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## Health status labour force non-participation nexus: Evidence from pooled NHS data

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### Abstract

This paper examines the association between health status and labour force non-participation using pooled data from the 1989, 1995 and 2001 National Health Surveys (NHS).

The analysis adds to the wealth of information about the health-labour force nexus by incorporating *age*, *period* and *cohort* effects into the analysis. While controlling for these, the analysis looks at the association between labour force non-participation and specific health conditions (e.g. presence of hypertension, asthma, arthritis, diabetes, cancers and anxiety), risk factors (e.g. smoking, obesity, lack of exercise) and other socio-economic demographic factors.

A multiple logistic regression framework is used. The model estimates the odds of non-participation in the labour force given the set of explanatory variables mentioned above. Results showed that there is a strong association between labour force non-participation and long-term health conditions, risk factors and health related actions. Odds ratios suggest that men and women as they grow older are more vulnerable to leave the labour force due to long-term medical conditions and health risk factors.

The analysis contributes to the understanding of the associations between labour force status and health by using pooled survey data. The sequential cross-sectional data used in a multivariate logistic regression framework enables us to control for sex, age and birth cohorts when analysing the associations.

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# Health status – labour force non-participation nexus: evidence from pooled NHS data<sup>1</sup>

## 1 Introduction

Health affects a person's capacity to work productively (Stronks et al 1997; Bartley and Owen 1996). Chronic health conditions, for example, have been found to diminish physical and mental capabilities, leading to disruption in normal work functioning (Chirikos 1993; Mathers 1994; and Bound et al 1998). As a result, individuals with poor health status spend less time in the labour force, retire younger and/or change the kind of work performed.

The association between health and labour force participation has been extensively analysed using a variety of data. For instance, Bound et al (1998) examined the dynamic relationship between health status and labour force behaviour among older working-age adults in the U.S. using longitudinal data. Cai and Kalb (2004) explored the effect of health on labour force participation in Australian context using the Household, Income and Labour Dynamics in Australia (HILDA) Survey data. They used simultaneous equation modelling to determine the relationship between health (using self-assessed health as a variable) and labour force participation. Other analyses that determine the relationship between health and labour market outcomes were based on cross-sectional surveys (Mathers and Schofield 1998; Bartley 1994; and Wilson and Walker 1993). In many of these studies, the impact of labour force status on health (or vice versa) has been examined while controlling for other socio-economic-demographic variables.

A common difficulty discussed in the literature is determining the direction of causation between health status and labour force status, or generally between health and socioeconomic status, especially when using only cross-sectional data (Marmot and Wilkinson 1999; Deaton 1999; Deaton and Paxson 1999). It is recognised that the relationship is not one directional. A person's labour force status and outcomes have an influence on his health. Conversely, a person's health status impact on his ability to participate in the labour force. This study, while recognising these two-way possibilities, examines only the *association* between health and labour force status, and not the direction of causation.

This study adds to the wealth of information about the health-labour force nexus by incorporating *age*, *period* and *cohort* effects into the analysis, and by considering the effects of specific health conditions, risk factors and other socio-economic demographic factors not present in other studies. (As noted above in relation to health status, the direction of any causal relationships between these non-health variables and labour force status may also be two way, rather than one). The study makes use of pooled unit record data from three National Health Surveys (1989, 1995 and 2001). The pooling of data is done to account for age, period and cohort effects, and to give the study a richer sample from which the association can be examined. Survey design effects have also been taken into account in the analysis.

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<sup>1</sup> The views expressed in this paper are the authors' and do not necessarily reflect those of the Australian Bureau of Statistics. Where quoted or used, they should be attributed to the authors.

## 2 Concepts

This study focuses on health status and non-participation in the labour force. Health status is understood to be a person's state of being, and therefore its meaning varies according to individual or community expectations and context (ABS 2001a). Physiologically, it relates to both the physical and mental state of a person. However, it is not simply about the absence of disease or disability, but is "a continuum that includes states of well-being" (ABS 2001a p. 84). Some people may have a disease or disability but still consider themselves as being in good health if they are able to manage their condition or maintain their quality of life (ABS 2001a). Being a continuum, health status is indicated not by one but by several health indicators. Thus in this study, health status is indicated by the presence or absence of long term health conditions, risk factors and health related actions.

The labour force status concept used in this study is non-participation or being out of the labour force. People *not in the labour force* (NILF) is defined as people 15 years old and over who were neither employed nor unemployed. This group includes those who were keeping house (unpaid), retired, voluntarily inactive, or permanently unable to work, and people in institutions. However, while people in institutions are by definition out of the labour force, in this study they are not considered because the scope of the National Health Surveys -- the data used in this analysis-- does not extend to non-private dwellings. (For more detailed information on the definitions see ABS 2001c).

