

Health and mortality

Strand organiser: José Manuel Aburto (University of Oxford and LSHTM)

16:45 - 18:15 Monday 9 September: Health and mortality 1: International perspectives on health and mortality

Poverty effects of chronic health conditions in Europe – heterogeneity by demographic and socioeconomic subgroups

Aapo Hiilamo - Max Planck Institute for Demographic Research

Background:

We know little about how much the effect of health conditions on poverty varies across countries and subgroups. Are some population groups more protected from the poverty effects of health conditions? Are the effects stronger in some countries?

Methods

We use EU-SILC data on European countries from 2004-2022. We focus on self-reported chronic health conditions of adults. Our outcome measure is income poverty defined as 60% of the median national equivalized income. We explore the role of education, employment status, age, and family status as potential covariates and moderators.

We start by estimating the associations of chronic health conditions with poverty prevalence and entries in different countries, time points, and subpopulations. We use multilevel modeling and partial pooling across small subnational subgroups to demonstrate heterogeneity. We fit logistic models in which we regress the odds of the poverty entry on the onset of a chronic health condition and a set of covariates. We allow the intercept and slope of the health condition onset to vary across subgroups.

Expected results

We expect the association of chronic health conditions with poverty to be stronger in southern than in northern European countries because of their differences in social insurance arrangements. We expect health conditions to link to a higher poverty risk among less educated groups because, for them, health conditions are more likely to cause work disability.

Implications

Illuminating varying effects of health on poverty is important because it can move us closer to better targeting and making inequalities more visible.

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In utero exposure to pandemic influenza and accelerated ageing: an investigation of the long-term effects of exposure to the 1958 Asian flu epidemic

Emilie Courtin - LSE, Charis Bridger Staatz - CLS, UCL, Gemma Shireby - CLS, UCL, David Church - CLS, UCL, et al

Objectives: Infection during pregnancy or in early life has been recognised as a potential contributor to a range of diseases in adulthood. A hypothesised biological mechanism is fetal 'programming', through the effect of the environment on epigenetic make up. Participants in the 1958 National Child Development Study were exposed to the pandemic 1958 Asian flu during their second semester of gestation, a particularly sensitive period in pregnancy with potential consequences for later life health. Using the NCDS, we therefore aim to investigate the long-term effects of exposure to infection during pregnancy, on markers of accelerated ageing.

Methods: We will measure accelerated ageing through a number of indicators, such as biomarkers and derived epigenetic clocks of ageing (age 44 and 62 when available) and cognition at age 50. We will measure exposure to influenza through the mother's report of flu during pregnancy (12% of mothers), and through regional variations in influenza severity, taken from official pneumonia notifications made to the Registrar Generals.

We plan to use inverse probability of treatment weighting to identify the effects of in-utero exposure to influenza on accelerated biological ageing. Additionally, we will use regional variation in the likelihood of mothers infected at the local authority level and combine the two approaches in an instrumental variable model.

Conclusions: We aim to contribute to the literature by providing a comprehensive picture of health and ageing, a better identification of treatment effects and better understanding of mechanisms that link early life infections to later life health.

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Racial and regional variation in the mid-century tuberculosis decline in apartheid South Africa, 1948-1968.
Nicholas Fitzhenry - London School of Economics and Political Science

This study investigates racial and regional disparities in the mid-century decline of tuberculosis (TB) mortality in apartheid-era South Africa from 1948 to 1968. Large historical health inequalities, notably in life expectancy gaps across racial groups, were primarily driven by infectious diseases, particularly TB. Despite the development of effective TB treatments by the early 1950s, understanding how these interventions impacted the population within the highly unequal and racially segregated societal context remains crucial.

Utilising vital register and census data, I construct the first panel of district-level crude mortality rates by race and rural-urban classification for South Africa in the mid-20th century. This dataset is augmented with district-level information on medical accessibility, measured by the density of healthcare workers and hospitals per capita, along with a battery of socio-economic controls. This dataset reveals stylised patterns in the temporal, regional, and racial inequalities in overall crude mortality and its decline.

