



Australian adults' behaviours, knowledge and perceptions of risk factors for heart disease: A cross-sectional study

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ABSTRACT

This research aimed to determine Australian adults' perceptions of risk factors for heart disease, self-reported behaviours relating to modifiable risk factors, and knowledge of leading causes of death. This study reports on *HeartWatch* survey data collected between January 2015 and December 2015 in a sample of Australian adults. The setting of the research was Australian communities, with all states and territories represented in the final sample. Participants were Australian adults aged 30–59 years ($n = 8425$), and were representative of the wider Australian population based on key demographic and health characteristics. Half of the sample overall correctly identified *heart disease* as the biggest underlying cause of death of males, and 26% for women. For risk factors for heart disease, respondents most frequently reported; *poor diet* (58.2%, 95%CI 57.0–59.1), *physical inactivity* (49.0%, 95%CI 47.9–50.1) and *smoking* (38.7%, 95%CI 37.7–39.8). A low proportion ($< 10\%$) recognised underlying clinical risk factors for heart disease including *high blood pressure* (6.3%, 95%CI 5.8–6.8) and *dyslipidaemia* (9.8%, 95%CI 9.2–10.5). This study revealed broad misconceptions with regard to the leading cause of death and risk factors for heart disease among Australian men and women. Overall the lack of understanding in all groups suggests the need for a comprehensive national campaign reaching schools and the broad adult population. The health system alone cannot achieve national and international targets for disease prevention without understanding and engagement in the general community.

1. Introduction

In 2015, ischaemic heart disease (IHD) was the leading cause of death for both Australian men and women (Australian Bureau of Statistics, 2016). IHD includes angina, heart attack and other forms of coronary artery disease. The collective term *heart disease* is used to refer to IHD and all other diseases that affect the heart including valve disease, cardiomyopathy, arrhythmia and heart failure. In 2015, there were a total of 29,576 deaths attributed to heart disease in Australia, including 15,427 deaths among men, and 14,149 among women (Australian Bureau of Statistics, 2016). Cardiovascular diseases (CVD) broadly, including all heart, stroke and blood vessel diseases, were the cause of 45,392 deaths of Australians in 2015 (Australian Bureau of Statistics, 2016). The need for awareness of heart and cardiovascular disease and its causes in the Australian community is of critical importance as much is preventable.

Modifiable lifestyle behaviours that contribute to the development

of heart disease include tobacco use, poor diet, overweight/obesity and physical inactivity (World Health Organization, 2013). High levels of alcohol consumption, or single heavy drinking sessions (binge drinking) can cause stress to the heart, arrhythmia and raise blood pressure (World Health Organization, 2012). The clinical risk factors for heart disease include dyslipidaemia (including high cholesterol), high blood pressure, and diabetes. Stress and psychological health are also associated with heart disease, partly through interactions with other risk behaviours, and comorbidity with mental disorders (Stansfeld & Marmot, 2002). There are also genetic risk factors for heart disease. A recent cross-sectional study of over 130,000 Australian General Practitioner records demonstrated that specific sub-groups are more (e.g., diabetics) or less (e.g., women) likely to be screened for CVD risk factors, and $< 2\%$ had all clinical, lifestyle, and other major risk factors recorded. Identifying high risk individuals through clinical practice and enhancing risk factor knowledge are critical factors in the prevention and management of heart disease.

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Current Australian and global public health policy aims to tackle the significant burden of these risk factors and prevent disease. With such population-wide efforts, it is imperative to understand the level of population awareness of heart disease risk factors and to engage the public. Given known inequalities in the burden and prevalence of heart disease (Nichols et al., 2014), it is also of interest whether demographic characteristics such as gender, age and area of residence, in addition to health characteristics, are associated with risk factor awareness.

The present study addressed the following research questions;

1. What do Australian adults report as the leading cause of death for men and women?
2. What clinical, lifestyle, genetic, and psychological factors do Australian adults recognise as increasing their risk of heart disease, and what demographic associations exist?
3. What health characteristics are associated with risk factor awareness of heart disease?

