1-1-2002

Risk factors for coronary heart disease and mediation by socio-economic status : An analysis of the 1995 National Health Survey

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USE OF THESIS

Running Head: SOCIOECONOMIC STATUS AND CHD

Risk factors for Coronary Heart Disease and Mediation by Socio-economic Status: An analysis of the 1995 National Health Survey

by

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A Thesis Submitted in Partial Fulfillment of the Requirements for the Award of

Master of Health Science (Generic)

Faculty of Communications, Health and Science

Edith Cowan University

Date of Submission: 31 July 2002

Abstract

As the leading cause of death and disease in Australia, Coronary Heart Disease (CHD) places a significant burden on society. There are many lifestyle factors that are known to increase the risk of CHD. This study looks at both risk factors and protective factors of CHD. Research also shows CHD prevalence to be predicted by socio-economic status (SES) variables. This study aims to identify the extent to which risk and protective factors predict CHD prevalence in an Australian National survey and whether the association between risk factors and CHD is confounded by SES variables.

This study used data from the 1995 National Health Survey (NHS/1995) to evaluate known risk factors as well as the mediating effect of SES factors. Risk factors included regular cigarette smoking, physical activity and alcohol consumption. SES variables are education, income, occupation, and an index of socio-economic disadvantage based on residence. Two dependent variables for CHD used in the analysis are the first health condition reported in medical consultation and the reported use of Heart Disease / Blood Pressure (HD/BP) medications.

The results indicated that ex-smokers were more likely to report CHD than those who had never smoked and those who were current smokers. Those who engaged in regular exercise were less likely to report CHD. There were no conclusive results for alcohol consumption. While income and SEIFA index, a measure of SES of residential areas, are associated with CHD prevalence, these associations are independent of the risk and protective factor associations. There is no evidence from this study that SES variables

confound the effects of known risk and protective factors. The implications of these results are discussed.

Declaration

I certify that this thesis does not, to the best of my knowledge and belief:

(i) Incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher education;

(ii) contain any material previously published or written by another person except where due reference is made in the text; or

(iii) contain any defamatory material.

[redacted]

Natalie Sherriffs

Acknowledgements

I would sincerely like to thank my supervisor David Ryder for his constant support, flexibility, patience and expertise throughout the entire process of my research. With his constant encouragement I have been able to complete my thesis. I would also like to thank David for the statistical support he gave me during my analysis of data.

I would like to dedicate this thesis to my family. I would like to thank them for their support and continual encouragement through the entirety of my thesis.

To Kristie and Adam, thank-you for helping out at the Western Australian end to ensure that my thesis could get handed in.

To my husband Jonathan, thank-you for your patience and belief in me.

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CHAPTER 1: REVIEW OF LITERATURE

1.1 *THE IMPORTANCE OF STUDYING CORONARY HEART DISEASE*

Coronary Heart Disease (CHD) is a major cause of morbidity and mortality. It was responsible for about 80 Australians dying every day in 1994 (National Heart Foundation, 1999a) and for 23% of all deaths in 1997 (Health Department of WA, 1999). CHD is the leading cause of the burden of disease in Australia (Mathers, Vos & Stevenson, 1999; Australian Institute of Health and Welfare (AIHW), 2000). During 1995-96 an estimated $3300 million was spent on health care relating to all diseases of the circulatory system, with an estimated $1100 million in indirect costs (Donovan, 1995) as almost two thirds of coronary events did not result in death (AIHW, 2000). In 1995-96 there were an estimated 19,910 coronary events in the 35-69 years age group in Australia (AIHW, 2000). In a financial context, mortality and morbidity in the working age group places an increased pressure on the economy (Lai & Hardy, 1999). As average life expectancy is increasing, this places further pressure on Government budgets (Mathers et al, 1999).

The incidence of CHD has been declining since 1968 when cardiovascular diseases were at their peak (Donovan, 1995). The steady decline in CHD may be due to improvements in medicine and the use of public health campaigns (Health Department of WA, 1999). Between 1989 and 2000 CHD rates in Australia fell at an average rate of 4.8% for males and 4.7% for females per year (Australian Institute of Health and Welfare (AIHW), 2002). The cost of CHD is estimated to increase to $95.2 million in Australia by the end of 2014 (Mui, 2000).

In summary, CHD is a significant and preventable health care event that impacts extensively on the health and well being of the population and on the cost of health care for that population.

1.2 RISK FACTORS

The risk factors for CHD have been well documented. Major risk factors for CHD are high alcohol consumption (Mathers et al, 1999), low fitness (Paneth & Susser, 1995; Blair, Kampert, Kohl, Barlow, Macera, Paffenbarger & Gibbons, 1996) and cigarette smoking (Donovan, 1995; Paneth & Susser, 1995; Blair et al., 1996; Blane, Hart, Smith, Gillis, Hole, & Hawthorne, 1996; & Marmot et al., 1999). 42% of men and 35% of women in Australia have at least one risk factor with 8% of males and 5% of females having 2 or more risk factors (Donovan, 1995), with mortality from CHD being four times higher for men than women (Kmietowicz, 1999).

CHD risk factors are major contributors to the overall burden of disease in Australia (Mathers, Vos, Stevenson & Begg, 2000). The number of healthy years of life lost due to either premature death or disability for all causes depends upon the specific risk factor involved (Mathers et al., 1999). Cigarette smoking provides the largest burden of disease, with 10% of the total, followed by physical inactivity (7%). High risk alcohol consumption adds 4.9% to the total burden of disease, however this is reduced by the benefits that moderate alcohol consumption provides to cardiovascular disease to between 2.2% and 2.1% of the total burden of disease (Mathers et al., 2000).

1.2.1 SMOKING CIGARETTES

One of the strongest predictors of CHD is cigarette smoking (Hill, 1990; McArdle, Katch & Katch, 1991). The majority of preventable deaths in Australia are caused by cigarette smoking (Norton, 1985) which is regarded as the most modifiable risk factor for CHD (Prescott, Hippe, Schnohr, Hein & Vestbo, 1998). Mortality, as a result of CHD, over the past several decades can be attributed to the high number of young adults smoking cigarettes (Liu, Peto, Chen, Boreham, Wu, Li, Campbell & Chen, 1998), with 31.4% of all 20-29 year olds being regular smokers (AIHW, 1999). The number of regular smokers decreases as age increases, and therefore the number of ex-smokers will increase as age increases (AIHW, 1999). Approximately 25% of Australian adults regularly smoke cigarettes (Dupen, Bauman & Lin, 1999) causing an estimated 18,000 deaths in 1998 (AIHW, 1999).

The risk of developing CHD increases by two to three times for smokers than for non-smokers (Borushek & Borushek, 1981; Norton, 1985; Syme & Guralink, 1987; Taylor, 1991; McArdle et al., 1991; Paffenbarger, Hyde, Wing, Jung & Kampert, 1993). Smoking is responsible for the build-up of plaque on artery walls, coronary thrombosis (Grundy, 1999) and vasoconstriction of the blood vessels (Dargie & McMurray, 1994). The level of High Density Lipoproteins (HDL) cholesterol is lower in smokers compared with non-smokers, which also increases the risk of CHD (Hill, 1990; McArdle et al., 1993).

1.2.2 PHYSICAL INACTIVITY

Physical inactivity is an important risk factor for cardiovascular disease (Dupen et al., 1999). One in four American adults do not participate in regular physical activity (National Institute of Health (NIH) Consensus Conference, 1996) and in Australia it has been estimated that 50% of Australian adults do not participate in physical activity (Dupen et al., 1999).

The morbidity and mortality of many chronic diseases has been inversely associated with physical activity (Blair, Kohl, Paffenbarger, Clark, Cooper & Gibbons, 1989) and is a major independent risk factor for CHD (Livengood, Kaspersen, Koplan & Blair, 1993; Fentem, 1994; Dupen et al., 1999). In comparison to physically active people, the risk of CHD for a sedentary person is higher by between 36% and 50% (Livengood et al., 1993; Paffenbarger et al., 1993; National Heart Foundation, 1999a).

Physically inactive people also have a higher rate of obesity, which is an independent risk factor for CHD in itself (Powell, 1990).

1.2.3 ALCOHOL

Australia is ranked 13th in the world for the amount of alcohol consumed each year (Baum, 1998). Excessive alcohol consumption may increase the risk of high blood pressure (National Health & Medical Research Council (NHMRC), 2000), CHD and death

(Single, Ashley, Bondy, Rankin & Rehm, 1999). Individuals who consume more than 5 alcoholic beverages per day increase their risk of sudden cardiac death. More than 90% of all sudden cardiac deaths are caused by CHD (Albert, Manson, Cook, Ajani, Gaziano & Hennekens, 1999).

