New Zealand Population Review, 39:101-120.

The Association of Residential Mobility with Affiliation to Primary Care Providers

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Abstract

There has been considerable discussion in the literature about theoretical and empirical associations between the health of individuals and the material and social deprivation of their place of residence. However, the importance of residential mobility for use of primary care services has not been thoroughly assessed in the literature. Knowledge about such effects may, for example, help primary care physicians decide which patients to concentrate on. In this paper, we take advantage of longitudinal data to explore the association between residential mobility and affiliation with a Primary Care Provider (PCP) in New Zealand. Affiliation refers to having a doctor, nurse or medical centre one could go to if need arises. We found that respondents who moved were less likely to be affiliated with a PCP than those who did not move, even after controlling for likely known confounders and all unmeasured time-invariant confounders in logistic fixed-effects regression models. Our findings suggest that policies to encourage the building and maintaining of the relationship between a PCP and patients should be in place before and after patients move, with follow-up to aid mobile families and individuals

This paper considers the relationship between affiliation with a primary care provider (PCP) and residential mobility over time. Affiliation, which refers to having a usual source of care (doctor, nurse or medical centre) or primary care provider, is a key attribute of primary health care systems (Starfield, 1992). A PCP is usually the first point of contact with health services for patients, and PCPs in New Zealand, and in some other countries, are "gatekeepers" who facilitate

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access to more costly secondary and tertiary care. Affiliation with a PCP is particularly important in New Zealand where patients need to be enrolled/registered with a General Practitioner (GP) to be eligible for lower GP consultation fees. Hence, patients pay more for a GP visit if they are not affiliated with a PCP. Research has suggested that having a regular and consistent source of care is associated with lowering health care costs (Weiss & Blustein, 1996) by decreasing use of emergency services (Christakis, Wright, Koepsell, Emerson, & Connell, 1999; Gill, Mainous, & Nsereko, 2000) and hospitalisations, (Gill & Mainous, 1998; Mainous & Gill, 1998), particularly for ambulatory-care-sensitive conditions (conditions that are more amenable to primary care interventions). Hence, identifying and understanding factors that help or hinder affiliation with a PCP is important for population health. Residential mobility is one such factor that can play both a positive and negative role in affiliation with a PCP.

There has been considerable discussion in the literature about theoretical and empirical associations between the health of individuals and the material and social deprivation of their place of residence (Cox, Boyle, Davey, & Morris, 2007; Curtis, 2004; Curtis & Rees Jones, 1998; Diez-Roux, 1998, 2000; Duncan, Jones, & Moon, 1993; Macintyre, Maciver, & Sooman, 1993). People in poor health are typically more concentrated in socioeconomically deprived areas while those in better health are likely to live in more advantaged places. Empirical research has also shown that the associations between area deprivation and health are likely to be temporally dynamic processes. For example, some studies are concerned with socio-geographical processes of 'health selection' through which people with illness (especially chronic conditions) are more likely to move into, or remain in, relatively deprived areas while people in better health are more likely to move into, or remain in, more affluent areas. These selective migration patterns may over time contribute to greater concentrations of people in poor health living in deprived, rather than advantaged areas. There is some evidence of such socio-economic 'sorting' of people according to their health status, namely that health selection contributes to, but does not completely account for, area inequalities in health (Boyle, Norman, & Rees, 2002; Brown & Leyland, 2009; De Verteuil et al., 2007; Larson, Bell, & Young, 2004).

Extending this health and place and health selection debate to primary health care raises questions, such as whether people are less healthy in certain areas because they don't have an affiliation with a PCP, or because they are mobile. Also, if people are mobile, they might be less likely to affiliate with a PCP, and this in turn may negatively affect their health. Thus, a related but less recognised issue is whether mobility predicts affiliation with a PCP. Mobility produces challenges and opportunities and can have both negative and positive impacts on affiliation with a PCP. For example, it is likely that moving disrupts affiliation and it takes time for movers to find and register with a PCP and become affiliated again. It is also possible that moving residence could affect health positively if a low-quality affiliation is replaced with a higher-quality affiliation. Frequency of residential movement adds another dimension to this debate.