2. Methods

The *HeartWatch* survey was developed by the National Heart Foundation of Australia and this study examines data collected during January 2015 to December 2015. *HeartWatch* is an online survey (except the Northern Territory which was a Computer Assisted Telephone Interview) that has been reported bi-annually since July 2009 among cross-sectional samples of Australian adults aged between 30 and 65 years. The study sample was recruited from an online panel. A purposive non-probability sampling method was used with all panel members qualifying for survey completion, up to quotas for age, gender and area of residence to reflect the wider Australian population based on Australian Demographic Census (Australian Bureau of Statistics, 2017). The survey captures Australian adults' understanding of heart disease and associated risk factors, in addition to health behaviours and existing health conditions. This study received an ethics waiver from the Alfred Health Human Ethics Committee.

2.1. Design

The survey took an average 20–25 min to complete. Participation was voluntary and participants were informed that privacy laws protected the information they provided and responses would be de-identified and treated as strictly confidential. The survey consisted of eight modules, as well as demographic characteristics.

2.2. Participants

This study examined a subset of the total survey sample who participated during 2015 ($n = 12,077$). A total number of 8425 participants aged 30–59 years had complete data available and were included in subsequent analyses. The subset was also representative of the sample as a whole and of the Australian population in age, sex, and area of residence (Australian Bureau of Statistics, 2017).

2.3. Measures

2.3.1. Health status

Participants reported their height (in metres, centimetres, or feet and inches) and weight (in kilograms, pounds, or stones and pounds), allowing calculation of body mass index (BMI) (kg/m^2). Weight status was derived based on World Health Organization criteria whereby a $\text{BMI} > 25 \text{ kg}/\text{m}^2$ is overweight, and equal to or $> 30 \text{ kg}/\text{m}^2$ is obese (World Health Organization, 2015). Participants reported whether they currently smoke, and to report their fruit and vegetable consumption patterns. Fruit and vegetable consumption responses were combined to form an overall variable which indicated whether participants met or did not meet Australian dietary guidelines of two serves or more of fruit

per day, and five serves or more of vegetables per day (National Health and Medical Research Council, 2013).

Participants were asked; 'Have you ever been told by a doctor that you (have)...?' with a range of health outcomes listed including heart disease and diabetes. Medication status was derived from the item 'Are you currently taking medications for...?' with responses; 'High blood pressure', 'High cholesterol', 'Heart disease', and 'Diabetes'. Previous heart-related events were assessed by the item 'In the last five years have you had...?' 'A heart attack', and 'Angina'.

2.3.2. Knowledge and perceptions of heart disease and risk factors

Participants were asked 'What do you believe are the top three causes of death for women/men in Australia, ranking them from one to three, where one is the highest cause of death?', with this item being asked of all participants, for cause of death in women and men separately. Responses were open verbatim. The order of first, second and third listed was captured by the survey software. Participants were also asked 'Based on what you know, what things do you think increase your risk of heart disease?' with responses being open verbatim and multiple responses allowed. Items were aligned with those used in previous population health surveys (e.g., 'What is the leading cause of death of all women?'), perceptions of risk factors for, and strategies to mitigate, heart disease (Mosca et al., 2004)). The items reported here were deemed acceptable surrogates in the absence of accessible, valid and reliable measures of risk factors for heart disease (Gholizadeh et al., 2009).

2.3.3. Demographics

As part of the initial screening module on the survey, participants reported their age, gender, their state and postcode of residence. Participants also reported educational attainment, language spoken at home, and other demographic profile items relating to household and family structure.

2.4. Statistical analysis

All data were analysed using Stata release V.14.1 (Stata Corp., College Station, Texas, USA, 2013). All variables were checked for missing data. Besides weight status (where approximately 10% were missing), there were $< 5\%$ missing values for all other variables and case-wise deletion was used accordingly. Little's Missing Completely At Random test was significant for weight status (Little, 1988). When missing and non-missing weight status data were further analysed with chi-square tests and logistic regression models, a subset of predictor variables (e.g., gender, age, and educational attainment) were found to be significantly associated with missing data for weight status. Case-wise deletion was deemed appropriate as unbiased estimates were expected given the inclusion of predictor variables in final regression models (Allison, 2002), and based on previous recommendations that missing data $< 10\%$ should not be expected to introduce biases (Bennett, 2001).