Low risk alcohol consumption may affect the circulation of blood around the body, by affecting heart rate and the functioning of the heart, and blood pressure (NHMRC, 2001; Friedman, 1998). The consumption of high levels of alcohol is known to negatively affect blood pressure, increasing an individual's risk of heart disease (NHMRC, 2001). Abstaining from alcohol consumption increases the risk of CHD when compared to low to moderate alcohol intake, though high levels of alcohol consumption leads to an even greater risk of CHD than both abstainers and low to moderate alcohol consumption (Ryder et al, 2001).

High risk alcohol consumption has been associated with cardiomyopathy, heart arrhythmia (Dargie & McMurray, 1994; Zakari, 1997; Klatsky, 1999; NHMRC, 2000), hypertension (Zakari, 1997; Klatsky, 1999; NHMRC, 2000), a decrease in HDL cholesterol, an increased risk of stroke (Zakari, 1997), shortness of breath and cardiac failure (NHMRC, 2000).

The risks associated with alcohol are different for males and females. Recent guidelines suggested by the NHMRC suggest that males should not exceed drinking 4 standard drinks per day (equivalent to 40 grams of alcohol per day), not exceeding 28 standard drinks in a week, with no more than 6 standard drinks consumed in one day. The guidelines for alcohol consumption for females indicated that females should not exceed 2 standard drinks per day (equivalent to 20 grams of alcohol per day), consuming no more than 14 standard drinks in one week, no exceeding 4 standard drinks in any one day. The NHMRC guidelines also recommend one or two alcohol free days per week for both males and females (NHMRC, 2001).

1.3 PROTECTIVE FACTORS

Protecting against CHD can occur through lifestyle changes. Cessation of smoking, participating in moderate physical activity and consuming moderate amounts of alcohol are all lifestyle changes that can decrease the risk of CHD (Fentem, 1994; NHMRC, 2000).

1.3.1 CEASING SMOKING

The risk of CHD decreases towards the level of risk of a non-smoker if a person quits smoking (Borushek & Borushek, 1981; Norton, 1985; Taylor, 1991) and therefore ceasing smoking is considered a protective factor against CHD. Prescott et al. (1998) reported that the risk of myocardial infarction reduced by 50% within the first year of a smoker quitting (Prescott et al., 1998). A study by Paffenbarger et al (1993) found the risk of CHD decreased by 44% in males who ceased smoking, in comparison to males who continue to smoker (Paffenbarger et al., 1993).

1.3.2 PHYSICAL ACTIVITY

Men and women experience lower mortality when they participate in regular physical activity (McCarthy, 1999; Sherman, D'Agostino, Silbershatz & Kannel 1999). Participation in regular physical activity has many lasting health benefits (Bauman & Smith, 2000) and has been found to play an important role in protection from CHD (Hill, 1990). Men who participate in moderate to vigorous physical activity have a 41% lower risk of CHD than men who do not participate in physical activity (Paffenbarger et al., 1993).

Regular physical activity strengthens the heart muscle (Norton, 1985; Memmler, Cohen & Wood, 1992; Morris & Hardman, 1997), decreases blood pressure (Dargie & McMurray, 1994; NIH Consensus Conference, 1996; Morris & Hardman, 1997) and reduces the risk from cholesterol (Norton, 1985; Hill, 1990; Fentem, 1994; Morris & Hardman, 1997) by increasing HDL's (Dupen et al., 1999) and decreasing the amount of low density lipoproteins (LDL) (NIH Consensus Conference, 1996; Halbert, Silagy, Finucane, Withers & Hamdorf, 2000). Other cardiac health benefits associated with regular physical activity are that the electrical stability of the heart is maintained and the risk of cardiac arrhythmia is decreased (Dargie & McMurray, 1994). Physical activity is also known to positively affect circulation within the heart (Memmler et al., 1992).

Physical activity plays a role in reducing the risk of CHD from other known risk factors. Regular physical activity plays a vital role in the maintenance of a healthy body weight (Norton, 1985; Hill, 1990; Dargie & McMurray, 1994; Fentem, 1994; NIH Consensus Conference, 1996; Morris & Hardman, 1997; Dupen et al., 1999). Obesity is a known risk factor for CHD and physical activity favourably affects obesity (Powell, 1990). An individual is also less likely to smoke if they participate in regular physical activity (Hill, 1990).

1.3.3 ALCOHOL

Moderate alcohol consumption of 1-2 standard alcoholic drinks per day (NHMRC, 2001) for males over the age of 40 and for females over 45 years of age provides protection against CHD (Zakari, 1997; Single et al., 1999; NHMRC, 2000). The pattern of drinking also influences the beneficial effects of alcohol (Single et al., 1999). Daily moderate alcohol consumption has different health consequences compared with weekly alcohol consumption levels which have been averaged to become a daily alcohol consumption level (Klatsky, 1999). For example, one drink per day over 7 days may be protective whereas seven drinks on one day and no alcohol on the other 6 days is not, even though the average amount consumed is the same.

Protection against CHD by alcohol consumption may be limited to certain populations (Single et al., 1999). Individuals with other CHD risk factors, and in particular people who have already been diagnosed with CHD benefit the most through the protective effect of alcohol (NHMRC, 2000).

Previous research for males shows that consumption of 1-2 standard drinks per day decreases mortality by 20-25% (Hart, Davey-Smith, Hole & Hawthorne, 1999), and consumption of 2-4 standard drinks per day reduces risk of sudden cardiac death by 60%. In addition, consumption of 5-6 drinks per week reduces the risk of sudden cardiac death by 79% in comparison to other males who abstain from drinking any alcohol (Albert et al., 1999). Previous research for females indicates that females who consume any amount of alcohol have a 20% decreased risk of CHD compared with female abstainers. Alcohol consumption between half and two and a half standard drinks per day for females decreases the risk of CHD by 40% (Garg, Wagener & Madans, 1993).

It is also known that it is alcohol that protects against CHD rather than other components in alcoholic beverages (Single et al, 1999) as it increases the amount of HDL cholesterol (Rimm, Klatsky, Grobbee & Stampfer, 1996; Zakari, 1997) and protects against atherosclerosis (degenerative changes in arteries) (Zakari, 1997).

1.4 SOCIO-ECONOMIC STATUS

Individuals who have low socio-economic status (SES) have twice the risk of premature mortality than those with high SES, as those of low SES characteristically have a greater number of lifestyle risk factors (Baum, 1998).

There are numerous ways in which SES can affect health (Paneth & Susser, 1995). For example, it has been suggested that an important determinant of population mortality is income inequality (Davey-Smith, 1996), as individuals with lower incomes report more injury and illness than more highly paid individuals (Baum, 1998). Those in less skilled occupations report the highest sickness absence (North, Syme, Feeney, Head, Shipley & Marmot, 1993). The relationship existing between health and SES is linear, with poorer health being associated with lower SES (Baum, 1998).

SES can be measured by education level, occupation, income and residential area of social disadvantage (Pekkanen, Tuomilehto, Uutela, Vartiainen & Nissinen, 1995; Baum, 1998; Osler, Gerdes, Davidson, Brϕnnum-Hansen, Madsen, Jϕrgensen, & Schroll, 2000). As a measure of SES, education plays an important role because it assists in the determination of future employment and increases knowledge base (Baum, 1998).

Education level has been identified in numerous studies to be related to smoking prevalence and physical activity level (Choinierè et al, 2000; Iribarren et al, 1997; Luepker et al, 1993). In a study by Choinierè et al (2000) it was found that smoking prevalence was greatest amongst the participants who had not completed high school and was lowest amongst the participants who had completed university degrees. It was also identified that participants who had not completed high school were less likely to participate in regular physical activity (Choinierè et al, 2000).

A study by Song & Byeon (2000) on Korean male public servants, using gross personal income as the measure for SES, found that preventable mortality was greater amongst men in the lower income groups in comparison to the higher income groups (Song & Byeon, 2000). The effect of income decreases with age, especially for women (Morrison, Woodward, Leslie & Tunstall-Pedoe, 1997). Individuals who are classified in the higher income bracket are more likely to make good lifestyle decisions and have a higher self-esteem in comparison to individuals who are in the lower income group (Baum, 1998).

Morbidity and mortality are higher in Australians with lower incomes (Baum, 1998). Income is responsible for providing goods and services (Kaplan & Keil, 1993) suggesting that individuals with low incomes may not have access to many things that have an affect on health, such as housing, stable, safe and rewarding employment, nutritious food and educational opportunity. In addition, healthy food is more expensive than unhealthy food (Kaplan & Keil, 1993; Baum, 1998).

