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2. One (or more) author must state: “I (we) accept full responsibility for the conduct of the study, had access to the data, and controlled the decision to publish”.
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Abstract page – this must not exceed 200 words and should describe the core of the paper’s message, including essential numerical data. Use four headings: Aims, Methods, Results, Conclusions.

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Figures must be glossy prints or high quality computer printouts. Since these are likely to be reduced in size when printed, use large type and approximately twice column size for the figure.

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Measuring Māori health status accurately - more needs doing

Tony Blakely, Senior Research Fellow; Bridget Robson, Research Fellow (Te Ropu Rangahau a Eru Pōmare); Alistair Woodward, Professor, Department of Public Health, Wellington.

As everyone knows, there is a substantial health gap between Māori and non-Māori, with non-Māori having approximately half the death rates of Māori. Why is this inequality important, and why is it important to measure it accurately? There are many interpretations of the Treaty of Waitangi, but a basic understanding revolves around a governance agreement for Pākehā settlement, and a guarantee of protection of Māori interests against any negative impacts from settlement, both immediate and ongoing. Disparities in health are evidence that Māori interests are not being protected and appropriate interventions need to be put in place. Accurate health statistics by ethnic group in New Zealand are essential for monitoring our society's progress towards (or away from) equity.

Effective monitoring of disparities requires consistent and complete ethnic data collection both within and across data-sets. This means using a standard ethnicity question (consistent with the census), allowing for identification with more than one ethnic group, and ensuring each person is asked. Self-identification underpins ethnic classification and a person's ethnicity cannot be assumed. Currently there is a poor consistency across health data sets both because of missing data and because alternative ethnicity questions are used. To determine whether gaps are closing (or widening) over time, continuity in ethnicity data is also necessary. Inaccurate ethnicity data in health records and changes to the census ethnicity question have made it difficult to interpret trends in Māori mortality and other health outcomes.

The paper in this issue of the Journal by Smartt et al adds to the growing evidence of the difficulties in reporting ethnic differences in health status in Aotearoa/New Zealand. The authors aimed to quantify the years of life lost (YLL) per person by ethnic group. In so doing, they used mortality data from 1986 to 1994 for the numerators, and 1986 and 1991 census data to interpolate denominators for the same years. Best practice for this time-period was to use census sole-ethnic group counts for the denominator to adjust (at least partially) for the suspected undercounting of Māori deaths on mortality data relative to census data. The authors find that the YLL per person were similar between Māori and non-Māori when using the larger (denominator) total Māori ethnic group. Using the census sole Māori ethnic group resulted in moderately elevated YLL for Māori compared to non-Māori – but still less than the twofold difference reported elsewhere using late 1990s data (page 125, ref1). They conclude that using the total Māori ethnic group for the late 1980s and early 1990s underestimates Māori mortality and support Thomas' proposal for developing standard protocols in the collection and reporting of ethnic specific health statistics.
and quality of health care. Discrimination is recognised as underlying these determinants, while also having a direct impact on health.\textsuperscript{6} Treatments and services designed for the majority of the population may not be effective for all ethnic groups. Even at the basic level of how disease outcomes are defined, ethnicity may be an important factor.\textsuperscript{11} To appreciate these important differences, and to tailor services where this is appropriate, we need reliable measures of ethnicity.

Ethnic disparities are monitored in order to intervene appropriately and to judge how well our interventions are working. A concerted, rapid and comprehensive improvement in ethnic data quality is needed so we can proceed with monitoring the effect of policy changes instead of artefactual effects of data changes. The current emphasis by government on reducing inequalities in health, the increasing recognition of the role that discrimination and racism play in determining social, economic and health outcomes for Māori and the associated implications of Treaty risk - these are all reasons why more needs to be done to measure Māori health status more accurately.

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**Highest French court awards compensation for “being born”**

French obstetricians and specialists in prenatal diagnosis last week protested about a decision by France’s highest court of appeal that upheld damages to a boy for “being born.”

The decision states that a child can be compensated for being born with a handicap or a malformation if a mother had not had the opportunity to ask for a therapeutic abortion because she had not been informed of the risk that could have been evaluated during prenatal diagnosis.

Compensation was awarded to two boys born with Down’s syndrome. The court judged that further testing, notably amniocentesis, should have been proposed and that, informed of the risk, the mothers would have chosen therapeutic abortion.

The judgment confirmed a previous hotly disputed case, the Perruche case, in which compensation was awarded last year to Nicholas Perruche, a boy who had been born with severe malformations caused by rubella contracted by his mother during pregnancy.

Doctors deemed to be responsible have to pay compensation, normally covered by insurance. Doctors say they can now be condemned for not being able to predict a malformation with 100% certainty.

In France, where every year about 14 000 babies are born with anomalies of varying severity, the Perruche precedent could encourage hundreds of parents to lodge a complaint. Dr Roger Bessis, president of the French College of Fetal Echography, said that the practice of antenatal diagnostic techniques would be threatened by insurance costs, which would inevitably rise.

Members of the associations for handicapped people demonstrated in front of the court, protesting that the decision reflected contempt for handicapped children.


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**Can’t go to sleep? Don’t count on sheep**

Oxford psychologists have cut through the woolly thinking about insomnia. Don’t count sheep. Think waterfalls, or languid picnics in the Pyrenees, the advise.

Doctors have sound advice for sufferers who want to avoid sleeping tablets. A light meal, light exercise, a dull book and a quiet room figure highly in the prescriptions. But even the weakest insomniacs tend to snap awake as they snuggle under the duvet.

New Scientists reported last week that Allison Harvey, a cognitive psychologist at Oxford University, tested that classic recipe for numbing thought and quelling anxiety: counting sheep. Fifty volunteer insomniacs were divided into groups, a strategy was proposed for each, and the rates at which eyelids closed and breathing became regular was then monitored.

Those who imagined torpid afternoons in the south of France, or lazy twilights in the Tyrol, went to sleep on average 20 minutes earlier than they would normally do on nights when they were not concentrating on faraway places. The sheep counters actually stayed awake for longer than their normal ration of restlessness.

“Counting sheep is just too mundane to effectively keep worries away,” Dr Harvey said.

House dust mite allergen levels in individual bedding components in New Zealand

Sarah Mills, House Surgeon; Robert Siebers, Senior Technical Officer; Kristin Wickers, Research Fellow; Julian Crane, Professor; Gordon Purdie, Research Fellow; Penny Fitzharris, Associate Professor, Wellington Asthma Research Group and Department of Public Health, Wellington School of Medicine and Health Sciences, Wellington.

Abstract

Aims. House dust mite allergen (Der p 1) levels are high in New Zealand and bedding Der p 1 levels have been shown to be associated with the clinical severity of asthma. The aim of this study was to measure Der p 1 levels in synthetic and feather duvets and other individual bedding items, and to examine factors affecting these levels.

Methods. Reservoir dust samples were collected and analysed for Der p 1 content by ELISA from 65 duvets, 81 pillows, and 65 mattresses of 34 children and 31 adults in 34 households.

Results. Der p 1 geometric mean levels (95% confidence interval) were: 13.4 µg/g (9.5-18.9) in pillows; 29.4 µg/g (19.8-43.5) in duvets; and 53.8 µg/g (39.4-73.4) in mattresses. Synthetic pillows and duvets yielded significantly more Der p 1 than feather pillows and duvets (about 7-fold and 15-fold respectively). The presence of under-bedding resulted in significantly higher pillow and duvet Der p 1 levels. Mattresses >10 years old had significantly higher Der p 1 levels.

Conclusions. Synthetic pillows and duvets contain higher levels of Der p 1 than feather pillows and duvets. Advise for house dust mite sensitized individuals to use synthetic bedding does not prevent house dust mite allergen exposure.

Tables 2, 3 and 4 show Der p 1 levels expressed as ratios of the geometric mean allergen levels (per pillow or per m² for duvets and mattresses). We found about six to seven-fold higher Der p 1 levels in synthetic pillows and about 15-fold higher Der p 1 levels in synthetic duvets, compared to feather pillows and duvets respectively. The presence of under bedding resulted in significantly higher Der p 1 levels of pillows and duvets (Tables 2 and 3). Mattresses ten years or older had about six to seven-fold higher Der p 1 levels compared to mattresses less than four years old. Recent washing of pillows or duvet covers resulted in non-statistically lower Der p 1 levels (results not shown).

**Table 1.** Geometric mean (95% confidence interval) Der p 1 levels in individual bedding components.

<table>
<thead>
<tr>
<th>Component</th>
<th>n</th>
<th>µg/m²</th>
<th>µg/g</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pillows</td>
<td>81</td>
<td>1.30</td>
<td>0.81-2.03</td>
<td>13.38 (9.47-18.92)</td>
<td>0.0003</td>
</tr>
<tr>
<td>Duvets</td>
<td>65</td>
<td>2.83</td>
<td>1.57-5.11</td>
<td>29.36 (19.82-49.47)</td>
<td>0.0032</td>
</tr>
<tr>
<td>Mattresses</td>
<td>65</td>
<td>37.49</td>
<td>21.28-66.04</td>
<td>53.77 (39.42-73.35)</td>
<td>0.0003</td>
</tr>
</tbody>
</table>

*Total Der p 1 (µg/pillow).

**Table 2.** Factors associated with pillow Der p 1 levels.

<table>
<thead>
<tr>
<th>Factor</th>
<th>n</th>
<th>Ratio</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pillow type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feather</td>
<td>81</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthetic</td>
<td>63</td>
<td>0.64</td>
<td>0.20-2.18</td>
<td>0.002</td>
</tr>
<tr>
<td>Allergen cover</td>
<td>4</td>
<td>0.70</td>
<td>0.09-5.47</td>
<td>0.72</td>
</tr>
<tr>
<td>Wool</td>
<td>3</td>
<td>0.33</td>
<td>0.04-3.27</td>
<td>0.34</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Under bedding</th>
<th>n</th>
<th>Ratio</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>13</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>68</td>
<td>8.19</td>
<td>1.54-43.65</td>
<td>0.02</td>
</tr>
</tbody>
</table>

Adjusted for variables in Table plus person type, pillow washing and airing; duvet type, washing and airing, mattress type and age, airing, vacuuming, bed base, presence of under bedding and allergen covers. *Ratio of geometric mean Der p 1 µg/pillow.

**Table 3.** Factors associated with duvet Der p 1 levels.

<table>
<thead>
<tr>
<th>Factor</th>
<th>n</th>
<th>Ratio</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duvet type</td>
<td>64†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feather</td>
<td>21</td>
<td>1.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synthetic</td>
<td>39</td>
<td>15.45</td>
<td>4.28-55.8</td>
<td>0.001</td>
</tr>
<tr>
<td>Wool</td>
<td>4</td>
<td>1.74</td>
<td>0.17-17.72</td>
<td>0.63</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Under bedding</th>
<th>n</th>
<th>Ratio</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>10</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>55</td>
<td>6.68</td>
<td>1.19-37.53</td>
<td>0.03</td>
</tr>
</tbody>
</table>

Adjusted for variables in Table plus person type, duvet washing or airing, mattress type and age, airing, vacuuming, bed base, presence of allergen covers. *Ratio of geometric mean Der p 1 µg/m². †Type unknown for 1 duvet.

