Preventive Medicine 64 (2014) 32–36

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Is change in global self-rated health associated with change in affiliation with a primary care provider? Findings from a longitudinal study from New Zealand

Santosh Jatrana [a,*], Ken Richardson [b], Peter Crampton [c]

[a] Alfred Deakin Research Institute, Deakin University Waterfront Campus, Geelong, Victoria 3220, Australia
[b] Department of Public Health, Wellington School of Medicine and Health Sciences, University of Otago, PO Box 7343, Wellington, New Zealand
[c] University of Otago, Dunedin, New Zealand

ARTICLE INFO

Available online 25 March 2014

Keywords:
Affiliation
Primary health care
Global self-rated health (SRH)
New Zealand

ABSTRACT

Aims. To investigate the association of self-rated health and affiliation with a primary care provider (PCP) in New Zealand.

Methods. We used data from a New Zealand panel study of 22,000 adults. The main exposure was self-rated health, and the main outcome measure was affiliation with a PCP. Fixed effects conditional logistic models were used to control for observed time-varying and unobserved time-invariant confounding.

Results. In any given wave, the odds of being affiliated with a PCP were higher for those in good and fair/poor health relative to those in excellent health. While affiliation for Europeans increased as reported health declined, the odds of being affiliated were lower for Māori respondents reporting very good or good health relative to those in excellent health. No significant differences in the association by age or gender were observed.

Conclusions. Our data support the hypothesis that those in poorer health are more likely to be affiliated with a PCP. Variations in affiliation for Māori could arise for several reasons, including differences in care-seeking behaviour and perceived need of care. It may also mean that the message about the benefits of primary health care is not getting through equally to all population groups.

Introduction

Primary health care emerged at the forefront of national and international health policy in 1978, when the World Health Organization identified its importance and potential for improving population health outcomes in the Alma Ata Declaration (World Health Organization, 1978). There is continuing interest in the role of primary health care for improving health outcomes, reducing health inequalities, and improving access to health services (World Health Organization, 2008). Affiliation, which refers to having a usual source of care (doctor, nurse or medical centre) or primary care provider (PCP), is a key attribute of primary health care systems (Starfield, 1992). Affiliation with a PCP is especially important for improving a patient's overall health given that a PCP is usually the first point of contact, provides ongoing preventive care, and in New Zealand (NZ) and some other countries is a "gatekeeper" who facilitates access to more costly secondary and tertiary care (Goodyear-Smith et al., 2012).

Our previous work has shown that male sex, never married, Asian ethnicity, current smokers, and having post school education were independently associated with lower odds of affiliation, while older age, reporting poor health and having one or more co-morbid conditions were associated with higher odds of affiliation (Jatrana and Crampton, 2009). While previous research broadly reports a positive association between the provision of primary care services and population health (Gulliford, 2002; Macinko et al., 2003; Shi, 1994; Shi and Starfield, 2001; Shi et al., 2002; Starfield, 1991; Starfield and Shi, 2002; Vogel and Ackermann, 1998), our research suggests a greater likelihood of poor health among those affiliated with a primary care provider (Jatrana and Crampton, 2009). However, whether declining health predicts affiliation with a PCP is not known because previous work has been mainly cross sectional in nature and it is important to investigate associations between health and affiliation with a PCP to check that the health system is responding to population health needs.

Using data from a NZ longitudinal study we investigate whether a decline in SRH is associated with increased affiliation with a PCP and whether there are differences by ethnicity, age, and gender. We hypothesise that after adjusting for demographic, socioeconomic and behavioural factors, and accounting for unmeasured time-invariant confounders (unobserved fixed characteristics of individuals such as intelligence or beliefs that are likely to be associated with both health and affiliation), those in good to poor health would be more likely to be affiliated than those in excellent health. We also aimed to demonstrate

* Corresponding author. Fax: +61 3 5227 8650.
E-mail addresses: santosh.jatrana@otago.ac.nz, santosh.jatrana@deakin.edu.au (S. Jatrana).

http://dx.doi.org/10.1016/j.ypmed.2014.03.012
0091-7435/

the value of longitudinal methods to quantify associations between health exposures and primary care outcomes, thus adding to limited longitudinal research in the primary health care literature.