The less equitable the income distribution in a country the less favourable the health outcome (Baum, 1998). Mortality is higher among individuals who rent their home, do not have access to a vehicle and who are not highly educated (Shaw, Dorling & Davey Smith, 1999). Being poor and without a home means lacking the basic requirements to maintain health (Baum, 1998).

High unemployment leads to higher levels of mortality. Individuals who are semi-skilled or unskilled experience more unemployment than any other occupational group (Baum, 1998). Education and income play an important role in occupation status (Kaplan and Keil, 1993).

An inverse relationship exists between SES as measured by occupation and CHD (Blane et al., 1996; Marmot et al., 1999; Taylor, Chey, Bauman & Fewster, 1999). The lowest SES groups are twice as likely as the highest SES groups to develop CHD (Najman, 1994). CHD has been linked to a variety of occupation predictors such as low job control (Marmot, Bosma, Hemingway, Brunner & Stansfield, 1997; Marmot et al., 1999), grade of employment (Marmot et al., 1997), unemployment (Siahpush & Singh, 1999) and the area of residence (MacLeod, Finlayson, Pell & Findlay, 1999).

It is assumed for the definition of SES that all people living in a particular area have the same or similar characteristics (Kaplan & Keil, 1993). Mortality is lowest in the most affluent areas and is highest in the most deprived areas (Ben-Scholomo, White & Marmot, 1996). People living in unhealthy environments tend to have greater inequality in health compared to people living in healthy environments (Baum, 1998).

1.4.1 SES AND RISK FACTORS

Behaviour is linked to health differences between SES groups (Baum, 1998). People in lower SES groups have a greater incidence of risk factors than higher SES groups (Baum, 1998; Robertson, Brunner & Sheiham, 1999) with a greater risk of having a poor diet, obesity, (Jarvis & Wardle, 1999), smoking and being physically inactive (Baum, 1998).

An inverse relationship exists between smoking status and SES factors, where SES is defined by income, education and occupation (Baum, 1998; George & Davis, 1998; Marmot et al., 1999; Song & Byeon, 2000). Smoking prevalence has decreased in the higher SES groups though there is evidence of an increase in smoking prevalence occurring in the lower SES group (Robertson et al., 1999).

Education has been inversely associated with smoking, with less educated people likely to smoke more than those who have higher levels of education (Leino, Raitakari, Porkka, Taimela & Viikari, 1999). There is also an association between employment and smoking status (Marmot et al., 1997). Blue collar, unskilled and low-income workers are more likely to smoke than white-collar workers and high-income earners (Pekkanen et al., 1995; Najman, Lanyon, Andersen, Williams, Bor & O'Callaghan 1998). Smoking incidence also increases as deprivation increases for people with an intermediate education level. Individuals who have an intermediate education level have a greater incidence of smoking with greater deprivation (Sundquist, Malstrom & Johansson, 1999).

Physical activity is influenced by education, income and the area in which an individual lives (NIH Consensus Conference, 1996). Participating in physical activity is inversely associated with education for females (Leino et al., 1999). Wister (1996) found that males with post-secondary education are twice as likely to participate in physical activity than individuals who didn't complete high school (Wister, 1996). All measures of SES demonstrate a strong relationship with activity level and smoking status (Blane et al., 1996; Wister, 1996).

Alcohol abstainers, both male and female, are more likely to be in lower grade employment compared with those who work in higher grade employment, whereas moderate alcohol consumption is more prevalent amongst people in higher grade employment (Marmot, 1997).

1.4.2 SES AND PROTECTIVE FACTORS

Education and occupation are important predictors of exercise and to a lesser extent smoking, which indicates that health may be influenced by knowledge, beliefs and values rather than by materialistic conditions (Wister, 1996). The areas in which people live influences participation in recreational and physical activities, with people who live in more affluent communities having greater access to healthier food, safe recreation spaces, physical, leisure and cultural activities and to smoke-free environments (Sundquist et al., 1999).

This study is focussed on whether SES effects and risk/protective factor effects are independent of each other or whether SES confounds risk factor effects.

1.5 RESEARCH QUESTIONS

The purpose of this study is to identify the relationship between CHD, its risk factors, and SES. As such there are three research questions:

- Does cigarette smoking, physical inactivity and alcohol consumption predict CHD prevalence?
- Do SES variables predict CHD prevalence?
- Is the association between risk/protective factors and CHD prevalence independent of or confounded by SES variables?

CHAPTER 2: METHODOLOGY

2.1 SAMPLE

The 1995 National Health Survey (NHS/1995) was the second of 5 yearly data collections regarding the health of the Australian population. The Australian Bureau of Statistics (ABS) collected the data between January 1995 and January 1996 using trained interviewers. A standard questionnaire was used for all interviewees. There were no medical tests or procedures required for the survey and there was no requirement to access any medical records.

Surveys were completed by individuals over the age of 15, with those who were between the ages of 15 and 17 requiring consent from their parents or guardians. For the individuals under the age of 15, parents or guardians answered the questions on their behalf. There were 23,800 households surveyed with 57,633 individuals from across Australia. 97% agreed to be interviewed, and 3,882 exclusions due to incomplete households. After these exclusions there were 53,751 participants.

Data relating to smoking status and alcohol consumption were not collected for any participant under the age of 18. Therefore individuals under the age of 18 are excluded from this study. After exclusions, the total number of subjects included in the study was 39,110 of which 18,945 (48.4%) were female and 20,165 (51.6%) were male.

2.2 INSTRUMENTS, DESIGN AND PROCEDURE

The NHS/1995 consisted of 907 questions on a variety of health-related topics and demographic information. The database is available in SPSS Version 10.0 in the Centre for Public Health at Edith Cowan University.

The current study uses binary logistic regression modelling to analyse the impact of two blocks of independent variables (risk factors and SES factors) on two dependent variables of CHD: whether CHD was reported as the first condition in a medical consultation and the use of Coronary Heart Disease/Blood Pressure (HD/BP) medication.

2.2.1 DEPENDENT VARIABLES

For this investigation, there were two dependent variables used for CHD prevalence. The first dependent variable was taken from participant responses to the question, "Do you have any health conditions that have lasted and will likely last for six months or more?" (Question 448). Those who indicated CHD as their first condition on this variable were coded for this study as positive (1) and all other subjects were coded as negative (0).

The second indicator for CHD was determined by the answers from questions 608 ("What are the names or brands of all the medications you took in the past two weeks?") and 610 ("Which of these categories best describes the first mentioned medication?"). These answers were coded in this study into a single data item that specifically looked at whether subjects had taken any medications for heart disease or blood pressure (HD/BP) in the two weeks prior to the interview. Participants either indicated a positive response to taking HD/BP medication (1) or did not indicate that they had taken medications' (0).

2.2.2 INDEPENDENT VARIABLES

Independent variables were grouped into two categories – CHD risk factors and SES variables.

2.2.2.1 CHD RISK FACTORS

The CHD risk factors were cigarette smoking, physical inactivity and alcohol consumption. As the risk of CHD is known to be closely associated with age, this variable was included in the model at the same time as the risk factors. This adjustment removes the potential for results to be confounded by age. The NHS/1995 codes age according to that reported for the subjects' previous birthday. Age was recoded for the purpose of this study into 6 different age categories: 18-24, 25-34, 35-44, 45-54, 55-64, and 65 and over.

2.2.2.2 SMOKING

Smoking prevalence was determined by three questions in the NHS/1995 relating to smoking. The first question asked if the interviewee was a current smoker? The second question asked if they smoked regularly (at least once per day) and the third question asked if they had ever smoked regularly (at least once per day). All answers to the questions required a yes/no answer. The responses were coded in the NHS/1995 as one variable, that of smoking status.

Respondents to the NHS/1995 were also asked to select from three options to describe their smoking status – "never smoked", "current smoker" or "ex-smoker". A "never smoked" subject was classified as a person who had never smoked regularly (at least one cigarette per day), an "ex-smoker" was classified as a person who had previously smoked at least one cigarette per day but no longer smoked, and a "current smoker" smokes at least one cigarette per day regularly.

Smoking status of the participants was classified into 4 categories prior to the data re-coding. For the analysis, smoking status was re-coded into 2 separate variables, smoking1 and smoking2. For the first re-coding of the variables (smoking1) current smokers (0) were compared with ex-smokers (1) and never smoked (2). The second re-code (smoking2), never smoked (0) was compared with current smokers (1) and ex-smokers (2). Those subjects who were not classified in any of these categories were placed in category 3.