However, little is known about whether and how residential mobility is associated with affiliation with a PCP. Knowledge about such effects may, for example, help primary care physicians decide which patients to concentrate on, and would extend the theoretical debate on health and place and health selection. To determine whether residential mobility and affiliation with a PCP are associated, and whether health is a motivation for residential mobility, we need longitudinal information on residential mobility, affiliation with a PCP, and health events. Such data are not readily available. This paper aims to examine the effect of change in residence on affiliation with a PCP using three waves of data (waves 3, 5 and 7) from a New Zealand longitudinal study. We hypothesise that after adjusting for demographic, socio-economic, health behavioural and health factors, those who moved residence are less likely to be affiliated with a PCP compared with those who did not move residence. New Zealand provides an ideal environment for examining the association between mobility and affiliation with a PCP: there is a high level of domestic migration and a requirement that patients be enrolled/registered with a GP to access lower GP consultation fees. Just under half of the New Zealand usually resident population changed domestic residence in the period between 1996 and 2006 (Statistics New Zealand, 2002).

Methods

Data

This research used data from three waves (waves 3, 5 and 7) of the SoFIE-Health survey, which is an add-on to the Survey of Family, Income and Employment (SoFIE Version 2, Wave 1 to 7) (Carter, Cronin, Blakely, Hayward, & Richardson, 2010). SoFIE is an eight-year (2002–2010) longitudinal household panel survey, managed by Statistics New Zealand under the Statistics Act (1975). Computer-assisted face-to-face interviews were used to collect information annually on income levels and sources, and on the major influences on income such as employment and education experiences, household and family status, demographic factors, and health status.

The population covered by SoFIE is the usually resident population of New Zealand living in private dwellings (excluding people living in institutions or establishments such as boarding houses, rest homes, etc.). The initial SoFIE sample comprised approximately 11,500 responding private households (response rate of 83 percent), with 22,265 adults (aged 15 years and older) responding in wave 1, this reduced to just over 19,000 in Wave 3 (86 percent of wave 1) and almost 17,000 in Wave 7 (76 percent of wave 1).

The SoFIE-Health add-on comprised 20 minutes of questionnaire time in waves 3 (2004/05), 5 (2006/07) and 7 (2008/09), in the following health-related domains: SF-36 (Short-Form health survey), Kessler-10 (K-10), perceived stress, chronic conditions (heart disease, diabetes and injury-related disability), tobacco smoking, alcohol consumption, access and continuity of primary health care, and an individual deprivation score.

Measures

The main outcome measure was affiliation with a PCP; this was measured by asking individuals "Do you have a doctor, nurse or medical centre you usually go to, if you need to see a doctor?". Response categories included 'Yes', 'No', 'Don't know' and 'Refused'. We recoded this measure into two categories that contrasted affiliated with not affiliated. For this paper, we excluded the 'Don't know' and 'Refused' categories as there was no a priori way of categorising these respondents as 'Yes' or 'No'. The affiliation measure was only available in waves 3, 5 and 7, restricting analyses to just those waves.

The main exposure used in this paper was residential mobility, derived by Statistics New Zealand. This is a categorical variable that indicates whether a respondent has changed meshblock (aggregations of approximately 100 people) from the time of the last interview in the immediately preceding wave. Thus a non-reference value for the mobility indicator at wave 5 means the movement was between waves 4 and 5 (not between 3 and 5). We used this information to derive a variable indicating movement over the two waves preceding the current wave ($w = 3$, 5 or 7), with levels of no movement in either of the two previous waves, movement two waves before the current wave (between w-2 and w-1), movement one wave before the current wave (between w-1 and w), or movement in both preceding waves. Thus for wave 3, movement two waves before the current wave means movement between wave 1 and 2, movement one wave before the current wave means movement between wave 2 and 3, and movement in both preceding waves means movement between wave 1 and wave 2, and between wave 2 and wave 3. The reference was no movement in either of the two preceding waves. Note that the movement indicator is a lower limit for the number of actual meshblock movements since respondents may have changed meshblocks more than once between interviews on consecutive waves.

Time-varying confounders measured at each wave are labour force status, marital status, family structure, self reported health, New Zealand Deprivation Index 2001 (Salmond & Crampton, 2012) (a measure of small area deprivation, categorized into quintiles, where quintile 5 corresponds to higher deprivation), wave (time), and NZiDep (Salmond, Crampton, King, & Waldegrave, 2006) (a measure of individual deprivation).

