Changing response rates from Māori and non-Māori in national sleep health surveys

Jo W Fink, Sarah-Jane Paine, Philippa H Gander, Ricci B Harris, Gordon Purdie

Abstract

**Aim** To understand declining response rates in New Zealand sleep health surveys by examining contextual changes and specific aspects of the questionnaires and research design that may have contributed.

**Method** From 1999-2008, four population surveys were undertaken, seeking to recruit equal numbers of Māori and non-Māori, consistent with the Kaupapa Māori principle of equal explanatory power; using the electoral roll as a sampling frame and including extensive follow-up.

**Results** In successive surveys, there were fewer respondents in all age groups. Response rates from Māori were lower in all surveys and the percentage decline was greater than for non-Maori. Between 1999 and 2008, the response rates from the initial mail-out decreased by 50% and the proportion of the sample that were uncontactable increased by 50%. Identified societal trends included decreased currency of electoral roll address information, declining use of listed landline telephone numbers, and possibly declining willingness to participate from increasing respondent burden. Contributing study design features may have included changes in Māori leadership, increasing complexity of questions and saliency of the research topic to potential participants.

**Conclusions** The declining response rate in sleep population surveys is likely to be due to a number of factors. The pros and cons of using the electoral roll as a sampling frame in mail surveys should be carefully considered.

The Kaupapa Māori principle of ‘equal explanatory power’ promotes the inclusion of equal numbers of Māori and non-Māori participants in health research. This concept has been developed to ensure Māori health needs are effectively addressed and understood at a comparable level to those of non-Māori.

Several national sleep health surveys in New Zealand have integrated equal explanatory power into their study design. Incorporating this principle allows separate analysis of data for Māori and non-Māori with the same level of power, while also allowing Māori and non-Māori comparisons to be made.

This programme of work, undertaken in partnership by the Sleep/Wake Research Centre and Te Rōpū Rangahau Hauora a Eru Pōmare, aims to produce accurate population prevalence estimates for sleep disorders and risk factors among Māori and non-Māori adults, and to examine predictive factors for sleep problems for both groups.

Whilst the first national sleep survey in 1999 successfully achieved high response rates from both Māori and non-Māori (Table 1), the response rates for both samples
have steadily decreased in subsequent surveys, despite very similar methods being used.

In this paper we aim to identify the contextual changes and specific aspects of the questionnaires and research design that may be affecting this process.

### Table 1. Response rates for Māori descent and non-Māori samples in sleep population surveys 1999-2008

<table>
<thead>
<tr>
<th>Survey topic</th>
<th>Year</th>
<th>Māori descent (%)</th>
<th>non-Māori (%)</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstructive sleep apnoea syndrome</td>
<td>1999</td>
<td>70.6</td>
<td>78.9</td>
<td>74.4</td>
</tr>
<tr>
<td>Insomnia</td>
<td>2001</td>
<td>58.2</td>
<td>76.2</td>
<td>72.5</td>
</tr>
<tr>
<td>Morningness/eveningness</td>
<td>2003</td>
<td>53.4</td>
<td>58.2</td>
<td>55.7</td>
</tr>
<tr>
<td>Circadian rhythm sleep disorders</td>
<td>2008</td>
<td>48.1</td>
<td>61.6</td>
<td>54.3</td>
</tr>
</tbody>
</table>

*Note: The denominator for calculating total response rates excluded: 'return to senders', people who had moved outside the target region and those who were identified as deceased. In addition, the 2003 survey excluded from the denominator those unable to answer the questionnaire due to physical or mental illness and in the 2008 survey, incorrect telephone numbers.*

### Survey method

In all surveys, the electoral roll was used as the sampling frame. Since it includes information on Māori descent and year of birth for all electors, it is possible to take a random sample of the population stratified by Māori descent and age. The electoral roll does not collect information on sex, so samples cannot be stratified by this variable, although it is presumed that samples from the electoral roll will contain approximately equal numbers of males and females.