**Table 4.** Factors associated with mattress Der p 1 levels.

<table>
<thead>
<tr>
<th>Factor</th>
<th>n</th>
<th>Ratio</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mattress type</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foam</td>
<td>17</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inner sprung</td>
<td>43</td>
<td>2.79</td>
<td>0.52-14.98</td>
<td>0.22</td>
</tr>
<tr>
<td>Water bed</td>
<td>4</td>
<td>0.08</td>
<td>0.01-1.05</td>
<td>0.05</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mattress age†</th>
<th>n</th>
<th>Ratio</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 month-4 year</td>
<td>16</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;4 yr-10 yr</td>
<td>31</td>
<td>1.27</td>
<td>0.95-11.21</td>
<td>0.06</td>
</tr>
<tr>
<td>≥10 yr</td>
<td>14</td>
<td>6.53</td>
<td>1.56-27.22</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Adjusted for variables in Table plus person type, bed base, mattress airing and vacuuming, presence of under bedding and allergen covers. *Ratio of geometric mean Der p 1 µg/m². †Age unknown for 4 mattresses.

Pillow Der p 1 levels were positively correlated with mattress and duvet Der p 1 levels (r=0.26, p=0.032; and r=0.31, p=0.012 respectively). Duvet Der p 1 levels were positively correlated with mattress Der p 1 levels (r=0.43, p=0.0003).

**Discussion**

This study has shown a wide variation in Der p 1 levels in individual components of bedding. As we have found previously, these levels are high by international comparisons. In this study synthetic pillows were shown to contain higher Der p 1 levels than feather pillows, confirming previous findings. It could be argued that in assessing personal exposure to HDM allergens, individual bedding components should be taken into consideration. For instance, HDM allergen content of pillows and duvets may be more relevant given that they are in close proximity to the airways during sleep. Further studies are required to determine the contribution of individual bedding components to either airborne or inspired HDM allergens during sleep. Sensitive techniques to address these issues have recently become available.

Most studies on bedding HDM allergens have used composite bedding samples. Associations between asthma severity and levels of HDM allergens in composite bedding samples have been demonstrated. Marks and colleagues found that individual Der p 1 levels from mattresses and upper bedding did not differ significantly from Der p 1 levels from composite samples from the same bed, implying that mattress or upper bedding Der p 1 levels can be taken as indicative of the whole bed. However, in that study pillow Der p 1 levels were about three-fold lower than Der p 1 levels from the whole bed composite sample. As the use of synthetic pillows appears to be related to asthma prevalence, and HDM allergen levels are higher in synthetic pillows, future studies may require Der p 1 measurements in individual bedding items, as opposed to composite bedding samples.

Duvets are widely used in New Zealand as upper bedding. We have shown in this and a previous study that duvets contain high levels of Der p 1. This study has also shown that synthetic duvets contain significantly higher levels of Der p 1 than feather duvets. Reasons for the higher Der p 1 levels in synthetic duvets were not determined but are probably due to the greater pore size in the encasement material, as has previously been demonstrated in synthetic pillows. This would allow either freer movement of HDM into the duvet, or allow greater accumulation of HDM allergen. Recently Vaughan and colleagues have shown that tightly woven fabrics, similar to that used to keep feathers inside feather pillows, can block passage of Der p 1 allergen.

Mattresses are an ideal habitat for HDM given the abundance of food in the form of shed skin scales, and the warm and humid microenvironment. It is therefore not surprising that many studies have shown that mattresses contain the highest level of HDM allergens in the bedroom. Although statistically not significant, we found that inner sprung mattresses had higher levels of Der p 1 compared to foam mattresses. This is similar to previous findings by our group with composite bedding samples, and by Moshech and colleagues in Denmark. Abbott and colleagues in New Zealand also demonstrated higher dust mite numbers in inner sprung mattresses compared to foam mattresses. One surprising finding from our study was the relatively lower levels of Der p 1 of pillows and duvets in beds without under-bedding. One of these beds included a plastic sheet on the mattress, the remainder had nothing between the sheet and the mattress. A limitation of our study may be the select nature of the participants. However, the pillow and mattress allergen levels in the present study are very similar to our previous studies.
levels of synthetic pillows compared to feather pillows is virtually identical to previous studies.\textsuperscript{28-30} In conclusion, we have shown that synthetic pillows and duvets contain higher Der p 1 levels than feather pillows and duvets. It is at least plausible that the increased use of synthetic bedding materials in New Zealand over the last two decades has added significantly to the domestic allergen burden and thus to the severity of allergic asthma. Current advice for house dust mite sensitized atopics to choose synthetic bedding in preference to feather bedding may be inappropriate given the findings of our study. A recent Finnish study demonstrated that true feather allergy is rare.\textsuperscript{28} The down now used to fill feather pillows and duvets in our study contained significantly lower levels of HDM allergens than synthetic pillows and duvets, these levels, from international studies, are still high. Advise for HDM sensitized patients remains-the use of occlusive covers for all bedding items.\textsuperscript{30}

Acknowledgments. This study was supported by the Wellington Medical Research Foundation. The Health Research Council of New Zealand supports the Wellington Asthma Research Group, Julian Crane and Gordon Purdie.

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Factors affecting general practitioner involvement in a randomised controlled trial in primary care

Ann Richardson, Senior Lecturer; Margaret Sutherland, Research Coordinator; Elisabeth Wells, Senior Research Fellow (Biostatistics); Les Toppel, Professor of General Practice; Libby Plumridge, Senior Lecturer, Department of Public Health and General Practice, Christchurch School of Medicine, Christchurch.

Abstract

Aims. To investigate factors associated with patient recruitment by general practitioners (GPs) in a randomised controlled trial in primary care. Methods. Cross sectional survey of 100 GPs who had agreed to recruit patients for a randomised controlled trial. A postal questionnaire was sent to the 100 GPs to collect information on factors associated with recruitment in the randomised controlled trial. Results. The response rate to the survey was 97%. GPs who reported that practice nurses were involved in the research project were significantly more likely to recruit patients into the trial. Age, sex, membership of an independent practitioner association (IPA), number of half days worked, and the number of GPs working in a practice were not associated with recruitment. Conclusions. Involvement of practice nurses together with GPs may improve recruitment of patients in randomised controlled trials in primary care in New Zealand.
This was the first large general practice-based randomised controlled trial carried out between primary care practitioners and the academic department in Christchurch, and we tried to establish a rapport which would foster future collaborative research. Participating GPs were sent regular reminder letters and faxes, and were visited at intervals. Brightly coloured stickers were provided to remind GPs about the trial, and computer-based flags were instituted in some practices to alert GPs when they were about to prescribe a drug for dyspepsia. We also held two evening Continuing Medical Education (CME) meetings for participating GPs. Although we were unable to pay GPs for recruiting patients, each participating GP received Maintenance of Professional Standards (MOPS) points when they joined the research group and when they attended CME sessions.

We were concerned that the prevalence of dyspepsia might have dropped since the estimates we made before commencing the trial, and that this could explain the lower than expected recruitment. But this did not seem to be the explanation as some GPs recruited ten or more patients (range 0-15). If all participating GPs had enrolled patients at the rate of the most successful GPs, (or even if each had enrolled eight patients) there would have been no difficulty in reaching the target of 800 patients over two years.

It is important to undertake randomised trials in primary care so that primary care practice is evidence-based.5,6 We carried out a survey to investigate factors that might influence recruitment in randomised controlled trials in primary care in New Zealand.

Methods
A single-sided one-page questionnaire was posted to all GPs who had agreed to participate in the trial. The questionnaire sought demographic information about each GP, together with the number of half days each worked in general practice. Information about the number of GPs and practice nurses working in the practice was sought, whether the practice nurse(s) helped with the trial and what this help entailed. GPs were asked to return the questionnaires by mail (a freepost envelope was provided) or fax. If the questionnaire had not been returned within two weeks a second questionnaire was mailed and this was followed by a third questionnaire if no reply to the second had been received within two weeks. For the few GPs who did not respond to the mailed questionnaires or reminder, a telephone reminder was used. Data from the questionnaires, and information on recruitment, and IPA membership, were used to investigate factors that might be associated with recruitment of patients into the trial. Data were analysed using Epi-Info.7

Results
Questionnaires were sent to the 100 GPs who had agreed to participate in the trial. Two GPs were no longer practising in Christchurch. Of the remaining 98 questionnaires, 95 were returned, giving a response rate of 97%. The responses are shown in Table 1. Nearly half the respondents were female, nearly three quarters were aged 40 or over, most worked more than half time in general practice, and two-thirds worked in practices with three or more GPs. Characteristics of the respondents are shown in Table 2.

Table 2. Characteristics of respondents.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td>22 (23)</td>
</tr>
<tr>
<td>40-49</td>
<td>49 (52)</td>
</tr>
<tr>
<td>50-59</td>
<td>21 (22)</td>
</tr>
<tr>
<td>60-69</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Male</td>
<td>50 (53)</td>
</tr>
<tr>
<td>Female</td>
<td>45 (47)</td>
</tr>
<tr>
<td>Half-days worked per week</td>
<td></td>
</tr>
<tr>
<td>&lt;5</td>
<td>7 (7)</td>
</tr>
<tr>
<td>5-9</td>
<td>35 (37)</td>
</tr>
<tr>
<td>&gt;9</td>
<td>53 (56)</td>
</tr>
<tr>
<td>Number of general practitioners working in practice</td>
<td></td>
</tr>
<tr>
<td>1-2</td>
<td>30 (32)</td>
</tr>
<tr>
<td>3-5</td>
<td>39 (41)</td>
</tr>
<tr>
<td>&gt;5</td>
<td>26 (27)</td>
</tr>
<tr>
<td>Member of Pegasus IPA</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>69 (73)</td>
</tr>
<tr>
<td>No</td>
<td>26 (27)</td>
</tr>
<tr>
<td>Recruited patients into trial</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>42 (44)</td>
</tr>
<tr>
<td>No</td>
<td>53 (56)</td>
</tr>
<tr>
<td>Help from practice nurse with trial</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>46 (48)</td>
</tr>
<tr>
<td>No</td>
<td>49 (52)</td>
</tr>
</tbody>
</table>

Recruitment was categorised into “1 or more patients enrolled” and “no patients enrolled”. Of the 95 GPs who responded, 42 (44%) recruited one or more patients, and 53 (56%) recruited no patients. (Of the 100 GPs who had agreed to take part in the trial, 45 enrolled one or more patients and 55 enrolled none). Associations between recruitment in the trial, and the responses to the questionnaire were examined. Age (categorised as <50, 50+), sex, the number of GPs in the practice (categorised as 1-2, 3-5, and >5), and half days in general practice (categorised as <9, 9+) were not associated with recruitment. The most important factor associated with recruitment was involvement of practice nurse(s). Of the 95 GPs who responded, 46 (48%) said the practice nurse(s) helped them with the trial. GPs who said the practice nurse(s) helped them with the trial were significantly more likely to recruit patients into the trial than those who reported no practice nurse involvement. Of the 46 GPs who had help from practice nurses 26 (56%) recruited for the trial, while 16 (33%) of those who did not have help from practice nurses recruited for the trial ($\chi^2 = 5.48, p = 0.02$). Where practice nurses were involved with the trial, they helped with paperwork and administration for the trial, helped to obtain informed consent from patients, administered breath tests, and reminded GPs about the trial. Practice nurse involvement with the trial is shown in Table 3.