2.2.2.3 EXERCISE LEVEL

Respondents to the NHS/1995 were asked several questions about exercise. The one used for this study asked them to report whether their regular exercise level was vigorous and moderate, low level or sedentary.

As vigorous and moderate exercise are both considered to be preventive against CHD, they are re-coded together as 0 and are compared with low level exercise (1) and sedentary exercise (2). Subjects who were not classified in any of these categories were placed in category 3.

2.2.2.4 ALCOHOL

Data for the analysis of alcohol intake were determined from the NHS/1995 item "average amount of alcohol consumed from up to last three occasions in reference week."

The determination of the levels of low risk alcohol consumption differs between the two genders. Therefore separate variables were created for males and females. Alcohol consumption for this analysis was also divided into three groupings - abstainers, low risk and high risk. The three groupings were chosen to account for the different effects that alcohol has on CHD risk. Table 1 indicates the different alcohol consumption levels for both males and females.

Table 1
Alcohol consumption classifications (males and females)

Alcohol consumption	Males	Females
Abstainers	0ml	0ml
Low risk	50-70ml	20-50ml
High Risk	>70ml	>50ml

(Australian Bureau of Statistics, 1996)

Originally the data for the consumption for alcohol were coded in accordance to the amount consumed. For this analysis alcohol consumption is re-coded to reflect the risk associated with alcohol consumption rather than the actual amount of alcohol consumed. The first analysis compared male abstainers (0) with male high-risk alcohol consumers (1). The remainder of the male participants who did not fit into either of these two groups are excluded from the analysis. The second analysis compared female alcohol abstainers (0) with female high-risk alcohol consumers (1). The remainders of the participants are excluded from the analysis. The third analysis was the comparison of male low risk alcohol consumers (0) with male high-risk alcohol consumers (1). The final analysis compared female low risk alcohol consumers (0) with female high-risk alcohol consumers (1). The remaining participants, in both the third and fourth analyses are excluded from the analysis.

2.2.3 INDICATORS OF SOCIO-ECONOMIC STATUS

The socio-economic status variables used for this analysis are gross personal income, occupation, SEIFA index and education qualifications.

2.2.3.1 GROSS PERSONAL INCOME

Gross Personal Income (GPI), in the NHS/1995, was defined by the amount of money the interviewee reported earning before tax in the previous financial year. This was determined by the amount of money received or lost through investment property, businesses, dividends, interest, wages/salary, family payment, any cash payment from the Government (including pensions), maintenance/child support, superannuation, workers compensation/accident or sickness absence.

In order to increase the numbers in each group, GPI was reduced to 7 levels for analysis. These levels were earning:

- greater than $50 000 per year (0),
- $40 000 - $49 999 (1),
- $30 000 - $39 999 (2),
- $20 000 - $29 999 (3),
- $10 000 - $19 999 (4),
- $1 -$9 999 (5),
- less than $1 per year, negative income and not applicable (6).

Participants with a GPI of less that $1 in the previous year, those who reported negative money earned and other answers that are not applicable are combined into one category. To exclude these would reduce the number of subjects across all variables and limit the power of the statistical analysis. The outcomes for this group are ignored in the interpretation of the results.

2.2.3.2 OCCUPATION

Information regarding the occupation of the participant was asked by question 122 of the NHS/1995. Information was asked regarding the job title and the main tasks and duties to assist in the classification of the job. These are then recoded for the purposes of this study into 3 groups to increase the numbers in each group and to reduce the number of comparisons. These groups are:

- managers, administrators, professionals and para-professionals (0);
- tradespersons, clerks, clerical and service workers (1);
- transport and elementary clerical, sales, service and labourers (2).

Those not currently working are put into a separate group for the analysis (group 3), though their results are not subject to interpretation in the discussion.

2.2.3.3 SEIFA INDEX

The SEIFA index of socio-economic disadvantage (SEIFA) is measured as a series of quintiles, with the first quintile being the highest as determined by the ABS. There were no questions directly asked in the survey in regards to the SEIFA index. Information was collected by the interviewer about the area and type of dwelling the interviewees lived in. The level of an area is based on collective data regarding the average income of the area, qualifications and land value in that area. The data item for SEIFA was coded from 0 to 4, with the lowest SEIFA quintile (and lowest level of SES) (0) used for comparison against the remaining quintiles. Incomplete SEIFA scores were included in the database as a separate data file in this item, with the results ignored in the analysis.

2.2.3.4 EDUCATION

Educational qualifications were recorded in question 109 of the NHS/1995. The interviewees were given a range of responses with the lowest educational level being completing a secondary school qualification through to the highest level, having a Masters degree/doctorate. The number of education qualification categories is reduced for the purpose of this study from 12 qualifications to 4, to increase the number of participants in each group. These education levels were:

- secondary qualifications only (0),
- skilled/basic vocational (1),
- undergraduate/associate diploma (2),
- tertiary qualifications (3).

2.2.4 SUBJECTS, DEPENDENT & INDEPENDENT VARIABLES

A breakdown of the subjects included in the study are summarised in Tables 2 and 3 below. In both tables the two dependent variables used in this current study are compared with the risk factors (table 1) and the SES factors (table 2).

The dependent variables are shown by diagnosis or HD/BP medication. Diagnosis of the subjects are indicated using (0) for subjects who have reported they been diagnosed with CHD and (1) for subjects who have not reported CHD diagnosis. In the reported use of HD/BP medication, the number of subjects who reported use of medications were noted as (0) with subjects who did not report use of HD/BP medications were classified as (1).

Both the risk factors and SES factors were listed in the tables as per the coding of the data for analysis.

Table 2
The number of participants dependent variables and risk factors

		DIAGNOSED		HD/BP MEDICATION	
		0	1	0	1
Smoking Status					
Current	Male	15	5121	342	4794
Current	Female	9	4236	289	3956
Never	Male	39	7548	705	6882
Never	Female	46	11193	1745	9494
Ex-smoker	Male	97	6125	1334	4888
Ex-smoker	Female	24	4657	621	4060
Exercise level					
Moderate – Vigorous	Male	51	7347	696	6702
Moderate – Vigorous	Female	11	5858	560	5309
Low	Male	50	6155	784	5421
Low	Female	23	8358	866	7515
Sedentary	Male	51	6485	902	5634
Sedentary	Female	45	7006	1231	5820
Alcohol Consumption					
Abstainer	Male	116	19870	1610	18376
Abstainer	Female	66	22513	2178	20401
Low risk	Male	1	786	69	718
Low risk	Female	3	1938	158	1783
High Risk	Male	1	1733	112	1622
High Risk	Female	0	819	29	790

Table 3
The number of participants dependent variables and SES

		DIAGNOSED		HD/BP MEDICATIONS	
		0	1	0	1
Gross Personal Income					
$50,000+	Male	5	2137	163	1979
$50,000+	Female	0	462	18	444
$40,000 - $49,999	Male	5	1440	116	1329
$40,000 - $49,999	Female	0	613	40	573
$30,000 - $39,999	Male	7	2621	155	2473
$30,000 - $39,999	Female	0	1590	69	1521
$20,000 - $29,999	Male	11	3738	300	3449
$20,000 - $29,999	Female	7	3282	144	3145
$10,000 - $19,999	Male	35	2458	401	2092
$10,000 - $19,999	Female	13	4359	460	3912
$1 - $9,999	Male	70	4329	913	3486
$1 - $9,999	Female	40	7309	1467	5882
Education					
Secondary qualifications	Male	38	4773	657	4154
Secondary qualifications	Female	32	6329	1040	5321
Skilled/basic vocational	Male	22	2697	352	2367
Skilled/basic vocational	Female	5	1711	153	1563
Undergraduate /associate diploma	Male	8	826	93	741
Undergraduate /associate diploma	Female	1	903	84	820
Tertiary qualifications	Male	9	1283	117	1175
Tertiary qualifications	Female	1	1263	62	1202

Table 3 (continued)
The number of participants dependent variables and SES

			DIAGNOSED		HD/BP MEDICATIONS	
			0	1	0	1
Occupation						
	Managers, administrators, professionals & para-professionals	Male	14	4847	334	4527
	Managers, administrators, professionals & para-professionals	Female	1	3273	126	3148
	Tradespersons, clerks, clerical & service workers	Male	12	5439	274	5177
	Tradespersons, clerks, clerical & service workers	Female	8	6326	235	6099
	Transport and elementary clerical, sales, service & labourers	Male	6	3295	182	3119
	Transport and elementary clerical, sales, service & labourers	Female	3	1582	85	1500
SEIFA						
	1st Quintile	Male	33	4452	445	4040
	1st Quintile	Female	22	4767	587	4202
	2nd Quintile	Male	34	4684	496	4222
	2nd Quintile	Female	12	4977	579	4410
	3rd Quintile	Male	36	4837	412	4461
	3rd Quintile	Female	14	4898	481	4431
	4th Quintile	Male	26	5695	504	5217
	4th Quintile	Female	23	5922	496	5449
	5th Quintile	Male	23	6559	525	6057
	5th Quintile	Female	11	6657	511	6157

2.3 *DATA ANALYSIS*

A series of binary logistic regression analyses were performed to determine the influence of the independent variables on the two CHD dependent variables. For both dependent variables, separate analyses are carried out for males and females for each of three CHD risk factors - smoking status, level of exercise and alcohol consumption.