The survey method was developed in the first national sleep survey in 1999, which investigated the prevalence of symptoms and risk factors for Obstructive Sleep Apnoea Syndrome (OSAS) among Māori and non-Māori aged 30-59 years. It built on a regional pilot study that sampled 300 adults of Māori descent and 300 non-Māori which achieved an overall RR of 75% (Māori descent response rate=70%, non-Māori response rate= 80%, with the denominator excluding, people identified as deceased or no longer living in the target region). In the pilot study, the number of responders that identified as being in the Māori ethnic group as a proportion of responders of Māori descent was 91%. Since ethnicity using the Māori ethnic group was to be used to classify Māori and non-Māori during data analysis, the national OSAS survey included an age stratified random sample of 5500 electors of Māori descent and 4,500 non-Māori, in order to achieve approximately equal numbers of participants by ethnicity.

The key elements of the first survey that facilitated high response rates included the use of a short questionnaire (two A4 sides), questions requiring primarily tick-box or single value answers, providing the opportunity to enter a draw to win an incentive prize, and the use of information sheets that were tailored to Māori and non-Māori samples (i.e. for the Māori sample appropriate salutations in te reo Māori, the use of
The survey method also included intensive follow-up. After the initial mail-out of study packages, at approximately 2-weekly intervals a reminder postcard was sent to non-responders, and then a new study pack. Telematching was provided by a search service using name and address information provided on the electoral roll. Telephone follow-up was then undertaken where telephone numbers were available, with Māori interviewers available for Māori participants.

Table 2. Differences between New Zealand sleep population surveys 1999–2008

<table>
<thead>
<tr>
<th>Survey topic</th>
<th>Obstructive sleep apnoea syndrome</th>
<th>Insomnia</th>
<th>Morningness eveningness</th>
<th>Circadian rhythm sleep disorders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year of survey</td>
<td>April 1999</td>
<td>April 2001</td>
<td>August 2003</td>
<td>October 2008</td>
</tr>
<tr>
<td>Sample size</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori descent</td>
<td>5500</td>
<td>2100</td>
<td>2674</td>
<td>5000</td>
</tr>
<tr>
<td>Non-Māori</td>
<td>4500</td>
<td>1900</td>
<td>2326</td>
<td>4100</td>
</tr>
<tr>
<td>Total</td>
<td>10,000</td>
<td>4000</td>
<td>5000</td>
<td>9100</td>
</tr>
<tr>
<td>Age range (10-year age groups)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-59 years</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td>Nationwide</td>
<td>Nationwide</td>
<td>Wellington region</td>
<td>Nationwide</td>
</tr>
<tr>
<td>Questionnaire length (A4 pages)</td>
<td>1× double-sided</td>
<td>1× double-sided</td>
<td>2× double-sided</td>
<td>1.5× double-sided</td>
</tr>
<tr>
<td>Question style</td>
<td>Majority tick boxes</td>
<td>Majority tick boxes</td>
<td>Majority tick boxes</td>
<td>~50% tick boxes, ~50% written answers</td>
</tr>
<tr>
<td>Collaboration with Māori Research Centre</td>
<td>Yes. Led by Māori researcher.</td>
<td>Yes. Led by Māori researcher.</td>
<td>No, but led by Māori researcher.</td>
<td>No, but led by Māori researcher.</td>
</tr>
<tr>
<td>Questionnaire sent from</td>
<td>TRRHaEP a</td>
<td>Questionnaire sent from SWRC b</td>
<td>Questionnaire sent from SWRC b</td>
<td>Questionnaire sent from SWRC b</td>
</tr>
<tr>
<td>Incentive prize</td>
<td>Mystery holiday weekend</td>
<td>Sleepyhead product</td>
<td>Rimu mirror</td>
<td>5× iPod shuffles</td>
</tr>
<tr>
<td>Telematches of published telephone numbers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Māori descent</td>
<td>39.0%</td>
<td>31.5%</td>
<td>45.8% c</td>
<td>24.8%</td>
</tr>
<tr>
<td>Non-Māori</td>
<td>50.0%</td>
<td>45.5%</td>
<td>60.8% c</td>
<td>36.9%</td>
</tr>
<tr>
<td>Non-responder follow-up</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Postcard</td>
<td></td>
<td>Postcard</td>
<td>Postcard</td>
<td>Postcard</td>
</tr>
<tr>
<td>New study pack</td>
<td></td>
<td>New study pack</td>
<td>New study pack</td>
<td>New study pack to Māori</td>
</tr>
<tr>
<td>Telephone call</td>
<td></td>
<td>Telephone call</td>
<td>Telephone call</td>
<td></td>
</tr>
<tr>
<td>Māori telephone interviewers</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

