Mental health, physical health and employment propensity

Gail Pacheco[1] and Don J. Webber[2]

[1] *Department of Economics, Auckland University of Technology, Auckland, New Zealand*
[2] *Department of Accounting, Economics and Finance, University of the West of England, Bristol, UK*

Abstract

This paper presents an investigation into the impacts of mental and physical health on the propensity to be employed. Health status is parameterised using three physical (energy, pain and activity-limiting) and three mental (depression, social-limiting and accomplishment-limiting) health indicators. Application of limited dependent variable regression techniques generates results which indicate that activity-limiting physical health and accomplishment-limiting mental health issues significantly affect the propensity to be employed. Further investigations reveal gender and ethnicity divides and that mental health is mostly exogenous to employment propensity.

Keywords: Mental health; Physical health; Employment status; Ethnicity; Gender

JEL Classification: I1; J29; J16

1. Introduction

This paper examines the relationship between employment propensity and health status. This is an important area of research as poor health diminishes labour productivity, reduces labour force participation and can impose an additional cost on society. Understanding the relationship between health and employment is complex, not least because there are two potentially non-mutually exclusive categories of health status that should be considered: physical and mental.

The links between employment propensity and either physical or mental health cannot be easily generalised across a population. The mechanisms in which a range of health indicators affect individuals may depend on their gender, ethnicity and other demographic and socio-economic characteristics. There are marked differences across the lines of gender and ethnicity especially with respect to both health and labour market characteristics and, in particular, the narrowing gender gap in labour force participation. Although many studies have focussed on a range of covariates (including education, experience, training and individual characteristics) and their impacts on labour market activity, few have accounted for measures of both physical and mental health. This paper's main contribution is to fill this gap in the literature.

Analysis of the link between health status and labour market activity is strongly influenced by the ability to measure health indicators. Perhaps due to data limitations, much of the past international literature focuses on *either* physical *or* mental health, and does not control for both. For example, Ojeda *et al*. (2010) analyzed the impact of mental health on labour supply in the US, but did little to control for the physical

health characteristics of the individuals in their sample.[i] In contrast to many other studies that have used a limited number of health identifiers (Cai and Kalb, 2006; Pelkowski and Berger, 2004; Hamilton *et al*. 1997) that probably capture only one part of the multidimensional health issue, this study makes use of six self-assessed health variables that encompass both physical and mental health status.

Another issue which makes the analysis of this relation between health and employment problematic is that employment may cause poor health or poor health may affect employment propensity. This research also tackles this endogenous aspect of the relationship between health and employment.[ii] Very few previous empirical studies account for the possibility of reverse causality, and consequently the debate regarding the flow of causality between various labour market outcomes and health status is ongoing.

For instance, Bellaby and Bellaby (1999) investigated the relationship between unemployment and ill-health, and find that increasing levels of unemployment affect job-stress levels and high levels of unemployment impact on self-assessed health. Lewchuk *et al*. (2008) examined the impact of employment on health, and did use physical and mental health variables in an investigation. Their results show an association between characteristics of the employment relationship and health, with weak commitments between employers and employee potentially impacting on the health and well-being of individual workers, their families and on society. Taylor *et al*. (2003) researched occupationally induced ill-health and found that industry specific effects (in their case call handling in call-centres) require radical job redesign.

However recent developments in this causality literature include Cai (2009), who confirms that a better health status has a positive and significant impact on wages and finds an insignificant reverse effect from wages to health, and Schmitz (2011), who focuses on the link between unemployment and mental health and finds no evidence of a reverse impact. This paper also contributes to this part of the literature by asseing the endogeneity of mental health and employment propensity across gender and ethnicity.

The remainder of this paper is organized as follows: Section 2 outlines the rich data source and details the six health identifiers that are used in this study, Section 3 explains the econometric strategies undertaken. Section 4 reports the results of the standard models and the tests for endogeneity. Section 5 concludes.

2. Data

Thus far, and to the knowledge of the authors, there is no study of the effects of mental *and* physical health on employment propensity. Although many studies do analyse one or the other health status in various countries, no study exists that attempts to appreciate fully the multidimensional impacts of health on employment. A prime inhibitor to the initiation of such an analysis is data availability.

New Zealand appears to be similar to many other developed countries in that she has a growing awareness of the importance and consequences of physical and mental illness. For instance, the Mental Health Commission (which is tasked with promoting mental health awareness and advocating the needs of the mentally ill) and the District

Health Boards have recently been provided with additional funding from the government with the aim of improving mental health.[iii] Despite an array of overseas studies on this topic, only Gibb *et al*. (2010) have analysed NZ data. Specifically, they made use of the Christchurch Health and Development Study that began in 1997 and conducted a regression analysis focusing on three outcomes (workforce participation, income and living standard, and educational achievement) dependent on experiencing a psychiatric disorder early in life. Their research had a narrow focus on mental health status and did not control for physical health indicators. As such, the effects of mental *and* physical health on labour market outcomes for the different genders and ethnicities within NZ have not been studied thus far.

The data used in this study is the New Zealand General Social Survey 2008 (NZGSS), which is a relatively new source of information on physical and mental health characteristics. It provides data on a wide range of social and economic outcomes of individuals aged 15 years and over. This multidimensional survey was carried out between April 2008 and March 2009 and a total of 8,721 people were interviewed regarding several aspects of their lives, such as education, paid work, income, social relationships and health. Respondents were randomly selected using a multi-stage sample design and interviewed face-to-face. In our final sample, respondents above the age of 65 were excluded to enable a focused analysis on the working age population of NZ.

For the purpose of our study, the outcome variable of interest, and our dependent variable in the upcoming empirical analysis, is the employment status of the

individual. This employment variable, the six health status indicators and the other covariates used in our analysis are described in Table 1.[iv]

< Insert Table 1 about here >

There are three physical health indicators (Health limiting, Pain and Energy) and three mental health indicators (Depression, Health social, Health accomplishment). All six variables have been coded in an analogous fashion (ordinal categorical variables ordered from one to five) such that the higher the value of the variable, the worse the health of the individual. For example, a value of five for the Health limiting variable signifies that during the past four weeks, the respondent felt they were limited *all of the time* in their regular daily activities as a result of their physical health. Similarly, a value of five for the Health social variable indicates that during the past four weeks, the respondent felt that emotional problems interfered with their social activities *all of the time*. *A priori* reasoning of the effect of all six health variables on employment propensity suggests that their expected signs should all be negative.[v]

There is the possibility of overlap between these physical and mental health variables which can best be illustrated with an example: suppose that the interviewee was asked the question relating to the pain variable. Depending on the issues that the respondent had experienced recently, they could mistake the motive for the question as either physical pain or emotional pain.[vi] Table 2 presents the correlation coefficients across all six health variables as well as the employment status variable. The highest correlation is between depression and accomplishment, at 0.600, which can both be considered as mental health issues. As would be expected, all physical health

variables are positive correlated, and the same can be stated for mental health variables too. Also of interest is that all health variables are negatively correlated with employment status suggesting that, from a non-causal perspective, unemployment is positively correlated with poorer physical and mental health status.

