



The British Journal of Criminology

---

**Increases in disadvantage and instability are associated  
with rising violence**

|                  |                                       |
|------------------|---------------------------------------|
| Journal:         | <i>British Journal of Criminology</i> |
| Manuscript ID    | Draft                                 |
| Manuscript Type: | Original Manuscript                   |
|                  |                                       |

SCHOLARONE™  
Manuscripts

**Increases in disadvantage and instability are associated with rising violence**

Ferhat Tura<sup>1</sup>, Ruth Weir<sup>2</sup>, Niels Blom<sup>3</sup>, Oluwole Adeniyi<sup>4</sup>

<sup>1</sup>Department of Social Sciences and Social Work, Bournemouth University, UK. ORCID:  
<https://orcid.org/0000-0002-6683-2438>

<sup>2</sup>Violence and Society Centre, City St George’s, University of London, UK. ORCID:  
<https://orcid.org/0000-0002-5554-801X>

<sup>3</sup>Department of Criminology, The University of Manchester, UK. ORCID:  
<https://orcid.org/0000-0003-0742-4554>

<sup>4</sup>Department of Strategy, Analytics and Operations, Nottingham Business School,  
Nottingham Trent University, UK. ORCID: <https://orcid.org/0000-0002-9888-0063>

**Corresponding author information:**

Name: Ferhat Tura

Affiliation: Bournemouth University

E-mail: [ftura@bournemouth.ac.uk](mailto:ftura@bournemouth.ac.uk)

**Funding:**

Weir and Blom’s time was funded by the UK Prevention Research Partnership (Violence, Health and Society; MR-VO49879/1) and the internal City, University of London Policy Support Fund.

**Word count:** 9,712

## Abstract

This study explores the relationship between changes in neighbourhood characteristics and changes in violence rates across England and Wales from 2011 to 2021. Rising social disadvantage, particularly increased unemployment, poor health, lone-parent households, residential mobility, and social housing, was significantly associated with rising violence. While overall ethnic heterogeneity was not linked to violence, increases in heterogeneity were more strongly associated with violence in areas where poor health and low qualifications also rose. Growth in transport infrastructure was linked to rising violence, suggesting that increased footfall may elevate risk. Findings highlight the need to address structural inequalities through investment in housing, health, education, and community stability. Policy responses should extend beyond criminal justice to promote long-term violence reduction and community wellbeing.

**Key words:** Violence, neighbourhood change, social disadvantage, residential instability, ethnic heterogeneity

# Introduction

Violence is a critical issue in the UK, both in terms of its impact on individuals and communities and its prominence in public and media discourse (Youth Endowment Fund, 2024). Violence has many negative effects for victims, ranging from emotional and/or physical impacts to isolation and withdrawal from social life (Shapland and Hall, 2007; Jackson and Gouseti, 2016; Semenza et al., 2021; Baranyi et al., 2021). Moreover, victims of violence suffer the effects for longer periods of time compared to victims of other crime types (Hanson et al., 2010), and the societal economic cost of violence is also considerable (Heeks et al., 2018) with the total cost of violence in London alone in 2018-19 was £3 billion (Wieshmann et al., 2020; see also Jones et al., 2020).

Understanding the dynamics of violence in local communities is therefore crucial for informing effective crime prevention policy and resource allocation. In the UK, risk of violence has been examined at the individual-level (e.g., Brennan et al., 2010; Bui and Farrington, 2016; Brennan, 2019; Vulliamy et al., 2018; Sivarajasingam et al., 2019; Bryant and Lightowlers, 2021; Blom and Gash, 2023) and at the area-level, typically focusing on relatively large geographies such as regions or police force areas (e.g., Sampson and Groves, 1989; Tura et al., 2023). However, few studies have examined violence at the neighbourhood level, and even fewer have investigated how *changes in neighbourhood* characteristics relate to *changes in violence* over time. That’s why the current study investigates the association between changes in neighbourhood characteristics and changes in violence rates in England and Wales between 2011 and 2021.

Longitudinal research that assesses whether shifts in neighbourhood conditions are associated with shifts in violence risk is widely regarded as one of the most robust ways to identify potential predictors of violence. Yet much of this research has been conducted in the United States (e.g., Kirk and Laub, 2010; Hipp and Kane, 2017; Hipp and Luo, 2022; Krivo et al., 2018) or focused on specific types of violence, such as domestic abuse (Weir, 2019). In the UK, progress in this area has been hampered by data limitations: the Crime Survey for England and Wales (CSEW) is not large enough to support neighbourhood-level analysis, and police-recorded crime data at the neighbourhood level only became available from 2010 onwards (see <https://data.police.uk/data/archive/>). With the recent release of the 2021 UK Census, this study, for the first time, systematically examines how changes in social and

economic characteristics of neighbourhoods are associated with changes in violence rates across in England and Wales between 2011 and 2021.

In this study, we argue that rising levels of social disadvantage - particularly in relation to unemployment, poor health, lone-parent households, residential mobility, and social housing - are associated with increased neighbourhood-level violence. We also show that increased ethnic heterogeneity when it coincides with growing deprivation (e.g., poor health and no qualification) is associated with rising violence risk. We conduct our analysis using linear multilevel models with change scores, accounting for the hierarchical structure of the data, in which neighbourhoods (Lower Super Output Areas; LSOAs) are nested within Police Force Areas (PFAs). By focusing on changes over time, our study offers new insights into the structural conditions that are correlated with changes in violence, which have important implications for public policy and community safety. The study also contributes to theoretical understandings of how interacting structural conditions, such as instability, health inequality, and deprivation, may cumulatively shape patterns of localised violence.

## Literature review

Social disorganisation theory suggests that neighbourhoods characterised by concentrated disadvantage, residential instability, family disruption, or racial and ethnic diversity are more likely to experience higher levels of crime (Shaw and McKay, 1942; Sampson and Groves, 1989). In essence, such factors relate to weaker formal and informal social control, thereby leading to higher levels of both property and violent crime. Conversely, greater social cohesion promotes collective efficacy, fostering a shared willingness among residents to regulate deviant behaviour and thereby reduce crime. Previous research drawing on social disorganisation theory has consistently supported these associations and found that residential instability (Heitgerd and Bursik 1987; McNulty, 2001; Peterson et al., 2000; Warner and Pierce, 1993; Warner and Rountree, 1997), racial/ethnic heterogeneity (Hipp, 2007; Roncek and Maier, 1991; Sampson and Groves, 1989; Warner and Rountree, 1997), and poverty (Hipp 2007; Warner and Pierce, 1993; Warner and Rountree, 1997) were associated with higher crime rates in local areas.

In addition to social disorganisation theory, other criminological perspectives offer complementary insights into the relationship between structural disadvantage and crime. Strain theory (Agnew, 1992), for instance, suggests that individuals exposed to structural

stressors, such as poverty, unemployment, or poor health, may experience increased psychological strain, frustration, or a sense of injustice, which can increase the likelihood of engaging in criminal behaviour. This is also relevant in the context of neighbourhoods as neighbourhood disadvantage and stability significantly affect neighbourhood levels of strain, which in turn affect violence (Warner and Fowler, 2023).

Economic theories of crime further reinforce these associations by highlighting how diminished access to legitimate economic opportunities can increase incentives for crime, particularly in contexts of entrenched or worsening deprivation (Blau and Blau, 1982; Draca and Machin, 2015). From this perspective, neighbourhoods characterised by persistent poverty or rising unemployment may see crime as a rational adaptation to blocked opportunities, especially where institutional supports have weakened. These theoretical frameworks are especially important given the UK's post-2010 austerity period, which saw substantial reductions in local government spending, including cuts to police, youth services, and other preventative infrastructures. Furthermore, the COVID-19 pandemic introduced additional shocks to employment, health, and social cohesion, all of which may have shaped local crime trends in the latter part of the decade. Integrating these broader theoretical and contextual perspectives therefore offers a more rounded understanding of the complex forces shaping neighbourhood-level changes in violence.

While social disorganisation theory, strain theory, and economic theories of crime help identify key structural correlates of violence, they may not fully explain how these factors operate in combination across neighbourhoods. Research within the crime and place literature suggests that the impact of features such as ethnic heterogeneity or residential instability can vary depending on broader contextual factors, including poverty, health, and housing insecurity (Peterson et al., 2000; Vélez, 2001; Sampson and Groves, 1989). For instance, in more disadvantaged neighbourhoods, the erosion of prosocial ties may be especially detrimental due to limited access to alternative forms of social control, such as private security or formal surveillance (Clarke, 1995; Wo, 2019; Andresen, 2020). This supports the concept of cumulative disadvantage, whereby multiple overlapping stressors jointly weaken informal social regulation and amplify violence risk. To capture these dynamics, the current study includes interaction terms, particularly between ethnic heterogeneity and other structural disadvantages, to assess whether the criminogenic effects of these variables are conditional on one another. This approach helps move beyond additive models and better reflects the complexity of neighbourhood-level processes shaping violence.