Two blocks of variables are used in each binary logistic regression analysis – block 1 was the CHD risk factor plus age and block 2 are the SES variables. The CHD risk factors are entered into the analysis using the "Enter" method. All of the block 2 factors are entered together using the "Forward Conditional" method. By using "Enter" for the first block of variables, both age and the risk factor under consideration are included in the model whether they are significant or not. This ensures that they are also included when the model is extended by the inclusion of the block 2 SES variables. Forward conditional is used for the second block, such that only those variables that significantly add to the best fit of the model are included (George & Mallery, 1995).

The first binary logistic regression model uses smoking status as the block 1 variable. Two different analyses are completed to establish the effects of smoking. In the first analysis, never smoked is compared with ex-smoker and current smoker. In the second analysis, current smoker is compared with ex-smoker and never smoked.

The second set of binary logistic regression analyses uses level of exercise plus age as the block 1 variable. Vigorous to moderate exercise is compared with low level exercise and sedentary exercise. The block 2 SES indicators are then introduced into the analyses.

There are separate analyses conducted on alcohol consumption. The first analysis compares alcohol abstainers and high-risk alcohol consumers, with the second analysis comparing low risk and high-risk alcohol consumers.

The measures used in the analysis of data were odds ratio (OR), confidence intervals (CI) and level of significance (p). A CI of 95% was set for the analysis.

2.4 LIMITATIONS

There are three major limitations in this research. The first limitation is that the data is self-report and relies on accurate reporting of the CHD variable and risk factors by the participants. Participants were not specifically asked to indicate whether they had CHD, but were asked to list their existing health conditions. Therefore, it is possible that people with CHD could have been excluded from the sample because they did not list CHD as their primary health condition.

As the NHS/1995 is a cross-sectional survey the results of the study must be interpreted as associations rather than as cause and effect. A longitudinal study would have allowed a more appropriate means to address this issue. The only risk factor to include any time factors is smoking, which includes current smoking, previous smoking and never smoking. By having no chronology of risk factors and CHD and the use of medications, it is not possible to state whether the risk factors caused the CHD or whether being diagnosed with CHD lead to change in the risk factor.

The third limitation in this study refers to the reporting of alcohol consumption. As alcohol consumption was reported over one week in this study, the true alcohol consumption reported may not accurately reflect alcohol consumption over a longer time period.

CHAPTER 3: RESULTS

The results for each analysis are as follows. Firstly, the results for block 1 risk factors (smoking, exercise and alcohol consumption) are presented. Secondly, the effects of introducing block 2 socio-economic (SES) variables are discussed. Finally, where SES variables are shown to significantly improve the fit of the model, these results are discussed.

After exclusions, 39,110 subjects remained in the database. Of this 48.4% (18,945) are female and 51.6% (20,165) are male. Distribution of the subjects by age was relatively even, with the highest percentages of subjects between the ages of 25 and 54 years. As age is known to contribute to CHD, it is adjusted for in the data analysis by including it in block 1. Age and gender of subjects is presented in Table 2.

Table 4
Subjects by gender

	COMBINED		FEMALE		MALE	
	Number	Percentage	Number	Percentage	Number	Percentage
18-24	5438	13.9	2655	14.0	2783	13.8
25-34	8560	21.9	4098	21.6	4462	22.1
35-44	8513	21.8	4153	21.9	4360	21.6
45-54	6652	17.0	3336	17.6	3316	16.4
55-64	4316	11.0	2163	11.4	2153	10.7
65+	5631	14.4	2540	13.4	3091	15.3
Total	39 110	100	18945	99.9	20165	99.9

There are 236 subjects who reported CHD as their first long-term health condition (0.4% of the total number of subjects surveyed). 5,048 subjects report taking HD/BP medications (9.4% of the total).

3.1 SMOKING

Just under half (48.1%) of the subjects reported they had never smoked cigarettes regularly (18,826), with 24% (9,381) of the subjects reporting they were current smokers and 27.9% (10,903) reported being ex-smokers.

Male ex-smokers are more likely to report CHD than subjects who had never smoked (OR: 1.542; CI 1.253/2.259; *p*=.026) or who are current smokers (OR: 2.436; CI: 1.399/4.243; *p*= .002). There were no significant differences for females, smoking status and reported CHD.

The introduction of the second block did not change the significance of the findings for males. Table 5 presents the data for smoking status and CHD.

Gross personal income (GPI) is the only SES variable for males to indicate any influence on smoking as a risk factor. Males earning between $1 and $9,999 and $10,000 - $19,999 are found to be more likely to report having CHD as a result of smoking than participants earning greater than $50,000 per year (OR: 3.239; CI: 1.260/8.326; *p*= .015; OR: 3.606; CI: 1.373/9.469; *p*=.009 respectively). These results are summarised in table 7. There were no significant differences for females, CHD smoking status and SES.

Table 5
Smoking status (smoking1) and CHD (males and females)

	Block 1			Block 2		
	Odds Ratio	**CI (95%)**	**Significance**	**Odds Ratio**	**CI (95%)**	**Significance**
Males						
Current smoker						
Never smoked	1.580	.867-2.878	.135	1.756	.961-3.211	.067
Ex-smoker	2.436	1.399-4.243	.002	2.591	1.485-4.522	.001
Females						
Current smoker						
Never smoked	.962	.466-1.988	.918			
Ex-smoker	1.343	.618-2.916	.456			

Table 6
Smoking status (smoking2) and CHD (males and females)

	Block 1			Block 2		
	Odds Ratio	**CI (95%)**	**3.1.4 Significance**	**Odds Ratio**	**CI (95%)**	**3.1.4.1 Significance**
Males						
Never smoked						
Ex-smoker	1.542	1.053-2.259	.026	1.475	1.006-2.164	.047
Females						
Never smoked						
Ex-smoker	1.395	.848-2.295	.189			

Table 7
Gross Personal Income, smoking and the incidence of CHD

	Odds Ratio	CI (95%)	Significance
Males $50 000+			
$40 000 – $49 999	1.748	.503-6.072	.380
$30 000 – $39 999	1.418	.447-4.498	.554
$20 000 – $29 999	1.311	.451-3.811	.619
$10 000 – $19 999	3.606	1.373-9.469	.009
$1 – $9 999	3.239	1.260-8.326	.015

There are significant differences between male ex-smokers and those who had never smoked in the reporting of HD/BP medications, with ex-smokers more likely to be taking the medication (OR: 1.304; CI: 1.166/1.458; $p<.000$). Ex-smokers are more likely to be taking HD/BP medications than current smokers (OR: 1.751; CI: 1.523/2.013; $p<.000$). Subjects who have never smoked are significantly more likely than subjects who are current smokers to be taking HD/BP medications (OR: 1.343; CI: 1.158/1.558; $p<.000$). There are no changes in the significance when the second block was introduced to the analysis. Refer to table 8 for the results of the block 2 analysis.

Females who had never smoked are more likely to take HD/BP medications than current smokers (OR: 1.323; CI: 1.141/1.535; $p<.000$). Ex-smokers are more likely to take HD/BP medications than current smokers (OR: 1.197; CI: 1.013/1.415; $p=.035$). The introduction of the second block did not result in any changes to the significance to the block 1 results, as presented in tables 8 & 9.

