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**Voting Patterns, Mortality, and Health Inequalities in England**

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**Contributors and sources:** Professor Philip Clarke is a Professor of Health Economics at the University of Oxford, and lead on the initial idea and drafting of the manuscript. Dr Charles Rahal is an Associate Professor of Data Science and Informatics at the University of Oxford, and lead on all data analysis, visualisation, and replication materials. Dr. Josh Knight is a cardiovascular disease epidemiologist and undertook additional data analysis. Dr Veline L’Esperance contributed to drafting of policy section and Melinda Millscontributed to drafting the manuscript. All authors contributed to the revision of the manuscript. All secondary data analysed is publicly available: see the replication materials for further information.

**Replication Materials:** Replication materials (including a data availability statement and details of the relevant GNU GPL 3.0 license) are available at [github.com\crahal\replicating\_smith\_and\_dorling](https://github.com/crahal/replicating_smith_and_dorling).

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**Key Points:**

* Patterns of mortality by voting characteristics and area-based deprivation observed in a 1996 BMJ article were still present in the 2019 election.
* A large number of reports and inquires have attempted to address health inequalities with mixed results.
* Over the last two decades, the association of deprivation and life expectancy at birth has remained high in males and worsened in females.
* A new way of addressing the issue is needed, both in terms of improving evidence, developing strategies, and the translation of policies that will bring about reductions in health inequalities.

**Voting patterns, mortality, and health inequalities in England**

**Abstract (244 words)**

**Objectives: To replicate an analysis conducted just prior to the 1997 UK General Election on the relationship between voting patterns at the constituency level, correlations between voting patterns, measured inequality, and premature mortality.**

**Design: Observational study using data from the Office of National Statistics.**

**Setting: England, UK.**

**Participants: The health and mortality co-variates come from the English population across multiple publicly available datasets from the Office of National Statistics and are cross-tabulated against members of the public who voted in the 2019 UK General Election in constituencies in England.**

**Main Outcome Measures: Age-standardised mortality rate (ASMR) for premature deaths for 2021, Health Deprivation and Disability (HDD) and Index of Multiple Deprivation (IMD) for 2019, Slope Indices of Inequality (2001-20), Healthy Life Expectancy (2011-20).**

**Results: When observing the proportion of the eligible vote for Labour at the constituency level, there was a strong correlation with higher ASMR in both males (r=0.707, p<0.0001) and females (r=0.6505, p<0.0001). There is a strong correlation between Labour vote share ranks and deprivation, with Spearman’s rank correlation coefficients of 𝜌=-0.687 (p<0.0001) for deprivation as measured by the HDD and 𝜌=-0.695 (p<0.0001) for the IMD ranks. Slope indices of inequality (SII) remain high for males and are increasing for females. Healthy life expectancies remain stratified, and differentials across deprivation remain wide and unchanged.**

**Conclusions: Health inequalities across constituencies and socio-economic indicators such as IMD remain high. New approaches are likely to be required to reduce inequalities in the UK.**

**Trial Registration: N/A.**

**Introduction**

In the lead-up to the 1997 election, the BMJ published an article looking at the relationship between mortality rates, deprivation, and voting patterns in English and Welsh constituencies during the three prior electoral cycles of 1983, 1987, and 19921. The study found a very strong, statistically significant bivariate relationship between voting patterns and standardised mortality ratios, a measure of relative mortality. Proportions of Conservative electoral votes within a constituency were inversely correlated (1983, -0.76; 1987, -0.74; 1992 -0.74) with higher mortality; conversely, there were large and significant positive correlations (0.76; 0.77; 0.73) with the proportion of votes won by the Labour Party (all p<0.0001).

Since the publication of the Acheson Report2 in 1998, there have been more than twenty subsequent reports and inquiries into health inequalities. These document the large variation in health across England and propose a wide range of public health and related strategies to reduce structural inequalities. Several contained specific targets, such as the Labour Government’s ambition in 2001 to "reduce by at least 10 per cent the gap between the quintile of areas with the lowest life expectancy at birth and the population as a whole"4 with some evidence that this goal was achieved.5 In 2022 the Conservative Government's *Levelling Up* agenda had an explicit mission that "By 2030, the gap in Healthy Life Expectancy between local areas where it is highest and lowest will have narrowed, and by 2035 Healthy Life Expectancy will rise by five years"6. The Labour party in the run up to 2024 election has committed itself to "Improve healthy life expectancy for all and halve the gap in healthy life expectancy between different regions of England"7.