Employing a difference-in-difference methodology, I estimate the influence of preexisting and supplemented medical services on this mortality decline. My findings, supplemented by detailed notification and cause-of-death data from city-level medical reports, suggest that the introduction of combined antibiotic out-hospital treatments of isoniazid, para-amino-salicylic acid, and streptomycin significantly contributed to this decline, and reduced, in some contexts, racial gaps in mortality rates. However, the efficacy of these treatments was moderated by the levels of i) preexisting medical human capital accessible to local populations, ii) preexisting racial inequalities and iii) rural locations.

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09:00 - 10:30 Tuesday 10 September: Health and mortality 2: Innovation in methods in health and mortality

Using Singular Value Decomposition to Understand Variation in Mortality Age Schedules Across Multiple Populations

Antonino Polizzi - University of Oxford, Monica Alexander - University of Toronto

Understanding variation in mortality age schedules across populations is a key objective of demographic research. Existing decomposition methods partition differences in demographic summary indicators—such as life expectancy at birth—into age-specific contributions for only two populations. Here, we demonstrate how Singular Value Decomposition—an existing mathematical decomposition technique—can be

used to summarize and understand variation among mortality schedules from multiple populations. We explain how Singular Value Decomposition can be used to extract key mortality age patterns and their relative weights. We demonstrate this method by decomposing variation in the mortality schedules of US states, showing that (a) most of the variation in 2019 was due to differences in young-adult mortality, and that (b) different US states achieved the same high level of life expectancy at birth with fundamentally different mortality profiles. The Singular Value Decomposition approach complements existing pairwise decomposition methods for describing and summarizing mortality differences across populations, and we discuss further potential areas of application.

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Reclassifying undetermined intent and ill-defined deaths to estimate true suicide rates in the United States from 2010 to 2019.

Clara Renée Girault - University of Southampton

Suicide deaths are prone to underestimation. Few studies have tried to estimate corrected suicide rates at the national level by reclassifying deaths registered in the “garbage code” categories such as ill-defined and undetermined intent causes of death. Improving the accuracy of suicide statistics is necessary to implement relevant prevention strategies. This paper aims to reassign undetermined intent deaths registered as such in the United States for individuals aged 20 or older at death. We use multinomial regression models separately for males and females trained on known outcomes (suicide, assault, accidents, and transport accidents) and we include all multiple causes of death registered in the death certificates to estimate the changes in the age-standardized suicide rates from 2010 to 2019 in the United States. We use different methods of calculating the total numbers of reclassified suicides, including assigning causes based on the highest probability; setting a more conservative threshold (i.e., allowing some deaths to remain undetermined); and calculating the expected number of deaths by cause by summing the predicted probabilities. To reassign ill-defined deaths, the training model included all causes of death except for those labelled under other ill-defined codes (e.g., ill-defined cancer, septicaemia, etc.), as well as undetermined intent. We used k-fold cross-validation methods to check the accuracy of the model. We aim to apply machine learning methods, using classification trees and random forests, and compare the differences in reclassification as machine learning methods can capture more complex relationships between the predictors compared to generalised linear models.

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Needles in a Haystack: Modelling Excess Mortality Against a Heterogeneous Baseline **Hampton Gaddy - LSE**

Popular methods for modelling all-cause excess mortality are an efficient way of estimating crisis death tolls. However, their efficiency relies on assumptions that various data structures and demographic contexts can violate. Some of these limitations are well known, but this paper demonstrates a new one. If one's mortality baseline contains localised epidemics or other crises that are not temporally synchronised, one will fail to recognise them as a source of bias when using aggregate data alone. As a result, one will overestimate baseline mortality and therefore underestimate the excess mortality of the crisis of interest. Unfortunately, mortality “baselines” in historical contexts often contain this type of lurking heterogeneity; contemporary high-mortality settings also face this problem to some extent. Removing the bias caused by this heterogeneity requires using mortality data disaggregated down to the level of true baseline homogeneity. Using subnational data from the US and Japan, I demonstrate how failing to use spatially disaggregated data can lead one to underestimate 1918 influenza pandemic excess mortality by up to 10%.