Also used in the analysis were the time-invariant confounders sex and ethnicity. The ethnicity variable was constructed using a “prioritised” definition. Each respondent was assigned to a mutually exclusive ethnic group by means of a prioritisation system commonly used in New Zealand: Māori (the indigenous people of New Zealand), if any of the responses to self-identified ethnicity was Māori; Pacific, if any one response was Pacific but not Māori; Asian, if any one response was Asian but not Māori/Pacific; and the remainder non-Māori non-Pacific non-Asian (nMnPnA; mostly

New Zealanders of European descent, but strictly speaking not an ethnic group). The reference group used here was nMnPnA.

Analysis

Analyses were conducted on an unbalanced panel of eligible respondents in wave 1 who responded in waves 3, 5 and 7, and who were aged more than 15 years. Transition probabilities for mobility and affiliation averaged over waves 3, 5 and 7 were computed to illustrate the dynamic nature of meshblock movement and affiliation "behaviours".

Since affiliation is a binary outcome variable, we modelled the probability of being affiliated using fixed effects conditional logistic models. Such models eliminate nuisance variables representing time-invariant unobserved confounding by conditioning on a sufficient statistic (Agresti, 2002; Allison, 2005; Wooldridge, 2002). Exponentiated parameter estimates for the affiliation model can be interpreted as odds ratios (specifically the odds of having a health provider relative to the reference level of the specified covariate).

Fixed effects conditional logistic analysis only uses change occurring within the same individuals over time to estimate effects and ignores observations on variables that do not change temporally. Thus it excludes the effect on affiliation of those who never move (or always move). However, it is possible to fit interactions between time-varying and time-invariant variables in a fixed effects model. We included interactions between gender and mobility, and between ethnicity and mobility, to test whether the association between mobility and affiliation has been modified by gender or ethnicity. We also included a main effect for health and an interaction between health and mobility to see whether the association between mobility and affiliation was modified by health (time-varying). In our previous work, we have shown that gender, ethnicity and health are significant predictors of affiliation (Jatrana & Crampton, 2009). A significant interaction for gender would mean that the relationship between affiliation and mobility depends on gender, and similarly for ethnicity and health interactions. We also tested for an interaction between mobility and age at wave 5, coded as a 2-level covariate cut at age 25 years, to see if there was variation in the association of mobility and affiliation by age.

All counts presented in this paper are averaged over waves 3, 5, and 7, and rounded as per the Statistics New Zealand protocol. Analyses were done within the Statistics New Zealand data laboratory using the R environment (http://www.r-project.org) for statistical computation, version 2.13.0, available from the Comprehensive R archive Network (CRAN) website (http://cran.r-project.org).

Results

Table 1 shows the empirical mean transition probability matrix for residential meshblock movement over waves 3, 5 and 7 using a total of 29515 transitions in residential mobility from an unbalanced panel of 16355 adults (averaged across waves 3, 5, and 7). Each row of the transition matrix represents categories of mobility at wave w (= 3 or 5) while the columns represent categories of movement at wave $w + 2$. Note that relative frequencies in each row sum to 1, within rounding error. For example, of those who did not change meshblock in the two waves prior to any given wave, 2.5% changed meshblock (at least) once in each of the subsequent two waves. The numbers on the table diagonal (bold) show the proportion of transitions to the same movement state in waves 3, 5 and 7. Thus, 83.7 percent of respondents did not change meshblocks in the two waves before or after a given wave.

Table 1: Empirical transition probabilities (%) derived from counts of the number of times respondents reported the indicated pair of meshblock movement states in successive observations over three waves.

	To (w+2)			
From (w)	No move	One move: wave w-2 to w-1	One move: w-1 to w	Two moves
No move	**83.7**	7.0	6.8	2.5
One move (w-2 to w-1)	64.0	**13.8**	14.4	7.8
One move (w-1 to w)	58.7	17.7	**13.1**	10.4
Two moves	38.9	19.9	19.3	**21.9**

Table 2 shows the mean empirical transition probability matrix for affiliation with a Primary Care Provider (PCP) over waves 3, 5 and 7. Each row of the transition matrix represents categories of affiliation with a PCP at wave w while the columns represent categories of affiliation with a PCP at wave $w + 2$. For example, of those who were affiliated with a PCP in a given wave, 5.1 percent were not affiliated two waves later. The numbers on the table diagonal (bold) show the people who do not change affiliation between waves 3, 5 and 7: 94.9 percent remained affiliated and 38.8 percent remained not affiliated. Approximately 5 percent of people move from affiliated to not affiliated, and 61 percent from not affiliated to affiliated.