Descriptive data and participant characteristics were calculated as proportions with 95% confidence intervals. Associations between a range of demographic and health characteristics and each of the respective clinical, lifestyle, genetic and psychological risk factors were estimated using logistic regression models and expressed as odds ratios with 95% confidence intervals. Each risk factor (dependent variable) was examined in separate models with all of the identified predictor variables; gender, age, level of education, area of residence, weight status (overweight/obese compared to normal weight), medication and diagnostic status, and whether the individual had reported experiencing a heart attack or angina in the previous five years. The purpose of these analyses was to determine any differences in level of knowledge pertaining to risk factors for heart disease, based on demographic and health characteristics. In addition, month of survey was included (not reported). Statistical significance was assumed when $p < 0.05$.

Table 1
Demographics and health characteristics of Australian adults participating in *HeartWatch 2015*.

	Males	Females	Total
N (%)	4095 (48.6)	4330 (51.4)	8425 (100.0)
Age group (years) n (%)			
30–39	1112 (27.2)	1372 (31.7)	2484 (29.5)
40–49	1331 (32.5)	1407 (32.5)	2738 (32.5)
50–59	1652 (40.3)	1551 (35.8)	3203 (38.0)
Highest education level n (%)			
Less than year 12	479 (11.7)	591 (13.7)	1070 (12.7)
Completed year 12	1856 (45.3)	1948 (45.0)	3804 (45.2)
Completed tertiary	1760 (43.0)	1791 (41.3)	3551 (42.2)
Language spoken at home n (%)			
English	3305 (80.7)	3622 (83.7)	6927 (82.2)
Other	790 (19.3)	708 (16.3)	1498 (17.8)
Location			
Metro	3131 (76.5)	3153 (72.8)	6284 (74.6)
Regional	964 (23.5)	1177 (27.2)	2141 (25.4)
Health characteristics n (%)			
Overweight/obese	2832 (69.2)	2341 (54.1)	5173 (61.4)
Smokers (yes)	676 (16.5)	601 (13.9)	1277 (15.2)
Meeting fruit and vegetable consumption	236 (5.8)	413 (9.5)	649 (7.7)
Medication for high blood pressure/dyslipidaemia	1035 (25.3)	781 (18.0)	1816 (21.6)
Diagnosed heart disease/diabetes	459 (11.2)	343 (7.9)	802 (9.5)
Heart attack or Angina in last 5 years	170 (4.2)	86 (2.0)	256 (3.0)
Perceived leading causes of death in Australian women (% selected as leading cause)			
Cancer – breast cancer	1559 (38.1)	1376 (31.8)	2935 (34.8)
Cancer (other)	1196 (29.2)	1145 (26.4)	2341 (27.8)
Heart disease/heart attack	789 (19.3)	1424 (32.9)	2213 (26.3)
Other	551 (13.4)	385 (8.9)	936 (11.1)
Perceived leading cause of death in Australian men (% selected as leading cause)			
Heart disease/heart attack	1644 (40.1)	2318 (53.5)	3962 (47.0)
Cancer (other)	1043 (25.5)	924 (21.3)	1967 (23.3)
Cancer – prostate	496 (12.1)	582 (13.4)	1078 (12.8)
Other	912 (22.3)	506 (11.7)	1418 (16.8)

3. Results

Participant characteristics are reported in [Table 1](#) and broadly reflected the wider Australian population based on; age distribution, level of education, language spoken at home, and the proportion residing in metropolitan and regional areas ([Australian Bureau of Statistics, 2017](#)). Of the 8425 participants, a quarter of males were on medication for high blood pressure, dyslipidaemia, heart disease or diabetes, compared to 18% of females. Approximately one tenth had been diagnosed with heart disease or diabetes, with proportions similar for males and females, and 4% of males and 2% of females reported having a heart attack or angina in the previous five years. The health characteristics of this sample resembled those of the wider Australian population based on 2014–15 Health Survey findings ([Australian Bureau of Statistics, 2015](#)).

The most frequently listed cause of death for Australian men was *heart disease, cancer (general)* and *prostate cancer*. For women, the most frequently listed cause of death was *breast cancer, cancer (general)* and *heart disease*. While 47% of the sample overall correctly identified *heart disease* as the leading cause of death of males, there were just 26% who correctly identified *heart disease* as the biggest underlying cause of death for women. [Table 2](#) demonstrates the actual and perceived causes of death among the Australian adult population.