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A new methodology for quantifying excess mortality in the UK

Daniel Ayoubkhani, Piotr Pawelek, Vahé Nafilyan - Office for National Statistics

Measures of excess mortality – the difference between the observed and expected number of deaths – came to the forefront of public attention during the COVID-19 pandemic, and there is now demand from policymakers and public health officials for ongoing surveillance as we move beyond the pandemic. The Office for National Statistics (ONS), in collaboration with other government agencies, the devolved administrations and private sector partners, has developed an innovative new approach for quantifying excess mortality in the UK by applying quasi-Poisson regression models to published deaths registrations and population data.

Compared with the previous approach of simply taking a five-year average of recent death counts, the new methodology offers several clear advantages: it takes account of population growth and ageing; it reflects trends, seasonality and calendar-based variations in mortality; it ensures additivity by age, sex and geography; it takes a more nuanced approach to dealing with periods substantially affected by COVID-19; and confidence intervals can readily be obtained.

The new and previous approaches provide similar estimates of excess deaths in the peak pandemic years of 2020 to 2022. However, the new method estimated notably fewer excess deaths in 2023 – 11,000 compared with 31,000 – and suggests negative excess deaths (that is, fewer registered deaths than would be expected under normal conditions) over the second half of the year.

This presentation will describe the ONS's new method for quantifying excess mortality, how we communicated the change in approach to the public, and how we intend to further refine the methodology in the future.

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Black-White Mortality Crossover: New Evidence from Social Security Mortality Records

Casey Breen - University of Oxford

The Black-White mortality crossover is a well-studied demographic paradox. In the United States, Black Americans experience higher age-specific mortality rates than White Americans throughout most of the life course, but this puzzlingly reverses at advanced ages. The leading explanation for the Black-White mortality crossover centers around selective mortality over the life course ("heterogeneity in frailty"). Black Americans who survived higher age-specific mortality risk throughout their life course are highly selected on robustness, and have lower mortality than White Americans in late life. However, skeptics argue the Black-White mortality crossover is simply a data artifact from age misreporting or related data quality issues. We use large-scale linked administrative data (N = 2.3 million) to document the Black-White mortality crossover for U.S. cohorts born in the early 20th century. We find evidence the crossover is not a data artifact and cannot be uncrossed using sociodemographic characteristics alone. To complement our empirical analysis, we employ simulation and analytical techniques to estimate the amount of observable heterogeneity in frailty required to create a mortality crossover.

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13:30 - 15:00 Tuesday 10 September: Health and mortality 3: Health and mortality in the UK

Which environmental characteristics explain the worse mental health of young people who lived in deprived coastal communities in adolescence?

Emily Murray - Centre for Coastal Communities, Institute of Public Health and Well-being, University of Essex

Previous research has shown that English adolescents who lived in the most deprived coastal neighbourhoods had worse mental health outcomes up to 10 years later than if they had lived in equivalent inland neighbourhoods. One possible explanation is that environments of deprived coastal areas differ from

deprived inland areas. For this analysis, UK Household Longitudinal Study participants aged 15, or closest available age, were linked to coastal community classification and 25 environmental measures from four domains: economic, social, educational, and built-up. Coastal was chosen if the lower-super output area (LSOA) included or overlapped built-up areas which lay within 500m of the “Mean High Water Mark”). Each youth was then followed up for up to ten waves, for age 16+ Mental Component Summary (MCS) scores from the 12-item Short-Form Survey.