Table 2: Empirical transition probabilities (%) derived from counts of the number of times respondents reported the indicated pair of affiliation states in successive observations over three waves.

	to	
From	Affiliated	Not affiliated
	94.9	5.1
Not affiliated	61.2	**38.8**

Table 3 presents mean (across waves 3, 5 and 7) cross-sectional associations between time-varying covariates and affiliation with a PCP. The proportion of respondents reporting affiliation with a PCP was 91.8 percent. The average proportion of affiliation among those respondents who did not move meshblocks was 93.4 percent. For those who moved once in the previous two waves, once in the previous wave, and in both previous waves, the corresponding proportions were 88.5, 85.1 and 79.6 respectively.

The highest average affiliation was found for those reporting fair to poor health (97.1 percent), the lowest (88.2 percent) for those reporting excellent health. Overall, affiliation declined as reported health increased, and conversely for those who were not affiliated. The average affiliation rate with a PCP among married and divorced, widowed or separated respondents was 93.5 percent and 95.2 percent respectively, but somewhat lower for respondents who had never married (84.0 percent). Amongst levels of the Family Status variable, affiliation with a PCP among single people averaged 94.1 percent, whereas sole parent respondents (88.6 percent), couples with no dependants (91.0 percent), and couples with dependants (91.5 percent) reported lower levels of affiliation. Affiliation with a PCP was on average slightly higher for non-working (93.7 percent) than working respondents (90.5 percent). Affiliation levels were also similar across levels of deprivation (91.8 percent in the least-deprived areas, 91.2 percent in medium-deprived areas, and 91.2 percent in the most deprived areas) and individual deprivation (affiliation 91.2 – 92.5 percent). Affiliation levels for respondents with qualifications at degree or higher level were on average 88.1 percent, slightly below that observed for other qualifications (90.5 percent for those with school qualifications, 92.4 percent for those with vocational qualifications, and 93.7 percent, those with no qualifications).

Table 3: Means and standard deviations of study population counts and proportions for movement status and demographic strata by affiliation status for SoFIE-Health waves 3, 5, and 7.

	N (SD)	% Not Affiliated (SD)	% Affiliated (SD)
Total	16,354 (1155)	8.2 (0.8)	91.8 (0.8)
Movement			
None	13,445 (245)	6.6 (0.5)	93.4 (0.5)
One move (wave *w*-2 to *w*-1)	1537 (196)	11.5 (1.6)	88.5 (1.6)
One move (wave *w*-1 to *w*)	1527 (275)	14.9 (1.3)	85.1 (1.3)
Two moves	782 (120)	20.4 (2.2)	79.6 (2.2)
Health			
Excellent	5099 (659)	11.8 (1.1)	88.2 (1.1)
Very good	5831 (237)	8.4 (0.8)	91.6 (0.8)
Good	3770 (177)	5.3 (0.5)	94.7 (0.5)
Fair-poor	1654 (94)	2.9 (0.3)	97.1 (0.3)
Marital status			
Never married	3925 (206)	16.0 (1.5)	84.0 (1.5)
Divorced, widowed, or separated	2574 (76)	4.8 (0.2)	95.2 (0.2)
Married	10782 (557)	6.5 (0.6)	93.5 (0.6)
Family Status			
One person	4999 (200)	5.9 (0.7)	94.1 (0.7)
Sole parent	3695 (145)	11.4 (1.2)	88.6 (1.2)
Couple only	1621 (115)	9.0 (0.8)	91.0 (0.8)
Couple with dependents	6974 (375)	8.5 (0.8)	91.5 (0.8)
Labour Force Status			
Working	11335 (500)	9.5 (0.9)	90.5 (0.9)
Not working	5948 (347)	6.3 (0.3)	93.7 (0.3)
NZDeprivation			
Least deprived	10607 (250)	8.2 (0.8)	91.8 (0.8)
Medium deprived	3544 (261)	8.8 (0.6)	91.2 (0.6)
Most deprived	3133 (327)	8.8 (0.8)	91.2 (0.8)
NZiDeprivation			
0	12551 (752)	8.4 (0.7)	91.6 (0.7)
1-2	3657 (212)	8.8 (1.0)	91.2 (1.0)
3-7	1070 (137)	7.5 (0.6)	92.5 (0.6)
Highest Qualification			
Degree or higher	2585 (20)	11.9 (0.8)	88.1 (0.8)
No qualification	4115 (353)	6.3 (0.5)	93.7 (0.5)
School qualification	4602 (243)	9.5 (0.8)	90.5 (0.8)
Vocational qualification	5979 (219)	7.6 (0.9)	92.4 (0.9)