Notes:

a TRRHaEP = Te Rōpū Rangahau Hauora a Eru Pōmare;
b SWRC = Sleep/Wake Research Centre;
c The Wellington region is socioeconomically less deprived than other regions in New Zealand. Both the Māori descent and non-Māori samples in this study were less deprived than the national population surveyed in 1999. This may help to explain the high rate of telematching success for this survey.
Table 2 describes the major differences in the four population-based sleep surveys including the sample sizes and age ranges, questionnaire style and length, increasing requirement for further follow-up, change in the leadership of studies from Te Rōpū Rangahau Hauora a Eru Pōmare to Māori health researchers at the Sleep/Wake Research Centre, and the lack of Māori interviewers during telephone follow-up for the final survey.

Response rates in sleep surveys

The response rates achieved for each survey are shown in Table 1. The response rate for Māori participants in each survey is consistently lower than that for non-Māori ($\chi^2$, p<0.0001) and has declined with each successive survey. Māori were also over-represented in the most deprived NZDep deciles in all surveys, and response rates decreased with increasing socioeconomic deprivation (Cochrane-Armitage test for trend, p<0.0001) in each survey.

Figure 1 demonstrates that the gradients of socioeconomic deprivation have not changed over time for either the Māori descent or non-Māori sample. Additionally, in each survey there was a significant trend for increasing response rates with each additional decade of age (Cochrane-Armitage test for trend, p<0.0001).

Figure 1. Response rate in each NZDep decile for the Māori descent and non-Māori sample in 1999 and 2008, showing a trend of decreasing response with increasing socioeconomic deprivation

The changes in response rate are most apparent between the initial survey in 1999 and the most recent survey in 2008. Table 3 compares the response rate at each stage of
data collection for these two surveys. While telephone follow-up achieved a higher percentage of responses in the 2008 survey, the first mail-out elicited only about half as many responses as in the 1999 survey. Furthermore, the percentages of the sample who were ineligible or unable to be contacted had more than doubled between the two surveys. One factor contributing to this was the inclusion of 20-29 year olds in the 2008 survey, but not the 1999 survey.

Figure 2 shows the breakdown of response rate by descent and age for the two surveys. In both the Māori and non-Māori samples, the percentage of respondents in each age group was lower in 2008 than in 1999.

Table 3. Comparison of responses at each stage of data collection between the Māori descent and non-Māori samples (30–59 year age groups) in 1999 and 2008 in addition to the complete sample (20–59 year age groups) in 2008

<table>
<thead>
<tr>
<th>Variables</th>
<th>Māori descent sample</th>
<th>non-Māori sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age 30-59</td>
<td>Age 30-59</td>
</tr>
<tr>
<td></td>
<td>% of 5,500</td>
<td>% of 3,750</td>
</tr>
<tr>
<td>Mail-out 1</td>
<td>30.4</td>
<td>16.1</td>
</tr>
<tr>
<td>Mail-out 2</td>
<td>14.0</td>
<td>11.6</td>
</tr>
<tr>
<td>Mail-out 3</td>
<td>15.9</td>
<td>6.7</td>
</tr>
<tr>
<td>Phone follow-up</td>
<td>6.1</td>
<td>10.7</td>
</tr>
<tr>
<td>Mail-out 4 a</td>
<td>-</td>
<td>1.6</td>
</tr>
<tr>
<td>Total</td>
<td>66.3</td>
<td>45.1</td>
</tr>
<tr>
<td>Overseas/ineligible b</td>
<td>1.0</td>
<td>0.7</td>
</tr>
<tr>
<td>Incorrect contact details c</td>
<td>5.1</td>
<td>5.6</td>
</tr>
</tbody>
</table>