Table 3. Practice nurse involvement with the randomised controlled trial.

<table>
<thead>
<tr>
<th>Type of involvement</th>
<th>Number (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help with paperwork and administration</td>
<td>40 (87.0)</td>
</tr>
<tr>
<td>Help to obtain informed consent from patients</td>
<td>27 (58.7)</td>
</tr>
<tr>
<td>Administration of breath tests*</td>
<td>24 (52.2)</td>
</tr>
<tr>
<td>Reminded general practitioner about the trial</td>
<td>16 (34.8)</td>
</tr>
</tbody>
</table>

*For patients randomised to the intervention group, GPs had the option of offering breath tests themselves or referring patients to the After Hours surgery for breath tests. Some GPs did not wish to offer breath tests at their surgeries.

Perhaps unsurprisingly, there was an association between recruitment into the trial and response to the questionnaire, with GPs who had recruited patients being significantly more likely to respond to the first mail-out than those who had not recruited patients. Of the 55 GPs who responded to the first mail-out, 31 (56%) had recruited one or more patients, while of the 40 GPs who had required two or more mail-outs eleven

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(27.5%) had recruited one or more patients ($\chi^2 = 7.82$, p = 0.005). GPs who had not managed to recruit any patients into the trial were significantly more likely to say that they found it difficult to enrol patients. Of the 72 GPs who found it difficult to enrol patients, 29 (40%) had recruited one or more patients, while of the eighteen GPs who had not found it difficult to recruit patients 12 (67%) had recruited one or more patients ($\chi^2 = 4.04$, p = 0.04).

GPs who are members of Pegasus (IPA) were no more likely than non-Pegasus practitioners to recruit patients into the trial. Of the 69 Pegasus GPs 28 (41%) recruited one or more patients, while 14 (54%) of the 26 non-Pegasus GPs recruited one or more patients ($\chi^2 = 1.35$, p = 0.25).

**Discussion**

GPs whose practice nurses were involved with the research were significantly more likely to recruit patients into the trial. These results are consistent with those of Weir et al., who found higher notification rates of gastrointestinal illness by Canterbury and West Coast GPs were associated with practice nurses being involved in notification.

Other reported factors affecting recruitment in primary care-based randomised controlled trials are unwillingness to randomise patients, and the additional workload research entails for already busy GPs. These factors have not been investigated in New Zealand, and could not easily be addressed in any depth in a postal survey. We intend to investigate these factors further, and to this end we hope to carry out formal interviews with GPs to examine the relationships and processes that optimise practice nurse involvement with research in primary care.

It is important to identify factors associated with recruitment if we are to continue to undertake research in primary care. In the meantime, approaching practice nurses to seek their involvement in primary care-based research would be a sensible first step.

**Acknowledgements.** Our thanks to the general practitioners who took part in the survey.

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**Unwanted pregnancies involving young women and men in a New Zealand birth cohort**

Nigel Dickson, Senior Lecturer in Epidemiology; Meg Wilson, Junior Research Fellow; Peter Herbison, Biostatistician; Charlotte Paul, Associate Professor of Epidemiology, Department of Preventive and Social Medicine, University of Otago Medical School, Dunedin.

**Abstract**

**Aims.** To examine the circumstances of wanted and unwanted pregnancies before age 25 years for both women and men, and compare the circumstances of the most undesired pregnancies with all others.

**Methods.** Cross-sectional study within a birth cohort using a computer-presented questionnaire.

**Results.** Of the 477 women, 173 (36%) had been pregnant before age 25 years, and experienced 289 pregnancies of which 173 (60%) were unwanted. Of the 489 men, 142 (29%) reported 225 pregnancies before age 25, of which 165 (73%) were unwanted. By age 25 about a quarter of the study members (27% of women and 24% of men), had been involved in at least one unwanted pregnancy. Wantenedness increased with age and length of relationship with the other parent; both factors remained significant in multivariate analysis for men, but not age for women. For women unwanted pregnancies were more likely to be due to non-use of contraception than failure. For both women and men the commonest single reason for not using contraception was not thinking about it, followed by alcohol use.

**Conclusions.** An environment has emerged for men and women in their twenties in New Zealand where most are sexually active but do not want a pregnancy to occur. To delay pregnancy for a prolonged period requires dedication and commitment to effective contraception. While more attention needs to be paid to promotion of effective use of contraception, more understanding is called for over the difficulties of avoiding pregnancy with long-term reversible contraception. A further approach to the problem of unwanted pregnancies which should be investigated is to encourage committed sexual relationships.
Abortions for every 100 births. Abortions are most common among women aged 20-24, among whom in 2000 there was more than one abortion for every 30 women, and 45 abortions for every 100 births.

In spite of government concern, little is known about unwanted pregnancies in New Zealand, except for the number of abortions. This paper reports the circumstances and retrospective views at age 26 of women who experienced pregnancies, and men who had been responsible for a pregnancy, before age 25 in a birth cohort.

Methods

Sample. The sample was enrolled in the Dunedin Multidisciplinary Health and Development Study, a longitudinal study of a cohort born in Dunedin, between 1 April 1972 and 31 March 1973. The sample was first followed up at three years of age when 1037 of 1139 eligible children were seen. Following that, the sample was seen every two years until 15 years, then at 18, 21 and 26 years. The history of the sample has been described by Silva and Stanton.

Data collection. Questions on sexual behaviour and pregnancies were presented by computer. An interviewer was present who sat so that she could not see the participants' responses to the questions. She instructed the study members in the use of the computer, and aided those with very low reading ability, if requested. Participants were informed of the strict safeguards for confidentiality.

At the 26-year-old assessment the women who reported having sexual intercourse were asked "Have you ever been, or are you currently, pregnant?" and the men "Have you ever got someone pregnant?" Those who replied that they had, were asked about each pregnancy separately. First they were asked their age when they became pregnant or caused a pregnancy. The women were then asked "Did you want to get pregnant when you did?" and the men "Did you want your partner to get pregnant?" For each unwanted pregnancy they were asked if this occurred either because contraception was "not used" or because it "failed". Those who had not used contraception were asked to indicate, in two separate questions, which of a list of options applied to themselves and to their partner (Table 4). All who had reported a pregnancy were asked how they felt when it occurred, "very happy", "fairly happy", "rather unhappy", "very unhappy" or "don’t know/can’t remember"), and whether they "were in a regular relationship with the father (or the mother) at that time. Those that were in a relationship were asked how long this had lasted before the pregnancy occurred. Information was also sought on outcome of the pregnancy, and for abortion whether it was because of a fetal abnormality.

To assess the representativeness of the sample in terms of educational attainment, information on highest school qualification of people normally resident in New Zealand at ages 25 and 26 was obtained from the national census in 1996 and compared to that of the participants. This analysis was restricted to pregnancies before the age of 25. Associations were tested by the chi-squared statistic. General estimating equation (GEE) models were used to evaluate simultaneously the association between whether the pregnancy was both unwanted and caused unhappiness. The next most common factor was the use of alcohol. Of the 289 pregnancies experienced by the women, 173 (60%) were reported by them as unwanted (Table 1). Regarding the 225 pregnancies caused by the men, 165 (73%) of the men reported not wanting their partner to get pregnant. By the age of 25, 27% of the women and 24% of the men had experienced or caused, at least one unwanted pregnancy. The proportion of unwanted pregnancies decreased with age. Among women, 85% of pregnancies before age 18 were unwanted, compared to 47% in the age group 23-24. Among men, the respective proportions were 83% and 65%. Pregnancies were much more likely to be wanted if the parents were in an ongoing relationship at the time of conception, and this proportion increased with the length of the relationship.

Of the 173 unwanted pregnancies experienced by the women, for 120 - 69% of the unwanted and 42% of all - pregnancies, the women felt "rather" or "very unhappy" at the time. This was also true for 97 - 59% of the unwanted and 43% of all - the pregnancies caused by the men. Not surprisingly more pregnancies that were wanted resulted in live births, and more of those that were not wanted, in abortion (neither of the two apparently wanted pregnancies that were aborted had an abnormality).

Circumstances of the most undesired pregnancies. Among both women and men the proportions of pregnancies that were most undesired - those that were both unwanted and where the individual reported being unhappy at the time - declined with increasing age and among those in relationships (Table 2). Among women, the second or third pregnancy was less likely to be undesired than the first or only pregnancy.

These three factors were examined simultaneously in a multivariate model (Table 2). Among the women, the shorter the relationship the more likely the pregnancy was to be undesired, and the first pregnancy was less desired than the second. However age was no longer significant when adjustment was made for these factors. Among the men, the length of the relationship, and young age were both independently associated with an undesired pregnancy, but pregnancy number was not important.

Unwanted pregnancies and contraception non-use and contraceptive failure. For women unwanted pregnancies were more likely to be due to contraception not being used than it failing (Table 3) (55% v 40%, p=0.005), with the proportion due to non-use decreasing with increasing age (p=0.07). For the men, the proportions of unwanted pregnancies due to contraceptive non-use and failure were similar. Contraceptive non-use was most common among women and men who were not in an ongoing relationship at the time.

The commonest reason for not using contraception reported by both women and men with unwanted pregnancies was not thinking about it (Table 4). Overall 40% of the women reported this as applying to themselves, just over half (55%) to their partners, 31% to both and 64% to either themselves or their partners. 51% of the men said it applied to them, slightly less (45%) to their partner, 36% to both and 61% to either themselves or their partners.

The next most common factor was the use of alcohol. Of the women 25% said they were “a bit drunk”, slightly fewer (18%) that their partners were, 12% that both were, and in 31% of cases either themselves or their partner was. The men reported alcohol to be a factor for themselves in 20%, for their partners in 12%, for both in 6.6% and for either in 21% of cases. In 11% of unwanted pregnancies where no contraception was used the women reported that their partners did not want to use a condom, and the men mentioned this themselves as a factor in 16% of cases. The
women cited themselves not being able to afford any contraception in 6% of these pregnancies and 3% of men mentioned their partner not being able to afford any. Concerns about side effects of contraception were cited as a reason for non-use by 5% of women and 15% of men. Between 20% and 30% of the men and women said “other factors” than those offered applied to either themselves or their partners at the time. These were not elucidated further.

