Turning Points:

Convergence in Mortality Patterns, 1800–1950

A workshop on Wednesday 6 May 2026

Melville Room, Gilbert Scott Building, University of Glasgow

Organizers: Konstantinos Angelopoulos (University of Glasgow), Rebecca Mancy (University of Glasgow and Cardiff University), Tim Riswick (Radboud University), Sanne Muurling (Radboud University) & Paul Puschmann (Radboud University)

This workshop explores when, where, and under what conditions mortality rates converged during the period 1800–1950 to uncover turning points in the dynamics of mortality decline. By combining insights from (i) the dynamics of mortality change and (ii) the cross-sectional variation across social and spatial groups, we aim to understand how different interventions and social structures shaped the path toward convergence.

Turning points may have arisen from specific interventions (such as vaccination, water and sanitation reforms, or hospital expansion) or from the cumulative effects of multiple, interacting improvements in health or, more generally, in living conditions. Interventions may have been most effective where mortality was initially high, and their influence may have grown over time as people and institutions adapted. The social composition within areas, including the distribution of rich and poor households, may also have mediated these effects. Whether early gains were confined to privileged groups or diffused gradually as innovations became more accessible and affordable could be a key factor. Cause-specific mortality data may provide an additional lens to distinguish infectious from non-infectious disease trajectories and to trace how shifts in disease environments reshaped social inequalities in health.

Drawing on contributions from different cities and countries, the workshop seeks to integrate analyses of mortality dynamics and inequalities, identifying patterns that reveal the mechanisms of health improvement. Ultimately, the aim is to develop a comparative framework that explains how interventions, institutional contexts, and social conditions interacted to determine both the timing and the equity of Europe's mortality transition.

This workshop is funded by the Radboud-Glasgow Collaboration Fund project 'The Deep Roots of Persistent Health Inequalities: Socioeconomic and Epidemiological Drivers Since the 19th Century', COST-Action GREATLEAP (CA22116) and the Dutch Research Council Veni project 'Unravelling Health Inequalities. The Historical Roots of Inequality in Death and Disease in West-European Port Cities, 1850–1950' (VI.Veni.231F.001).

Programme

All presenters have 20 minutes for their presentation with 10 minutes Q&A.

Location: Melville room, Gilbert Scott Building, Main campus, University of Glasgow. For an interactive map and access information, please see:
https://frontdoor.spa.gla.ac.uk/map/embedded.html#!/?to=1040458

For participants joining online, please use the following Zoom link:
https://uofglasgow.zoom.us/j/88456367146?pwd=nU2VUBWOCg4jWkbjwxXa9aknPHBFB7.1
Meeting ID: 884 5636 7146. Passcode: 785400

9:00-9:30 **Walk-in with coffee/tea**

9:30-9:45 **Welcome and round of introductions**

9:45-10:15 **The Mortality Decline (1841-1913): A Novel Model and Application to Belgian Municipalities**

Philippe Bocquier, Isabelle Devos, Sylvie Gadeyne, Caterina Mauri, and Wouter Ronsijn

To date, international research on the timing or onset of the mortality decline has relied heavily on visual data inspection or the application of arbitrary mortality thresholds. Moreover, the literature has overwhelmingly focused on national figures, national averages, or at best, province-level aggregates. As a result, much of our current understanding of the timing and determinants of mortality decline is based on data that is too spatially aggregated to capture localized processes and contextual factors that likely shape these transitions. In this paper, we introduce a novel piecewise linear model for Belgium that statistically detects the onset of sustained mortality decline and apply it to the 2,461 Belgian municipalities between 1841 and 1913. Unlike conventional approaches, our method objectively identifies when decline began in each locality. We then examine which municipal characteristics were associated with earlier decline, how these turning points varied across Belgium, and what this spatial pattern reveals about the mechanisms of transition. By shifting the focus from regional averages to local trajectories, our approach opens new methodological ground for historical demography.

10:15-10:45 **Clean Water and Mortality in 19th-Century Scotland: A Natural Experiment in Glasgow using the Loch Katrine water works**

Andrew Stevenson, Hanna Jaadla, Lee Williamson and Chris Dibben

Across nineteenth-century Britain, recurrent cholera and enteric fever outbreaks led to major municipal water reforms. Glasgow's Loch Katrine scheme, commissioned in the late 1850s, brought gravity-fed upland water to the city that was rolled out progressively across districts in the city. This staggered timing provides a natural experiment to study how clean water affected water-borne diseases and mortality among adults and children in the city. In this paper we will exploit this setting to implement an interrupted time-series study with a control

comparison. Using digitised cause-of-death civil registration data (from the Scottish Historic Population Platform – SHiPP), we construct age-specific mortality rates for cholera, typhoid/enteric fever, diarrhoeal diseases, and all-cause mortality in Glasgow spanning pre- and post-introduction periods. We model these hazards, accounting for secular trends, seasonality, and estimate both level and slope changes at intervention points aligned with the phased connection of Loch Katrine water. Dundee serves as a comparison data series enabling us to account for contemporaneous co-occurring events common to both cities sanitary and economic changes. The study aims to quantify the magnitude and timing of mortality reductions attributable to cleaner water, disentangling immediate effects on cholera from more gradual effects on enteric and diarrhoeal mortality. The findings will quantify the causal returns from nineteenth-century municipal infrastructure and refine estimates of the population-level benefits of water quality improvements.