UK-based studies mainly drew on the social disorganisation theory and used a range of geographical units of analysis. These include neighbourhoods (McVie and Norris, 2006; Bannister et al., 2018; Massey et al., 2019; Weir, 2019; Lymperopoulou et al., 2022; Lymperopoulou and Bannister, 2022; Sutherland et al., 2020; Braakmann, 2023; Libuy et al., 2024), districts/wards (Sampson and Groves, 1989; Lowenkamp et al., 2003), postcode sectors (Kaylen and Pridemore, 2013), local authorities (Tarling and Dennis, 2016), Crime and Disorder Reduction Partnership (Whitworth, 2012), police force areas (Willis, 1983; Reilly and Witt, 1996; Witt et al., 1999; Machin and Meghir, 2004; Bandyopadhyay, 2012; Han et al., 2013; Abramovaite et al., 2023; Tura et al., 2023), and regions (Carmichael and Ward, 2000; Wu and Wu, 2012; Reilly and Witt, 1992; Pyle and Deadman, 1994). However, larger geographical units may lack the granularity necessary for understanding the relationship between social factors and community dynamics and levels of crime. Neighbourhood-level analysis is often more appropriate, as social disorganisation processes typically operate at this level (e.g. Bannister et al., 2018). Furthermore, such analysis not only broadens our theoretical grasp of neighbourhood-level processes affecting violence but also enables policymakers to target interventions more effectively towards those most in need (Weir, 2019). That's why the current study focuses on neighbourhoods.

Among UK studies employing longitudinal design at the neighbourhood level, many indicated that there is an association between neighbourhood deprivation and crime. Concentrated disadvantage, often assessed via the Index for Multiple Deprivation, was associated with higher rates of violence (Lightowlers et al., 2023; Lymperopoulou et al., 2022). Investigating more specific forms of disadvantage, such as poverty, Lymperopoulou and Bannister (2022) found that changes in crime in Birmingham and Glasgow mirrored changes in poverty, particularly in areas closer to the city centre. Similarly, Sutherland et al. (2020) showed that deprivation was consistently related to changes in violence in London, particularly health deprivation but findings for income deprivation were less consistent across multiple years. Among adolescents specifically, economic deprivation was related to both increased delinquency (McVie and Norris, 2006) and exposure to neighbourhood crime (Libuy et al., 2024).

However, evidence regarding social disorganisation and violence is more mixed. Lymperopoulou et al. (2022) found that social disorganisation indicators, such as residential turnover, ethnic heterogeneity, and family disruption, provided only limited explanatory power for variations in call-for service rates across neighbourhoods. Similarly, collective

efficacy or population instability were not significantly associated with delinquency amongst 16-year-olds (McVie and Norris, 2006). In contrast, Braakmann (2023) found a positive relationship between residential turnover, measured via property sales, and increased violence rates in urban areas and those with extreme housing price changes. Bannister et al. (2018) found that areas with consistently high levels of crime were often marked by economic deprivation and crime attractors such as businesses, high levels of private renting and younger populations, whereas areas with low or declining crime areas displayed the opposite characteristics. Interestingly, areas that experienced a crime drop were more similar to the consistently low crime area.

Although several of these studies used longitudinal crime data, many relied on static neighbourhood indicators, such as one-time Census data or a single-year deprivation index (Lightowlers et al., 2023; Lymperopoulou et al. 2022; McVie and Norris, 2006; Sutherland et al., 2020). While an improvement over purely cross-sectional designs, this approach does not capture how *changes* in social deprivation or disorganisation relate to *changes* in violence patterns. Another limitation of the UK literature is its urban bias, with many focusing on individual large cities such as Birmingham, Edinburgh, Glasgow, London, and Greater Manchester (Bannister et al., 2018; Lymperopoulou and Bannister, 2022; Lymperopoulou et al., 2022; McVie and Norris, 2006; Sutherland et al., 2020), overlooking that dynamics of violence, disorganisation, and economic deprivation may differ between more urban, suburban, semi-rural, and rural areas (Abraham and Ceccato 2022), as exemplified by Lymperopoulou et al. (2022) and Braakmann (2023). In addition, while most recent studies have focused specifically on violence (Braakmann, 2023; Lightowlers et al., 2023; Lymperopoulou and Bannister, 2022; Lymperopoulou et al., 2022; Sutherland et al., 2020), others investigated broader categories such as overall crime (Bannister et al., 2018; Libuy et al., 2024) or delinquency (McVie and Norris, 2006). Considering violence can have unique spatial dynamics compared to other forms of crime, studying this crime type separately is needed.

In sum, while UK-based research has established important links between neighbourhood disadvantage and violence, several limitations remain. Much of this work has relied on static or cross-sectional indicators, limiting our understanding of how changes in neighbourhood conditions are associated with changes in violence. Additionally, there has been a strong focus on large urban centres, with less attention paid to spatial variation across urban, suburban, and rural contexts. Finally, existing studies often aggregate different types

of crime, despite evidence that violence may have distinct correlates and spatial patterns. This study addresses these gaps by using longitudinal data to examine how changes in neighbourhood characteristics, including unemployment, health, housing, and ethnic heterogeneity, relate to changes in recorded violence across neighbourhoods in England and Wales between 2011 and 2021. In doing so, it contributes new empirical evidence to theoretical debates on structural disadvantage, social disorganisation, and cumulative disadvantage, while offering insights with direct relevance for policy and violence prevention.

## Methodology

### Data

To address the limitations of previous studies, this study examines the relationship between changes in neighbourhood (LSOAs) characteristics and changes in violence rates across England and Wales between 2011 and 2021. The use of a ten-year period is primarily driven by the decennial nature of the UK Census, which provides comprehensive, consistent, and comparable data at two key time points, and the availability of police recorded crime data at the neighbourhood-level from 2010 onwards. While the ten-year interval is determined by data availability, it also aligns with theoretical perspectives suggesting that meaningful neighbourhood change - such as shifts in socioeconomic status, population composition, or housing conditions - often unfolds over extended periods rather than in the short term (Sampson, 2012; Sharkey and Faber, 2014; Liska and Bellair, 1995). While we acknowledge that shorter periods (e.g., 1-5 years) may be suitable for capturing short-term shocks (e.g., policy shifts, economic downturns), a decade-long window allows us to capture both gradual and more pronounced transformations in neighbourhood contexts that may influence violence risk. This ten-year period therefore provides a unique opportunity to explore long-term neighbourhood dynamics using robust, longitudinal data, and to advance our understanding of how evolving social and economic environments shape patterns of violence.

The study integrates data from multiple sources. Data on violence incidents were obtained from the UK's police recorded crime data, available through the open access portal (<https://data.police.uk/data/>). This dataset provides monthly counts of crime incidents at the street level for each PFA with each incident geocoded to the approximate location of occurrence (e.g. a street or road segment, a public place such as a park, or a commercial

premise) to ensure anonymity. These locations are subsequently aggregated to the LSOA-level. LSOAs were selected as they are the lowest level of granularity at which deprivation data is available and also due to methods of anonymisation used in data.police.uk any lower level or geography could be assigned to the incorrect geographical area (Tompson et al, 2015). It is recognised that using LSOAs is not ideal, as it is unlikely that residents would define their neighbourhoods by these administrative boundaries (Sampson et al., 2002), but it does enable the relationship between violence and other variables to be explored at a much lower level of granularity in areas with an average population of 1,500 people. Other source we use are the 2011 and 2021 UK Censuses (available via <https://www.nomisweb.co.uk/>) to measure (change in) neighbourhood characteristics. Points of Interest (POI) data are obtained from Digimap – EDINA, which provides maps and geospatial data for the Ordnance Survey. Police officer data were sourced from <https://www.gov.uk/government/collections/police-workforce-england-and-wales>, and PFA-level population data were obtained from <https://www.ons.gov.uk/peoplepopulationandcommunity/crimeandjustice/datasets/policeforceareadatatables>.

Data from all sources were merged based on 2011 LSOA codes, ensuring compatibility across datasets. Some LSOAs boundaries changed between 2011 and 2021 with LSOAs being split, merged, or completely redefined to create new LSOAs to ensure that the number of households and population were within acceptable thresholds (Office for National Statistics, 2021). To ensure uniformity and comparability across time, only LSOA boundaries that were unchanged between 2011 and 2021 are included in our analyses (N = 32,005; 92.1% of all 2011 LSOAs = 34,753). Omitting LSOA with changing boundaries potentially make the analyses more conservative, considering the areas with the largest change are excluded.