**Discussion**

Nearly six out of ten of the pregnancies experienced by women before age 25, and nearly three quarters caused by men by this age, were unwanted by them. Although the proportion of unwanted pregnancies decreased with age, there were more in the age group 20-24 years than among teenagers. This is consistent with this age group having the highest rate of abortions.13

While having children is natural, fulfilling and from an ecological perspective necessary, clearly many New Zealanders wish to delay this, which is consistent with the median age of childbearing now being 30.13 To date there has been emphasis on the prevention of teenage pregnancies. This study shows that to reduce the number of unwanted pregnancies, policy in this area must be aimed at a wider age range.

The strengths of this study are that it is based on a relatively large birth cohort with a very high response rate and that information was sought from both men and women. Moreover the use of a computer, with safeguards to protect confidentiality, is likely to have improved disclosure.12 This may also have been helped by the trust in the study built up over many years. Reported attitudes to a pregnancy may have been influenced by how it ended.13 Any such bias should lead to an underestimate of the total number of unwanted pregnancies. Conversely, the proportion of unwanted pregnancies may be a little lower in the whole population, because of a slightly higher level of education and fewer Maori in the cohort than in the population as a whole, and as abortions (used as a surrogate for unwanted pregnancies) are less common outcomes of teenage pregnancies among those of lower socioeconomic status and Maori.14

We asked about pregnancy wantedness and happiness, rather than intendedness or planning. This makes comparisons with earlier studies of unplanned and unintended pregnancies difficult. For instance the 1978 Manawatu Family Growth Study17 reported that only 26% of first pregnancies preceded by contraceptive use were “unplanned”. Although this suggests that unwanted pregnancies have increased substantially since that time – as fewer pregnancies tend to be unwanted than unplanned – the different wording of questions is important. Recent research suggests that the concept of a wanted pregnancy is different from intended or planned, and more salient for women’s choices.16 Similarly, the degree of happiness or unhappiness with a pregnancy may be a better predictor of outcome than intendedness.12 For this reason we combined both unwantedness and unhappiness to determine the most undesired pregnancies. This also overcomes some of the ambiguity of the term “wanted” which could be interpreted as being synonymous with “unplanned”.

The most undesired pregnancies were those in which there was no ongoing relationship with the partner. The length of the relationship was more important than age – especially for women. This suggests that there should be as much policy emphasis on the prevention of pregnancies outside of established relationships, as prevention among teenagers.

To delay pregnancy for a prolonged period among sexually active people – as is necessary with earlier initiation of intercourse and a desire for later birth – requires dedication and commitment to effective contraception.1 In typical use the oral contraceptive pill has been found to have a 6% failure rate (chance of experiencing an accidental pregnancy) among groups of women in their first year of use.18 Although the failure rate is likely to reduce with time, it has been calculated that, even if this drops linearly to zero over ten years, over a quarter of users will experience failure over this period. These non-trivial risks need to be taken more seriously. Even with relatively good contraception,

<table>
<thead>
<tr>
<th>Table 1. Wantedness of pregnancies by age, relationship with partner, happiness at the time, and outcome.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age (yrs)</strong></td>
</tr>
<tr>
<td><strong>Total Wanted</strong></td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>17 or less</td>
</tr>
<tr>
<td>18/19</td>
</tr>
<tr>
<td>20/21/22</td>
</tr>
<tr>
<td>23/24</td>
</tr>
<tr>
<td><strong>Relationship with partner</strong></td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>None/NA</td>
</tr>
<tr>
<td>&lt;6 months</td>
</tr>
<tr>
<td>6-11 months</td>
</tr>
<tr>
<td>1-4</td>
</tr>
<tr>
<td>5 years or more</td>
</tr>
<tr>
<td><strong>Feeling at time</strong></td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Very happy</td>
</tr>
<tr>
<td>Fairly happy</td>
</tr>
<tr>
<td>Rather unhappy</td>
</tr>
<tr>
<td>Very unhappy</td>
</tr>
<tr>
<td>DK/NA*</td>
</tr>
<tr>
<td>Not stated</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Live birth</td>
</tr>
<tr>
<td>Miscarriage/ectopic/stillbirth</td>
</tr>
<tr>
<td>Abortion</td>
</tr>
<tr>
<td>Not stated</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>

*Don’t know or not answered.
Abortions will be required if unwanted births are to be avoided.

Technological developments are making an impact on effective contraception. In the US part of the recent decline of teenage fertility has been attributed to the increased popularity of long-acting methods such as the contraceptive implant and injectable contraception.19 Now there are better tests to exclude pre-existing cervical infection, it has been suggested that there might be more of a place for intrauterine devices,20 although these should be confined to those not at risk of acquiring a sexually transmitted infection.21 Future requirements include oral contraceptive regimes which are more forgiving of missed pills and effective contraceptive sponges.22 Research is opening some opportunities in the field of male systemic methods.23

Non-use of contraception was associated in our study with not thinking about it, alcohol use, the woman thinking she could not get pregnant, and the man not wanting to use a condom. All these issues need to be addressed. The frequency with which alcohol use was cited as a reason for non-use of contraception is a particular concern.

Overall the proportion of women with an unwanted pregnancy who reported not using contraception was similar in our study to the proportion of non-contraceptors among women having abortions nationally in 2000 (51.4%), but higher than in an Auckland study in 1992/3 (38%).24 This may be because our cohort included only pregnancies that occurred up to age 25, as we found the proportion of non-users decreased with age. Moreover, the Auckland study reported only those who had no contraceptive use at all in the month of conception as non-users. Fewer of our participants reported cost to be an issue.

An environment has emerged for men and women in their twenties in New Zealand where most are sexually active but do not want a pregnancy to occur. More attention needs to be paid to the promotion of effective use of contraception. However, much more understanding is called for of the difficulties of avoiding pregnancy even with relatively effective methods. A further approach to the problem of unwanted pregnancies, which should be investigated, is to encourage committed sexual relationships.

Acknowledgements. This study was part of the Dunedin Multidisciplinary Health and Development Study and funded by the Health Research Council of New Zealand. We thank Paula Sowerby and Diane Morrison for monitoring the interviews, and the other staff of the DMHDS who were involved in the collection of the data and other aspects of the study. Helpful comments on an early draft of this paper were received from Dr Marion Poore and Dr Tree Cocks. We particularly thank the sample members and their families for their long-term involvement in the study.

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### Table 2. Independent effects on the odds of undesired pregnancies (that are both unwanted and unhappy) of age, relationship with partner and pregnancy number.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Total % undesired</th>
<th>Odds Ratio Unadj. 95% CI</th>
<th>Odds Ratio Adj.* 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 years or less</td>
<td>105 57.1</td>
<td>2.7 1.6-4.5</td>
<td>1.7 0.95-3.1</td>
</tr>
<tr>
<td>20-25 years</td>
<td>184 32.6</td>
<td>1.0 Ref.</td>
<td>1.0 Ref.</td>
</tr>
</tbody>
</table>

Relationship with partner

| None | 61 65.6 | 7.7 3.7-15.7 | 5.7 2.8-11.9 |
| Less than a year | 86 51.5 | 3.7 1.9-7.3 | 2.7 1.4-5.3 |
| One year or more | 142 23.9 | 1.0 Ref. | 1.0 Ref. |

Pregnancy number

| Only/first | 173 53.2 | 1.0 Ref. | 1.0 Ref. |
| Second | 82 19.5 | 0.19 0.10-0.36 | 0.25 0.12-0.50 |
| Third or greater | 34 35.3 | 0.44 0.19-1.01 | 0.84 0.32-2.2 |

Total | 289 41.5 | | 225 43.1 |

*Don't know or not answered.

---

### Table 3. Contraception non-use or failure as reason for unwanted pregnancies by age and relationship status with partner.

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Total % undesired</th>
<th>Odds Ratio Unadj. 95% CI</th>
<th>Odds Ratio Adj.* 95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 years or less</td>
<td>105 57.1</td>
<td>2.7 1.6-4.5</td>
<td>1.7 0.95-3.1</td>
</tr>
<tr>
<td>20-25 years</td>
<td>184 32.6</td>
<td>1.0 Ref.</td>
<td>1.0 Ref.</td>
</tr>
</tbody>
</table>

Relationship with partner

| None/NA | 61 65.6 | 17 (40.5) | 1.0 1.0 |
| Less than a year | 86 51.5 | 18 (38.3) | 2 (4.3) |
| One year or more | 142 23.9 | 21 (45.7) | 5 (10.9) |

Total | 289 41.5 | | 225 43.1 |

*Adjusted for the other variables in the model.
The occurrence of leg ulcers in Auckland: results of a population-based study

Natalie Walker, HRC Training Fellow; Anthony Rodgers, Co-Director, Clinical Trials Research Unit, University of Auckland; Nicholas Birchall, Consultant Dermatologist, Auckland Dermatology, Auckland; Robyn Norton, Director and Professor of Public Health; Stephen MacMahon, Director and The Medical Foundation Professor of Epidemiology and Cardiovascular Medicine, Institute for International Health, University of Sydney, Australia.

Abstract

Aim. To estimate the cumulative incidence rate and prevalence of leg ulcers in Auckland.

Methods. A cross-sectional study was conducted to identify all individuals who had or developed a leg ulcer in the North Auckland and Central Auckland health districts between 1997 and 1998. Cases were identified through multiple sources, including community-based and hospital-based health professionals and by self-notification. All ulcer types were investigated.

Results. 611 individuals with healed or current leg ulcers were identified during the study period, of whom 426 had current leg ulcers. The annual cumulative incidence rate was 32 per 100 000. The point prevalence of current leg ulcers was 39 per 100 000, with a period prevalence of 79 per 100 000 per year. Men had lower age-adjusted incidence rates than women, but a higher age-adjusted point prevalence of leg ulceration, indicating that ulcers take longer to heal in men. Annual cumulative incidence rates increased steeply with age (<60 years = 4, 60–69 years = 62, 70–79 years = 191, 80+ years = 466 per 100 000 per year), as did point prevalence (<60 years = 5, 60–69 years = 76, 70–79 years = 238, 80+ years = 564 per 100 000).

Conclusions. These data indicate that the risk of developing leg ulcers increases dramatically with age, with individuals aged 60 years and over particularly at risk. Given New Zealand’s rapidly ageing population, the number of older people with leg ulcers each year is expected to double in the next 25 years.

In New Zealand no published data are available on the number of individuals in the community who suffer from leg ulcers. Consequently, the planning and provision of adequate and effective health care management for such people is based on incidence and prevalence data from other countries.² The estimates from these studies, however, are

Table 4. Factors given for non-use of contraception for unwanted pregnancies by sex. (Percentages add to more than 100 as more than one answer could be given).

