Deaths from non-communicable diseases are over represented in disadvantaged areas

Findings

Background

Deaths data are a vital measure of a population's health providing information on patterns of disease that cause death. Deaths by non-communicable diseases (NCDs) represent an overwhelming majority of all deaths, with the most common conditions being related to cardiovascular and respiratory systems, as well as cancer and diabetes.

Equity gap

There are disparities in NCDs related deaths by socioeconomic status over the majority of age-groups between 2009 and 2019. The greatest difference is for the population aged 30 to 59 years where NCD death rates were around two times higher in the most disadvantaged areas compared to the most advantaged areas of Australia. This difference, and those in other age-groups was prominent across the whole socioeconomic gradient, not just between the most disadvantaged and advantaged groups. This reflects the persistent overrepresentation of NCDs related deaths in lower socioeconomic status groups in the Australian community across all life stages.

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Deaths from non-communicable diseases are over represented in disadvantaged areas

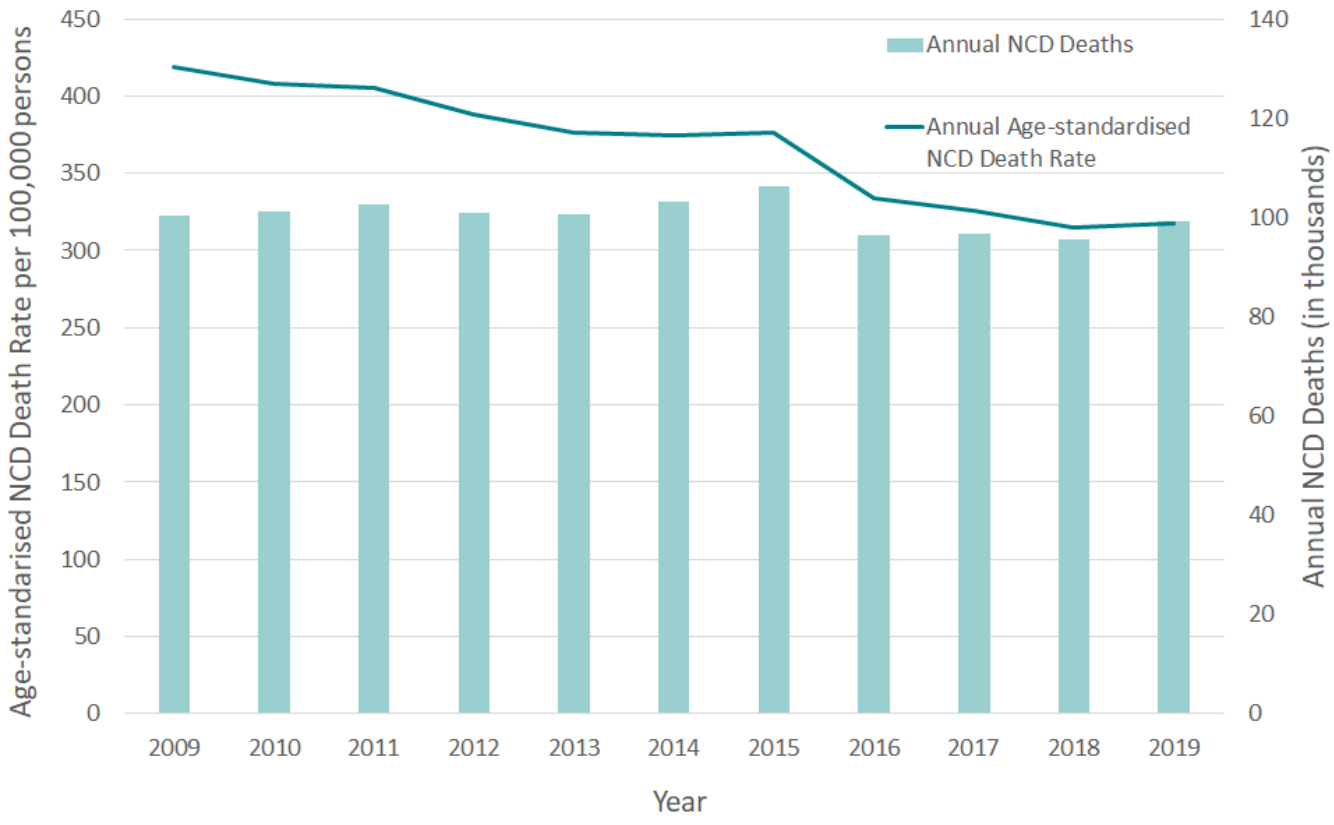
Background

Deaths data are a vital measure of a population's health, and provides information on patterns of diseases that cause death, by population groups and over time. Examining death patterns can help explain differences and changes in health status, evaluate health strategies, and guide planning and policy-making [1].