We found that people not in the labour force have higher prevalence rates of long-term conditions than people in the labour force. Further, an analysis using the 2001 Australian General Social Survey (GSS) indicated that health condition is the most dominant factor increasing the probability of being outside the labour force for both men and women (Kumar et al 2004). Hence, this study focused on people NILF in looking at the association of between labour force status and health status.

As mentioned, the study controls for the influences of age, period and cohort effects when explaining the association between labour force non-participation and health status. Age effects are influences associated with growing older. Year or period effects are influences associated with each period of time (i.e., survey year), regardless of age. Cohort effects reflect changes that have occurred and are exclusive to that particular birth cohort. This effect influences that particular cohort for their entire life and it is independent from period effects.

## 3 Research question

The mature age group of the population has been the constant subject of policy making, in the areas of labour force participation, productivity, health expenditures and delivery of services. Recently, policy attention was focused on the timing of retirement and how mature age people can be encouraged to stay longer in the work force, or for those not in the labour force, to return back to work. This is becoming a relevant policy agenda in view of Australia's ageing population. Mature age workers (those aged 45 years and over) currently make up almost a third of the labour force (ABS 2003). For the most part, withdrawal from full-time work by these people can be linked to retirement. However, many of them leave the labour force, either permanently or temporarily, due to ill health or disability.

In Kumar et al (2004), a study using the 2002 GSS found that a major factor associated with non-participation of mature age people (i.e. those aged 45-64 years) in the labour force is self assessed health status. Men who rate their health as fair to poor are around 8.3 times more likely to be outside the labour force than men who rate their health as good to excellent , (controlling for other effects, including age). Women who rate their health as fair to poor are 4.3 times more likely to be outside the labour force than women who rate their health as good to excellent.

This study answers the question: What evidence does a pooled data of three National Health Surveys provide about the association between non-participation in the labour force, and various health status indicators, after taking into account age, period and cohort effects and other socio-economic-demographic variables.

It complements the work on the GSS by Kumar et al (2004), by using specific health conditions (Kumar et al made use of self-assessed health status). Specifically, this study contributes to the literature by examining the association between labour force non-participation and specific National Health Priority Areas (NHPA) conditions, a detail not provided in previous studies. These conditions include hypertension, asthma, arthritis, diabetes, cancer and anxiety. In addition, the association between labour force non-participation and health risk factors are also examined.

The association between labour force non-participation and health status is examined in terms of probabilities, using a logistic modelling framework explained below. The general modelling question being answered is "What is the probability of non-participation in the labour force, given one's health status as indicated by selected health variables, after controlling for age, period and cohort effects and other socio-economic-demographic variables?"

#### 4 Method

A multiple logistic regression framework is used. This type of model estimates the odds (or probability) of non-participation in the labour force given a set of health status indicators, socio-economic-demographic variables while controlling for age, period and cohort effects. The basic model is expressed in the form:

$$\log\left(\frac{P_i}{1-P_i}\right) = \alpha + \beta_i X_i + \varepsilon_i$$

where  $P_i$  is the probability of an event (i.e. the person is not in the labour force) and  $(1-P_i)$  is the probability of the non-event (i.e the person is in the labour force). The explanatory variables  $X_i$  s are the long term health conditions, health related actions, risk behaviours, sex, age, period and cohort dummies. The intercept is denoted by  $\alpha$  and the logistic coefficients are denoted by  $\beta$ s.

The dependent variable  $\log(P_i / 1-P_i)$  is known as the log of odds ratios in favour of an event. For example, as our response variable is persons NILF the dependent variable is then the log of odds of being NILF. The model is estimated using maximum likelihood method. The inclusion of dummies for age, sex, cohorts and periods allows us to control

for age, sex, cohorts and periods to analyse and establish a meaningful relationship between labour force status variable in question and health variables. (Note: because age, period and cohort dummy variables are linearly dependent, two sets of models have been estimated (Age-Period and Age-Cohort models).

## **5 Data**

The last three National Health Surveys (NHSs) conducted by the Australian Bureau of Statistics (ABS) are the sources of data for this analysis. These are the surveys for 1989-90, 1995 and 2001. Surveys earlier than 1989-90 were not used because of data comparability problems.

Unit record data from the three NHSs were pooled so that the model described above can control for period and cohort effects. Pooling the data gives the analysis a sequential cross-sectional perspective, i.e. a pseudo-longitudinal format that enables the consideration of the effects of current and past period's health status or risk factors on labour force non-participation, for selected birth cohorts.

## **6 Results**

The association between labour force non-participation and selected health status and other variables (including the age, period and cohort effects) is modelled using multivariate logistic regression. We used 'Age-Cohort' and 'Age-Period' models to examine the associations between the people not in the labour force and their health status by controlling for socio-demographic factors.

Table 1 presents a summary of the results of analysis for people aged 44–60 years.