<table>
<thead>
<tr>
<th>(a) Women</th>
<th>(b) Men</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Related to self</strong></td>
<td><strong>Total (n=96)</strong></td>
</tr>
<tr>
<td>I don’t think about contraception</td>
<td>38</td>
</tr>
<tr>
<td>I was concerned about side effects</td>
<td>5</td>
</tr>
<tr>
<td>I could not afford any</td>
<td>6</td>
</tr>
<tr>
<td>I was a bit drunk</td>
<td>24</td>
</tr>
<tr>
<td>I did not think I could get pregnant</td>
<td>16</td>
</tr>
<tr>
<td>Other factors applied</td>
<td>20</td>
</tr>
<tr>
<td>Don’t know/can’t remember</td>
<td>19</td>
</tr>
</tbody>
</table>

**Related to partner**

<table>
<thead>
<tr>
<th>(a) Women</th>
<th>(b) Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don’t think he thought about it</td>
<td>53</td>
</tr>
<tr>
<td>He did not want me to use contraception</td>
<td>2</td>
</tr>
<tr>
<td>He did not want to use a condom</td>
<td>10</td>
</tr>
<tr>
<td>He was a bit drunk</td>
<td>17</td>
</tr>
<tr>
<td>He thought it was my responsibility</td>
<td>11</td>
</tr>
<tr>
<td>Other factors applied</td>
<td>28</td>
</tr>
<tr>
<td>Don’t know/can’t remember</td>
<td>9</td>
</tr>
</tbody>
</table>

Correspondence. NP Dickson, Department of Preventive and Social Medicine, University of Otago Medical School, PO Box 913, Dunedin. Email: ndickson@gandalf.otago.ac.nz

not the most appropriate to use in a New Zealand setting, given their methodological problems and population differences in sociodemographic and other variables. To address the paucity of New Zealand-specific data, a study was conducted in Auckland to obtain more reliable estimates of the occurrence of leg ulcers in this country.

Methods
The Auckland Leg Ulcer Study involved the identification of all individuals resident in the North Auckland and Central Auckland health districts who had or developed a leg ulcer over a 12-month period (1 November 1997 - 31 October 1998). Cases of all ages were included in the study, regardless of aetiology. A leg ulcer was defined as any break in the skin on the lower leg (below the knee) or on the foot, which had been present for more than six weeks. A healed leg ulcer was considered a wound that had been resurfaced with epithelium and looked pink, dry and smooth. An individual was included in the case, and thus a case was considered to be the person and not the ulcer.

Cases were identified through notifications from health professionals and by self-notification. Health professionals practicing within the study region, who were likely to encounter leg ulcer patients were identified from the 1997 Auckland telephone directory. The health professionals included general practitioners (GPs) and practice nurses, district nurses and nurses from the Auckland ulcer team, rest home and retirement village nurses and supervisors, specialists (including dermatologists, diabetes nurses, vascular surgeons, podiatrists, orthopaedic surgeons), hospital key staff at public and private hospitals (outpatient departments and inpatient wards), key staff at accident and emergency centres, and hyperbaric nursing staff at the Royal New Zealand Navy base. Health professionals who agreed to participate in the study were asked to identify and notify the study centre (via free-post form) of each person who had a current or healed leg ulcer or who developed a leg ulcer during the study period. A self-referral pathway was also established so that cases who did not seek medical care for their ulcers could be recruited. A toll-free telephone number was advertised via monthly newspaper advertisements and poster displays throughout the community and in the offices of non-participating health professionals.

Information collected on each notification form included: the source of ascertainment (health professional or self-notified), date of birth and gender of ulcer patient; whether the case had a current or healed leg ulcer, and if current, the date of onset of the ulcer. No data were collected on ethnicity or ulcer aetiology. All notifications were cross-checked to ensure that individuals who were identified from more than one source were counted only once. Age was considered ‘age at notification’.

Cumulative incidence rates, point prevalence, and period prevalence were calculated using standard techniques.8 The number of new cases that developed during the study period, in addition to data incidence rates were standardised to the 1996 New Zealand population11 using the direct method of standardisation.8,9

70% (426) of cases had a leg ulcer at the time of notification, while 30% reported healed leg ulcers only. Of the 611 cases identified, 606 (99%) provided their date of birth. Age ranged from 18 to 96 years, with an average of 73 years (median = 75 years). More than 75% of cases were aged 67 years and older. Just over 60% (374) of cases were female. The age distribution of cases was negatively skewed for both sexes, with women aged 75 years on average (median = 77 years) compared to 70 years on average for men (median = 73 years) (p < 0.001).

Cumulative incidence rates. Of the 426 cases with current leg ulcers, 385 (90%) provided details about when their ulcer first occurred. 174 (45%) people were identified as having incident leg ulcers. Given a population of 540 435 in the study region,11 the cumulative incidence rate was 32 per 100 000 per year (95% CI = 27 – 37 per 100 000 per year). After adjusting for age, the North Auckland region was found to have a higher cumulative incidence rate of leg ulcers than the Central Auckland region (33 per 100 000 per year North Auckland versus 29 per 100 000 per year Central Auckland, p < 0.001). Age-adjusted data also indicated that women had a much higher cumulative incidence rate of leg ulcers than men (33 per 100 000 per year in women versus 26 per 100 000 per year in men, p < 0.001). Furthermore, cumulative incidence rates were seen to increase markedly with age (Table 1).

Point prevalence. 211 (55%) people with current leg ulcers were identified as prevalent cases, giving a point prevalence of 39 per 100 000 (95% CI = 34 – 44 per 100 000). This estimate was higher in the North Auckland region compared to the Central Auckland region, after adjusting for age (42 per 100 000 North Auckland versus 35 per 100 000 Central Auckland, p = 0.02). Age-adjusted data also indicated that men had a higher point prevalence than women (39 per 100 000 versus 35 per 100 000, p < 0.001). Point prevalence was seen to increase progressively with age for both sexes (Table 1).

Period prevalence. Overall, 426 people with current leg ulcers were identified, giving a one-year period prevalence of 79 per 100 000 (95% CI = 71 – 86 per 100 000 per year). Age-adjusted data showed that North Auckland had a higher period prevalence of leg ulcers than Central Auckland (76 per 100 000 per year North Auckland versus 75 per 100 000 per year Central Auckland, p < 0.001). Period prevalence was also found to increase progressively with age for both men and women (data not presented). Additionally, after adjusting for age, men were found to have a higher period prevalence of current leg ulcers than women (75 per 100 000 per year versus 73 per 100 000 per year, p < 0.001).

Comparison of data with other studies. Four published studies were identified that provided information on the age and gender distribution of leg ulcers in their study population. These studies included the Lothian and Forth Valley Study,16-19 the Perth Study,21-24 the West London Study,25 and the 1988 Skaraborg Study.26-29 The age-standardised prevalence figures obtained in the Auckland

Results
426 health professional practices within the study region were identified from the Auckland telephone directory. The majority of health professionals (93%) agreed to be involved in the study.

Number and source of notifications. 632 notifications were received during the 12-month study period, representing 611 individuals with current or healed leg ulcers. Almost 60% (347) of cases were resident in the Central Auckland region at the time of notification. Two hundred and eighty eight (46%) cases self-notified. District nursing groups identified 212 (34%) cases and general practitioners identified 81 (13%). Less than 6% of notifications were received from each of the other health professional groups involved in the study (restitutions and retirement villages 29, specialists 6, podiatrists 7, private and public hospitals 9). Cases that self-notified were younger, more likely to be male, more likely to have healed ulcers, and to be from the North Auckland region than cases notified by health professionals (data not presented).

Number and source of notifications.
study were on average three times lower than estimates obtained in Sweden, Australia, Scotland, and England, for cases aged 40 years and older, 55 years and older, and for all ages combined (Table 2).

Discussion
This study has shown that in the Central and North Auckland regions less than 0.1% of the population suffer from leg ulcers at any one time. However, the cumulative incidence rates, point prevalence, and period prevalence of leg ulceration were found to increase dramatically with age. While approximately one in every 21,000 people under 60 years of age will have a leg ulcer at any one point in time, the rates increase to approximately one in every 1300 people aged 60 to 69 years, one in every 400 people aged 70 to 79 years, and one in every 200 people aged 80 years and older. Men had lower age-adjusted incidence rates than women, but a higher point prevalence of leg ulceration, indicating that ulcers take longer to heal in men. A geographical difference in the occurrence of leg ulcer cases was also noted. The observed difference in estimates according to gender and study region may be partly explained by different case referral patterns, but may also be real differences due to variations in ulcer management and/or risk factors.

As with most cross-sectional studies of disease frequency, certain biases will have affected the validity of the data. It is possible that we failed to locate some leg ulcer cases due to differential selection of cases and referral bias. While exhaustive efforts were made to identify all cases, some individuals will not have been found, resulting in an under-

Table 2 Comparison of age-standardised point prevalence and period prevalence of leg ulcers from five countries, using the Segi world population as the standard population.

<table>
<thead>
<tr>
<th>Study name and year started</th>
<th>Country of study</th>
<th>Method of case identification</th>
<th>Time period of study</th>
<th>Minimum duration of ulcer</th>
<th>Case definition</th>
<th>Age-standardised data (&gt;=40 years)</th>
<th>Age-standardised data (&gt;=55 years)</th>
<th>Age-standardised data (all ages)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skaraborg Study (1988)</td>
<td>Sweden</td>
<td>HP referral</td>
<td>6 weeks</td>
<td>6 weeks</td>
<td>Yes</td>
<td>575</td>
<td>103</td>
<td>134</td>
</tr>
<tr>
<td>Auckland Study (1997)</td>
<td>New Zealand</td>
<td>HP referral and self referral</td>
<td>12 months</td>
<td>6 weeks</td>
<td>Yes</td>
<td>802</td>
<td>117</td>
<td>20</td>
</tr>
<tr>
<td>Perth Study (1989)</td>
<td>Australia</td>
<td>HP referral and self referral</td>
<td>3 months</td>
<td>4 weeks</td>
<td>Yes</td>
<td>205</td>
<td>70</td>
<td>238</td>
</tr>
<tr>
<td>Auckland Study (1997)</td>
<td>New Zealand</td>
<td>HP referral and self referral</td>
<td>3 months</td>
<td>6 weeks</td>
<td>Yes</td>
<td>191</td>
<td>24</td>
<td>39</td>
</tr>
<tr>
<td>Lorn and Forth Valley Study (1988)</td>
<td>Scotland</td>
<td>HP referral and self referral</td>
<td>3 months</td>
<td>Not stated</td>
<td>Yes</td>
<td>149</td>
<td>168</td>
<td>26</td>
</tr>
<tr>
<td>Auckland Study (1997)</td>
<td>New Zealand</td>
<td>HP referral and self referral</td>
<td>3 months</td>
<td>Not stated</td>
<td>Yes</td>
<td>283</td>
<td>353</td>
<td>61</td>
</tr>
<tr>
<td>West London Study (year not stated)</td>
<td>England</td>
<td>HP referral and self referral</td>
<td>12 months</td>
<td>Not stated</td>
<td>Yes</td>
<td>135</td>
<td>162</td>
<td>26</td>
</tr>
</tbody>
</table>

HP=Health professional. Note: The Auckland study refers to the study described in this paper.

