

Cost of living research and crime in London

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Purpose and outcomes of this study

MOPAC commissioned analytics to explore the impact of the Cost-Of-Living Crisis on Londoners

The aims are to:

- Predict what impact the cost-of-living crisis has across a range of crime types.
- Explore where the impact may be felt the most (or on which groups).
- Explore the wider harms of the crisis, both in the short and longer-term.

Findings suggest:

- A 10% increase in cost of living is associated with an 2.4% decrease in police demand and an 8% increase in crimes.
- The most affected areas are the very city center and eastern outer areas.
- Most impact will take place in 2023 (25.6% increase in crime). In 2024 milder impacts are expected (0.6%).

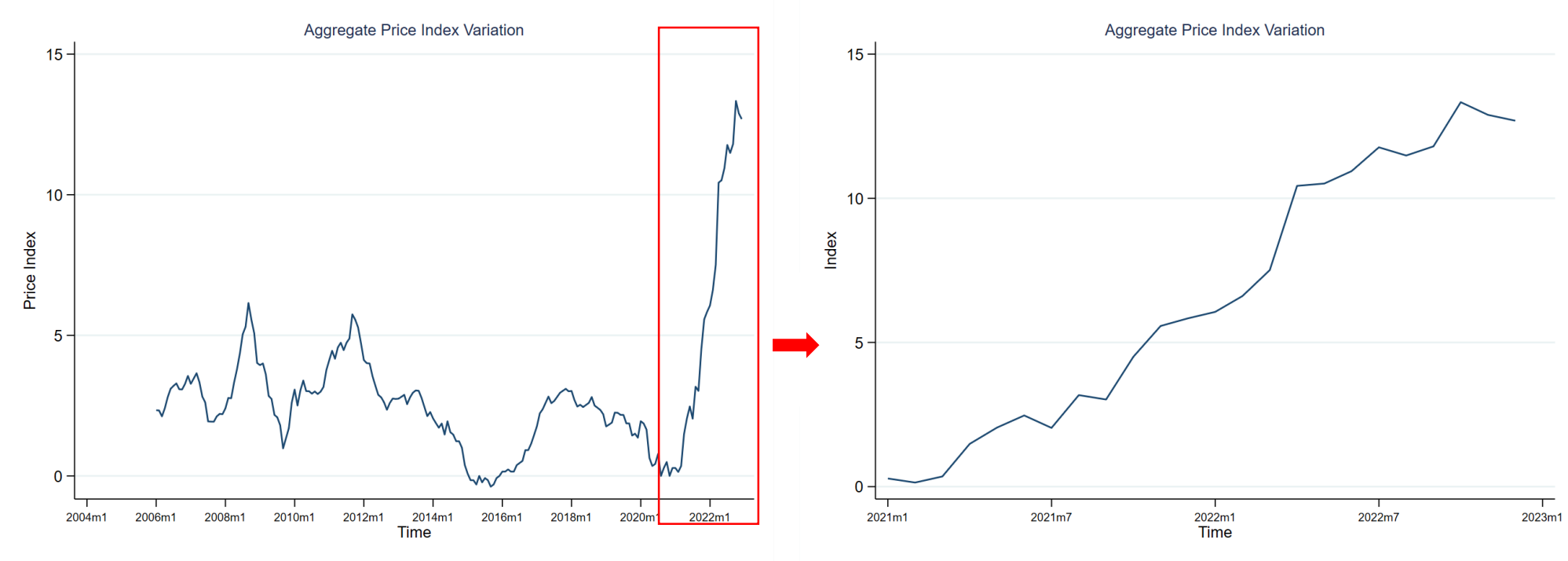
Setup

The cost-of-living crisis: an overview

- The cost of living has been at worrying high levels during the past two years in the United Kingdom.
 - Inflation reached its highest value in 40 years in October 2022 (annual increase of 11.1%).
 - The latest measure (July 2023) is of 6.8%.
- Prices have grown more than wages, reducing real income and purchasing power of households.
 - 50% of adults reported that they were worried about the cost of energy and food (Office for National Statistics, Opinions and Lifestyle Survey).
 - This mostly affects low-income households as they spend a higher share of their income on energy and food, the prices of which rose most.

The latest hike in inflation. 2022 to date

Consumer Price Index at highest growth rate in 40 years:



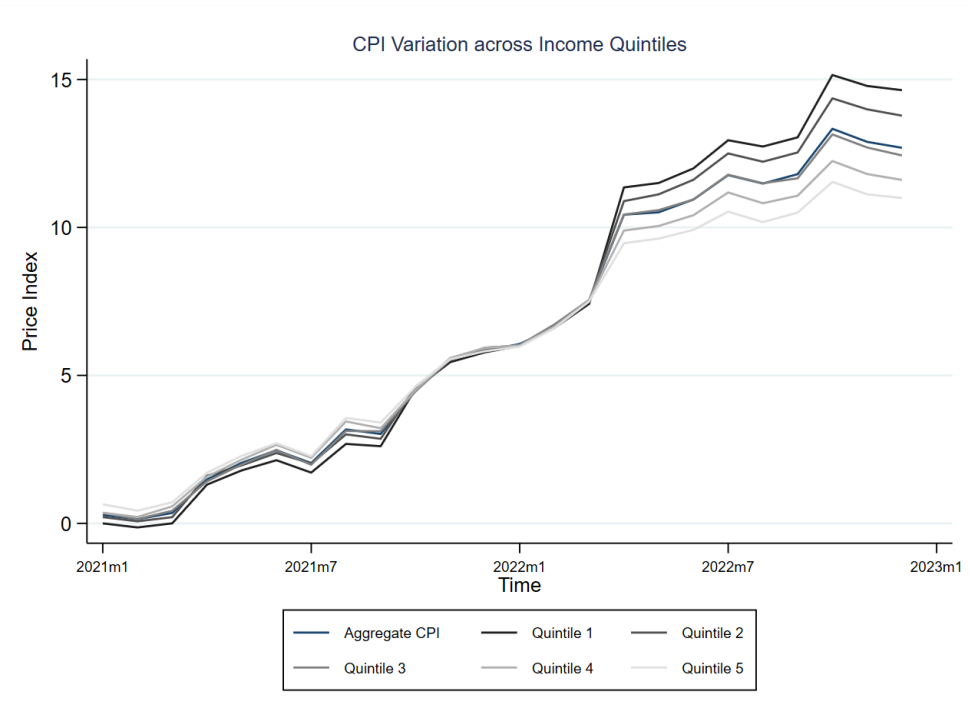
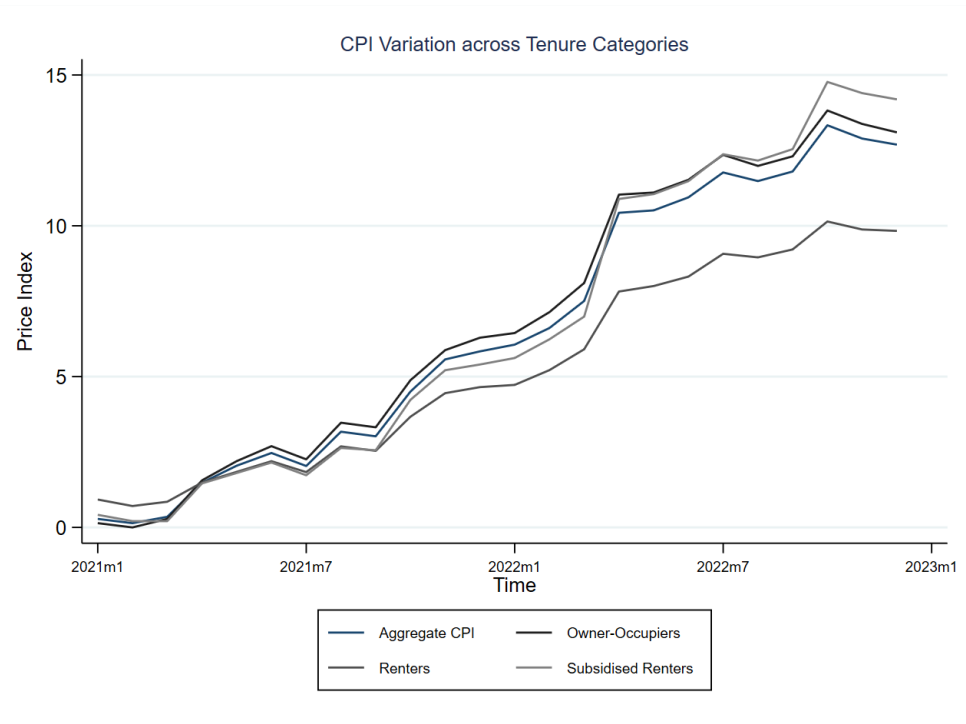
The graphs highlight the trends in inflation. While the left figure plots the variation in consumer price index from 2004, the graph on the right side expands on the latest registries. They portray a substantial increase in inflation since 2022.