**Table 1. Odds Ratios for Non-participation in the Labour Force: Women and men aged 44-60 years by selected health variables based on three National Health Surveys (1989-90, 1995, 2001)<sup>a, b</sup>**

Variables	Age-Cohort Model*	
	Women : Age 44- 60 years	Men : Age 44- 60 years
Hypertension	1.30	1.25
Asthma	1.26	1.36
Arthritis	1.25	2.05
Diabetes	1.84	2.47
Cancer	1.47	1.09
Anxiety	1.07	3.75
Never Smoked	1.00	1.00
Current Smoker	1.28	2.02
Ex Smoker	0.82	1.23
Underweight	1.02	2.18
Acceptable Weight	1.00	1.00
Overweight	1.17	0.99
Obese	1.30	1.25
Sedentary/Low Exercise	0.95	0.71
Moderate exercise	1.00	1.00
High Exercise	1.22	0.96
Doctor Visits	1.31	2.49
Year 1989**	1.00	1.00
Year 1995**	0.66	1.10
Year 2001**	0.61	1.29
<i>Goodness of fit test</i>		
<i>Likelihood ratio index</i>	0.09	0.17
<i>H-L test p-value</i>	0.143	0.283

a. All variables are statistically significant at 5% level of significance.

b. All tests for joint significance of the explanatory variables reject the null hypothesis that all coefficients in the model are zero. And the likelihood ratio index test show that the models are improvements on restricted model with all coefficients set to zero.

\* For simplicity, the age and cohort effects are not shown on this table, but are depicted using Figures 1 and 1, respectively.

\*\* Based on the 'Age-Period' Model.

## 6.1 Long term health conditions

The National Health Priority Area Initiative (NHPA) focuses on major chronic diseases and conditions. In our analysis we included these NHPA long-term conditions, namely: hypertension, asthma, arthritis, diabetes, cancer and anxiety.

Results indicate that long term health conditions are significantly related to labour force status. In the 'Age-Cohort' model for women, the odds ratios for long-term conditions range from 1.07 to 1.84. For example, asthma sufferers are 26 per cent more likely to be non-participating in the labour force than non-asthma sufferers; diabetes sufferers are 84 per cent more likely to be non-participating in the labour force than non-diabetes sufferers. We can interpret the other odds ratios for other NHPA conditions in Table 1 in a similar fashion.

Men who suffer from anxiety-related problems are more than three times more likely to be outside the labour force than non-anxiety sufferers. The odds of not participating in the labour force because of anxiety-related problems are considerably higher for men than for

women. As noted earlier, this analysis does not indicate causation. Men may not be working as a consequence of an anxiety condition, or not working may lead to anxiety.

## **6.2 Risk factors**

It is well-known that a range of biomedical and behavioural risk factors are associated with major causes of ill health, disability and death. For example, smoking is associated with coronary heart disease, several cancers, stroke and lung disease. Physical inactivity is associated with coronary heart disease, stroke, osteoporosis and mental illness, to name a few.

The risk factors we included in the analysis are smoking, body mass index (BMI), and exercise level.

### **6.2.1 Smoking**

Results of the analysis show that for women, current smokers are 28 per cent more likely to be non-participating in the labour force than those who have never ever smoked. Those who previously smoked are 18 per cent less likely to be non-participating in the labour force than those who have never smoked. (These ambiguous and counter-intuitive findings for women may simply reflect the notion that while an important health risk factor, smoking's association with labour force participation is less direct). For men, current smokers are twice more likely to be outside the labour force, while ex-smokers are 23 per cent more likely to be out of the labour force.

### **6.2.2 Body mass index**

Results of our analysis show that women who are obese are 30 per cent more likely to be outside the labour force than women who are in the acceptable weight range (i.e. the reference group). Similarly, women who are overweight are 17 per cent more likely to be outside the labour force than those who are in the acceptable range.

Men who are obese are 25 per cent more likely to be non-participating in the labour force. However, the odds ratio for men who are overweight shows otherwise. These results may be attributed to the underreporting of men's actual weights. For example, in 2001 men tended to perceive their weight as being in the acceptable range when it was not. On the other hand, the women's self-assessment of weight was more accurate (ABS 2001b).

### **6.2.3 Exercise**

The results for exercise are less clear and need more careful examination. For instance, women who do a higher level of exercise are 22% more likely to be outside the labour force than those who do a moderate level of exercise. But women who do a low level exercise, as opposed to those who do moderate exercise, are five per cent less likely to be outside the labour force. For men, both those with low and high level of exercises are less likely to be outside the labour force relative to those who do moderate exercise.