* Based on the population of the North Auckland and Central Auckland health districts (from 1996 census data). Note: Period prevalence data are available on request from the authors.
estimation of disease frequency. Furthermore, some patient groups are more likely to have been notified than other groups. For example, people with significant comorbidity, pain or mobility problems may receive more intensive follow-up and therefore be more likely to be notified. By comparison, the low proportion of notifications received from specialists may be due to the reluctance of this group to refer cases to the study, although it is more likely to be a reflection of the fact that most care is community-based.

Recall bias is also likely to have occurred. Recall of dates in particular, would have resulted in misclassification bias, such that some prevalent cases may have been misclassified as incident cases and vice-versa. Reporting delays would also have led to the misclassification of prevalent and incident cases and healed or current leg ulcer cases. The number of false positive cases was not determined in this study. However, the number was likely to be small given that a false positive rate of only 5% was observed when 241 cases from this study were interviewed for a subsequent case-control study. The presence of recall and misclassification bias will have resulted in either an under- or over-estimation of the observed estimates.

Although trends in the age and gender distribution of leg ulcer cases in the Auckland region were similar to those observed in previous studies, results are not directly comparable due to the wide variability in study methodology and case definitions used. However, the age-standardised prevalence figures obtained in the Auckland study do appear to be lower than estimates obtained in other countries. As well as a true difference in occurrence rates, the observed disparity may be an indication that the Auckland study was less successful at identifying leg ulcer cases than the other studies.

The Auckland study is unique since it provides some of the first detailed cumulative incidence rate data in the world on leg ulcers. Although cumulative incidence rates were published from the Basle study, the Malmo study and the London Study, detailed age- and gender-specific cumulative incidence rate data were not available from these studies. Using data from all three published studies, the unadjusted cumulative incidence rate of leg ulcers for all ages is estimated to be between 0.3 and 3.4 per 1000 per year. The rate obtained in the Auckland study lies at the lower end of this range. As with the prevalence data from this study, it is not known whether this rate is a true reflection of the number of incident cases in Auckland or whether there was significant under-reporting of incident cases in this study.

This study was conducted on an urban population with a very similar age and gender distribution to the overall New Zealand population. It would be reasonable to assume, therefore, that the data obtained are broadly generalisable to the New Zealand population. One can assume that the number of new leg ulcer cases in New Zealand each year will also double in the next 25 years. This finding has important implications for allocation of health care resources for the management of leg ulcers.

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Measuring quality of primary health care is a focus of attention within New Zealand and internationally as health care providers and funders recognise the need for objective measures.1 One method of demonstrating quality is through maintenance of membership of professional colleges and participating in continuing medical education or ‘maintenance of professional standards’ (MOPS) programmes. Quality may also be measured at a practice level. Tools have been proposed for this purpose by colleges of general practice in New Zealand, Australia and UK, and by other organisations eg, Australian Community Health Accreditation and Standards Programme (CHASP) and Health Plan Employer and Data Set (HEDIS) from the USA National Committee on Quality Assurance.2

There is increasing emphasis on delivering and purchasing primary care at a population level.1 The measurement of outcomes, for example mortality and morbidity rates, remains the gold standard for measuring population health. However, crude rates are insensitive measures of the quality of health care since they may take a long time to reflect changes in quality of care and are heavily confounded by environmental determinants. Process measures can provide more timely indicators of quality and reduce confounding effects of environmental variables on assessments of the quality of care.3 This paper proposes a set of process measures for quality of primary care that may be easily calculated from data collected by computerised queries of practice databases.

Methods
The RNZCGP Research Unit was commissioned by FirstHealth, to develop a set of quality of care indicators for the FirstHealth network of general practices. We reviewed recent publications and reports from New Zealand, Australia and the UK.3,10,11 We constructed a list of all proposed indicators but restricted this list to indicators that were (a) evidence-based, (b) population-focused and (c) could be easily measured using computerised queries of practice databases or other electronic data sources. To examine the feasibility of this approach in practice we attempted to calculate the indicators using data from seventeen fully computerised general practices in the FirstHealth network.

Results
The indicators developed fell into natural groups: smoking cessation, preventive health activities, prescribing quality, chronic disease management and data quality. Table 1 gives the complete set of indicators and shows whether an indicator could be calculated, whether a modified structured query language (SQL) query could enable the indicator to be calculated from collected data, or whether a new data element would be needed.

### Table 1. Indicator summary.

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Now</th>
<th>New SQL</th>
<th>New data</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of asthmatic patients with action plans.</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with eye check in last 2 years</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with diabetes with HbA1c below 7%</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with elevated BP (≥160/90)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with heart failure and ACE inhibitor</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with elevated BP (≥160/90)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with cardiovascular risk assessed</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with microalbuminuria on ACE inhibitor</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with creatinine &gt; 0.150 on metformin or glibenclamide</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with microalbuminuria on ACE inhibitor</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with elevated BP (≥160/90)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>% with elevated BP (≥160/90)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
</tbody>
</table>

'Select' = could be calculated from currently collected data. 'New SQL' = requires access to patient level data, 'New data' = requires recording of new data element in patient notes (or sophisticated/time consuming searching of written notes or letters).

Smoking cessation. Smoking cessation was placed in its own category because smoking is the single most important modifiable risk factor for mortality and morbidity in the population. Provision of simple advice10 and/or the provision of nicotine replacement therapy are effective in promoting smoking cessation.12 Two indicators were proposed – percentage of patients who are smokers and percentage of smokers who have been offered advice on stopping smoking. We restricted the denominator to patients over sixteen years and assumed that if smoking status was not recorded, the patient was a smoker. This will
substantially overestimate the number of smokers initially, but will provide a strong incentive to enter complete data. The second indicator requires collecting a new data item: whether advice has been offered on smoking cessation. This may require that software vendors modify their software to support the delivery and recording of smoking cessation advice. A mechanism similar to cervical smear recalls would need to operate, which reminded GPs to offer cessation advice at regular intervals, and recorded that it was offered.

**Preventive health activities.** Five indicators were proposed - percentage of eligible women who have had a smear in the last 3 years, percentage of eligible women who have had a mammogram in last 24 years, percentage of children whose immunisations were completed at two years, percentage of people aged 66 and older who have had received influenza vaccination in the previous year, and the percentage of people over 35 who have had their blood pressure recorded in the last five years.

The first three indicators are uncontroversial, being included in many proposed quality indicator sets. The fourth, (influenza vaccination) has been shown to reduce morbidity and mortality in the elderly. We chose the cut off age of 66 years to allow eligible persons a year to get immunised and to allow the examination of immunisation data from the previous year.

The fifth indicator in this set, recording BP, was included because of the strong evidence linking antihypertensive treatment to improved outcomes. It would be desirable to document actual levels of blood pressure, as it is this which correlates with improved outcomes (for BP < 160/90); this indicator is included in a later component.

**Prescribing quality indicators.** Considerable attention has been directed in the UK to developing prescribing quality indicators. The collection of complete data in the prescribing analyses and cost (PACT) system has made this a useful source of data on prescribing quality and prescribing cost-effectiveness. After considering the various proposed indicators we proposed two sets of indicators, depending on how tightly each was bound to disease coding.

**Set 1 - derived from raw data from Health Benefits Limited (HBL).** These indicators can be calculated from claims data directly from HBL. They all rely upon complete data collection and for some indicators this is not guaranteed if the maximum allowable patient prescription charge exceeds the cost of the pharmaceutical. There is a move to require complete data collection from pharmacies, and at that time indicators dependent on the costs of these cheaper pharmaceuticals will become more reliable.

Until that time community service card (CSC), general medical services (GMS) category and high user health card (HUHC) adjustments can be made to control for differences in the eligibility of patient populations to subsidies, for example calculating ratios by adjusting prescribing rates for CSC holding rates. A much better alternative would be to calculate rates and ratios using data directly extracted from the patient record. This will be possible when all (or nearly all) prescribing is computerised.

The only complicating variable then becomes differential prescription pick-up rates. However, it is reasonable to argue that, for the purposes of prescribing indicators of quality, it is the act of prescribing that is relevant, not obtaining the prescription.

We suggest the following indicators:

(a) Ratio indicators

- bronchodilators to inhaled steroids
- penicillins to cephalosporins
- trimethoprim to cotrimoxazole

(b) Rate indicators

- Rate of hypnosedative and anxiolytic prescribing per patient.

Studies on some of these ratios have been published and are available on the BMJ’s web page (www.bmj.com/cgi/content/full/313/7069/1371/DC1). We chose indicators based on the patterns of prescribing in New Zealand. The distribution of ratios is presented in Figure 1 to show how these might be reported. We recast the calculation of ratios so that 0% is a good score. This avoids division by zero problems in calculating ratios. Ratios reflect total prescription numbers, that is number of prescriptions dispensed by a pharmacist, not the volume of drug dispensed (number of prescribing units). The percentage values reported have been scaled by dividing each value by the average value for each indicator. Thus a score of 1 on the x-axis for each indicator represents the average rate of the indicator.

![Figure 1. Summary of ratio prescribing indicators. The X-axis is a ratio constructed as described in the text. A score of zero is high quality practice. Scores are scaled so that 1 corresponds to the mean ratio of drug group volumes for each category.](image)

The rate measure in this set, the number of prescriptions for anxiolytics and hypnosedatives dispensed per registered patient should be calculated with age-standardisation as the different age structures of practice populations can have an important effect on prescribing rates. This is less important for ratio measures, which reflect prescribing choices in a specific clinical situation. It must be stressed that these ratios and rates are arbitrary, not absolute values.

**Set 2 - requiring cross referencing to disease coding.** These indicators are tightly bound to disease prevalence within the registered population. They can be calculated by comparing aggregate statistics from the practice and HBL databases in the first instance, but could also be calculated from practice databases if prescribing were computerised and accessible in a SQL query.

- warfarin in non-valvular atrial fibrillation
- ACE inhibitors in heart failure
- statins in secondary prevention of ischaemic heart disease
- aspirin for cerebral vascular events prophylaxis

In calculating these indicators for the supplied datasets, ie using aggregate rates instead of examining individual patients records, we were seriously constrained by the accuracy of disease coding. If prescribing were linked with individual patient data the effect of non-recording on the...
usefulness of these indicators would be lessened, as a ‘zero’ score, would indicate that a recommended intervention had not occurred. The calculation of these indicators requires a SQL query to access patient level regular medication and diagnosis tables.

**Chronic disease management indicators.** These indicators measure the quality of care being received by patients with chronic illnesses. The previous section on prescribing quality indicators includes a number of indicators that relate to management of chronic illnesses. The items in this group relate to additional, validated interventions that have been proven to improve outcomes. Most of them would require the collection of new data from clinical records and/or linking prescribing and laboratory data to individual patients. Whenever possible these indicators are based on guidelines, published or in preparation.