Note: Total counts are rounded means

Table 4 shows mean cross-sectional associations between time-varying covariates and meshblock movement. For those who did not move meshblocks in the preceding two waves, moved once two waves previously, moved once in the previous wave, and moved in both previous waves, the overall proportion of respondents was 76.7, 9.3, 9.2, and 4.7 percent respectively. As might be expected, the overall proportion of respondents who moved meshblocks in both preceding waves was lower than for either single movement category. Overall proportions of movers in each of the single movement categories were similar in magnitude. These patterns were often repeated in each covariate group.

The proportion of respondents who did not move meshblocks in the previous two waves were lowest for the unaffiliated (58.3 percent), those in (individual) deprivation (64.3 – 67.9 percent), sole parents (67.0 percent), and never married (69.9 percent). These same groups generally showed the highest rates of movement (e.g. for double movers the proportions were 11.8 percent, 7.8-10.1 percent, 9.0 percent, and 8.8 percent respectively). Highest rates of no movement (and lowest rates of movement) were seen amongst those with no qualifications (83.0 percent), the unemployed (81.8 percent), those reporting fair-poor health (81.7 percent), one-person families (81.1 percent), and those not individually deprived (80.1 percent).

Table 4: Means and standard deviations of study population counts and proportions for affiliation status and demographic strata by movement status for SoFIE-Health, waves 3, 5, and 7.

	N (SD)	% No moves	% One move wave *w*-2 to *w*-1	% One move wave *w*-1 to *w*	% Two moves
Total	16354 (1155)	76.7 (2.0)	9.3 (0.5)	9.2 (1.0)	4.7 (0.4)
Affiliation status					
Not affiliated	1361 (183)	58.3 (3.8)	13.1 (1.1)	16.8 (2.2)	11.8 (0.7)
Affiliated	15171 (916)	78.3 (1.7)	9.0 (0.5)	8.6 (0.9)	4.1 (0.3)
Health					
Excellent	5099 (659)	74.1 (2.1)	9.8 (0.7)	10.5 (1.1)	5.6 (0.3)
Very good	5831 (237)	76.4 (2.3)	9.5 (0.7)	9.2 (1.1)	5.0 (0.5)
Good	3770 (177)	78.7 (1.4)	8.9 (0.6)	8.5 (0.8)	3.9 (0.3)
Fair-poor	1654 (94)	81.7 (1.5)	7.9 (0.3)	7.1 (0.9)	3.2 (0.5)
Marital status					
Never married	3720 (259)	69.9 (1.9)	9.5 (0.3)	11.8 (0.9)	8.8 (0.9)
Divorced, widowed, or separated	2424 (119)	79.2 (0.8)	9.0 (0.4)	8.3 (1.2)	3.5 (0.1)
Married	10408 (680)	78.4 (2.2)	9.3 (0.8)	8.6 (1.1)	3.6 (0.3)
Family Status					
One person	4836 (260)	81.1 (2.0)	8.0 (0.7)	7.4 (0.8)	3.4 (0.5)
Sole parent	3469 (211)	67.0 (1.9)	11.0 (0.4)	13.0 (1.4)	9.0 (0.9)
Couple only	1529 (141)	72.5 (2.0)	11.3 (0.5)	10.2 (1.0)	6.0 (0.6)
Couple with dependents	6784 (433)	79.3 (2.0)	8.9 (0.8)	8.5 (1.1)	3.3 (0.1)
Labour Force Status					
Working	10903 (663)	74.0 (2.2)	10.5 (0.7)	10.0 (1.0)	5.6 (0.5)
Not working	5709 (395)	81.8 (1.3)	7.1 (0.2)	7.9 (1.0)	3.2 (0.1)
NZDeprivation					
Least deprived	10241 (387)	76.7 (2.3)	9.5 (0.8)	9.3 (1.1)	4.5 (0.4)
Medium deprived	3398 (306)	75.6 (1.4)	9.4 (0.1)	9.4 (1.1)	5.6 (0.3)
Most deprived	2974 (357)	77.8 (1.6)	8.6 (0.1)	8.7 (0.9)	4.9 (0.6)
NZDeprivation					
0	12100 (891)	80.1 (1.9)	8.3 (0.5)	8.1 (1.1)	3.5 (0.3)
1-2	3443 (236)	67.9 (2.0)	11.9 (0.5)	12.4 (0.8)	7.8 (0.8)
3-7	991 (149)	64.3 (2.6)	12.7 (0.7)	12.9 (1.6)	10.1 (0.5)
Highest Qualification					
Degree or higher	2474 (67)	71.2 (2.9)	12.0 (1.0)	10.1 (0.7)	6.7 (1.3)
No qualification	3965 (383)	83.0 (1.3)	6.5 (0.2)	7.7 (0.7)	2.9 (0.4)
School qualification	4433 (291)	75.2 (1.7)	9.0 (0.7)	10.5 (1.1)	5.2 (0.1)
Vocational qualification	5741 (307)	75.7 (2.4)	10.3 (0.6)	9.0 (1.4)	4.9 (0.4)