10:45-11:15 **Break**

11:15-11:45 **From non-persistent natural to sustainable vaccine immunity: Incidence and mortality from diphtheria in Switzerland from 1877 to 2022**

Katarina Matthes, Sarah-Maria Tuor, Phung Lang, Jan Fehr, Maarten van Wijhe and Kaspar Staub

Diphtheria was a major cause of childhood morbidity and mortality in Switzerland until the mid-20th century. While mortality declined already before vaccination due to improvements in living conditions and medical care, recurrent epidemic waves persisted. The role of vaccination programs introduced in the 1930s and 1940s has not been systematically quantified for Switzerland. We compiled and digitized multiple historical time series on diphtheria morbidity, hospitalizations and mortality in Switzerland from 1877 to 2022, including cantonal incidence data from 1910 onwards. Using Bayesian negative binomial models, we estimated counterfactual incidence and mortality trajectories in the absence of vaccination. We compared observed trends with model predictions, focusing on the early mandatory program in Geneva (from 1933) and on differences between cantons with mandatory versus recommended vaccination following the nationwide recommendation in 1943. Between 1877 and 2022, 35,271 diphtheria deaths were recorded, with 99.5% occurring before widespread vaccination in the 1940s. Incidence and mortality declined in several stages but were punctuated by major epidemic waves around World War I, 1930, and World War II. After the introduction of mandatory vaccination in Geneva, observed incidence and mortality were consistently lower than predicted counterfactual levels. Following the nationwide vaccination recommendation, diphtheria declined rapidly in all cantons, but reductions were earlier and more pronounced in cantons with mandatory vaccination, which also experienced fewer and smaller residual outbreaks. Our findings show that while pre-vaccination declines reduced diphtheria burden, sustained control was only achieved through vaccination. Replacing short-lived natural immunity with durable vaccine-induced immunity was crucial for preventing recurrent epidemics and maintaining long-term population protection.

11:45-13:15 **Lunch Break**

13:15-13:45 **Turning Points in Urban Mortality Decline: Disease-Specific and Socioeconomic Dynamics in Amsterdam, 1856–1899**

Joris Kok, Tim Riswick, Sanne Muurling and Paul Puschmann

This paper examines when and how mortality decline unfolded in Amsterdam between 1856 and 1896 by identifying turning points across diseases, age groups, and sexes, and by assessing how these changes differed along socioeconomic lines. Using individual-level cause-specific mortality data, we first trace moments of accelerated decline to determine which diseases drove shifts in overall mortality patterns. We then link these dynamics to neighborhood-level rental values as a proxy for socioeconomic status, allowing us to explore how mortality improvements varied across urban space and over time. By combining temporal analysis of mortality trajectories with cross-sectional socioeconomic variation, we provide evidence on whether early gains were concentrated among privileged populations or diffused more broadly as disease environments changed. Our findings may highlight the role of specific diseases in shaping turning points in the urban mortality transition and shed light on how social inequalities mediated the timing and extent of mortality convergence in a rapidly changing nineteenth-century city.

13:45-14:15 **Convergence in mortality rates? Evidence from Registration Districts in England and Wales, 1850-1920**

Siqi Qiao, Konstantinos Angelopoulos, Bernard Harris and Rebecca Mancy

We ask whether advancements in health during the period of the mortality transition, 1850-1920, contributed to a reduction in mortality inequalities between Registration Districts in England and Wales, and during which decades this was strongest. We use annual data on cause-specific mortality rates to test whether a higher initial mortality rate was associated with a higher rate of subsequent mortality decline, and assess the dynamic evolution of this relationship over time. Our analysis contributes to research on the dynamic evolution of health inequalities by examining whether advancements in health – taken together – were an equalising force, over and above effects of other factors that may have worked to generate different paths of mortality in different areas. The effects of advancements that had a broader reach across the population, implying that they made a substantial contribution to reducing mortality at the population level, should be observed as declines in mortality rates that were faster in areas with initially higher mortality. By helping us determine the periods during which interventions had an equalising effect, our research thus also contributes to the literature on identifying advancements that constituted important drivers of the mortality transition.

14:15-14:45 **Break**

14:45-15:45 **Roundtable with Alice Reid (University of Cambridge), Alex Trew (University of Glasgow) and Dimitris Christelis (University of Glasgow)**.

Each person in the roundtable has 5-10 minutes to present reflections/ideas on the topic in general and/or presentations, followed by group discussion.

15:45-16:00 **Break**

16:00-17:00 **Brainstorming about ideas for joint projects**

All participants are welcome to join the discussion, but this is optional.

17:00-18:00 **Optional: Walk on campus and/or drinks**