Methods

Data

This research used data from three waves of the SoFIE-Health survey, which is an add-on to the Statistics New Zealand Survey of Family, Income and Employment (SoFIE Version 2, Waves 1 to 7: Carter et al., 2010). SoFIE is an 8 year (2002–2010) longitudinal household panel survey. Computer-assisted face-to-face interviews were used to collect data annually on income levels and sources, and on the major influences on income such as employment and education, household and family status, demographic factors, and health status.

The population covered by SoFIE are those living in private dwellings i.e., excluding people living in institutions or establishments such as boarding houses and rest homes. The initial SoFIE sample comprised approximately 11,500 responding private households (response rate of 83%) with 22,200 adults (aged 15 years and older) responding in wave 1, reducing to just over 20,000 in wave 2 (91% of wave 1 responders) and over 19,000 in wave 3 (86% of wave 1 responders). By wave 7, there were almost 17,000 (76% of wave 1) from the original sample still participating. Higher rates of attrition occurred for youth, ethnic minorities, people on lower income, and people reporting poor health (Statistics New Zealand, 2011). On average, 16,354 respondents contributed information from at least 2 waves to this analysis.

The SoFIE-Health add-on is comprised of 20 min 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 (Cohen et al., 1983), 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 which 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?" and response categories included "yes", "no", "don't know" and "refused". We recoded this measure into two categories that contrasted affiliated with not affiliated, excluding the 'don't know' and 'refused' categories.

The main exposure used in this paper was global SRH, based on the question: "In general would you say your health is: excellent, very good, good, fair or poor?" We treated this as a categorical variable after combining fair/poor levels into one category.

Time varying confounders measured at each wave were labour force status, marital status, family structure, NZ Deprivation Index 2001 (a measure of small area deprivation, categorized into quintiles, where quintile 5 corresponds to high deprivation: Salmond and Crampton, 2012), wave (accounting for the effect of time), and NZiDep (a measure of individual deprivation: Salmond et al., 2006). Also used in the analysis were the time-invariant covariates age (at first interview), 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; 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 was nMnPnA. Early adulthood is a time of important transitions and the same is true of the period post-retirement and so the age covariate was categorised into those less than 25 years, 25–65 years, and 65 years or over to see whether these life-course events impacted on the health-affiliation association.

Analysis

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

Since affiliation is a binary outcome variable, we modelled the probability of being affiliated using a fixed effects conditional logistic model. Such models eliminate nuisance variables representing time-invariant unobserved confounding, modelled as a set of fixed parameters (one for each respondent), 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.

Conditional fixed effects analysis only uses changes occurring within the same individuals over time to estimate effects and ignores observations on variables that do not change temporally. However, it is possible to fit interactions between time-varying and time-invariant variables in a fixed effects model. We tested for interactions between age and health, gender and health, and ethnicity and health to detect differences between younger and older age groups, between men and women, and between ethnic groups respectively in the association of SRH with affiliation.

All counts presented in this paper are rounded means of sample counts from waves 3, 5 and 7 and comply with the Statistics New Zealand protocols for such quantities. Analyses were carried out within the Statistics NZ data laboratory using the R statistical environment (http://www.r-project.org) for statistical computation, version 3.0.1, available from the Comprehensive R archive Network (CRAN) website (http://cran.r-project.org).

Table 1
Means and standard deviations of study sample counts and proportions by demographic strata for the unbalanced SoFIE-Health panel used in this study (waves 3, 5, and 7).