Initially, cross-sectional regression models were fitted between environmental variables and coastal classification, with adjustments made for clustering of individuals within LSOAs. Second, longitudinal associations were fitted between environmental variables and MCS scores up to 10yrs later. Longitudinal models were fitted at the individual and study wave, with additional adjustments for longitudinal study weighting. If an environmental variable was associated with both coastal classification and MCS score, they were included in the full model. We also tested for effect modification between coastal community and Townsend index, through fitting interaction terms to models. A total of 5,269 (44.6%) youth had complete environmental and follow-up MCS data (n=19,594 observations). After adjustment for age at MCS measurement, gender, ethnicity, household income and tenure, adolescents who resided in the most deprived coastal LSOAs had average MCS scores 4.2 points lower (95% CI: -7.0, -1.5), than equivalent inland adolescents. Only three environmental variables - percent 18–19-year-olds progressed to higher education, mean index of multiple deprivation crime score, and mean Nitrogen dioxide ($\mu\text{g}\text{m}^3$) – substantially explained this association.

Changes in Faith and Health among Muslims during COVID-19 Pandemic

Hiroshi KOJIMA - Waseda University

This study attempts to clarify the effects of faith changes on changes in self-rated health among Muslim men and women aged 18-39 in the UK. drawing on the analysis of microdata from the 2021 web survey on Islamic Practices during COVID-19 Pandemic (n=328). The trichotomous logit analysis for 2019-2020 changes in physical health shows the positive effect of 1) stronger faith on the odds of better vs constant, the positive effect of 2) higher level of contribution on the odds of worse vs constant, and the positive effect of 3) higher level of voluntary work and the negative effect of 2) on the odds of better vs worse. The analysis for 2020-2021 changes reveals the positive effect of 5) more frequent prayer in congregation at home and the negative effect of 4) more frequent prayer at the mosque on the odds of better vs constant as well as the negative effect of 4) on the odds of better vs worse. The analysis for 2019-2020 changes in mental health shows the positive effect of 4) on the odds of better vs worse, but the analysis for 2020-2021 changes reveals the negative effect of 4) on the odds of better vs constant and the odds of better vs worse as well as the positive effect of 2) on the odds of better vs worse. In sum the effect of faith changes on the health changes is not so strong and changes in Halal food consumption and Ramadan fasts have no significant effects.

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Maternal characteristics and infant and child mortality: A cohort study in England linking Census and health data

Isobel Ward - Office for National Statistics, Sarah Barratt - Office for National Statistics, Cameron Razieh - Office for National Statistics, Leicester University, Charlotte Standeven - Office for National Statistics et al

Child mortality is a common measure of the overall health of society. Maternal characteristics, such as ethnicity and socioeconomic status are known to contribute to inequalities in health and mortality in babies and children. Overall, in the UK babies born to non-white mothers have a higher risk of mortality, and there is also a strong association between deprivation and risk of death. However, population data is currently lacking for England disentangling the various socioeconomic risk factors which are known to contribute to increased risk. We utilise population level data to assess the association between socioeconomic status, ethnicity, and child mortality.

Our cohort consisted of all live singleton births in England between 2011 and 2016. We linked birth notifications to mothers' 2011 Census records using NHS number, which provides person-level sociodemographic information. Death registration data was linked to identify all-cause and cause-specific deaths in babies. Babies were followed from date-of-birth for up to 10-years, or date-of-death. We report risk

of all-cause mortality for a 10-year follow-up for neonatal, infant and child deaths based on maternal socioeconomic and ethnic groups. Cox proportional hazard models are used to estimate hazard ratios for neonatal, infant and child deaths, with both minimally adjusted (maternal age and baby sex) and fully-adjusted models (accounting for other maternal, household and birth characteristics). This presentation will give an overview of our unique linked data sources, the statistical techniques employed, the latest available analytical results, and the emerging implications of the research.