Differences in inflation

- Inflation impacts different types of households in different ways.
- Not all households experience the same average rate of inflation because of the difference in their underlying consumption basket.
- For example, richer households experienced a lower impact of inflation than those at the bottom of income distribution.
 - Consumption basket differences: food and energy (prices that have grown the most) weight differently in both groups.

Differences in inflation, graphical evidence

The situation has been worse for low-income households and for renters



The graphs highlight the trends in inflation depending on housing tenure (left panel) and income levels (right panel). The left panel shows that inflation is higher for subsidised renters as compared to owner-occupiers, and the right one shows that inflation is higher for the lower income quintiles. Thus, they highlight differential effects for different housing groups.

Does this matter for police agencies?

- Academic literature has shown that economic hardship relates to crime.
 - Economic incentives (Draca and Machin, 2015), Deprivation (Kawachi et al., 1999), Recessions (Bell, Bindler and Machin, 2018), Welfare cuts (Melander and Miotto, 2022).
- The relationship is complex and multifaceted.
 - Economic incentives: acquisitive crime (burglary, theft, fraud/scams).
 - Psychological effects: interpersonal violence (violence against the person, domestic violence).
 - Social disorganization: gang recruitment.
- How applicable are previous research findings to the current cost of living crisis situation?

Data and Model

A detailed COLC measure

We construct a Cost-Of-Living Crisis (COLC) measure that varies over time and space, using:

- Consumer Price Indices (“CPI”, monthly variation) – It indicates the inflation level at a time. It is taken from the ONS.
- Household composition (“n”, spatial variation) - It indicates the composition of the population, as it will have different consumption baskets. Taken from the 2021 Census.

A detailed COLC measure

- Result: COLC measure is a “weighted average” CPI at the OA-month level.

$$COLC_{it} = \sum_{g=1}^G \underbrace{CPI_{gt}}_{\text{Inflation for population group "g" at month "t"}} \cdot \underbrace{\frac{n_{ig}}{n_i}}_{\text{Relevance of population group "g" in area "i"}}$$

In simple terms, $COLC_{it}$ provides a very detailed inflation measure, for a specific point in time (a month) and a specific area in London (an output area).

A police demand measure

- The outcome variable to analyze from changes in COLC is police demand.
- We proxy it with Computer Aided Dispatch (CAD)¹ call data from 2019-2022 for London.
 - Approximately 10.3 M registries
 - Date --> Year and Month
 - Geographical coordinates --> Output Area (OA)
 - Opening code --> Call Category

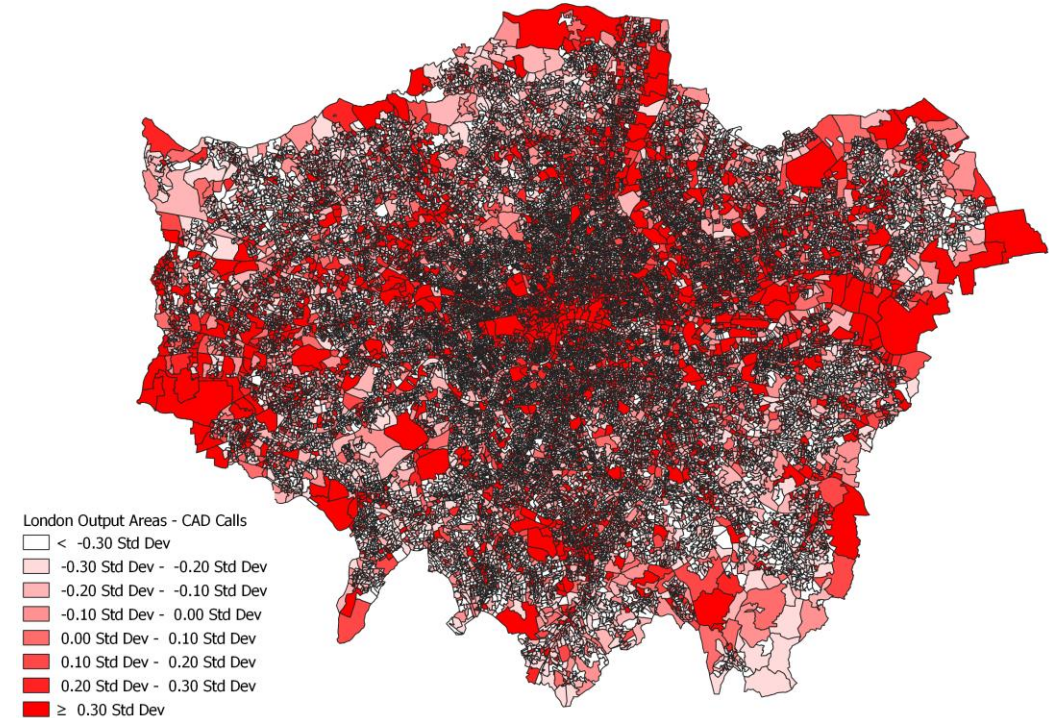
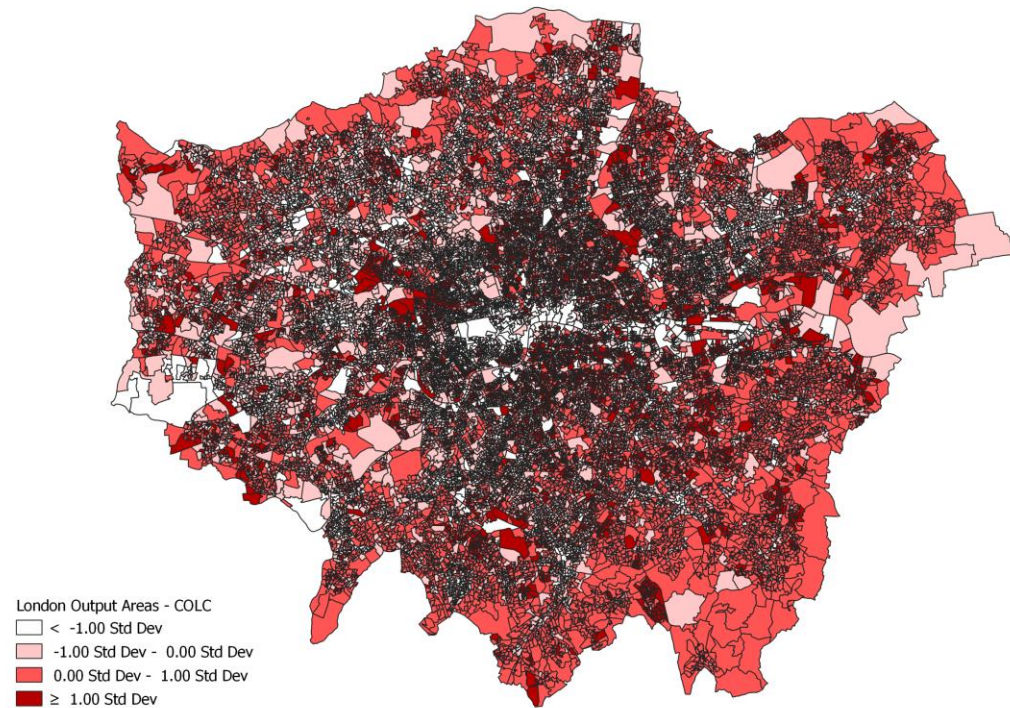
CAD Call Category	Average per OA-Month	% Total
All Calls	8.29	100
Public Safety	2.41	29
Crime	2.00	24
Anti-Social Behaviour	0.95	11
Administration	2.35	28