Each year 71% of all deaths globally are caused by Non-communicable diseases (NCDs), of which over a third are in people between 30 and 69 years of age[1]. NCDs are often described as chronic conditions, with the most common conditions related to the cardiovascular (such as coronary heart disease and stroke) and respiratory (such as chronic obstructive pulmonary disease (COPD)) systems, as well as cancer and diabetes.

In Australia, NCD deaths[1] have been decreasing with the age-standardised NCD death rate dropping from around 420 per 100, 000 persons in 2009 to around 320 per 100, 000 persons in 2019 (Figure 1). During this time period, the annual number of deaths for NCDs have remained fairly constant at 100, 000 deaths per year. While this overall decrease has been favourable, NCD deaths were still at 64% of all-cause deaths in 2019. Furthermore, these broad population averages hide the disproportionate distribution of NCD deaths when analysed by socioeconomic position. It is the aim of this fact sheet to illustrate the differences in socioeconomic inequality in NCD deaths by age-group across the time period, 2009 to 2019.

Figure 1: Age-standardised NCD death rates per 100,000 persons and annual NCD deaths in thousand for the years 2009 to 2019 for Australia



[1] Non-Communicable diseases as defined by the Australian Bureau of Statistics as ICD 10 codes: Cancers: C00-C97, D45-D46, D47.1, D47.3-D47.5; Cardiovascular diseases: I00-I99; Diabetes: E10-E14; Chronic lower respiratory disease: J30-J98.

The data

The Geography used

The geography of analysis is the Australian Bureau of Statistics (ABS) defined 2016 Statistical Area Level 2 under the Australian Statistical Geography Standard (ASGS). This geography represents the residence of the person at the time of death and the corresponding residential population. There are 2,310 SA2 areas covering the whole of Australia [2].

Defining socioeconomic disadvantage across Australia

Socioeconomic disadvantage is defined from the ABS produced Index of Relative Socioeconomic Disadvantage (IRSD). It reflects the average level of disadvantage of the population within an SA2 boundary based on summary attributes of the SA2's economic and social conditions, derived from the 2016 Census of Population and Housing.

To categorise the gradient of disadvantage across Australia a quintile of socioeconomic status classification by SA2 was used. SA2s were ranked based on their IRSD scores and the SA2s were then divided into five groups, with each group comprised of approximately 20% of the total 2016 population in Australia. From this each SA2 was given a quintile value of 1 to 5. Because the IRSD is not calculated every year and a common ranking is needed to make yearly comparisons, the 2016 SA2 quintile ranking provided the basis for comparing socioeconomic disadvantage across years.

Person populations were taken from the Estimated Resident Population (ERP) from the ABS for June 2009 to June 2019 at the SA2 level. The data were broken up into 5-year age groups for age until 84, and one additional category was included for those over 84, the 85+ category. The SA2 quintile ranking category was then applied to each SA2 age-group within each year. Because we used quintiles based on 2016 population for comparison, we checked how consistent this population based ranking was across other years and found that the average rates were fairly consistent across quintiles with the initial 20% break-up (Table 1). The corresponding small standard deviations for each quintile indicated that the percentages did not change substantially over age groups over time within each quintile (Table 1).

Table 1: Average percentage, standard deviation, minimum and maximum population percentages in each 2016 based quintile of socioeconomic disadvantage, 2009 to 2019 (excluding 2016).