< Insert Table 2 about here >

In terms of the descriptive statistics provided in Table 1, a couple of interesting patterns are immediately evident. First, in comparison to males, females' health perceptions are worse across all facets of physical and mental health (bar the energy variable), which is consistent with several previous studies on the topic of self-rated health (Green and Pope, 1999; Parslow *et al*., 2004). This gender difference is most visible when investigating self-rated reports of mental health, and particularly psychological distress (Gove and Tudor, 1973; Chesler, 1971). Previous research investigating gender differences in physical illnesses show a more convoluted story. For instance, while morbidity rates tend to be higher for women (Marcus and Siegel, 1982), mortality rates and serious incapacitations are found to be higher for men (Verbrugge, 1976; Gove and Hughes, 1979).

While many arguments have been made as to why women report having poorer health than men, there are two that have become most prevalent in recent debates. First, the perception-reporting hypothesis states that the differences are due to perceptual differences, such as women being more aware of their symptoms and being more likely to recall and report them (Gijsbers van Wijk and Kolk, 1997). On the other hand, the social construction of gender hypothesis suggests that the differences stem

from relative social roles and expectations regarding labour force participation patterns (Anson *et al*., 1993). For example, when Verbrugge (1989) accounted for the lower rate of paid labour involvement and the greater stress and unhappiness that women tend to feel, gender differences in morbidity disappeared.

Another pattern which emerges from Table 1 is that while it appears that most New Zealanders rated their different aspects of health status relatively well (evidenced by mean values closer to the value of one, rather than five), the energy variable again seems to stand out as being different. Specifically, all other health variable means range from 1.429 to 1.742, whereas the Energy variable had mean values of 3.682 and 3.501 for males and females, respectively.

In terms of the remaining descriptive information in Table 1, the sample is fairly evenly divided along the gender line (46.4% male) and there are three distinct ethnic groups (Maori, Pacific Islanders and NZ European – also termed Pakeha in much NZ literature). Since the early 1990s, Statistics NZ has moved away from prioritising ethnicity data and instead enables respondents the opportunity to co-select a number of ethnicities to describe their background, and consequently, the sum of the ethnic groups is larger than 100%. This is truly reflective of the culturally diverse backgrounds in NZ and is the reason why Statistics NZ continues to emphasize the need to maintain multiple ethnicity responses in many of their surveys (Statistics NZ, 2005).

Also of importance is the percentage of respondents who are employed. Table 3 presents percentage of respondents split by gender and ethnicity. There are

asymmetries in employment propensity across ethnicity and gender. The highest employment propensity is for NZ European males, where nearly 86 percent were in employment; this contrasts strongly with Pacific Islander females, where fewer than 57 percent were in employment.[vii]

< Insert Table 3 about here >

While these descriptive statistics give us a glimpse into possible health status and employment differences, the next section provides an outline of the specific econometric approaches that were used here to investigate the relationships that exist between employment propensity and the six health status indicators.

3. Modelling approaches

In its simplest form, whether an individual is in employment or not can be represented by a dichotomous variable taking a value equal to 1 (one) if the individual is employed and a value of 0 (zero) otherwise. Econometric modelling of the determinants of employment in this sense will require a limited dependent variable approach. Probit and logit modelling approaches are based on the assumption that a continuous and unbounded variable, *Z*, is influenced by a set of independent variables, $X_{1..k}$, and a random disturbance term, ε, such that:

$$Z = \alpha + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k + \varepsilon \quad (1)$$

This is a linear and additive form as the effects of the independent variables are assumed to be identical across all values of *X* and because the effect of each independent variable is the same regardless of the values of other independent variables.

The limited dependent variable approach builds on the assumption that *Z* cannot be observed directly and that a dichotomous indicator, *Y*, can be used instead where:

$$\begin{matrix} Y = 0 \\ Y = 1 \end{matrix} \quad if \quad \begin{matrix} Z \leq 0 \\ Z > 0 \end{matrix}$$

Probit and logit modelling approaches are based on the assumption that there is no interaction among the independent variables. In the probit model:

$$\Pr(Y = 1) = \Phi(Z) = \Phi(\alpha + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k) \tag{2}$$

where $\Pr(Y = 1)$ denotes the probability that *Y* equals 1 and Φ is the cumulative normal distribution, and in the logit model where:

$$\Pr(Y = 1) = \frac{e^{(\alpha + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k)}}{(1 + e^{(\alpha + \beta_1 X_1 + \beta_2 X_2 + ... + \beta_k X_k)})} \tag{3}$$

both functional forms are nonlinear and nonadditive because of the nonlinear relationships between each *X* and $\Pr(Y = 1)$ and the independent variables that interact when influencing this probability; nevertheless they retain the underlying assumption

that the independent variables have a linear and additive effect on the unmeasured and unbounded *Z*.

Standard textbooks illustrate that the probit and logit approaches assume that when $\Pr(Y=1)$ is equal to 0.5 then it is most sensitive to changes in the values of independent variables. However if the probabilities under scrutiny are likely to be slightly different, as are the probabilities of being employed across ethnicities and gender illustrated in Table 3, then a skewed limited dependent variable approach may be more appropriate. The scobit (sometimes called skewed logit) approach, which can be seen as a generalization of the logit approach, does not constrain the value of $\Pr(Y=1)$ to be equal to 0.5 when it is most sensitive to changes in the *X*s and may be favourable in this case.[viii]

The underlying theoretical model that we estimate is:

$$E = \alpha + \beta_1 PH + \beta_2 MH + \beta_3 Ed + \beta_4 Eth + \beta_5 G + \beta_6 SE + \varepsilon$$

where *E* is our dichotomous variable equal to 1 (one) if the respondent is employed and equal to 0 (zero) otherwise, *PH* is a set of physical health variables, *MH* is a set of mental health variables, *Ed* are education dummies according to the level of achievement, *Eth* is a set of ethnicity dummy variables, *G* is a gender dummy variable and *SE* represents a set of other socioeconomic control variables which include parental status, marital status and age.

All three limited dependent variable approaches will be applied in the econometric estimation process presented below. Probits will be employed because of the useful underlying assumption that the cumulative distribution is normal. Logits will be employed because, although the underlying distribution assumes a logistic distribution, this approach permits greater interpretation through the use of odds-ratios.[ix] Scobits are employed because of the potential for the effects of the variables to be more sensitive at different points in the distribution for different ethnicities and gender; applications of scobits also permit the interpretation of odds-ratios. Application of all three approaches can be seen as an attempt to identify whether the effects of explanatory variables on the employment decision are sensitive to functional form. Results of these modelling applications are presented at the beginning of Section 4.

Finally, although the application of probit estimations may seem slightly constraining due to its underling cumulative normal distribution, tests for exogeneity through the use of instrumental variables can be easily executed with probits and be used to inform us whether the assumption that health is exogenous to employment status can be rejected. The results of instrumental variable probit regressions are presented in subsequent sub-sections of Section 4.