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The coast is always changing: multimorbidity and coastal living
Stephen Jivraj - UCL Institute of Epidemiology and Health Care

Poor health in England's coastal communities highlighted by the 2021 Chief Medical Officers Annual report suggests a 'coastal excess' of disease. This paper will explore whether growing up in a coastal community is associated with multimorbidity, the co-occurrence of more than one long term condition using data from a cohort of people born in 1958 and followed until they are 55 years old. Existing research shows there is an increased prevalence of contemporaneous multimorbidity in more deprived neighbourhoods compared with less deprived neighbourhoods in England. There might be an overestimation in the importance of where people currently live and therefore contemporaneous neighbourhood deprivation might proxy for neighbourhood deprivation experienced over the life course. Moreover, high levels of deprivation in coastal areas might explain its excess of disease. Using the National Child Development Study, with coastal residence and neighbourhood deprivation measured at age 16 and multimorbidity at age 55, when the prevalence of was 33.0%, we find those living in the most deprived coastal areas experience a double disadvantage in terms of their risk of multimorbidity. The results will help shape locally sensitive policies which may reduce health inequality.

18:15 - 19:15 Tuesday 10 September: Health and mortality among selected populations

Migrant mortality advantage in two different welfare contexts: A comparison of England & Wales and Norway

Joseph Harrison, Frank Sullivan, Katherine Keenan, Hill Kulu - University of St Andrews

The migrant mortality advantage is a well observed phenomenon in Western industrialised nations. A combination of selection, positive health behaviours amongst migrants and the rapid health transition, in which environmental risks faced in less developed origin countries decrease after migration, are thought to be the contributing factors to this phenomenon. However, research on migrant mortality has seldom compared differences in magnitude of this advantage across destinations, nor compared the mortality outcomes of comparable migrants in different destination contexts. This study uses the Office for National Statistics Longitudinal Study of England and Wales and the Norwegian Population Register to study migrant mortality across two contexts. We use event history analysis to compare the advantage across two contexts and identify if it is found in the descendants of immigrants too. We compare similar origin groups across the destinations to infer if health assimilation operates differently under competing welfare regimes. In aggregate, we find that the migrant mortality advantage exists in both countries, but with different magnitudes of advantage between groups, culturally similar countries experience the least advantage. We find no observable advantage for descendants; in fact they may experience a disadvantage. The most comparable group is that of Pakistani immigrants which has a smaller advantage in England and Wales compared to other migrant groups and a mortality disadvantage in Norway. We posit that the universal welfare state in Norway sustains inequalities and cannot maintain the positive health advantage that migrants tend to experience.

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Suicides in UK armed forces veterans, England and Wales: 2021

Michael Archbold, David Mais, Vahé Nafilyan - Office for National Statistics

This analysis investigates mortality and suicide rates among male UK armed forces veterans aged 16 and over in England and Wales during 2021 and was the result of a collaborative project between the Office for National Statistics (ONS), Office for Veterans' Affairs and Ministry of Defence (MOD).

No information is collected that enables deaths in veterans to be accurately identified from ONS death registration records. However, the ONS linked death registration records to Census 2021 data, and the MOD's Service Leaver Database (SLD) to identify veteran deaths and understand mortality patterns within this group.

Analytically, age-standardised rates per 100,000 population were calculated using veterans as the standardised group. These showed that after accounting for age, there was no evidence of a difference in the rate of suicide between male UK armed forces veterans and the male general population. Age-specific rates were also produced which showed variations by age group, particularly among veterans aged 25 to 44, who had a higher rate of suicide compared with males aged 25 to 44 years in the general population. We also found that a higher proportion of veteran suicides involved firearm discharge than in the general population.

The study emphasises the importance of leveraging comprehensive data sources and analytical techniques to address health disparities effectively among UK armed forces veterans. In addition, these findings contribute directly to evidence-based strategies to improve veteran health outcomes and reduce suicide rates. Significant media interest was received with coverage in The Standard, The Telegraph, Daily Mail, The Independent.