## Dependent variable

The police-recorded crime type this study focuses on is “violent and sexual offences” (hereafter referred to as violence). It includes a broad range of offences such as assault, attempted assaults, homicide, rape, stalking and harassment, other sexual offences, and death or serious injury caused by illegal driving. For the current analysis, the dependent variable was calculated as the change in violence rates per 1,000 population between 2011-2012 and 2021-2022. Annual violence rates were calculated for each year by dividing the total violence counts by the census population for 2011 and 2021, and multiplied by 1,000. It is

subsequently natural log transformed to reduce skew and minimize the possibility of outliers. This method accounts for year-to-year variations within each period which provides a reliable measure of change over time. The change in violence rates was obtained by subtracting the logged average violence rate for 2011-2012 from the logged average for 2021-2022.

## Independent variables

Based on the censuses, our statistical models include the percentage of unemployed people, percentage of people with no formal educational qualifications, housing tenure (percentage of social renters, and percentage of private renters), residential stability (percentage of households that lived in their area less than 2 years), percentage of people aged 15 to 24 years, family composition (percentage of lone parent households), ethnic heterogeneity, and health (percentage of people who report bad or very bad health).

Indicating socioeconomic deprivation, percentage of people unemployed can reduce social stability and cohesion and raise social disorganisation (Sampson and Groves, 1989). Similarly, educational attainment is often a marker of socioeconomic status (Sampson and Groves, 1989), with low levels of education are linked to reduced resources and opportunities which contributes to neighbourhood instability.

Regarding housing tenure and residential instability, percentages of social rented and private rented households are included as is percentage of households living in the area for less than 2 years. High levels of social housing may indicate concentrated disadvantage, which is associated with weaker social organisation and control (Sampson et al., 1997), and private renting can reflect transience and residential instability, which might reduce the formation of strong community bonds (Sampson and Groves, 1989). Residential instability is a core component of social disorganisation theory, with frequent population turnover weakens social ties, making it harder to establish trust and collective norms (Sampson and Groves, 1989). Thus, the percentage of households living in the area for less than 2 years and percentage of private renting, which both reflect transience and residential instability, are important to include.

Young people are often associated with higher crime rates due to developmental and socioeconomic factors (Hirschi and Gottfredson, 1983) and is a key aspect of social disorganisation theory (Sampson and Groves, 1989), therefore we include the percentage of 15- to 24-year-olds.

Also linked to social disorganisation is the percentage of lone-parent households, which is often linked to economic hardship and reduced supervision of children, household property and general activities in the community (Sampson and Groves, 1989).

Ethnic heterogeneity was measured using the Ethnolinguistic Fractionalisation Index (ELF). It captures the diversity of the population in a given area. The ELF is based on the Herfindahl-Hirschman Index (HHI), which calculates the probability that two randomly selected individuals belong to the same ethnic group (Steele et al., 2022). For each year (2011 and 2021), the HHI was calculated by summing the squared proportions of the population in five ethnic groups (White, Asian, Black, Mixed, and Other). The ELF was then derived as  $ELF = 1 - HHI$ . Higher ELF values indicate greater ethnic diversity. In the context of social disorganisation theory, greater heterogeneity can impede communication and shared norms, reducing social cohesion and collective efficacy (Sampson and Groves, 1989), and changes in ethnic composition have been shown to relate to changes in violence (Hipp and Luo, 2022).

Furthermore, percentage of people reporting bad or very bad health can also be considered an indicator of socioeconomic disadvantage (Marmot et al., 2008). It can reduce residents' capacity to participate in social activities or collective efforts, which might weaken informal social controls (Sampson and Groves, 1989), and health deprivation has been linked to violence (Sutherland et al., 2020). However, it must be noted that violence and fear of violence have also been linked health (Krug et al., 2002; Macassa et al., 2017), indicating the potential for reversed causality.

The statistical models we fitted are adjusted for the number of eating and drinking establishments per 1,000 residents, and number of bus stops and train stations per 1,000 residents. High densities of eating/drinking establishments or transport hubs might strain community cohesion by increasing transience, attracting non-resident populations, and increase crime (Adeniyi et al., 2023; Cohen and Felson, 1979; Sutherland et al., 2020). Furthermore, we also adjust for the number of police officers per 1,000 residents in a PFA, considering there is mixed evidence regarding to the relationship between police officer numbers and crime levels (Lim et al., 2010; Carriaga and Worrall, 2015; Lee et al., 2016; Bradford, 2011; Tura et al., 2023), and because police forces with more police officers might record violence more accurately. The PFA-level variable is the change in the number of police officers per 1,000 population between 2010-2012 and 2020-2022. Change scores for

all independent variables were calculated by subtracting values from the earlier period (2011, 2014 for POI data) from those of the later period (2021).

## Analytic strategy

To investigate the relationship between changes in neighbourhood characteristics and changes in violence rates in England between 2011 and 2021, we used a stepwise modelling approach. We first investigated spatial dependency for change in violence to see whether change in violence is clustered across neighbourhoods by using the Moran's I test for residual spatial autocorrelation (Cliff and Ord, 1981). The observed Moran's I value was 0.001 ( $p > .05$ ) showing very limited evidence of spatial dependency. Therefore, we continued by fitting standard linear and linear multi-level regression models.

We started by fitting a linear regression model with no predictors (Model 0) to estimate the overall mean change in violence rates across LSOAs. This null model provided a baseline against which subsequent models could be compared.

Next, we introduced random intercepts for PFAs to account for the hierarchical structure of the data, where LSOAs are nested within PFAs. This model (Model 1) allowed us to assess how much variation in violence rates was attributable to differences between PFAs.

In Model 2, we added changes in neighbourhood-level characteristics to explore how these were associated with changes in violence. Model 3 extended this by including changes in the number of public transport locations, eating and drinking establishments, and police officers. In Model 4, we further added the average violence rate for the earlier period (2011-2012) to control for baseline differences in violence levels across neighbourhoods (Morenoff and Sampson, 1997). These initial models (Models 0-4) are presented in the supplementary material. The main analysis focuses on more comprehensive models described below.

In model 5, the primary model reported in the main text, we included both the change and baseline values for all independent variables. This model allowed us to assess how both changes over time and starting conditions in neighbourhood characteristics are associated with changes in violence rates (Krivo et al., 2018).

Building on this, and informed by prior research (e.g., Wo, 2024), we examined whether the relationship between ethnic heterogeneity and violence varied depending on broader neighbourhood conditions such as deprivation, health, or housing. Ethnic diversity may reduce or increase violence depending on whether it coexists with integration-supportive

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

resources and services or instead with deprivation and marginalisation. For example, health deprivation may indicate communities with reduced resilience to demographic change.

To investigate this, we tested a series of interaction terms between change in ethnic heterogeneity and other structural characteristics (Models 6-14). Although these tests were exploratory, they were grounded in theoretical arguments from social disorganisation theory and prior criminological research on the conditional effects of diversity. Only statistically significant interactions are discussed in the main text; other models are reported in Appendix Table 2.

While this study examines how changes in neighbourhood characteristics are associated with changes in violence rates over time, it does not claim causal effects. Neighbourhoods are not closed systems, and changes in both crime and social composition may be shaped by broader structural forces such as national economic policies, housing market shifts, or policing practices. Our multilevel modelling approach includes Police Force Area (PFA) as a second-level grouping, which adjusts for unobserved differences in baseline violence levels and broader contextual conditions across PFAs. This accounts for some higher-level variation, such as differences in policing strategies or regional economic trends, but does not fully capture time-varying shifts within those areas. Additionally, processes such as selective migration, where more affluent or more vulnerable populations move into or out of certain areas, may jointly affect both deprivation levels and violence patterns. Although using change scores helps to control for time-invariant confounders, unmeasured time-varying factors may still bias associations (Alison, 1990). As such, we interpret our findings as indicators of associational patterns, not definitive causal effects.