Note: Total counts are rounded means

Results from the fixed effects conditional logistic models are provided in Tables 5 to 7. Three models are reported in these tables: Model 1 (Table 5) included only movement and wave as covariates, while model 2 (also Table 5) included the full set of time-varying covariates (discussed above) as main effects. Model 3 (Table 6) extends model 2 by adding an interaction between ethnicity (time-invariant) and movement, and model 4 (Table 7) extends model 2 by adding a main effect and an interaction between health and movement. The interaction between gender and movement was not significant.

The results in Table 5 indicate that moving meshblocks was significantly associated with affiliation with a PCP. After controlling for demographic and socio-economic factors (model 2), relative to those who did not move the odds of being affiliated with a PCP were 0.61 times lower for those who moved once over the previous two waves, 0.40 times lower for those who moved in the previous wave, and 0.33 times lower for those who moved in both preceding waves. The interaction model 3 in Table 6 shows that these odds were dominated by those of European ethnicity (equivalent odds ratios are 0.63, 0.35 and 0.30 respectively). The effect of moving meshblocks was similar for Māori (equivalent odds ratios are 0.68, 0.34 and 0.31), although unlike European respondents the effect of moving once 2 waves ago was not significant. Odds ratios were generally not significant for respondents of Pacific or Asian ethnicity (confidence intervals include the null). In model 4 (Table 7), the main effect for health was significant, but the interaction of health with movement was not, suggesting that the association between moving meshblock and affiliation was similar across levels of health. Including just the main effect for health did not substantially change the odds ratios for affiliation reported above.

Table 5: Models 1 and 2 - Odds ratios (95% confidence intervals) for a fixed effects conditional logistic regression model predicting the probability of being affiliated with a health provider

Characteristics	Model 1		Model 2	
	OR (CI)	*p*-value	OR (CI)	*p*-value
Mobility				
No move	1.00		1	
One move (wave *w*-2 to *w*-1)	0.61 (0.51, 0.72)	<0.0001	0.61 (0.51, 0.73)	<0.0001
One move (wave *w*-1 to *w*)	0.39 (0.33, 0.46)		0.40 (0.34, 0.48)	
Two moves	0.33 (0.26, 0.41)		0.33 (0.27, 0.42)	
Wave				
3	1		1	
5	0.79 (0.71, 0.87)	<0.0001	0.80 (0.72, 0.89)	<0.0001
7	1.19 (1.06, 1.33)		1.21 (1.07, 1.36)	
Marital status				
Currently married			1	
Previously married			1.19 (0.78, 1.81)	0.35203
Never married			1.26 (0.92, 1.71)	
Family Type				
Couple only			1	
One person			0.91 (0.69, 1.22)	0.09323
Sole parent			1.35 (0.89, 2.04)	
Couple with dependants			1.14 (0.89, 1.47)	
Labour force status				
Employed			1	0.13216
Not employed			1.12 (0.93, 1.36)	
NZ Deprivation				
Least deprived			1	
Middle deprived			1.07 (0.87, 1.33)	0.13186
Most deprived			1.29 (0.99, 1.69)	
NZiDeprivation				
0 dep			1	
1-2 dep			1.18 (1.00, 1.33)	0.13225
3-7 dep			1.16 (0.83, 1.55)	
Education				
Degree or higher			1	
No qualification			1.53 (0.84, 2.78)	0.09513
School qualification			1.69 (1.06, 2.71)	
Vocational qualification			1.80 (1.07, 3.03)	

Notes:

1. All covariates in models a1 and 2 enter as main effects only.
2. *p*-values represent the significance of adding covariates to the model sequentially from first to last.