Notes:

a A fourth mail-out was not performed in the 1999 study.
b Ineligible respondents included those who were deceased, and in the 2008 survey also those who could not complete the questionnaire because of language difficulties and/or physical or emotional illness.
c In 1999 this included only ‘return to senders’ whereas in 2008 incorrect telephone numbers were also included.

Figure 2. Response rate in each 10-year age group for the (a) Māori descent and (b) non-Māori samples in 1999 and 2008

Note: The 1999 survey did not include a 20-29 years age group.
Contextual trends affecting access to survey populations

The percentage of eligible voters on the electoral roll in each age group has increased slightly between each survey, however the proportion of younger voters enrolled in 2008 was still considerably lower than among older age groups (18-24 years=76%; 25-29 years=87%; 50-59 years=97%).

The Statistics New Zealand Household Economic Survey has reported that household access to cellular phones has increased from 59% in 2001 to 73% in 2007. In 2004 an estimated 6.4% of households did not have access to a landline, and some groups, including Māori and those with the lower incomes, had higher than average access to cellular phones alone. It can be expected that the number of cellular-phone-only households in New Zealand will continue to increase, as has been seen in other countries. Thus, without a public telephone directory of cellular phone numbers, telephone follow-up is becoming increasingly difficult. In the 2008 national survey, telephone listings could not be found for approximately 75% of the non-responders, for whom the majority were of Māori descent, either through computerised telematching or manual search of telephone listings (total telematches are stated in Table 2).

In November 2006, New Zealand Post introduced a $20 charge for their previously free mail redirection service. These change of address notifications previously prompted 95% of the changes that were made to maintain the accuracy of details on the electoral roll. Since 2002, New Zealand voters are continuously enrolled on the electoral roll and do not need to re-enrol prior to each election. Thus, without change of address notifications or the return of a pre-election enrolment update form, it is presumed that voters’ contact details remain the same. This may in turn, affect the accuracy of the address information on the electoral roll.

Contextual trends affecting the survey-taking climate

There is evidence that survey response rates are decreasing worldwide, in part due to an increase in refusals, and that more effort is required to obtain responses. In New Zealand mail surveys, the usual practise of two reminders in the 1990s has been routinely superseded by the need for three reminders in the last decade.

It is thought that declining response rates may be a consequence of “over-surveying”, as potential responders are exposed to an increasing number of research surveys, political polls and telemarketing requests. A 1991 study found that in New Zealand, 60% of respondents had been exposed to a survey in the preceding 12 months, with 14% surveyed four times or more over the same time period. The subsequent increase in use of the internet and the proliferation of telemarketing in New Zealand may have increased this exposure, and hence the potential “survey burden”, although research evidence is lacking.

Both the 1999 and 2008 surveys were performed in Parliamentary election years. However, only the 2008 survey involved data collection immediately prior to and following the election. This may have been an added disincentive for some non-responders.
Specifics of each survey

A significant feature of this program of work has been the use of Kaupapa Māori as the underlying methodology that has informed our research strategy. For Te Rōpū Rangahau Hauora a Eru Pōmare, Kaupapa Māori research has evolved to encompass a broad spectrum of understanding, however the following principles guide their work:

- The research prioritises Māori in its questions, methods, processes and dissemination;
- The research is controlled by Māori, conducted by Māori researchers and with Māori;
- It is not a prescribed set of methods but rather about how research should be framed;
- It focuses on generating solutions and aspirations from within Māori realities; and,
- It contains a notion of action and commitment to change, and to Māori development.