Table 8
Smoking status (Smoking1) and the use of HD/BP medications

	Block 1			Block 2		
	Odds Ratio	**CI (95%)**	**Significance**	**Odds Ratio**	**CI (95%)**	**Significance**
Males						
Current smoker						
Never smoked	1.343	1.158-1.558	.000	1.425	1.227-1.656	.000
Ex-smoker	1.751	1.523-2.013	.000	1.818	1.580-2.092	.000
3.1.8.1.2 Females						
Current smoker						
Never smoked	1.323	1.141-1.535	.000	1.341	1.156-1.556	.000
Ex-smoker	1.197	1.013-1.415	.035	1.229	1.040-1.454	.016

Table 9
Smoking status (Smoking2) and the use of HD/BP medications

	Block 1			Block 2		
	Odds Ratio	**CI (95%)**	**Significance**	**Odds Ratio**	**CI (95%)**	**Significance**
Males						
Never smoked						
Ex-smoker	1.304	1.166-1.458	.000	1.275	1.140-1.427	.000
Females						
Never smoked						
Ex-smoker	.905	.807-1.015	.088	.917	.817-1.029	.139

For both male and female subjects GPI is the only socio-economic variable that significantly predicted CHD/BP medications. Males in the income ranges of $1 – $9,999 (OR: 1.62; CI: 1.324/1.983; *p*<.000); $10,000 – $19,999 (OR: 1.546; CI: 1.244/1.922; *p*<.000); $20,000 – $29,999 (OR: 1.283; CI: 1.035/1.591 *p*: .02) and $40,000 – $49,999 (OR: 1.34; CI: 1.03/1.744; *p*=.007) are more likely to use HD/BP medication than males in comparison to subjects earning greater than $50,000 per annum.

The results indicated significant differences for females and GPI, showing an inverse relationship between income and reporting HD/BP medications. Compared with females earning $50,000 per year or more, those earning between $1 and $9,999 per annum are three times more likely to take HD/BP medications (OR: 3.023; CI: 1.837/4.973; *p*<.000); those earning between $10,000 and $19,999 are 2.655 times more likely to take HD/BP medications (OR: 2.655; CI: 1.604/4.397; *p*: <.000); those earning between $20,000 and $29,999 are 1.856 times more likely to be taking HD/BP medications (OR: 1.856; CI: 1.1/3.131; *p*=.02); subjects earning between $30 000 and $39 999 are more likely to report taking HD/BP medications (OR: 1.730; CI: .994/3.011; *p*=.053); and subjects earning between $40,000 and $49,999 are 2.268 times more likely to take HD/BP medications (OR: 2.268; CI: 1.247/4.127; *p*=.007). Table 10 shows the results for income for both males and females.

Table 10
Gross Personal Income, smoking and medications

	FEMALE			MALE		
	Odds Ratio	**CI (95%)**	**Significance**	**Odds Ratio**	**CI (95%)**	**Significance**
$50 000+						
$40 000 – $49 999	2.268	1.247-4.127	.007	1.340	1.030-1.744	.029
$30 000 – $39 999	1.730	.994-3.011	.053	1.049	.823-1.337	.702
$20 000 – $29 999	1.856	1.100-3.131	.020	1.283	1.035-1.591	.023
$10 000 – $19 999	2.655	1.604-4.397	.000	1.546	1.244-1.922	.000
$1 – $9 999	3.023	1.837-4.973	.000	1.620	1.324-1.983	Gb.000

3.2 EXERCISE

There are three levels to the variable used to determine the effect of exercise on CHD. The number of subjects at each level are evenly distributed, with 24.6% of all subjects participating in moderate to vigorous exercise, 27.1% low level exercisers and 25.2% sedentary level exercisers. The remaining 23.1% are in the not applicable category. There are no significant differences for CHD and exercise level for males. There are, however, significant differences for females. Sedentary females are twice as likely to have CHD compared with females who exercise at a moderate to vigorous level (OR: 2.27; CI: 1.168/4.413; p=.016). There is no significant difference between low level exercisers and moderate to vigorous exercisers. Refer to table 11 for a summary of these results.

Table 11
Exercise behaviour and the prevalence of CHD

	Block 1			Block 2		
	Odds Ratio	**CI (95%)**	**Significance**	**Odds Ratio**	**CI (95%)**	**Significance**
MALES						
Moderate/vigorous v low level	1.053	.709-1.564	.796	1.079	.726-1.604	.705
Moderate/vigorous v sedentary	.859	.580-1.274	.451	.905	.610-1.344	.621
FEMALES						
Moderate/vigorous v low level	1.434	.697-2.951	.327			
Moderate/vigorous v sedentary	2.270	1.168-4.413	.016			

The introduction of the second block of variables into the analysis of variables for male participants did not significantly change the results.

Numerous significant results occurred between exercise and HD/BP medications. Males with a low level of exercise are more likely to take medication than those who exercise at a moderate to vigorous level (OR: 1.271; CI: 1.123/1.439; $p<.000$). In comparison with moderate to vigorous exercisers, sedentary males are more likely to take HD/BP medications (OR: 1.138; CI: 1.009/1.282; $p=.035$). There are no changes in significance regarding exercise behaviour with the introduction of the second block of SES variables.

Sedentary females are more likely to take HD/BP medications than moderate to vigorous exercisers (OR: 1.425; CI: 1.259/1.613; $p<.000$). There is no significant difference between low level exercisers and moderate to vigorous female exercisers for the use of CHD/BP medications (OR: 1.08; CI: .949/1.228; p=.242). The introduction of the second block of SES variables does not alter the significance of these. Refer to table 12 for details.

Table 12
Exercise behaviour and the use of HD/BP medications

	Block 1			Block 2		
	Odds Ratio	CI (95%)	Significance	Odds Ratio	CI (95%)	Significance
MALES						
Moderate/vigorous v low level	1.271	1.123-1.439	.000	1.288	1.137-1.459	.000
Moderate/vigorous v sedentary	1.138	1.009-1.282	.035	1.159	1.027-1.307	.017
FEMALES						
Moderate/vigorous v low level	1.080	.949-1.228	.242	1.083	.952-1.232	.228
Moderate/vigorous v sedentary	1.425	1.259-1.613	.000	1.412	1.246-1.599	.000

Income produces significant results for exercise level and CHD/BP medication for both male and female subjects. Males earning a GPI between $1 and $9,999 (OR: 1.275; CI: 1.019/1.596; p=.034), $10,000 and $19,999 (OR: 1.345; CI: 1.067/1.694; p=.012), and $40,000 and $49,999 (OR: 1.34; CI: 1.028/1.746; p=.031) are more likely to take medications for CHD and BP than people earning above $50,000. Results for males earning between $20,000 and $29,999 and $30,000 and $39,999, are found not to be significant. See table 13 for a summary of results.

Table 13
Gross Personal Income, exercise level and HD/BP medication (male)

Income	Odds Ratio	CI (95%)	Significance
$50 000 +			.001
$40 000 – $49 999	1.340	1.028-1.746	.031
$30 000 – $39 999	1.017	0.793-1.304	.897
$20 000 – $29 999	1.216	.967-1.530	.095
$10 000 – $19 999	1.345	1.067-1.694	.012
$1 – $9 999	1.275	1.019-1.596	.034

Compared to females earning over $50,000 per year, those earning between $1 and $9,999 are more likely to take HD/BP medications (OR: 2.322; CI: 1.392; p=.001); subjects earning between $10,000 and $19,999 are more likely to take HD/BP medications (OR: 2.25; CI: 1.342/3.773; p=.002); those with an income of between $20,000 and $29,999 are more likely to take HD/BP medications (OR: 1.757; CI: 1.03/2.996; p=.039); those earning between $30,000 and $39,999 are more likely to take HD/BP medications (OR: 1.770; CI: 1.009/3.105; p=.046); and the subjects earning between $40,000 and $49,999 are twice as likely to take HD/BP medications (OR: 2.438; CI: 1.328/4.475; p=.004). Refer to Table 14 for a summary of the results.

Table 14
Gross Personal Income, exercise level and HD/BP medication (female)

Income	Odds Ratio	CI (95%)	Significance
$50 000 +			.001
$40 000 – $49 999	2.438	1.328-4.475	.004
$30 000 – $39 999	1.770	1.009-3.105	.046
$20 000 – $29 999	1.757	1.030-2.996	.039
$10 000 – $19 999	2.250	1.342-3.773	.002
$1 – $9 999	2.322	1.392-3.874	.001

Significant results also arise for the SEIFA index. The results showed that subjects in the 5th quintile are less likely to take medications than subjects living in the 1st quintile (OR: .801; CI: .688/.933; p=.004). Females living in the 4th quintile are less likely to take HD/BP medications than female subjects living in the 1st quintile (OR: .811; CI: .697/.945; p=.007). There are no other significant results for the SEIFA index. Refer to Table 15 for a summary of the results.