4. Results

Tables 4 and 5 present the results for the full sample and the gender sub-samples, respectively. Initially we present the results of the models with only the physical health variables included and then subsequently present the results based on a model

that includes both physical and mental health variables. As can be seen from Table 4, the omission of mental health variables artificially inflates the magnitudes of the effects of the physical health variables, suggesting the exclusion of mental health variables in such equations may result in important omitted variable bias. Nevertheless, the statistical significance of physical health variables remains high with the inclusion of mental health variables. The presence of a mental health issue reduces the probability of being employed; for the full sample, the strongest effect appears to be attributable to the health accomplishing variable. If associated policy is going to be implemented for the whole population then it appears that providing emotional support to those in need may result in an increase in accomplishment and an increased probability of being employed.

< Insert Table 4 about here >

< Insert Table 5 about here >

It is important to recognise the stability of results across all three modelling approaches and sub-samples; note, for example, the positive impact on employment propensity if the individual is male, the inverted-U shaped effect of age, and the negative impact of all ethnicities (Maori, Pacific Islanders and others) relative to the control group of NZ European. Specifically, the logit model illustrates that Maoris are approximately 53% less likely to be employed (odds-ratio of 0.654) relative to NZ European. This negative and highly statistically significant effect is also stronger for male versus female Maoris (odds-ratios of 0.562 versus 0.674, respectively).

Many of the other covariates also yield expected results. For example, a child present in the household significantly reduces the employment propensity of the individual, and this impact is much stronger for females versus males. Having a partner increases the probability of being employed and, in general, the higher the educational attainment then the better chance of being employed.

Turning our attention to the health variables presented in Table 4, as expected all six variables have a negative effect on employment status, in terms of the whole sample. However, not all health related variables have an impact on employment status when referring solely to their statistical significance. The two variables with the strongest effects are health-limiting and health-accomplishing, which are both statistically significant at the 1% level. According to the odds-ratios that are the result of our fitted model, a one-unit increase in the health-accomplishing variable results in a reduction of employment propensity by 18% on average for the whole sample (approximately 11% and 22% for males and females, respectively). Similar results for health-limiting are obtained where a one-unit increase in the health-limiting variable results in a reduction of employment propensity by 38% on average for the whole sample (approximately 61% and 25% for males and females, respectively). These results indicate the importance of both physical and mental health issues on employment status.

Moreover, based on the generalised results for the whole sample, it appears that poor mental health has an important impact on labour market outcomes in addition to physical health issues. There is evidence via the scobits results which indicate that all three mental health variables (depressed, health-social and health-accomplishing)

have statistically significant effects on employment propensity, and the same cannot be said for the physical health variables. These results therefore suggest that from a policy perspective improving mental health awareness is of vital importance when attempting to improve productivity via increased labour force participation.[x]

There are some results that are worthy of further investigation. For instance, although health-limiting is consistently statistically significant across all results, health-accomplishing appears to be less important for males. Also, there is evidence that pain influences female employment propensity though not males, and there appears to be no statistically significant role of energy. In general, males' employment propensity appears to be hindered significantly by only one of the health variables: health-limiting. In contrast, the probability of being employed for women is significantly negatively influenced by three health aspects: health-limiting, pain and health-accomplishing. These findings illustrate the importance of investigating gender differences with respect to the relationship between health and labour market activity. Research by Pelkowski and Berger (2004), which focussed on wages rather than employment propensity in the United States, also found evidence to suggest that poor health conditions had a larger negative impact on females rather than males. Research from Europe by Gambin (2005) concentrated on physical health and their results showed self-assessed general health having a greater impact on men's wages, while chronic health conditions in particular had more of an effect on women's wages. Similarly, an Australian study by Cai and Kalb (2006) also found better health increased labour market participation more for women and older age groups.

Gender and ethnicity demarcations

Tables 6 and 7 present results further disaggregated by ethnicity and split between males and females, respectively.[xi] Table 6 illustrates that there is an asymmetry across ethnic backgrounds in terms of the effect of health variables on employment propensity. The empirical evidence suggests that Maori and European males' employment propensity is adversely affected by health-limiting physical issues. Although similar coefficients and odd-ratios are found for Pacific Islander males, the results are not statistically significant; future research could address this issue.[xii]

Of particular interest is the health variable indicating depression. While it was weakly significant for the whole sample (under the scobit specification), it was not significant when looking at the gender sub-samples in Table 5, even though it was more negative for males relative to females. However, Table 6 reveals the individual characteristic that was driving the negative impact of depression on males' employment status: Pacific Island ethnicity. Specifically, for male Pacific Islanders, the logit and scobit odds-ratios indicate that a one-unit increase in the depression variable results in 114% and 72% increases in their propensity not to be employed, respectively. Jensen *et al*. (2005) also found that the likelihood of employment of people within the Pacific ethnicity category was more affected by disabilities (which included experiencing mental illness) than either Maori or NZ European.[xiii] In terms of international evidence on mental health issues impacting on employment propensity dissimilarly across ethnicities, the limited evidence available is mixed. While Chatterji *et al*. (2007) found significant negative associations between being employed and psychiatric disorders for Latinos, their figures were comparable to similar studies

conducted in the United States on mostly white samples. However, the impact on the probability of employment was found to be larger for Latinos in comparison to Asians. Research by Ojeda *et al*. (2010) also focussed on the impact of mental distress on employment (namely, labour supply) and although their results were not strictly ethnic based, they compared immigrants with U.S. born citizens and found that there was an insignificant difference in the likelihood of being employed between healthy immigrants and those affected by mental illness. Future research should further investigate the likelihood of ethnic minorities being more at risk of being affected by mental health issues, and in particular the mechanisms in which this then impacts on their labour market activity.

< Insert Table 6 about here >

Table 7 presents comparable results for females. They corroborate the effect of the health-limiting physical issue on employment propensity, and with it having different strengths across ethnicities, albeit with a smaller negative effect for females than for males. There is no statistically strong evidence that depression has an adverse effect on employment propensity for females. However, there is evidence that female employment propensities are significantly influenced by the limiting effects of mental health for different reasons across ethnicities. For instance, the social-limiting health effect is particularly strong for Pacific Islander females bit is non-existent for Maoris. Although the odds-ratios suggest similar effects of health-accomplishing on employment propensity across ethnicities, they are only highly-statistically significant for Maoris and Europeans. Further research should investigate whether similar effects are present across different ethnicities in other countries.

< Insert Table 7 about here >

Endogeneity

The results presented above implicitly assume that the direction of causality is from health to employment status. This assumption may be incorrect if being in employment reduces the severity of mental and physical health issues or if being unemployed accentuates an individual's physical or mental health status. Although this issue has not been the focus of a substantial amount of empirical research, three recent contributions to this literature are noteworthy. Cai's (2009) results illustrates that better health status positively impacts on wages and he finds no evidence of a reverse effect from wages to health. In contrast, when Cai (2010) conducts similar research in terms of labour force participation, he finds that the reverse effect from labour force status to health was different across the genders. In particular, his results indicate that there is a negative and strong reverse effect for males, and a positive and weakly significant reverse effect for females. Schmitz (2011) also attempts to investigate the causal effect of labour force status (specifically, unemployment) on health and finds no evidence of the reverse impact that unemployment influences mental health.