1. CAD is a crime management system to manage the reporting of crimes and allocate police forces accordingly. Every time a call comes in, a call handler at the back end records the details of the crime incident on CAD, and further flags it with appropriate required response. During the process, a sequential CAD or incident log number is automatically generated. This facilitates easy follow-up actions for either party to serve the interests.

COLC and CAD Calls: geographical variation

COLC measure – 2022 average

CAD Calls – All – 2022 average



The maps represent the COLC measure (on left) and the volume of CAD calls (right) distributed across output areas in Greater London in 2022. Darker shades of red indicate higher values, and the distribution gives us an idea about the geographical variation of COLC and calls.

Analysis setup: Correlational study

Estimating equation:

$$Calls_{it} = \beta \cdot COLC_{it} + \lambda_i + \delta_t + \varepsilon_{it}$$

- The fixed effect for Output Areas λ_i is introduced in the model to control for variation in OAs across London.
- The fixed effect for calendar months δ_t is introduced in the model to control for common cyclical variables that are common to all areas.
- Our left-hand side or dependent variable reflects the registered CAD call data for each OA-month pair.
- β captures the average correlation between the cost-of-living measure and police demand.

Side note: Confidence Intervals

- From our estimation, we will obtain the impact of cost-of-living on CAD calls on average. This is referred to as a point estimate.
- It is also relevant to provide 'Confidence Intervals' to these estimates. This will provide a within which the actual impact from 2019- 2022 is likely to fall.
- Confidence Interval will also be used to determine the uncertainty associated with point estimates of predicted effects for 2023 and 2024.
- The lower bound and upper bound of the confidence interval of point estimates is calculated as:

Lower-bound of CI = point estimate - (z * standard error)

Upper-bound of CI = point estimate + (z * standard error)

1. The lower bound of Confidence Interval indicates the lowest value of the range within which our point estimate is likely to fall.
2. The upper bound of Confidence Interval indicates the highest value of the range within which our point estimate is likely to fall.
3. 'z' indicates the level of confidence we have in the intervals created from the standard normal distribution. In simple words, it indicates how likely it is that the interval we have constructed contains the actual point estimate. We have conducted our analysis at 95% of the Confidence Interval

Main Findings

Main findings – Correlational study

Estimating equation:

$$Calls_{it} = \beta \cdot COLC_{it} + \lambda_i + \delta_t + \varepsilon_{it}$$

Findings:

- A 10% increase in the cost of living (an intuitive point of reference that has a similar value to the recent largest increase in inflation) is associated with a decrease of all calls by 2.4% with respect to their mean. This is for all calls across all the sample period (2019-2022).
 - It is associated with a decrease on Anti-Social Behaviour and Administration calls (approx. 27% and 13% respectively). Decreases in ASB Nuisances and Police Generated Resource Activity calls.
 - It is associated with an increase on Crimes and Public safety calls (approx. 8% for both). Increases in Burglaries, Thefts, Violence Against The Person, Abandoned Calls and Wanted -Police/Court Order/Bail.

Correlational study- All Categories

	All Calls	Public Safety and Welfare	Crime	Anti-Social Behavior	Administration	Violent
COLC	-0.013*** (0.002)	0.011*** (0.002)	0.010*** (0.001)	-0.015*** (0.001)	-0.019*** (0.001)	0.006*** (0.000)
Observations	1,242,816	1,242,816	1,242,816	1,242,816	1,242,816	1,265,712
R-squared	0.895	0.738	0.752	0.516	0.908	0.681

Note: The table represents the coefficient β obtained from regressing COLC measure on the large call categories we already presented using Equation 1. ***, **, * indicate significance at the 1%, 5% and 10% respectively.

Correlational study- Crime Categories

Sub-Categories for Crime						
	Abduction Kidnap	Bomb Threat	Burglary Dwelling	Burglary Other Than A Dwelling	Criminal Damage	Drugs Offence
COLC	-0.000 (0.000)	0.000** (0.000)	0.002*** (0.000)	0.001*** (0.000)	0.000 (0.000)	0.001*** (0.000)
	Fraud And Forgery	Harassment Act Offences	Malicious Communications	Robbery	Sexual Offences	Sexual Offences Rape
COLC	-0.001*** (0.000)	-0.000* (0.000)	-0.001*** (0.000)	0.000** (0.000)	-0.000 (0.000)	-0.000 (0.000)
	Theft Shoplifting	Theft Of Motor Vehicle	Theft From Motor Vehicle	Theft Other	Unlisted Crime	Violence Against The Person
COLC	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	-0.000 (0.000)	0.003*** (0.000)

Note: The table represents the coefficient β obtained from regressing COLC measure on 18 different categories of crime using Equation 1. We find an increase in acquisitive crimes (theft, burglary, shoplifting), violence against the person and drug offences. We don't find an association between COLC measure and sexual offences. ***, **, * indicate significance at the 1%, 5% and 10% respectively.