As reported in [Table 3](#), respondents most frequently reported lifestyle risk factors including poor diet (58%), physical inactivity (49%), smoking (39%), and overweight/obesity (31%). Clinical risk factors were least frequently reported risk factors for heart disease overall, with 6% nominating high blood pressure and 10% nominating high cholesterol. [Table 4](#) demonstrates the actual contribution of each risk factor to cardiovascular disease burden in Australia, and the proportion of Australian adults who recognised these risk factors in this study.

Of the known risk factors for heart disease, females were more likely than males to recognise risk factors, except for poor diet, which

appeared to be universally recognised ([Table 5](#)). The oldest age group more frequently individual risk factors, except for poor diet (OR = 0.78, 95%CI = 0.70–0.89, $p < 0.05$). Greater recognition of risk factors was observed in those with the highest-level educational attainment. Participants living in regional areas more frequently recognised overweight/obesity as a risk factor (OR = 1.14, 95%CI = 1.02–1.27, $p < 0.05$) than those in metropolitan areas, but no other differences were observed for area of residence. Participants who were overweight or obese more frequently reported weight status as a risk factor (OR = 1.69, 95%CI = 1.52–1.87, $p < 0.05$), and less frequently reported poor diet (OR = 0.90, 95%CI = 0.82–0.99, $p < 0.05$), smoking (OR = 0.80, 95%CI = 0.73–0.88, $p < 0.05$), and stress (OR = 0.81, 95%CI = 0.70–0.95, $p < 0.05$) compared to normal weight participants.

Those on medication were twice as likely (OR = 1.97, 95%CI = 1.58–2.46, $p < 0.05$) to report blood pressure as a risk factor, compared to those not medicated. Medication was associated with lower likelihood of reporting poor diet (OR = 0.70, 95%CI = 0.62–0.80, $p < 0.05$), and smoking (OR = 0.84, 95%CI = 0.74–0.96, $p < 0.05$), and greater likelihood of reporting overweight/obesity (OR = 1.33, 95%CI = 1.17–1.52, $p < 0.05$). No other significant associations were found for people taking medication or not and their reporting of risk factors.

Being diagnosed with heart disease or diabetes was associated with lower odds of reporting poor diet (OR = 0.83, 95%CI = 0.70–0.98, $p < 0.05$), smoking (OR = 0.76, 95%CI = 0.63–0.91, $p < 0.05$) and overweight/obesity (OR = 0.73, 95%CI = 0.60–0.88, $p < 0.05$), but no other significant differences were observed when compared those who had not reported being diagnosed. Those who reported having a heart attack or angina in the last five years were less likely to report physical inactivity (OR = 0.60, 95%CI = 0.45–0.79, $p < 0.05$) and overweight/obesity (OR = 0.69, 95%CI = 0.50–0.94, $p < 0.05$) as risk factors.

Table 2

Actual (according to Australian Bureau of Statistics *Australia's Leading Causes of Death, 2015* (Australian Bureau of Statistics, 2016), including International Classification of Diseases and Related Health Problems coding (World Health Organization, 2004)) and perceived leading causes of death among Australian adults in *HeartWatch 2015*.

What is the leading cause of death among Australian women?			What is the leading cause of death among Australian men?		
Actual	Male respondents	Female respondents	Actual	Male respondents	Female respondents
	Perceived	Perceived		Perceived	Perceived
1. Ischaemic heart disease (I20–I25)	Cancer – breast cancer (38.1%)	Heart disease/heart attack (32.9%)	1. Ischaemic heart disease (I20–I25)	Heart disease/heart attack (40.1%)	Heart disease/heart attack (53.5%)
2. Dementia and Alzheimer disease (F01, F03, G30)	Cancer (other) (29.2%)	Cancer – breast cancer (31.8%)	2. Cancer of trachea, bronchus, lung (C33–C34)	Cancer (other) (25.5%)	Cancer (other) (21.3%)
3. Cerebrovascular diseases (I60, I69)	Heart disease/heart attack (19.3%)	Cancer (other) (26.4%)	3. Dementia and Alzheimer disease (F01, F03, G30)	Cancer – prostate (12.1%)	Cancer – prostate (13.4%)
4. Chronic lower respiratory diseases (J40–J47)	Other (13.4%)	Other (8.9%)	4. Cerebrovascular diseases (I60, I69)	Other (22.3%)	Other (11.7%)