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Declining population of “Particularly Vulnerable Tribe” (PVTGs) Sabar Tribe of India Ram Kishor Soren - Assam Central University

India as a nation produces sufficient food to feed its population, it is unable to provide access to food to a large number of people, especially the marginalized section of the society. Unfortunately, India largest undernourished and hungry population in the world.

194.6 million people go hungry every day and about 15.2% of the total population is undernourished. The Global Hunger Index 2023 ranks India at 111 out of 121 countries.

Particularly Vulnerable Tribe Groups Tribes (PVTGs) in Jharkhand are among the most vulnerable to Hunger and starvation. The Sabars are one of the eight Particularly Vulnerable Tribal Groups in Jharkhand. They are spread over the forested hills of south-eastern Jharkhand. The Socio-Economic Caste Census (2011) puts their count at 86,110, barely 0.27% of the Jharkhand population, and their population is said to be falling. This has prompted the state government to design special interventions on mortality, literacy and nutrition.

Though the Infant Mortality Rate has decreased from 54 (NFHS III, 2005-06) to 46 (NFHS V, 2019-21) in rural tribal areas but it's a poor status among the PVTGs residing in Jharkhand – high infant mortality rate, less life expectancy, high prevalence of anemia among the PVTGs. According to the report of NFHS V, 88% of children belonged to PVTGs community are underweight in the state. 71.5 % children 6-59 months, 63.7% pregnant women, 67.5% all women of age 15-49 years are anemic (NFHS V). The full antenatal care is only of 5.5% among PVTGs.

The Sabar tribe is mentioned in the Hindu epic Mahabharata (Nandi C, 2019) was labelled a criminal tribe under colonial rule and continues to bear the stigma of criminality. From any perspective, their abuse and exclusion are visible (Ghosh S K, Guchhait SK, 2017). They were once a hunting-tribe, who are entirely now dependent on the administration for their livelihood and nourishment. Malnutrition among the children is very evident among the tribe and men seldom do find livelihood opportunity for the better expression of life. This critical interpretive synthesis examined research articles published between 2000 and 2024 that involved study on Sabar tribe and assessed the context, purpose, and methodologies that were reported. Implications of findings will be discussed, with particular focus on current health status, declining population, malnourishment, mortality rate and natality rate of child.

The study designed to find out the relationship between socio-demographic characteristics and nutritional status among adult Sabars. The study will tried to understand the relationship with nutrition value and declining population. This paper tries to investigate and understand the reason behind the declining of the

vulnerable Sabar tribal. Ultimately, this study illustrates the quality of integrated archaeological and anthropological data needed to assess the links between Sabar tribe population decline and ecological change after permanent settlement.

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Disparity in the Golden Age of Medicine: The Hill-Burton Act and Infant Health in the US South

Matthew Purcell - LSE

My research asks if the Hill-Burton Act affected county-level infant mortality and stillbirth rates? And if so, how did the Act's effect change the health outcomes within racial populations? The Hill-Burton Act marked a turning point in health system funding for the US Government. It was the first legislation that involved the federal government in subsidizing hospital care. Earlier federal legislation related to healthcare, most notably the Sheppard-Towner Act, had focused on public health education, leaving direct clinical care outside of federal influence. The Hill-Burton Act began the growth of capital-intensive research hospitals, a hallmark of the modern US healthcare system. The act is notable for being the only piece of US legislation that used a 'separate-but-equal' clause. That clause was critical to the act's funding formula. I use county-level health statistics as well as hospital project data from the Hill-Burton Act to look at how the construction, renovation, and upgrading of hospitals altered health outcomes within a county. The methods used are Panel regressions with county and time fixed effects and an IV strategy. My Preliminary results suggest that the act reduced infant mortality across all racial groupings. Stillbirth rates had weaker results, returning a null result for the Black population. Notably, the strongest effect came from extensions and upgrades to pre-existing hospital facilities rather than newly constructed hospitals.

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