Almost three decades after the publication of the BMJ article1 on voting patterns and mortality, we again explore where things stand regarding both the political geography of health inequalities and changes in the overall level of health inequalities in England.

**Data and Methods**

This study is based on official published statistics of both health inequalities and voting patterns and involves a descriptive analysis to understand how levels of mortality vary across geographically based electoral constituencies and examines trends in commonly used measures of health inequalities over time.

Data

To represent constituency voting patterns, data from the Westminster House of Commons Library for the most recent (2019) elections was analysed based on the proportion of eligible votes cast for the Labour candidate in all 533 constituencies. Three measures of mortality were included in the analysis: age standardised mortality (ASMR) was used across constituencies, and healthy life expectancy (HLE) at birth was used over time (2011-2020) as was the Slope Index of Inequality (2010-2020). The ASMR data was age-standardised based on the 2013 European Standard Population and provided as per 100,000 rates by sex. The year of death was based on the date of the registration of the death. Measures of inequality based on life-expectancy at birth was based on three-year overlapping annual periods to enable a sufficiently reliable and accurate measurement of life expectancy for local areas. For data by constituency, deaths were allocated to specific constituencies based on the postcode of the decedent and only for registrations in the year 2021. HLE adjust the years of life to reflect the period when individuals perceive their general health to be “very good” or “good”, and therefore, it incorporates quality of life alongside the length of life.

Two measures of deprivation were also included in the analysis; Index of Multiple Deprivation (IMD) and the Health Deprivation and Disability (HDD) domain. The IMD is based on seven dimensions of deprivation which are calculated at and aggregated up from the lower layer Super Output Areas (LSOAs) which represent approximately 1,500 individuals each. The IMD is used in two formats in the analysis. First, as a population-weighted average of the deprivation scores for the LSOAs in each constituency, and second by grouping the population by deprivation decile. The HDD is also an area-based rank metric and measures the risk of premature death and the impairment of quality of life through poor physical or mental health. It measures morbidity, disability and premature mortality, but not aspects of behaviour or environment that may be predictive of future health deprivation.

The slope index of inequality (SII) is a commonly used epidemiological approach to measuring inequality across measures of socioeconomic status within a given time period12. SIIs are calculated by taking the difference between the minimum (representing the most deprived area) and the maximum points (the least deprived) on a fitted slope of best fit. An SII can be interpreted as an absolute measure of the difference between the most and least deprived areas. To account for any variation in the size of the categories SSI are weighted to account for the population.

All references to constituency boundaries are to those which were in place at the 2019 elections.

Methods

The relationship between voting patterns and ASMR by electorate was assessed using Pearson’s correlation coefficient (*r*) was calculated for males and females separately. Bivariate choropleths were uses colour to display the relationship between voting patterns and HDD and IMD, with Spearman’s rank correlation coefficients (*ρ*) calculated for constituencies as a whole. To observe trends in the association between mortality and inequalities over time, the SIIs were plotted for the period 2001 to 2020. HLEs were plotted over time and across three deciles; the most deprived, median deprived, and least deprived for the period in which these statistics are available 2011 to 2020.

