Strengthening Measurement of Multiple Causes of Death and Their Socio-Economic Inequalities in Australia: Leveraging Linked Datasets for Improved Evidence

Introduction

The accurate measurement of mortality, including comprehensive analysis of multiple causes of death (MCOD), are vital components in the development of effective public health policies and interventions. In Australia, like in many other countries, chronic diseases are the leading cause of death and are typified by multiple conditions contributing to death (Kabir et al., 2022). However, current mortality metrics, particularly the use of the underlying cause of death (UCOD), often fail to fully account for the complexities introduced by MCOD, which can lead to incomplete or misleading interpretations of mortality trends (Bishop et al., 2023a; Lopez-Barrios et al., 2023). In this context, it is therefore essential to refine how mortality is measured and reported. Additionally, research has shown that the rate of decline in chronic disease mortality in Australia has slowed in recent years, and one of the key reasons for this slowdown is the widening area-level socio-economic inequalities in chronic disease mortality rates and their associated risk factors, such as obesity and smoking (Adair & Lopez, 2020; Adair & Lopez, 2021). While there has been progress in recent years in the development of metrics to measure MCOD (Bishop et al., 2023a, 2023b), there is a lack of evidence about the extent of both individual- and area-level socio-economic inequalities in the contribution of MCOD to mortality. This research addresses these gaps by leveraging large, integrated datasets to enhance mortality measurement and its socio-economic inequalities in Australia.

Research Objectives

The primary objective of this study is to extend the existing frameworks for mortality measurement by incorporating analysis of MCOD and its socio-economic inequalities in Australia. Specifically, the research aims to:

- apply the multiple cause weighting (MCW) method to quantify the contribution of MCOD in Australia and compare the resulting estimates with those based on the UCOD method,
- leverage data from the Australian Bureau of Statistics (ABS) Person Linked Integrated Data Asset (PLIDA) to measure socio-economic inequalities in mortality from UCOD and MCOD at the area- and individual-level

Data and Methodology

This study utilises data from PLIDA, a linked data asset developed by the ABS. PLIDA uses a Personal Linkage Spine derived from information on health, education, government payments, income, employment, and population data to link a range of datasets at the household/individual and area level, including 2007–23 death registration, 2011, 2016 and

2021 Population Censuses and 2014/15 and 2017/18 National Health Survey (NHS) data (Australian Bureau of Statistics [ABS], 2024). PLIDA is designed to support both government decision-making and academic research by providing a rich, longitudinal view of individual-level data.

Mortality Measurement Approaches

This study draws on the cause of death component of PLIDA to implement two complementary strategies for quantifying mortality: one based on the traditional UCOD method and the other utilising a MCOD framework.

The UCOD approach adheres to international statistical conventions by assigning each death to a single underlying cause, identified according to ICD-10 coding rules defined by the World Health Organization (WHO, 2016). This method forms the basis for national mortality reporting and allows for comparability with official statistics.

In contrast, the MCW method accounts for the full spectrum of causes recorded on the death certificate. Under this framework, 50% of the weight is attributed to the underlying cause, with the remaining 50% evenly distributed across contributing causes (Piffaretti et al., 2016; Bishop et al., 2023b). This method captures the complexity of chronic disease mortality and produces more representative estimates of disease burden.

Age-standardised mortality rates (ASMRs) are calculated under both approaches, using the 2007 Australian standard population for consistency across years and population subgroups.

Analysis of Socio-Economic Inequalities

To assess how mortality outcomes differ across socio-economic strata, this study links death records (2016–2022) with Census-derived indicators of both individual/household and area-level socio-economic position. Analyses are stratified by sex and age group (25–64 years and 65+ years), ensuring demographic comparability.

At the area level, socio-economic status is measured using the Index of Relative Socio-economic Advantage and Disadvantage (IRSAD), a core component of the ABS Socio-Economic Indexes for Areas (SEIFA). IRSAD scores are categorised into both quintiles and deciles to enable detailed exploration of gradients in mortality across areas.

At the individual and household level, the analysis incorporates equivalised household income and highest educational attainment, each grouped into quintiles. These indicators provide a more granular picture of socio-economic status, especially when combined with area-level data.

Inequality is quantified using two complementary indices. The Relative Index of Inequality (RII), estimated via multiplicative Poisson regression, captures the proportional difference in mortality across the socio-economic spectrum. The Slope Index of Inequality (SII), calculated through an additive Poisson model, provides an estimate of the absolute mortality rate gap between the most and least advantaged groups. While SII estimates are fully age-standardised, RII models adjust for age group through covariate inclusion. Both models utilise ridit scores to represent socio-economic rank as a continuous measure.

This dual-level approach offers a robust framework for evaluating how structural disadvantage contributes to disparities in chronic disease mortality across Australia.

Expected Findings

The findings from this study are anticipated to significantly refine the current mortality measurement frameworks. By incorporating insights gained from MCOD analysis, the study expects to:

- Improve the precision of mortality measurement: By accurately accounting for the interplay of MCOD, leading to more reliable data for public health planning.
- Enhance understanding of inequalities in chronic disease mortality and risk factors across socio-economic groups and regions: This research will contribute to knowledge about the inequalities in chronic disease mortality and associated risk factors at both individual and regional levels, and how these inequalities differ by gender and age groups in Australia. This is particularly valuable for the development of public policy responses to the slowdown in mortality decline.

Conclusion

By applying refined mortality measurement techniques and linking rich socio-economic data, this research advances the understanding of mortality patterns and inequalities in Australia. The findings contribute valuable evidence for academics and policymakers alike, enabling more accurate monitoring of population health and the design of targeted interventions to improve health equity.

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