While each of the sleep surveys have maintained consistency with regards to the methods used for data collection, an important point of difference between the 1999/2001 and the 2003/2008 surveys is the level of involvement of Māori health researchers and research Centres (see Table 2). The 1999/2001 surveys were collaborative research projects between Te Rōpū Rangahau Hauora a Eru Pōmare and the Sleep/Wake Research Centre, and this collaboration was made known to the survey participants through the use of Te Rōpū Rangahau Hauora a Eru Pōmare letterhead and the involvement of senior Māori health researchers.

Conversely, the 2003/2008 surveys were solely conducted by the Sleep/Wake Research Centre, but led by a Māori health researcher. Despite the continued commitment to the principles and ideals of Kaupapa Māori research and ongoing informal relationships between the two centres, the lack of explicit or formal collaboration with a Māori health research partner may have influenced the willingness of some Māori to complete the 2003/2008 questionnaires, particularly if there were concerns regarding the kaitiakitanga or guardianship of the research data, or if they had previous negative experiences with health researchers who did not reciprocate appropriately when they had agreed to participate in research.

The perceived saliency of each survey topic may also have affected response rates. The topics investigated in the first surveys, OSAS and insomnia, have received increasing attention in the popular media in recent years. In contrast, the topics of the final two surveys (morningness/eveningness and disorders of sleep timing) are less well known.

The question structure used in the later surveys was also more demanding. The original 1999 and 2001 surveys were comprised almost entirely of questions with tick box or single value answers. In 2003, participants were required to provide ratings on scales for many questions. In 2008, although approximately half of the questions required tick box or single value answers, participants were also asked provide a range of information on their sleep timing and to respond to unfamiliar ideas.
Discussion

Findings from the national sleep surveys have been published in leading international journals. Identified strengths of the earlier studies in particular are the inclusion of representative national samples, and the capacity to simultaneously evaluate the association of ethnicity and socioeconomic deprivation on sleep health. For surveys to achieve equal explanatory power for Māori and non-Māori, it is necessary to be able to recruit equal numbers of Māori and non-Māori participants, with representative samples of both groups. However, our experience with the national sleep mail surveys suggests that this is becoming increasingly difficult.

National health mail surveys using the New Zealand electoral roll as a sampling frame vary considerably in the study designs used and the response rates achieved. A major advantage of using the electoral roll as a sampling frame is that it is possible to select a random sample stratified by Māori descent and age. This is important within the context of Kaupapa Māori as it allows researchers to adequately sample Māori and non-Māori participants and control for differences in the age structure between the Māori and non-Māori populations. The use of the electoral roll as a sampling frame also allows the comparison of responders and non-responders for the demographic variables of Māori descent, age, and socioeconomic deprivation. Researchers are then able to estimate the size of the selection bias inherent within their data particularly when less than adequate response rates are achieved, and/or weight data for responses by these variables.

The present study has identified a number of limitations that need to be considered when using the electoral roll as a sampling frame for national surveys. First, the currency of address information appears to have declined. From 1999 to 2008 there was a doubling in the proportions of electors with incorrect addresses, or for whom it was impossible to match telephone numbers and addresses, for both Māori and non-Māori. This was unexpected in 2008 as the electoral roll was obtained immediately prior to the parliamentary election, when the roll would be expected to be most up to date. The accuracy of address information on the roll may have been affected by New Zealand Post’s introduction of charges for change-of-address notification. This might be expected to exacerbate the higher rate of non-response among more socioeconomically disadvantaged groups.

Although enrolment rates in general are increasing, younger voters are still less likely to be on the electoral roll. All the sleep surveys found a trend for increasing response rates with increasing age. Thus, using the electoral roll as a sampling frame to obtain representative information about younger adults remains a challenge. This is particularly pertinent for Māori, who due to their population structure are over-represented in the younger age groups. Some interview surveys have trialled using dual sampling frames, to target both the total population and smaller ethnic groups.

This study has also identified a number of other factors inherent within the study method that may have affected response rates over time. The effectiveness of telephone follow-up of non-responders is declining with the declining use of landlines in households, and the lack of a public directory of cellular phone numbers. There is evidence that this may also disproportionately affect Māori and more
socioeconomically deprived people (and probably younger people), thus exacerbating
the lower response rates from these groups.

