30th IUSSP International Population Conference
13-18 July 2025, Brisbane, Australia

Do Welfare Regimes Matter? A Comparative Analysis of Spatial Inequalities in Mortality in Germany and the United Kingdom, 2003–2021

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ABSTRACT

While population health inequalities at a spatial scale are well documented for national contexts in isolation, very little is known how these compare across different countries and welfare state regimes. In this paper, we assessed the magnitude of spatial inequalities in life expectancy across Germany, and the four countries of the United Kingdom (UK): England, Scotland, Wales, and Northern Ireland. We used official mortality data from the respective national statistical offices to derive abridged life tables and life expectancy estimates for the period 2003–2021. We then compared trends over time and assessed the magnitude of mortality inequalities across districts and deprivation deciles, within and between the countries, using different measures of inequality. On average, life expectancy across districts of Germany and the UK were at similar levels. While area-level inequalities in life expectancy have increased among both countries, inequalities were consistently higher and increased more sharply in the UK. Our provisional results suggest that deeply rooted differences in governmental approaches to the provision of equitable living conditions in light of economic pressures could be key for explaining diverging trends in the magnitude of area-level health inequalities between Germany and the UK.

Key words: mortality, area-level inequalities, welfare regimes, Germany, United Kingdom

BACKGROUND AND AIM

Despite substantial differences in the timing and pace of life expectancy improvements across nations throughout the 20th century, this development has often been interpreted as evidence of a generalizable and universal improvement in population health. However, national-level life expectancy is likely never going to be the same across all population subgroups or geographical areas (Leon 2011). Inequalities in life expectancy become particularly manifest when approached through an area-level lens. Within this context, mortality inequalities are primarily interpreted as the outcome of inequalities in the distribution of resources and opportunities across areas, as well as the access to these by different population subgroups. As a result, national-level trends in life expectancy do not necessarily have to correspond to a universal trajectory across all sub-national levels and population subgroups.

Several high-income countries have recently experienced slowing down and reversing mortality trends (Ho and Hendi 2018). More recently, these have been further amplified by the COVID-19 pandemic (Aburto et al. 2022). In the United States, national-level life expectancy has stagnated since the 1980s and started to decrease since the 2010s (Woolf et al. 2019). While sharing some similarities, details of direction and magnitude of life expectancy changes differed significantly across states (Woolf et al. 2023). These differences can be attributed to a range of contextual factors ranging from economic history to current economic circumstances, alongside inequalities in the distribution of wealth and

differential effects of federal and state economic policies across states (Woolf et al. 2023). Another prominent example includes the UK and its four nations Scotland, England, Wales, and Northern Ireland. In the United Kingdom (UK), life expectancy improvements slowed down throughout the 2010s and began to reverse in the late 2010s (Minton et al. 2020). Historically, life expectancy across the UK has always varied significantly, with Scottish males and females having the lowest levels of life expectancy compared to their English, Welsh, and Northern Irish counterparts (McCartney 2012). Conversely, English males and females have experienced the highest life expectancy across the UK. Despite these historic gaps in levels of life expectancy, a very similar trajectory of stagnation and reversal has been reported across the four UK nations. Germany represents another European nation for which mortality trends became a matter of great concern more recently. Despite a comparatively strong economic performance, generous social security, and an equitable and well-resourced health care system, Germany has been a long-time life expectancy laggard among the group of high-income countries (Jasilionis et al. 2023). Within Germany, particularly the East and the North are lagging behind, while the South shows the highest levels of life expectancy. At the same time, compared to other countries, spatial inequalities in mortality in Germany remain relatively low, despite high regional inequalities in economic conditions (van Raalte et al. 2020).

We aim at comparing mortality trends and assessing inequalities by deprivation deciles across 400 districts of Germany and 374 local authorities (thereafter districts) of the four nations of the United Kingdom; England, Wales, Scotland, and Northern Ireland over the period 2003–2021. Reflecting examples of two distinct welfare states, Germany, and the UK provide a fascinating comparative perspective for understanding recent mortality trends and differentials not only in these but also in other high-income countries.