Correlational study- Public Safety Categories

Sub-Categories for Public Safety						
	Abandoned Call	Absconders AWOL	Alarm Police Installed	Alarm Central Station	Alarm Premises Audible Only	Animals Pets Domesticated
COLC	0.007*** (0.001)	0.000 (0.000)	0.000 (0.000)	0.001*** (0.000)	0.000** (0.000)	0.000** (0.000)
	Civil Disputes	Collapse Illness Injured Trapped	Concern For Safety	Domestic Incident	Firearms	Hoax Call To Emergency Services
COLC	0.000*** (0.000)	0.001*** (0.000)	-0.001 (0.001)	-0.001*** (0.000)	0.000 (0.000)	0.001*** (0.000)
	Immigration	Industrial Incident Accident	Insecure Premises vehs	Licensing	Missing Person	Natural Disaster Incident Warn
COLC	0.001*** (0.000)	-0.000** (0.000)	0.000 (0.000)	-0.000*** (0.000)	0.001 (0.001)	-0.000*** (0.000)
	Protest Demonstration	Sudden Death	Suspicious Circumstances	Suspicious Package Object	Truancy	Wanted Pol Crt Order Bail
COLC	-0.000** (0.000)	0.000*** (0.000)	-0.001*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.002*** (0.000)

Note: The table represents the coefficient β obtained from regressing COLC measure on 18 different categories of public safety using Equation 1. We find an increase in abandoned calls and wanted calls. ***, **, * indicate significance at the 1%, 5% and 10% respectively.

Correlational study- Violence Categories

Sub-Categories for Violent Crime				
	Violence Against The Person	Sexual Offences	Burglary Dwelling	Burglary Other Than A Dwelling
COLC	0.003*** (0.000)	-0.000 (0.000)	0.002*** (0.000)	0.001*** (0.000)
	Robbery	Bomb Threat	Abduction Kidnap	Sexual Offences Rape
COLC	0.000** (0.000)	0.000** (0.000)	-0.000 (0.000)	-0.000 (0.000)

Note: The table represents the coefficient β obtained from regressing COLC measure on different categories of violent crime using Equation 1. ***, **, * indicate significance at the 1%, 5% and 10% respectively.

Correlation is not causation

- Our current findings indicate a significant correlation between the cost of living and CAD calls.
- However, they do not imply causation (i.e. an increase in cost of living causes a change in CAD calls).

Further Findings

Further Evidence

Temporal Estimation: We now allow the effect of COLC to vary over time.

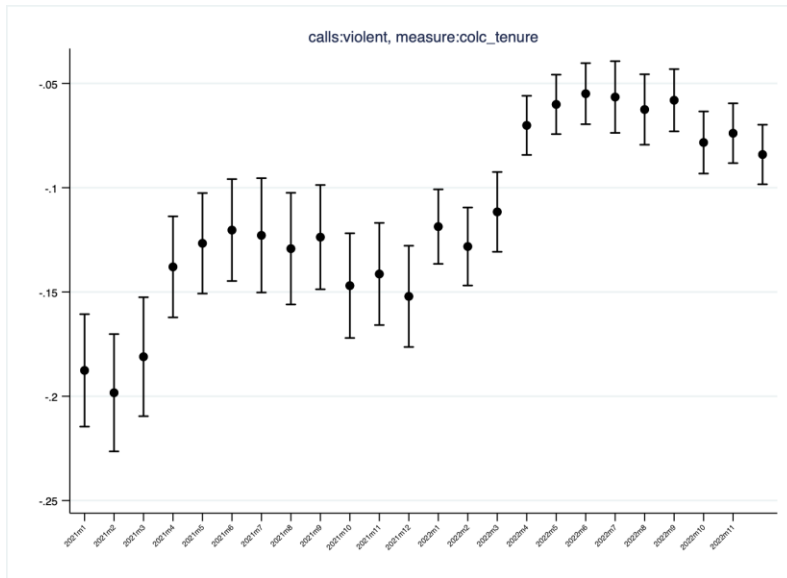
$$Crime_{it} = \beta_t \cdot COLC_{it} \times Time_t + \lambda_i + \delta_t + \varepsilon_{it}$$

where,

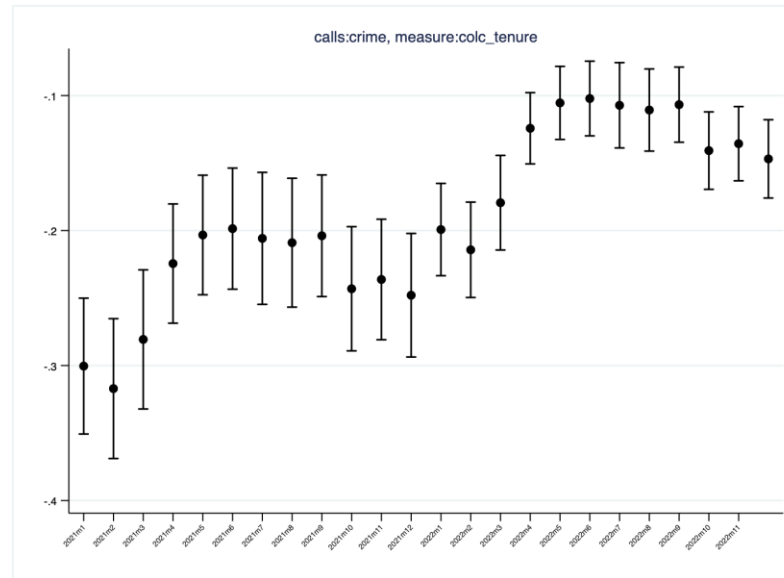
- $Time_t$ ranges from Jan 2019 to Nov 2022, with Dec 2022 as base.
- β_t allows us to estimate the effect of COLC on crime for different points in time.
- We do not allow the effect to vary over space too (aggregate measure: London).

Variation over time (β_t): 2021 onward

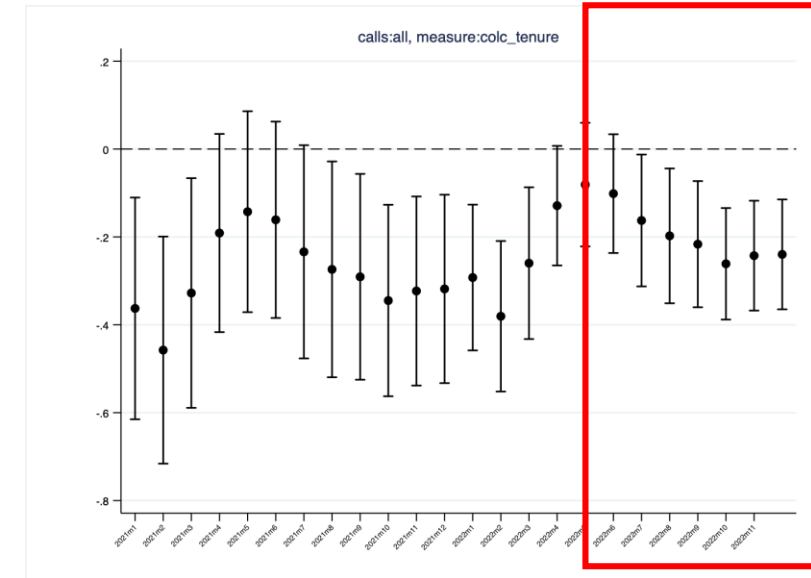
Panel A: Calls for violent crimes



Panel B: Calls for crimes



Panel C: All calls



- The graphs show the point estimates of the correlation between COLC and CAD calls over time. Each dot is the estimated correlation for that month. The vertical line around each point shows its confidence interval.
- While the correlation weakens (gets closer to zero) from 2021 to early 2022, we observe a larger negative correlation of the COLC measure on all calls, crimes and violent crimes for the last few months in the sample.