Quintile	Average percentage	Standard deviation	Minimum	Maximum
1	20.00	1.12	17.99	22.03
2	19.40	1.58	17.06	21.70
3	19.76	0.39	18.74	20.40
4	20.34	1.45	18.48	22.66
5	20.51	1.39	18.22	22.79

Australian death data, 2009 to 2019

Death data were based on deaths occurring from 2009 to 2019 and were taken from the Causes of Death Unit Record Files supplied by the Australian Coordinating Registry and the Victorian Department of Justice, on behalf of the Registries of Births, Deaths and Marriages and the National Coronial Information System. Deaths were extracted by age, place of residence (SA2) and cause of death. Deaths for the years 2009 to 2015 were concorded from the ABS 2011 Australian Standard Geographical Classification (ASGC) SA2 geography to the 2016 ASGS geography. Residence of death for 2016 to 2019 was based on the 2016 ASGS geography. The SA2 geography was then allocated to the corresponding quintile of socioeconomic disadvantage.

Indicators of socioeconomic inequality

A simple way to assess the degree of socioeconomic inequality is through the rate ratio statistic. The ratio represents the magnitude of variation between directly age-standardised death rates in the most disadvantaged (Quintile 5) and those in the least disadvantaged (Quintile 1) quintile. A rate ratio of 1 indicates that the rate in the most and least disadvantaged quintiles are the same. A rate ratio greater than 1 shows there is a higher rate in the most disadvantaged quintile. However, it is also important, and informative, to note that variations occur across all the quintiles: in many cases there is a social gradient, a variation in the data that runs from top to bottom of the socioeconomic spectrum. To analyse this gradient, a summary statistic called the Gini coefficient can be used to measure the degree of inequality in mortality burden across all quintiles of socioeconomic disadvantage. The coefficient is produced graphically, involving the calculation of the Lorenz curve. Creating the curve requires the plotting of the cumulative percentage of deaths against the cumulative percentage populations across the five quintiles of socioeconomic disadvantage (ranked in terms of increasing disadvantage). Equality in deaths across the quintiles is defined by a plotted 45-degree line, named the line of equality (Figure 2). Points on the line, represent 20% of deaths for 20% of the population for each quintile. Plotting both the Lorenz curve and the line of equality together provides a comparison of inequality with a Lorenz curve closer to the line of equality illustrating more equality. Mathematically, the Gini coefficient can be determined by applying an area under the curve formulae and produces a value between 0 (perfect equality) and 1 (perfect inequality). The example below gives a Gini coefficient of 0.28. Quintile 1 represents around 9% of deaths while Quintile 5 represents 38% of deaths for equivalent populations.

Figure 2: An example illustrating the calculation of the Gini coefficient by using the Lorenz curve and the line of equality.

We calculated the rate ratio between the most and least disadvantaged quintiles for NCD deaths in each of the five-year age intervals for the years 2009 to 2019. To investigate the magnitude of the socioeconomic gradient in relation to NCD deaths we applied the Gini coefficient to the dataset.

Results

The average rate ratio (most disadvantaged quintile's rate divided by the least disadvantaged quintile's rate) from the years 2009 to 2019 (Figure 3) differed by age group, with those aged 0-4 years having a ratio of over 2.6 compared to the 0.9 for those aged 85+. The error bars show the standard deviation of these estimates with large widths particularly for the 0-4 and the 10-14 to 20-24 year age groups. These patterns illustrate a large range in rate ratio values caused by large yearly fluctuations mostly caused by variations in the small numbers of deaths in each quintile for these lower age groups. In comparison, the smallest variation in the rate ratio was in the 85+ years old category which had a large number of deaths occurring consistently in the same quintiles. The range of other rate ratio values was fairly even across other age-groups ranging from 1.5 to 2 indicating that across the majority of age-groups NCD deaths were disproportionally larger in the most disadvantaged areas, sometimes double that of deaths in the most advantaged areas. The small range in the standard deviation bars seen in the age groups 35-39 and onwards indicates that these rate ratio are persistent across the 11 years of analysis.

Figure 3: Average rate ratios by five-year age groups for NCD deaths from 2009 to 2019. Error bars represent the standard deviation of rate ratios for each five-year age group over the 11 years of analysis.

