Migration and mental health: Evidence from a natural experiment

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ABSTRACT

People migrate to improve their well-being. Yet a large literature suggests that migration can be a stressful process, with potentially negative impacts on mental health. However, to truly understand the effect of migration one must compare the mental health of migrants to what their mental health would be had they stayed in their home country. The existing literature is not able to do this. New Zealand allows a quota of Tongans to immigrate each year with a random ballot used to choose amongst the excess number of applicants. Experimental estimates of the mental health effects of migration are obtained by comparing the mental health of migrants who were successful applicants in the random ballot to the mental health of those who applied to migrate under the quota, but whose names were not drawn. Migration is found to lead to improvements in mental health, particularly for women and those with poor mental health.

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1. Introduction

People migrate to improve their well-being. Economic migrants moving from a developing to a developed country will generally experience large gains in material well-being as they take advantage of higher wages abroad. However, the effects of migration on other dimensions of well-being are less clear. In particular, the process of moving from one cultural setting to another can be a very stressful process, with potentially negative impacts on mental health (Bhugra and Jones, 2001). In fact, the World Health Organization (2001, p.13) goes as far to claim "usually migration does not bring improved social well-being; rather. . .it often results in. . .exposing migrants to social stress and increased risk of mental disorders". To the extent that these mental health changes reduce the net benefits of migration they are of potential interest to economists, especially because there are strong economic arguments for increasing international migration (World Bank, 2005).

However, migration also has a number of effects that may improve mental health. Although recent evidence suggests there is little association between income levels and mental health in developing countries (Das et al., 2007), it is argued that immigrants may experience a deep sense of fulfillment in the short-term by using their new-found wealth to contribute to their extended family, village and church at home (Foliaki, 1997). Migrants may also experience mental health improvements from a change in cultural setting, which allows them to shed the burden of social restrictions that caused them to be anxious or depressed in their home countries.

To truly understand the effect of migration on mental health one must compare the mental health of migrants to what their mental health would have been had they stayed in their home country. However, the existing literature is not able to do this. The majority of studies compare the mental health of immigrants to those of natives.[1] Such comparisons take no account of any pre-existing differences between immigrants from developing countries and

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[1] For example, Muynck (1997), as cited in Carballo et al. (1998), finds that during the period of resettlement, Moroccan immigrants in Belgium are five times more likely to develop peptic ulcers than Belgian nationals, Bhugra (2004b) reviews a series of studies which find higher rates of schizophrenia among African–Caribbean immigrants in the UK than among white British natives, and Nazroo (1997) finds lower rates of emotional disorders and depression among immigrants from South Asia in the UK than among native-born whites.

natives in these developed countries.[2] While a few studies have made comparisons between movers and stayers from the same country (Odegaard, 1932; Maveras and Bebbington, 1988), these studies are also unable to control for the potential selection bias that will occur if unobserved characteristics which increase the propensity to migrate are also associated with either higher or lower risks of mental health disorders.

The direction of this bias is unclear since mental illnesses may lead to restlessness and hence make individuals more likely to migrate, but on the other hand, since long-distance migration is a complicated event, individuals with worse mental health may not be able to handle the processes needed to emigrate (Bhugra, 2004b). VanLandingham and Fu (2007) is the only paper we know of which attempts to deal with this selection, by comparing Vietnamese immigrants in New Orleans to never-leavers in Vietnam and to returnees in Vietnam who initially made it to a country of first asylum but were then repatriated because they could not show a bona fide risk of persecution in Vietnam. While the returnees provide a comparison group in Vietnam of individuals who also wished to migrate, forced repatriation is unlikely to be a random event and likely has its own direct impact on mental health, thus this group provides a less than ideal control group.

This paper overcomes the selection problems affecting these previous studies by examining Tongans who migrate to New Zealand through the pacific access category (PAC). The PAC allows an annual quota of Tongans to migrate to New Zealand, additional to those approved through other migration categories such as skilled migrants and family streams. Many more applications are received than the quota allows, so a ballot is used to randomly select from among the registrations. A unique survey conducted by the authors in both Tonga and New Zealand allows experimental estimates of the mental health effects of migration to be obtained by comparing the mental health of migrants who were successful applicants in the ballot to the mental health of those who applied to migrate under the quota, but whose names were not drawn. We are also able to compare the mental health of applicants to this migration program to that of non-applicants, examining the role of selection.

Our measure of mental health is the MHI-5 of Veit et al. (1983), a measure of mental health for the general population, which is useful for detecting depression, anxiety, and general affective disorders. Our results show that despite being positively selected in terms of education, Tongans with worse mental health are more likely to apply to migrate to New Zealand. We find that there are large and significant positive effects of migration on mental well-being. We also extend on the current literature, by allowing migration to have non-uniform impacts on mental health and find that migration has larger impacts on women and on individuals with poor mental health. Thus, rather than there being a mental health cost offsetting some of the economic gains from migration in an overall welfare assessment, these results suggest that migration brings positive benefits beyond economic gains.

Public and policy discussions about migration often express significant concern about possible negative social and mental health effects of migration on the migrants, with little hard evidence. Our paper provides the first cleanly identified estimate of the short-term impact of migration on mental health in any context, showing that, at least for Tongans moving to New Zealand, migration is also accompanied by mental health gains. The natural question which arises is then how generalizable these results are to other settings. There are a variety of types of migration, including permanent

migration for work, refugees, political asylees, seasonal workers, and forced migrants, and it seems unlikely the mental health effects will be the same for all groups.

Our study concerns the short-term impact of individuals migrating for work with their immediate family from a developing to a much richer developed country. This is one of the most common forms of migration worldwide. Moreover, Tongan migrants are similar in several important respects to the average developing country emigrant moving to work in a rich country. They work in jobs such as construction, cleaning, and retail services frequented by immigrants worldwide. The average Tongan in our sample has 11.7 years of education, compared to 11.0 years for the average 18–45-year-old new immigrant in the US, and Tongans exhibit a similar degree of positive selection on schooling as found among Mexican migrants moving to the US. As such, the results of this study may well generalize to other developing country economic migrants.

2. The association between mental health and migration

Since the classic study of Odegaard (1932), which found higher hospital admission rates for schizophrenia among Norwegians who had migrated to the United States than those who stayed in Norway, it has been generally presumed in the literature that migration is harmful for mental health. For example, according to Pernice et al. (2000, p. 24).

"the adverse effects on mental health of migration have been widely researched and established".

Much of the clinical literature concentrates on schizophrenia, where five hypotheses are suggested for the apparently high incidence rates amongst migrants (Cochrane and Bal, 1987):

1. Sending countries have high rates of schizophrenia,
2. schizophrenia predisposes people to migrate,
3. the process of migration produces stress and elevated rates of schizophrenia,
4. certain cultural practices of migrant groups get misdiagnosed as schizophrenia, and
5. some symptoms of schizophrenia are more common amongst the cultures that migrants are from.

There is debate about the strength of each of these hypotheses. Moreover, they illustrate the difficulties associated with ascribing a causal role to migration. Most studies in the literature compare immigrants to natives. However, if people from different countries have different rates of mental illness (explanation 1), or different probabilities of getting diagnosed (explanations 4 and 5), then these will confound the effect of migration. Studies which compare migrants and non-migrants from the same country still face the problem of distinguishing selection (explanation 2) from causation (explanation 3).