## Results

Table 1 presents descriptive statistics for the main variables included in the analysis. The average change in the logged violence rate per 1,000 population between 2011 and 2021 was 1.16 (SD = 0.54), which corresponds to an average increase of over threefold in actual violence rates ( $\exp(1.16) \sim 3.2$ ). There was considerable variation across neighbourhoods, with changes ranging from a decrease of -1.12 (equivalent to a 67% reduction;  $\exp(-1.12) \sim 0.33$ ) to an increase of 4.13 (equivalent to more than a 60-fold rise;  $\exp(4.13) \sim 61.9$ ). This indicates that while violence rates rose sharply in many areas, others experienced relative stability or decline. In addition, neighbourhood characteristics show evidence of marked

shifts over the decade. On average, neighbourhoods experienced declines in unemployment (mean change = -1.00%, SD = 1.66) and in the percentage of residents with no qualifications (mean change = -4.46%, SD = 3.83), suggesting some overall improvements in socioeconomic conditions. However, these average trends mask substantial variation: some areas saw increases in unemployment of up to 13.69%, while others saw declines of over 13.34%. Similarly, changes in educational attainment varied widely, with some areas experiencing a 26.6% reduction in residents without qualifications and others seeing increases of over 22.34%. Housing and mobility patterns also shifted. The percentage of private renters increased on average by 3.52%, while social renting declined slightly (mean change = -0.43%). These shifts reflect broader housing market trends across England and Wales, including expansion of the private rental sector and reduced availability of social housing. Residential mobility, measured as the percentage of residents living in an area for less than two years, increased slightly (mean change = 0.10%), again with wide variation across areas. Demographic and health-related changes were also evident. The average percentage of young people aged 15-24 declined by 1.45%, while lone-parent households increased slightly (mean change = 0.47%). There was also a small decline in the percentage of residents in bad health (mean change = -0.26%), which may reflect improvements in population health in some areas, although again this varied widely. The Ethnic-Linguistic Fractionalisation (ELF) index, which captures ethnic heterogeneity, showed a modest increase overall (mean change = 0.05), indicating greater diversity in many neighbourhoods by 2021. Finally, changes in the local built environment and public services showed some interesting patterns. Increases in eat/drink establishments (mean change = 0.03 per 1,000 residents) and modest declines in bus/transport services (mean change = -0.03) suggest evolving patterns in commercial activity and public infrastructure. The number of police officers per 1,000 residents declined by an average of 0.14. Together, these descriptive findings show the complex and uneven nature of neighbourhood change across England and Wales between 2011 and 2021. They point to important structural shifts in housing, education, employment, population health, and service provision, which may have contributed to the observed variation in violence. The multilevel models presented below explore how these changes are associated with changes in violence rates.

**[TABLE 1 HERE]**

Table 2 presents the findings from multilevel models predicting neighbourhood-level changes in police-recorded violence between 2011 and 2021. Model 5 includes all

neighbourhood-level change variables (and baseline values), while Models 6-8 incorporate statistically significant interaction terms. Results from Models 0-4 and 9-14 are available in the supplementary materials.

Starting with socioeconomic indicators in Model 5, increases in the percentage of people unemployed were positively associated with increases in violence rates ( $\beta = 0.010$ ,  $p < .001$ ). This indicates that for every one percentage point increase in unemployment between 2011 and 2021, neighbourhoods experienced an average 1% increase in the violence rate, holding other variables constant. This was calculated as  $(\exp(\beta) - 1) * 100$  since the dependent variable is logged transformed. While this effect may appear modest in isolation, the cumulative impact could be meaningful in areas experiencing larger shifts in unemployment. This finding aligns with theories linking economic hardship to community-level stress and violence. In contrast, changes in the percentage of people with no formal qualifications were not significantly associated with changes in violence in Model 5. However, this variable becomes statistically significant in later models that include interaction terms, as discussed below.

Regarding housing, an increase in social renting was significantly associated with increased violence ( $\beta = 0.005$ ,  $p < .001$ ). This suggests that for each additional percentage point increase in households living in socially rented accommodation, the neighbourhood-level violence rate increased by 0.5%. This may reflect increased levels of concentrated disadvantage or resource constraints in these areas. By contrast, private renting showed no significant association with changes in violence rates.

Neighbourhood instability, measured by the percentage of households who had lived in the area for less than two years, was also positively associated with increased violence ( $\beta = 0.013$ ,  $p < .001$ ). For example, a five-percentage point increase in recent movers corresponds to a predicted 6.7% increase in the violence rate. This was calculated as  $(\exp(\beta * 5) - 1) * 100$ . This supports the view that high residential turnover may weaken social cohesion and informal control, increasing vulnerability to violence.

Interestingly, an increase in the percentage of young people aged 15-24 was associated with a decrease in violence ( $\beta = -0.002$ ,  $p < .01$ ). This finding is counterintuitive, given common associations between young people presence and crime risk. One possible explanation may lie in shifts in lifestyles, such as greater time spent online or at home,

consistent with routine activity theory (Cohen & Felson, 1979) and recent evidence suggesting a decline in socialising among young people (ONS, 2017).

A further indicator of neighbourhood disorganisation, the percentage of lone-parent households, showed a strong positive association with changes in violence ( $\beta = 0.014$ ,  $p < .001$ ). A one percentage point increase in lone-parent households corresponds to a predicted 1.4% increase in violent rate, which may reflect increased stress, reduced informal guardianship, or economic precarity in these households.

Changes in ethnic heterogeneity were not significantly related to changes in violence in the main effects model (Model 5), after adjusting for baseline levels. This suggests that, on average, increasing ethnic diversity across the decade was not associated with higher or lower neighbourhood violence rates.

However, we explored whether the relationship between changes in ethnic heterogeneity and violence was moderated by other contextual factors. These interaction models were informed by prior research suggesting that the effects of demographic change may depend on broader social and economic conditions. In Model 6, we included an interaction between changes in ethnic heterogeneity and changes in the percentage of residents in bad or very bad health. The interaction was marginally significant ( $\beta = 0.062$ ,  $p < .1$ ), suggesting that increases in ethnic heterogeneity were more strongly associated with rising violence in neighbourhoods also experiencing worsening health (see Figure 1). This may reflect compounding effects of stress, social fragmentation, or overburdened local services.

In Model 7, we examined an interaction between changes in ethnic heterogeneity and changes in the percentage of people with no formal qualifications. This interaction was statistically significant ( $\beta = 0.025$ ,  $p < .05$ ), indicating that violence rates increased more sharply in areas where both ethnic diversity and educational disadvantage rose. For example, a five-percentage point increase in the proportion of residents without formal qualifications, combined with a 0.1-point increase in the ELF ethnic diversity index (equivalent to approximately two standard deviations above the mean change), was associated with a predicted 13.3% increase in the violence rate. This finding highlights the impact of intersecting disadvantage in shaping local patterns of violence.

Model 8 included both interaction terms simultaneously. Here, only the interaction between ethnic heterogeneity and no qualifications remained statistically significant, while

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

the interaction with bad health dropped below significance. AIC values indicated that Models 6 and 7 offered better fit than Model 8, meaning including both interaction terms does not substantially improve model performance. Other control variables in all models showed generally consistent patterns. Increases in public transport infrastructure (bus/train establishments) were associated with higher violence rates ( $\beta = 0.058$ ,  $p < .001$ ), potentially due to increased accessibility and foot traffic. Changes in the number of eating and drinking establishments and the number of police officers were not significantly related to changes in violence. Overall, these results suggest that increases in ethnic diversity do not uniformly lead to higher violence, but may do so in neighbourhoods where other indicators of disadvantage - such as low education levels or poor health - are also increasing. This underscores the importance of examining the interplay between demographic change and structural inequality when analysing neighbourhood-level violence trends.

[TABLE 2 HERE]

[FIGURE 1 AND 2 HERE]

## Discussion and Conclusion

This study examined the relationship between changes in neighbourhood characteristics and change in violence rates across England and Wales between 2011 and 2021. Significant associations were found between increase in social disadvantage and deprivation (measured through unemployment, bad health, lone parent households, living in social housing) and increase in the rate of violence across neighbourhoods in England and Wales. These findings align the with evidence from the CSEW, which indicates that those living in the most deprived areas are more likely to be a victim of violent crime (Office for National Statistics, 2022). However, our research extends this understanding by examining the relationship between these variables over time and supports Weir’s (2019) argument for the need for social policy responses that address structural inequalities rather than just using the criminal justice system to reduce violence.

We also found that increase in population exodus (residential mobility) had statistically significant relationship with increase rate of violence, aligning with Shaw and McKay’s (1942) original theory. However, ethnic heterogeneity, a key variable of the social disorganisation theory, was not found to be significant. This finding supports research on property crime (Wo, 2024) but contradicts a study from Los Angeles and Southern

California, where shifts in ethnic composition were linked to higher rates of both violence and property crime (Boggess, 2017; Hipp and Luo, 2022). However, we found that increases in ethnic heterogeneity were associated with higher violence levels only when accompanied by a rise in the proportion of people without educational qualifications and bad health. This suggests that structural disadvantage intensifies the relationship between socio-economic deprivation and violence.