Instrumental variable probit regression is an econometric method that permits the investigator to empirically identify whether there is the statistical presence of endogeneity of specific explanatory variables. The statistical validity of the results from instrumental variable regressions rest, at least in part, on the appropriateness of the instrument. While the NZGSS does provide a wide range of variables, our

inspection did not provide us with a variable that would be convincingly correlated with *physical* health status and, at the same time, not correlated with employment status. Nevertheless, our examination of the data did provide us with a variable that could be employed as an instrument for *mental* health, called *Calm*, as described in Table 1.

Our selected instrumental variable for mental health corresponds to whether the respondent felt relatively calm and peaceful during the last four weeks. In order to examine this endogeneity issue a new variable was created with a value equal to 1 (one) if there was at least one mental health issue indicated by the respondent, and equal to 0 (zero) otherwise. This variable was then instrumented by *Calm*. Note from Table 2 that the absolute values of the correlations between *Calm* and the mental health related variables rest between 0.37 and 0.41, but that the correlation between *Calm* and Employment is only 0.07. A further consideration behind the justification of this instrumental variable selection of *Calm* is based on the supposition that calmer people are no more and no less likely to be employed than less-calm people. Although there are reasons to suggest that a person's calmness may be related *to the industry* in which they self-select and become employed,[xiv] to the knowledge of the authors the extent of being calm is not necessarily related to the selection into or out of employment *per se*.

Given the difficulty in selecting an instrumental variable, the subsequent regressions conducted below require the instrument to be appropriate for *all* mental health variables. Accordingly a variable is constructed, *Mental Health*, which is equal to 1 (one) if the individual states that they have any of the three mental health issues

(Depressed, Health social, Health accomplishing) and equal to 0 (zero) otherwise. This variable is then instrumentalised with *Calm*. Given this transformation of three variables into one, the aforementioned results in Section 4 and the instrumental variable probit results that follow are not strictly comparable. Nevertheless, the main purpose of this section is to attempt to identify whether mental health issues are exogenous to employment under the fitted model.

Application of the instrumental variable probit regressions to the full sample and for males and females separately are presented in Table 8. The corresponding Wald statistical tests (see Wooldridge, 2002, pp. 472-477), where the null hypothesis is that the mental health variable is exogenous to employment, are provided at the bottom of the Table. They are never significant at the 5% confidence level, indicating that we cannot reject this null hypothesis at traditional levels of statistical confidence.[xv] Given the important gender-ethnicity issues revealed above, we re-estimated the instrumental variable models for each sub-group and present only the Wald test statistics in Table 9 for brevity. It is reassuring to note that the cautious conclusion of exogeneity of mental health related issues from employment probabilities is sustained across all the sub-groups demarcations; the only exception is for Pacific Islander males at the 5 percent confidence level, although this may be a result of the small sample size (N = 169), suggesting that low employment propensity may cause mental health related issues. Thus, the majority of this empirical evidence suggests that mental health is not endogenous to employment propensity.[xvi] Such evidence corroborates similar results of Cai (2009) and Schmitz (2011) that health status is not endogenous to wage and unemployment status, respectively.

< Insert Table 8 about here >

< Insert Table 9 about here >

Discussion

Although the initial probits, logits and scobits and the later instrumental variable probits results all appear relatively stable from a statistical perspective, and this paper has presented a clear extension of the literature by considering the effects of both physical *and* mental health issues on the probability of being employed, it is worth emphasising and clarifying a number of issues. First, our evidence suggests that estimations of the effect of only physical health variables on the probability of being employed are biased upwards by omitted variable bias attributable to the exclusion of mental health variables.

Second, policy drawn from empirical studies of whole populations will not identify the nuances that are present between sub-groups of the population, most notably here that the effect of depression and health social on the probability of being employed is greater for Pacific Islander males and females, respectively, than for other society groups, and that health accomplishing factors are much stronger for Maori and NZ European females than for corresponding males.

Third, this study splits mental and physical health issues into clear and separable issues. This may not be the case for some, as physical impairment may affect mental issues; for example physical constraints may result in depression if individuals are unable to participate fully or be included in activities with others. The reverse effect

(from mental to physical health) is also possible, such as when depression results in low energy levels. Moreover, there may be a circularity issue, whereby, for example, depression results in lower energy levels which then result in greater depression. Further research should continue to disentangle the relationship between physical and mental health in order to identify their separate and combined effects on employment propensity.

Fourth, such a study would need to explicitly accommodate unobserved heterogeneity (such as a genetic disposition), systematic measurement error and the possibility of reversed causality across the health measures and beyond.

Fifth, a complication could be the preference for risk, whereby individuals who are more likely to remain in a job may also be less affected by health issues. A possible way forward, and something that we propose for future research, is to employ fixed effects regression using a panel data approach when such data become available.

5. Conclusions

This paper presented an investigation into the impacts of mental and physical health issues on employment propensity across gender and ethnicity. This is the first paper to explore the effects on employment of both health issues simultaneously.

Results from this study illustrate that both mental and physical health issues significantly affect employment propensity. The results were consistent across different limited dependent variable probits, logits and scobits specifications. The

latter functional form was particularly important given the potential for the effects of the core health variables to be more sensitive at different points in the distribution for different ethnicities and gender.

In general the results emphasise three important themes. First, across all the ethnicities, there is a substantial impact of the physical health-limiting variable for males. Future research should focus on what specific type of physical health problems this variable encompasses and the severity of them. For example, it would be useful to know whether this variable signifies more short or long term physical ailments and consequently the likely barriers to participating in the labour market for males. Second, there is a considerable impact of mental health issues (in particular, health-accomplishing) on employment of females. Again, the direction for future work is to investigate the mechanisms by which females' labour market activity are more affected by mental health problems in comparison to males. Third, depression has a sizeable negative effect on employment propensity, and is especially statistically significant in our sample for Pacific Island males.

Our results strongly suggest that health status influences employment status, but there is also the theoretical possibility that causality in only this direction is incorrect. Instrumental variable probit regression was applied to test for this endogeneity, and the results indicate that the direction of causality, at least for mental health status, is from health to employment. Awareness that mental and physical health issues influence different groups in society in different ways should enhance the appropriateness of future policy directions.

References

Anson, O., Paran, E., Neumann, L., and Chernichovsky, D. (1993) "Gender differences in health perceptions and their predictors," *Social Science and Medicine* **36**, 419–427

Bellaby, P. and Bellaby, F. (1999) "Unemployment and ill-health: Local labour markets and ill-health in Britain 1984-1991," *Work, Employment and Society* 13(3), 461-82

Cai, L. and Kalb, G. (2006) "Health status and labour force participation: Evidence from Australia," *Health Economics* **15**, 241-261

Cai, L. (2009) "Effects of health on wages of Australian men," *Economic Record* **85**, 290-306.