### **6.2.4 Consultation with general practitioners and specialists**

A person's health-related actions generally indicate his or her need for medical attention as a result of a health condition. The variable we included in our analysis is 'consultations

with doctors and specialists'. The odds ratios for this variable are 1.31 and 2.49 for women and men, respectively. These suggest that for women who consulted doctors and specialists, the odds are that they are 31 per cent more likely to be outside the labour force relative to those who didn't consult doctors or specialists. The odds for men are higher. Those who consulted doctors or specialists are 2.5 times more likely to be outside the labour force relative to those men who didn't consult doctors or specialists. These results could be partly explained by the fact that men are more likely than women not to be in the labour force because of a health problem. Further they tend to consult a doctor or a specialist more when they have a specific medical condition whereas women visit doctors for a wider range of preventative health reasons.

### **6.2.5 Period effects**

Year or period effects are influences associated with each period of time (i.e., survey year), regardless of age. They represent the impact of periodic phenomena such as economic cycles. Odds ratios of the Year 1995 and 2001 in Table 1 show that the year effect works in opposite directions between women and men. It shows that in recent times women are less likely to be outside the labour force (i.e., increasing participation rate) than they once were, and vice-versa for men. This is a well documented trend (ABS 2004).

### **6.2.6 Age effects**

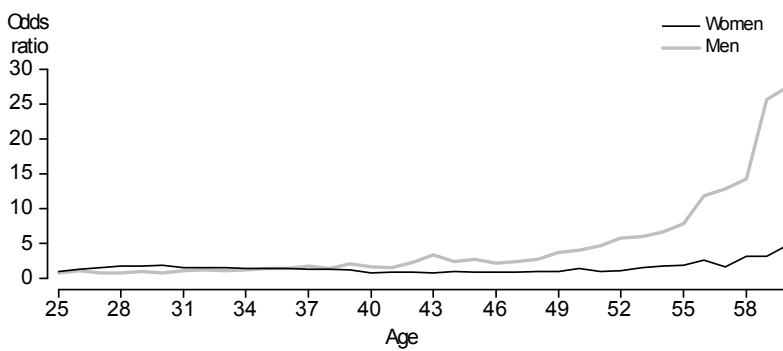
Age effects are influences produced by growing older. They reflect changes in the labour force variable due to the ageing processes common to all people over the periods.

The odds ratios of Age for women are significant, except for the age 45. Figure 1 (which was based on the analysis of persons aged 24 to 60) shows that women who are above 50 years are more likely to be NILF (or less likely to be participating in the labour force) compared to those who are aged 44 years (the reference age).

The odds ratios of Age for men are significant. Similarly, men aged above 50 years are more likely to be NILF compared to the younger age groups.

The increasing odds of being outside the labour force for both women and men over 50 years, after controlling for health and related factors, is likely to reflect factors affecting mature age workers, such as early retirement and choosing to leave the labour force rather than remain unemployed. The effect of age is more strongly associated with labour force participation among men than women (see Figure 1). This is because men's participation in the prime work years is much higher than women's (90% and over compared with 70-75%). The difference in age effect tends to narrow towards the late 40s and then widens after the late 50s.

**Figure 1** AGE EFFECT FOR WOMEN AND MEN: Age-Cohort Model



Note: The reference category is age 24.

### 6.2.7 Cohort effects

The odds ratios for birth cohorts are statistically significant (except for women born in 1952 and 1949). As shown in Figure 2, men's odds ratios for the birth cohorts are more volatile than the women's odds ratios. Various factors could be attributed to the changes in men's participation in the labour force. It is shown that the younger cohorts are more likely to be NILF than the older cohorts. This could partly be explained by increases in the number of people among younger cohorts undertaking further study. Early retirement (voluntary or involuntary) among the working age groups could also partly explain the trend.

Women born in the 1960s, as compared to the 1945-born cohorts, are increasingly participating more in the labour force than the men. There has been an increasing trend in more women participating in the labour market, particularly through part-time employment. The significant increase in the number of employed women working part-time has been due to the increase in the supply of part-time labour particularly in the industry and service sectors (ABS 2001d). Changing social attitudes such as balancing work and household roles may also help explain the increasing trend in labour market participation among younger women.

**Figure 2** COHORT EFFECT FOR WOMEN AND MEN: Age-Cohort Model



Note: The reference category is cohort born in 1945.

## 7 Conclusion

The analysis contributes to the understanding of the associations between labour force status and health by using pooled survey data. The sequential cross-sectional data used

in a multivariate logistic regression framework enables us to control for sex, age and birth cohorts when analysing the associations.

Our results showed that there is a strong association between labour force non-participation and long-term health conditions, risk factors and health related actions. Odds ratios suggest that men and women as they grow older are more vulnerable to leave the labour force due to long-term medical conditions and health risk factors. The results for men are generally higher than for women.

The ABS conducts the national health survey every six years. It has been shown that data can be pooled to come up with analyses on many other variables of interest.

For more information about the analysis please contact Annette Jose (annette.jose@abs.gov.au).

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