	N (SD)	% affiliated (SD)
Total	16,354 (943)	91.8 (0.6)
Health		
Excellent	5099 (538)	88.2 (0.9)
Very good	5831 (194)	91.6 (0.6)
Good	3770 (144)	94.7 (0.4)
Fair/poor	1654 (76)	97.1 (0.2)
Marital status		
Never married	3672 (232)	84.5 (1.2)
Previously married	2386 (115)	95.3 (0.2)
Married	10,296 (601)	93.6 (0.5)
Family status		
Couple only	4770 (235)	94.2 (0.6)
One person	3408 (196)	89.0 (1.0)
Sole parent	1496 (127)	91.4 (0.7)
Couple with dependents	6680 (385)	91.6 (0.7)
Labour force status		
Working	10,740 (587)	90.7 (0.8)
Not working	5614 (364)	93.9 (0.3)
NZ deprivation		
Least deprived	10,086 (365)	92.0 (0.6)
Medium deprived	3356 (264)	91.5 (0.5)
Most deprived	2912 (315)	91.3 (0.7)
NZ individual deprivation		
0	3672 (232)	84.5 (1.2)
1–2	2386 (115)	95.3 (0.2)
3–7	10,296 (601)	93.6 (0.5)
Highest qualification		
Degree or higher	2435 (65)	88.3 (0.7)
No qualification	3899 (337)	93.7 (0.3)
School qualification	4361 (264)	90.7 (0.7)
Vocational qualification	5659 (277)	92.8 (0.9)
Age		
25 years or older	13,532 (933)	93.8 (0.6)
Less than 25 years	2822 (12)	82.6 (1.1)
Sex		
Male	7512 (452)	89.0 (0.9)
Female	8842 (491)	94.2 (0.4)

Note: Total counts are rounded means.

Results

Table 1 presents the 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% with some variability from changes in the proportion of respondents with missing values for this variable. The average proportions of affiliation among those reporting excellent, very good, good, and fair/poor health were 88.2, 91.6, 94.7, and 97.1% respectively, with a tendency for affiliation to increase as reported health declined.

The average proportion of affiliation with a PCP among married and previously married respondents was 93.6% and 95.3% respectively, but was slightly lower for never married respondents (84.5%). Affiliation with a PCP among respondents belonging to a one person family was 89.0%, whereas sole parents (91.4%), couples with dependents (91.6%), and couples with no dependents (94.2%) reported higher levels of affiliation. Affiliation with a PCP was lower for working (90.7%) than for non-working respondents (93.9%). Affiliation levels were similar across levels of (area) deprivation (91.3–92.0%) but were lower for individuals who were not individually deprived (84.5%) than for those who were (93.6–95.3%). Affiliation levels for respondents with a degree or higher qualifications were on average 88.3%, slightly below that observed for other qualifications (92.8% for those with vocational qualifications, 90.7% for those with school qualifications, and 93.7% for those with no qualifications). Younger people (less than 25 years old) were less likely to be affiliated (82.6%) than those who were 25 years or older (93.8%), and males were less likely to be affiliated (89.0%) than females (94.2%).

The cross-sectional associations in Table 1 provide no information about changes in health or affiliation over time. In contrast, Table 2 shows the empirical mean transition probability matrix for SRH over waves 3, 5 and 7. Each row of the transition matrix represents categories of SRH at wave w (=3 or 5) while the columns represent categories of SRH at wave $w+2$. Note that relative frequencies in each row sum to 1. Of those with excellent health in wave w, 59.9% had excellent health in the wave $w+2$, while 30.3%, 8.2%, and 1.6% respectively had poorer health (very good, good, fair/poor) in wave $w+2$. The numbers on the table diagonal (bold) show the people who did not change health between waves w and $w+2$. Conversely, 50–60% of people moved in or out of health categories between waves 3, 5, and 7.

Table 3 shows the mean empirical transition probability matrix for affiliation with a 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 $w+2$. Of those that were affiliated with a PCP in wave w, 94.9% were affiliated in the wave $w+2$, and 5.1% were not affiliated. The numbers on the table diagonal (bold) show the people who do not change the affiliation between waves 3, 5, and 7: 94.9% remained affiliated and 38.8% remained unaffiliated. Approximately 5% of people moved from affiliated to non-affiliated, and 61% from non-affiliated to affiliated.