Cai, L. (2010) "The relationship between health and labour force participation: Evidence from a panel data simultaneous equation model," *Labour Economics* **17**, 77-90

Chesler, P. (1971) "Women as psychiatric and psycho therapeutic patients," *Journal of Marriage and Family* **33**, 746-759

Gambin, L. (2005) *The Impact of Health on Wages in Europe — Does Gender Matter?* University of York Health, Econometrics and Data Group Working Paper 05/03, York, England

Gibb, S., Fergusson, D. and Horwood, L. (2010) "Burden of psychiatric disorder in young adulthood and life outcomes at age 30," *The British Journal of Psychiatry* **197**, 122-127

Green, C. and Pope, C. (1999) "Gender, psychosocial factors and the use of medical services: a longitudinal analysis," *Social Science and Medicine* **48**, 1363-72.

Gijsbers van Wijk, C. M. T. and Kolk, A. M. (1997) "Sex differences in physical symptoms: The contribution of symptom perception theory," *Social Science and Medicine* **45**, 231-246

Gove, W. and Hughes, M. (1979) "Possible causes of the apparent sex differences in physical health: An empirical investigation," *American Sociological Review* **44**(1), 59-81

Gove, W. and Tudor, J. (1973) "Adult sex roles and mental illness," *The American Journal of Sociology* **78**, 812-835

Hamilton, V., Merrigan, P. and Dufresne, E. (1997) "Down and out: Estimating the relationship between mental health and unemployment," *Health Economics* **6**, 397-406

Hogan, R., Hogan, J. and Roberts, B. W. (1996) "Personality measurement and employment decisions: Questions and answers," *American Psychologist* **51**(5), 469-477

Jensen, J., Sathiyandra, S., Rochford, M., Jones, D., Krishnan, V. and McLeod, K. (2005) *Disability and Work Participation in New Zealand: Outcomes relating to paid employment and benefit receipt*. Wellington: Ministry of Social Development.

Lewchuk, W., Clarke, M. and de Wolff, A. (2008) "Working without commitments: Precarious employment and health," *Work Employment and Society* 22, 387-406

Marcus, A. and Siegel J. (1982) "Sex differences in the use of physician services: A preliminary test of the fixed role hypothesis," *Journal of Health and Social Behavior* **23**, 186-196

Mid Central District Health Board (2011) Downloaded from: http://www.midcentraldhb.govt.nz/Planning/MDHBHealthPriorities/MentalHealth.htm#P0708 on 10/02/11 at 14.37NZT

Nagler, J. (1994) "Scobit: An alternative estimator to logit and probit," *American Journal of Political Science* **38**(1), 230-255

Oakley Browne, M., Wells, J., Scott, K. (eds) (2006) *Te Rau Hinengaro: The New Zealand Mental Health Survey. Wellington: Ministry of Health*, Pacific Research and Development Services.

Ojeda, V., Frank, R., McGuire, T. and Gilmer, T. (2010) "Mental illness, nativity, gender and labor supply," *Health Economics* **19**, 396-421.

Parslow, R., Jorm, A., Christensen, H., Jacomb, P. and Rodgers, B. (2004) "Gender differences in factors affecting use of health services: An analysis of a community study of middle-aged and older Australians," *Social Science and Medicine* **59**, 2121-2129

Pelkowski, J. and Berger, M. (2004) "The impact of health on employment, wages and hours worked over the life cycle," *The Quarterly Review of Economics and Finance* **44**, 102-12

Ramage, C., Bir, J., Towns, A., Vague, R., Cargo, T. and Niumata-Faleafa, M. (2005) *Stocktake of Child and Adolescent Mental Health Services in New Zealand*. Auckland: Werry Centre: University of Auckland.

Schmitz, H. (2011) "Why are the unemployed in worse health? The causal effect of unemployment on health," *Labour Economics* **18**, 71-78

Statistics New Zealand (2005) *Understanding and working with ethnicity data: A technical paper*. Downloaded from: http://www.stats.govt.nz/surveys_and_methods/methods/ classifications-and-standards/classification-related-stats-standards/ethnicity.aspx on 10/02/11 at 14.25NZT

Tarling, R. (2009) *Statistical modelling for social researchers: Principles and practice*, Routledge, Oxfordshire, England

Taylor, P., Baldry, C., Bain, P. and Ellis, V. (2003) "'A unique working environment': Health, sickness and absence management in UK call-centres," *Work, Employment and Society* 17, 435-58

Verbrugge, I. M. (1989) "The twain meet: Empirical explanations of sex differences in health and mortality," *Journal of Health and Social Behavior* **30**, 282-304

Verbrugge, L. (1976) "Females and illness: Recent trends in sex differences in the United States", *Journal of Health and Social Behavior* **23**, 275-296

Wooldridge, J. M. (2002) *Econometric analysis of cross section and panel data*, MIT Press, Cambridge, Mass.

Table 1: Descriptive statistics

Variable	Definition	Mean (Standard deviation)		
		All	Males	Females
Employed	Dummy variable: 1 for employed; 0 otherwise.	0.775 (0.418)	0.839 (0.367)	0.718 (0.450)
Health limiting	Question: During the past four weeks, how much of the time were you limited in the kind of work or other regular daily activities you do as a result of your physical health? Categorical variable: 1 = none of the time; 2 = a little of the time; 3 = some of the time; 4 = most of the time; and 5 = all of the time.	1.521 (0.967)	1.474 (0.936)	1.563 (0.991)
Pain	Question: During the past four weeks, how much did pain interfere with your normal work including both work outside the home and housework? Categorical variable: 1 = not at all; 2 = a little bit; 3 = moderately; 4 = quite a bit; 5 = extremely.	1.729 (1.134)	1.713 (1.118)	1.742 (1.147)
Energy	Question: How much of the time during the past four weeks did you have a lot of energy? Categorical variable: 1 = all of the time; ….; 5 = none of the time.	3.586 (0.912)	3.682 (0.881)	3.501 (0.930)
Depressed	Question: How much of the time during the past four weeks have you felt downhearted and depressed? Categorical variable: 1 = none of the time;…..; 5 = all of the time.	1.680 (0.902)	1.620 (0.876)	1.733 (0.920)
Health social	Question: During the past four weeks, how much time has your physical health or emotional problems interfered with your social activities, such as visiting friends, relatives, etc. Categorical variable: 1 = none of the time;,,,,,; 5 = all of the time.	1.487 (0.917)	1.429 (0.875)	1.538 (0.948)
Health accomplishing	Question: During the past four weeks, how much of the time have you accomplished less than you would like as a result of any emotional problems, such as feeling depressed or anxious? Categorical variable: 1 = none of the time; …; 5 = all of the time.	1.541 (0.887)	1.490 (0.860)	1.585 (0.906)
Maori	Dummy variable: 1 = Maori; 0 otherwise	0.131 (0.337)	0.121 (0.326)	0.139 (0.346)
Pacific Islanders	Dummy variable: 1 = Pacific Islander; 0 otherwise	0.053 (0.224)	0.055 (0.228)	0.051 (0.219)
NZ European	Dummy variable: 1 = NZ European; 0 otherwise	0.812 (0.391)	0.818 (0.386)	0.806 (0.396)
Other ethnicities	Dummy variable: 1 = Ethnicities other than Maori, Pacific Islander and NZ European; 0 otherwise	0.072 (0.259)	0.067 (0.250)	0.077 (0.267)
Male	Dummy variable: 1 = Male; 0 = Female	0.464 (0.499)	-	-
Children	Dummy variable: 1 = presence of children in household; 0 otherwise	0.433 (0.496)	0.406 (0.491)	0.457 (0.498)
Older children	Dummy variable: 1 = presence of adult children in household; 0 otherwise	0.076 (0.265)	0.078 (0.268)	0.075 (0.263)
Partnered	Dummy variable: 1 = non-partnered; 0 = partnered	0.586 (0.493)	0.617 (0.486)	0.559 (0.497)
Qual Cert	Dummy variable: 1 = highest educational qualification is a school certificate; 0 otherwise	0.458 (0.498)	0.490 (0.500)	0.429 (0.495)
Qual Diploma	Dummy variable: 1 = highest educational qualification is a post-school Diploma; 0 otherwise	0.132 (0.338)	0.106 (0.308)	0.154 (0.361)
Qual Degree plus	Dummy variable: 1 = highest educational qualification is at least a degree; 0 otherwise	0.082 (0.274)	0.077 (0.267)	0.085 (0.279)
Calm	Dummy variable: 1 = if the respondent has felt calm and peaceful in the last four weeks some, most or all of the time; 0 = otherwise	0.650 (0.477)	0.684 (0.465)	0.620 (0.485)
Sample size		*6737*	*3130*	*3607*