Further Evidence

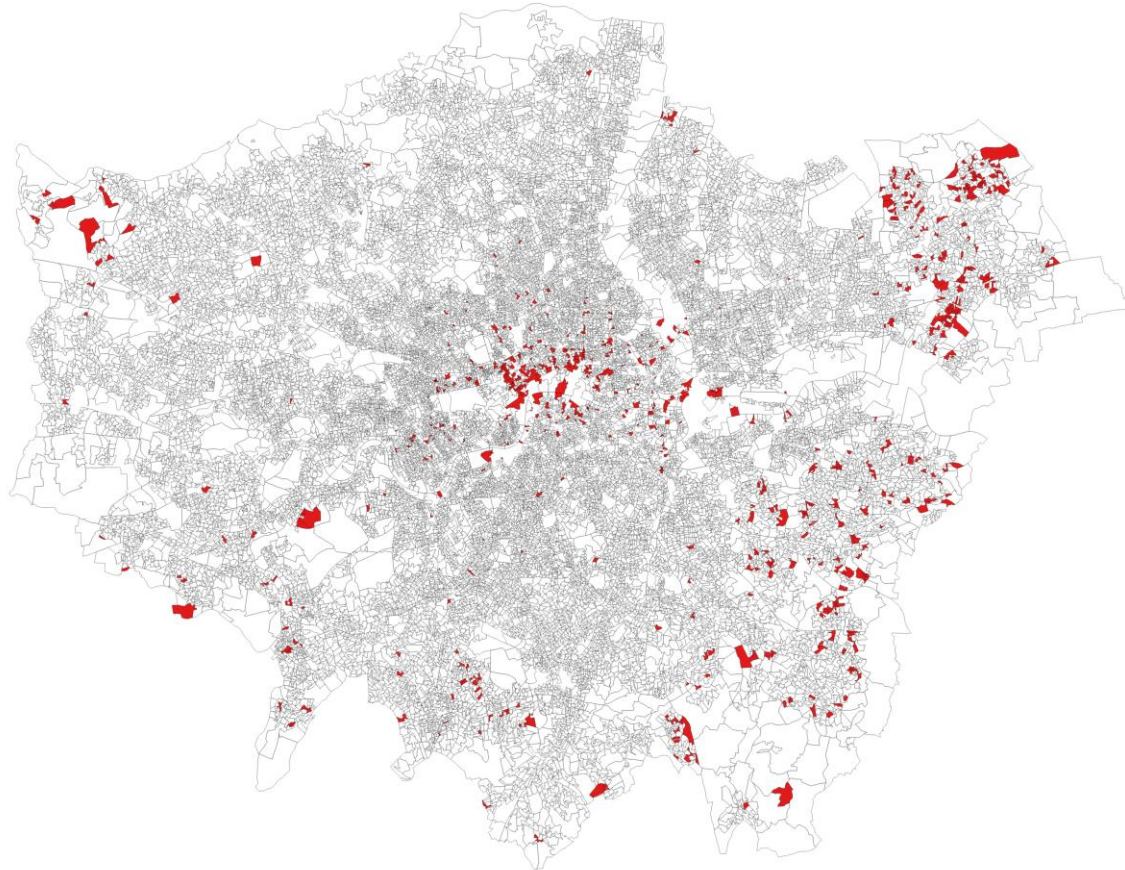
Spatial Estimation: We now allow the effect of COLC to vary over space.

$$Crime_{it} = \beta_g \cdot COLC_{it} \times Group_g + \lambda_i + \delta_t + \varepsilon_{it}$$

where,

- $Group_g$ includes sub-divided groups of Output Areas, using an ONS classification ([link](#)).
- β_g allows us to estimate the effect of COLC on crime for each of the groups in the spatial classification.
- We do not allow the effect to vary over time too (aggregate measure 2019-2022).