The only statistically significant negative relationship was with the proportion of young people aged 15-24. This indicates that areas with growing young people populations experienced reductions in violence. This finding aligns with recent UK (Matthews and Minton, 2018; Morgan, 2014) and USA-based research (Farrell et al., 2015) which suggests that the decline in violence may be partly attributed to reductions in offending among young people.

While social disorganisation theory provided a useful foundation for selecting and interpreting our variables, our findings also resonate with other criminological theories. For example, strain theory (Agnew, 1992) would suggest that increases in unemployment, health deprivation, and housing insecurity may worsen psychological strain and social frustration, thereby increasing the likelihood of violence. Similarly, economic theories of crime that argue that reductions in legitimate economic opportunities - combined with increased social stressors - can raise the risk of crime in disadvantaged areas (Blau and Blau, 1982; Draca and Machin, 2015). These perspectives are particularly relevant given the economic disruptions following austerity policies and, later, the COVID-19 pandemic. Indeed, several broader contextual factors may have shaped the patterns observed over the decade. The post-2010 austerity era in the UK saw cuts to local government services, including policing, youth services, and public health - services that might otherwise mitigate the risk of violence in vulnerable communities. Additionally, the impact of COVID-19, particularly during 2020–21, may have disrupted community cohesion, strained public services, and exacerbated inequalities. Though our study spans the full 2011-2021 period, future research could further explore whether pandemic-related shocks amplified pre-existing trends or introduced new spatial patterns of violence.

The paper acknowledges some of the challenges associated with using the rate of violence as a measure but also offer some solutions. Firstly, the rate of violence is based on the location of where the crime took place with the resident population in the LSOA as the

denominator. This therefore excludes those who may travel into the area for work or leisure, with town and city centres particularly affected. Indeed, increases in public transport infrastructure, measured through bus stops and public transport, were found to be positively associated with increases in violence, suggesting that transport points of interest data is a good control for changes in footfall in an area. Whilst eating and drinking establishments were not found to be statistically significant in this research, other points of interest, including variables like Airbnb activity, have recently been found to be positively related to robbery, burglary, theft, and violence in London neighbourhoods (Lanfear and Kirk, 2024). Secondly, assumptions have been made that changes in neighbourhood characteristics affect crime in a consistent way. For example, increasing poverty increases crime by the same amount that decreasing poverty would reduce it (Hipp and Luo, 2022). However, any change in a neighbourhood, positive or negative, can lead to increases in violence if local structures are disrupted, or changes may be asymmetric where an increase in a neighbourhood characteristic has a different association with crime compared to a decrease in the same characteristic (Hipp and Luo, 2022). This relationship is something that warrants further exploration. Thirdly, the number of crimes in an area is based on those that are reported to the police. Our model does not factor in potential variation in the “dark figure of crime”, which Buil-Gil et al (2021) in their neighbourhood level research found varied according to levels of deprivation, neighbourhood and demographic composition. The model also assumes that the predictors are consistent over space, however previous neighbourhood level research has found the predictors of domestic abuse (Weir, 2019) and violence (Cahill and Mulligan, 2007) to be non-stationary. Further research could therefore be undertaken that factor in both non-stationarity in space and time using methods such as geographically weighted regression. Finally, the model did not account for changes in potentially criminogenic features in the built environment, which Cole (2019) argues should be considered alongside social features when modelling neighbourhood effects. For example, Lanfear (2022) found that neighbourhoods with high collective efficacy maintain low rates of crime in part by limiting criminogenic built environment features, such as abandoned buildings. More research that adopts a socio-physical approach and that measures and quantifies collective efficacy is needed (Cole, 2019; Hipp and Wickes, 2017).

In conclusion, this first of its kind study underscores the relationship between changes in structural neighbourhood disadvantage and violence rates over time. The findings reinforce the importance of addressing underlying social and economic inequalities, particularly

1  
2  
3 unemployment, bad health, and residential instability, rather than relying on criminal justice  
4 interventions alone. Social policies should focus on long-term investment in deprived  
5 neighbourhoods, including affordable and stable housing to reduce residential turnover and  
6 improve long term outcomes for residents.  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

For Peer Review

## References

- Abraham, J. and Ceccato, V. (2022), 'Crime and Safety in Rural Areas: A Systematic Review of the English-Language Literature 1980–2020', *Journal of Rural Studies*, 94: 250–73.
- Abramovaite, J., Bandyopadhyay, S., Bhattacharya, S. and Cowen, N. (2023), 'Classical Deterrence Theory Revisited: An Empirical Analysis of Police Force Areas in England and Wales', *European Journal of Criminology*, 20/5: 1663–80.
- Adeniyi, O., Tura, F. and Newton, A. (2023), 'Analysing the Effect of Betting Shops on Crime in England', *Regional Studies*, 57/11: 2252–68.
- Agnew, R. (1992), 'Foundation for a General Strain Theory of Crime and Delinquency', *Criminology*, 30(1), 47-88.
- Allison, P. D. (1990), 'Change Scores as Dependent Variables in Regression Analysis', *Sociological Methodology*, 20: 93-114.
- Andresen, M. A. (2020). *Environmental Criminology: Evolution, Theory, and Practice*. Routledge.
- Bandyopadhyay, S. (2012), *Acquisitive Crime: Imprisonment, Detection and Social Factors*. London: Civitas.
- Bannister, J., Bates, E. and Kearns, A. (2018), 'Local Variance in the Crime Drop: A Longitudinal Study of Neighbourhoods in Greater Glasgow, Scotland', *The British Journal of Criminology*, 58/1: 177–99.
- Baranyi, G., Di Marco, M. H., Russ, T. C., Dibben, C. and Pearce, J. (2021), 'The Impact of Neighbourhood Crime on Mental Health: A Systematic Review and Meta-Analysis', *Social Science & Medicine*, 282: 114106.
- Blau, J. R., and Blau, P. M. (1982), 'The Cost of Inequality: Metropolitan Structure and Violent Crime', *American Sociological Review*, 114-129.
- Blom, N. and Gash, V. (2023), 'Measures of Violence within the United Kingdom Household Longitudinal Survey and the Crime Survey for England and Wales: An Empirical Assessment', *Social Sciences*, 12/12: 649.

- Boggess, L. N. (2017), 'Disentangling the Reciprocal Relationship Between Change in Crime and Racial/Ethnic Change', *Social Science Research*, 68: 30–42.
- Braakmann, N. (2023), 'Residential Turnover and Crime—Evidence from Administrative Data for England and Wales', *The British Journal of Criminology*, 63/6: 1460–81.
- Bradford, B. (2011), *Police Numbers and Crime Rates – A Rapid Evidence Review*. London: University College London.
- Brennan, I. R. (2019), *Victims of Serious Violence in England and Wales, 2011–2017*. Available at: [https://library.college.police.uk/docs/college-of-policing/Victim\\_of\\_serious\\_violence.pdf](https://library.college.police.uk/docs/college-of-policing/Victim_of_serious_violence.pdf)
- Brennan, I. R., Moore, S. C. and Shepherd, J. P. (2010), 'Risk Factors for Violent Victimization and Injury from Six Years of the British Crime Survey', *International Review of Victimology*, 17/2: 209–29.
- Bryant, L. and Lightowlers, C. (2021), 'The Socioeconomic Distribution of Alcohol-Related Violence in England and Wales', *PLoS One*, 16/2: e0243206.
- Bui, L. and Farrington, D. P. (2016), 'First-Generation Immigrants Feel Socially Excluded and Have Greater Pro-Violence Attitudes than the Native Population in England and Wales', *Journal of Aggression, Conflict and Peace Research*, 8/1: 46–60.
- Buil-Gil, D., Medina, J. and Shlomo, N. (2021), 'Measuring the Dark Figure of Crime in Geographic Areas: Small Area Estimation from the Crime Survey for England and Wales', *The British Journal of Criminology*, 61/2: 364–88.
- Cahill, M. and Mulligan, G. (2007), 'Using Geographically Weighted Regression to Explore Local Crime Patterns', *Social Science Computer Review*, 25/2: 174–93.
- Carmichael, F. and Ward, R. (2000), 'Youth Unemployment and Crime in the English Regions and Wales', *Applied Economics*, 32/5: 559–71.
- Carriaga, M. L. and Worrall, J. L. (2015), 'Police Levels and Crime: A Systematic Review and Meta-Analysis', *The Police Journal*, 88/4: 315–33.
- Clarke, R. V. (1995), 'Situational Crime Prevention', *Crime and Justice*, 19, 91–150.
- Cliff, A. D. and Ord, J. K. (1981), *Spatial Processes: Models and Applications*. London: Taylor & Francis.