Table 2: Health variables correlations

	Health Limiting	Pain	Energy	Depression	Health Social	Health Accomplishing	Employed	Calm
Health Limiting	–	–	–	–	–	–	–	–
Pain	0.463	–	–	–	–	–	–	–
Energy	0.396	0.272	–	–	–	–	–	–
Depression	0.269	0.189	0.344	–	–	–	–	–
Health Social	0.481	0.332	0.403	0.496	–	–	–	–
Health Accomplishing	0.351	0.204	0.350	0.600	0.534	–	–	–
Employed	-0.202	-0.112	-0.128	-0.144	-0.172	-0.177	–	–
Calm	-0.188	-0.148	-0.383	-0.409	-0.324	-0.373	0.070	–

Table 3: Percentage employed

	All	Males	Females
All	77.46	83.94	71.83
NZ European	80.14	85.92	75.05
Maori	65.99	72.63	60.99
Pacific Islanders	65.27	74.14	56.83

Table 4: Regression results for whole sample

Variable	Probit		Logit			Scobit			
				OR			OR		OR
N	6753	6737	6753		6737	6753		6737	
Health limiting	**-0.228** **(0.021)**	**-0.190** **(0.022)**	**-0.386** **(0.036)**	0.680	**-0.322** **(0.038)**	0.725	**-0.260** **(0.037)**	0.771	**-0.220** **(0.035)**	0.803
Pain	-0.029 (0.018)	-0.022 (0.018)	-0.053 (0.031)	0.948	-0.041 (0.032)	0.961	-0.029 (0.020)	0.971	-0.021 (0.021)	0.979
Energy	**-0.077** **(0.022)**	-0.028 (0.023)	**-0.138** **(0.038)**	0.871	-0.056 (0.040)	0.946	**-0.076** **(0.027)**	0.927	-0.026 (0.026)	0.975
Depressed	-	-0.049 (0.026)	-	-	-0.082 (0.044)	0.922	-	-	**-0.060** **(0.030)**	0.941
Health social	-	-0.045 (0.025)	-	-	-0.074 0.043)	0.929	-	-	**-0.053** **(0.029)**	0.948
Health accomplishing	-	**-0.095** **(0.026)**	-	-	**-0.165** **(0.045)**	0.848	-	-	**-0.100** **(0.033)**	0.904
Male	0.418** (0.038)	0.418** (0.039)	0.707** (0.068)	2.029	0.709** (0.068)	2.033	0.466** (0.069)	1.608	0.475** (0.068)	1.608
Age: 15-19 years	-0.579** (0.087)	-0.610** (0.087)	-0.953** (0.148)	0.385	-1.006** (0.149)	0.366	-0.696** (0.114)	0.476	-0.743** (0.118)	0.476
20-24 years	-0.076 (0.090)	-0.091 (0.090)	-0.124 (0.156)	0.884	-0.144 (0.157)	0.866	-0.085 (0.097)	0.900	-0.105 (0.100)	0.900
25-29 years	-0.041 (0.083)	-0.039 (0.084)	-0.077 (0.145)	0.926	-0.066 (0.146)	0.936	-0.038 (0.089)	0.960	-0.041 (0.092)	0.960
30-34 years	*Control variable*									
35-39 years	0.267** (0.078)	0.276** (0.079)	0.473** (0.138)	1.605	0.496** (0.139)	1.642	0.281** (0.093)	1.342	0.294** (0.095)	1.342
40-44 years	0.338** (0.080)	0.339** (0.080)	0.595** (0.142)	1.813	0.599** (0.143)	1.820	0.360** (0.098)	1.445	0.368** (0.100)	1.445
45-49 years	0.301** (0.081)	0.305** (0.081)	0.540** (0.144)	1.717	0.543** (0.145)	1.722	0.317** (0.098)	1.392	0.330** (0.100)	1.392
50-54 years	0.117 (0.084)	0.105 (0.085)	0.200 (0.149)	1.221	0.185 (0.149)	1.204	0.130 (0.090)	1.121	0.114 (0.093)	1.121
55-59 years	-0.119 (0.087)	-0.131 (0.088)	-0.193 (0.154)	0.824	-0.209 (0.155)	0.811	-0.139 (0.093)	0.854	-0.158 (0.096)	0.854