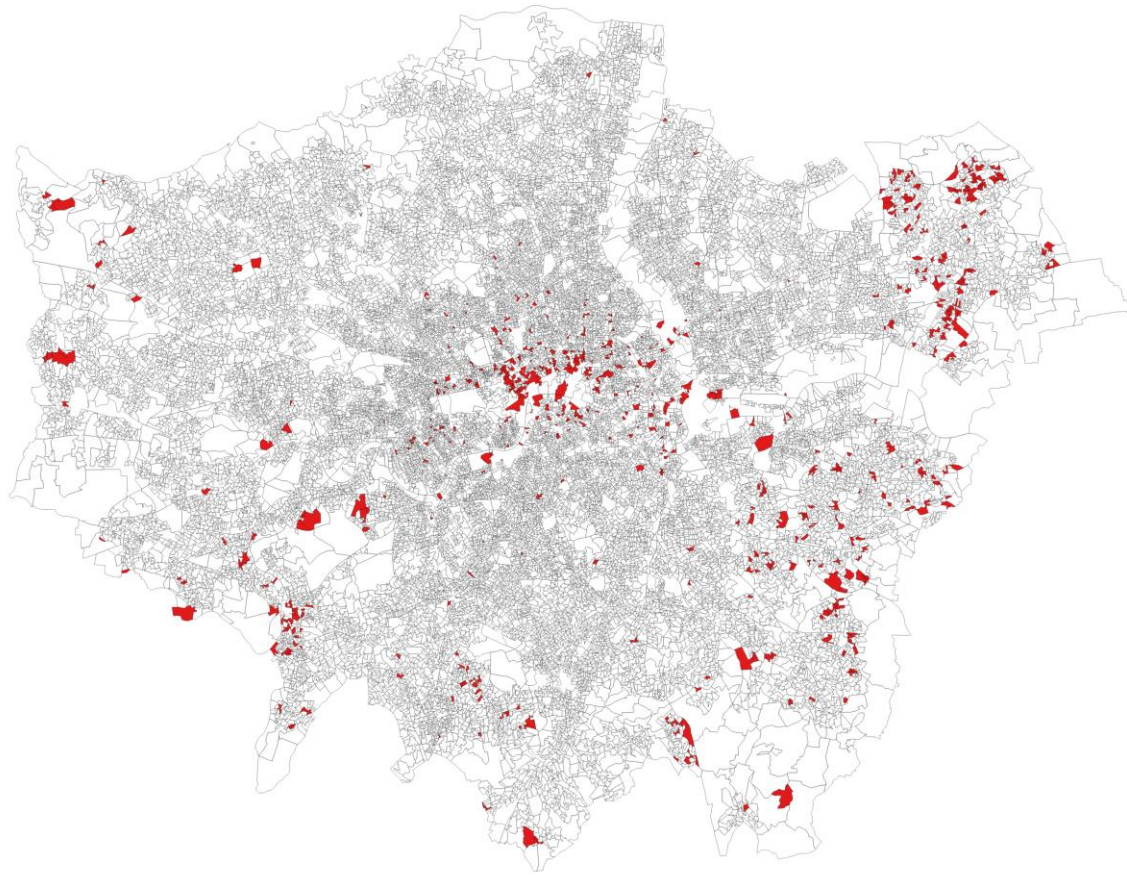
Spatial Variation: all calls



- The correlation between COLC and all CAD calls seems bimodal.
- The effect of the COLC measure on calls is larger in two spatial clusters: one in central London, and another in outskirts London.
- The underlying factors might differ between these two.

Note: The map highlights the areas with higher correlation between COLC and all CAD calls

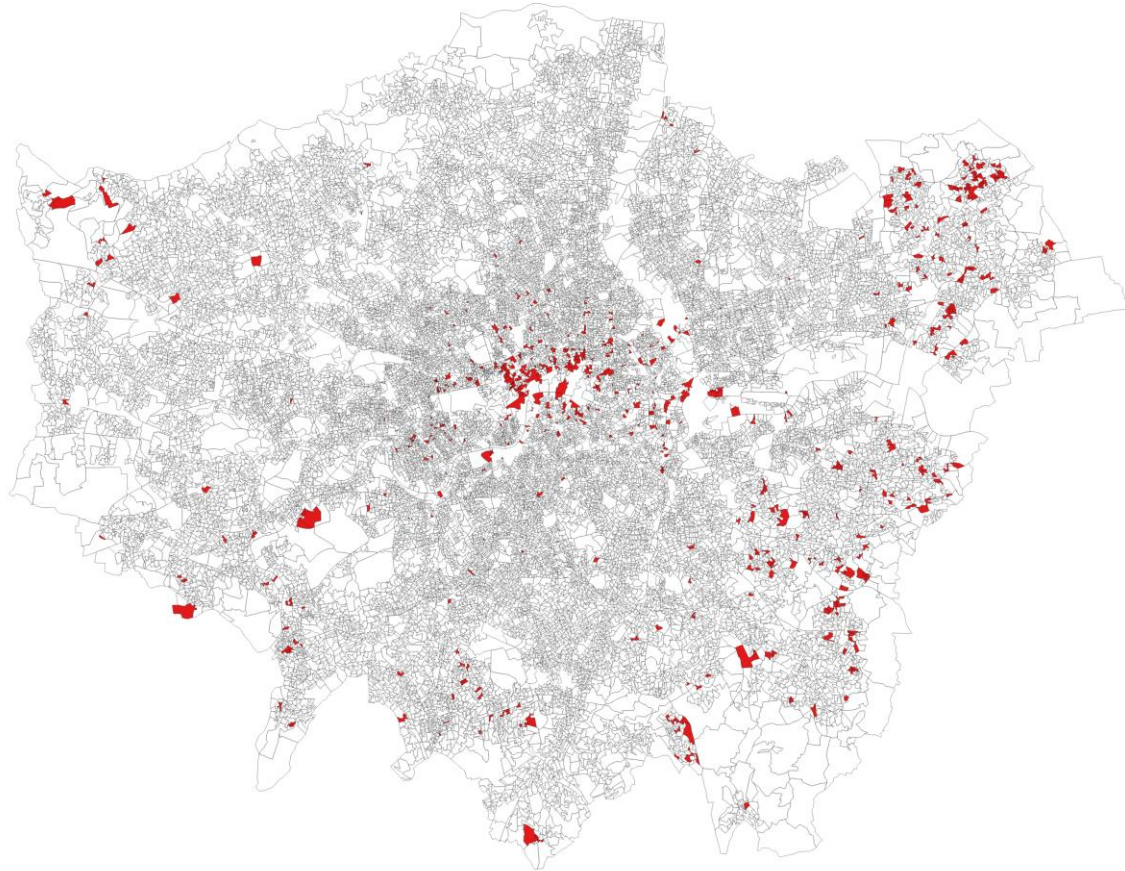
Spatial Variation: crime calls



- The effect of the COLC measure on crime calls is largest in central London.
- It is also present and distributed across patches of outer areas of London.

Note: The map highlights the areas with higher correlation between COLC and crime CAD calls

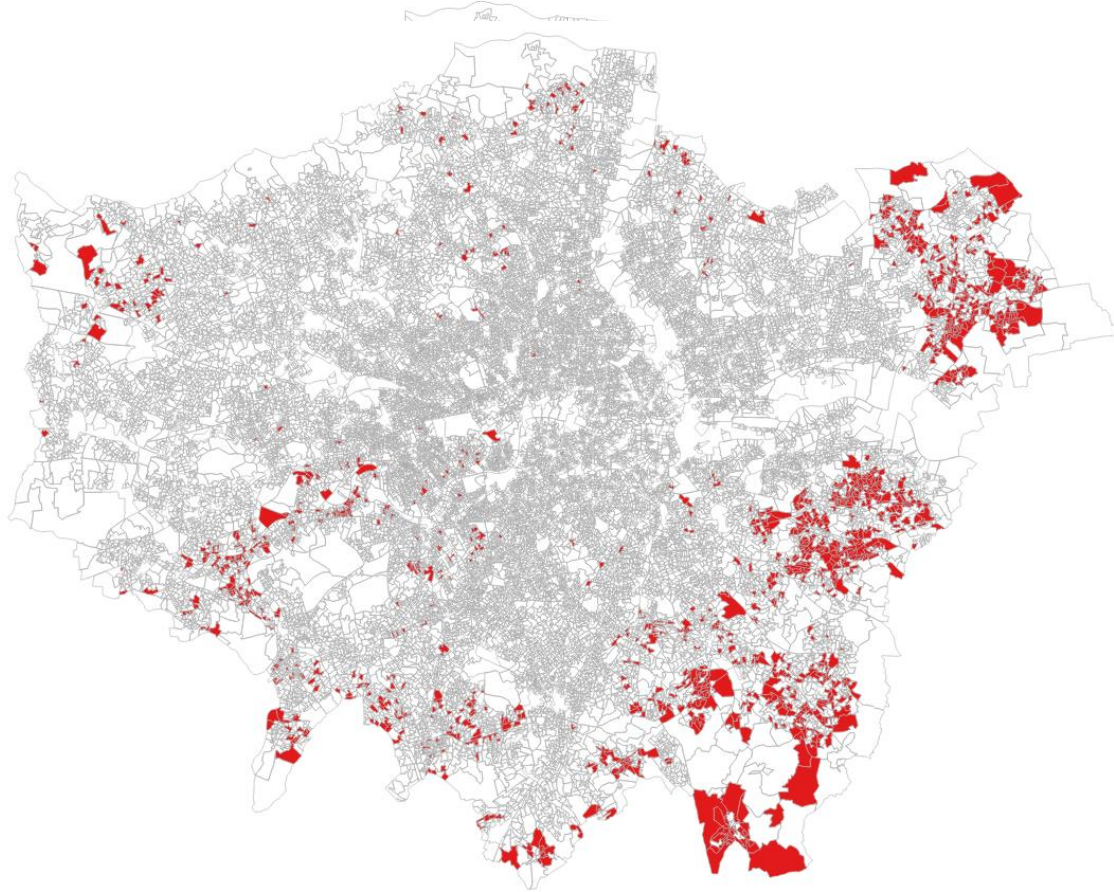
Spatial Variation: violent crime calls



- The effect of the COLC measure on violent crime calls is larger in central London.
- We also find increase in violent crime calls in some fringes of outer London.