Bhugra (2004a,b) notes that the evidence is less clear cut when one considers common mental disorders such as anxiety and depression, with some studies finding higher incidences in immigrant groups than among natives, and others the opposite. Similar mixed results are found among immigrants to New Zealand. Pernice and Brook (1994) find the mental health of a sample of Pacific Island immigrants in New Zealand to be as low as that of a sample of Southeast Asian refugees, and significantly lower than that of British immigrants. In contrast, Graves and Graves (1985) surveyed Samoans, Cook Islanders and native-born New Zealanders of European background, and found the Pacific Islanders to have significantly fewer psychosomatic symptoms of health problems than did the European New Zealanders.

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[2] A further problem is that many of these studies compare clinical populations, and therefore are faced with the further selection issue of whether immigrants and natives are equally likely to use clinical facilities.

Nevertheless, despite this mixed evidence, there are a number of hypotheses and theories which suggest that migration should have a causal effect on mental health. Carta et al. (2007) note that emigration involves far-reaching changes in practically everything that surrounds a person, with changes in climate, language, culture, status, and social relations. They claim that every person who migrates experiences affective loss. Depression may arise from this loss. However, Bhugra (2004b) also notes that the genesis of depression can often lie in a sense of entrapment and defeat. Individuals who feel trapped by limited job and social opportunities in their home countries may therefore emerge out of depression when new opportunities open through migration. The net effect is ultimately an empirical matter, requiring careful attention to self-selection.

3. Context and survey

3.1. Background

The Kingdom of Tonga is an archipelago of islands in the South Pacific, about two-thirds of the way from Hawaii to New Zealand.[3] The population is just over 100,000, with a GDP per capita of approximately US$ 2200 in PPP terms. One-third of the labour force is in agriculture and fishing, with the majority of workers in the manufacturing and services sectors, which are dominated by the public sector and tourism. Employment concerns are particularly prevalent among youth, and appear to contribute to elevated levels of depression amongst this group (UNICEF, 2001).[4]

Emigration levels are high, with 30,000 Tongans living abroad, primarily in New Zealand, Australia and the United States. Migration to New Zealand began in sizeable numbers during the 1960s and 1970s, with Tongans arriving on temporary permits to take up work opportunities. After their permits expired, some returned to Tonga and others stayed on in New Zealand illegally. An amnesty in 1976 granted many of these individuals permanent residence. Migration for work continued in the late 1970s and 1980s, and by 1986 the Tongan population in New Zealand had reached 13,600. However, in 1991, New Zealand introduced a selection system for immigration, in which potential migrants are awarded points for education, skills, and business capital. Few Tongans qualified to migrate under this system, and so most Tongan migration during the 1990s was under family sponsored categories—as the spouse, parent, or child of an existing migrant. For example, in 1997/1998 only 29 Tongans were admitted as principal applicants under the points system, compared to 436 under family categories. With family migration, the Tongan-born population in New Zealand had grown to 19,000 by the 2001 Census. Migration to Australia and the United States has also become much more restrictive and reliant on family reunification categories. Australia admitted 284 Tongans during the 2004/2005 financial year.[5] The United States admitted 324 Tongans in the 2004 calendar year, comprising only 5 under employment-based preferences and 290 under immediate relative or family sponsored categories.[6]

3.2. The pacific access category

In early 2002, another channel was opened up for immigration to New Zealand through the creation of the PAC, which allows for a quota of 250 Tongans to emigrate to New Zealand each year without going through the usual migration categories used for groups such as skilled migrants and business investors.[7] Specifically, any Tongan citizens aged between 18 and 45, who meet certain English, health and character requirements,[8] can register to migrate to New Zealand.[9] Many more applications are received than the quota allows, so a ballot is used by the New Zealand Department of Labour (DoL) to randomly select from amongst the registrations. During the 2002–2005 period we study, the odds of having one's name drawn were approximately one in ten. Individuals whose names are not selected can apply again the next year.

Once their ballot is selected, applicants must provide a valid job offer in New Zealand within 6 months in order to have their application to migrate approved. After a job offer is filed along with their residence application, it typically takes 3–9 months for an applicant to receive a decision. Once receiving approval, they are then given up to 1 year to move. The median migrant in our sample moved within 1 month of receiving their residence approval. At the time of our survey, the median migrant had spent 8 months in New Zealand (mean of 11 months). Thus, this paper examines the impact of migration on mental health in the short-term.

3.3. Survey data

The data used in this paper are from the Tongan component of the Pacific Island-New Zealand Migration Survey (PINZMS), a comprehensive household survey designed to measure multiple aspects of the migration process and take advantage of the natural experiment provided by the PAC.[10] The survey design and enumeration, which was overseen by the authors in 2005–2006, covered random samples of four groups of households, surveying in both New Zealand and Tonga.

The first group consists of a random sample of 101 of the 302 Tongan immigrant households in New Zealand, who had a member who was a successful participant in the 2002–2005 PAC ballots.[11] Administrative data show that none of the ballot winners had returned to live in Tonga at the time of the survey, nor had any of them after a further 2 years. The second group consists of a sample of households of successful participants from the same random

[3] This sub-section is based on information from the CIA World Factbook (http://www.cia.gov/cia/publications/factbook/geos/tn.html) and from the Tongan Statistical Abstract 2006 (http://www.spc.int/prism/tongatest/StatisticalAbstract 2006/AbsSection/lfm.pdf).

[4] According to a UNICEF study, one-third of school age youth in Tonga reported experiencing severe sadness or depression in the previous 6 months. Almost one half of the sample felt it was unlikely or impossible that they would find a job upon leaving school (UNICEF, 2001).

[5] Source: Settler Arrivals 2004–2005, Australian Government Department of Immigration and Multicultural Affairs.

[6] Source: 2004 Yearbook of Immigration Statistics, U.S. Department of Homeland Security Office of Immigration Statistics.

[7] The pacific access category also provides quotas for 75 citizens from Kiribati, 75 citizens from Tuvalu, and, prior to the December 2006 coup, 250 citizens from Fiji to migrate to New Zealand. There have been some changes in the conditions for migration under the pacific access category since the period we examine in this paper (see Gibson and McKenzie, 2007 for details)—here we describe the conditions that applied for the potential migrants studied in this paper.

[8] Data supplied by the New Zealand Department of Labour for residence decisions made between November 2002 and October 2004 reveals that out of 98 applications only 1 was rejected for failure to meet the English requirement and only 3 others were rejected for failing other requirements of the policy. See McKenzie et al. (forthcoming) for more details on this policy.

[9] The person who registers is a principal applicant. If they are successful, their immediate family (spouse and children under age 24) can also apply to migrate as secondary applicants. The quota of 250 applies to the total of primary and secondary applicants and corresponds to about 70 migrant households.

[10] See www.pacificmigration.ac.nz for more details of the survey.