60-64 years	-0.508** (0.083)	-0.535** (0.084)	-0.882** (0.144)	0.414	-0.925** (0.145)	0.397	-0.538** (0.116)	0.555	-0.589** (0.119)	0.555
Children	-0.475** (0.046)	-0.480** (0.047)	-0.850** (0.082)	0.427	-0.854** (0.083)	0.426	-0.501** (0.092)	0.592	-0.525** (0.091)	0.592
Older children	0.008 (0.074)	-0.003 (0.075)	-0.009 (0.132)	0.991	-0.027 (0.132)	0.974	0.021 (0.079)	1.006	0.006 (0.081)	1.006
Partnered	0.366** (0.041)	0.322** (0.042)	0.637** (0.072)	1.890	0.560** (0.073)	1.751	0.391** (0.069)	1.428	0.356** (0.064)	1.428
Smoker	-0.123* (0.044)	-0.099* (0.045)	-0.214* (0.077)	0.807	-0.170* (0.078)	0.844	-0.132* (0.052)	0.891	-0.116* (0.052)	0.891
NZ European	*Control variable*									
Maori	-.0259** (0.053)	-.0253** (0.054)	-0.434** (0.091)	0.648	-0.425** (0.092)	0.654	-0.285** (0.067)	0.755	-0.281** (0.068)	0.755
Pacific Islanders	-0.333** (0.077)	-0.315** (0.078)	-0.581** (0.131)	0.559	-0.558** (0.132)	0.572	-0.368** (0.099)	0.706	-0.347** (0.101)	0.706
Other ethnicities	-0.448** (0.069)	-0.435** (0.069)	-0.774** (0.119)	0.461	-0.751** (0.120)	0.472	-0.487** (0.099)	0.614	-0.487** (0.098)	0.614
No school qualifications	*Control variable*									
Qual Cert	0.174** (0.042)	0.170** (0.042)	0.306** (0.072)	1.357	0.298** (0.072)	1.347	0.176** (0.052)	1.195	0.178** (0.053)	1.195
Qual Diploma	0.362** (0.064)	0.356** (0.064)	0.645** (0.114)	1.905	0.634** (0.115)	1.886	0.372** (0.088)	1.457	0.376** (0.088)	1.457
Qual Degree plus	0.443** (0.083)	0.435** (0.083)	0.791** (0.153)	2.205	0.779** (0.154)	2.180	0.452** (0.110)	1.581	0.458** (0.111)	1.581
Constant	1.203** (0.094)	1.344** (0.097)	2.055** (0.164)	-	2.293** (0.170)	-	-0.487 (1.039)	-	-0.139 (0.912)	-

Table 5: Regression results by gender

Variable	**Probit**		**Logit**				**Scobit**			
	Males	Females	Males	OR	Females	OR	Males	OR	Females	OR
N	*3130*	*3607*	*3130*		*3607*		*3130*		*3607*	
Health limiting	**-0.269** **(0.036)**	**-0.137** **(0.049)**	**-0.476** **(0.064)**	0.621	**-0.227** **(0.049)**	0.797	**-0.344** **(0.081)**	0.709	**-0.182** **(0.048)**	0.833
Pain	0.024 (0.030)	**-0.051*** **(0.039)**	0.044 (0.055)	1.045	**-0.088*** **(0.039)**	0.916	0.033 (0.040)	1.033	-0.065 (0.034)	0.937
Energy	-0.035 (0.037)	-0.024 (0.050)	-0.069 (0.067)	0.933	-0.047 (0.050)	0.954	-0.044 (0.049)	0.957	-0.027 (0.040)	0.973
Depressed	-0.054 (0.043)	-0.044 (0.056)	-0.088 (0.076)	0.916	-0.072 (0.056)	0.930	-0.074 (0.056)	0.929	-0.060 (0.044)	0.942
Health social	-0.067 (0.042)	-0.033 (0.054)	-0.120 (0.073)	0.887	-0.053 (0.054)	0.949	-0.087 (0.056)	0.917	-0.045 (0.043)	0.956
Health accomplishing	-0.060 (0.044)	**-0.118**** **(0.057)**	-0.107 (0.078)	0.898	**-0.196**** **(0.057)**	0.822	-0.077 (0.058)	0.926	**-0.152**** **(0.052)**	0.859

Notes: OR = odds ratios; Standard errors in parentheses; * and ** signify statistical significance at the 5% and 1% confidence level, respectively.
All other variables included in the regressions presented in Table 4 were also included in these regressions but are not reported for brevity.

Table 6: Regression results: Males only by ethnicity

	Maori *N* = 376			**Pacific Islander** *N* = 169			**NZ European** *N* = 2565		
	Probit	Logit OR	Scobit OR	Probit	Logit OR	Scobit OR	Probit	Logit OR	Scobit OR
Health limiting	**-0.346** **(0.103)**	**0.549** **(0.101)**	**0.719** **(0.073)**	-0.370 (0.212)	0.530 (0.196)	0.651 (0.145)	**-0.261** **(0.040)**	**0.624** **(0.045)**	**0.620** **(0.079)**
Pain	0.141 (0.079)	1.293 (0.185)	1.152 (0.084)	0.150 (0.133)	1.276 (0.289)	1.250 (0.188)	-0.009 (0.035)	0.984 (0.062)	0.984 (0.063)
Energy	0.029 (0.103)	1.036 (0.183)	1.055 (0.108)	-0.077 (0.191)	0.890 (0.301)	0.986 (0.196)	-0.028 (0.043)	0.947 (0.074)	0.946 (0.077)
Depressed	0.023 (0.112)	1.039 (0.203)	1.011 (0.113)	**-0.428*** **(0.182)**	**0.467*** **(0.153)**	**0.583*** **(0.132)**	-0.062 (0.050)	0.895 (0.080)	0.894 (0.084)
Health social	0.047 (0.109)	1.074 (0.206)	1.052 (0.109)	0.040 (0.202)	1.133 (0.396)	1.031 (0.247)	-0.086 (0.048)	0.855 (0.074)	0.853 (0.080)
Health accomplishing	-0.080 (0.106)	0.903 (0.172)	0.878 (0.095)	-0.214 (0.198)	0.692 (0.236)	0.843 (0.182)	-0.052 (0.052)	0.914 (0.087)	0.913 (0.089)

Notes: OR = odds ratios; Standard errors in parentheses; * and ** indicate statistical significance at the 5% and 1% confidence level, respectively.
All other variables included in the regressions presented in Table 4 were also included in these regressions but are not reported for brevity.

Table 7: Regression results: Females only by ethnicity

	Maori *N* = 485			**Pacific Islander** *N* = 180			**NZ European** *N* = 2907		
	Probit	Logit OR	Scobit OR	Probit	Logit OR	Scobit OR	Probit	Logit OR	Scobit OR
Health limiting	-0.075 (0.080)	0.878 (0.119)	0.868 (0.150)	-0.083 (0.122)	0.861 (0.176)	0.901 (0.125)	**-0.153** (0.033)**	**0.776** (0.043)**	**0.830** (0.044)**
Pain	-0.012 (0.067)	0.968 (0.109)	0.924 (0.155)	0.193 (0.120)	1.388 (0.293)	1.238 (0.157)	-0.044 (0.026)	0.925 (0.042)	0.950 (0.032)
Energy	-0.083 (0.078)	0.868 (0.112)	0.830 (0.153)	0.066 (0.137)	1.120 (0.258)	1.092 (0.171)	-0.026 (0.034)	0.949 (0.056)	0.976 (0.041)
Depressed	-0.031 (0.084)	0.952 (0.134)	0.925 (0.172)	-0.031 (0.150)	0.946 (0.241)	0.924 (0.176)	-0.046 (0.038)	0.928 (0.059)	0.948 (0.043)
Health social	-0.005 (0.080)	0.999 (0.132)	1.009 (0.169)	**-0.438** (0.167)**	**0.482** (0.135)**	**0.626* (0.125)**	-0.035 (0.037)	0.944 (0.058)	0.958 (0.043)
Health accomplishing	**-0.261** (0.085)**	**0.641** (0.091)**	**0.580* (0.151)**	-0.158 (0.152)	0.785 (0.201)	0.799 (0.136)	**-0.113** (0.039)**	**0.827** (0.054)**	**0.876* (0.048)**

Notes: OR = odds ratios; Standard errors in parentheses; * and ** indicate statistical significance at the 5% and 1% level, respectively.
All other variables included in the regressions presented in Table 4 were also included in these regressions but are not reported for brevity.