Table 15
SEIFA index, exercise level and HD/BP medications (female)

	Odds Ratio	CI (95%)	Significance
1st Quintile			.026
2nd Quintile	.956	.823-1.110	.551
3rd Quintile	.962	.823-1.125	.630
4th Quintile	.821	.705-.957	.012
5th Quintile	.809	.695-.943	.007

3.3 ALCOHOL

There are 12,479 male alcohol abstainers, 787 males who consumed between 50 and 70mls of alcohol (low risk consumers), and 1,734 males who consume more than 70ml of alcohol (high-risk consumers). Although not statistically significant, male alcohol abstainers are more likely to report CHD than male high-risk drinkers (OR: 0.144; CI: .02/1.039; p=.055). There is no significant difference between male low risk drinkers and high-risk drinkers (OR: .837; CI: .051/13.618; p=.901).

The introduction of block 2 SES variables into the model does not alter the significance of these results.

There are 15,368 female alcohol abstainers, 1,941 low risk alcohol drinkers (20-50ml) and 819 high risk (50ml+) alcohol consumers. In the comparison between abstainers and high risk alcohol drinkers there are no significant differences for CHD (OR: .006; CI: .000/5.04E+09; p: .899). There is no significant difference between low risk drinkers and high-risk drinkers (OR: .001; CI: .000/-; p: .899). Refer to table 16 for a discussion of these results.

Table 16
Alcohol consumption and CHD (Block 1)

	Odds Ratio	CI (95%)	Significance
MALES			
Low risk v High risk	.837	.051-13.618	.901
Abstainer v High risk	.144	.020-1.039	.055
FEMALES			
Low risk v High risk	.001	.000-	.899
Abstainer v High risk	.006	.000- 5.04E+09	.714

No significant relationships are found between alcohol consumption and HD/BP medications in the analysis for males. The introduction of the second block of factors does not change the significance of the results.

There are no significant differences between female high-risk alcohol consumers and abstainers or for female high-risk alcohol consumers and low risk consumers regarding the use of HD/BP medications. The introduction of the second block of SES variables does not alter these results.

Comparing alcohol abstainers and high risk alcohol drinkers, males earning between $1 and $9,999 are more likely to take HD/BP medications than males earning greater than $50,000 per year (OR: 1.443; CI: 1.142/1.823; p=.002). Males earning between $10,000 and $19,999 are more likely to take HD/BP medications than males earning over $50,000 per year (OR: 1.391; CI: 1.080/1.791; p=.011). No other comparisons are significant. See Table 17 for a summary of the results.

Table 17
Gross Personal Income and HD/BP medications, factoring in alcohol consumption (males)

	Step 1		
	OR	CI (95%)	Significance
$50 000 +			.000
$40 000 – $49 999	1.228	.899-1.677	.197
$30 000 – $39 999	.853	.637-1.144	.289
$20 000 – $29 999	1.065	.826-1.373	.626
$10 000 – $19 999	1.391	1.080-1.791	.011
$1 – $9 999	1.443	1.142-1.823	.002

Comparing female alcohol abstainers and female high-risk drinkers, income and the SEIFA index produces significant results. Females earning between $1 and $9,999 are more likely to be taking HD/BP medications than females earning over $50,000 (OR: .2.021; CI: 1.145/3.565; p=.015). Subjects earning between $10,000 and $19,999 are more likely to be taking HD/BP medications than the highest income earning group (OR: 1.857; CI: 1.046/3.296; p=.015). The female subjects earning between $40,000 and $49,999 are more likely to be taking HD/BP medications than females earning greater than $50,000 per year (OR: 2.112; CI: 1.07/4.169; p=.031). Table 18 has a summary of the results.

Table 18
Gross Personal Income and HD/BP medications, factoring in alcohol consumption (females)

	OR	CI (95%)	Significance
$50 000 +			.001
$40 000 – $49 999	2.112	1.070-4.169	.031
$30 000 – $39 999	1.257	.664-2.378	.483
$20 000 – $29 999	1.452	.802-2.628	.219
$10 000 – $19 999	1.857	1.046-3.296	.035
$1 – $9 999	2.021	1.145-3.565	.015

Women living in the 5th SEIFA quintile are less likely to take HD/BP medications compared with women living in the 1st SEIFA quintile (OR: .762; CI: .644/.903; p=.002). Significant results also occurred for females living in the 4th quintile SEIFA areas where there is less likelihood that a woman would use HD/BP medications than women living in the 1st quintile (OR: .841; CI: .712/.993; p=.041). Table 19 has a summary of the SEIFA index results.

Table 19
SEIFA index, alcohol consumption and HD/BP medications (female)

	Odds Ratio	CI (95%)	Significance
1st Quintile			.034
2nd Quintile	.911	.775-1.070	.254
3rd Quintile	.914	.771-1.084	.301
4th Quintile	.841	.712-.993	.041
5th Quintile	.762	.644-.903	.002

CHAPTER 4: DISCUSSION

A review of the literature indicated that risk factors for CHD include alcohol consumption, cigarette smoking and exercise level. CHD is also influenced by SES, specifically that CHD risk is increased amongst those of lower SES. This study using cross-sectional data, looked at whether SES factors act as confounders of risk factors or whether risk factors and SES act independently of each other. As this study is cross-sectional the risk factors are not regarded as having a cause-effect relationship but indicate associations that exist between CHD and the risk factors.

4.1 CIGARETTE SMOKING

A number of significant results were found for smoking status, CHD prevalence and in the reporting of taking HD/BP medications. The results indicated that in this study male ex-smokers were significantly more likely to report having CHD than both those whom had never smoked or who were current smokers. There were no significant differences for females comparing CHD and smoking status. In the reporting of taking HD/BP medications, both female and male ex-smokers were more likely to report using the medications when compared with those who had never smoked or who were current smokers. Females and males who had never smoked were more likely to report taking HD/BP medications when compared with current smokers. These results were not influenced by the introduction of SES factors into the logistic regression model. Gross personal income was the only SES factor to have significant results when the second block was introduced into the model and this was independent of smoking status.

This study did not find that cessation of smoking reduced the risk of CHD or the prevalence of HD/BP medications, but that there was a higher risk of reporting these amongst ex-smokers. The results of this study differed from the results of a study by Paffenbarger et al (1993) who found that quitting smoking reduced the risk of CHD in comparison to current cigarette smokers by almost half, towards the level of a never smoker (Paffenbarger et al, 1993). There are several possible explanations for this finding.

First, the data on which the current study is based did not look at the number of cigarettes smoked per day, which has been reported as an important factor in the development of CHD. Both Neaton and Wentworth (1992) and Prescott et al (1998) reported that the risk of CHD is relative to the amount smoked (Neaton & Wentworth, 1992; Prescott et al, 1998). The National Drug Strategy Household Survey (1998), found that the number of cigarettes smoked per day by current smokers was 11 or more and that there was more than 1 in 3 older smokers smoking more than 20 cigarettes per day. As a result, the effect of the number of cigarettes smoked on the dependent variable cannot be determined in this study.

A number of reports indicate that General Practitioners are more likely to give advice of quitting smoking to patients that come to them with a smoking related health problem (Coleman and Wilson, 1996; Coleman, Murphy & Cheater, 2000). A study by Butler, Pill & Stott (1998) indicated that the participants (who were all smokers) in their study often avoided going to their general practitioner or changed health care professionals in order to avoid being told that their health complaint was a consequence of smoking cigarettes. Participants stated that they would rather put up with chest pains than go to the doctor (Butler, Pill & Stott, 1998).

A further explanation of the findings suggests that ex-smokers may have ceased smoking due to CHD diagnosis or episode. It was suggested in a study by Ebrahim and Davey-Smith (1997) that lifestyle changes, such as smoking cessation, were more likely to occur after experiencing a myocardial infarction. These findings from previous research may assist in the explanation of the finding that ex-smokers are more likely to report CHD than current smokers. It may be that a recent CHD episode has prompted a visit to a doctor and / or cessation of smoking. These may therefore have ceased smoking recently and have yet to experience the benefits of cessation. For example, the risk of CHD reduces to 50% within twelve months of ceasing and is equal to that of those who have never smoked after four years of non-smoking (Okuyeme, Ahluwalia and Harris, 2000). It is important to note this relates to the limitation of the study, using as it does data that is cross-sectional rather than longitudinal.

According to Thun, Apicella & Henley (2000) smokers may have more than one serious health complaint therefore, it may not have been the first health complaint listed by the participant A study by Wannamethee, Shaper, Walker & Ebrahim (1998) found a negative association between smoking and all-cause mortality . The study also found that there were greater benefits to the cessation of smoking if the participant had a low body mass index (BMI) and were physically fit. As this current study only analysed the first health condition reported by each subject, failure to report CHD as the first health condition may have resulted in a number of participants with CHD being excluded from the study.