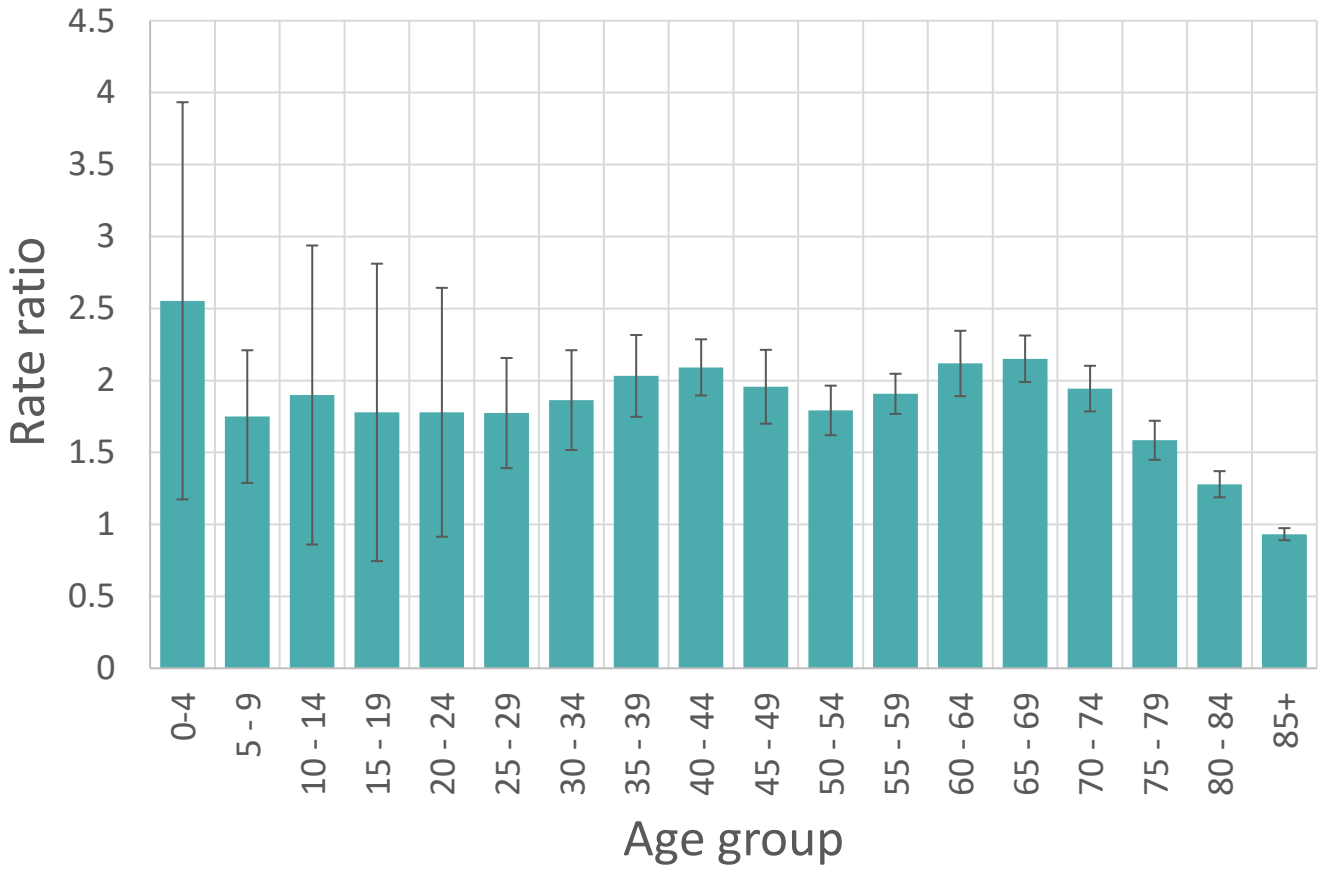
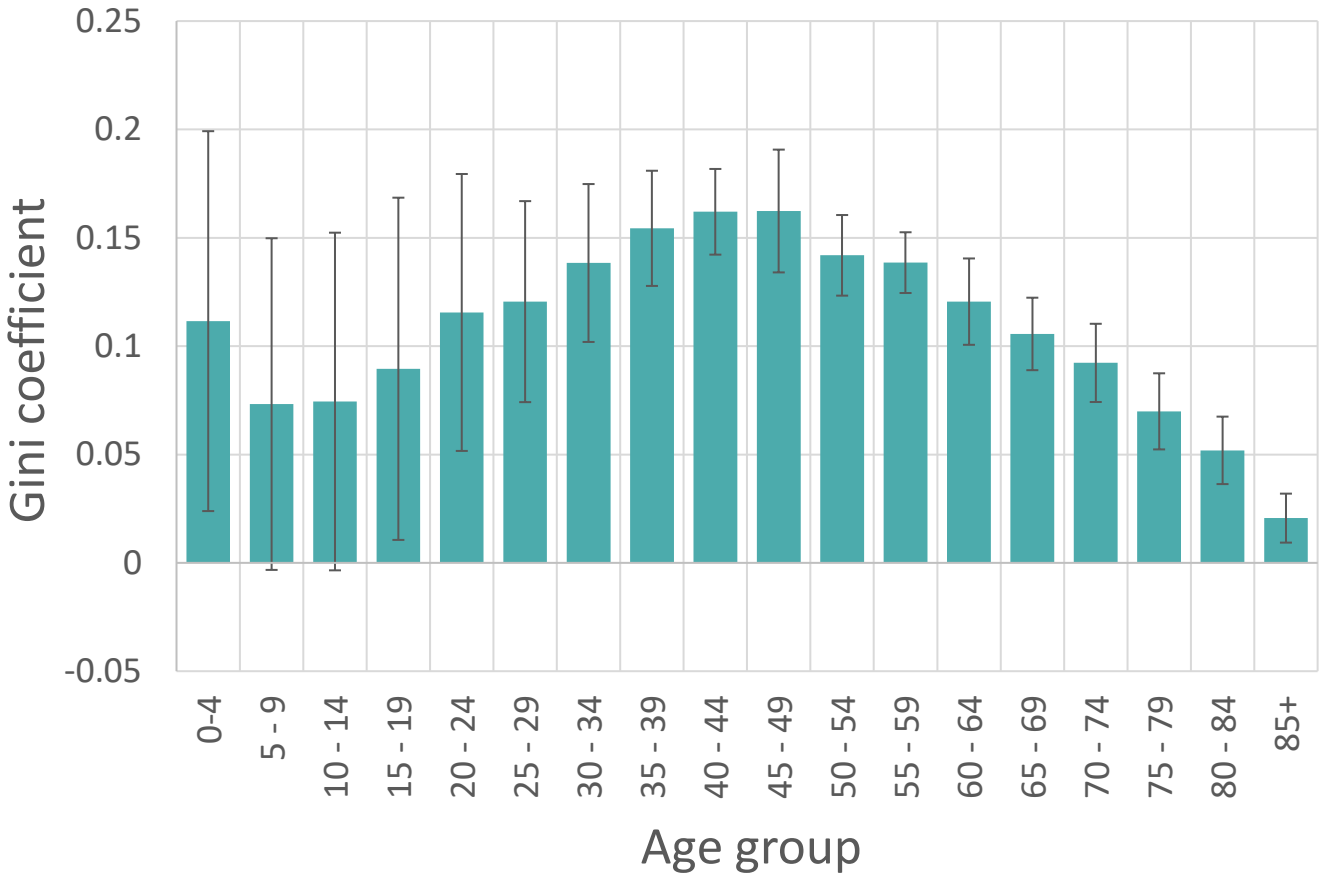