Table 6: Model 3 - odds ratios (95% confidence intervals) for movement by ethnicity relative to respondents (of the same ethnicity) reporting no movement

Health	OR (CI)
European : No moves	1
European : One move (wave *w*-2 to *w* 1)	0.63 (0.51, 0.78)
European : One move (wave *w*-1 to *w*)	0.35 (0.29, 0.43)
European : Two moves	0.30 (0.23, 0.38)
Māori : No moves	1
Māori : One move (wave *w*-2 to *w*-1)	0.68 (0.40, 1.16)
Māori : One move (wave w-1 to *w*)	0.34 (0.21, 0.54)
Māori : Two moves	0.31 (0.16, 0.61)
Pacific : No moves	1
Pacific : One move (wave *w*-2 to *w*-1)	0.46 (0.19, 1.11)
Pacific : One move (wave *w*-1 to *w*)	1.29 (0.65, 2.56)
Pacific : Two moves	0.67 (0.26, 1.72)
Asian : No moves	1
Asian : One move (wave *w*-2 to *w* -1)	0.36 (0.21, 0.63)
Asian : One move (wave *w*-1 to *w*)	0.70 (0.40, 1.22)
Asian : Two moves	0.55 (0.27, 1.10)

Notes:
1. Model 3 extends Model 2 by adding an interaction term between ethnicity and movement.
2. The *p*-value for the interaction term is 0.0006.

Table 7: Model 4 - odds ratios (95% confidence intervals) for mobility in a fixed effects conditional logistic model that include health as a covariate

Characteristics	OR (CI)	p-value
Mobility		
No move	1	
One move (wave *w*-2 to *w*-1)	0.60 (0.50, 0.72)	<0.0001
One move (wave *w*-1 to *w*)	0.40 (0.34, 0.48)	
Two moves	0.33 (0.26, 0.41)	

Notes:
1. Model 4 extends model 2 by adding a main effect for health and an interaction between health and movement.
2. *p*-values represent the significance of adding mobility to the model.

An additional model extended model 2 by including an interaction between age (at wave 5) and movement. However, the interaction was not significant.

Discussion and Conclusion

In our investigation of the association between change in residence and affiliation with a PCP, a strong independent effect of residential mobility on affiliation with a PCP was found. The relationship between change in residence and affiliation with a PCP was not attenuated (and remained highly significant) when we controlled for known potential confounders.

In New Zealand, primary care is the most important gateway to the formal health care system. It provides timely and comprehensive care and, when necessary, referrals for specialist care. The results of this study demonstrate the majority of the sample reported having an affiliation with a PCP. However, the probability of having a regular health care provider varies depending upon residential mobility.

We found that respondents who moved were less likely to be affiliated with a PCP than were those who did not move, even after controlling for likely known confounders and all time-invariant unmeasured confounders. This is in line with our hypothesis that movement disrupts relationships with PCPs. The higher probability of affiliation among non-movers may be interpreted in many ways. One simple hypothesis is that people affiliate with a PCP when they need health care, and stay affiliated until they move. However, reality is probably more complex: on the one hand, affiliation may discourage people from moving while, on the other hand, those who are affiliated may have characteristics that make them less likely to move or, if they do move, be quicker to re-affiliate. The interpretations of relatively low affiliation of the movers may, to some extent, be explained by their socio-economic characteristics. Movers tend to be young, never married, sole parents, currently working and more educated, though this is not the whole story since even after controlling for such known time-varying confounders and all time-invariant unmeasured confounders, an association between meshblock mobility and affiliation remains. Movers may have other priorities associated with settling in a new place, more important to them than finding a new PCP. For example, moving is not only psychologically stressful and disruptive (e.g. stress generated from the process of removal and resettlement and disruption generated by losing friends, and familiar neighbourhood) (Bollini, 1992; Bollini & Siem, 1995; Shuval, 1993) but challenging as well in terms of being in a new and unfamiliar neighbourhood. Movers would be occupied with their new houses or jobs and have less time than usual to find a PCP. On top of that, if the move is motivated by a personal crisis, say as a result of divorce, death, remarriage or loss of employment, adjustment to the new environment would be a higher priority rather than finding a new PCP.