DATA AND METHODS

We focused on the 400 districts of Germany ("Kreise") as well as the 374 districts of the UK (lower tier local authorities). As areas of local government, these areas are characterized by a range of devolved powers and decision-making functions. For all UK districts, we queried data on mid-year population estimates from the Office for National Statistics. In addition to this, we queried mortality data from the respective national statistical office: Office for National Statistics (England, Wales), National Records for Scotland (Scotland), and the Northern Ireland Statistics and Research Agency. For all German districts, mid-year population estimates and death counts were obtained from the German Federal and State Statistical Offices. These data are disaggregated by sex and 5-year age groups and refer to the period 2003–2021. To account for geographical changes over time, we harmonized the German data to account for the most recent territorial division as of 2022, which specifies a total of 400 areas. To account for the census break, we harmonized population counts in Germany before 2011 by redistributing the differences in 2011 between the first published age- and sex-specific numbers and the census-corrected ones proportionally over the previous intercensal years (Klüsener et al., 2018). This adjustment was necessary as the 2011 Census revealed official counts were overestimated by 1.5 million residents. For the UK, however, no further adjustment was necessary.

For each country, we created deprivation deciles to allow for a quantification of life expectancy inequalities within Germany and the UK, and to facilitate a direct comparison of these inequalities. Here, finding contextual factors which enable a direct comparison of inequalities between the UK and Germany was challenging. Challenges arose as country-specific deprivation indices are not comparable across countries (and within the UK). In addition to this, numerous contextual factors for the UK are often not reported for all 4 nations consistently over time due to the UK's decentralized statistical system. At the same time, the data that exists for the UK is often suffering from high levels of uncertainty and disclosure at a small-area level as estimates typically originate from surveys (e.g., Labor Force Survey).

To create deprivation deciles which allow for a direct comparison between the UK and Germany, we ranked areas within each country based on the average rank with respect to the employment rate. The employment rate was captured for men and women combined and for as many years of the study

period as possible. Despite minor differences in the conceptualization of the indicator (i.e. different approaches to capturing self-employment in the UK and Germany), employment rate stood out in terms of conceptual similarity and data availability. Based on the harmonized data on death counts and mid-year population we computed age-specific mortality rates for each year, area, and sex. After assigning a deprivation decile to each area with each country, we aggregated death and exposures by deprivation decile, and computed respective age-specific mortality rates. Additionally, by pooling death and population counts we computed mortality rates for the three periods: 2003–2005 (initial point), 2017–2019 (last point before the COVID–19 pandemic), and 2020–2021 (the pandemic years). All these sets of the produced age-specific mortality rates served as the basis for computing abridged life tables and estimating life expectancy at birth (e_0). All computations were based on raw data without any additional adjustments. Life expectancy estimates as well as inequality indicators (weighted standard deviation, the slope index of inequality) and their surrounding 95% confidence intervals were computed using the R package *PHEindicatormethods* (Anderson 2020). Spatial visualizations were produced using ArcGIS software.

SELECTED RESULTS

Figure 1 provides an overview of the spatial distribution of male life expectancy in Germany and the UK over the analyzed period. The values of e_0 are divided into five categories, allowing a direct comparison across all spatial units and over time. All districts in both countries experienced a substantial improvement in e_0 between 2003–2005 and 2017–2019. Initially, only few districts in the UK and none in Germany had life expectancy above 80 years. By 2017–2019, the number of areas having a male life expectancy of 80 years or more increased substantially, particularly in the south of England, while the number of areas in Germany remained relatively low. Furthermore, in Germany, the vast majority of the vanguard regions are located in the south. Germany still exhibits a notable East–West mortality gradient. Seemingly, it attenuated in the last pre-pandemic years but became more pronounced again during the years of the Covid-19 pandemic 2020–2021.