4. Discussion

4.1. Key findings

Just half of the sample correctly identified heart disease or heart attack as the leading cause of death among men, and the greatest proportion believed that breast cancer is the leading cause of death among women. A quarter correctly identified heart disease as the leading cause of death among women. It appears there are misconceptions of the proportion of deaths attributed specifically to heart disease among Australian adults. This may be due, in part, to the fact that cause of death varies with age. High awareness of breast cancer as a leading cause of death for Australian women reflects effective cancer awareness campaigns and should be commended. While gender differences in health literacy has been previously reported (Stroebele et al., 2011; Berkman et al., 2011; Manierre, 2015), the findings here warrant further investigation into misconceptions of health and potential behavioural and subsequent health outcomes among Australian adult men and women. For example, do beliefs surrounding leading causes of death among women lead to greater engagement in protective factors relating to such beliefs?

The finding that only a small proportion of the Australian public recognise clinical risk factors for heart disease is an important public health finding. The Australian Burden of Disease study (2011) found that while physical inactivity and poor diet were important attributable risk factors for the burden of cardiovascular diseases, one third (32%) was attributable to high blood pressure, and 16% to high cholesterol (Australian Institute of Health and Welfare, 2016). While limitations exist in interpreting independent contributions given risk factors are not mutually exclusive, the low awareness of clinical risk factors found in this study is nonetheless concerning. While onset of heart disease may occur at an older age, risk factors that predispose to the condition

Table 3

Proportion of selected risk factors for heart disease among Australian adults in *HeartWatch 2015*.

	Males	Females	Total	p
Clinical % selected (95%CI)				
High cholesterol	7.7 (6.9–8.5)	11.8 (10.9–12.8)	9.8 (9.2–10.5)	p < 0.000
High blood pressure	4.3 (3.8–5.0)	8.2 (7.4–9.0)	6.3 (5.8–6.8)	p < 0.000
Genetic % selected (95%CI)				
Hereditary heart problems	13.7 (12.6–14.7)	22.7 (21.5–24.0)	18.3 (17.5–19.1)	p < 0.000
Lifestyle % selected (95%CI)				
Poor diet	57.0 (55.5–58.5)	59.0 (57.6–60.5)	58.1 (57.0–59.1)	NS
Physical inactivity	45.6 (44.1–47.1)	52.2 (50.7–53.7)	49.0 (47.9–50.1)	p < 0.000
Smoking	36.8 (35.4–38.3)	40.6 (39.1–42.0)	38.7 (37.7–39.8)	p < 0.05
Overweight/obesity	25.3 (23.9–26.6)	35.7 (34.3–37.1)	30.6 (29.6–31.6)	p < 0.05
Alcohol consumption	11.7 (10.7–12.7)	10.3 (9.4–11.1)	10.9 (10.3–11.6)	p < 0.05
Psychological % selected (95%CI)				
Stress	8.9 (8.1–9.9)	10.6 (9.8–11.6)	9.8 (9.2–10.5)	p < 0.01

Table 4

Actual leading contributor to burden of cardiovascular disease based on Australian Burden of Disease study (2011) (Australian Institute of Health and Welfare, 2016) and perceived leading contributor to heart disease among Australian adult participants in *HeartWatch 2015*.

Actual leading contributor to burden of CVD in Australia	Perceived contributors to burden of heart disease in Australia (ordered by proportion recognised)
1. High blood pressure	1. Poor diet (58.1%)
2. Physical inactivity	2. Physical inactivity (49.0%)
3. High body mass	3. Smoking (38.7%)
4. High cholesterol	4. Overweight/obesity (30.6%)
5. Tobacco use	5. Hereditary heart problems (18.3%)
6. Diet low in fruit	6. Alcohol consumption (10.9%)
7. Diet low in vegetables	7. High cholesterol (9.8%)
8. Alcohol use	8. Stress (9.8%)
9. Air pollution	9. High blood pressure (6.3%)

may be present decades prior and public health and prevention measures will not be successful without awareness from an early age.

Exacerbating this was the finding that there were little differences in awareness of clinical risk factors in those who had and had not been diagnosed with heart disease or diabetes, and those who had a heart attack or angina the last 5 years. Those reporting these health conditions might be expected to have greater knowledge given their health status, however this assumption was not supported by the findings of this study. At face value those at high risk who needed an understanding of their risk were equally or less knowledgeable than the general population.