[11] A large group of the immigrant households were unavailable for us to survey because they had been reserved for selection into the sample of the longitudinal immigrant survey, conducted by Statistics New Zealand. In McKenzie et al. (forthcoming), we describe in detail the tracking of the sample in New Zealand, showing a contact rate of over 70%. The main reasons for non-contact were incomplete name and address details, which should be independent of mental health and therefore not a source of sample selectivity bias. There was only one refusal to take part in the survey in New Zealand and none in Tonga.

ballots who were still in Tonga at the time of surveying. We sampled 26 of the 65 households in this group, focusing our sampling on households located in villages from which the migrants in our first survey group had emigrated. Most of this group consists of individuals whose applications were still being processed at the time of surveying. In forming our experimental estimate, we weight the sample so that it reflects the actual ratio of migrants to successful ballots still in Tonga at the time of the survey.

The third survey group consists of households of unsuccessful participants in these same ballots. The full list of unsuccessful ballots from these years was provided to us by the New Zealand Department of Labour, but the details for this group were less informative than those for the successful ballots, as only a post office box address was supplied and there were no telephone numbers. We used two strategies to derive a sample of 119 households with a member with an unsuccessful ballots from this list, with this sample size again dictated by our available budget. First, we used information on the villages where migrants had come from to draw a sample of unsuccessful ballots from the same villages (implicitly using the village of residence as a stratifying variable). Second, we used the Tongan telephone directory to find contact details for people on the list. To overcome concerns that this would bias the sample to the main island of Tongatapu, where people are more likely to have telephones, we deliberately included in the sample households from the Outer Islands of Vava'u and 'Eua.

The final survey group consists of households living in the same villages as the PAC applicants but from which no eligible individuals applied for the quota in any of our sample years (e.g. 2002–2005). We randomly selected 90 non-applicant households with at least one member aged 18–45. This group will be used to examine selection into migration.

3.4. Measuring mental health

The same survey instruments were then administered to all four groups by the same survey team. The survey collected data on employment, income and demographics for all household members, along with detailed modules on health, remittances and the migration experience. Mental health was measured using the Mental Health Inventory 5 (MHI-5) of Veit et al. (1983).[12] This is a five item scale with a maximum score of 25 and minimum score of 5. Higher scores are desirable in that they indicate the experience of psychological well-being and the absence of psychological distress during the past month. The MHI-5 measure was developed for use in the general population and has been used as part of general surveys of health and quality of life in addition to specific studies on mental health. The measure compares well to other more detailed measures. For example, Berwick et al. (1991) compared the screening accuracy of the MHI-5 with that of the longer 18-item MHI, the 30-item version of the General Health Questionnaire (GHQ-30), and a 28-item Somatic Symptom Inventory (SSI-28). The MHI-5 was found to be as good as the MHI-18 and the GHQ-30, and better than the SSI-28, for detecting major depression, general affective disorders, and anxiety disorders.

Different thresholds of the MHI-5 score correspond to different degrees of mental distress. While there is no universal choice of a threshold, several studies of general populations have used a cutoff of less than 17 as an indicator of major depression, and a cutoff of less than 19 as an indicator of poor mental health (Urban Institute,

1999; Yamazaki et al., 2005). In our non-migrant sample, 6.5% of individuals have scores less than 17, 17.9% have scores below 18, 31.1% have scores below 19, and 48.7% have scores below 20. However, in the migrant sample, only one person has a score less than 17 and five people have a score less than 18, thus in our empirical models we consider threshold cutoffs of less than 19 and less than 20.

Mental health was collected for each individual aged 15 and over in the household. However, since PAC migrants can only move with their spouse and dependent children, our experimental estimates compare the mental health of the migrant, spouse, and children aged 15 and over to those of the principal applicant, spouse, and children aged 15 and over among PAC ballot entrants still in Tonga.[13] This results in sample sizes of 201 migrants, 56 ballot winners still in Tonga, and 240 ballot losers in Tonga. All results are clustered at the household level and weighted to represent the population of PAC ballot entrants.

4. Mental health patterns in Tonga

We begin by examining the correlates of mental health status for individuals aged 15–48 residing in Tonga, as estimated using the combined sample of unsuccessful ballot applicants, successful ballot applicants still in Tonga, non-applicants and previous household members of successful migrants now in NZ that are still in Tonga. These results will then be used later in the paper as an aid to help understand the possible channels through which migration may be affecting mental health. Table 1 presents the results of regressing the MHI-5 score on socioeconomic characteristics of these respondents. These results are used merely to describe the patterns present in the data, since many of the included independent variables, such as education, labour force status, religion, and physical health may themselves be affected by mental health status.

Column 1 presents a base regression, relating mental health status to some of the most common correlates studied in the literature. Women are found to have significantly better mental health than men. While this is in contrast to the patterns found in many other countries (Das et al., 2007), it is consistent with previous evidence from Tonga, at least amongst school age youth (UNICEF, 2001). Mental health declines with age (at least among the eligible age range for the PAC). Mental health status is found to be worse for individuals born on the main island of Tongatapu compared to those born on the other islands in Tonga, better for Catholics than those of other religions and better for individuals that have previously visited New Zealand.

Column 2 then adds controls for household income, employment and physical health. We see a positive and significant association between household income and mental health, and a positive, but marginally significant association, between employment and mental health. A one standard deviation increase in monthly total household income is associated with a 0.30 increase

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[12] We use version 2, which is the mental health component of the 36-item short-form health survey (SF-36) which has been used in over 50 countries as part of the International Quality of Life Assessment project (http://www.sf-36.org). Appendix A lists the specific questions used in the MHI-5.

[13] In the overwhelming majority of cases, all family members who were eligible to move with the principal applicant did so. In our survey, only five age-eligible and relationship-eligible family members did not move to New Zealand simultaneously with the migration of the lottery winner. Four of these who stayed were children, three of whom were below age two. The one spouse who stayed was the mother of one of these young children. In our follow-up survey in 2008, we established that all of these young children and the spouse had subsequently moved to New Zealand. The only eligible teenager who stayed was 18 years old. This teenager had an age-ineligible sibling (aged 27) who stayed in the family dwelling in Tonga and we presume that the teenager choose to initially stay with their sibling rather than move with the parents to New Zealand. However, by the time of our follow-up survey in 2008, they had moved to New Zealand to join the parents.

Table 1
Predictors of mental health status in Tonga.

