



Socioeconomic variation in absolute cardiovascular disease risk and treatment in the Australian population

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ABSTRACT

Cardiovascular disease (CVD), preventable through appropriate management of absolute CVD risk, disproportionately affects socioeconomically disadvantaged individuals. The aim of this study was to estimate absolute and relative socioeconomic inequalities in absolute CVD risk and treatment in the Australian population using cross-sectional representative data on 4751 people aged 45–74 from the 2011–12 Australian Health Survey. Poisson regression was used to calculate prevalence differences (PD) and ratios (PR) for prior CVD, high 5-year absolute risk of a primary CVD event and guideline-recommended medication use, in relation to socioeconomic position (SEP, measured by education). After adjusting for age and sex, the prevalence of high absolute risk of a primary CVD event among those of low, intermediate and high SEP was 12.6%, 10.9% and 7.7% (PD, low vs. high = 5.0 [95% CI: 2.3, 7.7], PR = 1.6 [1.2, 2.2]) and for prior CVD was 10.7%, 9.1% and 6.7% (PD = 4.0 [1.4, 6.6], PR = 1.6 [1.1, 2.2]). The proportions using preventive medication use among those with high primary risk were 21.3%, 19.5% and 29.4% for low, intermediate and high SEP and for prior CVD, were 37.8%, 35.7% and 17.7% (PD = 20.1 [9.7, 30.5], PR = 2.1 [1.3, 3.5]). Proportions at high primary risk and not using medications among those of low, intermediate and high SEP were 10.6%, 8.8% and 4.7% and with prior CVD and not using medications were 8.5%, 6.3% and 4.1%. Findings indicate substantial potential to prevent CVD and reduce inequalities through appropriate management of high absolute risk in the population.

1. Introduction

Cardiovascular disease (CVD) is the leading cause of death globally and a leading contributor to morbidity (GBD 2016 Causes of Death Collaborators, 2017). In Australia, CVD accounts for 12% of the total expenditure on health care, with estimated costs of \$7.7 billion in 2008–09 (Australian Institute of Health and Welfare, 2014). Approximately 80% of CVD events can be prevented by modifying risk factors to reduce events (Chiuve et al., 2011; Chiuve et al., 2006). In high income countries like Australia the prevalence of modifiable risk factors is known to be disproportionately high in disadvantaged groups, and individuals of low socioeconomic position are more likely to have a CVD event than those of high socioeconomic position (Australian Institute of Health and Welfare, 2011; Backholer et al., 2016; Clark et al., 2009). This inverse association is likely the result of a complex interplay between risk factors, including behavioural and biological factors, across the life-course (Clark et al., 2009), and social determinants of health (Chow et al., 2009).

International guidelines (e.g. (National Institute for Health and Care Excellence, 2014; National Vascular Disease Prevention Alliance, 2012)) recommend an absolute risk approach for the assessment and management of primary CVD risk. Absolute risk is quantified using a validated CVD risk calculator, whereby quantitative data on multiple factors that influence risk, including smoking status, systolic blood pressure, blood lipid levels, and diabetes status, are applied to a person's age- and sex-specific background level of absolute risk to predict an individual's risk of having a CVD event in a given period of time (typically five or ten years) (D'Agostino Sr. et al., 2008). For people who have had a prior CVD event or who are at high absolute risk of primary CVD event (> 15% over 5 years in Australia) lifestyle modifications and treatment with blood pressure- and lipid-lowering therapies are generally recommended, unless contraindicated (National Vascular Disease Prevention Alliance, 2012).

Although the links between socioeconomic position and individual CVD risk factors, morbidity and mortality have been demonstrated by studies internationally (Bagheri et al., 2015a; Davis-Lameloise et al.,

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2013; Ford et al., 2004; Ramsay et al., 2011; Su et al., 2015), there are no studies that have quantified absolute CVD risk in relation to socioeconomic position. Population-level data on variations in absolute CVD risk assessment and management are needed to inform population-level interventions and policies to prevent CVD and address inequalities. This paper aims to estimate the absolute and relative socioeconomic inequalities in absolute CVD risk and treatment of risk in Australia.

2. Methods

2.1. Study population

Details on the data sources have been published previously (Banks et al., 2016). Briefly, we used data from participants in the 2011–12 Australian Bureau of Statistics Australian Health Survey (Australian Bureau of Statistics, 2011–12) aged 45–74 years, and who provided data for the National Health Survey and biomedical data for the National Health Measures Survey, two components of the Australian Health Survey. All those that completed the National Health Measures Survey also completed the National Health Survey. The Australian Health Survey is a nationally representative survey of private households in Australia (~97% coverage). Of the 30,329 participants eligible to participate in the National Health Measures Survey, 11,246 (37%) took part (47% of those aged 45–74 years).