To the authors' knowledge this is the first comprehensive evaluation of population-level representations of health beliefs surrounding cause of death among Australians, and awareness of specific risk factors for heart disease. Previous studies have demonstrated low levels of

Table 5Logistic regression (odds ratio) for awareness of risk factors in *HeartWatch* 2015 for heart disease demographic and health predictor variables, adjusted for month of survey (not reported).

Model #	DV	Gender ^a	Age (years)		Level of education		Area of residence ^d	Weight status ^e	Med ^f	Diag ^g	Heart attack ^h
			40–49 ^b	50–59 ^b	> Year 12 ^c	Tertiary ^c					
		OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)	OR (95%CI)
<i>Clinical</i>											
1	Choles	1.66 (1.43–1.93)*	1.36 (1.12–1.66)*	1.79 (1.48–2.18)*	1.19 (0.92–1.53)	1.79 (1.39–2.30)*	0.91 (0.77–1.09)	0.89 (0.77–1.04)	1.10 (0.90–1.35)	0.93 (0.70–1.24)	0.92 (0.58–1.47)
2	BP	2.20 (1.82–2.66)*	1.25 (0.97–1.62)	1.81 (1.42–2.30)*	1.32 (0.97–1.79)	1.94 (1.42–2.64)*	0.93 (0.75–1.15)	1.20 (0.99–1.46)	1.97 (1.58–2.46)*	0.73 (0.52–1.01)	0.81 (0.46–1.44)
<i>Genetic</i>											
3	Hered	1.92 (1.71–2.16)*	1.24 (1.07–1.43)*	1.40 (1.20–1.62)*	1.72 (1.39–2.13)*	2.68 (2.16–3.22)*	1.04 (0.92–1.19)	0.99 (0.88–1.12)	1.04 (0.89–1.23)	0.89 (0.70–1.11)	0.85 (0.59–1.24)
<i>Lifestyle</i>											
4	Diet	1.02 (0.93–1.11)	0.94 (0.84–1.06)	0.78 (0.70–0.89)*	1.27 (1.10–1.46)*	1.10 (0.95–1.27)	1.00 (0.91–1.11)	0.90 (0.82–0.99)*	0.70 (0.62–0.80)*	0.82 (0.70–0.98)*	0.82 (0.63–1.07)
5	PA	1.31 (1.20–1.43)*	1.07 (0.96–1.19)	1.13 (1.01–1.26)*	1.50 (1.30–1.73)*	1.62 (1.40–1.87)*	1.00 (0.91–1.11)	1.05 (0.96–1.15)	0.95 (0.84–1.08)	0.88 (0.74–1.04)	0.60 (0.45–0.79)*
6	Smoke	1.12 (1.03–1.23)*	1.34 (1.19–1.50)*	1.36 (1.21–1.52)*	1.11 (0.97–1.28)	0.99 (0.86–1.15)	1.04 (0.94–1.15)	0.80 (0.73–0.88)*	0.84 (0.74–0.96)*	0.76 (0.63–0.91)*	1.04 (0.78–1.37)
7	Ov/Ob	1.85 (1.67–2.03)*	1.15 (1.01–1.30)*	1.57 (1.38–1.78)*	1.24 (1.06–1.45)*	1.43 (1.22–1.67)*	1.14 (1.02–1.27)*	1.69 (1.52–1.87)*	1.33 (1.17–1.52)*	0.73 (0.60–0.88)*	0.69 (0.50–0.94)*
8	Alcoh	0.84 (0.73–0.97)*	1.03 (0.86–1.23)	1.06 (0.89–1.27)	1.22 (0.97–1.53)	1.04 (0.82–1.32)	0.91 (0.78–1.08)	0.87 (0.75–1.01)	0.98 (0.80–1.19)	0.89 (0.68–1.18)	0.93 (0.60–1.44)
<i>Psychological</i>											
9	Stress	1.21 (1.04–1.40)*	1.43 (1.19–1.73)*	1.41 (1.16–1.71)*	1.42 (1.10–1.84)*	1.65 (1.27–2.15)*	0.85 (0.71–1.01)	0.81 (0.70–0.95)*	0.92 (0.75–1.14)	0.91 (0.68–1.23)	1.31 (0.85–1.99)

DV, dependent variable (risk factor identified compared to not identified); Choles, cholesterol; BP, blood pressure; Hered, hereditary; Diet, poor diet; PA, physical inactivity; Smoke, smoking; Ov/Ob, overweight/obesity; Alcoh, alcohol.