	(1) All	(2) All	(3) Males	(4) Females
Real total household income (000's of June 05 pa'anga)		0.0172** (0.007)	0.015 (0.010)	0.0195** (0.008)
Currently employed dummy		0.339* (0.190)	0.241 (0.290)	0.489* (0.284)
Female dummy	0.508*** (0.169)	0.505** (0.204)		
Married dummy	−0.113 (0.314)	−0.017 (0.303)	−0.016 (0.434)	0.099 (0.375)
Age	−0.174* (0.096)	−0.130 (0.100)	−0.123 (0.160)	−0.136 (0.119)
Age-squared	0.002 (0.001)	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Years of education	−0.0611** (0.031)	−0.0753** (0.030)	−0.0723** (0.047)	−0.0723** (0.030)
Born on Tongatapu dummy	−0.625*** (0.199)	−0.646*** (0.202)	−0.878*** (0.273)	−0.878*** (0.277)
Visited New Zealand before 2000	0.581*** (0.217)	0.536** (0.219)	0.470 (0.312)	0.509* (0.294)
Height	0.015 (0.009)	0.012 (0.013)	0.017 (0.013)	0.004 (0.015)
Catholic dummy	0.484 (0.333)	0.405 (0.357)	0.463 (0.357)	0.308 (0.380)
Mormon dummy	−0.325 (0.346)	−0.314 (0.362)	−0.308 (0.365)	−0.350 (0.450)
Very good self-reported health dummy		0.190 (0.209)	0.399 (0.282)	−0.185 (0.305)
Currently smoke dummy		−0.239 (0.210)	−0.688*** (0.246)	1.601*** (0.403)
Number of alcoholic drinks per typical month		0.000 (0.003)	0.002 (0.003)	−0.0716*** (0.020)
Constant	21.20*** (2.076)	20.73*** (2.127)	19.59*** (2.626)	22.87*** (3.062)
Observations	564	559	268	291
R-squared	0.19	0.22	0.22	0.27

Robust standard errors that account for clustering at the household level in parentheses. A control variable for the survey year are also included in the regression. Columns 1 and 2 are for combined sample of males and females.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 2
Self-selection into migration (unsuccessful ballots vs. non-applicants). Probit model of likelihood of applying for the pacific access category marginal effects and their standard errors are presented.

	(1)	(2)	(3)	(4)
Mental health score		−0.0384*** (0.015)		
Mental health score <19			0.200*** (0.065)	
Mental health score <20				0.185*** (0.060)
Currently employed dummy	0.121* (0.062)	0.124** (0.062)	0.124* (0.063)	0.112* (0.061)
Real total household income (000's of June 05 pa'anga)	0.00382* (0.002)	0.00450** (0.002)	0.00448** (0.002)	0.00448** (0.002)
Female dummy	−0.075 (0.067)	−0.065 (0.069)	−0.064 (0.069)	−0.066 (0.069)
Married dummy	−0.276*** (0.084)	−0.297*** (0.086)	−0.304*** (0.086)	−0.286*** (0.086)
Age	0.127*** (0.040)	0.134*** (0.039)	0.135*** (0.040)	0.126*** (0.039)
Age-squared	−0.00167*** (0.001)	−0.00180*** (0.001)	−0.00180*** (0.001)	−0.00166*** (0.001)
Years of education	0.0456*** (0.015)	0.0460*** (0.015)	0.0479*** (0.016)	0.0442*** (0.015)
Born on Tongatapu dummy	0.124** (0.060)	0.112* (0.059)	0.117** (0.058)	0.117* (0.059)
Visited New Zealand before 2000	0.145** (0.073)	0.174** (0.075)	0.174** (0.074)	0.173** (0.075)
Height	−0.002 (0.003)	−0.002 (0.003)	−0.002 (0.003)	−0.002 (0.003)
Catholic dummy	0.013 (0.093)	0.025 (0.096)	0.0130 (0.096)	0.031 (0.096)
Mormon dummy	0.085 (0.105)	0.077 (0.101)	0.103 (0.103)	0.087 (0.103)
Very good self-reported health dummy	−0.017 (0.058)	−0.006 (0.057)	0.006 (0.058)	−0.011 (0.057)
Currently smoke dummy	0.061 (0.073)	0.049 (0.072)	0.058 (0.073)	0.057 (0.073)
Number of alcoholic drinks per typical month	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
Observations	350	350	350	350

Robust standard errors that account for clustering at the household level in parentheses. A control variable for the survey year is also included in the regression. This compares unsuccessful principal applicants to all non-applicants age 18–45. 33.4% of the combined sample is unsuccessful principal applicants.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

(or 0.13 standard deviation) increase in mental health. There are no significant associations between physical health status and mental health.

Columns 3 and 4 of Table 1 then estimate the correlates of mental health separately by sex. Most of the variables have similar relationships with mental health for males and females. However, we do find different relationships for a few. In particular, a 1000 pa'anga increase in annual household income is associated with a 0.015 increase in mental health for men and a 0.020 increase in mental health for women.[14] Employment status also has a strong relationship with mental health for women. Smoking is associated with worse mental health for men, but with better mental health for women, while alcohol consumption is associated with worse mental health for women but not men.

5. Self-selection into migration by mental health status

One of the suggested explanations for finding worse mental health among migrants is that individuals with mental disorders may be more likely to try and migrate. However, we are not aware of any empirical study that has been able to test this hypothesis by comparing migrants prior to emigration to non-migrants. The PINZMS data allows us to investigate this by comparing the characteristics of unsuccessful applicants to the PAC, who wish to migrate to New Zealand, with non-applicants, who do not.

[14] At the time of the survey, 1000 pa'anga was equivalent to US$ 500 and NZ$ 730.

Table 2 presents marginal effects from probit estimation of the likelihood that an individual applies for the PAC as a function of their characteristics. It compares the sample of non-applicants aged 18–45 to the sample of principal applicants with unsuccessful ballots, who provide a random sample of people who want to migrate to New Zealand. Column 1 considers selection into the PAC without conditioning on mental health. Individuals who are employed, not married, with more education, who have previously visited New Zealand and who were born on Tongatapu are more likely to apply to migrate. The peak age for applying is 38. Column 2 then shows that conditional on these other observed characteristics, individuals with lower MHI-5 scores are more likely to apply to the PAC ballot. Since higher MHI-5 scores indicate better mental health, the point estimate shows negative selection into migration. Columns 2 and 3 consider cutoffs of less than 19 and less than 20 for mental health scores, which are similar to the cutoffs used in other studies to indicate poor mental health. Again, we find a strong and significant impact of mental health on migration. Individuals with poor mental health are 19–20 percentage points more likely to apply to migrate, even after conditioning on their age, gender, education, marital status, employment status, and household income per capita.

6. The effect of migration on mental health

6.1. Estimating treatment effects using experimental data

The remainder of this paper focuses on estimating the impact of migration to New Zealand on the mental health of Tongans. To determine the impact of migration on mental health, one must compare the mental health of the migrant to what their mental health would have been like had they not migrated. Typically, it is not possible to readily identify this unobserved counterfactual outcome. However, the PAC ballot, by randomly choosing among individuals eager to migrate to New Zealand, creates a control group of individuals that should have the same outcomes as what the

Table 3
Test for randomization. Comparison of ex-ante characteristics of principal applicants, spouse, children ≥15 in successful and unsuccessful ballots.

	Sample applicants Means		T-test of equality
	Successful ballots	Unsuccessful ballots	of means p-Value
Proportion female	0.52	0.52	1.00
Proportion who are married	0.63	0.64	0.81
Age	31.2	30.8	0.59
Proportion principle applicant (PA)	0.49	0.50	0.91
Years of schooling	11.2	10.6	0.18
Height	169.8	168.3	0.19
Proportion born on Tongatapu	0.77	0.74	0.57
Proportion Catholic	0.14	0.15	0.83
Proportion Mormon	0.17	0.17	0.92
Proportion Protestant	0.62	0.65	0.73
Employment in prior year/before moving	0.55	0.40	0.00
Income in prior year/before moving	85.9	82.9	0.79
Proportion who had been to NZ before 2000	0.39	0.26	0.01
Percent in New Zealand 2000	0.81		
Months in New Zealand	11.16		
Total sample size	257	240	

Test statistics account for clustering at the household level.