Results from our interaction models (Model 4, Table 7) show that including the interaction of health with affiliation was not significant, which suggests that the association between affiliation and moving meshblock is similar across levels of health. Thus, there is no evidence that the association between residential mobility and affiliation was influenced by health selection effects (whereby those who moved did so because they had poor health), hence contaminating the association of movement with affiliation. Additionally, it is possible that the relationship between residential mobility and affiliation changes with age since, as noted before, younger individuals are more likely to be mobile and less likely to be affiliated. To check this, we included an interaction between age and mobility in our fixed effect models. The interaction, which compared the effect of mobility on affiliation for SoFIE respondents aged younger than 25 years with those older than 25 (at wave 5) was not significant. Thus at least for these age groups, there seems to be no difference in the relationship between mobility and affiliation.

There are several limitations of this study that need to be considered. First, one of the most restrictive assumptions of these models is that of *strict exogenity* which rules out some types of feedback from past outcomes to current covariates and current outcome to future covariates. Thus having controlled for a given set of covariates (including mobility) at each time point, no past values of those covariates can affect current affiliation and, in turn, current affiliation cannot modify future values of those covariates. Importantly these models cannot allow for the effect of affiliation on (future) mobility, known as reverse causation (Wooldridge, 2002), or past mobility on current affiliation (state dependence). Second, as with other self-reported surveys, affiliation status is measured using self-reported data which rely on respondent ability to recall information accurately. Errors of this type can lead to biased results in comparison with other samples. Third, our analyses may have been affected by selection bias if those who dropped from the study would have reported substantially more or less affiliation. If those who dropped out of the study were more likely to have reported affiliation with a PCP and greater residential mobility than those that remained, then the true population relationship between residential mobility and affiliation with a PCP would be weaker than found in this study. However, the mobility-affiliation relationship in the "drop-outs" would need to be very different to the "stay-ins" to change our conclusions. Fourth, although we have adjusted for many confounding variables, it is possible that the differences we found in association with affiliation with a PCP could be the result of other time-varying factors associated with movement and affiliation that we did not measure.

Furthermore, our measure of residential mobility is a proxy measure which precluded using a distance dimension in the relationship between mobility and affiliation: we do not know whether short or long distance movers are more or less likely to be affiliated with a PCP than non-movers. It would be useful to explore this issue in future studies. Also the reason for moving or not moving is important in such analyses, for example, the individuals may be more or less likely to move because of personal characteristics or because of features of the area in which they live. While these are important questions, the analysis presented here is less interested in the 'context' versus 'composition' debate than in movement per se, and we recommend future studies look into these issues.

Bearing in mind these limitations, the conclusions from our analysis have significance for international debates about mobility and access to health services in countries where affiliation with a PCP is necessary in order to access high quality primary health care. This study used a large, national survey and a variety of health measures to examine the association between a change in residence and affiliation with a PCP. Our results suggest that moving residence has a negative effect on affiliation with a PCP. As noted earlier, research has suggested that having a regular and consistent source of care is associated with lowering health care costs (Weiss & Blustein, 1996; Christakis, et al., 1999; Gill, et al., 2000; Gill & Mainous, 1998; Mainous & Gill, 1998). Our findings suggest that policies are needed to encourage the building and maintaining of the relationship between a PCP and patients. Importantly, these policies should be in place before and after patients move, with follow-up to aid mobile families and individuals. Further research to determine the underlying reasons for residential mobility is required. Some of these reasons may be external to the individual, at a macro social or economic level. This paper identifies the importance of residential mobility for primary health care access and demonstrates that mobility is associated with low affiliation.

Statistics New Zealand Security Statement

Access to the data used in this study was provided by Statistics New Zealand in a secure environment designed to give effect to the confidentiality provisions of the Statistics Act, 1975. The results in this study and any errors contained therein are those of the authors, not Statistics New Zealand.

Disclaimer

Opinions expressed in this paper are those of the authors only and do not necessarily represent the views of peer reviewers or the University of Otago.

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