Results from the fixed effects conditional logistic models are provided in Tables 4 and 5. Two models are reported in Table 4: model 1 included only health and wave as covariates, and model 2 added the full set of confounders discussed above. All covariates in models 1 and 2 entered as main effects only and parameter estimates refer to the overall sample used in this analysis.

An interaction of ethnicity (time invariant) with health was added to the fully adjusted model (model 2) and results are given in Table 5. These provide estimates for the effect that SRH has on affiliation with a PCP for respondents belonging to Māori, Pacific and Asian ethnic groups reporting very good, good or fair/poor health compared to people of the same ethnicity who report excellent health. Interactions between age and health and between gender and health were not significant.

The results in Table 4 indicate that SRH was significantly associated with affiliation with a PCP. After controlling for wave, the odds of affiliation with a PCP were 1.5 times and 2.1 times higher for those in good and fair/poor health respectively, relative to those in excellent health (model 1). The odds ratio remained at this level after additionally adjusting for demographic and socioeconomic factors (model 2).

The interaction of ethnicity with health was also statistically significant (Table 5). After controlling for all time varying confounders and

Table 2
Empirical transition probabilities (%) computed from counts of the number of times respondents reported the indicated pair of health states in successive observations over 3 waves. Transition probabilities were derived by dividing these counts by row totals.

	To SRH (wave $w+2$)			
From SRH (wave w)	Excellent	Very good	Good	Fair/poor
Excellent	**59.9**	30.3	8.2	1.6
Very good	20.9	**59.3**	21.7	4.0
Good	8.1	29.6	**47.7**	14.6
Fair/poor	3.0	11.4	28.5	**57.1**

Table 3
Empirical transition probabilities (%) computed from counts of the number of times respondents reported the indicated pair of affiliation states in successive observations over 3 waves. Transition probabilities were derived by dividing these counts by row totals.

	To (wave $w+2$)	
From affiliated (w)	Affiliated	Not affiliated
Affiliated	**94.9**	5.1
Not affiliated	61.2	**38.8**

Table 4
Odds ratios (95% confidence intervals) for a conditional logistic fixed effects regression model predicting the probability of being affiliated with a health provider. p-Values represent the significance of adding terms to the model sequentially from first to last.

Characteristics	Model 1		Model 2	
	OR (CI)	p-Value	OR (CI)	p-Value
Health				
Excellent	1	<0.0001	1	<0.0001
Very good	1.02 (0.88, 1.18)		1.03 (0.89, 1.19)	
Good	1.52 (1.25, 1.84)		1.52 (1.25, 1.85)	
Fair/poor	2.12 (1.51, 2.96)		2.13 (1.52, 2.98)	
Wave				
3	1	<0.0001	1	<0.0001
5	0.78 (0.70, 0.86)		0.81 (0.73, 0.90)	
7	1.16 (1.03, 1.29)		1.24 (1.10, 1.40)	
Marital status				
Never married			1	0.78754
Previously married			1.07 (0.71, 1.61)	
Married			1.03 (0.76, 1.38)	
Family type				
Couple only			1	<0.0001
One person			0.77 (0.59, 1.02)	
Sole parent			1.46 (0.97, 2.19)	
Couple with children			1.41 (1.11, 1.81)	
Labour force status				
Employed			1	0.33071
Not employed			1.06 (0.88, 1.28)	
NZDep				
Least deprived			1	0.07182
Middle deprived			1.13 (0.91, 1.39)	
Most deprived			1.33 (1.02, 1.73)	
NZiDep				
0 dep			1	0.76789
1–2 dep			1.06 (0.90, 1.24)	
3–7 dep			0.99 (0.73, 1.35)	
Education				
Degree or higher			1	0.03295
No education			2.02 (1.12, 3.62)	
School			1.89 (1.19, 3.00)	
Post-school			2.00 (1.21, 3.32)	

Table 5
Odds ratios (95% confidence intervals) for health by ethnicity relative to respondents of the same ethnicity reporting excellent health. The p-value for the interaction term is 0.02078.