**Asthma.**
- % of asthmatic patients with action plans. This indicator requires the collection of a new piece of data – whether an asthmatic patient has an action plan or not. This would have to be entered as a new data item by the doctor, rather than merely writing a new SQL query.

**Diabetes.**
- % HbA1c recorded in last six months
- % of diabetics with HbA1c below 7%
- % with eye check in last two years
- % with feet sensation checked in last year
- % albumin/creatinine ratio (ACR) in last year
- % pats with creatinine > 0.150 on metformin or glibenclamide
- % pats with microalbuminuria not on ACE inhibitor

We were able to calculate the percentage of diabetics with HbA1c recorded in the last six months from existing data, however the other six items in the quality of care set could not be calculated due to lack of data. A comprehensive review and review of diabetes by GPs has been shown to be as good if not better than hospital clinics.21 Hence, the case for collecting these data is strong given the high prevalence (and incidence) of diabetes, and the high morbidity and mortality associated with poor diabetes management. Some of these indicators would require access to actual values of lab tests (HbA1c, creatinine, and ACR determinations). All these data are elements of a proposed national diabetes minimum dataset.26,27

**Hypertension.**
- % with elevated BP (>160/90). The screening for elevated BP is already in the dataset (% adults over 35 with BP recorded in last five years). This indicator requires the actual recorded BP, which is not presently available. Its interpretation is complicated by such factors as transient elevation, however anything more complicated than merely accessing the latest BP would be a very difficult informatics task.

**Cardiovascular risk assessment.**
- % with cardiovascular risk assessed. The National Heart Foundation guidelines for management of mildly elevated hypertension and hypercholesterolaemia are based on the concept of absolute risk. Access to subsidised medicines can also depend upon a patient being in a high risk group. Primary prevention of cardiovascular disease may be achieved by prescribing statins to high risk groups.28 Accordingly, we propose including the assessment of absolute risk of a cardiovascular event as a quality of care indicator. This would require the entering, or calculating, of a new piece of data by the doctor.

**Data quality indicators.** This indicator is included on the premise that high quality data are necessary for high quality general practice. We developed a set of data quality indicators in previous work, using prescribing and laboratory data to estimate disease prevalence rates.29 We suggest that the data quality indicator (% threshold crossed from a set of indicators) be included as a marker for high quality of care. The threshold values are of necessity arbitrary, and could change as requirements on data collection become more stringent.

**Discussion**
Some of the above proposed indicators are arbitrary and based on perceptions of good practice.30 Furthermore, they have a narrow focus and careful interpretation of the findings is required.1 Despite their limitations,1,16 these indicators serve as a starting point to encourage health professionals to collect measurable data on those aspects of professional performance over which they have substantial control and for interventions that can improve health outcomes.37 However, there is no ‘correct’ set. As new interventions and research data become available more meaningful indicators will be developed. The proposed indicators are suggested as a compromise between validity and feasibility, with ease of collection being the pre-eminent criterion. Analysis of individual case notes could more accurately assess quality of care for specific patients, but such an exercise would be labour intensive and cost prohibitive. More sophisticated information technology may permit this type of approach to be utilised in future.

The assessment of quality of care at the population level is becoming an important component of health care purchasing strategies in a capitation funding environment. It is imperative that quality indicators are trialed in practice to ensure they are appropriate and acceptable to both health care providers and funders.8,30 Studies have shown that such a task is feasible.9,30 In these days of evidence-based medicine, quality indicators have the potential not only to improve the quality of patient care but also have an impact on the population's health.

**Acknowledgements.** We are grateful for assistance with data collection and preparation to Karen Keberle, Clinical Informatics Analyst, First Health, Jane Millington, Manager, Quality and Performance, First Health, Sara Williams, Senior Business Analyst, First Health.

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Transbronchial intrapleural intubation with a feeding tube under unusual circumstances

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Some complications from malpositioning of nasogastric feeding tubes are well-known. We report an unusual case of transbronchial intrapleural perforation by a feeding tube in the presence of a cuffed tracheostomy. With the low reliability of current tests for determining the correct positioning of a nasogastric tube, a chest radiograph should be routinely performed after every insertion.

Case Report

A 74-year-old woman with a recent stroke and a tracheostomy required a feeding tube for enteral nutrition. She had a Glasgow Coma score of 10 and a poor swallow reflex. The enteral feeding tube (Entriflex® 8FR, Sherwood Medical, USA) insertion was achieved with very little resistance. The position was checked by the injection of 10 mL of air, and a bubbling sound was heard over the epigastrium. Furthermore, "gastric fluid" was easily aspirated. Apart from a gradual reduction in oxygen saturation from 97% to 94% while awaiting a chest radiograph, all vital signs were stable. The chest radiograph showed the feeding tube to be lying next to the tracheostomy, and descending down to near the carina though not apparently entering the right bronchus. There was a right 60% pneumothorax with a large portion of the distal end of the tube situated in the right pleural space (Figure 1). There was no cervical crepitus, neck emphysema or mediastinal air suggesting oesophageal perforation on the radiograph. The tube was removed without difficulty, and she made a full recovery from the pneumothorax after insertion of a chest drain.

Discussion

Problems associated with malplacement of feeding tubes have been widely reported and include tracheobronchial intubation, transbronchial intubation of the pleural space, oesophageal perforation, oesophagogastric tract formation without free perforation, gastric perforation and even oesophageal perforation with duodenal re-entry. The presence of a cuffed endotracheal or tracheostomy tube may not prevent and appears to afford little protection against feeding tube tracheobronchial intubation. In fact, there are suggestions that the inflated cuff can distort the local oesophageal-tracheal anatomy thereby increasing the risk of malpositioning and perforation. Our report seems to support this since no force was required for transpulmonary intubation of the pleural space.

Figure 1. Transpulmonary intubation in the presence of a cuffed tracheostomy associated with right pneumothorax. Distal tip of the feeding tube is situated in the pleural space.

Despite positive air injection and ‘gastric fluid’ aspiration in our patient, the feeding tube was still found to be in the wrong position. With regards to the air injection test, small-bore tubes do not always allow sufficient passage of air, peristalsis may be mistaken for insufflated air and the sound of insufflation can be falsely transmitted below the diaphragm to the epigastric region. Aspirated ‘gastric fluid’ may in fact be pulmonary secretions or pleural fluid as in our case. Bedside chest radiography is often accepted as the gold-standard for confirming correct positioning of a nasogastric feeding tube. The most important complication to exclude is oesophageal perforation, the prognosis of which depends enormously on rapid management. Cervical crepitus is not a reliable clinical sign, being detected in only 60% of perforations of the oesophageal space. It is uncommon in distal oesophageal perforations. Subcutaneous emphysema in the neck may be noted radiographically in 50% of patients with oesophageal perforation resulting from various causes.

In summary, tracheobronchial intubation of the pleural space is possible with a small bore feeding tube in the presence of a cuffed tracheostomy. Positive air injection and aspiration tests are not reliable indicators of correct positioning. The poor condition of our patient and reduced sensorium presumably increased the risk of malpositioning. The case is a reminder that clinicians should have a high index of suspicion and request a chest radiograph at the earliest opportunity for all patients after insertion of a feeding tube prior to enteral feeding.

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BRIEF REPORT

Reporting comparisons between Maori and non-Maori populations

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In a recent issue of the Journal, Thomas' highlighted the bias that can arise in comparisons of health in Maori and non-Maori populations. In a methodological study (unpublished), we used age standardised mortality rates (ASMR) and age standardised years of life lost per person (YLLp), as defined in the Global Burden of Disease and Injury Project (GBD), to examine mortality differences between New Zealand Maori and Europeans. Here we report the results of part of this study in which ASMR and YLLp are compared for Maori defined as “Maori sole ethnic group” and “Maori total ethnic group” and the European population in New Zealand between 1986-1994. The purpose of this paper is to illustrate and reinforce the points made by Thomas and others relating to the reporting of comparisons between Maori and other ethnic groups. It presents a comparison of trends in ASMR and YLLp for European, sole Maori and total Maori ethnic groups in New Zealand.

Methods

We used counts for Maori and Europeans for the census years 1986 and 1991 (interpolated between census years and extrapolated to 1990) as the rate denominator and the number of deaths in each calendar year as the numerator. Two census classifications of Maori were used during the period, ‘Maori sole ethnic group’ ie, all people self-identifying only with Maori in the census, and ‘Maori total ethnic group’ ie, sole Maori plus Maori also identifying with other ethnic groups (mixed Maori). These classifications resulted in two separate counts of the Maori population. The comparison group comprised the ‘Total European’ populations identified by the 1986 and 1991 censuses. Throughout the period 50% or more Maori ancestry was used to identify a decedent as ‘Maori’ in the death registration as assessed primarily by funeral directors. European decedents were identified using the Statistics New Zealand ethnic group codes ‘Other’, ie, non-Maori and non-Pacific Islander, for 1986-1987 and ‘New Zealand European/פקאה’ and ‘Other European’ for 1988-1994. The YLLs were calculated using the methods of the GBD but without age weighting or discounting. Age-standardised mortality rates (ASMR) were calculated with the Segi population used as the standard. We have used single years as the base age-unit. All calculations were carried out using an SAS macro written by one of us (RM).

Results

The number of people in the censuses identifying with New Zealand Maori, either alone or in combination with other ethnic groups, is shown in Table 1. The majority of people (73-74%) who considered themselves to be New Zealand Maori identified only with this group. In the 1991 census the number of people identifying themselves as mixed New Zealand Maori (Maori and other ethnic groups) was similar to the number of New Zealand non-Maori ethnic groups reporting some Maori ancestry (111 357 vs 116 907). The proportion of the New Zealand population classified as sole Maori, mixed Maori and total Maori changed little between the 1986 and 1991 censuses. The age distribution, in one-year age increments, for these groups in the 1991 census is shown in Figure 1.

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population between the ages of 0-20 years but 86% between the ages of 60-80 years. The effect of using different Maori populations in the calculation of ASMR and YLLp is shown in Figure 2 for Maori males; the trends are similar in Maori females. Both ASMR and YLLp show the same patterns over the period. It is clear that, when the sole Maori ethnic group population is used, Maori mortality is much worse than European. However, when the total Maori ethnic group population is used Maori and European mortality rates appear much closer. As the ethnic classification at death is the same for both total and sole Maori the difference arises quite simply because the denominators are different. It is also worth noting that ASMR and YLLp for sole Maori are relatively stable over the time period whereas ASMR and YLLp for Maori ethnic group and Europeans declined by over 20% between 1986 and 1994.

Discussion

The sole Maori population is commonly used in the reporting of Maori mortality rates to minimise numerator-denominator inconsistencies while the total Maori population is mostly used to report changes in the Maori population. For the 1986 and 1991 census years these two populations are quite different in size and age distribution (Table 1, Figure 1). Moreover, using the sole Maori or total Maori population as the denominator in the calculation of mortality rates and mortality burden (YLLp) substantially alters the relationship between Maori and European mortality gradients (Figure 2).