- Cohen, L. E. and Felson, M. (1979), 'Social Change and Crime Rate Trends: A Routine Activity Approach', *American Sociological Review*, 44: 588–608.
- Cole, S. J. (2019), 'Social and Physical Neighbourhood Effects and Crime: Bringing Domains Together through Collective Efficacy Theory', *Social Sciences*, 8/5: 147.
- Draca, M., and Machin, S. (2015), 'Crime and Economic Incentives', *Annual Review of Economics*, 7(1), 389–408.
- Farrell, G., Laycock, G. and Tilley, N. (2015), 'Debuts and Legacies: The Crime Drop and the Role of Adolescence-Limited and Persistent Offending', *Crime Science*, 4/1: 4–16.
- Han, L., Bandyopadhyay, S. and Bhattacharya, S. (2013), 'Determinants of Violent and Property Crimes in England and Wales: A Panel Data Analysis', *Applied Economics*, 45/34: 4820–30.
- Hanson, R. F., Sawyer, G. K., Begle, A. M. and Hubel, G. S. (2010), 'The Impact of Crime Victimization on Quality of Life', *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies*, 23/2: 189–97.
- Heeks, M., Reed, S., Tafsiri, M. and Prince, S. (2018), *The Economic and Social Costs of Crime. London*. Available at: <https://assets.publishing.service.gov.uk/media/5b684f22e5274a14f45342c9/the-economic-and-social-costs-of-crime-horr99.pdf>
- Heitgerd, J. L. and Bursik, R. J. Jr. (1987), 'Extracommunity Dynamics and the Ecology of Delinquency', *American Journal of Sociology*, 92/4: 775–87.
- Hipp, J. R. (2007), 'Income Inequality, Race, and Place: Does the Distribution of Race and Class Within Neighborhoods Affect Crime Rates?', *Criminology*, 45/3: 665–97.
- Hipp, J. R. and Kane, K. (2017), 'Cities and the Larger Context: What Explains Changing Levels of Crime?', *Journal of Criminal Justice*, 49: 32–44.
- Hipp, J. R. and Luo, X. I. (2022), 'Improving or Declining: What Are the Consequences for Changes in Local Crime?', *Criminology*, 60/3: 480–507.

- Hipp, J. R. and Wickes, R. (2017), 'Violence in Urban Neighborhoods: A Longitudinal Study of Collective Efficacy and Violent Crime', *Journal of Quantitative Criminology*, 33: 783–808.
- Hirschi, T. and Gottfredson, M. (1983), 'Age and the Explanation of Crime', *American Journal of Sociology*, 89/3: 552–84.
- Jackson, J. and Gouseti, I. (2016), 'Threatened by Violence: Affective and Cognitive Reactions to Violent Victimization', *Journal of Interpersonal Violence*, 31/18: 2987–3016.
- Jones, L., Bigland, C. and Quigg, Z. (2020), *Costs of Violence to the Healthcare System in Wales*. Available at: <https://phwwhocc.co.uk/wp-content/uploads/2021/07/Costs-of-violence-to-the-healthcare-system-in-Wales.pdf>
- Kaylen, M. T. and Pridemore, W. A. (2013), 'Social Disorganization and Crime in Rural Communities: The First Direct Test of the Systemic Model', *The British Journal of Criminology*, 53/5: 905–23.
- Kirk, D. S. and Laub, J. H. (2010), 'Neighborhood Change and Crime in the Modern Metropolis', *Crime and Justice*, 39/1: 441–502.
- Krivo, L. J., Vélez, M. B., Lyons, C. J., Phillips, J. B. and Sabbath, E. (2018), 'Race, Crime, and the Changing Fortunes of Urban Neighborhoods, 1999–2013', *Du Bois Review: Social Science Research on Race*, 15/1: 47–68.
- Krug, E. G., Mercy, J. A., Dahlberg, L. L. and Zwi, A. B. (2002), *The World Report on Violence and Health*. Geneva: World Health Organization.
- Lanfear, C. C. (2022), 'Collective Efficacy and the Built Environment', *Criminology*, 60/2: 370–96.
- Lanfear, C. C. and Kirk, D. S. (2024), 'The Promise and Perils of the Sharing Economy: The Impact of Airbnb Lettings on Crime', *Criminology*, 62/4: 769–98.
- Lee, Y., Eck, J. E. and Corsaro, N. (2016), 'Conclusions from the History of Research into the Effects of Police Force Size on Crime – 1968 through 2013: A Historical Systematic Review', *Journal of Experimental Criminology*, 12: 431–51.

- Libuy, N., Fitzsimons, E. and Church, D. (2024), 'Describing the Geographical Linkage Between the UK Millennium Cohort Study and Crime Incidents in England and Wales', *International Journal of Population Data Science*, 9/1.
- Lightowlers, C., Pina-Sánchez, J. and McLaughlin, F. (2023), 'The Role of Deprivation and Alcohol Availability in Shaping Trends in Violent Crime', *European Journal of Criminology*, 20/2: 738–57.
- Lim, H., Lee, H. and Cuvelier, S. J. (2010), 'The Impact of Police Levels on Crime Rates: A Systematic Analysis of Methods and Statistics in Existing Studies', *Pacific Journal of Police & Criminal Justice*, 8/1: 49–82.
- Liska, A. E. and Bellair, P. E. (1995), 'Violent-Crime Rates and Racial Composition: Convergence Over Time', *American Journal of Sociology*, 101: 578–610.
- Lowenkamp, C. T., Cullen, F. T. and Pratt, T. C. (2003), 'Replicating Sampson and Groves's Test of Social Disorganization Theory: Revisiting a Criminological Classic', *Journal of Research in Crime and Delinquency*, 40/4: 351–73.
- Lymperopoulou, K. and Bannister, J. (2022), 'The Spatial Reordering of Poverty and Crime: A Study of Glasgow and Birmingham (United Kingdom), 2001/2 to 2015/16', *Cities*, 130: Article 103874.
- Lymperopoulou, K., Bannister, J. and Krzemieniewska-Nandwani, K. (2022), 'Inequality in Exposure to Crime, Social Disorganization and Collective Efficacy: Evidence from Greater Manchester, United Kingdom', *The British Journal of Criminology*, 62/4: 1019–35.
- Macassa, G., Winersjö, R., Wijk, K., McGrath, C., Ahmadi, N. and Soares, J. (2017), 'Fear of Crime and Its Relationship to Self-Reported Health and Stress Among Men', *Journal of Public Health Research*, 6/3: Article jphr-2017.
- Machin, S. and Meghir, C. (2004), 'Crime and Economic Incentives', *Journal of Human Resources*, 39/4: 958–79.
- Marmot, M., Friel, S., Bell, R., Houweling, T. A. and Taylor, S. (2008), 'Closing the Gap in a Generation: Health Equity Through Action on the Social Determinants of Health', *The Lancet*, 372/9650: 1661–69.

- Massey, J., Sherman, L. W. and Coupe, T. (2019), 'Forecasting Knife Homicide Risk from Prior Knife Assaults in 4835 Local Areas of London, 2016–2018', *Cambridge Journal of Evidence-Based Policing*, 3: 1–20.
- Matthews, B. and Minton, J. (2018), 'Rethinking One of Criminology's 'Brute Facts': The Age–Crime Curve and the Crime Drop in Scotland', *European Journal of Criminology*, 15/3: 296–320.
- McNulty, T. L. (2001), 'Assessing the Race-Violence Relationship at the Macro Level: The Assumption of Racial Invariance and the Problem of Restricted Distributions', *Criminology*, 39/2: 467–90.
- McVie, S. and Norris, P. (2006), *Neighbourhood Effects on Youth Delinquency and Drug Use*. Centre for Law and Society, University of Edinburgh. Available at: <https://www.edinstudy.law.ed.ac.uk/wp-content/uploads/sites/36/2019/10/10Drugs.pdf>
- Morgan, N. (2014), *The Heroin Epidemic of the 1980s and 1990s and Its Effect on Crime Trends – Then and Now: Technical Report*. Home Office. Available at: <https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=1a6cf9a41c9790f90c2c509bd8a182468f204884>
- Morenoff, J. D. and Sampson, R. J. (1997), 'Violent Crime and the Spatial Dynamics of Neighborhood Transition: Chicago, 1970–1990', *Social Forces*, 76/1: 31–64.
- Office for National Statistics (2021), *Census 2021 Geographies*. Available at: <https://www.ons.gov.uk/methodology/geography/ukgeographies/censusgeographies/census2021geographies>
- Office for National Statistics (2017), *Young People Spend a Third of Their Leisure Time on Devices*. Available at: <https://www.ons.gov.uk/peoplepopulationandcommunity/leisureandtourism/articles/youngpeoplespendathirdoftheirleisuretimeondevices/2017-12-19>
- Peterson, R. D., Krivo, L. J. and Harris, M. A. (2000), 'Disadvantage and Neighborhood Violent Crime: Do Local Institutions Matter?', *Journal of Research in Crime and Delinquency*, 37/1: 31–63.