Table 4
Linear experimental estimates of intent-to-treat and treatment effects. Dependent variable: mental health score on 5–25 scale (25 = best).

	(1) OLS	(2) OLS	(3) IV	(4) IV	(5) IV-females	(6) IV-females
Ballot success dummy	1.772*** (0.249)	1.566*** (0.236)				
Migration dummy			2.185*** (0.289)	1.944*** (0.262)	1.596*** (0.321)	2.354*** (0.322)
Female dummy		0.188 (0.195)		0.189 (0.191)		
Married dummy		−0.403 (0.374)		−0.405 (0.367)	−0.036 (0.581)	−0.562 (0.434)
Age		0.014 (0.127)		0.014 (0.125)	−0.142 (0.173)	0.177 (0.146)
Age-squared/100		(0.000) (0.002)		(0.000) (0.002)	0.002 (0.003)	(0.003) (0.002)
Years of education		−0.0651* (0.038)		−0.0678* (0.037)	−0.062 (0.056)	−0.0990** (0.046)
Born on Tongatapu dummy		−0.249 (0.258)		−0.246 (0.253)	−0.116 (0.382)	−0.343 (0.376)
Height		0.005 (0.011)		0.005 (0.010)	0.007 (0.014)	0.010 (0.015)
Catholic dummy		1.105** (0.457)		1.112** (0.447)	0.658 (0.523)	1.663*** (0.485)
Mormon dummy		0.249 (0.357)		0.258 (0.348)	0.202 (0.427)	0.470 (0.457)
Past employment dummy		0.154 (0.382)		0.136 (0.375)	−0.235 (0.494)	0.593 (0.529)
Past income		−0.001 (0.001)		−0.001 (0.001)	0.000 (0.001)	−0.002 (0.002)
Visited NZ before 2000		0.802*** (0.269)		0.774*** (0.264)	0.828* (0.424)	0.689* (0.385)
Constant	19.30*** (0.19)	19.64*** (2.71)	19.30*** (0.19)	19.30*** (2.67)	21.26*** (3.30)	17.09*** (3.59)
First stage instrument F-stat			395.0	372.6	301.1	352.6
Mean for unsuccessful ballots			19.3	19.3	19.2	19.4
Observations	497	497	497	497	238	259
R-squared	0.05	0.25	0.06	0.26	0.24	0.32

Robust standard errors that account for clustering at the household level in parentheses. Control variables for whether past income is missing, visited New Zealand before 2000 is missing, and the survey year are also included in the regression. Ballot success is used as an instrument for migration. Columns 1–4 are for combined sample of males and females.

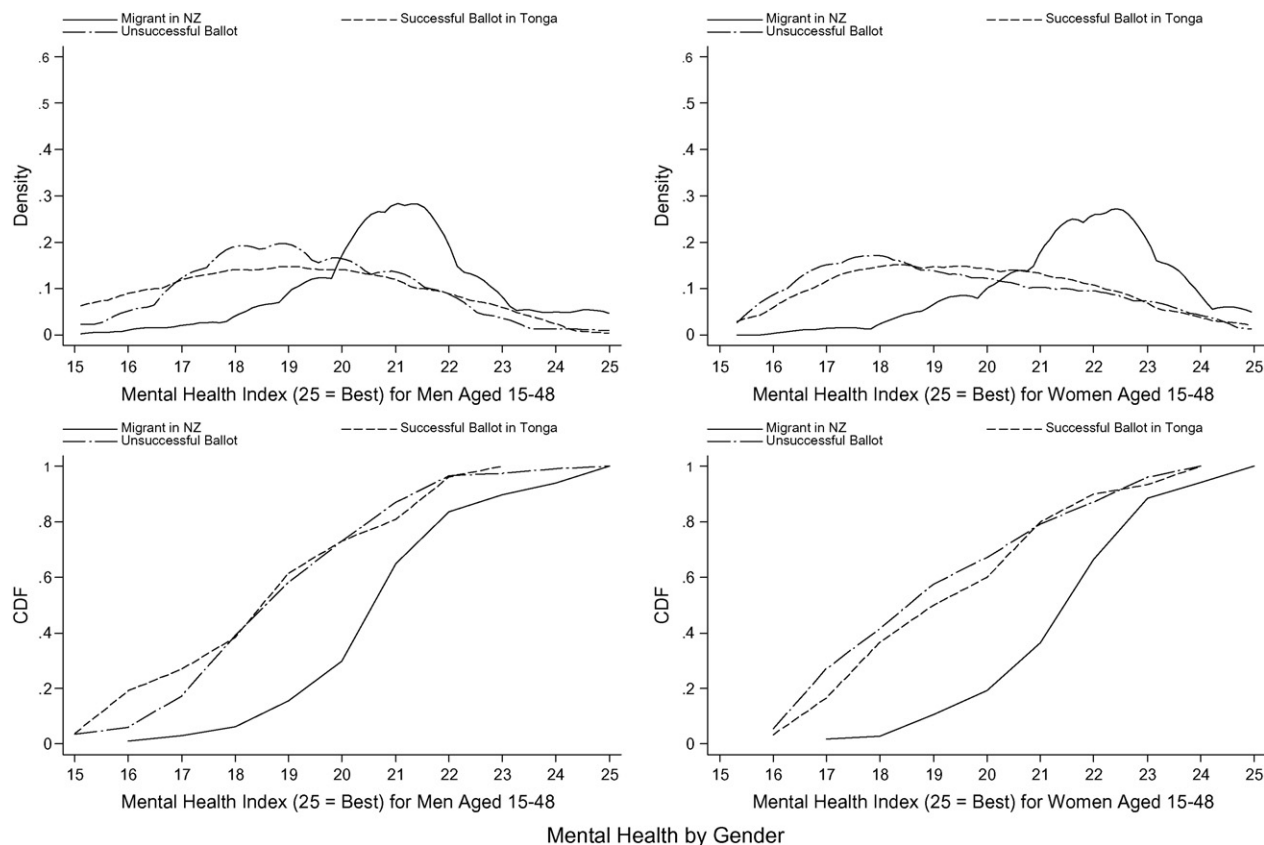* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Fig. 1. Mental health by gender.

migrants would have had if they had not moved. While random selection guarantees that the characteristics of the successful and unsuccessful ballots will have the same means on average, some differences can arise in any given sample. Table 3 compares the means of ex-ante characteristics for ballot winners and ballot losers among all individuals age 15–48 in our sample, and shows that the two groups are similar in most respects. In particular, they have the same gender, age, proportion principle applicant, education, height, religion, marital status, and income in the prior year. However, ballot winners have higher employment rates in our sample, on average, than ballot losers and are more likely to have visited New Zealand prior to 2000. Thus, we will control for these observed char-

Table 5
IV estimates of experimental impact for different thresholds. Dependent variable: ML bivariate probit models—marginal effects and their standard errors are presented.