Table 8: Instrumental variable probit regression results

	All	Males	Females
N	6736	3130	3606
Mental Health	-0.068	-0.450	0.139
	(0.170)	(0.289)	(0.219)
Health limiting	-0.223**	-0.266**	-0.183**
	(0.026)	(0.045)	(0.033)
Pain	-0.028	0.023	-0.057*
	(0.018)	(0.031)	(0.023)
Energy	-0.068*	-0.023	-0.097*
	(0.031)	(0.050)	(0.041)
Male	0.417**	-	-
	(0.039)		
Age: 15-19 years	-0.589**	-1.143**	-0.281*
	(0.088)	(0.158)	(0.116)
20-24 years	-0.081	-0.382*	0.030
	(0.090)	(0.160)	(0.117)
25-29 years	-0.048	-0.284	0.004
	(0.084)	(0.160)	(0.104)
30-34 years		*Control variable*	
35-39 years	0.266**	0.077	0.316**
	(0.078)	(0.157)	(0.096)
40-44 years	0.333**	-0.090	0.477**
	(0.081)	(0.154)	(0.100)
45-49 years	0.301**	-0.144	0.479**
	(0.082)	(0.152)	(0.104)
50-54 years	0.112	-0.128	0.104
	(0.085)	(0.163)	(0.106)
55-59 years	-0.120	-0.470**	-0.087
	(0.088)	(0.159)	(0.114)
60-64 years	-0.511**	-0.864**	-0.461**
	(0.086)	(0.153)	(0.114)
Children	-0.479**	-0.201*	-0.676**
	(0.047)	(0.081)	(0.061)
Older children	0.001	0.021	-0.030
	(0.075)	(0.116)	(0.101)
Partnered	0.357**	0.627**	0.163**
	(0.043)	(0.077)	(0.054)
Smoker	-0.126**	-0.089	-0.155**
	(0.045)	(0.073)	(0.059)
NZ European		*Control variable*	
Maori	-0.254**	-0.339**	-0.236**
	(0.054)	(0.089)	(0.070)
Pacific Islanders	-0.330**	-0.471**	-0.352**
	(0.078)	(0.124)	(0.104)
Other ethnicities	-0.451**	-0.362**	-0.503**
	(0.070)	(0.121)	(0.089)
No school qualifications		*Control variable*	
Qual Cert	0.168**	0.204**	0.128*
	(0.042)	(0.069)	(0.054)
Qual Diploma	0.349**	0.539**	0.289**
	(0.063)	(0.133)	(0.074)
Qual Degree plus	0.427**	0.331*	0.452**
	(0.082)	(0.145)	(0.102)
Constant	1.240**	1.807**	1.328**
	(0.099)	(0.166)	(0.125)
Wald exogeneity tests	0.07	1.77	1.66

Notes: Standard errors in parentheses; * and ** signify statistical significance at the 5% and 1% confidence level, respectively.

Table 9: Instrumental variable probit exogeneity tests

	All	Maori	Pacific Islander	NZ European
All	0.07	0.05	0.07	0.00
Males	1.77	0.81	4.69*	2.14
Females	1.66	0.16	0.71	1.28

Note: * and ** signifies statistical significance at the 5% and 1% confidence level. All other variables included in the regressions presented in Table 8 were also included in these regressions but are not reported for brevity.

Endnotes:

[i] Apart from mental illness and mania delusions, the only other health covariate that Ojeda *et al.* (2010) included in their specifications was self-rated health.

[ii] While this study tackles the issue of reverse causality, other possible influences such as unobserved heterogeneity cannot be controlled for in this research. The data used in this paper is cross sectional, meaning that a fixed effects approach is not possible. This presents a useful future empirical investigation, when a suitable panel data set is available.

[iii] See, for instance, a description of the mental health priorities and additional funding received by Mid Central District Health Board (2011).

[iv] Although not shown in Table 1 for brevity, dummy variables for the age categories 15-19, 20-24, … 60-64 were also included in the analysis, with 30-34 year olds used as the control group.

[v] We retain this ordering of responses in the subsequent analysis and implicitly assume that a change in response from "not at all" to "a little bit" has the same effect as the change from "quite a bit" to "extremely" on employment propensity. Although this is a rather restrictive assumption expanding the analysis to accommodate these issues would drastically extend the size of the paper and move attention away from the main and innovative contribution of this paper: that mental and physical health issues both have the potential to affect the employment decision.

[vi] Also note, however, that the results presented later do not indicate that the pain variable significantly influences the employment propensity.

[vii] Unfortunately taking account of discrimination and other labour market factors which may explain these patterns is beyond the scope of this study.

[viii] See Nagler (1994) for details of this econometric approach.

[ix] Calculated by estimating e^{β} (Tarling, 2009).

[x] Of course, increased funding is not necessarily the immediate response here. Rather, future research should delve into the mechanics of how mediating factors can lead poor mental health to a reduced employment propensity.

[xi] Note that the possibility of multiple ethnicity responses by an individual is controlled for in all regression tables.

[xii] A limitation of our results with regard to the Pacific Island ethnic group is the small sample size.

[xiii] Oakley Browne *et al*. (2006) find that Pacific peoples are less likely to access *Child and adolescent mental health services* in NZ due to a number of cultural barriers. These include a lack of culturally appropriate specialists and/or resources, and possibly culturally different definitions of health (Ramage *et al*., 2005). Plausible reasons for this include Pacific Islanders being less likely to accept mental health issues as a significant factor and/or less likely to seek professional help at a later stage of their depression, relative to other ethnicities.

[xiv] Hogan *et al*. (1995) argue that there is still considerable scepticism regarding the meaning and validity of personality measures on real world performance and conclude that well-constructed

measures of normal personality are valid predictors of performance *within* virtually all occupations. Nevertheless, they also argue that such measures do not result in adverse impact for job applicants from minority groups and that well-developed personality measures for pre-employment screening is a way to promote social justice and increase organizational productivity. Whether the extent of being calm has its own distinct effect on employment probability remains a moot point.

[xv] It is worth noting that while the results in Table 8 are not directly comparable with those in Tables 4 and 5, after controlling for endogeneity, the physical health indicators appear to be more significant. Of course, it is possible that the increased importance of these factors may be due to unobserved mental health issues at play, since our instrumental variable specification necessitates simplification of mental health issues from three variables to one.

[xvi] As mentioned above, our inspection of the data set did not reveal an appropriate instrument for physical health. The endogeneity issue associated with physical health should be assessed in future research.