Health	OR (CI)
European (nMnPnA)	
Excellent	1.0
Very good	1.22 (1.03, 1.44)
Good	1.82 (1.44, 2.30)
Fair/poor	2.26 (1.49, 3.44)
Māori	
Excellent	1.0
Very good	0.60 (0.38, 0.93)
Good	0.51 (0.30, 0.86)
Fair/poor	0.93 (0.60, 1.45)
Pacific	
Excellent	1.0
Very good	0.78 (0.45, 1.35)
Good	0.90 (0.44, 1.82)
Fair/poor	1.49 (0.84, 2.64)
Asian	
Excellent	1.0
Very good	1.65 (0.72, 3.77)
Good	1.42 (0.49, 4.09)
Fair/poor	2.20 (0.64, 7.53)

including an interaction between ethnicity and health, the odds of being affiliated with a PCP were 1.2, 1.8 and 2.3 times higher for nMnPnA respondents in very good, good, and fair-poor health (respectively) than for nMnPnA in excellent health i.e., affiliation for nMnPnA respondents increased as reported health declined. In contrast, for Māori respondents reporting very good health or good health, the odds of being affiliated with a PCP were 0.6 and 0.5 times lower than for Māori respondents reporting excellent health.

There was no statistically significant evidence that Māori respondents reporting fair-poor health were affiliated differently than Māori respondents reporting excellent health, and the same is true for Pacific and Asian respondents at any health level. However confidence intervals were broad, particularly for Pacific and Asian respondents, probably reflecting the small numbers of respondents of these ethnicities in the analysis sample.

Discussion & conclusion

The main research question of this study concerned the effect of change in health on affiliation with a PCP using three waves of data spanning 7 years from a New Zealand longitudinal study. While the majority of the population reported having an affiliation with a PCP and remained in good health, the probability of having a regular health care provider varies depending upon health. For the overall SoFIE sample used in this study, we found that respondents in good and fair/poor health have a significant increase in their affiliation with a PCP relative to those in excellent health even after controlling for observed confounders.

Our previous cross-sectional research found that respondents who reported fair-to-poor SRH and one or more co-morbid conditions were more likely to be affiliated with a PCP than those who reported good health or no co-morbid conditions (Jatrana and Crampton, 2009). In this study, we used three waves of longitudinal data spanning seven years and focused on individual changes in SRH and affiliation i.e., ignoring 'between-individual' differences (Allison, 2005) and controlling for observed time-varying and unobserved time-invariant confounders. While our results support the hypothesis that the primary health care system is reasonably responsive to the health care needs of the people in terms of access, it may also reflect changes in the care-seeking behaviour of people as their health changes. In other words, they reflect both the systems' responsiveness as well as the care-seeking behaviour of people. Moreover, the relationship between declining health and affiliation with a PCP may be more complex in reality. For example, initial regular interactions with a PCP may lead to deeper reflections about health, and reduce (or increase) estimates of health status.

We also found variations in the health–affiliation association by ethnicity. After controlling for all time invariant confounders and including an interaction between ethnicity and health, the odds of being affiliated with a PCP (Table 5) increased monotonically for nMnPnA respondents as their SRH declined (relative to nMnPnA in excellent health). In contrast the odds of being affiliated with a PCP were around 50% lower for Māori respondents reporting very good or good health relative to Māori respondents reporting excellent health.

