to have higher rates of fire incidents. Conversely, improvements in economic conditions appear to correlate with a reduction in fire-related incidents.

Among the economic indicators relating to the cost of living, the unemployment rate and IMD score have the strongest correlation with the frequency of fire incidents, particularly in districts like Wolverhampton, Sandwell, and Birmingham. The correlation between unemployment and fire incidents has strengthened in more recent years.

Comparing the two boroughs of Birmingham, the district with the highest rate of fire, shows Birmingham North with a higher score of deprivation, lower employment and income rate, and lower education levels experiencing more fire incidents.

### Value of the research

This research used real-world data from the UK government, providing crucial insights into how economic indicators, exacerbated by the cost-of-living crisis, affect fire incidents in the West Midlands while supporting evidence that improvements in income, employment, and housing conditions can lead to enhanced fire safety and a decrease in fire incidents. The study provides a basis for future research to explore additional socio-economic factors that may impact dwelling fire incidents, broadening the focus beyond current economic indicators.



Figure 1: Overview of IMD and fire incidents per districts in West Midlands

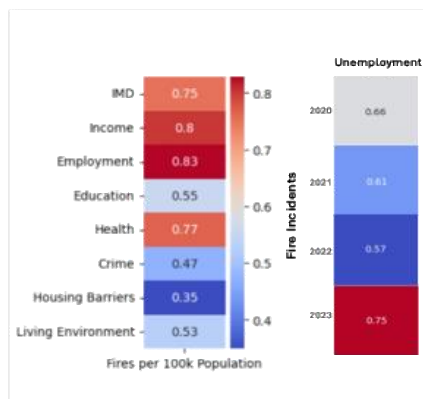


Figure 2: Correlation of fire incidents with 2019 deprivation indicators (left) and 2020-2023 unemployment (right) in West Midlands

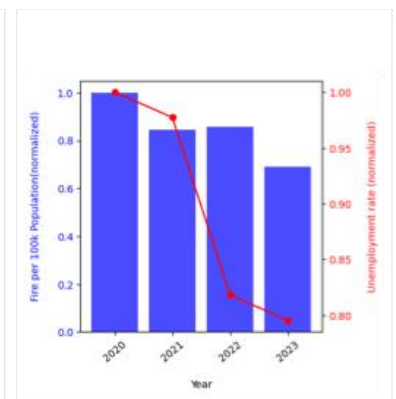


Figure 3: Frequency of fire incidents and unemployment in Birmingham