- Pyle, D. and Deadman, D. (1994), 'Crime and Unemployment in Scotland', *Scottish Journal of Political Economy*, 41/3.
- Reilly, B. and Witt, R. (1992), 'Crime and Unemployment in Scotland: An Econometric Analysis Using Regional Data', *Scottish Journal of Political Economy*, 39/2.
- Reilly, B. and Witt, R. (1996), 'Crime, Deterrence and Unemployment in England and Wales: An Empirical Analysis', *Bulletin of Economic Research*, 48/2: 137–59.
- Roncek, D. W. and Maier, P. A. (1991), 'Bars, Blocks, and Crimes Revisited: Linking the Theory of Routine Activities to the Empiricism of "Hot Spots"', *Criminology*, 29/4: 725–53.
- Sampson, R. J. and Groves, W. B. (1989), 'Community Structure and Crime: Testing Social-Disorganization Theory', *American Journal of Sociology*, 94/4: 774–802.
- Sampson, R. J., Morenoff, J. D. and Gannon-Rowley, T. (2002), 'Assessing "Neighborhood Effects": Social Processes and New Directions in Research', *Annual Review of Sociology*, 28/1: 443–78.
- Sampson, R. J., Raudenbush, S. W. and Earls, F. (1997), 'Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy', *Science*, 277/5328: 918–24.
- Sampson, R. J. (2012). *Great American City: Chicago and the Enduring Neighborhood Effect*. University of Chicago press.
- Semenza, D. C., Testa, A. and Turanovic, J. J. (2021), 'Trajectories of Violent Victimization Over the Life Course: Implications for Mental and Physical Health', *Advances in Life Course Research*, 50: 100436.
- Shapland, J. and Hall, M. (2007), 'What Do We Know About the Effects of Crime on Victims?', *International Review of Victimology*, 14/2: 175–217.
- Sharkey, P., and Faber, J.W. (2014), 'Where, When, Why, and For Whom Do Residential Contexts Matter? Moving Away from the Dichotomous Understanding of Neighborhood Effects', *Annual Review of Sociology*, 40: 559–579
- Shaw, C. R. and McKay, H. D. (1942), *Juvenile Delinquency and Urban Areas*. Chicago: University of Chicago Press.

- Sivarajasingam, V., Page, N., Green, G., Moore, S. and Shepherd, J. (2019), *Violence in England and Wales in 2018: An Accident and Emergency Perspective*. Cardiff: Crime and Security Research Institute, Cardiff University.
- Steele, L. G., Bostic, A., Lynch, S. M. and Abdelaaty, L. (2022), 'Measuring Ethnic Diversity', *Annual Review of Sociology*, 48/1: 43–63.
- Sutherland, A., Brunton-Smith, I., Hutt, O. and Bradford, B. (2020), *Violent Crime in London: Trends, Trajectories and Neighbourhoods*. College of Policing.
- Tarling, R. and Dennis, R. (2016), 'Socio-Economic Determinants of Crime Rates: Modelling Local Area Police-Recorded Crime', *The Howard Journal of Crime and Justice*, 55/1–2: 207–25.
- Tompson, L., Johnson, S., Ashby, M., Perkins, C. and Edwards, P. (2015), 'UK Open Source Crime Data: Accuracy and Possibilities for Research', *Cartography and Geographic Information Science*, 42/2: 97–111.
- Tura, F., Hunter, J., Thompson, R. and Tseloni, A. (2023), 'Analysing the Role of Police Officer Strength in the Crime Drop in England', *Policing: A Journal of Policy and Practice*, 17: p. paad079.
- Van Ham, M. and Manley, D. (2012), 'Neighbourhood Effects Research at a Crossroads: Ten Challenges for Future Research Introduction', *Environment and Planning A*, 44/12: 2787–93.
- Vélez, M. B. (2001), 'The Role of Public Social Control in Urban Neighborhoods: A Multilevel Analysis of Victimization Risk', *Criminology*, 39, 837–864
- Vulliamy, P., Faulkner, M., Kirkwood, G., West, A., O'Neill, B., Griffiths, M. P., Moore, F. and Brohi, K. (2018), 'Temporal and Geographic Patterns of Stab Injuries in Young People: A Retrospective Cohort Study from a UK Major Trauma Centre', *BMJ Open*, 8/10: e023114.
- Warner, B. D. and Pierce, G. L. (1993), 'Reexamining Social Disorganization Theory Using Calls to the Police as a Measure of Crime', *Criminology*, 31/4: 493–517.
- Warner, B. D. and Rountree, P. W. (1997), 'Local Social Ties in a Community and Crime Model: Questioning the Systemic Nature of Informal Social Control', *Social Problems*, 44/4: 520–36.

- Warner, B. D. and Fowler, S. K. (2003), 'Strain and Violence: Testing a General Strain Theory Model of Community Violence', *Journal of Criminal Justice*, 31/6, 511-521.
- Weir, R. (2019), 'Using Geographically Weighted Regression to Explore Neighborhood-Level Predictors of Domestic Abuse in the UK', *Transactions in GIS*, 23/6: 1232–50.
- Whitworth, A. (2012), 'Inequality and Crime Across England: A Multilevel Modelling Approach', *Social Policy and Society*, 11/1: 27–40.
- Wieshmann, H., Davies, M., Sugg, O., Davis, S. and Ruda, S. (2020), *Violence in London: What We Know and How to Respond*, Behavioural Insights Team. Available at: <https://www.bi.team/wp-content/uploads/2020/02/BIT-London-Violence-Reduction.pdf>.
- Willis, K. (1983), 'Spatial Variations in Crime in England and Wales: Testing an Economic Model', *Regional Studies*, 17/4: 261–72.
- Witt, R., Clarke, A. and Fielding, N. (1999), 'Crime and Economic Activity: A Panel Data Approach', *The British Journal of Criminology*, 39/3: 391–400.
- Wo, J. C. (2019), 'Mixed Land Use and Neighborhood Crime', *Social Science Research*, 78, 170–186.
- Wo, J. C. (2024), 'Neighborhood Effects on Crime: The Concentration of Racial/Ethnic Groups and the Heterogeneity Among Such Groups', *Crime & Delinquency*, 70/11: 2958–85.
- Wu, D. and Wu, Z. (2012), 'Crime, Inequality and Unemployment in England and Wales', *Applied Economics*, 44/29: 3765–75.
- Youth Endowment Fund (2024), *Children, Violence and Vulnerability 2024: What Role Does Social Media Play in Violence Affecting Young People?* Available at: [youthendowmentfund.org.uk/wp-content/uploads/2024/11/CVV24\\_R2\\_Online.pdf](http://youthendowmentfund.org.uk/wp-content/uploads/2024/11/CVV24_R2_Online.pdf).

For Peer Review

**Table 1.** Descriptive statistics and results of paired t-tests (2011 vs 2021)

| Variable                                                    | Mean difference (SD) | Min – Max      | 95% CI          | t-value | p-value |
|-------------------------------------------------------------|----------------------|----------------|-----------------|---------|---------|
| Violence per 1,000 population (logged)                      | 1.16 (0.54)          | -1.12 – 4.13   | 1.15 – 1.17     | 383.54  | < .001  |
| Change in % Unemployment                                    | -1.00 (1.66)         | -13.34 – 13.69 | -1.02 – -0.98   | -108.33 | < .001  |
| Change in % No qualifications                               | -4.46 (3.83)         | -26.60 – 22.34 | -4.50 – -4.42   | -208.22 | < .001  |
| Change in % Social renters                                  | -0.43 (2.89)         | -38.12 – 18.70 | -0.46 – -0.39   | -26.40  | < .001  |
| Change in % Private renters                                 | 3.52 (3.33)          | -32.79 – 35.40 | 3.48 – 3.56     | 189.29  | < .001  |
| Change in % Less than 2 years                               | 0.10 (1.29)          | -25.27 – 24.44 | 0.09 – 0.11     | 13.82   | < .001  |
| Change in % Age 15–24                                       | -1.45 (2.62)         | -44.43 – 43.45 | -1.48 – -1.43   | -99.34  | < .001  |
| Change in % Lone parent                                     | 0.47 (2.10)          | -15.70 – 16.30 | 0.45 – 0.50     | 40.38   | < .001  |
| Change in ELF index                                         | 0.05 (0.05)          | -0.25 – 0.43   | 0.047 – 0.049   | 168.31  | < .001  |
| Change in % Bad health                                      | -0.26 (1.17)         | -8.83 – 5.55   | -0.27 – -0.25   | -39.96  | < .001  |
| Change in Eat/Drink establishments per 1,000 population     | 0.03 (0.16)          | -4.18 – 7.29   | 0.024 – 0.028   | 29.07   | < .001  |
| Change in Bus/Transport establishments per 1,000 population | -0.03 (0.14)         | -4.40 – 2.23   | -0.027 – -0.024 | -32.28  | < .001  |
| Change in Police officers per 1,000 population              | -0.14 (0.16)         | -0.50 – 0.25   | -0.137 – -0.134 | -149.14 | < .001  |