	(1) <19 All	(2) <20 All	(3) <19 Males	(4) <19 Females	(5) <20 Males	(6) <20 Females
Migration dummy	−0.349*** (0.040)	−0.492*** (0.052)	−0.320*** (0.060)	−0.381*** (0.060)	−0.435*** (0.083)	−0.541*** (0.061)
Female dummy	0.017 (0.062)	0.023 (0.060)				
Married dummy	0.145 (0.089)	0.078 (0.108)	−0.118 (0.156)	0.321*** (0.108)	−0.003 (0.167)	0.134 (0.145)
Age	−0.010 (0.032)	0.006 (0.036)	0.071 (0.045)	−0.113** (0.050)	0.069 (0.047)	−0.061 (0.046)
Age-squared/100	0.000 (0.000)	0.000 (0.001)	10.001 (0.001)	0.00169** (0.001)	10.001 (0.001)	0.001 (0.001)
Years of education	0.012 (0.013)	0.021 (0.013)	0.001 (0.018)	0.0368** (0.018)	−0.005 (0.019)	0.0488*** (0.018)
Born on Tongatapu dummy	−0.020 (0.066)	0.078 (0.077)	−0.056 (0.112)	−0.039 (0.104)	0.049 (0.104)	0.057 (0.106)
Height	−0.001 (0.003)	0.002 (0.003)	−0.003 (0.004)	−0.002 (0.005)	−0.001 (0.004)	0.004 (0.005)
Catholic dummy	−0.133 (0.082)	−0.201* (0.121)	0.109 (0.114)	−0.357*** (0.121)	−0.3 (0.145)	−0.375*** (0.134)
Mormon dummy	−0.045 (0.080)	−0.079 (0.105)	0.034 (0.114)	−0.211** (0.114)	0.021 (0.138)	−0.258* (0.135)
Past employment dummy	−0.080 (0.109)	0.015 (0.110)	0.003 (0.142)	−0.255* (0.138)	0.034 (0.155)	−0.092 (0.171)
Past income	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
Visited NZ before 2000	−0.133** (0.066)	−0.120 (0.075)	−0.154 (0.104)	−0.078 (0.112)	−0.084 (0.119)	−0.121 (0.112)
Percent of unsuccessful ballots below threshold	0.406	0.582	0.395	0.416	0.588	0.576
Observations	482	482	229	253	229	253

Robust standard errors that account for clustering at the household level in parentheses. Control variables for whether past income is missing and the survey year are also included in the regression. 15 individuals missing whether they visited NZ before 2000 are dropped from each regression. Ballot success is used as an instrument for migration. Columns 1–2 are for combined sample of males and females.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 6
IV Quantile regression experimental estimates (CH method). Dependent variable: mental health score on 5–25 scale (25 = best).

	(1) 25th Pctile	(2) 50th Pctile	(3) 75th Pctile
Migration dummy	2.440*** (0.444)	1.960*** (0.389)	1.860*** (0.380)
Female dummy	0.006 (0.339)	0.047 (0.335)	0.197 (0.370)
Married dummy	−0.826 (0.558)	−0.887 (0.610)	−0.196 (0.529)
Age	0.064 (0.201)	0.009 (0.154)	0.017 (0.177)
Age-squared/100	−0.001 (0.003)	0.000 (0.002)	0.000 (0.003)
Years of education	−0.161 (0.080)	−0.094* (0.056)	−0.081 (0.051)
Born on Tongatapu dummy	−0.082 (0.386)	−0.055 (0.413)	−0.463 (0.431)
Height	−0.004 (0.019)	0.004 (0.019)	0.003 (0.013)
Catholic dummy	0.782* (0.633)	1.034 (0.695)	0.919** (0.537)
Mormon dummy	0.064 (0.472)	−0.034 (0.530)	0.062 (0.407)
Past employment dummy	0.270 (0.558)	0.100 (0.592)	−0.202 (0.542)
Past income	0.001 (0.002)	0.000 (0.002)	0.000 (0.002)
Visited NZ before 2000	0.733* (0.440)	1.022** (0.397)	0.294* (0.355)
Observations	497	497	497

Robust standard errors that account for clustering at the household level in parentheses. Significance levels are derived using the percentile method. Control variables for whether past income is missing, whether previously visited New Zealand is missing and the survey year are also included in the regression. Ballot success is used as an instrument for migration. 72 reps for 25th, 10 reps for 50th and 27 reps for 75th out of 1000 are dropped because of non-convergence.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

acteristics to improve the precision of our estimates and control for any differences in mental health arising from baseline differences in observed variables.

6.2. Linear treatment effects

Table 4 presents our experimental estimates of the impact of migration on mental health. The intent-to-treat effect is shown in column 1, and is the mean impact of the PAC program on mental health. On average, winning the PAC ballot is estimated to improve mental health by 1.77 points, which is significant at the 1% level. To improve the efficiency of our ITT estimate and control for any differences between the sample characteristics of the successful and unsuccessful ballots, we next add in variables which control for the observable pre-existing characteristics of the two groups and estimate β in the following regression:

$$\text{Mental health}_i = \alpha + \beta \times \text{ballot success}_i + \delta' X_i + \omega_i \qquad (1)$$

In column 2, we add a set of controls for pre-existing characteristics of individuals. These include standard variables, such as age, sex, marital status, and years of education. In addition, we include height as a pre-existing measure of health, whether or not the individual was born on the main island of Tongatapu, whether the individual visited New Zealand prior to 2000, and dummy variables indicating the individual's religion (Catholic vs. Mormon vs. Protestant or Other), and past income to capture the effect of a host of unobserved individual attributes. Adding these controls decreases the size of the estimated effect slightly, to 1.57. The fact that the coefficient does not change much when we add these controls is consistent with randomization ensuring that the treatment and control groups are balanced.

The ITT measures the impact of winning the PAC ballot, rather than the impact of migration, because not all ballot winners had migrated. Instrumental variables regression provides an approach for estimating average treatment effects with experimental data. In our application, the PAC ballot outcome can be used as an excluded instrument because randomization ensures that success in the ballot is uncorrelated with unobserved individual attributes which might also affect mental health and success in the ballot is strongly correlated with migration (the first stage F-statistic is

395).[15] This estimate is called the local average treatment effect (IV-LATE) and can be interpreted as the effect of treatment on individuals whose treatment status is changed by the instrument. Angrist (2004) demonstrates that in situations where no individuals who are assigned to the control group receive the treatment (e.g. there is no other way for unsuccessful applicants to migrate to New Zealand, which more or less characterizes the situation for PAC applicants) then the IV-LATE is the same as the average treatment effect on the treated (IV-TT).

Column 3 of Table 4 reports the IV-TT estimator when no other controls are included in the regression model, and estimates a 2.19 point improvement in mental health from migrating, which is a large (almost an entire standard deviation) and statistically significant effect at the 1% level. Column 4 then adds the same control variables as used above when estimating the ITT; the estimated impact decreases slightly to 1.94 points, which is again not significantly different from the results that do not include controls.[16] In columns 5 and 6 of Table 4, we examine whether the treatment effect of migration differs for males and females. The estimated impact is found to be significantly larger for females than for males at the 5% level (2.35 for females compared to 1.60 for males), with the impact statistically significant for both genders at the 1% level.