**Results**

## *Re-examining the relationship between mortality, deprivation and voting patterns.*

Figure 1 illustrates the contemporary relationship between voting patterns and mortality based on age-standardised mortality rate (ASMR) for data premature deaths across the 533 English constituencies contested at the 2019 general election. The average ASMR across all constituencies was 293 deaths per 100,000 for females and 462 for males, where higher values represent greater age standardised mortality. The mean values for constituencies that elected a Labour representative (n=179) were 554.1 and 345.7 per 100,000 males and females respectively, compared to 413.5 and 264.9 for Conservative constituencies (n=345). The ASMR for Richmond (Yorks) – Rishi Sunak’s constituency – is 196.3 (95% CI 159.9-232.7) for females, and 338 (95% CI 289.5-386.6) for males. In comparison –Kier Stammer's constituency Holborn and St Pancras – the ASMR is 309.6 (95% CI 256.6- 362.5) and 495.4 (95% CI 425.9- 564.9) for females and males respectively: both are around 50% greater than Sunak’s in relative terms. Despite large changes in voting patterns in the last election9, correlations. When observing the proportion of the eligible vote for Labour at the constituency level, there was a strong correlation with higher ASMR in both males (*r*=0.707, p<0.0001) and females (*r*=0.6505, p<0.0001).

Figure 2 illustrates the relationship between Labour vote share ranks and deprivation. A strong correlation is seen Spearman’s rank correlation coefficients of 𝜌=-0.687 (p<0.0001) for deprivation as measured by the HDD and 𝜌=-0.695 (p<0.0001) for the IMD ranks. In terms of constituencies, Richmond (Yorks) is in the least deprived quintile, while Holborn and St Pancras is the second most deprived quintile.

*Changes in inequalities in mortality over time*

Figure 3a shows that between 2001-2003 and 2018-2020, the largest gap in life expectancy at birth observed between the most and least deprived in males in England was 9.7 years (in the two periods of 2006-08 and 2018-2020), with a minimum gap of 9 years between 2011-2013. Despite relatively minor fluctuations over this time period, the gap for men remains high and within a relatively narrow range between 9 and 10 years. For females, there has been a continual increase in the gap in life expectancy at birth between the most and least, rising from 6.3 (2001-2003) to 7.9 years (2018-2020); a 25.4% increase over the observed 20 years.

Figures 3b and c show the relationship between HLE and deprivation deciles. In the earliest period available (2011-2013), the difference in HLE between those living in the most and least deprived deciles of England was 18.5 years for females (Figure 3 1b), whereas it was 18.3 years in 2018-2020. For men (Figure 3 1c), the differences in 2011-2013 and 2018-20 were 18 and 18.2 years respectively. Across these two measures of mortality – life expectancy at birth and HLE – the gap between the least and most deprived in England has either maintained or increased over the last decade.

**Discussion**

Correlations between mortality and the proportion of eligible votes cast for Labour were substantial, and of a similar magnitude to those seen during the 1983-92 elections1. These patterns are likely to be influenced by the strong correlation between vote share and level of deprivation. When the current gap in life expectancy measured as differences in life expectancy at birth across levels of IMD is around 10 years for males and 8 years for females. Compared with 2001-3 this gap has increase by more than one and half year for females and there have been no changes for males.

To put this into context, a similar analysis finds no significant relationship between voting patterns and mortality in Australia10. Counties that voted Republican in the 2016 US elections had overall worse health outcomes than those that voted Democrat; however, only a 2% decrease in median life expectancy was observed.11 A key factor behind the strong association between voting intensions and mortality is that in the England the voting patterns are strongly correlated with measures of deprivation.

**Policy implications**

Recent commitments from both the Conservative6 and Labour7 aim to reduce inequalities in health life healthy life expectancy (HLE).Given the large and persistent socio-economic differences in health and mortality at both an individual and regional level across England and indeed all nations of the United Kingdom, new strategies and policies are required. Avenues that should be explored include:

1. *Improving data, linkage, and integration to allow targeted interventions for the creation of an improved evidence base.*

While there have been considerable improvements in data linkage in the UK in recent years, the integration of data across multiple sectors will be required to fully identify underserved and excluded populations for research, public health monitoring, and enrolment in initiatives designed to address health inequalities.14 This may require improvements in identification of under-represented populations and in legislative frameworks that will facilitate the routine use of linked data. Recent initiatives such as the New Zealand Integrated Data Infrastructure have been able to provide an overall picture of disadvantage by combining health, justice, and welfare data15 which follows similar approaches to integration in Scandinavia. There is also the potential to make greater use of administrative data as outcomes in clinical studies, including randomized trials. For example, the long-term linkage of hospital administrative data and the UKPDS17 has recently shown the benefits of improved glycaemic control in reducing mortality for people with Type 2 diabetes.