2.2. Outcomes: absolute CVD risk assessment and treatment

The outcomes were prior CVD, high absolute risk of a primary CVD event, and use of preventive medications according to recommendations in national Australian guidelines. Prior CVD was self-reported as having had one or more of: ischaemic heart disease, angina, heart failure, oedema, other heart disease (including atrial fibrillation/flutter), cerebrovascular disease, and diseases of arteries, arterioles and capillaries. People with prior CVD are considered to be at high risk of secondary CVD events. In participants without prior CVD, absolute risk of a primary CVD event over the next five years was estimated using the Australian National Vascular Disease Prevention Alliance risk assessment algorithm (National Vascular Disease Prevention Alliance, 2012). Using this algorithm, some people are considered to be at clinically-determined high risk based on existing risk factors (for example, people with diabetes who are over 60 years old). For all other people, the Framingham CVD risk equation (National Vascular Disease Prevention Alliance, 2012; D'Agostino Sr. et al., 2008) was applied, with five-year risk categorised as low (< 10%), moderate (10–15%) or high (> 15%) (National Vascular Disease Prevention Alliance, 2012). Recommended treatment (according to Australian clinical guidelines (National Vascular Disease Prevention Alliance, 2012)) for individuals at high absolute risk of a primary CVD event was defined as the use of blood pressure- and lipid-lowering medications, as reported in a medications review. For people with prior CVD, recommended treatment also included antithrombotic medication, as per Australian clinical guidelines (Chew et al., 2016; National Heart Foundation of Australia and the Cardiac Society of Australia and New Zealand, 2012; National Heart Foundation of Australia and the Cardiac Society of Australia and New Zealand (Chronic Heart Failure Guidelines Expert Writing Panel), 2011; National Stroke Foundation, 2010). Medications were coded using the World Health Organization Anatomical Therapeutic Chemical (ATC) Classification System (World Health Organization Collaborating Centre for Drug Statistics Methodology, 2015) and included ATC codes: C02, C03, C07, C08 and C09 for blood pressure-lowering medications, ATC code C10 for lipid-lowering medications, and ATC code B01 for antithrombotic medication.

2.3. Main exposure: socioeconomic position

Socioeconomic position was based on educational attainment

ascertained from self-reported highest level of qualification and categorised as: high (university degree); intermediate (certificate, diploma or trade); or low (high school certificate or no qualifications).

2.4. Statistical analysis

The proportions with prior CVD and with low, moderate and high primary CVD risk were calculated, by socioeconomic position. We also summarised the distribution of individual CVD risk factors in those without a prior CVD event by socioeconomic position. We used Poisson regression with robust standard errors (Barros & Hirakata, 2003; Zou, 2004) to quantify absolute and relative inequalities in the prevalence of high absolute risk of primary CVD and of prior CVD, as well as in use of preventive treatments within each of these high risk groups. In the treatment analysis, we used data from the full National Health Survey dataset and included an additional 211 participants who reported having prior CVD and an additional 89 participants who had clinically determined high risk who were previously excluded due to missing biomedical data. Prevalence ratios (PR) were obtained directly from the Poisson regression coefficients, and post-estimation marginal effects were used to estimate the absolute prevalence differences, for each level of educational attainment in relation to the reference group (university degree). The models were adjusted sequentially, first for age and sex, and then additionally for region of residence (major cities, inner regional or other [outer regional and remote/very remote], measured using the Accessibility/Remoteness Index of Australia) and region of birth (Australia/New Zealand or other). We applied weights to the prevalence estimates to account for the sampling strategy and non-response (Australian Bureau of Statistics, 2013). 95% confidence intervals (95% CI) were calculated for all estimates. Analyses were performed using Stata version 13.1 (StataCorp, 2013).

2.5. Sensitivity analyses

We undertook three sensitivity analyses, re-running the main models using alternative measures of socioeconomic position: (1) educational attainment measured using highest year of school completed (year 11/12 or equivalent; year 9/10 or equivalent; year 8 or below); (2) equivalised household income in quartiles; and (3) area-level disadvantage measured using the Index of Relative Socioeconomic Disadvantage (Socio-Economic Indexes for Areas (Australian Bureau of Statistics, 2011)) in population-based quintiles. We also ran a post-hoc analysis to examine whether differences in medication use according to socioeconomic position varied by type of prior CVD.

Ethics approval for the National Health Measures Survey data collection was provided by the Australian Government Department of Health Human Research Ethics Committee (ref: 2/2011), with additional approval, for the current study, by the Australian National University Human Research Ethics Committee (ref: 2014/208).

3. Results

A total of 4751 people were included in the main analysis after excluding participants with missing data on education ($n = 82$, 1.5%) or on any variables needed for assessing absolute CVD risk ($n = 520$, 9.7%). Forty-nine percent of the participants were male and the median age was 59 years (interquartile range: 52–65 years). Overall, 24% of participants had a high socioeconomic position, 37% intermediate, and 38% had low socioeconomic position (Table 1). Compared to people with the highest socioeconomic position, those of the lowest socioeconomic position were more likely to be older, have been born in Australia or New Zealand, or be residing outside major cities (Table 1) and had a greater burden of CVD risk factors (Supplementary Table S1).

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