Since there are no systematic differences across ethnic groups in terms of co-payment for health care which would account for the observed variations in affiliation (Goodyear-Smith et al., 2012), ethnic variation in the health–affiliation association may reflect real differences in the care seeking behaviour of people and perceived need of care as their health changes. For example, previous studies have shown that the perception of need for care has an important influence on having a usual source of care. Thus, the majority of Americans without a regular source of medical care report that they do not have one because they have little need for health services (Centre for Disease Control and Prevention, 1998; Gallagher et al., 1997; Hayward et al., 1991; Viera et al., 2006; Weinick and Drilea, 1998). Research has shown that the patients most at risk of poor health outcomes are those on the fringe of health care systems, i.e., those without a regular health care provider who rely on emergency care for routine health care (Peek et al., 2007). Lack of a regular source of care was found to contribute to reduced health care utilization among blacks in America (Rust et al., 2004). In general, a regular source of care is preferred by patients for addressing new problems, providing preventive care, and getting referrals (Hargraves et al., 2001). The fact that Māori in very good or good health have a reduced likelihood of affiliation with a PCP may imply lower utilization of preventive care, late detection and delay in effective management of treatment which, in turn, increases the probability of using hospital facilities as a regular source of care. It may also mean that the message regarding benefits of having a regular primary care provider is not getting through to Māori. Policies promoting the benefits of affiliation with a PCP should increase awareness of benefits of regular contacts with a PCP while in good health to maximise the benefits of the primary health care system.

There are several limitations of this study that need to be considered. First, these models do not allow for the effect of either affiliation on future health (reverse causation), or past affiliation on future affiliation (state dependence) which violates the strict exogeneity condition required by fixed effects methods (Gunasekara et al., 2012; Wooldridge, 2002). More general models (e.g., g-method estimators) can provide unbiased results when there are complex dynamics of evolving exposures and outcomes (Greenland and Robins, 2009; Pearl, 2003; Robins and Hernán, 2009), but such methods are beyond the scope of this analysis which focused on the association between health and affiliation net of measured time-varying and unmeasured time-invariant confounding.

Second, SRH might also be affected by differential ethnic reporting behaviour. Systematic differences in the reporting of health outcome among ethnic groups might bias the results, though the magnitude and direction of such bias are unknown. Additionally, as with other self-reported surveys, health status is measured using self-reported data which rely on the ability of respondents to recall information accurately. While SRH is widely used in the social sciences and is a well-established and reliable instrument in cross-sectional studies (Idler and Benyamini, 1997; Lopez, 2004), its longitudinal reliability is less well-studied. Thus in longitudinal studies SRH may suffer from a variety of biases including measurement error e.g., from ceiling effects (Gunasekara et al., 2012). Measurement error can also affect the reporting of affiliation with a PCP. For example, it is possible that people

may be reporting access to any number of subspecialists or an emergency room at a hospital rather than a PCP. Such errors may bias our results, but are less problematic here because subsequent questions were about regular visits rather than visits to an emergency room.

Third, our analyses may be affected by selection bias if those who dropped from the study reported substantially more or less affiliation. Information from some dropouts has been included, specifically those who contributed to only two of waves 3, 5, and 7. If others who dropped out from the study were more likely to report non-affiliation with a PCP, then the true population relationship between declining health and affiliation with a PCP would be weaker than what was found in this study. However, the health–affiliation relationship in these "drop-outs" would need to be very different to the "stay-ins" to change our conclusions.

Fourth, although we have adjusted for many time-varying confounding variables, it is possible that the differences we found in the association of health with PCP affiliation were the result of unobserved time-varying confounders of the relationship.

Despite these limitations, the results presented here are important in several ways. This study uses a large, original, national survey in examining the association of a change in health with a change in PCP affiliation. The finding that a decline in health is associated with affiliation with a PCP is consistent with current NZ health policies encouraging people with greater health care needs to affiliate with a PCP. However, this may be less true for Māori than for other ethnic groups. In order to increase affiliation among Māori in good health, additional steps such as targeted information about the benefits of having an affiliation with a PCP through community support groups may lead to both population and health care system benefits.

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.

Conflict of interest statement

None.

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