Figure 4 shows that the average Gini coefficient (a measure of inequality) increases from the 5-9 year age group until the 45-49 year age group. This increase indicates an increase in socioeconomic inequality in NCD deaths during this age range. The highest degree of inequality was for the 30-34 to 55-59 year age groups where the coefficient was highest at between 0.14 and 0.16. The standard deviation of the Gini coefficients was highest for the 0-4 to 20-24 year old age groups. This indicates substantial changes in the coefficient over time for these age groups. Once again, the small number of deaths annually within these age group cause fluctuations between the quintiles, causing the coefficient values to change substantially, sometimes negatively (more deaths in most advantaged quintiles than in the

least disadvantaged quintiles). Alternatively, there was smaller fluctuations in the yearly coefficient values in the later age-groups shown by smaller ranges in the standard deviations bars. These Gini coefficient values decline after the 55-59 year age group to near equality (0.02) for the 85+ age group. This decrease, especially in the older age groups, reflects the movement of the older population to residential care homes, many of which are located in more disadvantaged areas.

Figure 4: Gini coefficient values by five-year age groups for NCD deaths from 2009 to 2019. Error bars represent the standard deviation of Gini coefficients for each five-year age group over the 11 years.



Conclusions

Deaths from non-communicable diseases are the major contributor to all-cause deaths in Australia. Their distribution is disproportionately overrepresented in disadvantaged populations, the most significant being in the 30 to 59 year age groups.

References

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