1. *Developing an evidence-based policy road map.*

The empirical and simulated modelling of various ‘what-if’ scenarios using linked data combined with evidence from epidemiological studies and clinical trials would enable an understanding of the resources required and the potential gains of pursuing different strategies. This roadmap would range from health system improvements, including population interventions, health system improvements such as risk-modifying medications in those at high risk of CVD18 and strategies targeting high-risk populations (e.g., the 25-year gap in life expectancy between those in prisons and the general population)19, as well as reinforcing existing strategies such as those focused on tobacco control.

1. *Reducing disparities in health system use*

It is important to recognise that a key challenge in reducing health inequalities is to reduce inequalities in the uptake of effective prevention and treatment interventions. For example, ONS statistics reveal substantial ethnic disparities in COVID-19 vaccinations in England; by the end of 2021 over 96% of those over 50 years of age classified as white British had received at least one COVID vaccination, compared with 74%among those classified as Black Caribbean20. Around the same time, overall COVID vaccine coverage in the United States was comparatively lower, but White, Hispanic, and Black ethnic groups ended up with a similar level of uptake.21 Exploring the potential role of informational nudges and incentives both at the patient and General Practice level could represent ways to help address these disparities.

1. *Explicitly incorporating a range of diverse health equity considerations into decision-making procedures*

While bodies such as the National Institute for Health and Care Excellence try to consider health inequalities alongside cost-effectiveness, emerging health economic methods such as Distributional Cost-Effectiveness analysis22 allow interventions that can reduce health inequities to be formally incorporated into evaluations. It is important to recognise that targeting interventions at underserved populations to address inequalities is likely to require additional and potentially reallocated resources, combined with effective implementation strategies including targets and incentives.

**Strengths and limitations of this study**

This study has two main limitations. First, as it is based on official statistics, there are differences between the health inequality measures used in this study (i.e., ASMR for premature mortality) and those reported in a previous BMJ study (i.e., standardized mortality ratios for all-cause mortality). While an analysis from Australia, which used both measures, found a similar relationship with voting patterns, it would be valuable to explore correlations across a wider variety of health measures by constituency in future research.

Second, the IMD is an area-based measure of socio-economic status, which is likely to show smaller differences in health and mortality levels compared to individual measures of socio-economic status, such as education and equalized household income.23 Integrating health, tax, and education data would allow individual measures of socio-economic status to be routinely used in official statistics alongside traditional area-based measures like IMD.

**Conclusions**

Despite numerous efforts, health inequalities as measured by mortality and life expectancy have remained, and, in some case, recently increased in England. Finding effective strategies to reduce health inequalities is an ongoing challenge that should be a primary focus of all UK politicians.

**Figures**

**Figure 1: Correlations between voting behaviour and mortality at the constituency level.** Subfigures a. and b. show the correlation between Labour vote share across constituencies in 2019 and Age Standardised Mortality Rates (ASMR) in 2021 for females and males respectively. Vote share data comes from the House of Commons Library, and mortality data from the Office for National Statistics. r indicates Pearson’s correlation coefficient (all p<0.0001). Supplementary material shows correlations between other party vote shares.

**Figure 2: Correlations between voting behaviour and deprivation at the constituency level.** Subfigures a. and b. show the correlation between Labour vote share in 2019 across constituencies and ‘Health Deprivation and Disability’ and the ‘Index of Multiple Deprivation’ (2019) respectively. Vote share data comes from the House of Commons Library, and deprivation data comes from the Office for National Statistics. Supplementary material shows correlations between other party vote shares.

**Figure 3 1: Inequalities Over Time.** Subfigure ‘a.’ shows the slope index of inequality (SII) for life expectancy at birth for females and males based on data from the Office for National Statistics. Colours denote Labour (red) and Conservative (blue) governments. Subfigures ‘b.’ and ‘c.’ show Healthy Life Expectancy over time and between three deprivation deciles (highest, median, and lowest) for males and females respectively.

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