Fig. 1 displays kernel density estimates in the top graphs and actual cumulative densities in the bottom graphs of the mental health scores of men (left column) and women (right column) among migrants, non-migrant ballot winners, and ballot losers.

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[15] Validity of the instrument also requires that the ballot outcome does not directly affect mental health conditional on migration status. One could conceive of stories such as that winning the ballot and not being able to migrate causes frustration which leads to a decline in mental health, or conversely, winning the ballot impacts mental health by causing adulation or worries about the prospect of migrating. However, the mental health of non-migrants among the successful ballots is not statistically different from that of the unsuccessful ballots giving us reason to believe that the instrument is a valid one.

[16] These results do not change very much if we restrict the sample only to the principal applicants, and not their family members. The ITT effect in column 2 falls from 1.57 to 1.32, and is still significant at the 1% level, while the IV-TT in column 4 falls from 1.94 to 1.59, still significant at the 1% level. Given that 54% of principal applicants are male versus only 48% of the full applicant sample, we are not surprised by the slight reduction in the impacts here. Since almost all eligible family members move, these findings suggest that the impact of migration on mental health is the same for principal applicants as other family members.

These figures show that the impact of migration on mental health appears to be strongly non-linear. While the mental health of non-migrants is distributed fairly normally (and is similar for non-migrants with both successful and unsuccessful ballots), the mental health of migrants is skewed towards the upper part of the mental health distribution.[17] This suggests that it will also be useful to estimate models that allow for non-linear treatment effects.

6.3. Non-linear treatment effects

We take two approaches to estimating non-linear treatment effects. First, we examine the impact of migration on the probability of having a mental health score below various thresholds. The rationale for this is that we might expect improvements in mental health to only occur for individuals who would have poor mental health in the absence of migration. As noted above, several studies of general populations have used a cutoff of less than 17 as an indicator of major depression, and a cutoff of less than 19 as an indicator of poor mental health. However, as noted above, few individuals in the migrant sample have mental health scores below 18, thus we restrict estimation to the likelihood of having a mental health score less than 19, and less than 20. We use a bivariate probit model since both migration and the mental health thresholds are discrete outcomes. Again, whether an individual has migrated to New Zealand is instrumented by whether a member of their household was successful in the PAC ballot. The dependent variable in each case measures whether or not the individual is in poor mental health, according to the specified threshold.

These results are presented in Table 5. The same covariates are included in the regression as when estimating the average treatment effects. We find strong and significant effects, showing that migration lowers the likelihood of being in poor mental health. Migrants are 35 percentage points less likely to have a mental health score less than 19 and 49 percentage points less likely to have a score less than 20 compared to non-migrants. These are very large effects. The percent of unsuccessful ballots with a mental health score below 19 is 41%, so the 35 percentage point reduction indicates that only 6% of migrants are below this threshold. The effect is larger for females both when we consider a threshold of less than 19 and when we consider a threshold of less than 20.

Second, we follow the methodology of Chernozhukov et al. (2005) for estimating quantile treatment effects (QTE) using instrumental variables. We estimate the impact of migration on mental health at the 25th, 50th, and 75th percentile of the mental health distribution. The key assumption of this econometric model is that individual unobservables are rank invariant to the potential treatment status, e.g. individuals who have relatively better (worse) mental health without migrating will also have better (worse) mental health if they migrate. Thus, rank invariance implies that a common unobserved factor, for example, general mental state, determines the ranking of a given person across treatment states.

Table 6 presents the results from this model. For our application, it is necessary to bootstrap standard errors. Consistent with our results from the bivariate probit models, the causal impact of migration on mental health appears to be larger at the lower part of the mental health distribution. For example, migration increases mental health by 2.44 points for individuals at the 25th percentile of the mental health distribution, compared to 1.96 points at the median

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[17] The difference in the densities of the mental health distribution of migrants and ballot losers is highly significant. Davidson–Duclos tests of stochastic dominance reveal that the migrant distribution first-order stochastically dominates that of the ballot loser group.

Table 7
Treatment effect of migration on correlates of mental health.

	(1) Real Hhold Income/1000 All	(2) Real Hhold Income/1000 All	(3) Employed All	(4) Employed Males	(5) Employed Females	(6) Smokes All	(7) Smokes Males	(8) Smokes Females
Migration dummy	10.44* (4.748)	6.202 (4.280)	−0.031 (0.050)	0.071 (0.059)	−0.105 (0.033)	−0.067 (0.043)	−0.143* (0.081)	−0.019 (0.033)
Female dummy		3.489* (1.799)	−0.031 (0.036)			−0.338*** (0.044)		
Married dummy		−0.123 (4.391)	−0.065 (0.056)	0.098 (0.087)	−0.180** (0.073)	0.028 (0.071)	0.001 (0.143)	0.007 (0.062)
Age		−4.912* (1.347)	0.0308* (0.018)	0.029 (0.027)	0.032 (0.023)	0.0477*** (0.018)	0.113*** (0.037)	−0.007 (0.009)
Age-squared/100		0.0740*** (0.020)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	−0.000604** (0.000)	−0.00146** (0.001)	0.000 (0.000)
Years of education		0.714 (0.498)	0.0116** (0.006)	0.0 (0.006)	0.0 (0.008)	−0.00814* (0.003)	−0.0155* (0.008)	−0.002 (0.003)
Born on Tongatapu dummy		2.662 (2.435)	0.050 (0.032)	0.071 (0.045)	0.043 (0.049)	0.00 (0.049)	0.087 (0.076)	0.013 (0.045)
Height		0.324* (0.133)	0.002 (0.001)	0.0 (0.002)	0.00522** (0.002)	−0.003 (0.002)	−0.006 (0.004)	−0.001 (0.001)
Catholic dummy		12.99* (7.400)	−0.038 (0.053)	−0.097 (0.079)	0.010 (0.081)	0.056 (0.077)	0.010 (0.108)	0.136* (0.072)
Mormon dummy		1.543 (4.689)	−0.0670* (0.037)	−0.117*** (0.043)	−0.043 (0.059)	−0.142* (0.027)	−0.354*** (0.053)	−0.0447* (0.027)
Past employment dummy		−5.437 (3.677)	0.692*** (0.055)	0.738*** (0.071)	0.635*** (0.077)	0.087 (0.066)	0.116 (0.118)	0.021 (0.041)
Past income		0.0535*** (0.014)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	−0.001 (0.000)	0.000 (0.000)
Visited NZ before 2000		3.501 (2.485)	−0.038 (0.046)	0.019 (0.063)	−0.107* (0.061)	−0.028 (0.053)	−0.090 (0.053)	0.038 (0.039)
Constant	27.42*** (2.309)	35.080 (26.690)	−0.698* (0.337)	−0.379 (0.822)	−1.261* (0.265)	−0.019 (0.461)	−0.471 (0.822)	0.279 (0.265)
Mean for unsuccessful ballots	27.4	27.4	0.48	0.52	0.44	0.20	0.37	0.04
Observations	497	497	475	230	245	494	238	256

Robust standard errors that account for clustering at the household level in parentheses. Control variables for whether past income is missing, visited New Zealand before 2000 is missing, and the survey year are also included in the regression. Ballot success is used as an instrument for migration. Columns 1–3 and 6 are for combined sample of males and females.