![Figure 1. Self reported Maori population as recorded in the 1991 NZ Census.](image)

There are potentially three numerator and denominator estimates for Maori; total Maori, sole Maori and mixed Maori. We have shown that the two latter groups have different age structures. The similarity between total Maori and Europeans mortality suggests that there may also be significant health differences between sole Maori and mixed Maori; it may be worthwhile for researchers to compare mortality rates or other health indicators for sole and mixed Maori groups in addition to (or instead of) total Maori.

![Figure 2. Mortality for New Zealand Males a) age standardised mortality (ASMR) and b) age standardised years of life lost per person (YLLp).](image)

Sole Maori is the preferred denominator for the reporting of rates for this period because it's definition more closely matches the definition of the numerator data. It has, however, been shown to be a conservative estimate of the 50% or more Maori ancestry population. The extent to which the known under-reporting of Maori deaths offsets the conservative population measure is difficult to establish. Changes to the New Zealand death registration procedure and the census since 1995 that

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**Table 1. New Zealand Maori ethnic group and New Zealand Maori ancestry populations enumerated from the 1986 and 1991 censuses.**

<table>
<thead>
<tr>
<th>Maori Population</th>
<th>1986 Census†</th>
<th>% of Maori Pop‡</th>
<th>% of NZ Pop§</th>
<th>1991 Census†</th>
<th>% of Maori Pop‡</th>
<th>% of NZ Pop§</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Self Reported Ethnic Group</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NZ Maori (sole ethnic group)*</td>
<td>295 514</td>
<td>72.96</td>
<td>9.05</td>
<td>323 493</td>
<td>74.39</td>
<td>9.58</td>
</tr>
<tr>
<td>NZ Maori (combined with other ethnic groups)</td>
<td>109 461</td>
<td>27.04</td>
<td>3.35</td>
<td>111 337</td>
<td>25.61</td>
<td>3.30</td>
</tr>
<tr>
<td>NZ Maori Ethnic Group*</td>
<td>404 775</td>
<td>100.00</td>
<td>12.40</td>
<td>434 850</td>
<td>100.00</td>
<td>12.89</td>
</tr>
<tr>
<td><strong>NZ Maori Ancestry</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NZ Maori Ancestry (&quot;any degree of Maori blood&quot;)</td>
<td>No Maori descent question in 1986</td>
<td>511 278</td>
<td>–</td>
<td>15.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NZ non-Maori Ethnic groups reporting some Maori ancestry</td>
<td>No Maori descent question in 1986</td>
<td>116 907</td>
<td>–</td>
<td>3.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


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were designed to minimise numerator-denominator discrepancies, suggest that Maori mortality rates in the period 1986-1994 were underestimated.11 It is possible that inconsistencies in the reporting of Maori deaths occurred during the period. A study of ethnicity recording on death registration forms by funeral directors in the Wellington area (Bashford A et al, unpublished) suggested that the lack of accuracy was a continuing problem during the period.

Major decisions about policies and practices are made on the basis of ethnic differences in health status yet many comparative studies have severe methodological shortcomings or fail to indicate exactly which Maori population is being used.1,12 Our mortality analysis, and a similar analysis of psychiatric hospital admissions3 show how sensitive mortality and morbidity rates are to definitions of population. Ethnicity is increasingly a sensitive policy issue in New Zealand and we agree that a code of effective practice, such as that suggested by Thomas,1 is urgently required. There is also a need to recognize that this issue will become more important for Pakeha/European and other ethnic groups in the future as ethnicity is increasingly being recognised as a determinant of health status in New Zealand.

The important point is that researchers and health research reporters should be explicit about the populations used.

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MOLECULE TO MALADY

A new receptor to turn on bone growth

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Several years ago, an eleven year old child was referred to the Bone Clinic at Auckland Hospital with a history of multiple vertebral fractures occurring after minimal trauma. She also had severe visual impairment. Her care was taken over by Dr Tim Cundy who specialises in paediatric bone disease. He recognised her as fitting the diagnostic criteria for osteoporosis pseudoglioma syndrome, a congenital condition of unknown cause and with no known treatment – a depressingly common combination of circumstances in the field of paediatric bone disease. Tim established contact with a group at Case Western Reserve University in Cleveland led by Dr Matt Warman, who were attempting to identify the genetic lesion responsible for this autosomal recessive condition. Accordingly, clinical data and DNA were contributed from the Auckland patient and her family. Another New Zealand patient and his family also took part, and two families from Australia were recruited to the international group, which included collaborators from fifteen countries.

This major international collaboration has now borne substantial fruit. In a paper recently published in Cell,1 they reported that the gene causing osteoporosis pseudoglioma syndrome is that for the LRP5 receptor, a member of the low density lipoprotein receptor family. These receptors do not seem to be involved in lipid metabolism, and they have never previously been known to have any involvement in bone development. However, they are expressed in osteoblasts and appear to regulate osteoblast proliferation and/or differentiation. Interestingly, individuals who are heterozygous for the abnormal gene (such as the parents) do have a substantially reduced bone density, though they do not have the major problem with fracturing which the homozygotes have. This implies that even a single copy of the abnormal gene has a significant impact on normal osteoblast function.

While this programme was proceeding in a number of centres around the world, a similar clinical genetic study was being carried out completely independently in Omaha, Nebraska. Dr Robert Recker and coworkers had identified a large family with very high bone density and had set about identifying the genetic variant that accounted for this phenomenon. At almost the same time as the data from the osteoporosis pseudoglioma group was presented, Recker's group reported that the family they were studying had an activating mutation of the gene for the LRP5 receptor, providing confirmation of the pivotal role that this receptor plays in osteoblast biology. Again, this group's work demonstrates the enormous synergies that result from astute clinicians working hand in hand with molecular biologists.

The product of these collaborations provides many questions for bone biologists to address. What are the endogenous ligands for the LRP5 receptor, which aspects of osteoblast function are regulated by it, and how does it interact with the other well recognised osteoblast regulators such as parathyroid hormone and calcitriol? This work will also open up enormous new horizons to pharmacologists who now have a novel receptor target at which they can aim new therapeutic agents for the management of osteoporosis. This is especially welcome at a time when almost all available pharmacological agents for managing this burgeoning clinical condition act by inhibiting the activity of the bone resorbing cells, the osteoclasts. To have discovered a switch which will turn on bone formation represents an enormous leap forward in the quest for a pharmaceutical which is truly a bone “anabolic”.

So does this sophisticated research have any relevance to the average practising clinician? I would suggest that it does in at least two quite different ways. The major discoveries made by the two groups outlined above, were entirely dependent on observations made by practising clinicians, some in small centres, who had the enterprise and initiative to form collaborations so that the DNA on which both these discoveries depended, could be collected. We should be mindful of this in
all our clinical work, particularly when dealing with patients with conditions of unknown aetiology. The current state of investigations into the genetic aetiology of such conditions can be accessed using the Online Mendelian Inheritance in Man website (access by searching OMIM). The second point of impact of this work on clinical practice will arise from the major novel insights into osteoblast biology which will result from this work. These may result in novel diagnostic tests or they may result in new pharmaceuticals, as discussed above. Either development has the potential to substantially affect the lives of osteoporosis sufferers and to impact on the epidemiology and economics of this major public health problem.

While these developments are novel and exciting in 2002, in 5-10 years’ time they will be being taught to medical students and have the same status as the currently established elements of bone biology. The exciting fact of practising medicine in an era of such investigative sophistication is that we are constantly confronted by new discoveries, carrying with them the possibility of novel therapeutic interventions. This increases the challenge involved in the practice of medicine but it also greatly increases the fulfilment of our professional lives since we see long-standing puzzles being solved, and enjoy the satisfaction of being able to offer our patients new treatments for previously intractable conditions.

**Acknowledgement.** I am grateful to Assoc Prof Tim Cundy for help in preparing this article.

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**MEDICOLEGAL DIARY**

**The supervision of junior doctors**

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The modern hospital environment requires consultants to delegate tasks to, and supervise, the junior doctors who are members of their clinical team. This column considers the extent of the consultant’s responsibility for the actions of junior doctors under their supervision.

The legal obligations on consultants to adequately supervise juniors are poorly defined. There is no legislation that sets out consultants’ responsibilities. However, the common law and Medical Council guidelines assist in predicting the scope of the consultant’s duty.

Under the common law, a patient who is admitted to a hospital under the care of a particular consultant will be owed a duty of care by that consultant. Likewise, junior doctors involved in treating the patient will also owe the patient a duty of care. However, the consultant will remain legally responsible for the patient’s care at all times whilst the patient is under that consultant’s care. This does not necessarily mean that consultants will be responsible for any negligence of junior doctors under their supervision. It will of course often be necessary for consultants to delegate tasks to others. However, a consultant is likely to be in breach of his duty to the patient if he has failed to provide adequate instructions or supervision. Where the junior doctor’s negligence harms the patient, the question asked of the consultant is likely to be whether the task was appropriately delegated, both in terms of the suitability of the junior to undertake the task, and the instructions and supervision provided.

Whether a consultant has appropriately delegated and supervised a task will largely be a matter of what the medical profession considers is acceptable. Right 4(2) of the Code of Health and Disability Services Consumers’ Rights provides that consumers have the right to services that comply with legal, professional, ethical and other relevant standards. The best evidence of current standards will come from the consultant’s peers’ analysis of what is acceptable. To this extent, acceptable legal standards will usually reflect acceptable clinical practice.

Another source of evidence as to acceptable practice is the Medical Council’s Guidelines for Consultants Supervising Resident Medical Officers. These guidelines state that a consultant should be “an empathetic, personal and professional mentor giving feedback on performance, acting as a role model for registrars, RMOs and students”. The guidelines address matters such as reporting and feedback, time commitments to supervision, and general attributes expected of consultants.

Many DHBs will have internal policies on supervision. Consultants wanting to clarify their supervisory obligations should also refer to their internal policy manuals.

The consultant’s obligations will extend to ensuring that junior doctors have taken an adequate patient history. In one case considered by the Health and Disability Commissioner, an admitting house surgeon’s examination of a patient’s nervous system was inadequate, with the house surgeon failing to note whether the patient was oriented. The Commissioner found that the consultant’s failure to ensure that the patient’s records were comprehensive amounted to a breach of acceptable standards by the consultant.

Consultants who are supervising junior doctors should also be aware that this is likely to mean that they will be considered to be acting in a managerial role. The Medical Council’s Guidelines on Responsibilities of Doctors in Management and Governance places managerial obligations on doctors who have responsibilities for managing colleagues. The responsibilities include taking action against colleagues where action is necessary to protect patients. Therefore if a consultant is aware that a junior doctor’s inexperience or standards of practice are jeopardising patient safety, he will have a duty to take action.

Consultants will always need to delegate tasks. Consultants will need to rely on junior doctors to undertake these tasks to an acceptable standard. The difficulty for consultants is in ensuring that a balance is maintained between ensuring that patients receive a reasonable standard of care, whilst giving junior doctors room to make decisions and gain the experience necessary for independent practice.

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