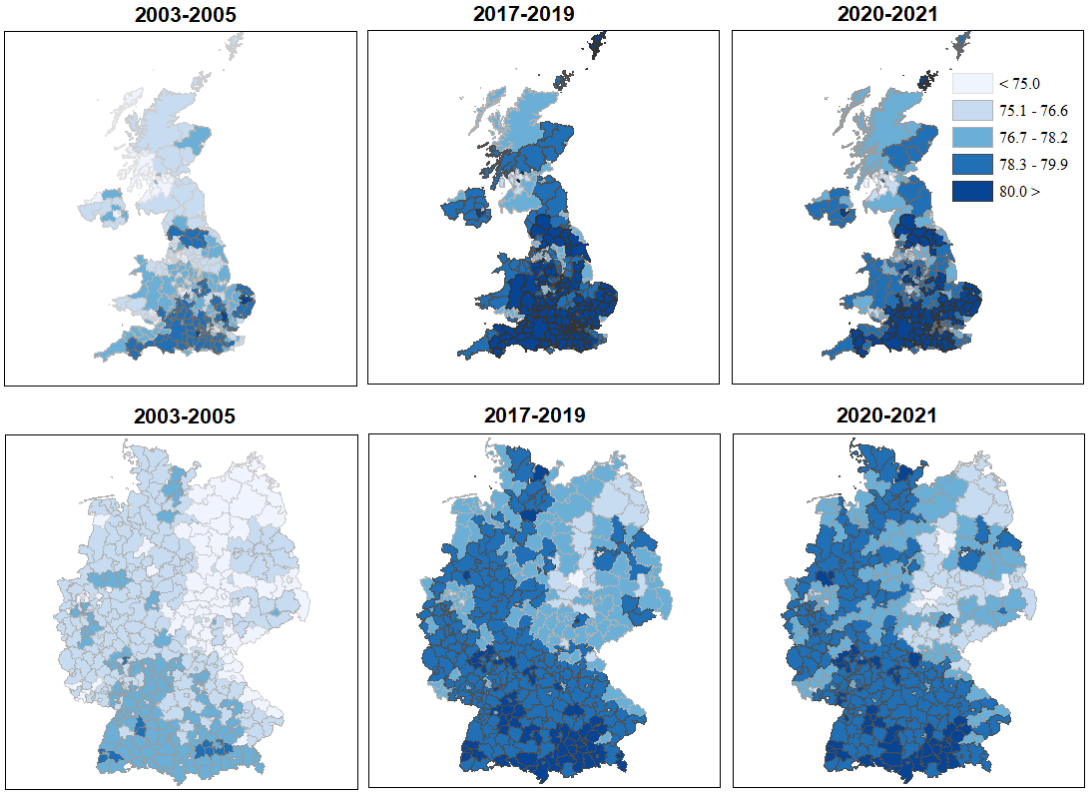

Figure 1. Male life expectancy at birth across districts of Germany and the UK, 2003–2005, 2017–2019, and 2020–2021

The evolution of mortality trends by deprivation deciles is presented in Figure 2. Decile 1 (dark red) and decile 10 (dark green) refer to the most and the least deprived districts. Both countries exhibit clear mortality gradients: higher life expectancy is associated with a lower degree of deprivation. Over the analyzed period, a steady increase in e_0 was observed in both countries, for both males and females, and across all deprivation deciles. However, improvements have clearly slowed in the UK since 2011 when compared to previous years. This positive trend was interrupted during the pandemic years. Compared to Germany, where life expectancy was falling down gradually in 2020 and 2021, the UK experienced a sharp drop in e_0 in 2020 and some recovery in 2021. The areas belonging to the most deprived deciles exhibited the most pronounced declines in e_0, especially in the UK.

Figure 2. Life expectancy at birth by deprivation deciles; Germany and the UK, 2003–2021

We found substantial differences between Germany and the UK in terms of mortality inequalities. Here, we found disparities to be highest among UK men, while they were lowest among German women. Inequalities among UK women were also high and, for example, higher than among German men. To further explore and compare the level of inequalities, we calculated the slope index of inequality (SII). In 2003, the SII constituted 4.54 [95% CI: 4.37–4.71] and 3.05 [2.89–3.21] years among the UK men and women, respectively. By 2021, it increased to 5.10 [4.93–5.26] and 4.4 [4.24–4.55] years, respectively. The mortality disparities in Germany were less pronounced. In 2021, the SII constituted 3.42 [3.28–3.55] and 1.78 [1.65–1.89] years among men and women, respectively. The corresponding figures in 2003 constituted 2,71 [2,56–2,86] and 1,31 [1,18–1,44] years, respectively. In both countries, an increase in SII occurred during the two pandemic years (2020 and 2021) after long periods of stagnation.

SUMMARY

To our knowledge, this is the first study comparing area-level inequalities in life expectancy across districts of two distinct welfare state regimes, represented by Germany (continental-conservative type) and the UK (Anglo-Saxon liberal type). For this purpose, we accessed and harmonized data from the respective national statistical offices to derive life tables and life expectancy estimates. To ensure the highest amount of comparability, life expectancy and inequalities in life expectancy were estimated consistently using the same methodology. Our results indicate that, on average, life expectancy was at very comparable levels across the local authorities of Germany and the UK between 2003 and 2021. In addition, our results revealed that both countries experienced a sharp increase in area-level inequalities in life expectancy during the pandemic years. We found that both, (i) the magnitude of area-level inequalities, and (ii) the increase in area-level inequalities were consistently highest in the UK. Overall, our results suggest that a consistently higher magnitude of area-level inequalities in life expectancy can be observed despite comparable average levels of life expectancy. Deeply rooted differences in governmental approaches to the provision of equitable living conditions might be key for explaining these diverging trends.

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