Note: The map highlights the areas with higher correlation between COLC and violent CAD calls

Spatial Variation: acquisitive crime calls

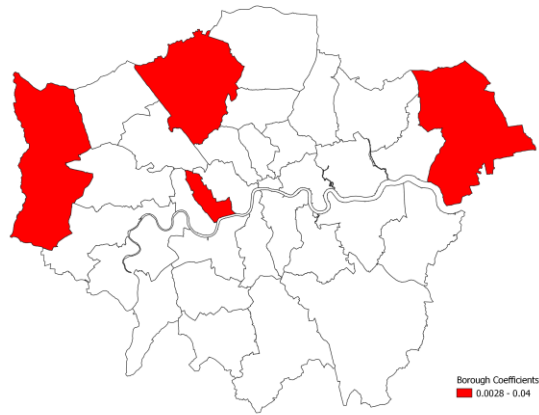


- The effect of the COLC measure on acquisitive crime calls is larger in outer east London.
- We also find increase in violent crime calls in some fringes of west London.

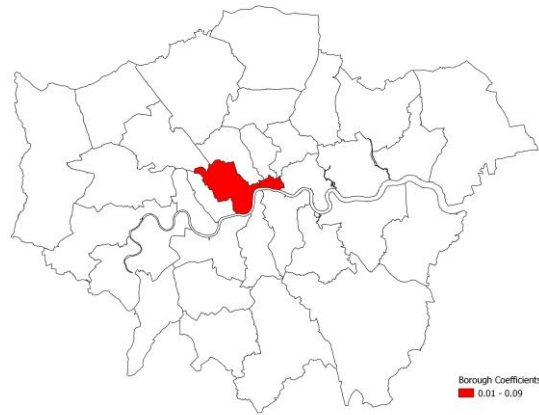
Note: The map highlights the areas with higher correlation between COLC and violent CAD calls

Spatial Variation: Analysis by Borough

All CAD Calls



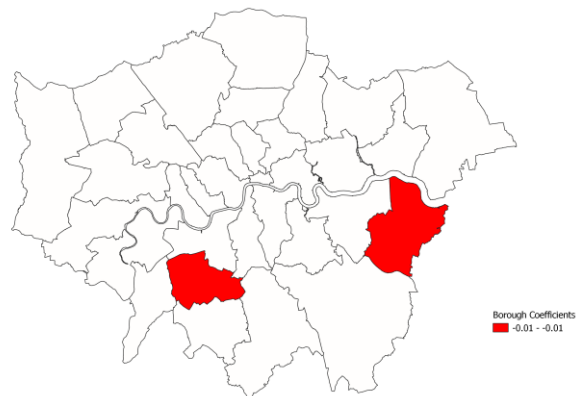
Crime Calls



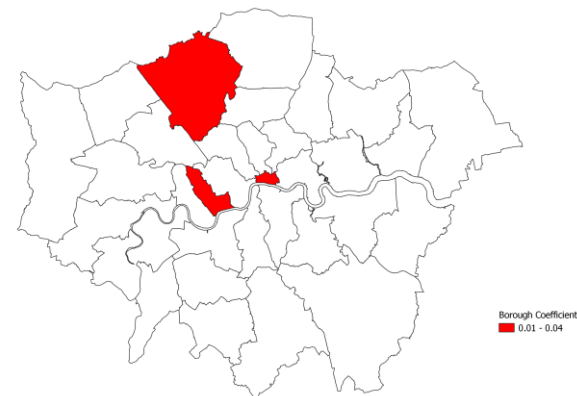
Violent Crime Calls



ASB Calls



Public Safety Calls



Public Attitude Survey

Has the COLC changed perceptions?

Yes.

- Boroughs with higher increases in cost-of-living (Havering, Bexley, Bromley) show:
 - More worries on their area (crime, knife crime, gun crime, gangs, and ASB).
 - Lower beliefs the police in their area are doing a good job or listen to concerns of local people.
 - Less trust in the Metropolitan Police Service.

Predictions

Predicting

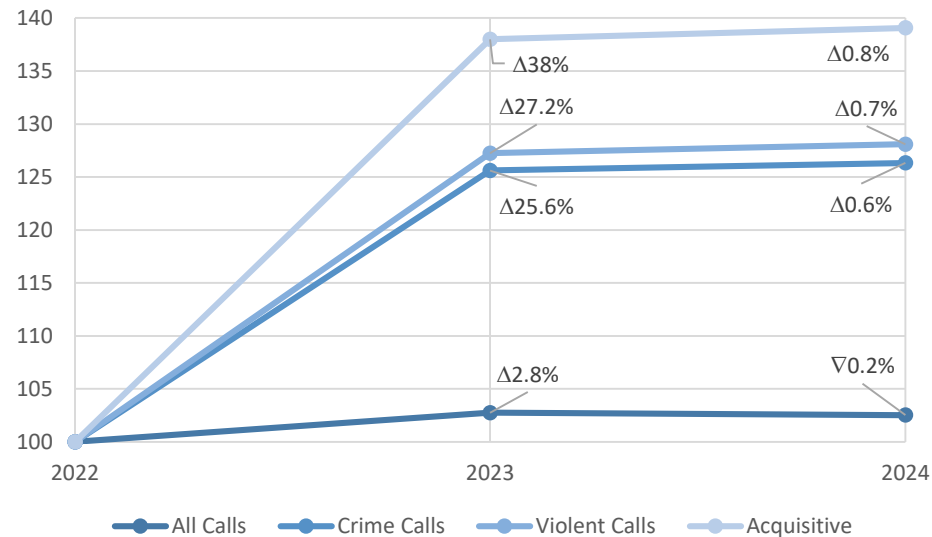
We now turn to understand how the forecasted cost-of-living in London in 2023 and 2024 will impact police demand. This will assist MOPAC to deploy resources and manage crime.

How is that done?

1. We forecast the COLC variable using:
 1. OBR's price forecast for goods and services.
 2. ONS' weights of those goods and services for each household group consumption basket.
2. We predict how much variation in CAD calls would be associated with the forecasted COLC in 2023 and 2024.
 1. Point estimates and confidence intervals.
 2. Predicted changes by year, semester, and quarter.