The result that male ex-smokers more likely to report CHD than males who had never smoked was consistent with a study by Ben-Shlomo, Davey-Smith, Shipley & Marmot (1994) who found that the effects of cigarette smoking had limited reversibility on CHD when the individual ceased smoking. A study by Kritchevsky, Waterer, Newman, Bauer, Pahor, Tracy & Harris (2001) found that some long term health consequences of smoking are associated with the amount of cigarettes smoked (measured in pack-years) was independent of current smoking status.

In a number of studies, cigarette smokers have been found to have lower blood pressure than their non-smoking counterparts. The study by Imamura, Tanaka, Hirae, Futagami, Yoshimura, Uchida, Tanaka & Kobata (1996) found that the systolic blood pressure levels of current smokers were significantly lower than in the subjects who had never smoked. Further to this, a study by Gerace, Hollis, Ockene & Svendsen (1991) identified that cigarette smokers had lower diastolic blood pressure and were less likely to be hypertensive in comparison to participants who had ceased smoking cigarettes. It has also been reported that patients who are on heart medications may suffer from hypotension as a result of dehydration from the medications (Dargie & McMurray, 1994).

The most likely explanation for the finding that males who are ex-smokers are more likely to report CHD is that ex-smokers have experienced CHD symptoms and/or been advised by their doctors of these, and been advised to cease smoking.

4.2 EXERCISE

The health benefits of regular moderate to vigorous exercise and physical activity have been widely reported (Pace, 2001; WHO/IFSM, 2001; Bauman, Wright & Brown, 2000; Halbert et al, 2000; Kokkinos, Choucair, Graves, Papademetriou & Ellahham, 2000; National Heart Foundation, 1999b; Livengood et al, 1993; Paffenbarger et al, 1993). The results of the present study indicate that there is significantly less reporting of CHD in females who engage in moderate to vigorous exercise. Female sedentary level exercisers were twice as likely to report CHD than females who participated in moderate to vigorous exercise. These results are consistent with the literature. However, the results for males did not demonstrate any association between exercise behaviour and CHD, contrary to the research literature.

Significant benefits in the prevention of HD/BP medications through physical activity were also demonstrated. The results indicated low-level exercisers (significant for males only) and sedentary level exercisers (significant for both males and females) were more likely to take HD/BP medications that moderate to vigorous exercisers.

The introduction of SES variables did not alter these results, in either of the analyses, for either males or females. However, GPI did produce significant results independent of the effects of exercise for both males and females. Those on lower incomes were more likely to report taking HD/BP medications than subjects on higher incomes. For females, significant differences, independent of exercise, are associated with the SEIFA index, where those living in the 4th and 5th quintiles were less likely to be taking HD/BP medications compared with those living in the 1st quintile.

The results of this current study can only identify the association between CHD and physical activity and does not look at the cause-effect relationship. The benefits of moderate to vigorous physical activity extend to people who have been diagnosed with CHD (Bauman et al, 2000). The lack of a significant result for males with CHD and physical activity may be partly explained by this, with participants previously diagnosed with CHD participating in exercise as advised by their physicians. Even though the benefits of long-term physical activity is lifetime health, it is also known that physical activity has immediate health benefits for participants (Bauman et al, 2000).

The results of a study by Paffenbarger et al (1993) differ from the results in this current study, where it was found that sedentary males were thirty-six percent more likely to develop CHD in comparison to physically active men. Any level of exercise was found to be beneficial to CHD reduction, with the risk of CHD mortality lowered to similar levels of long-term exercisers when a sedentary person starts to participate in regular moderate physical activity.

Overall exercise was associated with a lower risk of HD/BP medications and CHD for females. It was anticipated that the results for males would be similar to those of females for the impact of exercise on CHD, but this was not the case. As any level of exercise has been reported as beneficial to health (Paffenbarger et al, 1993), participants may have reported that they were not regular participants in physical activity, even though they may have been physically active at some level.

4.3 ALCOHOL

As discussed in the review of literature, previous studies on the influence of alcohol have shown that it is the amount of alcohol regularly consumed that is important in the reduction of CHD (Stockwell, 2000; Klatsky, 1999; Single et al, 1999; Zakhari, 1997; Rimm et al, 1996; National Heart Foundation, 1995). Once again, the findings regarding alcohol use and CHD need to be interpreted cautiously.

In this current study, male abstainers were significantly more likely to report CHD than high-risk drinkers. No other result for either male or female, reporting CHD or taking HD/BP medications were found to be significant.

The results did not change with the introduction of the SES variables into the analysis. However, GPI produced significant results independent of the results for alcohol, for both males and females, indicating that the less money earned, the more likely a person will be taking HD/BP medications. Significant results were also apparent for the SEIFA index, where the higher the SEIFA quintile area a female lived in, the less the chance of taking HD/BP medications.

The numbers in each of the alcohol risk groups were uneven, there being low numbers of high risk drinkers. There were a large number of subjects in the abstainers group for both males and females. The large confidence intervals (CI) may have been due to the small numbers in some of the groups.

The method of reporting daily alcohol consumption may also have lead to lower levels of reported consumption. A study by Donath (1995) found that the method of self-report used in the NHS/1995 may result in lower average daily alcohol consumption being reported than if using a seven day diary method, that was used in the NHS/1990. There are differences in the alcohol consumption between consuming on Friday, Saturday and Sunday, and Monday to Thursday (Donath, 1995) therefore the day on which the survey was conducted will influence the amount of alcohol reported as being consumed.

The results of alcohol consumption in this study may have been influenced by other CHD risk factors. A study on female alcohol consumption by Garg et al (1993) indicated that female alcohol abstainers were more likely to have other heart disease risk factors such as high BMI (body mass index), history of diabetes, high cholesterol and high systolic blood pressure when compared to females who consume alcohol. The only heart disease risk factor more likely in alcohol consumers was cigarette smoking (Garg et al, 1993). Current or previous smoking behaviour was identified to be more prevalent among male alcohol drinkers who consumed more than 125 grams of alcohol per week in a study conducted by Brenner, Rothenbacher, Bode, Marz, Hoffmeister & Koenig (2001). A study by Thun et al (2000) found that smokers were more likely to consume alcohol than those who had never smoked (Thun et al, 2000). Smoking and other risk factors that may confound the results were not controlled for in the analysis of alcohol in this particular study.

4.4 SOCIOECONOMIC VARIABLES

As previously detailed in the literature review, SES is known to influence health status. This study aimed to identify whether the association between CHD was confounded by or independent of the SES variables. The results of this study indicated that the association of SES and CHD was independent of risk factors of alcohol consumption, smoking and exercise.

Independent of the influence of the CHD risk factors, there were two SES variables that demonstrated significant associations – gross personal income (GPI) and SEIFA index (for females only), with subjects classified as lower SES having a greater risk of reporting CHD and taking HD/BP medications in comparison to the higher SES groups.

The infrastructure must be in place to enable people to feel comfortable to participate in physical activity. For example, such things as recreational facilities and the accessibility of the facilities are factors that are important in promoting physical activity. Hence the area in which people live is important (Bauman et al, 2000). It was stated amongst the strategies for promoting physical activity in the paper written for the National Heart Foundation of Australia that the infrastructure for physical activity be improved, including such things as transport to areas of recreational activities (Bauman et al, 2000).

Thun et al (2000) reported that SES may not have a major influence on the elderly in regards to smoking behaviour, as many took up smoking during and after war times and not as a result of education or any other SES factor.

Although education was not found to be a major SES contributor, a study by Burrows and Nettleton (1995) found that women with some form of higher education are less likely to engage in risky health behaviour than women with no qualifications, therefore suggesting that educated women were less likely to smoke cigarettes.

A study by Wister (1996) indicated that a relationship existed between income, education and labour force participation, and exercise and smoking behaviours. Education was an important factor for establishing exercise behaviour. In the prediction for smoking behaviour, income was found to be the most important factor (Wister, 1996).

CHAPTER 5: CONCLUSIONS

This study found that there was evidence that a relationship exists between known risk factors and the self-report of CHD. SES variables were not found to confound these associations. An independent effect on CHD was found to exist between CHD and the SES factors SEIFA index and GPI.

The implications of these findings suggests that policy and planning needs to be directed at the lower SES groups rather than at the community as a whole. Service provisions should also target the lower SES groups as the results of this current study indicate that lower SES groups have a greater risk of CHD than higher SES groups. As SES was identified as a CHD risk factor, as opposed to having a confounding effect, future health education programs should be directed at the lower SES groups.

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