* Significant at 10%.
** Significant at 5%.
*** Significant at 1%.

Table 8
Reasons for applying to migrate. Proportion of unsuccessful principle applicants saying reason is very important.

	By mental health score			By sex		
	<19	20–25	p-Value	Male	Female	p-Value
To be with family members already in NZ	0.750	0.710	0.638	0.683	0.778	0.253
To earn money for school fees in Tonga	0.042	0.043	0.962	0.048	0.037	0.780
So children can attend school in NZ	0.386	0.688	0.002	0.633	0.479	0.110
To earn money to start a business in Tonga	0.000	0.043	0.146	0.048	0.000	0.106
To earn money to build a better house in Tonga	0.021	0.058	0.333	0.032	0.056	0.530
Better public services such as health care in NZ	0.688	0.913	0.002	0.714	0.944	0.001
To earn higher wages in NZ	0.479	0.551	0.5510	0.556	0.481	0.428
To earn money to pay for social responsibilities in my home village	0.104	0.043	0.204	0.079	0.056	0.615
Better social life	0.688	0.464	0.016	0.508	0.611	0.267
Less cultural restrictions on what I can do and cannot do	0.042	0.043	0.962	0.063	0.019	0.234
Sample size	48	69		63	54	

Note: p-Value is for a t-test of equality of proportions between the two groups.

and 1.86 points at the 75th percentile. The treatment effect is statistically significant at the 1% level for each of the three quantiles estimated.

Taken together, these results indicate that the migration improves mental health, and improves it more for individuals with low mental health scores, thus reducing the overall likelihood of migrants having poor mental health. This is consistent with individuals with low mental health scores being more interested in migrating to New Zealand.

7. Interpreting the results

Migration is seen to improve mental health, particularly for those with low mental health in the absence of migration. In this section, we attempt to understand some of the channels through which this effect operates. As seen in Table 1, mental health status in Tonga is significantly associated with household income, has a large but insignificant association with employment status, and is significantly associated with smoking behaviour, all of which may change with migration. Therefore, in Table 7 we report the ATT effect of migration on these variables, once again using the ballot outcome as an instrument for migration.

As shown in McKenzie et al. (forthcoming), migration from Tonga to New Zealand results in large increases in income. Converting New Zealand dollars earned by migrants into Tongan pa'anga for ease of comparison with Table 1, column 1 shows a 10,440 pa'anga per year increase in household income from migration. Adding several controls in column 2 reduces this to a 6200 pa'anga increase and it is no longer significant, but neither is it significantly different from the initial result in Column 1. From Table 1, column 2, we see a 1000 pa'anga increase in household income is associated with a 0.0172 increase in mental health. Based on this, we would predict that changes in income from migration are related to a 0.11–0.18 increase in mental health from migration, which is only 5–9% of the overall effect found in column 4 of Table 4.

Table 7 shows no overall effect of migration on the probability of being employed, or on the likelihood of being a smoker. The results for employment persist when we estimate the ATT separately by gender. However, when we estimate the effect of migration on smoking separately for males and females, we find that while migration has a negative, but insignificant effect, on whether women smoke, it has a negative and significant effect of whether men smoke. Based on this, we would predict that the impact of migration on the likelihood of men smoking is related to a 0.10 increase in mental health from migration, which is only 5% of the overall effect found in column 4 of Table 4.

Thus, based on these estimates, it appears unlikely that changes in income, employment and smoking behaviour that are caused

by migration explain more than a minority of the improvement in mental health found in this paper. It does seem plausible that other, possibly non-monetary factors, may account for these differences. To explore this, we examine questions administered to the principal applicants to PAC for the sample of unsuccessful ballot participants. We asked these individuals how important different reasons were for wanting to migrate to New Zealand. In Table 8, we highlight whether there are differences in the motives for migrating for those with lower compared to higher mental health, and for females compared to males. We use a threshold of less than 20 for mental health status to split the sample into roughly equal groups of individuals with low and high mental health.

Table 8 does show significant differences in the motives for wanting to migrate between individuals with low and high mental health status in Tonga, and between men and women. Individuals with poor mental health are significantly more likely to say that the desire for a better social life are very important reasons for wanting to migrate; 69% of those with mental health score less than 20 say social life is a very important reason, compared to only 46% of those with mental health of 20 or higher. In contrast, those with better mental health are more likely to want to migrate so that their children can attend school in New Zealand and to have access to better public services such as health care. Women are more likely than men to say that accessing better public services such as health care is a very important reason for wanting to migrate and less likely to say that earning money to start a business in Tonga is a very important reason.

These results therefore suggest that in addition to the positive effect of increased incomes on mental health, the gain in mental health from migration may arise from the ability of some migrants to send their children to better schools, to have a better social life in New Zealand, and to access better public services. That is, it appears likely that there are lifestyle and non-financial factors which improve mental health on top of economic factors.

8. Conclusions

A large literature suggests that migration can be a stressful process, with potentially negative impacts on mental health. However, to truly understand the effect of migration on mental health one must compare the mental health of migrants to what their mental health would have been had they stayed in their home country. The existing literature is unable to do this and typically settles for comparing the mental health of migrants to that of natives in the destination country, which does not take into account any pre-existing differences between these groups. This paper overcomes the selection problems affecting these previous studies by exam-

ining a migration program which uses a random ballot to choose amongst excess number of applicants.

We find that migrating from Tonga to New Zealand leads to mental health improvements, in particular for women and for migrants with lower levels of mental health. This finding suggests that the overall welfare impact of migration is even larger than that brought about by the large increase in income that migration offers. These results refer to short-run changes in mental health status, roughly 1 year after migrating to New Zealand. Future waves of the survey will enable us to trace the process of mental health changes with time spent in New Zealand. Finally, a further contribution of the analysis in this paper is in showing that the impacts of large life changes on mental health can be nonlinear, and so studies of mental health need to look beyond average treatment effects.

Acknowledgements

Appendix A. MHI-5 Questions

1. During the past month, how much of the time were you a happy person?

   (1 = All of the time, 2 = Most of the Time, 3 = Some of the time, 4 = A little of the time, 5 = None of the time)

2. How much of the time, during the past month, have you felt calm and peaceful?

   (1 = All of the time, 2 = Most of the Time, 3 = Some of the time, 4 = A little of the time, 5 = None of the time)

3. How much of the time, during the past month, have you been a very nervous person?

   (1 = All of the time, 2 = Most of the Time, 3 = Some of the time, 4 = A little of the time, 5 = None of the time)

4. How much of the time, during the past month, have you felt down-hearted and blue?

   (1 = All of the time, 2 = Most of the Time, 3 = Some of the time, 4 = A little of the time, 5 = None of the time)

5. How much of the time, during the past month, did you feel so down in the dumps that nothing could cheer you up?

   (1 = Always, 2 = Very often, 3 = Sometimes, 4 = Almost never, 5 = Never)

Questions 1 and 2 are reverse-scored, so that answer one receives score 5, answer two score 4, and so on. Questions 3 through 5 are scored as they appear. This gives a maximum MHI-5 score of 25, and a minimum of 5, with higher scores representing better mental health.

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