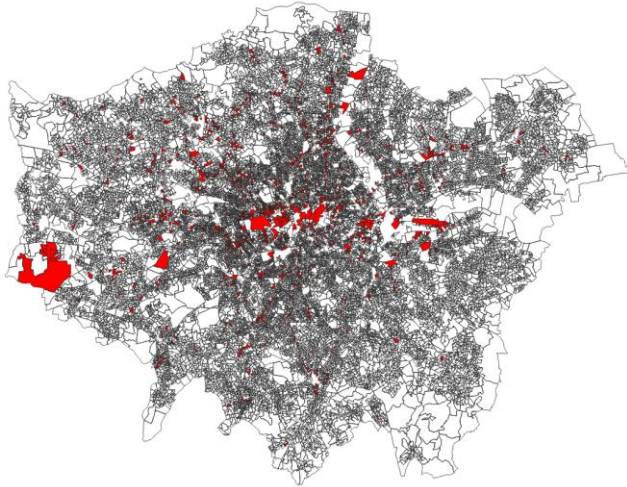
Main predicted variations 2023 and 2024

- Overall, CAD calls are expected to mildly increase in 2023 with respect to 2022.
- Calls related to crimes and violent crimes experience important rises in 2023 with respect to 2022.
- In 2024, we predict stability with respect to 2023, in line with a lower expected increase in the Cost-Of-Living measure.

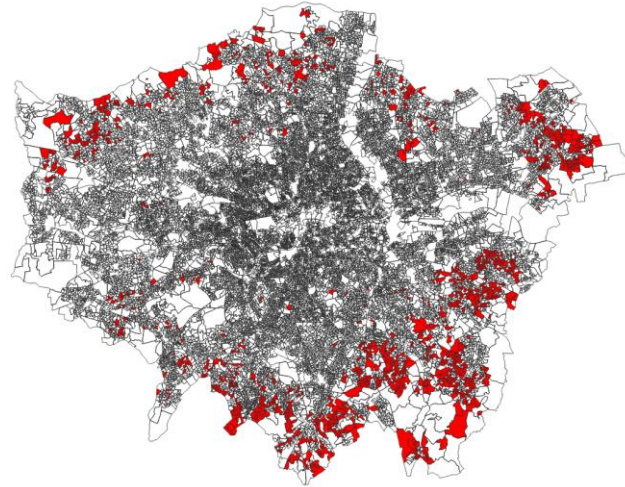


Spatial predicted variations - 2024

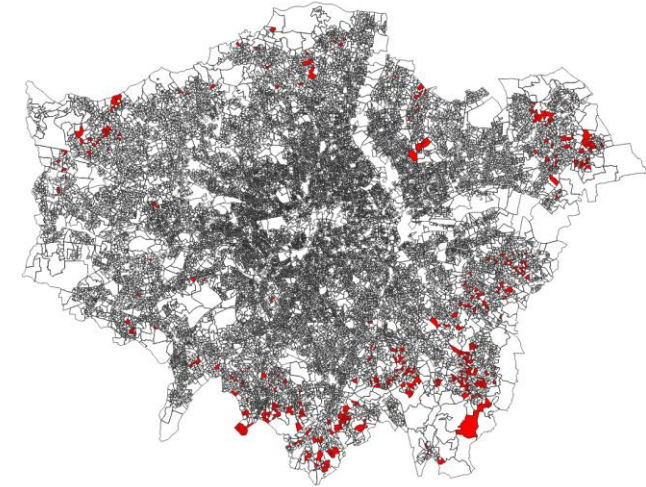
All calls



Violent crime calls

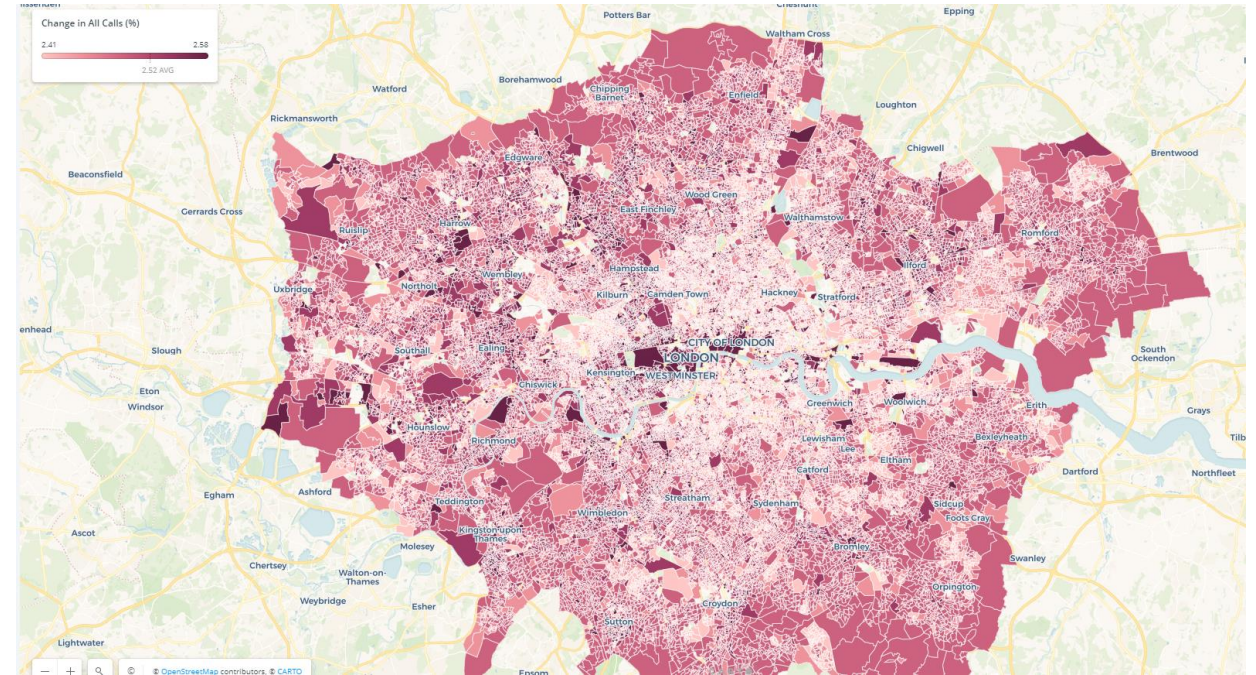


Acquisitive crime calls



COLC is to mostly affect police demand for violent crimes in the outer east.
ONS classifies most affected areas as “hard pressed living” migration and churn:
middle-aged households with high unemployment and mixed ethnic composition.

Visualization: interactive maps



Knowledge of differential impacts of the Cost-Of-Living Crisis across space and call categories will ensure best evidence is fed into MOPAC to support the office in future decision making on resource allocation.

Visualization: interactive maps

1. Cost of Living
2. All Calls
3. Crime Calls
4. Violent Crime Calls
5. Acquisitive Crime Calls

Cost of living research and crime in London

Magdalena Dominguez and Tom Kirchmaier

February 2024