* $p < 0.05$.

^a Females compared to males.

^b Compared to 30–39 year age group.

^c Compared to those who did not complete Year 12 (secondary education).

^d Regional compared to Metropolitan.

^e Overweight/obese compared to normal weight.

^f Reported taking medication for high blood pressure or high cholesterol compared to not taking medication.

^g Reported being diagnosed with heart disease or diabetes compared to not having a diagnosis.

^h Experienced a previous heart attack or angina compared to not experiencing, in the previous 5 years.

awareness of risk factors in other countries of similar economic profile to Australia (Mosca et al., 2004; Sanderson et al., 2009), among specific Australian sub-populations (Gholizadeh et al., 2009), and for other health conditions such as cancer risk awareness (MacTiernan et al., 2014; Ryan et al., 2015; Redeker et al., 2009).

4.2. Strengths and limitations

The recruitment method in this study was likely to have led to respondent bias in that participants were individuals who were interested in participating in surveys in exchange for payment. Furthermore, due to the purposive sampling technique used it is possible that unmeasured factors may have led to selection bias, and the extent to which this sample are truly representative of the wider population is unknown. In addition, this study did not capture information on non-responders, and this may have led to additional bias. Although several key factors were included as covariates, it is possible that residual confounding occurred from omitted factors. This study was also limited by factors typical to cross-sectional self-report survey design. These include; conclusions are not possible based on causality, findings are subject to response and social desirability bias. Furthermore, information bias may have occurred as a result of respondent misunderstanding with respect to heart disease items and this may have influenced response outcomes. Findings are, ultimately, dependent on the subjective perceptions of participants relating to heart disease and leading causes of death and may have been vulnerable to reliability and validity issues. Despite these limitations, the use of online survey data in health

research is pragmatic in capitalising on existing data sources and has previously demonstrated good reliability and validity (Pollard, 2002). While the *HeartWatch* survey was developed for the specific purpose of informing National Heart Foundation of Australia on the level of understanding in the general community, and limited by the non-probabilistic sampling technique, it is expected that findings hold important public health implications.

It has previously been demonstrated that there are biases in self-reported health behaviours. For example, individuals tend to under-report weight (Ezzati et al., 2006) and alcohol intake (Stockwell et al., 2004) and over-report physical activity (Adams et al., 2005), and this may have impacted upon findings pertaining to typical health behaviours of the study sample. However if indeed this sample had higher levels of overweight/obesity, did less physical activity, and drank more alcohol than they reported then the disparity between their understanding of their risk and their health status, suggested by previous studies (Ezzati et al., 2006; Stockwell et al., 2004; Adams et al., 2005), may be even greater than we report. An area for future research is whether level of knowledge significantly predicts behavioural action and which aspects of health are indeed motivating for action. Building on the current findings will provide more comprehensive public health messaging to ultimately improve health outcomes.

4.3. Implications for policy and practice

Significant implications for practice emerged from this study. It is clear that while lifestyle factors are most readily recognised, efforts to

improve awareness of clinical risk factors for heart disease are needed. This is critical given the large proportion of burden attributable to high blood pressure, in particular, in the Australian population. The finding of little differences between those who reported receiving medication, who have been diagnosed, or had a heart attack or angina in the preceding 5 years, and those who did not report such characteristics, is concerning. In a previous study we found that the availability of a practice nurse was a significant factor in achieving blood pressure targets in primary practice suggesting that busy general practitioners need additional support in helping their patients understand the need for achieving targets for risk factors (Carrington et al., 2015). Finally, lack of awareness of the role of heart disease in population health have broader political implications through influencing funding decisions that reflect perceptions of importance in the community.

5. Conclusion

Heart disease as the leading cause of death for Australian men and women is largely misunderstood and there exists a need for population-wide campaigns. The link between risk factors as precursors to disease needs to be promoted, as opposed to high blood pressure and cholesterol being an end, treatable, result. Improvements in recognition of heart disease as the leading cause of death is needed. Overall the lack of understanding in all groups suggests the need for a comprehensive national campaign reaching schools and the broad adult population. The health system alone cannot achieve national and international targets for disease prevention without understanding and engagement in the general community.

Transparency document

The [Transparency document](#) associated with this article can be found, in online version.

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