**Table 2.** Multilevel linear regression estimates for change in violence, 2011–2021

|                                                                                    | Model 5             | Model 6             | Model 7             | Model 8             |
|------------------------------------------------------------------------------------|---------------------|---------------------|---------------------|---------------------|
| (Intercept)                                                                        | 0.992***<br>(0.189) | 0.991***<br>(0.189) | 0.984***<br>(0.189) | 0.985***<br>(0.189) |
| Change in % of individuals unemployed                                              | 0.010***<br>(0.003) | 0.010***<br>(0.003) | 0.010***<br>(0.003) | 0.010***<br>(0.003) |
| Change in % of individuals with no qualifications                                  | -0.001<br>(0.001)   | -0.001<br>(0.001)   | -0.002*<br>(0.001)  | -0.002*<br>(0.001)  |
| Change in % of social renter households                                            | 0.005***<br>(0.001) | 0.005***<br>(0.001) | 0.005***<br>(0.001) | 0.005***<br>(0.001) |
| Change in % of private renter households                                           | -0.001<br>(0.001)   | -0.001<br>(0.001)   | -0.001<br>(0.001)   | -0.001<br>(0.001)   |
| Change in % of households in the area for less than 2 years                        | 0.013***<br>(0.002) | 0.013***<br>(0.002) | 0.013***<br>(0.002) | 0.013***<br>(0.002) |
| Change in % of individuals aged 15-24                                              | -0.002**<br>(0.001) | -0.002**<br>(0.001) | -0.002**<br>(0.001) | -0.002*<br>(0.001)  |
| Change in % of lone parent households                                              | 0.014***<br>(0.001) | 0.014***<br>(0.001) | 0.014***<br>(0.001) | 0.014***<br>(0.001) |
| Change in ethnic heterogeneity                                                     | -0.074<br>(0.048)   | -0.043<br>(0.051)   | 0.040<br>(0.065)    | 0.043<br>(0.065)    |
| Change in % of individuals with bad health                                         | 0.021***<br>(0.002) | 0.018***<br>(0.003) | 0.020***<br>(0.002) | 0.019***<br>(0.003) |
| Change in eat and drink establishments per 1,000 population                        | 0.012<br>(0.014)    | 0.012<br>(0.014)    | 0.012<br>(0.014)    | 0.012<br>(0.014)    |
| Change in bus and train establishments per 1,000 population                        | 0.058***<br>(0.017) | 0.057***<br>(0.017) | 0.057***<br>(0.017) | 0.057***<br>(0.017) |
| Change in police officer numbers per 1,000 population                              | -0.246<br>(0.239)   | -0.246<br>(0.239)   | -0.248<br>(0.239)   | -0.248<br>(0.239)   |
| Change in ethnic heterogeneity X Change in % of individuals with bad health        |                     | 0.062+<br>(0.034)   |                     | 0.038<br>(0.036)    |
| Change in ethnic heterogeneity X Change in % of individuals with no qualifications |                     |                     | 0.025*<br>(0.010)   | 0.022*<br>(0.010)   |
| Random effects: Variances                                                          |                     |                     |                     |                     |
| PFA-level                                                                          | 0.057               | 0.057               | 0.057               | 0.057               |
| LSOA-level (residual)                                                              | 0.143               | 0.143               | 0.143               | 0.143               |
| Summary statistics                                                                 |                     |                     |                     |                     |
| Number of PFAs                                                                     | 41                  | 41                  | 41                  | 41                  |
| Number of LSOAs                                                                    | 32,005              | 32,005              | 32,005              | 32,005              |
| AIC                                                                                | 29178.0             | 29181.6             | 29180.9             | 29186.6             |
| BIC                                                                                | 29412.5             | 29424.5             | 29423.8             | 29437.8             |
| Adjusted ICC                                                                       | 0.286               | 0.286               | 0.286               | 0.286               |
| Unadjusted ICC                                                                     | 0.250               | 0.250               | 0.249               | 0.249               |

+  $p < 0.1$ , \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Models 5-8 controls for all baseline values. See Appendix table 1 and 2 for full model results

**Figure 1:** Predicted change in violence by ethnic heterogeneity and bad health (Model 6)

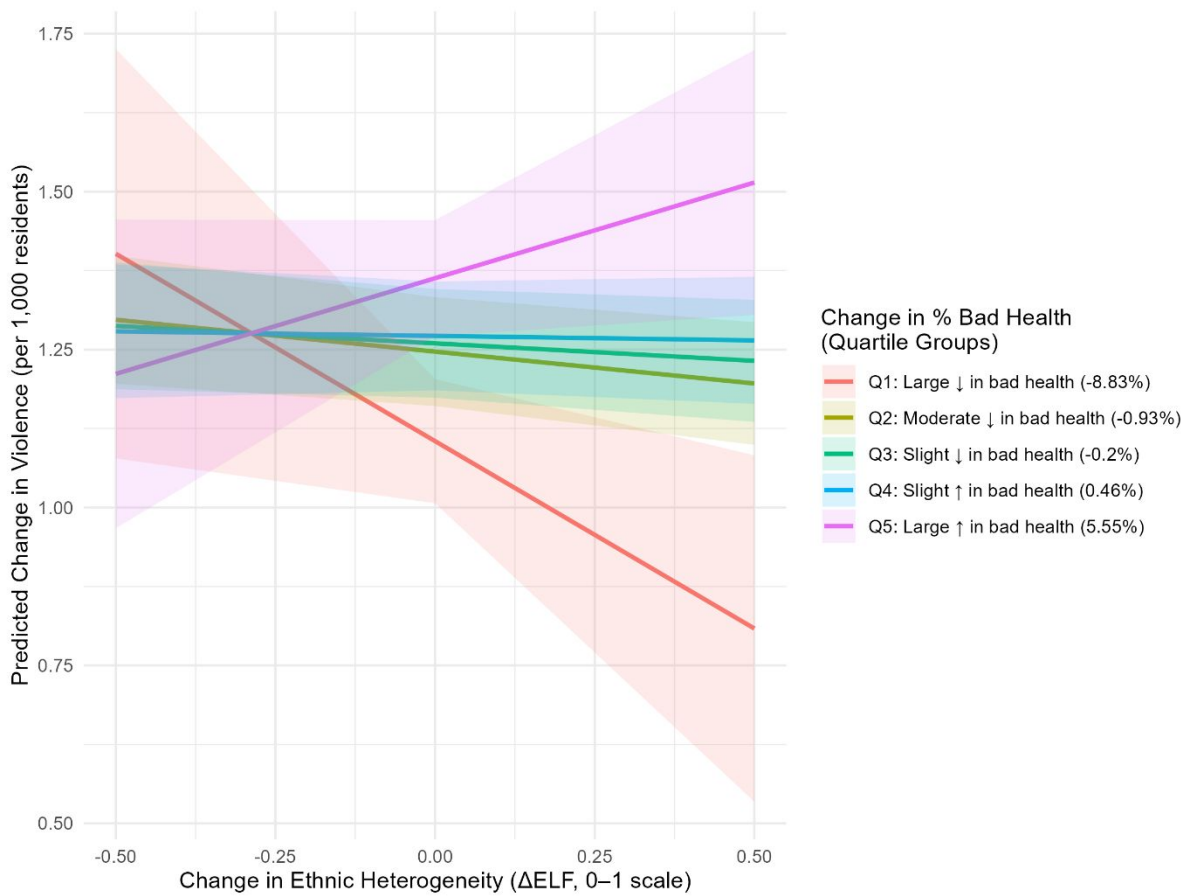


**Figure 2:** Predicted change in violence by ethnic heterogeneity and no qualification (Model 7)