Mail surveys with telephone follow-up were originally selected for obtaining
epidemiological data on the sleep health of New Zealanders, due to their relatively
low cost and national coverage. Among other possible approaches, telephone surveys
are quicker and less expensive than face-to-face surveys, but do not reach potential
participants without telephones. Although face-to-face surveys generally yield the
highest response rate, the cost and logistics of this approach were considered
prohibitive. However, the present findings on declining response rate to mail surveys
indicate that these and other approaches may need to be considered in future.

People may be becoming less willing to participate in surveys, due to increasing
“respondent burden”. In this context, it would seem to be increasingly important to
design questionnaires that are short and straightforward to complete, and on topics
that are considered relevant by, and are well described to, the population being
surveyed. Offering the option of on-line completion of questionnaires would reduce
participant workload (participants do not need to mail their response in the paper-
based postal system). However, this approach may exacerbate the declining response
gradient with increasing socioeconomic deprivation, as a result of lower access to the
internet among more disadvantaged groups.

From a Kaupapa Māori perspective, Māori leadership in research is central. It is not
clear whether the shift from leadership by a Māori health research centre to Māori
researchers in a non-Māori research centre had a major independent impact on Māori
response rate in the sleep surveys. Nevertheless, it is important for potential
participants to have a clear understanding of the role of Māori researchers and the
implications of a Kaupapa Māori approach in this type of study.

These analyses demonstrate that the proportion of the target population who cannot be
contacted by mail and/or telephone has increased. Declining response rates has
important implications for research in terms of the generalisability of the study
findings to the population and as a potential source of bias especially if there are
systematic differences between those who respond to the survey and those who do
not. To promote maximum response from the proportion of the sample who can be
contacted, and enable equal explanatory power modifiable survey design components
should be optimised. These include ensuring that:

- Power calculations take into account coverage of the electoral roll and a
differential between those who are listed as being of Māori descent and those
who identify as belonging to the Māori ethnic group;
- Collaboration with and involvement of Māori researchers and research
methods are clearly communicated to Māori participants;
- The survey topic is salient to participants and the questionnaire length and
question style are as short and simple as possible, with the majority of
questions requiring either tick box or single value answers;
- An appropriate incentive prize is included to decrease the likelihood of
response bias;
Digital or online response options are available in addition to freepost reply envelope and a toll free telephone number;

Extensive and timely follow-up of non-responders is performed by mail and telephone (where possible);

The timing of the data collection period does not coincide with other events that may negatively influence the likelihood of response through over-surveying or being too busy (e.g. parliamentary elections, sporting championships or vacation periods).

These factors need to be carefully considered in all survey studies and particularly those planning to use the electoral roll as a sampling frame..

Competing interests: None known

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Acknowledgments: We acknowledge with gratitude the participants who gave their time and support for these studies. We also wish to acknowledge our collaborators on these surveys, Associate Professor Papaarangi Reid (OSAS and insomnia surveys), Ms. Bridget Robson (OSAS survey), Dr. Guy Warman (CRSD survey) and our co-workers at the Sleep/Wake Research Centre, Massey University, Wellington and Te Rōpū Rangahau Hauora a Eru Pōmare, University of Otago, Wellington. The Health Research Council of New Zealand provided funding for: the National Sleep Apnoea Survey (HRC Project Grant 99/185); the National Insomnia Survey (Project Grant 00/273); the Morningness/Eveningness Regional Survey (a Māori health PhD Scholarship to Te Hereripine Sarah-Jane Paine HRC 03/020); and the National Circadian Rhythm Sleep Disorders Survey (the Eru Pōmare Fellowship in Māori Health to Te Hereripine Sarah-Jane Paine HRC 08/547).

Additional funding was provided by Fisher and Paykel Healthcare for the incentive prize in the national sleep apnoea survey and Sleepyhead New Zealand Ltd for the incentive prize in the national insomnia survey.

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References:


