THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

CONTENTS

This Issue in the Journal

Editorial

Original Articles

Viewpoint

Clinical Correspondence

Letters

100 Years Ago in the NZMJ

Proceedings

Methuselah

Obituary

Book Review

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

This Issue in the Journal

Health effects of cochlear implants
Kayla Guitar, Ellen Giles, Bill Raymond, David Welch

Cochlear implants have the capacity to improve the lives of adults who acquire hearing losses, but the health system limits funding for them. People with high need may be required to wait for years, during which time they are forced to live with severe to profound hearing loss. Living with difficulties communicating and poor environmental awareness while knowing that there is an effective treatment might be expected to lead to stress. We asked people on the waiting list for cochlear implants and people who already have cochlear implants about their health in terms of potentially stress-mediated conditions. Those on the waiting list had more types of illness, stayed ill for longer when they got sick, required more use of prescription medication, and had poorer mental health than those with implants. This suggests that reducing the waiting for implantation may reduce stress and improve health in people who have lost their hearing

Barriers to the safe transport of children to and from hospital
Maria KR Wilson, Julie Chambers, James KM Hamill

The purpose of this study is to determine how children are transported to and from hospital, and to understand caregivers' car restraint knowledge base. Parents or caregivers of 200 patients at Starship Children's Hospital in Auckland underwent a short interview, asking: the usual restraint used by their child; how the child was transported to hospital; their plans for transporting the child home; their knowledge of current New Zealand legislation and best practice recommendations regarding child car restraints. In their normal car travel, 95% children younger than 5 years were reported to be using a car seat all the time, versus 34% children aged 5 to 9 years. In their journey to hospital, 8% (7/91) of children younger than 5 years were not in a child car seat; 27% (3/11) of children younger than 5 years transported to hospital in a taxi, were not in car seats (one was held in the parent's lap). Responses about the planned trip home showed nine children (7%) were at immediate risk of being transported in an unsafe way, without a child restraint. There is an opportunity for child health professionals to provide support to families with children in hospital by working with established child restraint rental agencies and making best practice child restraint advice and products more readily available. Furthermore, New Zealand law should be updated to require the use of child car restraints beyond a child's fifth birthday.

Parent versus child reporting of tobacco smoke exposure at home and in the car
Marewa Glover, Georgy Hadwen, Carol Chelimo, Robert Scragg, Chris Bullen, Dudley Gentles, Vili Nosa, Judith McCool

Who should we believe? Parents or their children when it comes to reporting about exposure to tobacco smoke whether at home or in a car? Our study shows that children's reporting is consistent with biochemical testing for second hand smoke. On the other hand, parents tend to markedly underestimate it. We recommend that children's reports be preferred to their parents when it comes to reporting smoking exposure in the home or car.

The use and acceptability of electronic cigarettes among New Zealand smokers
Judy Li, Chris Bullen, Rhiannon Newcombe, Natalie Walker, Darren Walton

This study of smokers and ex-smokers who have quit smoking recently showed that only 7% have ever purchased an e-cigarette. However, respondents in general viewed e-cigarettes positively in terms of their safety and effectiveness in helping smokers to quit. There is also high acceptability of using e-cigarettes as a replacement product or a quit smoking aid.

Pacific secondary school students' access to primary health care in New Zealand
Tasileta Teevale, Simon Denny, Teuila Percival, Theresa Fleming

This study looked at primary health and dental care experiences of Pacific youth ages 13-17 years. Data were collected as part of Youth'07, a nationally representative survey of the health and well-being of New Zealand adolescents. 1,178 Pacific youth (Samoan, Cook Islands, Tongan, Niue, Tokelauan, Fijian, or Other Pacific Peoples) and 4797 NZ European young people were included. Compared to their NZ European peers, Pacific youth accessed primary health care services, including dental care less often in the previous year; Pacific youth were twice more likely to forego accessing health care and dental care when needed; were more likely to find it difficult to get healthcare for specific health issues like injuries/accident; to stop smoking, alcohol/drugs use and for chronic conditions. Not knowing how to access healthcare and rating unfair treatment by health professionals due to their ethnicity were significant factors impacting access. This study finds that Pacific youth are an underserved group experiencing inequitable access within the current New Zealand primary healthcare sector. Innovative approaches to specialist youth-oriented healthcare services, professional training and increasing the Pacific health workforce are recommended interventions.

Canterbury Health, Ageing and Life Course (CHALICE) study: rationale, design and methodology

PJ Schluter, JK Spittlehouse, VA Cameron, S Chambers, R Gearry, HA Jamieson, M Kennedy, CJ Lacey, DR Murdoch, J Pearson, R Porter, M Richards, PML Skidmore, R Troughton, E Vierck, PR Joyce

New Zealand's ageing population threatens the financial sustainability of our current health service delivery model. The Canterbury Health, Ageing and Life Course (CHALICE) study aims to develop a comprehensive and flexible database of important determinants of health to inform new models of ageing. CHALICE is a multidisciplinary prospective random cohort study beginning with 1,000 Māori and non-Māori Canterbury adults aged 50 years living within the community. It aims to follow these adults throughout the rest of their lives, with a comprehensive assessment done every 5 years and a short questionnaire completed annually. In addition to advancing scientific knowledge, CHALICE is designed to provide quality data that will inform policy development and programme implementation across a broad spectrum of health indicators. This paper describes the design of the CHALICE study and the first 300 participants who have completed the first assessment.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Cochlear implants—there's still a queue

Philip Bird

Cochlear implants (CIs) have revolutionised the management of severe-to-profound hearing loss in adults and children throughout the developed world. For adults whose hearing loss has exceeded the capabilities of hearing aids, CIs have meant the ability to understand speech is returned, bringing relief from social isolation and a huge improvement in quality of life. Seeing this occur regularly is the most rewarding part of my work as an otologist.

Guitar et al,[1] in this issue of the *Journal*, have shown that people on the Northern Cochlear Implant Programme's waiting list had worse self-reported indices of mental and physical health than those who had received cochlear implants.[1]

It must be remembered that the people on the adult waiting list are by no means the only people with potentially compromised mental and physical health due to their acquired hearing loss. Whilst CIs have been available in New Zealand since 1987, the intervention still has a low profile. I have no doubt that there is a significant unmet need in the community.

It is not uncommon to meet patients who have had hearing levels which would have made them CI candidates for decades prior to their referral and subsequent implantation. My clinical (but untested) impression is that when people like this have been placed on the waiting list they have a great deal of hope which may actually improve their outlook on life. Whilst funding for cochlear implantation has certainly improved, this large unmet need means that the referrals keep coming.

CIs are expensive. The approximate cost of a (single) CI including surgery and support for 12 months is NZ$50,000. This large "up front" cost for what is principally a publicly funded service is one of the reasons for long waiting lists.

What are the current waiting list issues? An excellent summary of adult funding issues was provided by Robert Gunn in a previous editorial in this *Journal* in 2010.[2] Since that time funding has improved. The Ministry of Health manages to "find" extra funding on a one-off basis relatively regularly which the cochlear implant programmes gratefully accept.

Our requests for increased guaranteed funding was met earlier this year with funding now for 60 adult implants for the country per year, up from 40 prior to 2013. Extra adults are implanted privately and through charitable means. This extra funding has meant that there is no longer anyone waiting over 2 years in New Zealand, which is a significant improvement.

Whilst the 50% increase in funding for adults is a big step in the right direction, waiting list numbers remain high. Currently there are 142 adults on the combined waiting lists of New Zealand's two cochlear implant programmes.

Demand for bilateral CIs in children will also stress funding. There is now very good evidence that congenitally deafened children are better managed with bilateral CIs.[3,4]

At the present time in New Zealand, children have effectively "on demand" access to a single CI. A proportion of parents fund a second implant privately through fundraising of various sorts, but there is increasing pressure to have these funded by the State. Many adults also perform significantly better with bilateral CIs but given all of our other issues no-one is asking for state funding for these.

With improving technology and device performance, CIs are becoming indicated for individuals with better hearing than in the past. There is also evidence for their efficacy in people with significant unilateral deafness.[5] All of these factors add up to a growing list of candidates and more pressure on funding.

A significant long-term financial issue is the problem of upgrading the speech processor (outside) portion of the CI system. Due to wear and tear this needs to be done every 6–8 years at a cost of approximately NZ$10,000. There is another advantage in upgrading, there are significant technological advances which generally are measurably different over a similar time span. At the present time CI programmes commit to providing replacement speech processors indefinitely for publicly implanted patients. This is a huge long-term financial commitment of dubious sustainability.

Aside from the obvious solution—i.e. greatly increased funding— are there any other changes that could help ease funding pressures? The Australian Government does not provide CI upgrades after early adulthood. New Zealand could adopt a similar policy or could perhaps subsidise upgrades in the way they do with hearing aids.

The initial cost of a CI is prohibitive to many. Various ways of part-funding have been explored by our CI programmes but there are significant challenges to making these sorts of schemes equitable.

In summary, the paper by Guitar et al makes a strong case for increased funding for adult cochlear implants in New Zealand. Severe-to-profound hearing loss has a huge impact on the social, mental and physical wellbeing of sufferers and it has a reliable, effective treatment.

The success of cochlear implantation has created funding headaches for the CI programmes and their funders but an increasing number of New Zealanders are benefitting from this life-changing intervention.

Competing interests: None known.

Author information: Philip Bird, Otologist; Cochlear Implant Surgeon, Southern Cochlear Implant Programme; Clinical Associate Professor, University of Otago, Christchurch; and Trustee, Southern Charitable Hearing Trust, Christchurch

Correspondence: Philip Bird, Otolaryngologist, Department of Otolaryngology – Head and Neck Surgery, Christchurch Hospital, Private Bag 4710, Christchurch, New Zealand. Fax: +64 (0)3 3640273; email: phil.bird@chchorl.co.nz

References:

1. Guitar K, Giles E, Raymond B, Welch D. Health effects of cochlear implants. N Z Med J. 2013;126(1375). http://journal.nzma.org.nz/journal/126-1375/5663/content.pdf
2. Gunn RG. Adult cochlear implants in New Zealand—a chronic funding issue. N Z Med J 2010;123(1321):9–12. http://journal.nzma.org.nz/journal/123-1321/4300/content.pdf

3. Ramsden JD, Gordon K, Aschendorff A, et al. European Bilateral Pediatric Cochlear Implant Forum Consensus Statement. Otol Neurotol 2012;33:561–565.
4. National Institute for Health and Care Excellence (NICE). The guidelines manual 2009. http://www.nice.org.uk/aboutnice/howwework/developingniceclinicalguidelines/clinicalguidelinedevelopmentmethods/GuidelinesManual2009.jsp
5. Kamal SM, Robinson AD, Diaz RC. Cochlear implantation in single-sided deafness for enhancement of sound localization and speech perception. Curr Opin Otolaryngol Head Neck Surg. 2012 Oct;20(5):393-7.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Health effects of cochlear implants

Kayla Guitar, Ellen Giles, Bill Raymond, David Welch

Abstract

Aim To investigate whether people on a waiting list for cochlear implantation are more likely than those who have cochlear implants to suffer from illnesses which are potentially mediated by stress.

Method A questionnaire, designed to assess the presence, persistence, and medication use associated with stress-related illnesses, was administered to two groups: those on a waiting list for cochlear implantation and adult users of cochlear implants.

Results Those on the cochlear implant waiting list had significantly poorer health as indicated by: a greater number of conditions experienced in the past year, longer illness length when affected by a condition, medication use for a greater number of conditions, and poorer mental health.

Conclusion There are lengthy waiting lists for adult cochlear implantation. The need to wait and the lack of a known date for surgery, in combination with having a profound hearing loss is likely to result in chronic stress. Chronic stress may increase the risk of physical and mental illness via physiological systems which mediate response to environmental threats. Cochlear implantation may alleviate chronic stress in people on the waiting list, and these findings support the hypothesis that this influences physical health.

In New Zealand, access to cochlear implantation for adults is limited.[1] Adults must go on a waiting list with no advised date of surgery. Many remain on that waiting list for over a year, whilst knowing that an operation would likely provide them with many benefits: the mean time on the waiting list is around four years.

Position on the waiting list is subject to change because if new people are admitted to the list, they may be placed higher than existing applicants: position is based primarily on need as assessed by hearing disability. Waiting for medical intervention has been shown to increase stress[2] and reduce quality of life.[2]

Thus, people on the cochlear implant waiting list are in a position that may be considered stressful. In addition to the stress of waiting, the effects of acquired profound hearing loss are also likely to be stressful.

Social isolation,[3] tinnitus,[4] grief,[5] and embarrassment[6] can all be consequences of hearing loss and may all result in stress. Further to this, a reduction in social support due to deterioration of interpersonal relationships may also diminish one's capacity to cope with stress.[7]

Stress will lead to negative emotions and physiological arousal (Figure 1). This arousal, mediated by individual factors such as stress reactivity and recovery, and the effects of stress-related health behaviours, will lead to increased risk of physical and mental illness.

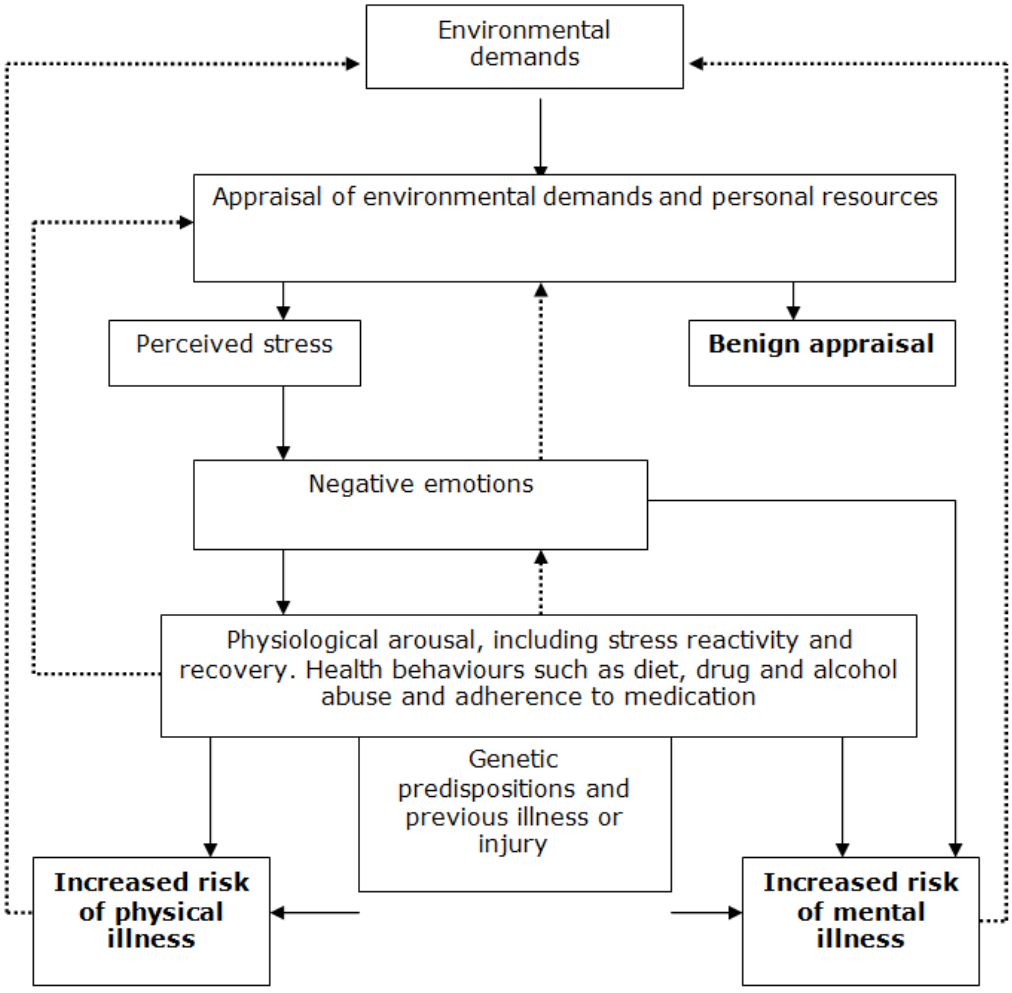
The development of a particular illness is affected by genetic predispositions, vulnerabilities, and previous illnesses or injury. Stress increases the risk of developing illnesses and can aggravate current illnesses:[8] it has been linked to diabetes, asthma, arthritis, and depression, among others.[9]

That stress affects people with hearing loss is supported by findings of reduced health-related quality of life,[10] increased depression,[11] increased anxiety,[11] and poorer physical health[10] in this group.

After cochlear implantation, an alleviation of stress may be expected. Cochlear implants (CIs) have been associated with better health-related quality of life [12] and reduced symptoms of mental illness.[13] However, no published findings indicate whether the improvement seen with mental health extends to physical health.

The aim of this study was to investigate the health (physical and mental) of CI recipients and compare it to that of those on the CI waiting list.

Figure 1. The development of psychophysiological illnesses
Solid lines indicate the processes through which illnesses develop due to stress and the dotted lines show how outcomes may feed back into this process and contribute to the burden of stress. Adapted from Cohen, Kessler and Gordon.[8]



Method

Participants—Two groups were compared: those on the Northern Cochlear Implant Trust (NCIT) waiting list for cochlear implantation and those who have received CIs through the NCIT or who are receiving follow-up care through the NCIT. A questionnaire was sent to all these individuals with approval from the Ethics committee of the University of Auckland (Ref no. 2010/199).

Candidacy for a CI depends upon having a bilateral severe to profound sensorineural hearing loss for their better ear and where hearing aids provide limited or no useful benefit. There is no maximum age for referral, and patients with additional needs are not excluded. Adults have normally acquired hearing loss post-lingually. In addition, the adults must be fit and well enough to undergo an operation. Of the 64 people on the waiting list, 44 (69%) responded.

The cochlear implant group consisted of adults who had received their implants at least 12-months ago, and were currently using, a cochlear implant through the NCIT, as well as those who had been implanted and funded by another provider (Accident Compensation Corporation (ACC) or private). Questionnaires were sent to 199 people for this group, and 119 (60%) responded.

Instruments—A questionnaire was created to investigate the presence and frequency of potentially stress-related, physical illnesses (Table 2): participants were asked to indicate how many days they suffered from symptoms of each condition in the previous year, thus creating variables that ranged from zero to 365; whether medication was used for each condition in the past year was also indicated. The 21-item Depression, Anxiety, and Stress Scale (DASS-21) [14] was used to assess mental health.

This questionnaire which has three scales: Anxiety, Depression, and Stress, and can also be used, as we have, to provide a total mental-health score.

Questions about demographics, general health perception (Question 1 from the Short Form health questionnaire (SF-36) [15]), frequency of physician visits and sick days, and self-rated dissatisfaction with hearing (10-point scale; Figure 5) were also included. Furthermore, the following factors which may be associated with the relationship between stress and health were investigated: smoking,[16] binge alcohol consumption,[17] cohabitation,[18] employment,[19] and body mass index (BMI).[20]

The two groups were compared in terms of overall health measures. In principle, overall measures should better reflect the impact of stress than specific conditions because the latter would be more influenced by individual predispositions and vulnerabilities: by considering overall effects, the impact of stress should be revealed.

Overall health measures were: percentage of each group experiencing any potentially stress-related health condition (Prevalence), the number of days affected during the previous year (Persistence: N.B. to prevent an artefactual inflation due to Prevalence, Persistence was calculated as the mean days affected for those with any health condition—i.e. the total days affected divided by the number of conditions), and the percentage of those affected who took prescription medication (Medication).

Prevalence gives a measure of the overall health of each group, while Persistence and Medication Use provide evidence of the impact of the conditions.

Data analysis—Questionnaire data were analysed using Analysis of Covariance (ANCOVA) to allow comparison of the waiting list and CI groups while controlling for potentially confounding variables.

To explore the data further, where significant overall effects were observed, analyses were conducted at the level of the specific health conditions assessed. These were conducted using either t-tests (continuous outcomes) or Chi-squared tests (discrete outcomes). Since these analyses were exploratory and there was low statistical power due to the relatively low numbers experiencing each of the individual conditions, no attempt to correct type-I error rates for multiple testing was made.

Least-squares linear regression models for the two stressors (time on the waiting list and dissatisfaction with hearing) were established overall and for the waiting list and cochlear implant groups separately.

Four outcome measures were used: Prevalence (sum of conditions experienced), Persistence (average days affected), Medications, and DASS-total score. Stressors were included as predictors in separate models; all of these controlled for age, sex, living situation, and employment status.

Results

No significant differences in age (t[158]=.511, *p*=0.610), sex (Chi-squared [1, N=162]=1.207, *p*=0.179), living situation (Chi-squared [1, N=158]=.775, *p*=0.252), or employment status (Chi-squared [1, N=155]=1.444, *p*=0.154) were found between the two groups (Table 1).

Table 1. Demographic characteristics of participants by group

Variables		Waiting list	Cochlear implant
Age	Mean	60.2 *(SD= 17.9)*	58.6 *(SD=17.3)*
Sex	Male	17 *(39%)*	57 *(48%)*
	Female	27 *(61%)*	61 *(52%)*
Living situation	Alone	9 *(21%)*	32 *(28%)*
	With others	34 *(79%)*	83 *(72%)*
Employment (full or part-time)	Employed	17 *(40%)*	58 *(51%)*
	Other	25 *(60%)*	55 *(49%)*

Those with cochlear implants had had their implant, on average, for 5.73 years (SD=4.93, Range: 375–6653 days) and they had, on average, spent approximately 9 months (mean=0.68 years, SD=0.67, Range: 8-1218 days) on the waiting list prior to their cochlear implant surgery. Those on the waiting list had been on the list, on average, for 18 months (mean=1.47 years, SD=1.18, Range: 45-1960 days).

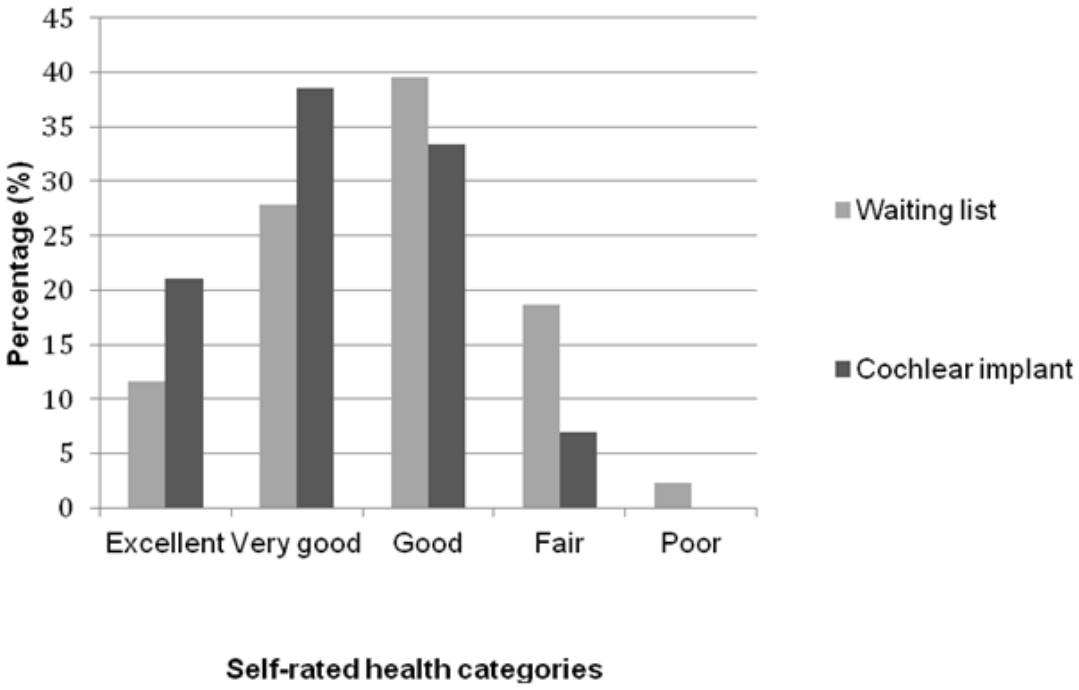
Health—11% (n=4) of those on the waiting list and 6% (n=7) of those with cochlear implants were smokers (Chi-squared [6, n=158]=4.552, *p*=0.602). In regards to binge alcohol consumption, 27% of those on the waiting list and 28% of those with cochlear implants reported consuming five units of alcohol or more, on at least one day a week (Chi-squared [8, n=157]=8.307, *p*=0.404).

Of those on the waiting list, 55% were considered overweight or obese according to their BMI compared to 62% with cochlear implants (Chi-squared [2, N=146]=1.295, *p*=0.523).

Those on the waiting list visited their doctor an average of 6.2 (SD=4.8) times a year, whereas those using cochlear implants did so 4.3 (SD=3.7) times a year (t(151)=2.616, *p*=0.010). However, no significant differences between the two groups were found in days off work because of illness or bedridden days (both *p*>0.4).

General health—People on the waiting list were less likely to rate their health as very good or excellent and more likely to rate their health as poor, fair or good than people with cochlear implants (Chi-squared [4, N=157]=9.609, *p*= 0.048; Figure 2).

Figure 2. Self-rated general health perceptions of those on the waiting list for cochlear implantation compared to those with cochlear implants



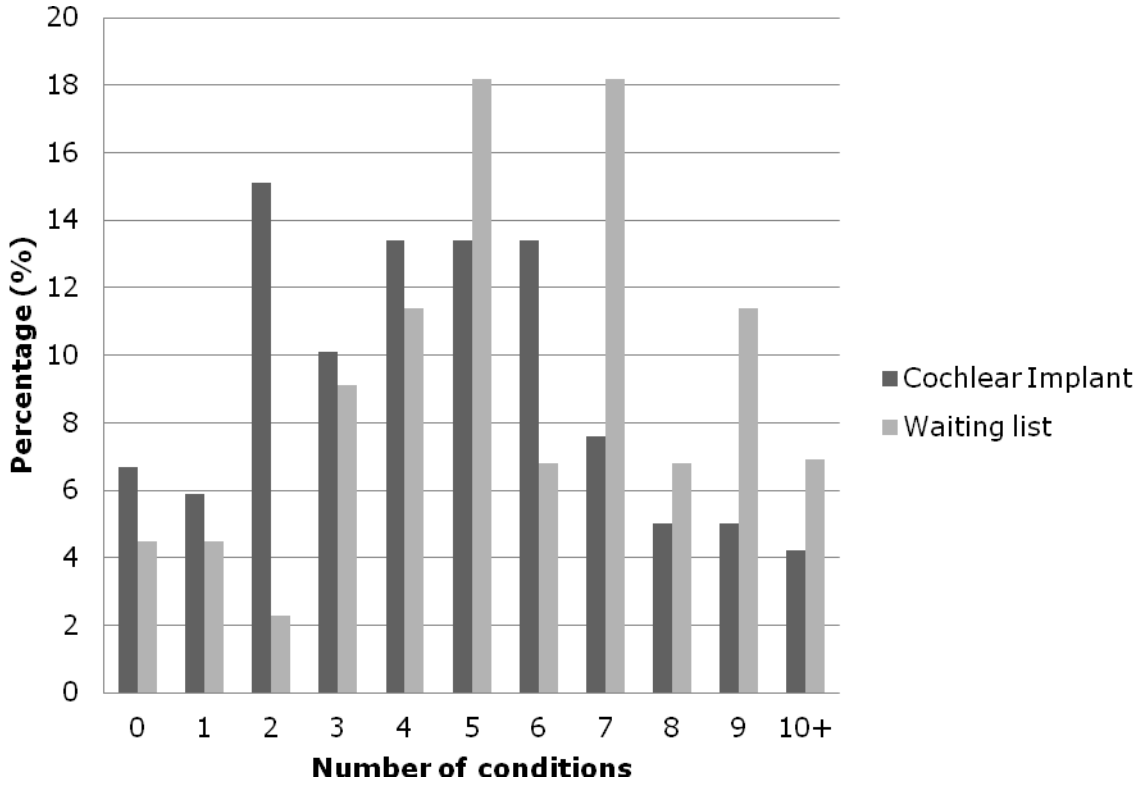
Prevalence of potentially stress-related health conditions—People on the waiting list reported experiencing an average of 5.8 (SD=3.01) different health conditions in the past 365 days whereas those with cochlear implants reported an average of 4.5 (SD=2.70) conditions, (F[1,161]=7.153, *p*=0.008).

This difference remained after correcting for age, sex, living situation and employment, (F[5,152]=5.525, *p*=0.020). The distribution of the number of conditions experienced in the past year is shown in Figure 3.

Within this, tinnitus (Chi-squared [1, N=160]=5.758, *p*=0.016); diabetes (Chi-squared [1, N=163]=7.705, *p*=0.006); CVD (Chi-squared [1, N=162]=4.324, *p*=0.038) and hypertension (Chi-squared [1, N=163]=5.272, *p*=0.022) were all significantly more common in those on the waiting list than in those with CIs (Table 2).

No conditions were significantly more common in the cochlear implant user group than in the waiting list group (all p>0.1).

Figure 3. Distribution of number of potentially stress-mediated conditions experienced by CI-users and people on the waiting list for a CI



Persistence—When people on the waiting list were affected by a condition, they were affected for longer than those with cochlear implants (F(1, 152)=11.604, *p*=0.001).

The average number of days affected for those in the WL group was 164 days (SD=121 days) compared to 97 days (SD=103 days) for the cochlear implant group. This difference remained after correcting for age, sex, employment status and living situation, (F(1, 142)=11.970, *p*=0.001).

Additionally, digestive problems (t(69)=2.154, *p*=0.035), migraines (marginally) (t(24)=1.913,*p*=0.068); and tinnitus (t(65)=2.830, *p*=0.006) when experienced, occurred more frequently in the waiting list group than the cochlear implant group (Table 2).

There was no difference between the two groups for any of the other individual conditions (all p>0.1).

Medication—People on the waiting list, on average, took prescription medication for 3.1 (SD=2.4) conditions whereas those with cochlear implants took prescription medication for 1.8 (SD=1.9) conditions (F(1, 161)=12.602, *p*=0.001). This difference remained after correcting for age, sex, living situation and employment, (F(1, 146)=11.597, *p*=0.001).

People on the waiting list were more likely to take prescription medication for migraines (F(1,26)=4.984, *p*=0.034), ear infections (F(1, 19)=8.44, *p*=0.009), and sleep disturbances (F(1, 42)=9.990, *p*=0.003) than those in the cochlear implant group (Table 2).

Table 2. Specific health conditions

Health condition	Number Responding		Prevalence (%)		Persistence (Days)		Medication (%)	
	Waiting List	CI Users	Waiting List	CI Users	Waiting List	CI Users	Waiting List	CI Users
Tinnitus	42	118	60*	38	308*	199	12	2
Hypertension	44	119	48*	29	280	237	94	90
Digestive symptoms	44	118	48	48	135*	62	71	63
Cold	44	119	48	49	6	9	30	23
Back Pain	43	119	42	42	140	108	65	43
Joint Pain	44	119	39	35	214	158	50	40
Neck Pain	44	119	34	28	142	72	54	31
Arthritis	44	119	25	17	349	309	50	53
Sleep problems	44	119	25	29	236	174	55*	12
Migraine	44	119	25	14	72**	19	64*	24
Ear infection	44	119	23	13	45	11	100*	46
Diabetes	44	119	21*	6	320	243	89	50
Influenza	44	119	21	19	5	10	50	39
Asthma	44	118	18	9	105	40	100	91
Chest infection	44	119	18	9	74	23	71	82
Cardiovascular Disease	43	119	16*	6	365	268	100	100
Heart palpitations	44	119	14	8	105	32	50	33
Skin problems	44	119	9	6	219	218	100	86
Thyroid disorder	44	119	7	2	365	365	100	100
Irritable Bowel Syndrome	44	119	7	9	365	139	50	55
Cancer	44	119	7	2	—	—	—	—
Stroke	44	119	2	1	—	—	—	—
Ulcer	44	119	0	3	—	365	—	100
Colitis	44	119	0	1	—	0	—	100
Other	44	119	25	21	—	—	—	—

Note: Prevalence (Percentage of group with any potentially stress-related health condition), Persistence (mean number of days experiencing potentially stress-related health conditions), and Medication (Percentage of group using medication to treat potentially stress-related health conditions).

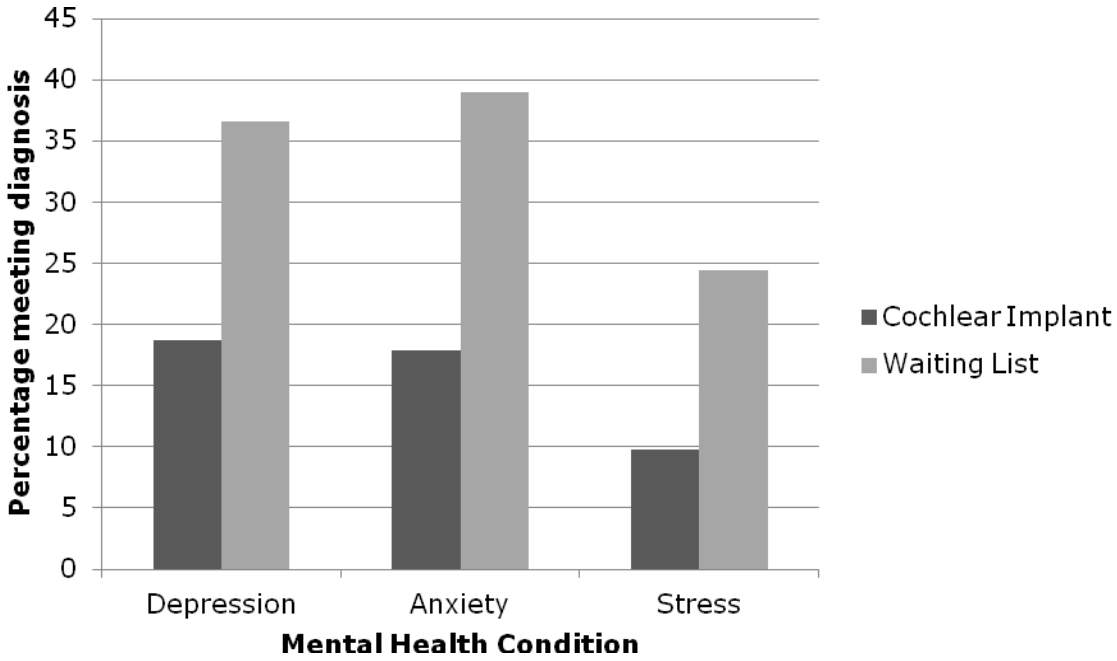
Asterisks indicate where the waiting list group had poorer health markers than the CI group.

*p<0.05; **p<0.01

Mental health—The proportion of each group meeting the DASS-21 diagnostic criterion for anxiety (Chi-squared [1, 158]=5.699, *p*=0.016), depression (Chi-squared [1, 158]=3.874, *p*=0.042), and stress (Chi-squared [1, 158]=5.347, *p*=0.023) was higher in those on the waiting list than in those using cochlear implants (Figure 4).

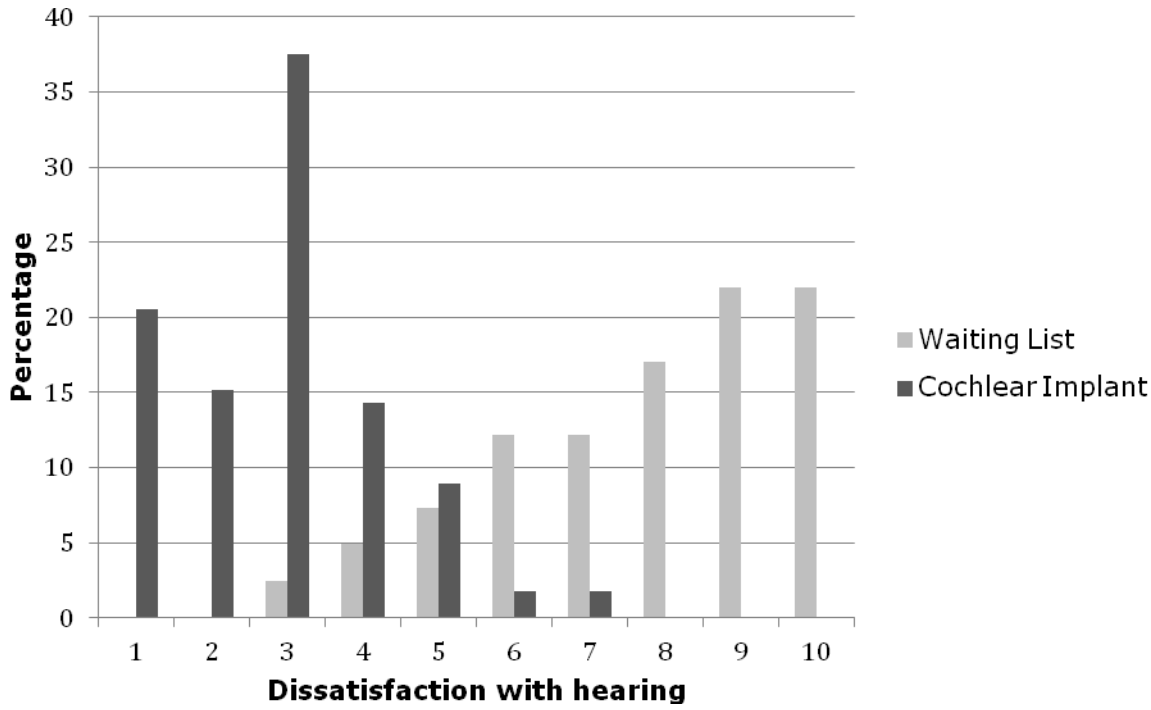
Total psychological distress, indicated by the total score on the DASS-21, was also increased in the waiting list group (Mean=22.9, SD =18.6) when compared to those with cochlear implants (Mean=15.4, SD=15.5), F (1, 156)=6.560, *p*=0.011. This difference remained after correcting for age, sex, living situation and employment, (F [1, 144]=5.678, *p*=0.018).

Figure 4. Percentage of each group meeting DASS-21 criteria for depression, anxiety, and stress



Dissatisfaction with hearing—As would be expected, people on the waiting list had greater dissatisfaction with their hearing (Mann-Whitney U= 142.5, p<.001) than those on the waiting list (Figure 5).

Figure 5. Distribution of rated dissatisfaction with hearing for people on the waiting list and people with cochlear implants. A rating of 10 represents great dissatisfaction, and 1 represents complete satisfaction.



Stressors prediction of health measures—Linear regression models controlling for age, sex, living situation and employment were run to examine the association between the potential stressors (Dissatisfaction with hearing and Time spent on the waiting list) and the four measures of health (Prevalence, Persistence, Medication, and DASS).

Dissatisfaction with hearing was associated with poorer health according to all four measures overall, but only with Persistence and Mental Illness in the CI group, and only (marginally) with Mental Illness in the Waiting List group (Table 3).

Time on the waiting list predicted greater Persistence and use of Medication overall, but was not related to Prevalence or Mental Illness, and was not associated with any of the health measures within the two groups separately (Table 3).

Table 3. Standardised linear regression coefficients (Beta) for the relationship between Stressors (Dissatisfaction with hearing and Time on waiting list) and Stress-related health measures. Models were run overall and for the CI and waiting-list groups separately. All models controlled for age, sex, living situation, and employment.

Variables	Dissatisfaction with Hearing			Time on Waiting List		
Stress-related Health Measures	Overall	Cochlear Implant Group	Waiting List Group	Overall	Cochlear Implant Group	Waiting List Group
Prevalence	0.189*	0.047	0.071	0.075	0.050	-0.066
Persistence	0.288**	0.209*	-0.039	0.200*	0.125	0.052
Medication	0.217**	0.040	0.044	0.198*	0.063	0.122
Mental Illness	0.291**	0.296**	0.380~	0.063	0.019	-0.196

~p<0.1; *p<0.05; **p<0.01

Discussion

We showed that potentially stress-related health conditions had greater prevalence, illness persistence, and use of medications for in people on the waiting list. These findings are consistent with previous findings of an association between stress and illness.[9]

There was no *a priori* reason why waiting list candidates should have poorer health than CI users, and nor did controlling for potential confounding factors influence the effects; this implies that poorer health was attributable to the experience of living with acquired hearing loss and/or the experience of being on a waiting list for life-changing surgery.

Associations were stronger between dissatisfaction with hearing and the health measures, but time spent on the waiting list was also associated with health. This may imply that both are influential.

Prevalence, persistence, and medication—People on the waiting list had higher prevalence of stress-related conditions than those with a cochlear implant. The effects of stress on health vary between individuals, and may be mediated by predispositions such as genetics or previous illnesses.[21]

Thus, individuals who are undergoing similar stressors may develop different illnesses, and an overall indication of the total conditions experienced provides a stronger indication of psychophysiologically-mediated illness than any individual condition alone. Basing analyses on the total conditions also avoids potential statistical power issues associated with the rarer conditions.

Health conditions were more persistent in those on the waiting list. On average, individuals on the waiting list, when affected by any condition, were affected for 164 days compared to 97 days for those with cochlear implants. The findings are consistent with earlier research showing stress to aggravate current conditions and delay recovery from illness.[22].

The greater use of prescription medication in the waiting list group also indicates reduced health for this group. The differences in Persistence described above may have been greater had it not been for the medication used.

Smoking and binge alcohol consumption—The poorer health of those on the waiting list could be directly due to stress, or could be indirectly influenced by health-related behaviours common in people under stress, such as consumption of too much alcohol or smoking.[23] However, no differences were seen between the two groups in relation to smoking and binge alcohol consumption.

There were few smokers and binge alcohol drinkers in both groups, which is consistent with previous findings of low levels of alcohol consumption and smoking in the hearing-impaired population [24], and this gave only limited statistical power to detect any differences which may have been present.

Tinnitus—The rate of tinnitus was 60% in the waiting list group and 38% in the cochlear implant group. This difference of about one third is comparable to previous reports of decreases in tinnitus rates after cochlear implantation [25].

Tinnitus holds a particular place in the relationship between stress, hearing loss and illness. Firstly, as for many of the conditions, tinnitus can be caused by stress [26], and can also lead to stress,[27] resulting in a cycle of increasing illness and stress. Secondly, tinnitus can be caused by hearing loss [4] or by stress.[26] Furthermore, cochlear implantation could reduce tinnitus via activation of the auditory pathways[4] or by reducing stress[26].

Thus, unlike other conditions, there were two mechanisms that may cause and reduce tinnitus. This may explain why tinnitus was the most commonly experienced condition in the waiting list group (stress plus hearing loss) and was also the condition with the greatest reduction following cochlear implantation (reduced stress plus auditory pathway activation).

Mental health—Symptoms of depression and anxiety28 have previously been shown to improve following cochlear implantation. The current study adds further support for the mental health benefits of cochlear implantation as symptoms of all three facets (stress, depression, and anxiety) of the DASS were lower in those with cochlear implants than in those on the waiting list.

Dissatisfaction with hearing—Overall, dissatisfaction with hearing predicted poorer physical and mental health. This is consistent with the idea that impaired hearing would have an impact on health via isolation and frustration leading to chronic stress and thus impaired immune function.

The effects were less clear within the groups, but this would be explained by the reduced statistical power and the relative homogeneity of hearing within groups: the people on the CI waiting list all hear very poorly, so it is difficult to detect gradual effects amongst them.

Amongst the CI-users, there was rather more variability in functional hearing, and those who were still dissatisfied with their hearing also tended to have more persistent health problems and poorer mental health.

Time on waiting list—Overall, time spent on the waiting list was associated with more persistent health problems and greater use of medication, consistent with the idea that the waiting is stressful in itself. When psychophysiological changes persist through time, their effects add up and the risk of illness increases.[29] Increased waiting times for elective surgery have previously been associated with increased mental distress.[30]

Implications of findings—The implications of this research are important: cochlear implantation is reliant on available funding (e.g. government, donations) because the cost of implantation and support is very high and is thus rarely covered by an individual recipient.

In New Zealand, public support of adult cochlear implantation is limited due to funding restrictions (for the Northern Cochlear Implant Programme, this has increased to 30 in the last 2 years). However, the increased presence and prolongation of illness in those on the waiting list will also burden the public health system. Thus, the true cost of cochlear implantation should take into account the consequent reduction of health system use and improved productivity.

Strengths and limitations—The main strengths of this research were that there were good and similar response rates for the two groups, and that the conditions assessed were all potentially mediated by stress. As far as we know, this is the first time that such differences have been observed in a CI/waiting list population, and the information may be valuable to policy-makers

It must be acknowledged that it is possible that some other factor(s) could lead to the observed differences in health. The research relied on self-report of health conditions, and those on the waiting list may have reported illness more readily than those with CIs for some unknown reason.

On the other hand, there was no obvious incentive for such behaviour, in that physical health state does not influence ranking on the waiting list, and the research was conducted independently and with anonymous questionnaires.

The research was cross-sectional and it cannot be ascertained that the health of the people on the waiting list was not already poor when they joined it. However, entry to the waiting list is permitted only if applicants are considered healthy enough to sustain an operation, and since entry to the waiting list is based primarily on hearing disability, there is no reason to suppose that the health, on entry to the waiting list, of current list members would have been poorer than those who have already received CIs.

Where present, associations between health measures and dissatisfaction with hearing and time on the waiting list were of the order of 0.2. These are small, but it must be borne in mind that our regression models controlled for potential confounding variables, and that many extraneous factors would be involved in influencing health. The effects are thus worthy of consideration, and the presence, rather than the magnitude of associations is of interest.

Finally, while the conditions we considered were potentially stress mediated, we had no physiological markers of stress in the waiting list group other than their physical

illnesses, and future research measuring physiological stress markers in both groups would be useful.

Conclusion

The findings of this research are important for two main reasons: they demonstrate the impact of long-term stress on both physical and mental health, and they imply that living with significant acquired hearing loss while waiting for a cochlear implant is detrimental to health.

Funding for adult cochlear implantation in New Zealand is limited, leading to lengthy waiting lists. Reduction of the waiting list time for cochlear implantation may contribute to the reduction of stress-associated medical conditions in those who have lost their hearing and thereby reduce the burden on the health system.

Competing interests: Nil.

Author information: Kayla Guitar, Educational Audiologist, Ministry of Education, New Brunswick, Canada; Ellen Giles, CI Rehabilitationist, Northern Cochlear Implant Programme, University of Auckland, Auckland; Bill Raymond, CI Audiologist, Northern Cochlear Implant Programme, University of Auckland, Auckland; David Welch, Senior Lecturer, Audiology Section, School of Population Health, University of Auckland, Auckland

Correspondence: David Welch, Audiology Section, School of Population Health, University of Auckland, Private Bag 92019, Auckland, New Zealand. Fax: +64 (0)9 3737496; email: d.welch@auckland.ac.nz

References:

1. Gunn RG. Adult cochlear implants in New Zealand-a chronic funding issue. The New Zealand Medical Journal. 2010;123(1321):9–12.
2. Mahon JL, Bourne RB, Rorabeck CH, et al. Health-related quality of life and mobility of patients awaiting elective total hip arthroplasty: a prospective study. CMAJ. 2002;167:1115–1121.
3. Gildston H, Gildston P. Personality changes associated with surgically corrected hypoacusis. Audiology. 1972;11(5):354–367.
4. Gabriel D, Veuillet E, Vesson JF, Collet L. Rehabilitation plasticity: influence of hearing aid fitting on frequency discrimination performance near the hearing loss cut-off. Hearing Research. 2006;213:49–57.
5. McKenna L, O'Sullivan A. Psychological aspects of acquired hearing loss. In: Graham J, Baguley D, eds. Ballantyne's Deafness. 7th ed. West Sussex: Wiley-Blackwell; 2009.
6. Stephens SDG. Evaluating the problems of the hearing impaired. Audiology. 1980;19:205–220.
7. Uchino BN, Cacioppo JT, Kiecolt-Glaser JK. The relationship between social support and physiological processes: a review with emphasis on underlying mechanisms and implications for health. Psychological bulletin. 1996;119(3):488–531.
8. Cohen S, Kessler RC, Gordon LU. Measuring stress: A guide for health and social scientists. New York: Oxford University Press; 1995.
9. Taylor SE. Health Psychology-International Edition. 7th ed. New York: McGraw-Hill 2009.
10. Hogan A, Taylor A, Doyle J, et al. The communication and health needs of older people with hearing loss: Are hearing aids enough? Australian & New Zealand Journal of Audiology. 2001;23(1):11–18.

11. Tambs K. Moderate effects of hearing loss on mental health and subjective well-being: Results from the Nord-Trøndelag hearing loss study. Psychosomatic Medicine. 2004;66(5):776–782.
12. Looi V, Mackenzie M, Bird P. Quality-of-life outcomes for adult cochlear implant recipients in New Zealand. N Z Med J. 2011;124(1340):21–34.
13. Knutson JF, Murray KT, Husarek S, et al. Psychological change over 54 months of cochlear implant use. Ear and Hearing. Jun 1998;19(3):191–201.
14. Lovibond PF, Lovibond SH. The structure of negative emotional states: Comparison of the depression anxiety stress scales (DASS) with the Beck Depression and Anxiety Inventories. Behaviour Research and Therapy. 1995;33(3):335–343.
15. Ware Jr JE, Sherbourne CD. The MOS 36-item short-form health survey (SF-36). I. Conceptual framework and item selection. Medical Care. 1992;30(6):473–483.
16. Alberg AJ. Cigarette smoking: Health effects and control strategies. Drugs of Today. 2008;44(12):895–904.
17. Grønbæk M. The positive and negative health effects of alcohol- and the public health implications. Journal of Internal Medicine. 2009;265(4):407–420.
18. Dean A, Kolody B, Wood P, Matt GE. The influence of living alone on depression in elderly persons. Journal of Aging and Health. 1992;4(1):3–18.
19. Evans J, Repper J. Employment, social inclusion and mental health. Journal of Psychiatric and Mental Health Nursing. 2000;7(1):15–24.
20. Colditz GA. Weight, weight gain, activity, and major illnesses: The nurses' health study. International Journal of Sports Medicine, Supplement. 1997;18(SUPPL. 3).
21. Heim C, Ehlert U, Hellhammer DH. The potential role of hypocortisolism in the pathophysiology of stress-related bodily disorders. Psychoneuroendocrinology. 2000;25:1–35.
22. Dhabhar FS. Enhancing versus suppressive effects of stress on immune function: Implications for immunoprotection and immunopathology. Neuroimmunomodulation. 2009;16(5):300–317.
23. Ng DM, Jeffery RW. Relationships between perceived stress and health behaviors in a sample of working adults. Health Psychology. 2003;22(6):638–642.
24. Zazove P, Niemann LC, Gorenflo DW, et al. The health status and health care utilization of deaf and hard-of-hearing persons. Archives of Family Medicine. 1993;2(7):745–752.
25. Bovo R, Ciorba A, Martini A. Tinnitus and cochlear implants. Auris Nasus Larynx. 2010.
26. Henry JL, Wilson PH. The psychological management of chronic tinnitus. Boston: Allyn Bacon; 2001.
27. Tyler RS, Stouffer JL. A review of tinnitus loudness. Hearing Journal 1989;42:52–57.
28. Mo B, Lindbæk M, Harris S. Cochlear implants and quality of life: A prospective study. Ear and Hearing. 2005;26(2):186–194.
29. McEwen BS, Wingfield JC. The concept of allostasis in biology and biomedicine. Hormones and Behavior. 2003;43(1):2–15.
30. Oudhoff JP, Timmermans DRM, Knol DL, et al. Waiting for elective general surgery: Impact on health related quality of life and psychosocial consequences. BMC Public Health. 2007;7.

Questionnaire

Below is a list of symptoms and conditions. In the second column, please indicate the approximate number of days in the **past 12 months** where you were affected by each of the items on the list. For example, if you haven't had a migraine in the past year, write down 0. Or if you had a migraine every day in the past year, write down 365.

For chronic conditions such as asthma, only write down the number of days where the symptoms were **bothersome** to you. For example, if you have been diagnosed with asthma but were only bothered by asthma symptoms for 5 days in the past year, write down 5.

In the third column, please write down any prescription **medication** you take for every item on the list and how often you take the medication.

For example, if you take medication to prevent migraines every day, write down 365. If you only took medication on 5 days you had a migraine, then write 5.

Symptoms/conditions	**Days affected**	**Medication taken & how often**
Digestive problems e.g. upset stomach, stomach cramps, indigestion, nausea, heartburn, diarrhoea or constipation		
Back pain		
Neck pain		
Joint pain		
Common Colds		
Ear infection (earache)		
Flu		
Chest infection , bronchitis, pneumonia		
Migraine		
Symptoms/conditions	**Days affected**	**Medication taken & how often**
Heart palpitations		

Eczema		
Tinnitus (noises, ringing in the ear)		
Sleep disturbance		
Irritable bowel syndrome (diagnosed by a doctor)		
Colitis (diagnosed by a doctor)		
Asthma (diagnosed by a doctor)		
Thyroid condition (diagnosed by a doctor)		
Diabetes (diagnosed by a doctor)		
Cardiovascular disease (diagnosed by a doctor)		
Ulcer (diagnosed by a doctor)		
High blood pressure (diagnosed by a doctor)		
Arthritis (diagnosed by a doctor)		
Cancer (diagnosed by a doctor)		
Stroke		
Other(s) (including any syndromes):_____ _____		

1. How many times did you visit a doctor (GP or specialist) in the past year, including visits to after-hours medical centres? _____

2. How many days were you bedridden because of illness in the past year? _____

3. If you are working, how many sick days did you take in the past year? Please do not include sick leave taken to care for children, partner, etc. _____

4. In general, would you say your health is:

Excellent
Very good
Good
Fair
Poor

5. How many cigarettes do you smoke per week?

_____

6. How many days a week do you consume 3 or more units of alcohol. A unit of alcohol=30ml of spirits, 330ml of beer or 100ml of wine. _____

7. What is your weight (indicate if weight is in kg or stones and pounds)?

_____

8. What is your height (indicate if height is in cm or feet)? _____

9. Do you live alone Yes No

10. Are you : Employed, either full time, part time or self-employed

Retired

Unemployed

11. On a scale of one to ten, how satisfied are you with your cochlear implant?

1 2 3 4 5 6 7 8 9 10

Very dissatisfied — Neither satisfied nor dissatisfied — Very satisfied

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you *over the past week*. There are no right or wrong answers. Do not spend too much time on any statement.

The rating scale is as follows:

0 -Did not apply to me at all

1 -Applied to me to some degree, or some of the time

2 -Applied to me to a considerable degree, or a good part of time

3 -Applied to me very much, or most of the time

I found it hard to wind down	0	1	2	3
I was aware of dryness of my mouth	0	1	2	3
I couldn't seem to experience any positive feeling at all	0	1	2	3
I experienced breathing difficulty (eg, excessively rapid breathing, breathlessness in the absence of physical exertion)	0	1	2	3
I found it difficult to work up the initiative to do things	0	1	2	3
I tended to over-react to situations	0	1	2	3
I experienced trembling (eg, in the hands)	0	1	2	3
I felt that I was using a lot of nervous energy	0	1	2	3
I was worried about situations in which I might panic and make a fool of myself	0	1	2	3
I felt that I had nothing to look forward to	0	1	2	3
I found myself getting agitated	0	1	2	3
I found it difficult to relax	0	1	2	3
I felt down-hearted and blue	0	1	2	3
I was intolerant of anything that kept me from getting on with what I was doing	0	1	2	3
I felt I was close to panic	0	1	2	3
I was unable to become enthusiastic about anything	0	1	2	3
I felt I wasn't worth much as a person	0	1	2	3
I felt that I was rather touchy	0	1	2	3
I was aware of the action of my heart in the absence of physical exertion (eg, sense of heart rate increase, heart missing a beat)	0	1	2	3
I felt scared without any good reason	0	1	2	3
I felt that life was meaningless	0	1	2	3

PLEASE REMEMBER TO SIGN THE CONSENT FORM AND INCLUDE IT IN THE RETURN ENVELOPE

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Barriers to the safe transport of children to and from hospital

Maria KR Wilson, Julie L Chambers, James K Hamill

Abstract

Aim The purpose of this study is to determine how children are transported to and from hospital, and to understand caregivers' car restraint knowledge base.

Method A convenience sample of 200 inpatients in five wards at Starship Children's Hospital. Parents or caregivers underwent a short interview, asking: the usual restraint used by their child; how the child was transported to hospital; their plans for transporting the child home; their knowledge of current New Zealand legislation and best practice recommendations regarding child car restraints.

Results In their normal car travel, 95% children younger than 5 years were reported to be using a car seat all the time, versus 34% children aged 5 to 9 years. In their journey to hospital, 8% (7/91) of children younger than 5 years were not in a child car seat; 27% (3/11) of children younger than 5 years transported to hospital in a taxi, were not in car seats (one was held in the parent's lap). Responses about the planned trip home showed nine children (7%) were at immediate risk of being transported in an unsafe way, without a child restraint. Questions about awareness of correct child restraint use showed 68% of the families with children aged 5 to 9 were unaware that it was important to continue to use a child restraint for their child.

Conclusion: There is an opportunity for child health professionals to provide support to families with children in hospital by collaborating with established child restraint rental agencies and making best practice child restraint advice and products more readily available. New Zealand law should be updated to require the use of child car restraints beyond a child's fifth birthday.

Trauma while travelling as a passenger in a motor vehicle is a leading cause of mortality and hospitalisation for children in New Zealand.[1–3]

Much of the serious trauma suffered by children in motor vehicle crashes is associated with poor seat belt fit.[4,5] Booster seats help to position the seat belt over the bony pelvis and chest wall, in order to evenly distribute forces in a crash and protect the internal organs from damage.[6]

The use of booster seats for children who have outgrown their child car seats but are not yet big enough to fit an adult seat belt alone, significantly reduces the risk of serious and fatal injuries in children involved in motor vehicle crashes.[4–9]

The continued use of child car restraints until a child reaches a height of 148 cm is recommended best practice to prevent such trauma.[10] The approximate age children reach this height is 11 years.

Despite best practice guidelines, children are often prematurely graduated to being restrained in the adult seat belt alone.[2,5,8,11] To combat this issue many countries have

updated their legislation to bring it more in line with best practice guidelines. For example, in the United Kingdom children must continue to use a child restraint or booster seat until they are 135 centimetres tall, or their 12th birthday. [2,12]

In New Zealand, however, legislation only requires the use of child car restraints for children under the age of 5 years (6 years less than best practice recommendations). New Zealand law also allows the transport of children in taxis without a child car restraint; regardless of the child's age.[13] These laws legitimise the suboptimal restraint of children in cars in New Zealand.

Little is known about the transport of patients to and from hospital. By interviewing parents and caregivers of paediatric inpatients we sought to determine car restraint use and knowledge, and to gauge the need for a hospital-based car seating service.

Method

The Northern X Regional Ethics Committee granted expedited ethics approval for information to be gathered in the form of short interviews from a convenience sample of parents and caregivers of 200 child inpatients. Inclusion criteria included age 0–13 years and inpatient in a surgical or medical ward at Starship Children's Hospital (wards 23B, 24A, 24B, 25A and 25B). Exclusion criteria were: no parent or caregiver present with the patient; the family was suffering social distress; or the patient was undergoing palliative care.

Participants were selected daily from the ward inpatient lists. Families considered suitable for interviewing were approached by investigators, provided with an information sheet, and verbal consent obtained.

We conducted interviews over a total of 15 working days using two structured interview sheets: one for children 0–4 years and the other for children aged 5 years and over. Participants were asked to provide information regarding the usual restraint used by their child; how the child was transported to hospital; their plans for transporting the child home; and their knowledge of current New Zealand legislation and best practice recommendations regarding child car restraints.

At the completion of each interview participants were offered a 'Booster Rooster' height chart and/or a leaflet about child restraints.[14]

Formulae proposed by Cochran were used to calculate the representativeness of the convenience sample. Specifically, demographic and economic characteristics of the study population were compared with all other inpatients in all Starship Hospital wards over the study period. Data was sorted into tables with totals converted to percentages for presentation.[15,16]

Results

Demographics—Demographic information on our study participants was collected and compared with the demographics of all 520 inpatients in all wards at Starship over the data collection period. This information is shown in Table 1.

Table 1. Demographic details of sample and inpatient population

Variables		Interview sample n=200 (%)	Starship inpatients n=520 (%)
Age	0–4	127 (63)	257 (49)
	5–9	53 (26)	116 (22)
	10–14	20 (10)	128 (25)
	15–19	0	19 (4)
Gender	M	108 (54)	284 (55)
	F	92 (46)	236 (45)
NZDep06	Decile 1 (least deprived)	11 (5)	28 (5)
	Decile 2	20 (10)	46 (9)
	Decile 3	15 (7)	42 (8)
	Decile 4	15 (7)	41 (8)
	Decile 5	22 (11)	63 (12)
	Decile 6	30 (15)	59 (11)
	Decile 7	11 (5)	34 (6)
	Decile 8	26 (13)	61 (12)
	Decile 9	15 (7)	50 (10)
	Decile 10 (most deprived)	31 (15)	80 (15)
	N/A (Overseas)	4 (2)	16 (3)
Ethnicity	NZ European	88 (44)	224 (43)
	Māori	37 (18)	103 (20)
	Pacific	44 (22)	105 (20)
	Asian	23 (11)	47 (9)
	Other	8 (4)	41 (8)

The sample was representative in terms of gender, ethnicity and socioeconomic status (as defined by the NZDep2006 scores).[17] Our sample was representative of the 5–9 years age group, but over-represented the 0–4 years age group and under-represented the 10–14 years age group.

Usual car seating and restraint use—In this initial section of the interview we asked how children are usually restrained when they travel in a car, how consistently restraints are used, what type of seat belt is used, where they sit in the car and whether or not they own a car seat or booster seat. The results are shown in Table 2.

Compliance with child car seat legislation was reported to be high, with 98% of children required to be in a car seat said to be using one. When asked to be more specific about the consistency of their child's car seat use, seven families of children younger than 5 years (5%) admitted not using the car seat all the time, with one family reporting they did not use a car seat at all.

There was a marked drop off in car restraint use (34%) in children aged 5 years and over, compared to those aged 0–4 years (98%). All participants restrained their child in at least a seat belt. Most respondents said they used a lap/sash belt, with two (4%) regularly using a lap only belt and a further four (8%) using a lap belt sometimes.

Table 2. How child is usually restrained when travelling in a car

Variables		Age 0–4 years n=127 (%)	Age 5–9 years n=53 (%)	Age 10–14 years n=20 (%)
Uses car seat or booster seat	Yes	124 (98)	18 (34)	2 (10)
	Sometimes	2 (2)	9 (17)	0
	No	1 (1)	26 (49)	18 (90)
Consistency of use of car seat or booster seat	All the time	120 (95)	18 (34)	2 (10)
	Usually	5 (4)	4 (8)	0
	Just now and then	1 (1)	6 (11)	0
	Don't use	1 (1)	25 (47)	18 (90)
Type of seat belt used	None	0	0	0
	Car seat/Booster	124 (98)	17 (32)	2 (10)
	Lap/sash	3 (2)	30 (57)	18 (90)
	Lap only	0	2 (4)	0
	Combination	0	4 (8)	0
Usual seating location in car	Back (side)	109 (86)	32 (60)	10 (50)
	Back (centre)	9 (7	3 (6)	0
	Front	3 (2)	0	1 (5)
	Combination	5 (4)	17 (32)	9 (45)
	Unsure or N/A	1 (1)	1 (2)	0
Ownership of car seat or booster seat	Own	111 (87)	27 (51)	2 (10)
	Rented	12 (9)	0	0
	Borrowed	3 (2)	1 (2)	0
	Don't use	1 (1)	25 (47)	18 (90)

Most children, in all age groups, were placed on the side in the back seat. However, sitting in the front seat, at least sometimes, became more common as children got older (6% in 0–4 years; 32% in 5–9 years; 50% in 10–14 years), indicating a possible change in parental attitudes to car restraint safety.

Child restraint ownership was not shown to have any apparent impact on patterns of use, but this was not tested as part of the research design and the result may have been due to the sample size.

Trip to hospital—We asked participants to provide information about how they had transported their child to hospital for this visit. Their answers are shown in Table 3.

Table 3. How families had transported their child to hospital for this visit

Variables		Age 0–4 years n=123* (%) *4 born in hospital	Age 5–9 years n=53 (%)	Age 10–14 years n=20 (%)
Car (n=147)	Car seat	84 (92)	15 (38)	2 (12)
	Seat belt	2 (2)	18 (46)	14 (82)
	Held in lap	5 (6)	3 (8)	0
	Not restrained	0	3 (8)	1 (6)
	TOTAL	91	39	17
Taxi (n=15)	Car seat	8 (73)	0	0
	Seat belt	2 (18)	2 (100)	2 (100)
	Held in lap	1 (9)	0	0
	Not restrained	0	0	0
	TOTAL	11	2	2
Ambulance (n=33)	Car seat	6 (30)	1 (8)	0
	Seat belt	12 (60)	10 (83)	1 (100)
	Held in lap	2 (10)	1 (8)	0
	Not restrained	0	0	0
	TOTAL	20	12	1
Helicopter (n=1)	Car seat	0	0	0
	Seat belt	0	0	0
	Held in lap	1 (100)	0	0
	Not restrained	0	0	0
	TOTAL	1	0	0

Table 4. Trip home from hospital

Variables		Age 0–4 years n=127 (%)	Age 5–9 years n=53 (%)	Age 10–14 years n=20 (%)
Car (n=168)	Own car seat	90 (87)	20 (42)	2 (12)
	Rented	8 (8)	0	0
	Borrowed	4 (4)	1 (2)	0
	Seat belt only	1 (1)	27 (56)	15 (88)
	TOTAL	103	48	17
Taxi (n=15)	Own car seat	7 (58)	0	0
	Rented	1 (8)	0	0
	Borrowed	0	0	0
	Seat belt only	4 (33)	0	3 (100)
	TOTAL	12	0	3
Ambulance (n=7)	Own car seat	0	0	0
	Rented	0	0	0
	Borrowed	2 (50)	0	0
	Seat belt only	2 (50)	3 (100)	0
	TOTAL	4	3	0
Unsure (n=10)	Own car seat	4 (50)	0	0
	Rented	0	0	0
	Borrowed	0	0	0
	Seat belt only	4 (50)	2 (100)	0
	TOTAL	8	2	0

The use of car seats for the 0–4 year age group reduced slightly from usual patterns of use (98%). Only 92% of those brought to hospital in a car used a car seat. This total

drops further (82%) if those brought in a taxi are included. It was noted that 8% (16/196) of children driven to hospital in vehicles, were unrestrained.

Plans for trip home—Parents and caregivers were asked to provide information about their plans for transporting their child home. The results of this are displayed in Table 4 below.

Nine (7%) children in the 0–4 year age group were at immediate risk of being transported home in an unsafe way, without a child car restraint.

Seven (3%) children required ambulance transfer. Three of these children required this due to lack of access to an appropriate car seat, as two were too small to be transported in a normal baby capsule and another had a hip spica cast fitted.

Booster seat use and awareness—Finally, we discussed the current child car restraint laws and best practice guidelines with parents and caregivers and asked them how much information they had previously known. We also showed them how tall 148 cm is and asked them to estimate whether or not their child was taller or shorter than this. We then used their estimates of their child's height to calculate how many of those children who should be in booster seats reported using one. These findings are shown in Table 5.

Table 5. Information families knew about child restraint use

Variables		0–4 years n=127 (%)	5–9 years n=53 (%)	10–14 years n=20 (%)
Aware of height recommendation	Yes	54 (43)	17 (32)	10 (50)
	No	73 (58)	36 (68)	10 (50)
Estimated height	<148cm	127 (100)	51 (96)	4 (20)
	>148cm	0	2 (4)	13 (65)
	Unsure	0	0	3 (15)
Uses car seat or booster if <148cm	Yes	124 (98)	18 (35)	1 (25)
	Sometimes	2 (2)	9 (18)	0
	No	1 (1)	24 (47)	3 (75)

Parents and caregivers report a substantial lack of knowledge with regards to best practice guidelines for child car restraint use. Overall, 60% of families interviewed were not previously aware that it is recommended for children to be restrained in a booster seat until they reach a height of 148 cm.

The group that reported the least knowledge were those with children in the 5–9 years age group, with only 32% of parents and care givers being aware.

When these results were cross referenced with those of reported booster seat use, it was found that 67% of parents and caregivers, whose children do not use or only sometimes use a booster seat, were unaware of this recommendation. However, this also implies that 33% of parents and caregivers of this age group are aware but are choosing to transport their child in suboptimal restraints.

Over 47% of 5–9 year olds who are shorter than 148 cm reportedly never use a booster seat.

Discussion

From interviews of 200 families we have demonstrated that approximately half of children over the age of 5 years are inappropriately restrained both in their travel to and from hospital and in their usual practice. A smaller, but significant proportion, of children aged younger than 5 years old were reported as being inappropriately restrained. Many children will travel home from a hospital in an unsafe fashion.

Many families would have benefited from access to a car seat service while they were at the hospital. In the group of children older than 5 years of age, these were mainly families that came from outside Auckland who had travelled to hospital by means other than a car. These families often did not have access to car seats whilst in Auckland and were more likely to transport their child in a taxi without a car seat.

Pre-admission and inter-hospital transfer processes might include advice notes for families about child restraints. Providing seats on short term rental would make child restraints available for use in vehicles travelling to and from airports. We found that families who brought their car seats with them into hospital often had nowhere to store them and were forced to store the bulky seats in the patients' rooms. A hospital-based carseat service would help troubleshoot in such situations.

Although most parents and caregivers are compliant with legislative requirements for restraining their children up to the age of 5 years, a significant number of children 5 years and over may not be using optimal restraints when travelling in the car, putting them at increased risk for serious or fatal injuries in a crash. It is apparent that the main reason for this is a widespread lack of knowledge in parents and caregivers of children of all ages, but particularly those families of children aged between 5 and 9 years. This finding is consistent with other studies looking at the use and non-use of booster seats.[2,4,6,18,19]

We found, similarly to Simpson,[18] that once we had offered information about best practice guidelines, many parents and caregivers appeared shocked to find out that they had not been doing their best by their child. A number of parents and caregivers expressed an immediate desire to change their current practice, while most others seemed open to the idea of change, especially once they had an understanding of why booster seats are recommended. Only one family expressed strong opposition to the recommendation, stating they thought it was 'unreasonably tall'.

Other reasons parents and caregivers gave for not using a booster seat were child resistance and the challenge of having enough space for more than two car seats or booster seats in the back of the family car. Cost was only mentioned as a factor by three families.[19]

Lack of knowledge appears to be the biggest barrier to appropriate child car restraint use. There is evidence to show that education alone will not adequately improve compliance with best practice guidelines.

Our study showed that at least a third of parents who do not use a booster seat for their booster eligible child are aware of the guidelines, but have chosen not to follow them. Updates to legislation regarding the use of booster seats would be expected to remedy this, and bring New Zealand in line with best practice recommendations.[9,20,21]

Many participants in our study expressed surprise that the law differs so much from safety recommendations. This difference is particularly concerning as parents are known to look to the law to guide their decisions around car seat safety.[4,18,19]

Parents and caregivers may be particularly receptive to receiving child safety information at a time when the health of a child has been threatened.[23] Health professionals are able to take the opportunity of the families' presence in hospital to encourage appropriate child car restraint use and encourage the utilisation of child car seat services to find out correct advice.

Car seat services have been shown to be effective for improving travel safety practices but literature is sparse, the provision of advice and child restraints within health services offers the opportunity to more carefully monitor responses to advice.[2,4,21,24]

A limitation of this study is that we relied on parents' and caregivers' reports of child restraint use and we were unable to verify whether these reports accurately corresponded to their actual practices. This could be relevant due to the tendency of self-reported data to overestimate use when compared to observational studies, which could be explained by people's desire to conform to socially acceptable norms.[5,19,22]

Another limitation to our study was that we were unable to verify the height of the children and therefore relied on parent and caregivers' estimates when judging whether or not they were taller or shorter than 148cm. We minimised the impact of this however, by only asking for an estimate after showing the parent or caregiver exactly how tall 148 cm was, either with a height chart[14] or a point previously identified by the interviewer.

Despite the potential issues with this method, most answered confidently, with only three parents and caregivers unable to estimate whether their child was taller or shorter than 148 cm.

Conclusion

There is a need for improved child car restraint practices for children being transported to and from hospital. Hospital-based car seat services provided in collaboration with community based services and qualified child restraint technicians would facilitate safer transport of children leaving hospital, and provide education to a receptive audience.

Booster seat legislation is recommended to improve restraint use by children older than 5 years of age (see Table 6).

Table 6. Suggestions for best-practice hospital-based child restraint services

Child health services collaborating with community based child restraint rental schemes so child car seats (on short and long term rental) and expert technical advice about car seats are accessible to families and clinical staff
Child restraint advice provided for families by qualified staff as routine part of pre-admission and discharge; and before transfer and transport between hospitals and health services
District Health Board vehicles are all fitted with anchor bolts for securing child restraints
Children's wards providing storage space for child car seats
Alignment of legislation to best practice advice for the transportation of older children

Author information: Maria KR Wilson, MBChB 4 Medical Student, Faculty of Medical and Health Science, University of Auckland, Auckland; Julie L Chambers, Trauma Coordinator, Starship Children's Health, Auckland; James K Hamill, Paediatric Surgeon, Starship Children's Hospital—and Department of Surgery, University of Auckland

Acknowledgements: This study was funded by Faculty of Medical and Health Science, University of Auckland. We also thank Peter Reed, Elizabeth Segedin, Gail Gillies and Ronald Ma for their support and help; Kiffin NZ Ltd for helping format the questionnaires; and Elizabeth Keeling and Jennifer Currigan for helping with data collection.

Correspondence: Julie Chambers, Starship Children's Hospital, Level 4, Surgical Service Support Office, PO Box 92024, Auckland 1142, New Zealand. Email: juliech@adhb.govt.nz

References:

1. Craig E, Jackson C, Han DY, Grimwood K. Monitoring the health of New Zealand children and young people: Indicator handbook: Paediatric Society of New Zealand and New Zealand Child and Youth Epidemiology Service; 2011.
2. Cameron L, Segedin E, Nuthall G, Thompson J. Safe restraint of the child passenger. J Paediatr Child Health. 2006;42(12):752-7.
3. Gulliver PJ, Simpson, JC. Injury as a leading cause of death and hospitalisation. Fact sheet 40. Dunedin: Injury Prevention Research Unit, University of Otago. 2007.
4. Macy ML, Reed MP, Freed GL. Driver report of improper seat belt position among 4-to 9-year-old children. Academic Pediatrics. 2011;11(6):487-92.
5. Winston FK, Durbin DR, Kallan MJ, Moll EK. The danger of premature graduation to seat belts for young children. Pediatrics. 2000;105(6):1179-83.
6. Yuma PJ, Maldonado M. Booster seats: Protecting the forgotten child. J Pediatr Health Care. 2006;20(2):137-40.

7. Bilston LE, Sagar N. Geometry of rear seats and child restraints compared to child anthropometry. Stapp Car Crash J. 2007;51:275-98.
8. Brown J, Bilston LE. Spinal injury in motor vehicle crashes: Elevated risk persists up to 12 years of age. Arch Dis Child. 2009;94(7):546-8.
9. Zaza S, Sleet DA, Thompson RS, Sosin DM, et al. Reviews of evidence regarding interventions to increase use of child safety seats. Am J Prev Med. 2001;21(4):31-47.
10. Klinich K, Pritz H, Beebe M, et al. Study of older child restraint/booster seat fit and NASS injury analysis: National Highway Traffic Safety Administration; 1994.
11. Arbogast KB, Jermakian JS, Kallan MJ, Durbin DR. Effectiveness of belt positioning booster seats: an updated assessment. Pediatrics. 2009;124(5):1281-6.
12. Ladyman S. Amendment to the seat belt wearing regulations 1993 regarding compulsory seat belt and child restraint wearing requirements in cars and goods vehicles Regulatory Impact Assessment (RIA). London: Department for Transport; 2006.
13. Land Transport Safety Authority. Child restraints–fact sheet no. 7. Available at: http://www.landtransport.govt.nz/factsheets/07 Wellington: New Zealand Land Transport Safety Authority; 2005.
14. Safekids New Zealand. Booster Rooster 148cm height chart. Available at: http://www.safekids.org.nz/index.php/page/Child_Passenger Auckland: Safekids NZ; 2009.
15. Cochran W. Sampling techniques. New York: Wiley; 1977.
16. Sousa VD, Zauszniewski JA, Musil CM. How to determine whether a convenience sample represents the population. Appl Nurs Res. 2004;17(2):130-3.
17. Statistics New Zealand. DHB maps and background information from the Atlas of Socioeconomic Deprivation in New Zealand NZDep2006. Wellington: Ministry of Health; 2008.
18. Simpson EM, Moll EK, Kassam-Adams N, Miller GJ, et al. Barriers to booster seat use and strategies to increase their use. Pediatrics. 2002;110(4):729-36.
19. Ebel BE, Koepsell TD, Bennett EE, Rivara FP. Too small for a seatbelt: predictors of booster seat use by child passengers. Pediatrics. 2003;111(4):e323-7.
20. Staunton C, Davidson S, Kegler S, et al. Critical gaps in child passenger safety practices, surveillance, and legislation: Georgia, 2001. Pediatrics. 2005;115(2):372-9.
21. Durbin DR, Elliott MR, Winston FK. Belt-positioning booster seats and reduction in risk of injury among children in vehicle crashes. JAMA. 2003;289(21):2835-40.
22. Streff FM, Wagenaar AC. Are there really shortcuts? Estimating seat belt use with self-report measures. Accid Anal Prev. 1989;21(6):509-16.
23. McBride C, Emmons K, Lipkus I. Understanding the potential of teachable moments: the case of smoking cessation. Health Education Research. 2003;18(2):156-70.
24. Hunter K, Keay L, Brown J, et al. A multifaceted program to increase the appropriate use and decrease the misuse of child restraints. Australasian Road Safety Research, Policing and Education Conference; Perth, Australia; 2011.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Parent versus child reporting of tobacco smoke exposure at home and in the car

Marewa Glover, Georgy Hadwen, Carol Chelimo, Robert Scragg, Chris Bullen, Dudley Gentles, Vili Nosa, Judith McCool

Abstract

Aim To compare self-reported exposure to tobacco smoke in the home or in cars between parents and their pre-adolescent children.

Methods We analysed data on self-reported exposure to secondhand smoke from 3,645 matched pairs of children at baseline (aged between 10 and 13 years) and their parents whether smokers or not, who were participants in Keeping Kids Smokefree (KKS), a community-based study in South Auckland, New Zealand from 2007-2009. The study aimed to reduce children's smoking initiation through parental behaviour change. The responses of the parent-child pairs were analysed using proportions, Kappa scores, and McNemar's Chi-squared test. Additionally, 679 children were biochemically tested for smoking exposure using exhaled carbon monoxide.

Results There was approximately a 30% discordance between the self-reports of children and their parents, with parents reporting less smoking in homes or cars than their children. Kappa scores for parent-child agreement by ethnicity ranged from 0.15 to 0.41 for smoking at home and 0.17 to 0.54 for smoking in cars. Biochemical testing suggested that around 30% of children had been exposed to secondhand smoke, corroborating their self-reported proportion of 37% (baseline in the home) whereas few parents (11%) reported smoking in home or cars.

Conclusion Parents were significantly less likely than children to report smoking inside the home or car. Biochemical testing indicated that children's reporting is more accurate. This has implications for future studies relying on self-reporting by children and/or their caregivers.

Exposure to secondhand smoke (SHS) is a serious health hazard for children.[1] SHS exposure is associated with a number of respiratory conditions;[2-4] pneumonia,[3,5,6] poor heart health,[7,8] allergic diseases,[9,10] and middle ear infections and ear drum abnormalities.[11,12] Exposure to adults who smoke also increases the likelihood of smoking uptake among children.[13]

Although overall, 22% of New Zealanders aged over 15 years smoke, Māori (the indigenous people of New Zealand) and Pacific Island people resident in New Zealand (NZ) have far higher smoking prevalence (45% and 31% respectively), than European New Zealanders (21%).[14]

Despite mass media campaigns designed to raise awareness of the harms to children of smoking in cars and homes,[15] children are still exposed to SHS in these settings. However, the data on SHS exposure are inconsistent when comparing data from

parents and children. For example, in the same year (2009), two studies conducted in NZ gave very different results.

In one study, 19% of Māori, 10% of Pacific and 7% of non-Māori, non-Pacific parents reported their pre-teen children were exposed to SHS at home.[16] In the other study 56%, 48% and 25% of Māori, Pacific Island and European adolescents respectively reported exposure to SHS in their homes, and 46%, 35% and 20% for Māori, Pacific Island and European adolescents respectively reported SHS exposure in cars.[17]

As well as showing major differences between the ethnic groups, the differences in reporting of SHS exposure between adults and adolescents in all ethnic groups were substantial.

We found four studies (two conducted in the United States, one in Canada and one in the Netherlands) that compared parents and children's reports on smoking status in the home and/or in cars. In all studies, parents' reports of their childrens' exposure to SHS were consistently lower than the childrens' reports.[18-21]

In our study we used exhaled carbon monoxide (CO) as an objective measure of tobacco smoke exposure in children and compared the results with the childrens' self-reports of SHS exposure in the home and in cars. We also compared the childrens' reports of smoking in the home or car with parental reports.

Another dimension to our research was to examine if the levels of reported and actual exposure were the same for the different ethnic populations involved in the Keeping Kids Smokefree (KKS) study (which has been described elsewhere)[22] and was focused largely on the Indigenous Māori and Pacific peoples.

Method

Study design—Data was collected in the baseline and follow-up survey of KKS from 2007-2009, a large quasi-experimental community-based intervention trial, which aimed to change the smoking behaviours and attitudes of parents in order to reduce their childrens' uptake of smoking.

In brief, four sociodemographically matched schools catering for children aged between 10 and 13 years, located in areas of Auckland, NZ with a high proportion of Māori and Pacific Islands residents were allocated to receive a 3 year long tobacco control intervention or delayed intervention (the control schools received one year of the intervention in the 4th year).

Our trial also included significant numbers of Indian and Asian children whom are included in our analysis. All children and their parents at the four schools were invited to participate in the study.

Data collection—Data were collected at baseline and follow up for each calendar years' student cohort from 2007 to 2009, except in 2007 the Year 8 students were only followed for that year as they leave School at the end of the year and in 2009 the Year 7 students were only followed for one year as that was the end of the study. All other year level cohorts were followed for 2 years.

Smoking exposure data was collected from children and parents in their baseline and follow up questionnaires (Table 1). Children were surveyed in class using self-administered questionnaires loaded onto personal digital assistants (PDAs). Parents completed paper-based questionnaires, which were given to children to take home to their parents.

Table 1. Questions on Smoking in Home, Car and Smoking Status

Measure	Child questionnaire	Parent questionnaire
Smoking inside the home	"During the past 7 days, on how many days have people smoked around you INSIDE your HOME?" (response: no days; 1-2 days; 3-4 days; 5-6 days; 7 days)	"Do people smoke INSIDE your house?" (response: yes; no)
Smoking in the car	"During the past 7 days, on how many days have people smoked while you were travelling in a CAR?" (response: no days; 1-2 days; 3-4 days; 5-6 days; 7 days; did not travel in a car)	"Do people smoke in your car?" (response: yes; no)
Smoking status	How often do you smoke now? (response: 1. I am not a smoker, 2. At least once a day, 3. At least once a week, 4. At least once a month, and 5. Less than once a month.)	How much do you smoke now? (response: I don't smoke now; 1-10 cigarettes a day; 11-20 cigarettes a day; More than 20 cigarettes a day). [a current smoker was defined as smoking at least one cigarette per day]

Biochemical data—The CO test was only conducted at follow up on children in 2008. Children exhaled slowly and completely into a disposable tube attached to a portable Bedfont Micro-4-Smokerlyzer. The reading, CO in parts per million (ppm), which gives an indication of blood carboxyhaemoglobin in percentages (%CoHb), displayed on the Smokerlyzer screen, was recorded.[23] Results were categorised as 0 = non-smoker; 1-4 = non-smoker but exposed to SHS; 5+ = smoker. We used a low cut-off of 5+ for CO to categorize smokers because of New Zealand's low air pollution.

Statistical analysis—Parent-child pairs were matched using their unique study identifiers and the year of data collection. Child reports of smoking exposure in the home and car were dichotomized into no exposure or one or more days of smoking exposure.

Concordance of responses from parent-child pairs on the two measures were counted and summarised using the Kappa coefficient (together with 95% confidence intervals) and percent agreement (number of concordant pairs divided by total number of pairs). P-values were obtained using McNemar's test for both the entire sample and also stratified by ethnicity. Statistical analysis was done using SAS version 9.2 (SAS Institute Inc., Cary, NC, USA).

Results

A total of 4,688 child-parent matched pairs (dyads) participated in the follow up survey, resulting in a response rate of 83% (out of a total of 5,676). The analyses were restricted to the 3,645 dyads that completed all the relevant questions at baseline.

Table 2 shows the numbers and proportions of both parents and children participating in the study, at baseline and follow-up, by ethnicity. A higher proportion of children than parents reported SHS exposure in the home or in a car.

For nearly 30% of the parent-child dyads there was a mismatch between reported exposure to SHS in car or home (Table 3). The mismatch between parent and children reporting was statistically significant ($p < 0.0001$) for all results (Table 3). For Māori dyads the differences in agreement between parent and child reports were highest (i.e. child and parent reports were further apart) (Table 4).

Table 2. Characteristics of parent-child pairs at baseline and follow-up

Variables	Baseline (n=3645)		Follow-up (n=2858)	
	Parents n (%)†	Children n (%)†	Parents n (%)†	Children n (%)†
Ethnicity				
Pacific Islands	1471(41.3)	–	1255 (44.5)	–
Māori	955 (26.8)	–	666 (23.6)	–
Indian	525 (14.7)	–	473 (16.8)	–
European and Other	374 (10.5)	–	235 (8.3)	–
Asian	240 (6.7)	–	194 (6.9)	–
Gender				
Male	805 (23.8)	1717 (47.1)		
Female	2579 (76.2)	1928 (52.9)		
Age				
10		297 (8.2)		
11		2551 (70.0)		
12		730 (20.0)		
13		67 (1.8)		
Current Smoker	1012 (29.0)	–		
Smoking in the home	389 (10.8)	1354 (37.2)	218 (7.7)	920 (32.2)
Smoking in the car	516 (16.4)	1344 (37.6)	402(14.8)	869 (31.0)

† Counts and percentages may not add-up to totals due to missing data and rounding, respectively

Table 3. Parent-child agreement for reports of smoking in the home and car at baseline and follow-up

Parent Report (n)	Child Report (n)			Agreement n (%)	Kappa (95% CI)	p-value†
Baseline						
Smoking in the home	**Yes**	**No**	**Total**	**2524**	**0.25**	**<0.0001**
Yes	327	61	388	(70.2)	(0.22 – 0.28)	
No	1008	2197	3205			
Total	1335	2258	3593			
Smoking in the car	**Yes**	**No**	**Total**	**2270**	**0.36**	**<0.0001**
Yes	411	87	498	(73.6)	(0.33 – 0.39)	
No	729	1859	2588			
Total	1140	1946	3086			
Follow-up						
Smoking in the home	**Yes**	**No**	**Total**	**2065**	**0.23**	**<0.0001**
Yes	184	34	218	(73.2)	(0.20 – 0.26)	
No	721	1881	2602			
Total	905	1915	2820			
Smoking in the car	**Yes**	**No**	**Total**	**2066**	**0.38**	**<0.0001**
Yes	308	87	395	(77.4)	(0.34 – 0.42)	
No	515	1758	2273			
Total	**823**	**1845**	**2668**			

† McNemar's test; CI= Confidence Interval

Table 4. Baseline parent-child agreement for reports of smoking in the home and car by ethnicity

Variables	n	Agreement n (%)	Kappa (95% CI)	p-value†
Smoking in the home				
Māori	940	558 (59.4)	0.24 (0.20 – 0.29)	<0.0001
Pacific Islands	1455	1016 (69.8)	0.15 (0.11 – 0.20)	<0.0001
Asian	236	193 (81.8)	0.41 (0.27 – 0.54)	<0.0001
Indian	523	442 (84.5)	0.16 (0.06 – 0.26)	<0.0001
European and Other	367	267 (72.8)	0.39 (0.30 – 0.47)	<0.0001
Smoking in the car				
Māori	756	485 (64.2)	0.31 (0.26 – 0.37)	<0.0001
Pacific Islands	1286	930 (72.3)	0.30 (0.25 – 0.35)	<0.0001
Asian	217	185 (85.3)	0.32 (0.15 – 0.49)	<0.0001
Indian	457	377 (82.5)	0.17 (0.07 – 0.27)	<0.0001
European and Other	313	250 (79.9)	0.54 (0.44 – 0.64)	<0.0001

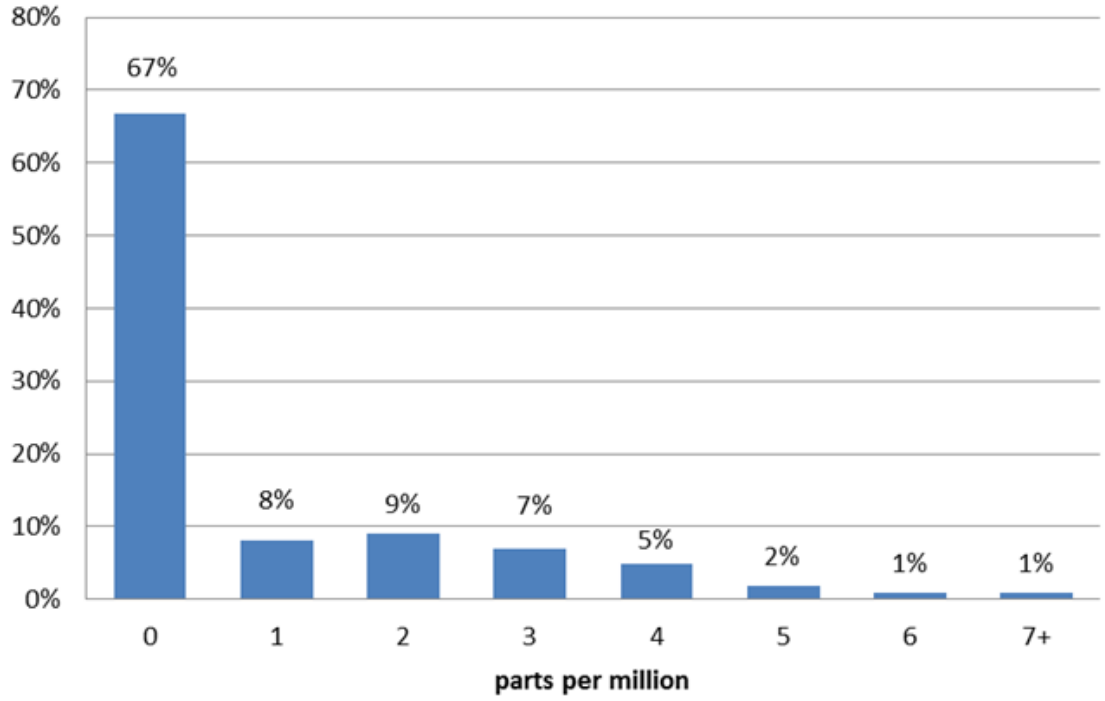
† McNemar's test; CI= Confidence Interval

Biochemical testing—The total number of children at follow-up was 1,134. Consent for CO testing was obtained at follow up from parents for 679 (59%) of children. The CO test detected a reading higher than 4, suggesting active smoking, for 4% of children (Table 5 & Figure 1). Nearly 30% of children had CO levels of 1-4 most likely due to exposure to SHS (Figure 1).

Table 5. Biochemical test compared to self-reported smoking for children

CO test	Self-reports		
	Smoke Daily	Irregular/Not/Never	Total
Positive (CO > 4ppm)	3	22	25
Negative (CO 0-4ppm)	5	649	654
Total	8	671	679

Figure 1. Exhaled carbon monoxide readings from children



Discussion

This study found that parents' and childrens' reporting of exposure to smoke at home and in cars differed significantly. Only 11% of parents reported that smoking occurred in the home at baseline while 38% of children reported being exposed to smoking in their home (Table 2). The CO tests supported this higher rate with nearly 30% of the children having readings indicative of exposure to SHS, despite the short half-life of CO (3-4hrs with sedentary activity).[24]

While it is not possible to be sure where exposure occurred, the findings suggest that the childrens' reports of SHS exposure in the home were likely to be more accurate than the parental reports indicated. Our results are consistent with another study reporting on adolescent SHS exposure[17] and suggest that reports by parents in a previous study may have underestimated exposure.[16]

Previous research found between 6%[20] and 19%[18] discrepancy (lack of agreement) on smoking in the home, and 10% [20] to 30% discrepancy on smoking in cars.[18] The present study is consistent with this previous research with the exception that the discrepancies were at the higher end (i.e. 30%) and were all statistically significant.

We found a substantially higher discrepancy between parent and child reports for home smoking, in particular for Māori dyads. However, when Kappa scores (indicating the proportion of agreement over and above chance) were used, the discrepancy for Māori, while still high, was similar to that of other ethnic groups. There were substantial discrepancies among all ethnic groups for reporting on

smoking in the home or car as indicated by the relatively low Kappa scores ranging from 0.15 for Pacific to 0.54 for Europeans/other.

Together, these data imply that the discrepancy is one of under-reporting by parents of smoking in the home and car which their children are likely exposed to. Also parental under-reporting is larger for smoking exposure in the home than the car (Table 2).

Explanations for under-reporting by parents include a number of possibilities: first, parents may not be aware that other adults or the childrens' friends sometimes smoke in the home.

Another New Zealand study found that one third of Year 10 students who reported being exposed to smoking in their home were exposed to smoking from their friends in their home.[17]

Second, parents' definition of a smokefree home may have been 'generous' or, parents have given the answer they thought to be 'right' (social desirability bias i.e. that neither they nor other people are smoking around their children).

Within the confines of a car children are exposed to concentrations of SHS equivalent to about half the concentrations found in a smoke-filled pub in England before the implementation of smokefree legislation in 2007.[25]

Unlike adults exposed in a pub, children don't have a choice about being exposed. Although, it has been claimed that there is widespread public support for smoking bans in the home or cars,[26] NZ politicians have argued against such bans.[27] The vast majority of youth do not think smoking should be allowed around children in those locations.[17, 28]

The call to ban smoking in vehicles when children are present is being echoed around the world. Such bans already exist in a number of US states, Canadian provinces, and Australian states.[29] Edwards et al[30] reported that the New Zealand Smokefree Environments Amendment Act (2003) (which does not include vehicle or home smoking bans) had a range of positive effects, including reducing SHS exposure at home among Māori communities.

A recent Cochrane review[31] found there was no change to SHS exposure in homes or private cars following a legislative ban. The result in this paper may provide a possible explanation for the lack of change – parents are either denying or are unaware of the level of their childrens' SHS exposure in homes and cars.

CO readings are useful for detecting exposure to SHS but are not as useful for validating self-reported smoking status among young irregular smokers because of the short half-life of CO.[24]

Strengths of this study are its focus on populations with high smoking prevalence rates, who suffer significant health disparities compared to the dominant NZ European population.

All parents rather than a sample were invited to participate and there was a very high response rate of 83%. Most parent participants were female (76%). This was a strength of the study given that the smoking prevalence in NZ is the highest among Māori females. This does however limit generalisability to broader populations.

On smoking in the home, children were asked *'During the past 7 days, on how many days have people smoked around you inside your home?'* (Table 1), while parents were asked a different question *'Do people smoke inside your house?'* It is possible for the child to answer 'no days' and the parent 'yes' yet both may be correct. That is, smoking might have occurred more than 7 days ago but not within the current week.

Our question on smoking in cars asked children: *'...how many days have people smoked while you were travelling in a car'* (Table 1), while parents were asked *'Do people smoke in your car?'* This means that the smoking could have occurred in a car other than the parents' car thereby overestimating (biasing) the childrens' 'yes' responses compared to their parents.

Other limitations are that the analysis did not include biochemical verification for each dyad of actual SHS and the very small number of children who were daily smokers (n=8).

To sum up, in our study's findings:

- Biochemical tests show that children report smoking more accurately than their parents. This was true for all ethnicities.
- 3 out of 10 children in South Auckland in 2008 were exposed to cigarette smoke at home and in the family car.
- Half or more of the time, parents did not report the smoking in the home or car to the same level as their childrens' reported exposure, and this applied across all ethnicities.
- Childrens' reports of exposure to smoke at home or in cars can be relied upon and should be preferred in general over parental reports of smoking in the home and car, for policy making on this topic in future. Also they should be listened to most because they are most affected.

Quitting for childrens' health is a common and powerful motivation for parents to quit, especially Māori and Pacific.[32] Our findings support that parents should be focused in the drive towards Smokefree 2025 to quit and because this would reduce harm due to SHS exposure.

Conclusions

Parents under-report (or are unaware of) their childrens' likely exposure to SHS in the home and car. Childrens' reports, show high fidelity with objective measures of smoke exposure and therefore should be preferred over that of their parents for establishing the prevalence of smoking in the home or in cars. We feel this has wider implications when using parent child self-reports to inform policy.

Clinicians could advise parents presenting with a child with any smoking related illness that their child may be exposed to smoke more than they realise, that is, in other peoples' cars and even in their own presumably smokefree home.

Competing interests: Nil.

Author information: Marewa Glover, Director, Centre for Tobacco Control Research, School of Population Health, University of Auckland; Georgy Hadwen, Lions Eye Institute, University of Western Australia, Perth, Australia; Carol Chelimo, Biostatistician, Department of Epidemiology & Biostatistics, School of Population Health, University of Auckland; Robert Scragg, Professor, Department of Epidemiology & Biostatistics, School of Population Health, University of Auckland; Chris Bullen, Associate Professor, National Institute for Health Innovation, School of Population Health, University of Auckland; Dudley Gentles, Biostatistician, Centre for Tobacco Control Research, School of Population Health, University of Auckland; Vili Nosa, Senior Lecturer, Pacific Health, School of Population Health, University of Auckland; Judith McCool, Global Health, School of Population Health, University of Auckland

Acknowledgements: Funding for this study was provided by the Health Research Council of New Zealand (05-065E). Candy Eason managed the data collection and storage. Dr Anette Kira provided internal reviews of the draft paper. At the time of writing the initial draft Georgy Hadwen was an employee at the Centre for Tobacco Control Research.

Correspondence: Dr Marewa Glover, Centre for Tobacco Control Research, School of Population Health, University of Auckland, New Zealand. Fax: +64 (0)9 3035932; email: m.glover@auckland.ac.nz

References:

1. Oberg M, Jaakkola MS, Woodward A, et al. Worldwide burden of disease from exposure to second-hand smoke: a retrospective analysis of data from 192 countries. Lancet. 2011;377:139-46.
2. Fergusson DM, Horwood LJ, Shannon FT. Smoking during pregnancy. N Z Med J. 1979;89:41-3.
3. Gergen PJ, Fowler JA, Maurer KR, et al. The burden of environmental tobacco smoke exposure on the respiratory health of children 2 months through 5 years of age in the United States: Third National Health and Nutrition Examination Survey, 1988 to 1994. Pediatrics. 1998;101:E8.
4. Li DK, Mueller BA, Hickok DE, et al. Maternal smoking during pregnancy and the risk of congenital urinary tract anomalies. Am J Public Health. 1996;86:249-53.
5. Suzuki M, Thiem VD, Yanai H, et al. Association of environmental tobacco smoking exposure with an increased risk of hospital admissions for pneumonia in children under 5 years of age in Vietnam. Thorax. 2009;64:484-9.
6. Vork KL, Broadwin RL, Blaisdell RJ. Developing asthma in childhood from exposure to secondhand tobacco smoke: insights from a meta-regression. Environ Health Perspect. 2007;115:1394-400.
7. Cohen G, Jeffery H, Lagercrantz H, Katz-Salamon M. Long-term reprogramming of cardiovascular function in infants of active smokers. Hypertension. 2010;55:722-8.
8. Lovasi GS, Diez Roux AV, Hoffman EA, et al. Association of environmental tobacco smoke exposure in childhood with early emphysema in adulthood among nonsmokers: the MESA-lung study. Am J Epidemiol. 2010;171:54-62.
9. Keil T, Lau S, Roll S, et al. Maternal smoking increases risk of allergic sensitization and wheezing only in children with allergic predisposition: longitudinal analysis from birth to 10 years. Allergy. 2009;64:445-51.
10. Kramer U, Lemmen CH, Behrendt H, et al. The effect of environmental tobacco smoke on eczema and allergic sensitization in children. Br J Dermatol. 2004;150:111-8.

11. Adair-Bischoff CE, Sauve RS. Environmental tobacco smoke and middle ear disease in preschool-age children. Arch Pediatr Adolesc Med. 1998;152:127-33.
12. Strachan DP, Jarvis MJ, Feyerabend C. Passive smoking, salivary cotinine concentrations, and middle ear effusion in 7 year old children. BMJ. 1989;298:1549-52.
13. Glover M, Scragg R, Min S, et al. Driving kids to smoke? Children's reported exposure to smoke in cars and early smoking initiation. Addict Behav. 2011;36:1027-31.
14. Ministry of Health. Tobacco Trends 2008: A brief update of tobacco use in New Zealand. Wellington: Ministry of Health; 2009.
15. Wilson N, Thomson G, Edwards R. Use of four major tobacco control interventions in New Zealand: a review. N Z Med J. 2008;121:71-86.
16. Ministry of Health. A Focus on the Health of Māori and Pacific Children: Key findings of the 2006/07 New Zealand Health Survey. Wellington: Ministry of Health; 2009.
17. Health Sponsership Council. 2008 HSC Year 10 In-depth Survey Report. Wellingon: Health Sponsorship Council; 2009.
18. Ding D, Wahlgren DR, Liles S, et al. A second reporter matters: agreement between parents' and children's reports of smoking bans in families. Am J Prev Med. 2011;40:572-5.
19. Mumford EA, Levy DT, Romano EO. Home smoking restrictions. Problems in classification. Am J Prev Med. 2004;27:126-31.
20. Nowatzki J, Schultz AS, Griffith EJ. Discrepancies between youth and parent perceptions of their household environment relevant to smoking: a secondary analysis of the 2004/05 Canadian Youth Smoking Survey. Chronic Dis Can. 2010;30:78-83.
21. Harakeh Z, Engels RC, Vries H, Scholte RH. Correspondence between proxy and self-reports on smoking in a full family study. Drug Alcohol Depend. 2006;84:40-7.
22. Glover M, Scragg R, Nosa V, et al. Keeping Kids Smokefree: rationale, design, and implementation of a community, school, and family-based intervention to modify behaviors related to smoking among Maori and Pacific Island children in New Zealand. Int Q Community Health Educ. 2009;30:205-22.
23. Smokerlyzer breath carbon monoxide (CO) monitors. 2012. URL: http://www.bedfont.com/uk/english/smokerlyzer
24. Benowitz NL. The use of biologic fluid samples in assessing tobacco smoke consumption. NIDA Res Monogr. 1983;48:6-26.
25. Semple S, Apsley A, Galea KS, et al. Secondhand smoke in cars: assessing children's potential exposure during typical journey conditions. Tob Control. 2012.
26. Wilson N, Blakely T, Edwards R, et al. Support by New Zealand smokers for new types of smokefree areas: national survey data. N Z Med J. 2009;122:80-9.
27. Thomson G, Hudson S, Wilson N, Edwards R. A qualitative case study of policy maker views about the protection of children from smoking in cars. Nicotine & Tobacco Research. 2010;12:970-7.
28. Leatherdale ST, Smith P, Ahmed R. Youth exposure to smoking in the home and in cars: how often does it happen and what do youth think about it? Tob Control. 2008;17:86-92.
29. Hitchman SC, Fong GT, Zanna MP, et al. Support and correlates of support for banning smoking in cars with children: findings from the ITC Four Country Survey. Eur J Public Health. 2011;21:360-5.
30. Edwards R, Thomson G, Wilson N, et al. After the smoke has cleared: evaluation of the impact of a new national smoke-free law in New Zealand. Tob Control. 2008;17:e2.
31. Callinan JE, Clarke A, Doherty K, Kelleher C. Legislative smoking bans for reducing secondhand smoke exposure, smoking prevalence and tobacco consumption. Cochrane Database Syst Rev. 2010:CD005992.

32. Glover M, Nosa V, Watson D, et al. WhyKwit. What motivates Māori and Pacific Island peoples to stop smoking: Research results summary [Booklet] [School of Population Health]. Auckland: University of Auckland; 2010.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

The use and acceptability of electronic cigarettes among New Zealand smokers

Judy Li, Chris Bullen, Rhiannon Newcombe, Natalie Walker, Darren Walton

Abstract

Aim To investigate New Zealanders' use, perceptions and views on the acceptability of electronic cigarettes (e-cigarettes).

Method 840 current smokers and recent quitters were recruited through random digit dialling as part of the New Zealand Smoking Monitor (NZSM), a 33-item telephone-based survey delivering 120 interviews per fortnight. Two sets of questions were deployed at different times to assess ever-purchase of e-cigarettes, perceptions of the safety and cessation efficacy of e-cigarettes, and acceptability of using them instead of tobacco cigarettes or as a cessation aid.

Results 7% of the sample reported having purchased an e-cigarette. One-third of respondents believed them to be safer to use than tobacco cigarettes, and could help people quit smoking tobacco. Forty-one percent considered it acceptable to use e-cigarettes as a replacement product and 58% as a cessation aid. Responses differed according to ethnicity, age and household income.

Conclusion Purchasing (and therefore we assume, use) of e-cigarettes in New Zealand is uncommon. Despite this finding, many respondents viewed e-cigarettes in a positive light and indicated willingness to use them. Ongoing monitoring on the use of and public attitudes towards this emerging product is recommended.

Electronic cigarettes (sometimes referred to as electronic nicotine delivery systems or ENDS but hereafter referred to as 'e-cigarettes') are devices that vapourise propylene glycol and/or glycerol, with or without nicotine, via an electrically-powered heating element activated when the user draws on the mouthpiece. These products are gaining popularity in many countries but little is known about their use in New Zealand.

E-cigarettes are produced by many different manufacturers and a wide range of products are now available. Nicotine-containing e-cigarettes can deliver nicotine to smokers who want to quit, in a similar way as nicotine replacement products do. [1-2]

In an on-line user survey undertaken in 2011, Etter and Bullen found that, compared with users of nicotine-free e-cigarettes, those who were using e-cigarettes that contained nicotine were more likely to report that the devices had helped them: deal with craving and withdrawal, cut down, quit completely.[3]

In New Zealand, only e-cigarettes that contain non-nicotine cartridges are allowed to be sold, as they are otherwise categorised as medicines.[4] However, importing nicotine cartridges from overseas for personal use is not prohibited. In fact, electronic cigarettes (with or within nicotine content) are easily obtainable from online shops.

Recent surveys show the proportion of adult smokers who had ever used an e-cigarette ranged from 6-11% in the USA and 18% in the United Kingdom.[5-7] Data on the use of e-cigarettes in general, and by youth in particular, are limited.

Only two youth-focussed studies have been published to date. One of them was a nationally representative sample of 13,787 Polish students aged 15-24 years that found 'ever-use' of e-cigarettes among 4,738 current smokers was 43% and 'use in the last 30-days' was 15%.[8] Among the 9,022 non-smokers in the study (never-smokers and ex-smokers combined), ever-use and 30-days use of e-cigarettes was 9% and 2% respectively. The proportion of Korean middle-school and high-school students who have ever used e-cigarettes was a lot lower, at 0.5% in a sample of 4,341 students.[9]

Despite the public interest in this product and claims by users and retailers that they help smokers quit, e-cigarettes remain controversial. One reason for this is a lack of safety and cessation efficacy data.[10-11] Another is that because most e-cigarettes are designed to resemble tobacco cigarettes, and using them mimics the many hand-to-mouth actions involved in regular cigarette use could possibly undermine gains made in youth tobacco initiation and smoke-free environments.[12]

In contrast, supporters see e-cigarettes as having potential for helping many smokers quit tobacco use, or minimise harm for those who do not want to stop smoking completely.[13-14] Borland (2011) acknowledged the potential benefits of e-cigarettes to smokers who were unable to quit smoking, but also noted the importance of encouraging use of proven cessation aids while monitoring the uptake of e-cigarettes among young people (including their uptake by non-smokers).[15]

A handful of e-cigarette studies conducted overseas have shed light on both the public's and users' perceptions and behaviours with these devices.[3,5,7-9,16-19] The largest of these studies, an online survey of 3,037 people from all over the world who had ever used e-cigarettes, found that 92% of current smokers considered e-cigarettes had helped them reduce the amount of tobacco they smoked and 96% of ex-smokers believed that e-cigarettes had helped them quit smoking.[3]

E-cigarettes were used by survey participants for smoking relapse prevention, reducing the health harm of tobacco smoking, to save money, and/or as a temporary solution to deal with cravings when they were unable to smoke tobacco. Almost all ever-users in the survey were still using e-cigarettes daily, drawing on average 120 puffs per day. About half of the daily-users intended to use them for at least another 12 months.

To date, there have been no published data on the use, perceptions and acceptability of e-cigarettes in New Zealand. In this study, we aimed to address this knowledge gap by analysing data collected from two samples of adult current smokers and recent quitters.

Method

Participants—The New Zealand Smoking Monitor (NZSM) is a fortnightly computer-assisted telephone interviewing (CATI) survey that has been used by the Ministry of Health and the Health Promotion Agency since 2011 to collect representative population data on tobacco use. This paper reports data collected from 840 current smokers and recent quitters aged 18 years or over. Half of the sample were current smokers who smoked at least one cigarette a month and who had not made a quit

attempt lasting 24 hours or more in the past three months (termed 'current smoker non-attempter'). The other half of the sample was those who have made a quit attempt lasting 24 hours or longer in the past three months which may or may not have been sustained (termed 'recent quit attempters').

Questionnaire—The survey collected information on knowledge, attitudes and beliefs about smoking and quitting, plus awareness of tobacco control activities. The questionnaire had an add-on module to enable additional questions to be incorporated in response to emerging issues. In 2011/12, two separate sets of questions/statements were added into the NZSM about e-cigarettes.

The first set of questions/statements was run in July-September 2011 (n=480) and the second in March-May 2012 (n=360). These sets included one question that assessed ever-purchase of e-cigarettes, and five statements that assessed the extent to which respondents agreed or disagreed with the safety and cessation efficacy of e-cigarettes, and willingness to use e-cigarettes to replace tobacco cigarettes or a cessation aid. The exact wordings were as follows:

Set 1:

1. Have you ever purchased an e-cigarette? (Yes/No)
2. E-cigarettes are safer to use than tobacco e-cigarettes.
3. E-cigarettes can help people quit smoking tobacco.

Set 2:

1. I would switch to e-cigarettes completely if they are cheaper than tobacco cigarettes.
2. If I wanted to stop smoking tobacco, I would give e-cigarettes a go to help me quit smoking.

'Ever-purchased' was used as a proxy for a planned effort to obtain an e-cigarette. A five-point scale was used for statements 2-5, and ranged from 1 = strongly disagree to 5 = strongly agree, in response to each statement.

Sampling procedure and statistical analyses—Respondents were selected from all New Zealand residents using random digit dial (RDD). A two-stage approach was followed to produce a random sample generated from a geographically and demographically diverse sampling frame.

The first stage involved computer-generation of three digit combinations (representing the geographical location of residence) where the chance of being selected was equal to the proportion of households in each defined geographical area.

The last four digits were randomly generated. One hundred and twenty interviews were conducted each fortnight, with a set target of 60 'current smokers non-attempters' and 60 'recent quit attempters'.

STATA 12.0 was used to perform the data analyses. Simple descriptive statistics were first calculated for proportions and means, with chi square-tests used to assess the strength of the associations between each of the outcomes and eight sociodemographic variables.

Variables that had a p-value greater than 0.10 were excluded from further analyses (e.g. household composition and household location - urban/rural). Multinomial logistic regression models were used to investigate the associations between each of the outcomes of interest and sociodemographic variables.

Statements related to whether respondents thought e-cigarettes were safer than tobacco cigarettes and whether they thought e-cigarettes could help people quit smoking had a high proportion of respondents answering 'don't know'.

Thus two multinomial logistic regression models were fitted for these variables: 1) to calculate the odds of respondents agreeing with these statements among those who could provide an answer using the five-point scale, and 2) to calculate the odds of respondents answering 'don't know' among all respondents.

Results

Table 1 shows the characteristics of the two samples. Of the 480 current smokers and recent quitters that answered set one questions, 34 (7%) respondents reported that they had ever purchased an e-cigarette.

Statistically significant differences were found by age and household income, where people aged 18-24 years had a four-fold higher odds of ever-purchasing an e-cigarette when compared with those aged 45 year or over.

People with a high household income had significantly increased odds of ever-purchasing an e-cigarette than those with a medium or unspecific household income (Table 2).

Table 1. Participants by sociodemographic and smoking-related characteristics

Variables	Set 1 (%) n=480		Set 2 (%) n=360	
	n	%	N	%
Gender				
Male	179	37.4	135	37.5
Female	300	62.6	225	62.5
Ethnicity				
Māori	107	22.3	99	27.5
non-Māori	373	77.7	261	72.5
Age	37	7.8	29	8.1
18–24	198	41.3	155	43.3
25–44	245	51.0	174	48.6
45+				
Highest qualification	81	54.9	65	58.2
Secondary school	360	45.1	272	41.8
Above secondary school level				
Household equivalised income				
Low	126	26.3	90	25.0
Med	110	22.9	95	26.4
High	131	27.3	94	26.1
Unspecified	113	23.5	81	22.5
Last 3 month quit attempt				
No attempt	240	50.0	180	50.0
1+ attempts	240	50.0	180	50.0

Note: Some categories do not add up to the total sample size due to respondents answering ‘don’t know’ or refusing to answer.

One-third of the respondents agreed that e-cigarettes were safer than tobacco cigarettes (n=158) and a similar proportion agreed e-cigarettes could help people quit smoking (n=162). For both statements, one-third of the sample answered ‘don’t know’.

Among those who could form an opinion, non-Maori were twice as likely to believe e-cigarettes were safer than tobacco cigarettes. Furthermore, those aged 45 years or older and people with high household income were more likely to believe that e-cigarettes could help people quit smoking (Table 2). People aged 45 years or older were more likely to answer ‘don’t know’ to these two statements (Table 3).

Table 2. Comparison of 'ever-purchased' and agreement with statements - odds ratios (OR) from binary logistic regression analysis

Variables		OR (95% CI)				
		Ever purchased (Yes) (Set 1)	Perceived safety (Strongly agreed/ agreed) (Set 1)	Perceived efficacy (Strongly agreed/ agreed) (Set 1)	Willing to switch to e-cigarettes if they are cheaper (Strongly agreed/ agreed) (Set 2)	Willing to use e-cigarettes to support a quit attempt (Strongly agreed/ agreed) (Set 2)
		n=480	n=317, excluded 'don't know'	n=313, excluded 'don't know'	n=360	n=360
Gender						
	Male	1	1	1	1	1
	Female	1.37 (.62-3.05)	1.39 (.85-2.27)	1.19 (.72-1.95)	1.38 (.85-2.26)	1.07 (.66-1.73)
Ethnicity						
	Māori	1	1	1	1	1
	Non–Māori	2.39 (.77-7.43)	**2.16 (1.16-4.03)**	.91 (.49-1.69)	1.18 (.70-1.98)	1.25 (.75-2.07)
Age group						
	45+ years	1	1	1	1	1
	18 - 24 years	**4.36 (1.17-16.16)**	1.81 (.78-4.18)	.50 (.21-1.17)	1.14 (.47-2.76)	**3.37 (1.17-9.69)**
	25 - 44 years	1.68 (.76-3.74)	1.56 (.94-2.60)	**.47 (.28-.78)**	.69 (.42-1.13)	.85 (.53-1.37)
Highest qualification						
	Up to secondary school	1	1	1	1	1
	Above secondary school	.97 (.34-2.75)	.67 (.34-1.32)	.50 (.25-1.00)	1.51 (.81-2.81)	1.14 (.62-2.10)
Household equivalised income						
	High	1	1	1	1	1
	Low	.53 (21-1.35)	.76 (.38-1.50)	**.49 (.24-.97)**	**2.98 (1.51-5.88)**	1.53 (.79-2.96)
	Med	**.32 (.11-.96)**	55 (.28-1.06)	**.50 (.26-.96)**	1.33 (.71-2.49)	.87 (.48-1.60)
	Unspecified	**.17 (.05-.66)**	.66 (.33-1.32)	.79 (.39-1.62)	1.50 (.75-3.01)	.86 (.43-1.71)
Last 3 month quit attempt						
	No attempt	1	1	1	1	1
	1+ attempts	1.74 (.81-3.75)	1.34 (.83-2.16)	1.47 (.90-2.39)	1.07 (.66-1.71)	1.06 (.66-1.68)

Table 3. Comparison of respondents to the set one statements who answered 'don't know' versus other valid responses on perceived safety and cessation efficacy—odds ratios (OR) from binary logistic regression analysis

Variables	OR (95% CI)	
	Perceived safety (Don't know) n=480	Perceived efficacy (Don't know) n=480
Gender		
Male	1	1
Female	1.13 (.73-1.74)	1.11 (.72-1.70)
Ethnicity		
Māori	1	1
Non–Māori	.77 (.46-1.29)	.70 (.42-1.16)
Age group		
45+ years	1	1
18 - 24 years	**.08 (.02-.37)**	**.16 (.05-.50)**
25 - 44 years	.74 (.48-1.13)	.70 (.46-1.07)
Education		
Up to secondary school	1	1
Above secondary school	.66 (.39-1.11)	.80 (.47-1.35)
Household equivalised income		
High $66,501+	1	1
Low $0-$34,600	1.30 (.75-2.27)	1.56 (.90-2.72)
Med $34,601-$66,500	.78 (.43-1.40)	.66 (.36-1.22)
Unspecified	1.30 (.73-2.32)	1.60 (.91-2.84)
Past 3 months quit attempt		
No attempt	1	1
1+ attempts	.95 (.63-1.43)	1.09 (.72-1.64)

Of the 360 current smokers and recent quitters who answered the second set of statements on the acceptability of e-cigarettes, 147 (41%) agreed they would switch to e-cigarettes if they were cheaper than tobacco cigarettes. Respondents with a low household income were three times more likely to say they would switch, than those with a high income (Table 2).

More than half of respondents (n=209, 58%) said they would use e-cigarettes to help them quit smoking, with 18-24 year olds three-times more likely to agree with this statement than those aged 45 years or older (Table 2).

Discussion

This is the first New Zealand study to provide data on the use, perceptions and acceptability of using e-cigarettes in a sample of current smokers and recent quitters. The reported rate of purchase of e-cigarettes was low compared to two recent

population surveys of adults undertaken overseas on ever-use (which ranged from 11-18%).[6-7]

While the data were not directly comparable (the question in the NZSM measured 'ever-purchase' of e-cigarettes rather than 'ever-use' in the other studies) we expect ever-use and ever-purchase are highly correlated based on indirect evidence from a previous survey.[3]

In our survey, the proportion of respondents reporting ever-purchase differed by age and household income but not by gender [3,8] or educational background[5,7] unlike the findings from several studies overseas.

Regardless of people's direct experience of using e-cigarettes, one-third of the set one sample held positive views of these devices, believing that they were safer to use than tobacco cigarettes and could help people quit smoking. About half of the set two sample were willing to use them either as a replacement product or a cessation aide.

In contrast, international studies have shown between 71-85% of adult smokers and 55% of youth believed these devices are safer to use than tobacco cigarettes.[7-8] These studies did not measure people's perception of cessation efficacy and acceptability of using e-cigarettes.

As e-cigarettes are not proven cessation aids, the high acceptability in these devices could create opportunities, as well as threats in tobacco control. More well-designed clinical trials are urgently needed to examine the effectiveness of e-cigarettes as a cessation aid. Indeed, a large randomised efficacy trial is currently underway in New Zealand that will contribute to the growing evidence-base.[20]

E-cigarettes appear to be more appealing to particular segments of smokers and recent quitters in New Zealand. Younger respondents were more likely to have purchased an e-cigarette and were willing to use it as a cessation product, compared with people 45 years of age or older.

This older group appeared to be less knowledgeable about e-cigarettes, with lower proportions having an opinion on their safety and cessation efficacy. Our findings align with those from a recent Polish study that found a high level of awareness of e-cigarettes amongst younger people.[8]

Our survey of current smokers and recent quitters did not examine the use and acceptability of e-cigarettes among young people who do not smoke tobacco. Monitoring the uptake of e-cigarettes in this group, and whether or not they use e-cigarettes as a gateway product to smoking, will be important.

People with a higher household income were more likely to have purchased an e-cigarette. Not surprisingly respondents with lower incomes were more likely to indicate a willingness to switch to e-cigarettes completely if they were cheaper than tobacco cigarettes. Previous research has shown that people with lower incomes find the cheapest products that enable them to maintain tobacco or nicotine use.[21] The cost associated with purchasing e-cigarettes (ranging from NZ$50 to NZ$200) could be a barrier for people on lower incomes and this might explain the differences in ever-purchase observed in the current study.

In New Zealand, the tax excise on tobacco had been increased on a yearly basis since 2010 and a pack of 20 cigarettes now costs around NZ$15. Three more annual tax increases had been scheduled until 2016 to further reduce the affordability of tobacco. Studies are needed to examine the extent to which New Zealand smokers will be willing to switch to e-cigarettes as the price of tobacco increases relative to the price of e-cigarettes.

Strengths and limitations—Our study has a number of strengths. This study is the first to assess the purchases of e-cigarettes in New Zealand and used a robust sampling methodology to canvas the views of New Zealanders who were smokers or recent quitters. The survey covered a range of topics to give a broad understanding on people's view of e-cigarettes amongst different subgroups.

Limitations include our use of the question on 'ever-purchase' of e-cigarettes. While this question is likely to be highly correlated with 'ever-use', it is not directly comparable to data from international surveys on 'ever-use' of e-cigarettes.

Second, we only explored people's views on the acceptability of using e-cigarettes as a cheaper alternative to tobacco cigarettes and a cessation product.

While cost and smoking cessation were two of the main reasons ever-users had reported for switching to e-cigarettes,[3,17] our survey did not assess whether or not people would use e-cigarettes for other purposes.

Third, the high proportion of respondents who answered 'don't know' to the first set of two statements suggests a general lack of awareness or knowledge of e-cigarettes and this may have diminished the internal validity of the findings around the perceptions and acceptability of using e-cigarettes.

Finally, the subgroup analyses undertaken should be interpreted with caution given the small numbers of respondents in these subgroups.

Implications—Given the public interest in e-cigarettes, we believe that it will be important to continue accumulating data to inform future policy development around these novel products. Understanding people's knowledge, attitudes and behaviours in regard to these devices and tracking sales volumes in New Zealand will be vital.

Considering the ease of importing e-cigarettes from overseas, future studies that assess market penetration of nicotine versus nicotine-free e-cigarettes would increase understanding on the status of e-cigarette use in New Zealand. Future studies should also consider collecting data on 'ever-use' as well as 'ever-purchase' to enable direct comparisons with studies conducted elsewhere, and also examine the extent to which smokers switch to using these and other emerging modified risk products as a cost-saving strategy and/or as a cessation aid.

Research should also investigate whether e-cigarettes are attractive to never smokers and their use of e-cigarettes as a gateway product to smoking.

Conclusions

The use of e-cigarettes by smokers and recent quitters is uncommon in New Zealand. There is limited knowledge of their safety and cessation efficacy but a surprisingly high willingness to switch to e-cigarettes completely if they were cheaper than

tobacco cigarettes, plus a high degree of willingness to use e-cigarettes to help them quit smoking.

Competing interests: Nil.

Author information: Judy Li, Senior Researcher, Health Promotion Agency, Wellington; Chris Bullen, Director, National Institute of Health Innovation, University of Auckland, Auckland; Rhiannon Newcombe, Principal Researcher, Health Promotion Agency, Wellington; Natalie Walker, Programme Leader (Addictions), National Institute of Health Innovation, University of Auckland; Darren Walton, Manager Research and Evaluation, Health Promotion Agency, Wellington

Acknowledgements: We thank the NZSM participants and TNS New Zealand for managing the data collection. We also acknowledge the Ministry of Health as the funder of the NZSM.

Correspondence: Judy Li, Research and Evaluation, Health Promotion Agency, PO Box 2142, Wellington 6140. Fax: 04 472 5799; email: j.li@hpa.org.nz

References:

1. Bullen C, McRobbie H, Thornley S et al. Effect of an electronic nicotine delivery device (e cigarette) on desire to smoke and withdrawal, user preferences and nicotine delivery: randomised cross-over trial. Tob Control. 2010;19:98-103.
2. Vansickel AR, Eissenberg T. Electronic cigarettes: effective nicotine delivery after acute administration. Nicotine Tob Res. 2012;15:267-270.
3. Etter JF, Bullen C. Electronic cigarette: Users profile, utilization, satisfaction and perceived efficacy. Addiction. 2011;106(11):2017-2028.
4. Medsafe. Categorisation of electronic cigarettes. URL: http://medsafe.govt.nz/regulatory/guideline/electroniccigarettes.asp Accessed online: 27/2/2013.
5. McMillen R, Maduka J, Winickoff J. Use of emerging tobacco products in the United States. Journal of Environmental and Public Health. 2012;Article ID 989474. Accessed online: 6/9/2012.
6. Friday's Media Group. Majority of smokers are ignoring 'Stoptober', says survey. 2012; http://www.responsesource.com/news/74438/majority-of-smokers-are-ignoring-stoptober-says-survey Accessed online: 6/9/2012.
7. Pearson JL, Richardson A, Niaura RS et al. E-cigarette awareness, use and harm perceptions in US adults. Am J Public Health. 2012; 102: 1758-66.
8. Goniewicz ML, Zielinska-Danch W. Electronic cigarette use among teenagers and young adults in Poland. Pediatrics. 2012;130(4):e879-85. doi: 10.1542/peds.2011-3448. Epub 2012 Sep 17.
9. Cho JH, Shin E, Moon SS. Electronic-cigarette smoking experience among adolescents. J Adolesc Health. 2011;49(5):542-546.
10. Pauly J, Li Q, Barry MB. Tobacco-free electronic cigarettes and cigars deliver nicotine and generate concern. Tob Control. 2007;16(5):357.
11. Riker CA, Lee K, Darville A et al. E-cigarettes: promise or peril? Nurs Clin North Am. 2012;47(1):159-71.
12. Lee S, Kimm G, Yun JE, et al. Public health challenges of electronic cigarettes in South Korea. J Prev Med Public Health. 2011;44(6):235-241.
13. Bell K, Keane H. Nicotine control: E-cigarettes, smoking and addiction. Int J Drug Policy. 2012;23(3):242-247.
14. Cahn, Z., & Siegel, M. Electronic cigarettes as a harm reduction strategy for tobacco control: A step forward or a repeat of past mistakes? Int J Drug Policy 2011;32(1):16-31.

15. Borland R. Electronic cigarettes as a method of tobacco control. BMJ. 2011;343(7836):1238.
16. Etter JF. Electronic cigarettes: a survey of users. BMC Public Health. 2010;10:231.
17. Foulds J, Veldheer S, Berg A. Electronic cigarettes (e-cigs): Views of aficionados and clinical/public health perspectives. Int J Clin Pract. 2011;65(10):1037-1042.
18. McQueen A, Tower S, Sumner W. Interviews with "vapers": Implications for future research with electronic cigarettes. Nicotine Tob Res. 2011;13(9):860-867.
19. Siegel MB, Tanwar KL, Wood KS. Electronic cigarettes as a smoking-cessation tool: Results from an online survey. Am J Prev Med. 2011;40(4):472-475.
20. Bullen C, Williman J, Howe C et al. Study protocol for a randomised controlled trial of electronic cigarettes versus nicotine patch for smoking cessation. BMC Public Health 2013, 13:210 doi:10.1186/1471-2458-13-210
21. Dunlop SM, Perez D, Cotter T. Australian smokers' and recent quitters' responses to the increasing price of cigarettes in the context of a tobacco tax increase. Addiction. 2011;106:1687-1695.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Pacific secondary school students' access to primary health care in New Zealand

Tasileta Teevale, Simon Denny, Teuila Percival, Theresa Fleming

Abstract

Aim Previous research states Pacific peoples' experience barriers to primary care. A better understanding of young Pacific peoples' experiences and perspectives on health services can improve responsiveness to young Pacific New Zealanders' health needs. This study identifies primary health (including dental care) barriers in access, utilisation and unmet need for Pacific youth ages 13–17 years.

Methods Data were collected as part of Youth'07, a nationally representative survey of the health and wellbeing of New Zealand (NZ) adolescents. 1178 Pacific students who identified any of their ethnicities as Samoan, Cook Islands, Tongan, Niue, Tokelauan, Fijian, or Other Pacific Peoples were included.

Results Compared to their NZ European peers, Pacific youth accessed primary health care services, including dental care less often in the previous year; Pacific students were twice more likely to forego accessing health care and dental care when needed; were more likely to find it difficult to get healthcare for specific health issues like injuries/accident; to stop smoking, alcohol/drugs use and for chronic conditions. Not knowing how to access healthcare and rating unfair treatment by health professionals due to their ethnicity were significant factors impacting access.

Conclusion Good access and utilisation of primary care services is an important resource of preventable health for Pacific New Zealanders. This study finds that Pacific youth are an underserved group experiencing inequitable access within the current primary healthcare sector. Innovative approaches to specialist youth-oriented healthcare services, professional training and increasing the Pacific health workforce are recommended interventions.

Over the past decade, reducing health inequalities through improving Pacific people's access to and through primary health services has been a key focus of the Primary Health Care Strategy (PHCS).[1] Access, in this context, means the capacity to obtain health care when needed. National data shows Pacific populations in New Zealand experience unmet health needs in primary care and there are variations in the quality of care experienced.[2–5]

A stocktake of health needs brought together information on more than 150 health and social indicators of relevance to Pacific peoples.[6] It identified poorer health status, greater exposure to risk factors for poor health and access barriers to health care for Pacific people. Whilst this study reports on a wide range of indicators, its weaknesses included a lack of indepth analysis and analysis for Pacific youth.

A key point of difference between Pacific and non-Pacific groups in New Zealand, is the youthful demography of Pacific People, with 38% of the Pacific population under the age of 15, which is much higher than the NZ general population overall at 22%.[7]

The median age for New Zealand's Pacific population is 21.1 years, which is considerably lower than the median age of the New Zealand population overall at 35.9 years. It should be noted here, that in terms of demography, Pacific young people account for the majority of the Pacific population in New Zealand (56% under the age of 24 years).

Good access and utilisation of primary care services is an important resource of preventable health for Pacific young people.[8] Current Ministry of Health targets prioritises effective primary health services that can be delivered "Better, Sooner, More Convenient".[9] The factors that affect access to health services and the delivery of quality of care need to be better understood in order to improve healthcare-related outcomes of an important burgeoning group of young New Zealanders.

This study undertook secondary analysis of the Youth 2007 data set to define any barriers in primary health and dental care access, utilisation and unmet need for Pacific youth. It identified factors impacting on access and defined disparities between Pacific and New Zealand European students.

This information will be vital in addressing the goals of the Better, Sooner, More Convenient Primary Health Care Strategy.[10]

Method

Survey background—Data for the current study were collected as part of Youth'07, a nationally representative sample of the health and wellbeing of secondary school students in New Zealand. First, 115 schools were randomly selected and 96 agreed to participate in the survey, representing an 84% response rate for schools. The participating schools reflected the general characteristics of secondary schools in New Zealand.[11] From the participating schools, students (n=12,355) were randomly selected from the school roll and invited to participate. Of these, a total of 9107 students formed the final Youth'07 sample, representing a 74% response rate.

On the day of the survey, students were asked to come to a designated room. Upon arrival students were given an anonymous login code to access the survey. The survey included a 622-item multimedia questionnaire administered on a Nokia Internet tablet and identification of their census meshblock number (based on their residential address) to determine the extent of their neighbourhood deprivation. The multimedia nature of the questionnaire meant that all students could read each question and response options themselves, while listening to the questions and responses being read aloud through headphones.

The University of Auckland Human Subject Ethics Committee granted ethical approval for the study. School principals consented to participation in the survey on behalf of the Boards of Trustees. Students and their parents were provided with information sheets about the survey. Students consented themselves to participate in the study on the day of the survey. A more detailed description of the research methodology can be obtained elsewhere.[11]

Secondary analysis of the data provided by Pacific students (13% of the total sample) was undertaken. Ethnicity was recorded using New Zealand 2006 Census ethnicity question whereby participants select all of the ethnic groups that they identified with.[12] All students who self-identified any of their ethnic groups as Samoan, Cook Islands, Tongan, Niue, Tokelauan, Fijian, or Other Pacific Peoples are included in these analyses (n=1178).

New Zealand European students identified through ethnic prioritisation (i.e., students that are non-Maori, non-Pacific, non-Asian) were included in the analyses (n=4797). Intra-Pacific ethnicity analyses could not be completed as findings may be confounded by small sample numbers.

Outcome measures—To assess the level of healthcare access amongst students, the question *When was the last time you went for health care?* was used for analysis.

This question had 4 response options:

- 0–6 months.
- 7–12 months.
- 13–24 months ago.
- More than 2 years ago.

These four responses were dichotomised into two categories, with the first two options classed as; accessing healthcare in the last 12 months and the last two options classed as; not accessing healthcare in the last 12 months.

To find out what **types of healthcare services students were accessing**, students were asked *Which of the following places for health care have you used in the last 12 months? (pick as many or as few as apply to you).*

Students were presented with 10 choices, 8 of which were used in this study:

- Family doctor, medical centre or GP clinic.
- School health clinic.
- After-hours or 24-hour accident and medical centre.
- Hospital accident and emergency.
- Youth centre.
- Family planning or sexual health clinic.
- Traditional healer (e.g. tohunga, fofo).
- Alternative health worker (e.g. naturopath, homeopath, acupuncturist).

(The last two response options "Other" and "None" were excluded from the analyses.)

Foregone healthcare was assessed using the question *In the last 12 months, has there been any time when you wanted or needed to see a doctor or nurse (or other health care worker) about your health, but you weren't able to?* Students were able to indicate by choosing a Yes or No response.

If students chose a Yes response to not accessing healthcare in the last 12 months, they were asked a further branching question on **reasons for not accessing healthcare when needed**. The question they answered was *Here are some reasons people don't get health care even though they need to. Have any of these ever applied to you? (you can answer as many or as few as you want.)*

Table 4 presents the 10 reasons (response options) students were offered to choose from using a Yes or No response. The last response option to this question was "other" reason(s) which has been excluded from the analyses.

All students were asked to indicate the **types of health issues they may have had difficulty getting help for**. The question was *In the last 12 months have you had any difficulty getting help for any of the following? (you can answer as many as apply to you).* Table 3 presents the eight reasons (response options) included in the analyses. The last two response options; "something else" and "I haven't had difficulty getting help" were excluded from the analyses.

Dental care access was measured using the question *How long has it been since you last visited a dentist, dental nurse or other dental health worker (such as dental therapists or orthodontists).*

There were 6 response options available:

- Within the past year (less than 12 months ago).
- Within the past 2 years (more than 1 year but less than 2 years ago).
- Within the past 5 years (more than 2 years but less than 5 years ago).
- 5 or more years ago.
- I have never seen a dentist or any other dental health worker.
- Don't know/not sure.

These 6 responses were dichotomised into two categories, with the first option classed as; **accessing dental healthcare in the last 12 months,** and all other options classed as; not accessing dental healthcare in the last 12 months.

Foregone dental healthcare was assessed using the question *In the last 12 months, has there been any time when you needed to see a dentist or dental nurse about your teeth or gums, but weren't able to?* Students were able to choose from three responses; Yes or No or don't know. These three options were collapsed into two categories, with the last two options combined as a No category.

The quality of health care received by young people was assessed with a question on personal interactions with a health professional (e.g. doctor, nurse, dentist etc.). Students were asked *Have you ever been **treated unfairly** (e.g. treated differently, kept waiting) **by a health professional** (e.g. doctor, nurse, dentist etc.) because of your ethnicity or ethnic group?*

Students were able to choose from 4 options:

- Yes, within the past 12 months.
- Yes, more than 12 months ago.
- No.
- Don't know/unsure.

These responses were dichotomised into two categories with the first two options combined to a "yes" category and the last two options combined as a "no" category.

Demography—*Age*, *gender* and *ethnicity* were determined by self-report. *Small area deprivation* (NZDep) was determined using the 2006 New Zealand Deprivation Index.[13] For descriptive purposes, the NZDep Index deciles were categorised into three groups reflecting low deprivation (1–3), middle levels of deprivation (4–7), and high deprivation (8–10).

Analysis—Frequencies and percentages were used to describe the characteristics of students. Chi-squared tests were used to investigate the bivariate associations between ethnicity and outcome variables. Adjusted relative risk (aRR) was estimated using a log-binomial regression model controlling for age, sex and socioeconomic deprivation. All analyses were conducted using the procedures in the SAS v9.2 software (Cary, NC) and accounted for the clustered design of the data.

Results

Table 1 shows the demographic characteristics of the students included in this study. Information was available for 5975 students; 1178 Pacific and 4797 NZ European students. There were no gender differences across the two groups of students, but there were differences by age and by socioeconomic status. Pacific youth were younger and had much higher levels of social deprivation than NZ European students.

Types of healthcare services utilised—A question on the types of healthcare services that Pacific students accessed in the previous 12 months, showed that the "family doctor, medical centre or GP clinic" was rated the most used by Pacific students (91.4% compared to NZ European students 93.9% $p = 0.01$), followed by "school health clinic" (32.9% compared to NZ European students 20.1% $p < 0.001$); "the hospital accident and emergency" (18.1% compared to NZ European students 19.1% $p = 0.45$); "an after-hours or 24-hour accident and medical centre" (13.4% compared to NZ European students 16.8% $p = 0.09$); "an alternative health worker (e.g. naturopath, homeopath, acupuncturist" (9.1% compared to NZ European students 12.6% $p = 0.002$); "family planning or sexual health clinic" (6.1% compared to NZ European students 5.0% $p = 0.17$); "a traditional healer (e.g. tohunga, fofo)" (5.1% compared to NZ European students 0.1% $p < 0.001$); "youth centre" (4.0% compared to NZ European students 1.8% $p = 0.002$).

Table 1. Demographic characteristics of Pacific and NZ European secondary school students

Variables	Pacific		NZ European		
	n	%	*n*	%	p-value
Total *n*	**1178**	**19.9**	**4797**	**80.1**	
Gender					
Males	548	46.5	2166	45.0	
Females	630	53.5	2631	55.0	0.77
Age					
13 and under	292	24.8	959	19.8	
14	267	22.6	1139	23.7	
15	240	20.4	1031	21.6	
16	224	19.0	932	19.5	
17 and over	155	13.2	736	15.4	0.009
NZ Deprivation band					
Low	101	8.9	2168	46.4	
Medium	283	25.1	1926	41.0	
High	744	66.0	594	12.5	<.0001

Healthcare access—Table 2 shows the numbers of students who accessed healthcare, including dental healthcare, in the previous 12 months, comparing Pacific and NZ European student proportions. Results showed that, less Pacific students (76.7%) accessed healthcare than NZ European students (86.1%) in the previous 12 months. In terms of dental care, significantly less Pacific students (67.4%) accessed dental health care than NZ European students (84.8%) in the previous year.

Students were asked to indicate whether they needed to see a health worker in the last 12 months, but weren't able to. This is called foregone health care. Table 2 shows that Pacific students were significantly more likely to report foregone healthcare (26.3%), that is, more than one in four Pacific students were not able to access healthcare when needed, compared to their NZ European peers (13.7%). This question was repeated for dental health care and the results were similar, with more Pacific students (17%) reporting not seeing a dentist when needed in the last year, compared to NZ European students (7.2%).

The adjusted relative risk scores for foregone health care was 1.82 and forgone dental care 1.95, meaning that Pacific youth were approximately twice more likely to forego accessing health care and dental care when needed than compared to their NZ European counterparts.

Table 3 presents the results of the analyses for the question relating to particular health issues that students had difficulty getting healthcare for. Pacific students were much more likely than their NZ European peers to rate difficulty in accessing healthcare for six out of the eight possible choices.

Higher proportions of Pacific students, compared to NZ European students, had difficulty in getting healthcare for an "injury/accident"; "help with stop smoking"; "help with stopping drug or alcohol use"; "a long term health condition e.g. Asthma"; "a condition that does not last very long e.g. a cold"; and "pregnancy or pregnancy test".

Table 2. Pacific and NZ European students' reports of dental and healthcare access and treatment by healthcare professionals

Variables	Pacific		NZ European		Adjusted Relative Risk*	CI	p-value*
	n	%	*n*	%			
Accessed healthcare in the last 12 months	850	76.7	4020	86.1	0.90	0.86 – 0.93	<.0001
Foregone healthcare in the last 12 months	293	26.3	642	13.7	1.82	1.57 – 2.12	<.0001
Accessed dental healthcare in the last 12 months	618	67.4	3770	84.8	0.83	0.79 – 0.88	<.0001
Foregone dental healthcare	176	17.0	331	7.2	1.95	1.57 – 2.41	<.0001
Treated unfairly by a health professional	98	10.5	95	2.2	4.53	3.33 – 6.19	<.0001

Table 3. Health issues Pacific and NZ European students' have had difficulty getting healthcare for in the past 12 months

Variables	Pacific		NZ European					
	n	%	*n*	%	p-value	Adjusted Relative Risk*	CI	p-value*
An injury/accident	205	19.9	352	7.9	<.0001	2.11	1.69 – 2.64	<.0001
Help with stop smoking	68	6.6	79	1.8	<.0001	2.42	1.55 – 3.76	<.0001
Help with stopping drug or alcohol use	57	5.5	73	1.7	<.0001	2.83	1.74 – 4.61	<.0001
A long-term health condition, e.g. asthma	63	6.1	129	2.9	<.0001	1.72	1.13 – 2.64	0.01
A condition that does not last very long, e.g. a cold	92	8.8	266	6.0	0.0024	1.39	1.01 – 1.90	0.04
Contraception/sexual health	50	4.9	212	4.8	0.9412	0.92	0.60 – 1.39	0.69
An emotional worry	83	8.1	388	8.7	0.4888	0.84	0.66 – 1.07	0.16
Pregnancy or pregnancy test	48	4.7	103	2.3	<.0001	1.56	1.03 – 2.34	0.03

* controlling for sex, age & SES.

Table 4. Pacific and NZ European students' reasons for not accessing healthcare when needed (*n*=903)

Variables	Pacific		NZ European					
	n	%	n	%	p-value	Adjusted Relative Risk*	CI	p-value*
Didn't know how	82	28.8	107	17.4	<.0001	1.34	1.03 – 1.75	0.03
Couldn't get an appointment	77	27.1	136	22.0	0.0742	1.14	0.89 – 1.47	0.31
Didn't want to make a fuss	146	51.2	344	55.7	0.2776	0.96	0.81 – 1.13	0.59
Couldn't be bothered	133	46.7	211	34.4	<.0001	1.29	1.06 – 1.56	0.01
Had no transport to get there	85	29.8	168	27.3	0.3956	1.02	0.79 – 1.31	0.91
Cost too much	75	26.4	209	33.9	0.0330	0.75	0.57 – 0.99	0.04
Couldn't contact the health professional	37	13.0	47	7.7	0.0004	1.19	0.73 – 1.94	0.48
Didn't feel comfortable with the person	63	22.1	136	22.0	0.9881	1.03	0.75 – 1.40	0.88
Too scared	94	33.0	187	30.3	0.4432	1.03	0.80 – 1.32	0.82
Worried it wouldn't be kept private	85	29.8	173	28.1	0.5920	1.02	0.81 – 1.30	0.85

* controlling for sex, age & SES.

After controlling for age, sex and socioeconomic deprivation, Pacific students were almost three times more likely to report difficulty accessing health care for help stopping drug or alcohol use than NZ European students. Difficulty getting help for stopping smoking or acute injuries or accidents was over two times more prevalent among Pacific youth than compared to NZ European young people.

Factors impacting on health care access—Students who reported foregone healthcare were asked a further question on reasons for not accessing healthcare when needed. Table 4 reports the reasons Pacific and NZ European students chose for not accessing healthcare. Of the eight possible choices, three reasons for foregone healthcare, was rated significantly higher by Pacific students than NZ European students. Pacific students did not access healthcare because they "didn't know how"; they "couldn't be bothered"; and because they "couldn't contact the health professional".

The data from the question on interactions with health professionals (Table 2) revealed that one in ten Pacific students (10.5%) reported unfair treatment by a health professional due to their ethnicity, compared to 2.2% of NZ European students. Pacific youth who reported unfair treatment by a health professional due to their ethnicity, were 3.18 (95% CI = 2.68–3.78, $p < 0.001$) times more likely to report forgone healthcare compared to students who did not report unfair treatment by a health professional due to their ethnicity, after controlling for age, sex, socioeconomic deprivation and ethnicity.

Discussion

The results of this study add to previous research, which shows that Pacific peoples experience barriers in access and use of services across New Zealand's health and disability system.[14–17]

Barriers to healthcare, which can be classed as financial, cultural, logistical, physical, linguistic or systems discrimination are key reasons that Pacific peoples are not benefiting from health services to the same extent as other groups.[5,18] Previous studies however have primarily concentrated on Pacific adult experiences and perspectives.

This study makes a contribution as it is the first indepth study exploring the health care experiences of Pacific young people, (secondary school aged 13–17 years), and whereby this cohort are a significant proportion of the Pacific population grouping in New Zealand, the ongoing monitoring of Pacific youth health experiences is important for the sector to note.

The differences in socioeconomic status between Pacific youth and their NZ European peers makes Pacific young people particularly at-risk of preventable health conditions. This over-exposure to upstream conditions leading to adverse health risks,[16] which has led to inequitable health at all life stages for Pacific people in New Zealand,[4] would lead one to expect that Pacific young people would be accessing healthcare more frequently as needed, compared to other groups.

Results of this study showed that despite the relative increased need for health services, Pacific young people are foregoing much needed health care.

In addition, Pacific young people had difficulty seeking healthcare for most types of health issues, especially for acute injuries and accidents and needing help to stop substance use, i.e. smoking tobacco and using alcohol or drugs. This may be highlighting the lack of accessible primary care and inadequate reach of quit-smoking, alcohol and drug-use recovery programmes for Pacific youth.

This study found also large discrepancies in dental health care access, with a third (32.6%), or one in three Pacific students not accessing dental care in the previous year. This clearly requires some urgent action to ensure that all types of health services, particularly those that screen and prevent further intensive and potentially more expensive public health care, are equitable for all of New Zealand's young people.

This study found the main barriers for healthcare access was not knowing how to access healthcare when needed and being treated unfairly by a health professional due to ethnicity. This study provides important information for developing more responsive health services for young Pacific New Zealanders. Modifying health promotion to better target Pacific youth and more urgent structured training of health professionals in culturally-competent care and specialist adolescent health training are relevant interventions.

Selected District Health Boards have consulted their respective young people on ways to improve their health and wellbeing.[19],[20] This study supports the priorities of the Ministry of Health to support innovative primary and community-based services for Pacific young people, namely the establishment of youth friendly services such as youth one-stop-shops and the effective school-based health services in low decile secondary schools,[21] teen parent units and alternative education settings.

Theorists on health seeking behaviours have confirmed the way in which ethnicity intersects with healthcare interactions.[22,23] Overseas studies have noted that diverse populations seek preferential treatment from healthcare professionals who are of the same ethnic group.[24],[25]

It is hypothesised that greater concordance between the health care professional's cultural and linguistic competencies to the patient, results in greater quality and satisfaction in care.[26,27] This has led for calls in healthcare systems to match their health workforce diversity to its population diversity.[24,25,28] The continued efforts in the development of the Pacific health workforce will contribute to more responsive health services for Pacific peoples.

The large relative risk scores attests that for Pacific youth, ethnic discrimination can be a significant barrier to healthcare access.[29] Previous research have confirmed the importance of health provider behaviours in adolescent's decisions to seek health care.[30] It is recommended that research that elicit young people's perspectives on how to counter perceived discrimination in health care settings may be valuable for the New Zealand context.[31]

Primary HealthCare is the pivotal point of entry for health services. There is a need for Primary HealthCare to make itself more user-friendly and developmentally appropriate for young people. This is an age group which has hitherto been ignored by Primary Care in its design and funding priorities. Pacific young people are an increasingly numerous and important part of Pacific and New Zealand communities

and should now be one of the most important considerations in the design of Primary Care and the training of its workforce.

Competing interests: Nil.

Author information: Tasileta Teevale, Postdoctoral Research Fellow, Pacific Health; Simon Denny, Senior Lecturer, Paediatrics; Teuila Percival, Head, Pacific Health; Terry Fleming, Lecturer, Paediatrics; Faculty of Medical and Health Sciences, University of Auckland

Correspondence: Dr Tasileta Teevale, Postdoctoral Research Fellow, Pacific Health, School of Population Health, University of Auckland, Private Bag 92019, Auckland 1142, New Zealand. Email: t.teevale@auckland.ac.nz

Acknowledgements: The Youth'07 study was funded by the Health Research Council of New Zealand (grant 05/216), Department of Labour, Families Commission, Accident Compensation Corporation, Sport and Recreation New Zealand, Alcohol Advisory Council of New Zealand, and Ministries of Youth Development, Justice and Health. We also thank students, staff and schools who participated in Youth'07.

References:

1. King A. The Primary Health Care Strategy. Wellington: Ministry of Health, 2001.
2. Ministry of Health. A portrait of health: Key results of the 2006/07 New Zealand health survey. Wellington: Ministry of Health, 2008.
3. Davis P, Suaalii-Sauni T, Lay-Yee R, Pearson J. Pacific Patterns in Primary Health Care: A comparison of Pacific and all patient visits to doctors: The National Primary Medical Care Survey (NatMedCa): 2001/02. Report 7. Wellington: Ministry of Health, 2005.
4. Statistics New Zealand, Ministry of Pacific Island Affairs. Health and Pacific peoples in New Zealand. Wellington: Statistics New Zealand and Ministry of Pacific Island Affairs, 2011.
5. Young N. Pacificans' access to primary health care in New Zealand: A review. Pac Health Dialog 1997;4(2):68-75.
6. Ministry of Health. Tupu Ola Moui: Pacific Health Chart Book 2012. Wellington: Ministry of Health, 2012.
7. Statistics New Zealand. QuickStats About Pacific Peoples. Wellington: Statistics New Zealand, 2008.
8. Tylee A, Haller DM, Graham T, et al. Youth-friendly primary-care services: how are we doing and what more needs to be done? Lancet 2007;369:1565-73.
9. Ministry of Health. Better, Sooner, More Convenient Health Care in the Community. Wellington: Ministry of Health, 2011.
10. Minister of Health and Minister of Pacific Island Affairs. 'Ala Mo'ui: Pathways to Pacific health and wellbeing 2010-2014. Wellington: Ministry of Health, 2010.
11. Adolescent Health Research Group. Youth'07: The health and wellbeing of secondary school students in New Zealand. Technical Report. Auckland: University of Auckland, 2008.
12. Statistics New Zealand. Statistical Standard for Ethnicity. Retrieved 1 August 2011, from: http://www.stats.govt.nz/browse_for_stats/population/census_counts/review-measurement-of-ethnicity.aspx 2005.
13. Salmond C, Crampton P, King P, Waldegrave C. NZDep: A New Zealand index of socioeconomic deprivation for individuals. Social Science & Medicine 2006;62(6):1474-85.
14. Barwick H. Improving access to primary care for Maori and Pacific peoples: A literature review commissioned by the Health Funding Authority. Wellington: Health Funding Authority, 2000.
15. CBG Health Research Ltd. Improving Access to Primary Health Care: An evaluation of 35 reducing inequalities projects. Wellington: Ministry of Health, 2006.

16. Ministry of Health. Looking Upstream: Cause of death - classified by risk and condition New Zealand 1997. Revised edition. Wellington: Ministry of Health, 2004.
17. University of Auckland Pacific Health Research Centre. The Pacific Island primary health care utilisation study. Auckland, N.Z: Pacific Health Research Centre, 2003.
18. Tobias M, Yeh L. How Much Does Health Care Contribute to Health Gain and to Health Inequality? Trends in amenable mortality in New Zealand 1981-2004. . Australian and New Zealand Journal of Public Health 2009;33(1):70-8.
19. Fleming T, Elvidge. Youth health services Literature Review: Report commissioned by Waitemata District Health Board. Auckland: Waitemata District Health Board, 2010.
20. Birks B, Counties Manukau District Health Board. Counties Manukau Pacific Youth One Stop Shop: A review of research, best evidence and youth opinion. Auckland: Youthline Auckland & Counties Manukau District Health Board, 2006.
21. Denny S, Balhorn A, Lawrence A, Cosgriff J. Student access to primary health care and preventive health screening at a school-based health centre in South Auckland, New Zealand. New Zealand Medical Journal 2005;118(1218):U1561.
22. Andersen RM. Revisiting the behavioral model and access to medical care: Does it matter? Journal of Health and Social Behavior 1995;36(1):1-10.
23. Pescosolido BA. Beyond Rational Choice: The Social Dynamics of How People Seek Help. American Journal of Sociology 1992;97(4):1096-138.
24. LaVeist TA, Nuru-Jeter A. Is Doctor-Patient Race Concordance Associated with Greater Satisfaction with Care? Journal of Health and Social Behavior 2002;43(3):296-306.
25. Saha S, Taggart SH, Komaromy M, Bindman AB. Do patients choose physicians of their own race? Health Affairs 2000;19(4):76-83.
26. Saha S, Komaromy M, Koepsell TD. Patient-physician racial concordance and the perceived quality and use of health care. Arch Intern Med 1999;159(9):997-1004.
27. Cooper-Patrick L, Gallo JJ, JJ G, et al. Race, gender, and partnership in the patient-physician relationship. JAMA 1999;282(6):583-89.
28. Betancourt JR, Green AR, Carrillo JE, Ananeh-Firempong O. Defining cultural competence: a practical framework for addressing racial/ethnic disparities in health and health care. Public Health Reports 2003 Jul-Aug;118(4):293-302.
29. Crengle S, Robinson E, Ameratunga S, et al. Ethnic discrimination prevalence and associations with health outcomes: data from a nationally representative cross-sectional survey of secondary school students in New Zealand. BMC Public Health 2012;12(45).
30. Freed LH, Ellen JM, Irwin Jr CE, Millstein SG. Determinants of adolescents satisfaction with health care providers and intentions to keep follow-up appointments. Journal of Adolescent Health 1998;22(6):475-79.
31. Ginsburg KR, Menapace AS. Factors affecting the decision to seek health care: The voice of adolescents. Pediatrics 1997;100(6):922.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Canterbury Health, Ageing and Life Course (CHALICE) study: rationale, design and methodology

PJ Schluter, JK Spittlehouse, VA Cameron, S Chambers, R Gearry, HA Jamieson, M Kennedy, CJ Lacey, DR Murdoch, J Pearson, R Porter, M Richards, PML Skidmore, R Troughton, E Vierck, PR Joyce

Abstract

Aims New Zealand's ageing population threatens the financial sustainability of our current model of health service delivery. The Canterbury Health, Ageing and Life Course (CHALICE) study aims to develop a comprehensive and flexible database of important determinants of health to inform new models. This paper describes the design, methodology, and first 300 participants of CHALICE.

Methods Commencing August 2010, CHALICE is a multidisciplinary prospective random cohort study and biobank of 1,000 Canterbury adults aged 49–51 years at inception, stratified by self-identified Māori (n=200) and non-Māori (n=800) ethnicity. Assessment covers sociodemographic, physical, cognition, mental health, clinical history, family and social, cardiovascular, and lifestyle domains. Detailed follow-up assessment occurs every 5 years, with a brief postal follow-up assessment undertaken annually.

Results For the first 300 participants (44 Māori, 256 non-Māori), the participation rate is 63.7%. Overall, 53.3% of participants are female, 75.3% are living in married or de facto relationships, and 19.0% have university degrees. These sociodemographic profiles are comparable with the 2006 Census, Canterbury region, 50–54 years age group percentages (50.7%, 77.2%, and 14.3%, respectively).

Conclusions CHALICE has been designed to provide quality data that will inform policy development and programme implementation across a broad spectrum of health indicators.

Grow old along with me! The best is yet to be.… Never have the words penned by poet Robert Browning in 1864 had such global resonance. We stand on the cusp of a demographic milestone; for the first time in recorded human history the number of people aged 65 years or older will soon outnumber children aged under 5 years.[1]

Driven by falling fertility rates and rapid increases in life expectancy, population ageing will continue, even accelerate; with the number of people aged 65 years or older worldwide projected to grow from an estimated 524 million in 2010 to nearly 1.5 billion in 2050.[1]

Population ageing presents both opportunities and challenges.[2,3] Older people already make a significant contribution to society, whether it is through the formal workforce, informal work and volunteering, or within the family and community. But towards the end of life, many older people will face health problems and challenges to their independence.

Currently, chronic non-communicable diseases impose the greatest burden on global health and health care delivery,[1,3] and these diseases more commonly effect older people. There is an urgent need to understand and effectively address the increasing prevalence of age-related illnesses which pose potentially profound economic, social and political implications for the global prosperity in the decades ahead.[3]

Due to New Zealand's ageing population, the current approach to health and disability services provision is considered financially unsustainable.[4,5] Assuming current models of care, real costs have been projected to almost double and health spending outstrip income growth (to be about 50% higher as a percentage of the gross domestic product by 2030).[4] Although the veracity of these projections are not without question, due to the healthy ageing effect and the associated compression of morbidity.[6,7] Regardless, the ageing of our population, and age-related disease, is arguably one of the greatest challenges for health services in New Zealand.

Fundamental challenges include how to preserve the health and independence of older people, and how to prevent age-related disease and disability. New models of care are likely to see patients receiving treatment closer to home, carried out through primary and community-based health services.[4] However, the evidence-base vindicating such systemic changes is currently wanting. It has been argued that systems must be developed to monitor and understand these patterns and relationships, specifically through longitudinal studies that incorporate measures of health, economic status, family, and wellbeing.[1]

One response, the Canterbury Health, Ageing and Life Course (CHALICE) project, has been established as a multidisciplinary longitudinal study of ageing. This prospective longitudinal study follows a cohort of Canterbury 50 years old adults in order to track their health and wellbeing with advancing age.

Geographically locating the CHALICE study within the Canterbury region is considered advantageous due to its relatively stable population, a history of high participation in epidemiological studies,[8] and that Canterbury's population is experiencing the ageing effects ahead of other regions of New Zealand (31.7% of Canterbury people aged ≥50 years in 2006 Census compared with 29.2% nationally).[9] Steeped in a modern population health conceptualisation, the general aims of the CHALICE study are to:

- Explore the interplay of culture, communities, families, environments, nutrition, lifestyle and genes on wellbeing, healthy ageing, heart health and brain health;
- Examine protective factors and risk factors for cardiovascular disease, cerebrovascular disease, dementia, mood disorder, digestive disorders and infections; and
- Report empirically-based findings and recommendations that fill our knowledge gap.

Within these general aims, various specific aims will be investigated, such as: cardiovascular risk factors associated with mid-life cognitive decline; the relationship between diet quality and wellbeing; cognitive impairment and its association with

stroke risk factors; genetic influences on healthy aging; and how differences in health knowledge, health beliefs, perceived discrimination and perceived barriers in health care interact with older Māori and non-Māori people.

Adopting apposite and current best-practice strategies, such as the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) guidelines,[10] the study will provide age-specific information to a variety of stakeholders on which to base interventions and inform policy development to enhance the health and wellbeing of people throughout life.

Methods

Design—Prospective random cohort study, stratified by Māori and non-Māori ethnicity. Māori are oversampled so that they represent approximately 20% of the sample. Commencing August 2010, baseline assessment is undertaken on the inception cohort and detailed follow-up will occur every 5 years thereafter. On an annual basis a brief postal follow-up assessment will also be undertaken.

Target population—50-year-old adults residing within the Canterbury District Health Board (CDHB) region at entry. Census 2006 figures show that 25,224 adults aged 45–49 years were within the CDHB region, of whom 1,782 identified as Māori.

Sample frame—New Zealand Māori and non-Māori electoral roll mapped to the CDHB region. Of the target population, 94.9% are estimated to appear on the electoral roll.[11]

Participant eligibility—Adults aged 49–51 years residing within CDHB region upon enrolment, living in the community (i.e. not in prison or rest home) and able to competently complete assessment (e.g. proficiently speak English).

Recruitment—New Zealand has a compulsory electoral roll for those aged ≥18 years which is actively maintained. Extracts from the Canterbury rolls are made annually for electors turning 50 years within the next 12 months, stratified by self-declared Māori ethnicity status. Potential participants are randomly sampled from these stratified extracts, using different ethnic-specific sampling fractions. Those selected are sent a letter that briefly outlines the study, and invites them to contact the research team (by free-post). Where no return contact is made, the ensuing follow-up protocol is initiated.

A maximum of four telephone calls are made at various days/times (including evenings and weekends) over 10–20 days. If contact is unsuccessful, then a second invitation letter is sent approximately 4–6 weeks after the first and a further four telephone calls over 10–20 days is undertaken. If no contact can be made, then two home visits are scheduled (where practical). There is no set time limit for these home visits.

Once contact is made, the study is re-outlined, potential participants who express interest in the study are screened for eligibility, and an appointment is scheduled to attend the CHALICE study office. Additional community networks have been developed to assist with the recruitment of selected Māori potential participants.

All potential participants are reminded by telephone the day before the assessment of their appointment time, that they should be fasting, and the time for their last meal. Extensive ongoing local media coverage of the CHALICE study commenced in 2009, so that potentially eligible subjects are likely to have heard about the study prior to receiving an invitation letter to participate.

Consent—Informed written consent is obtained from all participants for each study component. Consent is also specifically sought for whether participants want to receive a summary of their study results, having their general practitioner (GP) notified of study participation, and having their GP sent a summary of study results. Additionally, consent is sought for access to medical records through the National Health Index (NHI) database; storage and analysis of blood and plasma, urine, and DNA samples for ethics-approved research; and being contacted in future to ask about participation in related studies. Participants are also explicitly informed that they can withdraw from the study at any time and request that their biological samples be destroyed. Participants can elect to have their samples disposed of with an appropriate karakia (Māori prayer).

Assessment—After eligibility is formally determined and written informed consent obtained, the 4–6 hour baseline assessment interview commences. This interview consists of seven modules, each

structured to take approximately 30–60 minutes, using internationally recognised standardised instruments with good psychometric properties where possible.

Fasting urine and blood samples are collected and biobanked. A detailed description of the seven modules is included in Table 1. The brief annual postal questionnaire will assess some core health measures (highlighted in Table 1) and some novel pertinent questions of interest (such as personal impact of the Canterbury earthquakes). This questionnaire also serves to maintain regular contact with participants, and allows the tracking database to be updated where needed.

Table 1. Modules and instruments employed at the CHALICE baseline measurement phase

Post-consent, pre-assessment

Birmingham Irritable Bowel Syndrome symptom questionnaire (IBS),[22] Short Form 36 (SF-36) version 2,[23] self-completed Warwick Edinburgh Mental Well-Being Scale (WEMWBS),[24,25] and a questionnaire on food behaviour.

The food behaviour questionnaire comprised of questions relating to nutrition knowledge and decisions related to food choice (including beliefs and attitudes towards food and potential facilitators and barriers to healthy eating). All questions were adapted from previously validated questionnaires where possible,[26-32] and were pretested in a sample of 50 year olds before use in CHALICE.

Module 1: Physical

Height, weight, (derived body mass index (BMI)), body composition (measured by bioimpedance), heart rate, blood pressure, blood (100 ml) and urine (50 ml) including DNA extraction and biobanking, retinal photography, eye health questions to determine sun exposure sensitivity.[33]

Module 2: Health history

Interview questions were taken or adapted from the 2006/07 New Zealand Health Survey,[26] including demographics: date of birth, ethnicity, relationship status, education, income, employment, home ownership, medical insurance; chronic conditions: current medication, long-term conditions, infection and immunisation history, digestive disease, sleep patterns; health service utilisation: general practitioner use, medical specialist, complementary or alternative health care workers, secondary health care services use; risk and protective factors: screening programmes, environment conditions, tobacco consumption.

The Economic Living Standards Index Short Form (ELSI-SF)[34] and the Alcohol Use Disorders Identification Test (AUDIT)[35] were also employed. Māori participants were asked about their ethnic identity, family, cultural involvement, fluency and knowledge using questions derived from the Hauora Manawa study.[36]

Module 3: Family and social

Interview questions covered family medical history, attitudes to health,[37] job satisfaction,[38,39] Attitudes to Ageing Questionnaire (AAQ),[40] felt and ideal age,[41] experience of aging,[42] questions adapted from the Brief Illness Perception (BIP)[43] for participants with children ill with disorders, the Carers of Older People in Europe index[44] for participants who are primary carers for someone with illness or disability, abbreviated positive and negative social exchanges (PANSE),[45] questions adapted from lay beliefs about major health condition preventability,[46] medical scepticism,[47] adapted List of Threatening Experiences Questionnaire (LTE-Q),[48] abbreviated coping under stress scale (Brief COPE),[49] abbreviated purpose in life (LIF) questionnaire,[50] attitudes to religion/ spirituality,[51,52] selected social capital and social standing questions,[53,54] and discrimination.[26,55]

Module 4: Heart

ECG, echocardiogram (supine, 15–20 minutes cardiac data acquisition), 5-minute carotid intima-media thickness (with 15MHz high frequency probe) and blood pressure (manual and automatic).

Module 5: Mental health

Most questions were derived from the Mini International Neuropsychiatric Interview (M.I.N.I.).[56,57] Interview questions on major depressive episodes (current and lifetime), dysthymia, suicidality, (Hypo) manic episodes, panic disorder, agoraphobia, social phobia, obsessive-compulsive disorder, post-traumatic stress disorder, alcohol abuse and dependence, non-alcohol psychoactive substance use disorders, generalised anxiety disorders. Compulsive hoarding[58] was also assessed, as was personality using the short form of the Temperament and Character Inventory (TCI-R).[59,60]

Module 6: Cognitive

Cognitive assessment included the Montreal Cognitive assessment (MoCA)[61] on visuospatial/executive, naming, memory, attention, language, abstraction, delayed recall and orientation functions. A non-word consonant-vowel-consonant (CVC) test as a verbal test of learning and memory adapted from the Rey Auditory Verbal Learning Test (RAVLT).[62] Assessment hand dominance in everyday activities was undertaken using the Edinburgh Handedness Inventory.[63]

Module 7: Lifestyle

Interview questions elicited on lifestyle, exercise, and diet. Recent physical activity (last 7 days and 12 months) was assessed using the New Zealand Physical Activity Questionnaire – Short Form (NZPAQ-SF),[64] and physical functional assessed using balance tests, a gait speed test (4 m walk) and chair stand tests (5 chair stands). Participants were asked to keep a prospective food and exercise diary in the days following the main assessment.

The dietary diary contained three parts: (i) an adapted home food inventory;[65] (ii) questions on how and what is eaten (to assist with coding of records); (iii) a 4-day (3 weekdays, 1 weekend) food and drink record. The exercise diary is a prospective 7-day log developed to capture different domains of physical activity including recreational physical activity, active transport, occupational physical activity and sedentary activities as well as sleeping habits.[66]

*The first-year follow-up questionnaire included: general and physical health questions of the SF-12 version 2;[67] new diagnoses since baseline assessment of 11 specified medical conditions; Warwick Edinburgh Mental Well-Being Scale (WEMWBS);[24,25] whether baseline test results were discussed with GPs, further tests undertaken, and whether any medical, dietary or lifestyle changes were commenced due to any identified abnormal finding(s); the disruption section, difficulties and events since the quake, and impact of the quake over the last 7 days questions from the Newcastle Earthquake Impact Study (EIS);[68] and any changes in contact details (name, postal address, telephone, mobile phone, and email address).

Laboratory measures—A number of laboratory analyses and measurements are undertaken, including [1] extraction of DNA; [2] routine biochemistry and haematology, including glucose and lipids; and [3] Vitamin D, parathormone, insulin. A wide range of other biochemical and genetic measures will be made as funding permits.

Data management—For multi-modal longitudinal studies, effective data management is critical. In recognition and response, a Data Management Committee was established at the inception of the CHALICE study. This committee ensures that apposite technologies and best practice methods are employed for handling the diverse data. Most data are directly entered into a Progeny database (Progeny Software, Needham, South Norfolk, UK), which incorporates a sophisticated laboratory integrated management system using bar-codes to track samples biobanked for subsequent analyses.

Data from food diaries and echocardiograms are stored independently but summary variables, matched by study ID, are merged into the Progeny database. Data integrity and reliability is assessed using a formal protocol: a 10% randomly selected participant group is derived, re-entered into the Progeny database using a new ID number, exported and compared with the original entries, disparities recorded and error rates determined. For discrepant records, the original data sources are consulted to determine which data are correct, and amendments within the Progeny database are undertaken, if required.

The Progeny database includes no personal identifiers and is held in secure, password-protected storage under the responsibility of the CHALICE Study Director in accordance with the requirements of the New Zealand Privacy Act (1993) and the Health Information Privacy Code (1994).

Participant labelling in this database is made by study ID only. Personal identifying information is stored on a separate database in a password-protected file. All data are considered both sensitive and confidential, and only CHALICE study staff, authorised by the Director, have access to computerised data.

Sample size—Balancing the competing demands for increased statistical power in longitudinal studies[12] against conducting a feasible, efficient and cost-effective study, a final cohort of approximately 1,000 adults will be targeted; 200 Māori and 800 non-Māori. This sized cohort would generally have adequate statistical power for bi-ethnic comparisons although it is recognised that power will not always be adequate for analyses involving the detection of small differences between groups or for more complex analyses involving a greater number of categories. However, as the number of follow-up waves increase, so too will the corresponding statistical power.[12]

For cross-sectional analyses of baseline measurements, the sample size of 1,000 adults has 80% power at the 5% level of significance to detect a prevalence of 1.4% in the non-Māori given a prevalence of 5% in Māori. For greater differences and for higher prevalances, the associated power is higher.

Statistical analyses—Data will be exported after checking and cleaning into specialist statistical packages including: SAS (SAS Institute Inc., Cary, NC, USA), Stata (StataCorp, College Station, TX, USA) and R (R Foundation for Statistical Computing, Vienna, Austria). The precise analytical approach and corresponding power will depend on the specific research question under investigation. In general, cross-sectional analyses at each assessment time will be undertaken using generalised linear models, allowing the prevalence of key outcomes to be estimated and associated with risk factors.

As further waves of data are added, these approaches will be augmented by more sophisticated longitudinal analyses and variable selection techniques using methods that include survival analysis, structural equation modelling, multilevel mixed-effects models and generalised estimating equations (GEE). Binomial GEE models will be employed to determine whether differential attrition occurs over time. Should systematic differential attrition be identified then sensitivity analyses will be employed, including multiple imputed or probabilistic weighting methods. All analyses will be overseen by the CHALICE study biostatistician(s).

Ethics—Careful consideration is continually given to the ethical aspects of this longitudinal study. Ethical approval for the CHALICE study was obtained from the Upper South A Regional Ethics Committee on the 14 June 2010 (reference: URA/10/03/021). The study complied with the ethical standards for human experimentation as established by the Helsinki Declaration 1964 (sixth revision 2008).

Results

Recruitment—Recruitment commenced in August 2010, and despite the significant series of Canterbury earthquakes, over 340 participants have been recruited and have completed the baseline assessments. This methodological paper reports on the first 300.

Figure 1 depicts the participant flow chart for these 300 participants; of whom 44 (14.7%) self-identified themselves as being Māori. Of those who responded to the invitation and were eligible, 63.7% agreed to participate (58.3% for Māori).

Figure 2 displays the monthly participant assessment numbers since recruitment began, and graphically illustrates the impact of the Canterbury earthquakes on these numbers.

Figure 1. CHALICE participant flow chart as of 20 June 2012

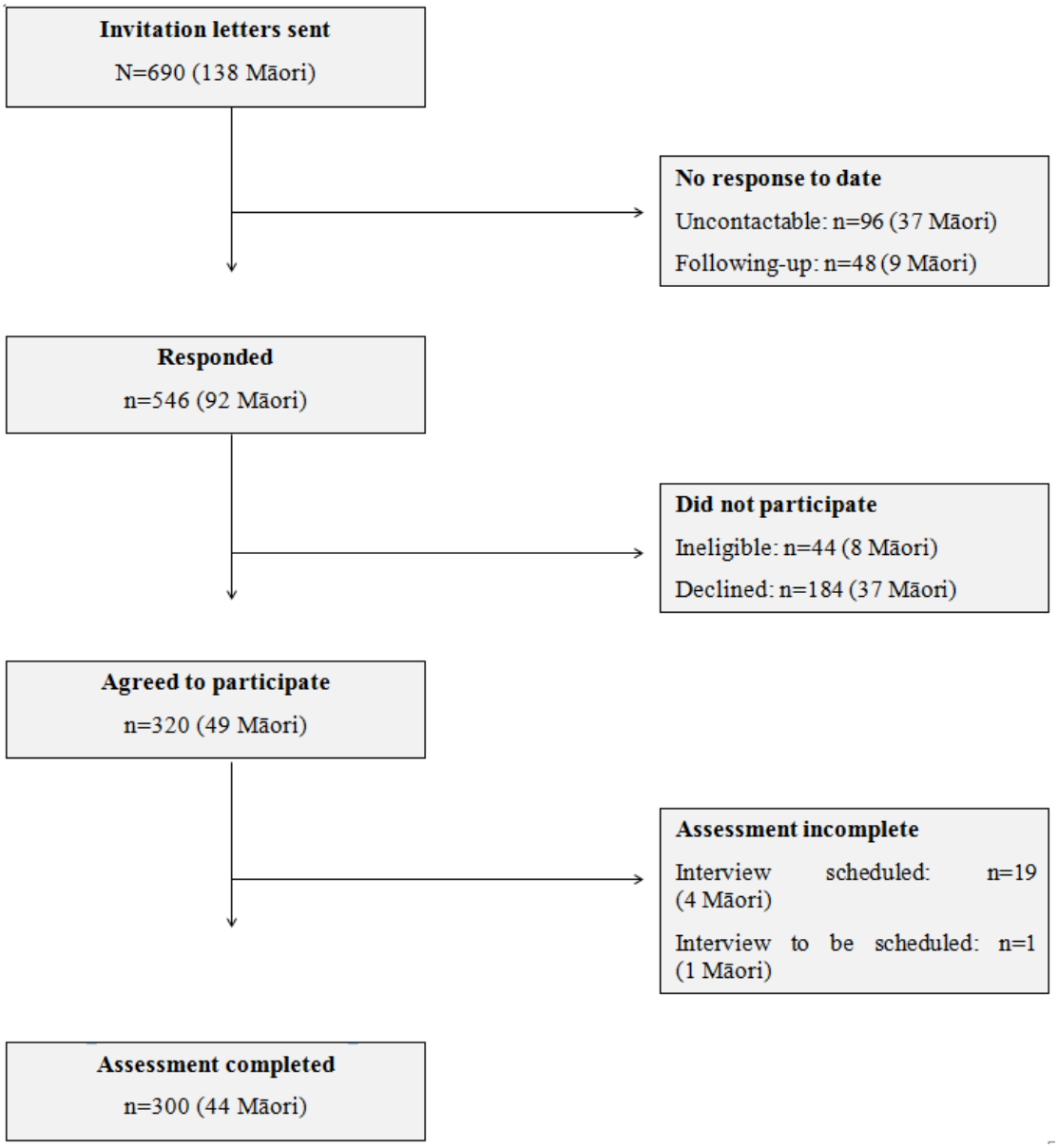
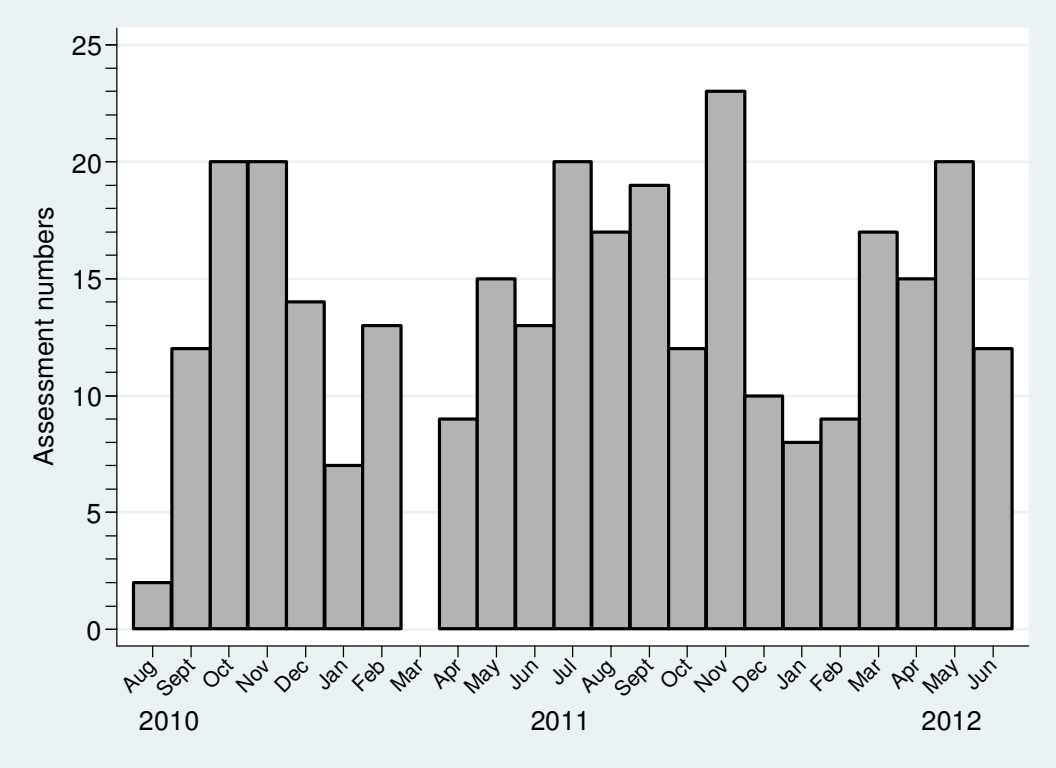


Figure 2. Participant assessment numbers per month since study inception. (The 22 February 2011 earthquake resulted in significant loss of life and damage to the city, including cordoning and long-term closure of the central business district and temporary closure of the CHALICE office.)



Sociodemographics—By design, all participants were aged 49–51 years. Table 2 includes the frequencies of these basic sociodemographics overall, and partitioned between the Māori and non-Māori groups. No significant ethnic differences were noted except for higher levels of tertiary qualifications found among non-Māori compared with Māori (p=0.003).

In the 50–54 years age group for the Canterbury region, Census 2006 figures reveal that 50.7% were female, 77.2% were living in married or de facto relationships, and 14.3% had university degrees.

Table 2. Sociodemographic profile of the first 300 participants overall, and partitioned by self-identified Māori/non-Māori ethnic status

	Overall		Māori		Non-Māori		
	n	(%)	n	(%)	n	(%)	P-value
Gender							**0.99**
Females	160	(53.3)	23	(52.3)	137	(53.5)	
Males	140	(46.7)	21	(47.7)	119	(46.5)	
Marital status							**0.19**
Married/de facto	226	(75.3)	29	(65.9)	197	(77.0)	
Separated/divorced	47	(15.7)	8	(18.2)	39	(15.2)	
Widowed	6	(2.0)	1	(2.3)	5	(2.0)	
Never married	21	(7.0)	6	(13.6)	15	(5.9)	
Highest educational qualification							**0.003**
No formal qualifications	47	(15.7)	14	(31.8)	33	(12.9)	
Secondary	77	(25.7)	9	(20.5)	68	(26.6)	
Post-secondary certificate, diploma or trade	116	(38.7)	15	(34.1)	101	(39.5)	
University	57	(19.0)	4	(9.1)	53	(20.7)	
Other	3	(1.0)	2	(4.5)	1	(0.4)	
Household income (NZD)							**0.57***
≤ $50,000	56	(18.7)	10	(22.7)	46	(18.0)	
$50,001-$80,000	71	(23.7)	12	(27.3)	59	(23.0)	
$80,001-$120,000	77	(25.7)	12	(27.3)	65	(25.4)	
> $120,000	85	(28.3)	9	(20.5)	76	(29.7)	
Unknown	11	(3.7)	1	(2.3)	10	(3.9)	
Current smoking status							**0.24**
Non-smoker	258	(86.0)	35	(79.5)	223	(87.1)	
Current smoker	42	(14.0)	9	(20.5)	33	(12.9)	
Years lived in Canterbury							**0.06**
< 20	57	(19.0)	3	(6.8)	54	(21.1)	
20-39	93	(31.0)	17	(38.6)	76	(29.7)	
40 ≤	150	(50.0)	24	(54.5)	126	(49.2)	

P-values calculated using Fisher's exact test. *'Unknown' category omitted from calculation.

Discussion

CHALICE is a large, multidisciplinary, comprehensive, longitudinal study that aims to generate a better understanding of the change in health with age. This research will provide evidence for cost-effective ways to maintain healthful lifestyles and everyday functioning within Canterbury, New Zealand, in the face of our rapidly changing demographic profile.[1]

There are many determinants of health and wellbeing[13] but nutrition, physical activity, and lifestyle factors are influential and potentially modifiable, and will receive particular interest within CHALICE. Maintaining or improving health and wellbeing may be one of the most important health strategies to delay the onset of age-related diseases. As such, this research project will have a key focus on the determinants of health and wellbeing, and in the longer term on the determinants of healthy ageing.

A central component of the CHALICE study is the development of an extensive repository of biological samples (biobank) for each participant. The purpose of this biobank will be to facilitate a wide range of genetic, biochemical and immunologic analyses (beyond those included in the initial assessment).

The biobank will be an enduring archive of carefully consented and stored samples that will be available to address future research questions, and allow analysis with novel technologies not yet available. The CHALICE biobank initially consists of genomic DNA extracted from peripheral blood, as well as multiple aliquots of serum, plasma, and urine.

Over the past few years genome wide association studies (GWAS) have yielded over 2,000 common genetic variants and copy number variants that influence risk of complex diseases and phenotypes.[14,15] CHALICE is designed to investigate the influence of such common genetic variants on many aspects of health, ageing and disease. In particular, relevant genotypes will be integrated with a phenotype rich data set inclusive of clinical, cardiovascular, neuropsychiatric and gastrointestinal phenotypes. In conjunction with specific environmental factors, CHALICE is also designed to evaluate the relative importance of genetic variation on measures of wellbeing, disease and phenotypes such as vitamin levels, hormone levels and metabolic characteristics.

Among diseases of ageing, those affecting the heart and the brain are leading causes of death and disability for Māori. Many of the major recent advances in these conditions are the development of biomarkers that assist in early identification and monitoring of treatment.[16,17]

Māori are at risk of being excluded from health gains created through non-Māori research because of inadequate representation in most of these study types. The requirement for Māori consultation when involving genetic research may be perceived as a barrier for non-Māori researchers, as well as the perception among researchers that Māori are reluctant to participate in biomedical and genetic research. Arguably these factors may have been exacerbated through poorly reported research that leads to further negative Māori stereotypes.[18]

Additionally, the single disease focus of many research projects with exclusion of people with significant comorbidities may contribute to systemic barriers to Māori inclusion.

The development of this longitudinal cohort of Māori participants willing to contribute to a resource of carefully consented biomedical samples and comprehensive health information that recognises the importance of whakawhanaungatanga (the process of establishing and maintaining relationships), manaakitanga (reciprocity of kindness, respect and humanity), tinorangatiratanga (self determination) has the potential to be an important resource for Māori and researchers.

While biomedical markers have the potential to yield future improvement in Māori health status, through identification of risk factors and early detection, this must be balanced by an ability to understand the cultural, community, whānau (family), sociodemographic and health care context of Māori.

Sociodemographic factors[19] and health care[20] are dominant factors in mortality inequalities. This study aims to unite the individual and community context of illness affecting Māori as they age with gains by adopting international biomedical research and validating its utility for Māori.

While having several salient strengths, such as the scientifically robust longitudinal design, oversampling of Māori, breath of domains investigated, and comparability with available Census figures, the CHALICE study also has potential weaknesses. It might be opined that the geographical localisation of the cohort might limit generalisability. However, generalizability of findings depend on a number of considerations, divorced from time and place, and stems from the particular research question being addressed.[21]

Stability, amenability to research participation,[8] and the age-profile of Canterbury's population[9] will also offset this potential limitation for many investigations. Undoubtedly, the Canterbury earthquakes have had a profound effect on its residents and communities. Despite this, and throughout this enormously difficult period, recruitment and participation has continued with only a small interruption.

Finally, Pacific and Asian ethnic group representation within the CHALICE study is likely to be small and will generally provide insufficient numbers to inform ethic-specific comparisons beyond the Māori and non-Māori stratification groupings; although, again, this will depend on the particular research question that is being addressed.

The CHALICE study has been designed to advance scientific knowledge in a number of disciplines and provide public benefits through the provision of good quality information. Findings from this study will inform policy development and assist programme implementation for a variety of stakeholders working towards maximising the potential of older people within broader New Zealand society.

Competing interests: Nil.

Author information: Philip Schluter, Public Health, Department of Public Health and General Practice, University of Otago, Christchurch; Janet Spittlehouse, Study Coordinator, Department of Psychological Medicine, University of Otago,

Christchurch; Vicky Cameron, Molecular Biology and Physiology Researcher, Department of Medicine, University of Otago, Christchurch; Stephen Chambers, Infectious Disease Physician, Department of Pathology, University of Otago, Christchurch; Richard Gearry, Gastroenterologist, Department of Medicine, University of Otago, Christchurch; Hamish Jamieson, Medical Registrar in General and Geriatric Medicine, Christchurch Hospital, Canterbury District Health Board, Christchurch; Martin Kennedy, Molecular Geneticist, Department of Pathology, University of Otago, Christchurch; Cameron Lacey, Psychiatrist, Māori Indigenous Health Institute (MIHI), University of Otago, Christchurch; David Murdoch, Clinical Microbiologist, Department of Pathology, University of Otago, Christchurch; John Pearson, Biostatistician, Department of the Dean, University of Otago, Christchurch; Richard Porter, Psychiatrist, Department of Psychological Medicine, University of Otago, Christchurch; Mark Richards, Cardiologist, Department of Medicine, University of Otago, Christchurch; Paula Skidmore, Nutritional Epidemiologist, Department of Human Nutrition, University of Otago, Dunedin; Richard Troughton, Cardiologist, Department of Medicine, University of Otago, Christchurch; Esther Vierck, Research Fellow, Department of Psychological Medicine, University of Otago, Christchurch; Peter Joyce, Study Director and Psychiatrist, Department of Psychological Medicine, University of Otago, Christchurch

Acknowledgements: The CHALICE study is supported by grants awarded from the Department of Internal Affairs' Lotteries Health, Canterbury Community Trust, Otago Thyroid Research Foundation, and University of Otago. The authors also gratefully acknowledge the participants of the study, content advisor Professor Gary Nicholls (hypertension), research assistants Ms Anna Thorpe and Ms Julia Martin, data manager Ms Monica Johnstone, research nurses Ms Bridget Kimber and Ms Robyn Abbott, laboratory staff Ms Allison Miller and Mr Alan Aitchison, and all other contributors to the CHALICE study.

Correspondence: Professor Philip Schluter, Head of School, School of Health Sciences, University of Canterbury, Private Bag 4800, Christchurch 8140, New Zealand. Fax: +64 (0)3 3643318; email: philip.schluter@canterbury.ac.nz

References:

1. World Health Organization; US National Institute of Aging. Global Health and Ageing. Geneva: World Health Organization; 2011.
2. World Health Organization. Good Health Adds Life to Years: Global brief for World Health Day 2012. Geneva: World Health Organization; 2012.
3. World Economic Forum. Global Population Ageing: Peril or Promise? Geneva: World Economic Forum; 2012.
4. Ministerial Review Group. Meeting the Challenge: Enhancing Sustainability and the Patient and Consumer Experience within the Current Legislative Framework for Health and Disability Service in New Zealand Wellington: The New Zealand Government; 2009.
5. NZIER. Ageing New Zealand and Health and Disability Services: Demand Projections and Workforce Implications, 2001-2021. A Discussion Document. Wellington: Ministry of Health; 2004.
6. Cornwall J, Davey JA. Impact of Population Ageing in New Zealand on the Demand for Health and Disability Support services, and Workforce Implications. A background paper completed for the Ministry of Health in June 2003 by the New Zealand Institute for Research on Ageing (NZiRA) and the Health Services Research Centre (HSRC), Victoria University of Wellington. Wellington: Ministry of Health; 2004.

7. Keene L. New Zealand's ageing population and health expenditure. Wellington: New Zealand Council of Trade Unions; 2010.
8. Fergusson DM, Horwood LJ. The Christchurch Health and Development Study: review of findings on child and adolescent mental health. Aust N Z J Psychiatry. 2001;35:287-96.
9. Statistics New Zealand. Table Builder: 2006 Census by age by region. Wellington: Statistics New Zealand; 2012.
10. Vandenbroucke JP, von Elm E, Altman DG, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. Epidemiology. 2007;18:805-35.
11. Electoral Commission - Te Kaitiaki Take Kōwhiri. Enrolment Statistics: Comparison of Estimated Eligible Voting Population to Enrolled Electors for Christchurch City. http://www.elections.org.nz/councils/ages/district_60_christchurch_city.html. Accessed 9 July, 2012.
12. Twisk J. Applied Longitudinal Data Analysis for Epidemiology. Cambridge: Cambridge University Press; 2003.
13. Cloninger CR. Feeling Good: The Science of Wellbeing. New York: Oxford University Press; 2004.
14. Visscher PM, Brown MA, McCarthy MI, Yang J. Five years of GWAS discovery. Am J Hum Genet. 2012;90:7-24.
15. Conrad DF, Pinto D, Redon R, et al. Origins and functional impact of copy number variation in the human genome. Nature. 2010;464:704-12.
16. Shaw LM, Korecka M, Clark CM, et al. Biomarkers of neurodegeneration for diagnosis and monitoring therapeutics. Nat Rev Drug Discov. 2007;6:295-303.
17. Braunwald E. Biomarkers in heart failure. N Engl J Med. 2008;358:2148-59.
18. Wensley D, King M. Scientific responsibility for the dissemination and interpretation of genetic research: lessons from the "warrior gene" controversy. J Med Ethics. 2008;34:507-9.
19. Malcolm L, Barnett R. Utilisation of inpatient cardiology services including by Māori: a study of hospital discharges for patients enrolled with Partnership Health practices for the 2 years ending June 2007. N Z Med J. 2009;122:63-71.
20. Lacey C, Porter RJ, Hona R. Cultural appropriateness of cognitive testing in Māori Acute In-Patient Care - National Conference. Christchurch, New Zealand. 2002.
21. Rothman KJ, Greenland S. Modern Epidemiology. 2nd ed. Philadelphia: Lippincott-Raven; 1998.
22. Roalfe AK, Roberts LM, Wilson S. Evaluation of the Birmingham IBS symptom questionnaire. BMC Gastroenterol. 2008;8:30.
23. Ware JE, Kosinski M, Dewey JE. How to Score Version 2 of the SF-36 Health Survey. Lincoln, RI: QualityMetric Inc.; 2000.
24. Tennant R, Fishwick F, Platt S, et al. Monitoring Positive Mental Health in Scotland: Validating the Affectometer 2 Scale and Developing the Warwick-Edinburgh Mental Well-being Scale for the UK. Glasgow: NHS Health Scotland; 2006.
25. Tennant R, Hiller L, Fishwick R, et al. The Warwick-Edinburgh Mental Well-being Scale (WEMWBS): development and UK validation. Health Qual Life Outcomes. 2007;5:63.
26. Ministry of Health. Methodology Report for the 2006/07 New Zealand Health Survey. Wellington: Ministry of Health; 2008.
27. Lappalainen R, Kearney J, Gibney M. A pan EU survey of consumer attitudes to food, nutrition and health: An overview. Food Qual Prefer. 1998;9:467-78.
28. Gibson EL, Wardle J, Watts CJ. Fruit and vegetable consumption, nutritional knowledge and beliefs in mothers and children. Appetite. 1998;31:205-28.
29. Kearney JM, McElhone S. Perceived barriers in trying to eat healthier - results of a pan-EU consumer attitudinal survey. Br J Nutr. 1999;81:S133-7.

30. López-Azpiazu I, Martínez-González MA, Kearney J, et al. Perceived barriers of, and benefits to, healthy eating reported by a Spanish national sample. Public Health Nutr. 1999;2:209-15.
31. Sullivan C, Oakden J, Young J, et al. Obstacles to Action: A Study of New Zealanders' Physical Activity and Nutrition: Technical Report. Wellington: SPARC; 2003.
32. Russell D, Parnell W, Wilson N. NZ Food: NZ People. Key results of the 1997 National Nutrition Survey. Wellington: Ministry of Health; 1999.
33. DeAngelis MM. Personal Communication: Ocular Molecular Genetics Institute, Massachusetts Eye and Ear Infirmary, Harvard Medical School, Boston, Massachusetts; and, University of Utah School of Medicine, Moran Eye Center, Salt Lake City, Utah; 2010.
34. Jensen J, Spittal M, Krishnan V. ELSI Short Form: User Manual for a Direct Measure of Living Standards. Wellington: Ministry of Social Development; 2005.
35. Saunders JB, Aasland OG, Babor TF, et al. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption - II. Addiction. 1993;88:791-804.
36. Pitama S, Wells JE, Faatoese A, et al. A Kaupapa Māori approach to a community cohort study of heart disease in New Zealand. Aust N Z J Public Health. 2011;35:249-55.
37. Ebersole P, Touhy T, Hess P, et al. Toward Healthy Aging: Human Needs and Nursing Response. 7th ed. Maryland Heights, Missouri: Mosby; 2004.
38. Warr P, Cook J, Wall T. Scales for the measurement of some work attitudes and aspects of psychological well-being. J Occup Psychol. 1979;52:129-48.
39. Hills D, Joyce C, Humphreys J. Validation of a job satisfaction scale in the Australian clinical medical workforce. Eval Health Prof. 2012;35:47-76.
40. Laidlaw K, Power MJ, Schmidt S, WHOQOL-OLD Group. The Attitudes to Ageing Questionnaire (AAQ): development and psychometric properties. Int J Geriatr Psychiatry. 2007;22:367-79.
41. Brim OG, Ryff CD, Kessler RC. How Healthy Are We? A National Study of Well-Being at Midlife. Chicago, IL: The University of Chicago Press; 2004.
42. Marmot M, Banks J, Blundell R, et al. Health, Wealth and Lifestyles of the Older Population in England: The 2002 English Longitudinal Study of Ageing (Wave 1). London: Institute for Fiscal Studies; 2003.
43. Broadbent E, Petrie KJ, Main J, Weinman J. The brief illness perception questionnaire. J Psychosom Res. 2006;60:631-7.
44. McKee KJ, Philp I, Lamura G, et al. The COPE index - a first stage assessment of negative impact, positive value and quality of support of caregiving in informal carers of older people. Aging Ment Health. 2003;7:39-52.
45. Newsom JT, Nishishiba M, Morgan DL, Rook KS. The relative importance of three domains of positive and negative social exchanges: a longitudinal model with comparable measures. Psychol Aging. 2003;18:746-54.
46. Smith B, Sullivan E, Bauman A, et al. Lay beliefs about the preventability of major health conditions. Health Educ Res. 1999;14:315-25.
47. Fiscella K, Franks P, Clancy CM. Skepticism toward medical care and health care utilization. Med Care. 1998;36:180-9.
48. Brugha TS, Cragg D. The List of Threatening Experiences: the reliability and validity of a brief life events questionnaire. Acta Psychiatr Scand. 1990;82:77-81.
49. Carver CS. You want to measure coping but your protocol's too long: consider the brief COPE. Int J Behav Med. 1997;4:92-100.
50. Ryff CD, Keyes CL. The structure of psychological well-being revisited. J Pers Soc Psychol. 1995;60:719-27.
51. Koenig H, Parkerson GR, Meador KG. Religion index for psychiatric research. Am J Psychiatry. 1997;154:885-6.
52. Straughan PT, Seow A. Fatalism reconceptialized: a concept to predict health screening behavior. J Gender Cult Health. 1998;3:85-100.

53. McManus S, Meltzer H, Brugha T, et al. Adult Psychiatric Morbidity in England, 2007. Results of a Household Survey. London: The NHS Information Centre for Health and Social Care; 2009.
54. Adler NE, Epel ES, Castellazzo G, Ickovics JR. Relationship of subjective and objective social status with psychological and physiological functioning: preliminary data in healthy white women. Health Psychol. 2000;19:586-92.
55. Forman TA, Williams DR, Jackson JS. Race, place, and discrimination. Perspect Soc Probl. 1997;9:231-61.
56. Sheehan DV, Lecrubier Y, Sheehan KH, et al. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. J Clin Psychiatry. 1998;59:22-33.
57. Amorim P, Lecrubier Y, Weiller E, et al. DSM-IH-R Psychotic Disorders: procedural validity of the Mini International Neuropsychiatric Interview (MINI). Concordance and causes for discordance with the CIDI. Eur Psychiatry. 1998;13:26-34.
58. Frost RO, Steketee G, Grisham J. Measurement of compulsive hoarding: saving inventory-revised. Behav Res Ther. 2004;42:1163-82.
59. Cloninger CR, Svrakic DM, Przybeck TR. A psychobiological model of temperament and character. Arch Gen Psychiatry. 1993;50:975-90.
60. Cloninger CR. The Temperament and Character Inventory-Revised. St. Louis, MO: Center for Psychobiology of Personality, Washington University in St. Louis; 1999.
61. Nasreddine ZS, Phillips NA, Bédirian V, et al. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. J Am Geriatr Soc. 2005;53:695-9.
62. Schmidt M. Rey Auditory Verbal Learning Test: A Handbook (RAVLT). Los Angeles, CA: Western Psychological Services; 1996.
63. Oldfield RC. The assessment and analysis of handedness: The Edinburgh inventory. Neuropsychologia. 1971;9:97-113.
64. McLean G, Tobias M. The New Zealand Physical Activity Questionnaires. Report on the validation and use of the NZPAQ-LF and NZPAQ-SF self-report physical activity survey instruments. Wellington: SPARC; 2004.
65. Fulkerson JA, Nelson MC, Lytle L, et al. The validation of a home food inventory. Int J Behav Nutr Phys Act. 2008;5:55.
66. Mandic S. Personal Communication. Dunedin: School of Physical Education, University of Otago; 2012.
67. Ware JE, Kosinski M, Turner-Bowker DM, Gandek B. How to score version 2 of the SF-12 health survey (with a supplement documenting version 1). Lincoln, RI Quality Metric Inc.; 2002.
68. Carr VJ, Lewin TJ, Webster RA, Kenardy JA. A synthesis of the findings from the Quake Impact Study: a two-year investigation of the psychosocial sequelae of the 1989 Newcastle earthquake. Soc Psychiatry Psychiatr Epidemiol. 1997;32:123-36.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Public support for more action on smoking

Philip Gendall, Janet Hoek, Ninya Maubach, Richard Edwards

Abstract

An online survey of 414 smokers and 414 non-smokers found strong support among New Zealanders for more tobacco control interventions. In particular, support for interventions that will protect children—smokefree playgrounds and smokefree cars when children are in them—was very high among both smokers and non-smokers. Predictably, non-smokers were more likely than smokers to support other tobacco control interventions including extending outdoor smokefree areas and restricting the availability of tobacco. Nevertheless, there was widespread support for the tobacco 'end game' goal of reducing smoking prevalence from around 20% to 5% or less by 2025. These results are consistent with growing evidence of public support for stronger tobacco control interventions and confirm that preventive health measures have broad public appeal.

In November 2011, Wilson, Thomson, and Edwards concluded that, while some progress had been made towards achieving the goal of reducing smoking prevalence and tobacco availability in New Zealand, "gaps remain which need to be addressed if substantive progress towards the smokefree nation goal is to be achieved"[1].

Since then, tobacco has been removed from open display in retail stores, above-inflation tobacco tax increases have been introduced, and the Ministry of Health has consulted over the implementation of plain packaging. While these evidence-based measures represent important progress, the government's 'end game' goal, of smoking prevalence below 5% by 2025, will require more comprehensive interventions.

Recent studies suggest New Zealanders agree the government should do more to tackle the harm caused by smoking,[2-4] but we know less about which measures they believe the government should implement. To address this question, we surveyed 828 adult New Zealanders to estimate support for additional tobacco control interventions.

Method

We conducted an online survey of 414 smokers and 414 non-smokers sampled from a commercial Internet panel in March 2012. An Internet panel is a pre-recruited group of individuals who have agreed to participate in on-line research studies in return for some sort of incentive or compensation (usually 'points' that can be exchanged for products or other rewards).

The panel we used is managed by ResearchNow and comprises more than 70,000 New Zealanders, recruited via email and through on-line and off-line marketing. Samples representative of the New Zealand population can be drawn from the ResearchNow panel. However, because we required equal numbers of smokers and non-smokers in our sample (to enhance comparisons between the two groups), we weighted our data so the age, gender, ethnicity, and smoking status of respondents matched that of the New Zealand population according to the 2006 census (the most recent census).

The survey initially used screening questions to identify respondents' smoking status (thus enabling management of sampling quotas). The questionnaire then comprised two main sections; the first of these used an 11-point scale ranging from 0 = 'No support at all' to 10 = 'Full support' to estimate

support for tobacco control interventions concerned with smokefree outdoor areas, smoking in cars, and retailing of tobacco products.

The second section used 5-point agree-disagree scales to explore opinions on these measures as well as the tobacco control 'end game'. Finally, we collected details of respondents' demographic attributes. We analysed the effects of age, gender, ethnicity and smoking status using linear regression and logistic regression, with policy support and support for 'end game' outcomes as the dependent variables and the independent variables entered as a series of dummy variables.

Table 1 shows the smoking prevalence among different age, sex, and ethnic groups in the weighted study sample.

Table 1. Sample smoking prevalence by gender, age and ethnicity

Variables	Smokers % *(n=158)*	Non-smokers % *(n=670)*
Gender		
Male *(n=401)*	20.0	80.0
Female *(n=427)*	18.2	81.8
Ethnicity		
NZ European/Other *(n=639)*	16.6	83.4
Māori & Pacific *(n=125)*	36.0	64.0
Asian *(n=64)*	10.9	89.1
Age group		
15 to 24 *(n=151)*	21.9	78.1
25 to 44 *(n=300)*	23.7	76.3
45 to 64 *(n=254)*	17.7	82.3
65+ *(n=123)*	7.3	92.7

Results

Overall, there was strong support for most of the tobacco control intervention measures examined. In particular, most respondents strongly supported extending smokefree outdoor areas to include children's playgrounds, sports grounds and areas outside building entrances and doorways. The mean level of support was over 60% for smokefree patrolled beaches, footpaths in shopping areas, parks and reserves, and 56% for smokefree outdoor areas of pubs, bars and cafes.

Support was close to 90% for restricting smoking in cars when children were present, and more than 65% when any non-smoker was present. Support for restricting the number of tobacco retail outlets and not allowing tobacco sales within one kilometre of schools was also around 65%.

Although non-smokers supported removing tobacco products from duty free stores and providing smokers with quit advice when they bought tobacco products, smokers opposed these measures, and overall support for these initiatives was just below 50% (see Table 2).

Table 2. Support for tobacco control intervention measures

Variables	Mean level of support * #		
	All participants (N=828) %	Smokers (n=158) %	Non-smokers (n=670) %
Smokefree Outdoor Areas			
Children's playgrounds	82	75	83
Sports grounds	68	56	71
Outside building entrances and doorways	65	48	69
Patrolled beaches	62	44	66
Footpaths in shopping areas	61	40	66
Town or city parks and reserves	61	42	66
Outdoor areas of pubs, bars and cafes	56	30	62
Smoking in Cars			
When children are in the car	88	78	91
When non-smokers are in the car	67	49	71
In all cars regardless of who is in them	45	27	49
Retailing of Tobacco Products			
No store within one kilometre of a school allowed to sell tobacco products	67	40	73
Only a small number of stores licensed to sell tobacco	63	29	70
Duty free stores in New Zealand not allowed to sell tobacco products	47	18	53
Smokers given quitting advice each time they buy tobacco products	47	23	52

* Mean response on an 11-point support scale converted to a percentage.

Responses weighted by age, gender, smoking status and ethnicity

As Table 2 shows, support for the measures tested was, predictably, lower among smokers than non-smokers; nevertheless, mean support among smokers for smokefree cars when children were present was 78%, and 75% for smokefree children's playgrounds.

Respondents' opinions on tobacco intervention measures were generally consistent with their support for these measures (see Table 3); 90% agreed or strongly agreed that people should not be able to smoke in cars with children in them and that outside areas where children go should be smokefree.

Most respondents (77%) agreed that stores selling tobacco products should also sell cessation products, that these stores should be licensed (70%), and that their number should be reduced (63%). More agreed than disagreed with the proposition that local communities should have input into the number of outlets selling tobacco in their area, but neither smokers nor non-smokers supported a proposal that people who sell tobacco products should be trained to offer quit advice.

There was some ambivalence about the efficacy of some of the tobacco control interventions suggested. For example, 85% of those interviewed felt smokers would smoke in their homes or cars if unable to smoke in public areas, while just over half thought most smokers would ignore smokefree signs in outdoor areas and that smokefree outdoor areas would be impractical to enforce. However, nearly half of respondents thought smokefree outdoor areas would help smokers who were trying to quit and 41% thought smokefree signs would discourage smoking in outdoor public spaces.

Table 3. Opinions on tobacco intervention measures

Intervention	Opinions on tobacco control interventions*					
	All Participants		Smokers		Non-Smokers	
	Agree %	Disagree %	Agree %	Disagree %	Agree %	Disagree %
Outdoor Smokefree Areas						
Outside areas where children go should be smokefree	90	4	76	8	93	3
If smokers cannot smoke in public areas, they will smoke in their cars or in their homes	85	5	82	6	85	5
When people smoke outdoors they affect non-smokers' right to a smokefree environment	64	17	26	45	73	11
Most smokers will ignore smokefree signs in outdoor areas	53	23	46	30	54	21
Smokefree outdoor areas are impractical because they are too hard to enforce	53	23	67	15	50	28
Smokefree outdoor areas would help smokers who are trying to quit	49	26	39	38	51	23
Smokefree signs will discourage people from smoking in outdoor public areas	41	42	41	42	42	42
Smoking in Cars						
People should not be allowed to smoke in cars with children in them	91	4	78	9	93	3
People should be allowed to smoke in cars if they want to	46	30	70	13	41	34
Retailing Tobacco Products						
If stores sell tobacco products, they should also sell products that help smokers to quit	77	8	68	13	80	7
Stores should have to have a licence to sell tobacco products	70	19	40	43	77	13
Fewer places should be allowed to sell cigarettes and tobacco	63	17	23	51	73	9
Local communities should help to decide how many stores sell tobacco products in their area	47	31	20	56	53	25
Only people qualified to give quitting advice should be allowed to sell tobacco products	22	46	15	66	24	42

*Responses weighted by age, gender, smoking status and ethnicity. 'Strongly agree' and 'agree' combined and 'strongly disagree' and 'disagree' combined.

'Don't knows' excluded but 'neither agree nor disagree' included.

The tobacco control 'end game'

Respondents strongly supported the 2025 smokefree goal of reducing smoking prevalence to 5% or less (nearly 80% agreement) and more than two-thirds agreed they wanted to live in a country where hardly anyone smokes (see Table 4).

Half agreed that they did not want to see tobacco sold in New Zealand in ten years' time (twice as many as opposed this proposition), and 70% thought more of the money from tobacco taxes should be spent on helping smokers to quit.

A majority of non-smokers agreed with all of these propositions. By contrast, while more smokers agreed than disagreed with the goal of reducing smoking prevalence to 5% by 2025 and spending more money from tobacco taxes on helping smokers to quit, the opposite was true for wanting to live in a country where hardly anyone smokes and that cigarettes and tobacco should not be sold in New Zealand in 10 years' time.

Table 4. Opinions on the tobacco control 'end game'

'End game' outcome	Opinions on 'end game' outcomes*					
	All Participants		Smokers		Non-Smokers	
	Agree %	Disagree %	Agree %	Disagree %	Agree %	Disagree %
I support the goal of reducing smoking from around 20% of the population to 5% or less by 2025	79	6	50	24	86	2
I want to live in a country where hardly anyone smokes	71	11	29	39	81	4
More of the money from tobacco taxes should be spent on helping smokers to quit	71	12	62	14	73	11
Cigarettes and tobacco should not be sold in New Zealand in ten years' time	50	25	18	58	58	17

*Responses weighted by age, gender, smoking status and ethnicity. 'Strongly agree' and 'agree' combined and 'strongly disagree' and 'disagree' combined. 'Don't knows' excluded but 'neither agree nor disagree' included.

Determinants of support for tobacco control and the 'end game'

To examine the factors associated with policy support, we developed indices of support for smokefree outdoor areas, smokefree cars and smokefree retail interventions by summing the individual support scores for each item associated with these topics and then dividing by the number of items involved. This created an average 'support score' for each respondent for each of the three areas of tobacco control intervention. These variables were regressed on dummy variables representing age, gender, ethnicity, and smoking status using multivariate OLS regression.

For 'end game' support we created a dichotomous variable which had a value of 1 if the respondent agreed or strongly agreed with all the three of the end game outcomes: "I support the goal of reducing smoking from around 20% of the population to 5% or less by 2025"; "I want to live in a country where hardly anyone smokes"; and

"Cigarettes and tobacco should not be sold in New Zealand in ten years' time", and zero otherwise.

Over the whole sample, 48% of respondents supported the 'end game' according to this measure. Logistic regression was used to determine the independent effects of age, gender, ethnicity, and smoking status on this variable.

The results of both analyses are shown in Table 5.

Smoking status had the greatest effect on support for the tobacco control interventions and tobacco 'end game' outcomes examined; smokers were significantly less likely than non-smokers to support all of these measures. Similarly, men were less likely than women to support the measures, though not significantly so for smokefree outdoor areas.

Māori and Pacific people were less likely than other ethnic groups to support smokefree outdoor areas, smokefree cars, smokefree retail interventions and the 'end game'. (Not all of the relevant coefficients are statistically significant but they are all negative or have an odds ratio less than 1.0.) However, lower support among Māori and Pacific people overall disguises differences between Māori and Pacific smokers and non-smokers.

Though these results are not shown in Table 5, Māori and Pacific smokers were more likely than Asian or Europeans smokers to support tobacco control interventions in the four areas considered, whereas Māori and Pacific non-smokers were less likely. (This is consistent with analyses of data from the International Tobacco Control (ITC) study, which reported stronger support for tobacco control interventions among Māori and Pacific smokers.[6,7]) However, the numbers of Māori and Pacific people (and Asians) in the sample were relatively small; consequently, these conclusions about ethnicity effects need to be treated with caution.

Overall, age appears to have relatively little or no effect on support for the interventions examined, though those over 65 tended to be more supportive of tobacco control interventions than those under 25.

Table 5. Regression analyses of support for tobacco control interventions and the 'end game'

Variables	Support for smokefree outdoor areas Adj R^2 = .09		Support for smokefree cars Adj R^2 = .11		Support for smokefree retail interventions Adj R^2 = .24		Support for end game outcomes	
	Mean values	B (Sig)	Mean values	B (Sig)	Mean Values	B (Sig)	Agree %	Odds Ratio (Sig)
Total	**6.5**		**6.7**		**5.6**		**48**	
Smoker status								
Non-smoker	6.9	0.00	7.0	0.00	6.2	0.00	53	1.00
Smoker	4.8	-2.02***	5.1	-1.71***	2.7	-3.25***	24	0.29***
Gender								
Female	6.7	0.00	7.0	0.00	5.9	0.00	52	1.00
Male	6.3	-0.27	6.4	-0.55**	5.2	-0.70***	44	0.73**
Ethnicity								
European/Other	6.8	0.00	6.7	0.00	5.6	0.00	49	1.00
Māori/Pacific	5.5	-0.93	6.0	-0.17	4.3	-0.52*	35	0.65**
Asian	5.9	-1.02**	7.8	1.20**	7.8	2.07***	55	1.10
Age Group								
Under 25	6.3	0.00	6.4	0.00	5.4	0.00	49	1.00
25 to 44	6.5	0.19	6.5	0.11	5.5	0.20	50	1.05
45 to 64	6.4	-0.16	6.6	0.19	5.3	-0.14	43	0.73
65 and over	7.0	0.14	7.6	1.06***	6.4	0.68*	52	0.83

* Coefficient significant at p<.10

**Coefficient significant at p<.05

***Coefficient significant at p<.001

Discussion and Conclusions

Achieving a smokefree Aotearoa/New Zealand by 2025 will need more than simply a continuation of current tobacco control policies. Additional interventions will be required and, while a public mandate is not a prerequisite for policy implementation, interventions with high levels of public support are more likely to be viewed favourably by policy makers and the government of the day.

Among those surveyed, support for tobacco control interventions that will protect children is very high and similar for both smokers and non-smokers. Support for other tobacco control interventions is primarily determined by smoking status – predictably, non-smokers are significantly more likely to support tobacco control interventions than smokers. However, most respondents, including 50% of smokers, supported the goal of of reducing smoking from around 20% of the population to 5% or less by 2025.

Furthermore, most want to live in a country where hardly anyone smokes and half agree that cigarettes and tobacco should not be sold in New Zealand in ten years' time.

These findings extend earlier New Zealand studies, conducted before the 2025 goal was publicised, and suggest a growing momentum in support for a smokefree society. Support for smokefree cars when children are present has increased since earlier studies[5], as has support for other smokefree areas, particularly children's playgrounds[6], reducing the number of retail outlets selling tobacco[7], and eliminating sales of tobacco in 10 years' time.[8]

Our findings on support for smokefree cars when children are present are similar to those reported in international studies.[9] However, support for smokefree outdoor areas was lower in our study than in a survey of New South Wales adults.[10]

Similarly, a recent paper reporting on two studies of Victorian adults and smokers respectively revealed stronger support for 'endgame' policies in Australia than estimated in our survey.[11] These differences may reflect Australia's more progressive policy environment and the Gillard government's determination to reduce smoking prevalence.

Nevertheless, given the Australian evidence and our own experience of increased support for smokefree bars and restaurants after this policy was introduced[12], it seems logical that, as smoking prevalence declines, support for interventions to lower it further will inevitably increase.

However, there is a degree of ambivalence about the efficacy of some of the proposed interventions we tested, including the practicality and effectiveness of smokefree signs in discouraging people from smoking in outdoor public areas. Furthermore, the lack of support among smokers for some measures suggests there is potential for such measures to alienate smokers, a possibility alluded to in previous research.[13] This possibility highlights the need to explore why smokers oppose these interventions and whether some policies could potentially harden attitudes among some smokers. More fundamentally, it suggests that comprehensive cessation support is pivotal to achieving the 2025 goal.

Most smokers regret having started smoking[14] and have been prompted by excise tax increases and other interventions to think seriously about quitting. Smokers strongly

support the increased use of tobacco tax on cessation support, thus enhancing this support should help to mollify smokers and increase the success rate of quit attempts.

Overall, our findings add to the growing evidence base documenting public support for more progressive tobacco control measures, particularly those concerned with smokefree outdoor places, smokefree cars and increased retail restrictions. The results provide clear direction to policy makers and again illustrate that preventive health measures have broad public appeal.

Competing interests: Nil.

Author information: Philip Gendall, Emeritus Professor & Senior Research Officer, Department of Marketing, University of Otago, Dunedin; Janet Hoek, Professor, Department of Marketing, University of Otago, Dunedin; Ninya Maubach, Post Doctoral Fellow, Department of Marketing, University of Otago, Wellington; Richard Edwards, Professor, Department of Public Health, University of Otago, Wellington

Correspondence: Philip Gendall, Senior Research Officer, Department of Marketing, University of Otago, P O Box 56, Dunedin 9054. Fax: +64 (0)3 4798172; email: philip.gendall@otago.ac.nz

References:

1. Wilson N, Thomson G, Edwards R. End-of-term brief review of the New Zealand Government's actions on five major health risk factors. N Z Med J. 2011; 124: 122-6. New Zealand Medical Journal 2011;124(1344):122-26.
2. Maubach N, Hoek J, Edwards R, et al. "The times are changing": New Zealand smokers' perceptions of the tobacco endgame. Tobacco Control (in press). Available at: http://tobaccocontrol.bmj.com/content/early/2012/06/15/tobaccocontrol-2011-050398.full
3. Edwards R, Wilson N, Peace J, Weerasekera D, Thomson GW, Gifford H. Support for a tobacco endgame and increased regulation of the tobacco industry among New Zealand smokers: results from a National Survey. Tobacco Control 2012 (in press). Available at: http://tobaccocontrol.bmj.com/content/early/2012/04/24/tobaccocontrol-2011-050324.abstract?sid=0e360adb-adbb-4ba6-9632-f56282f9c9d0
4. Thomson G, Wilson N, Edwards R. Kiwi support for the end of tobacco sales: New Zealand governments lag behind public support for advanced tobacco control policies. New Zealand Medical Journal 2010;123(1308):106-11.
5. Thomson G, Wilson N. Public attitudes to laws for smoke-free private vehicles: a brief review. Tobacco Control 2009;18(4):256-61.
6. Wilson N, Blakely T, Edwards R, et al. Support by New Zealand smokers for new types of smokefree areas: national survey data. New Zealand Medical Journal 2009;122;80-89..
7. Li J, Tu D, Trappitt R. Public opinion about tobacco control regulation - Health and Lifestyles Surveys 2008-2010 [In Fact]. Wellington: Health Sponsorship Council, 2011.
8. Li J, Tu D, Trappitt R. Public opinion about a smokefree New Zealand - Health and Lifestyles Survey 2010 [In Fact]. Wellington: Health Sponsorship Council, 2011.
9. Hitchman SC, Fong GT, Zanna MP, et al. Support and correlates of support for banning smoking in cars with children: findings from the ITC Four Country Survey. The European Journal of Public Health 2011;21(3):360-65.
10. Walsh R, Paul C, Tzelepis F, et al. Is government action out-of-step with public opinion on tobacco control? Results of a New South Wales population survey. Aust N Z J Public Health 2008;32:482 - 8.
11. Hayes L, Wakefield MA, Scollo MM. Public opinion about ending the sale of tobacco in Australia. Tobacco Control 2013. Available at: http://tobaccocontrol.bmj.com/content/early/2013/01/08/tobaccocontrol-2012-050777.full.pdf+html?sid=19403a8a-e56a-4d92-b5f0-1b561b9eb122[J1]

12. Price L, Allen M. Going Smokefree in New Zealand: Lessons from the battlefield. Auckland: ASH; 2006..
13. McCool J, Hoek J, Edwards R, et al. Crossing the smoking divide for young adults: Expressions of stigma and identity among smokers and non-smokers. Nicotine & Tobacco Research 2013;15:552-6.
14. Wilson N, Edwards R, Weerasekera D. High levels of smoker regret by ethnicity and socioeconomic status: national survey data. New Zealand Medical Journal 2009;122(1292):99-100.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Myocarditis associated with *Campylobacter jejuni*

David Murphy, Christopher Jolly, Sharyn MacDonald, Richard Troughton

Abstract

Myocarditis is frequently associated with a multitude of different viral infections but much less commonly a bacterial source. We present the case of a 33-year-old male with *Campylobacter jejuni* enteritis who subsequently developed myocarditis confirmed on cardiac MRI.

Campylobacter jejuni gastroenteritis is the most common notifiable disease in New Zealand. It comprises 41% of all 2011 notifications with a total rate of 151.9 per 100,000 population, with a regional bias towards Canterbury.[1]

Myocarditis and pericarditis are frequently attributed to a multitude of different viruses, fungi and protozoa and very occasionally bacteria. A review of the literature however reveals only a few reported cases of myocarditis as a result of *Campylobacter jejuni*, this being the third such reported case in New Zealand.[2,3]

Case report

A 33-year-old normally fit and healthy male was admitted to Christchurch Hospital (Christchurch, Canterbury, New Zealand) with a 2-day history of new onset chest pain.

He awoke on the day of admission with a dull central chest pain with no radiation graded 6/10 in severity. He had no associated shortness of breath, diaphoreis, palpitations, nausea, dizziness or pre-syncopal elements. There was no pleuritic component and his pain was not exacerbated or relieved by movement. The pain lasted about 1 hour before gradually subsiding. This was his second such episode in 2 days.

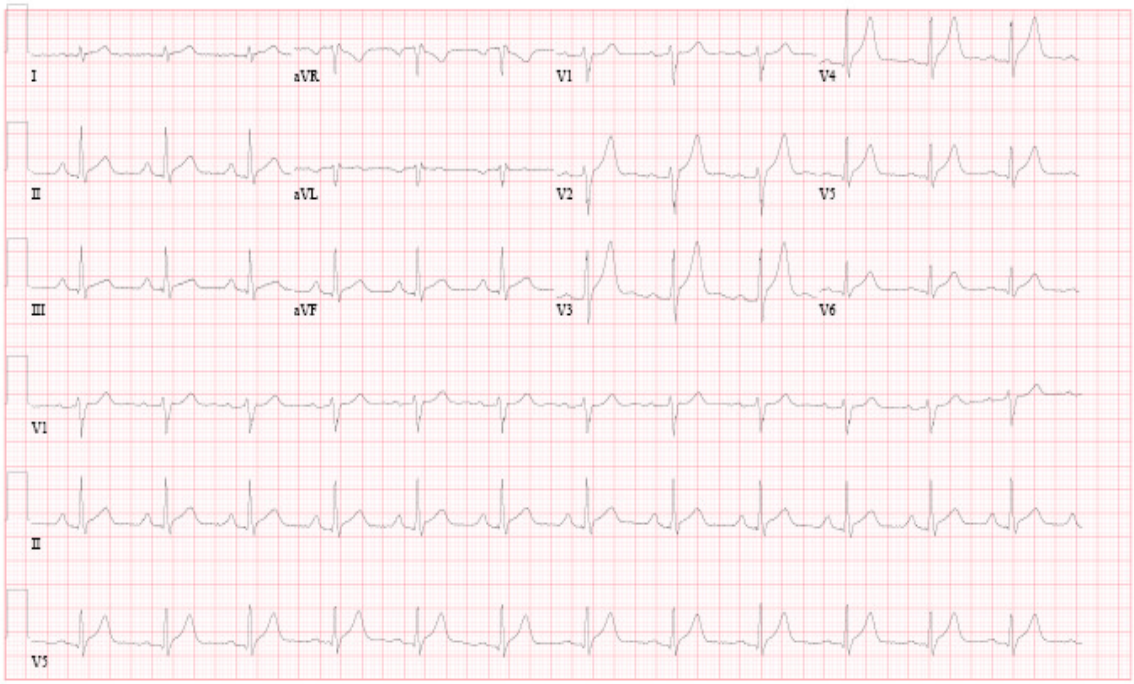
On admission he was pain-free. Review of systems revealed a 10-day history of diarrhoea. Smoking was his only cardiac risk factor.

On examination he appeared comfortable had a regular pulse of 70 bpm, blood pressure 110/70 mmHg and a respiratory rate of 12 saturating at 98% on room air. He was apyrexial. Cardiovascular examination was normal with normal heart sounds and no audible murmur or rubs.

His complete blood count, creatinine, urea and serum electrolytes were all within normal limits. His C-reactive protein (CRP) was elevated at 28 mg/L (n<5mg/l) as was his Troponin I (TnI) at 8.9 mcg/L (n<0.03 mcg/L).

Electrocardiogram demonstrated 1-2 mm ST elevation in leads V2-V6, II, III and aVF and hyperacute T-waves in leads V2-V4

Figure 1. 12 lead electrocardiogram on admission



Due to the initial concern in the Emergency Department that he may be suffering from acute coronary syndrome he was commenced on 180 mg of ticagrelor, 300 mg of aspirin and given a therapeutic dose of enoxaparin.

Further history revealed that 10 days prior to this admission he described feeling unwell suffering from fevers and rigors associated with one episode of vomiting. In addition to this he developed multiple episodes of watery diarrhoea. Initially this was non-bloody but then progressed to three episodes of bloody diarrhoea after 5 days. There was no associated abdominal pain.

He attended his GP and subsequent faecal testing confirmed *Campylobacter jejuni*. He was commenced on roxithromycin 300 mg daily. There was no coccidian protozoa seen. No giardia or cryptosporidium antigens were detected.

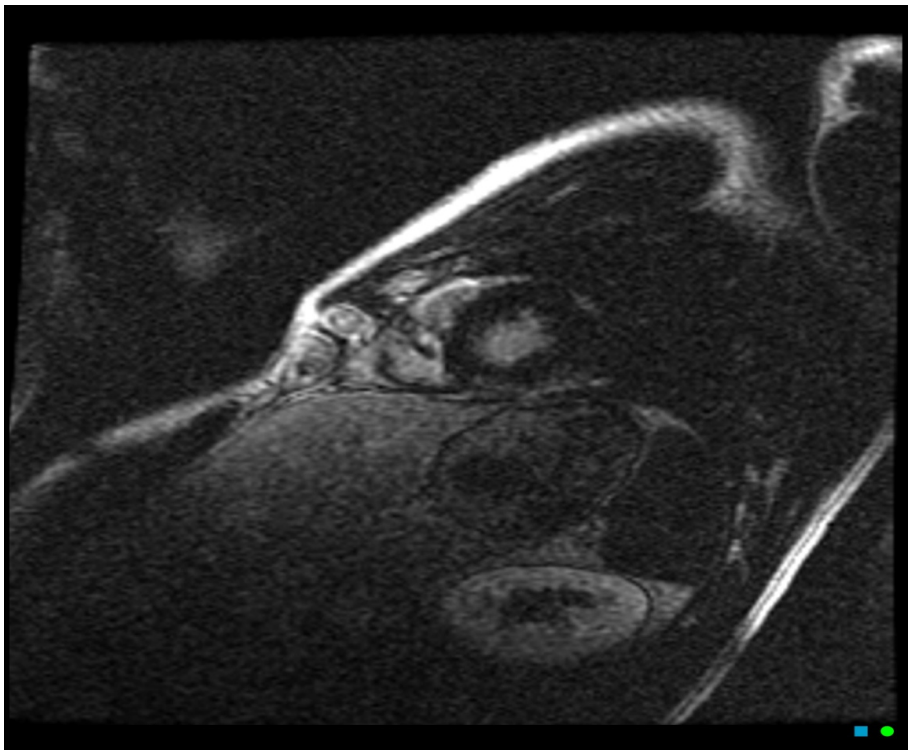
The provisional diagnosis was therefore changed to myocarditis and/or pericarditis secondary to *Campylobacter jejuni* and he was commenced on analgesia and continued with the oral antibiotics.

A transthoracic echo reported a low normal systolic function with a LVEF of 56% but otherwise normal with no evidence of pericarditis.

He underwent a cardiac MRI (cardiomyopathy protocol) which demonstrated a dilated left and right ventricle with subepicardial high signal intensity consistent with myocarditis.

There was no evidence of subendocardial enhancement that would be consistent with acute coronary syndrome. Selective coronary angiography was not performed.

Figure 2. Cardiac MRI—minor delayed enhancement of subepicardial apical, inferior and inferolateral segments



.

Over the next few days his ST elevation settled. His TnI rose to a peak of 18.6 mcg/L (tested on day 2) and then subsequently decreased to 4.3 mcg/L on the day of discharge.

His diarrhoea lasted a total of 15 days. He remained in hospital for 7 days suffering only 1 further episode of chest pain. He was discharged on metoprolol CR 47.5 mg with outpatient follow up.

Discussion

Myocarditis as defined by the WHO is an inflammatory heart muscle disease associated with cardiac dysfunction.[4] It is a well-recognised possible complication of many infectious diseases with a variable presentation. Most commonly fatigue, dyspnoea on exertion, palpitations and chest pain at rest.[5]

Our patient's chest pain occurred 10 days following the onset of diarrhoea. A review by Hanu et al in 1995 reported a maximum delay of about 2 weeks.[6] *De novo* heart failure may also occur. Myocarditis has also been implicated in between 8.6 and 12% of cases of the sudden death of young people.[7,8]

Clinical findings consistent with myocarditis, markers of myocyte necrosis (CK-MB and Troponin I or T) and increased wall stress (BNP) are all supportive of a diagnosis. ECG findings may include arrhythmias (ventricular or supraventricular), atrioventricular block, a pattern of acute injury or pericarditis and nonspecific repolarisation abnormalities. ECG can also be normal. Echocardiographic findings

may include segmental or global LV dysfunction, RV dysfunction or pericardial effusion.[5]

Increasingly cardiac MRI has become much more useful as a non-invasive diagnostic test. The International Consensus Group on Cardiovascular MR recently published the Lake Louise consensus criteria which among other things looked for evidence of new or recent myocardial damage, increased T2 signal or delayed enhancement on CMR.[9]

Given the prevalence of *Campylobacter jejuni* enteritis we recommend that physicians be aware of all of the potential sequelae of this bacterium.

Author information: David Murphy, House Surgeon, Department of Cardiology; Christopher Jolly, Registrar, Department of Cardiology; Sharyn MacDonald, Consultant Radiologist, Department of Radiology; Richard W. Troughton, Consultant Cardiologist, Department of Cardiology; Christchurch Hospital, Christchurch

Acknowledgements: We thank our patient for his kind consent to the publication of this case report. We also thank Dr MacDonald for providing the cardiac MRI images and expertise in this area.

Correspondence: David Murphy, c/o RMO Unit, Christchurch Public Hospital, Christchurch 8140, New Zealand. Email: david.murphy@cdhb.health.nz

References:

1. Institute of Environmental Science and Research Limited. Notifiable and other diseases in New Zealand. Annual Report 2011. Population and Environmental health group, 2011.
2. Reda E, Mansell C. Myocarditis in a patient with *Campylobacter* infection. N Z Med J. 2005 Aug 26;118(1221). http://journal.nzma.org.nz/journal/118-1221/1634/content.pdf
3. Florkowski CM, Ikram RB, Crozier IM, et al. *Campylobacter jejuni* myocarditis. Clin Cardiol. 1984 Oct;7(10):558-9.
4. WHO/ISFC task force on the definition of cardiomyopathies. Circulation. 1996;93:841–842.
5. Howlett J, McKelvie R, Arnold J, et al. Canadian Cardiovascular Society Consensus Conference guidelines on heart failure, update 2009: diagnosis and management of right-sided heart failure, myocarditis, device therapy and recent important clinical trials. Can J Cardiol. 2009 Feb;25(2):85-05.
6. Hannu T, Mattila L, Rautelin H, et al. Three cases of cardiac complications associated with *Campylobacter jejuni* infection and review of the literature. European Journal of Clinical Microbiology and Infectious Diseases. 2005;24:9.
7. Fabre A, Sheppard MN. Sudden adult death syndrome and other non ischaemic causes of sudden cardiac death: a UK experience. Heart 2006;92(3):316-320.
8. Doolan A, Langlois N, Semsarian C. Causes of sudden cardiac death in young Australians. Med J Aust. 2004;180:110–112.
9. Sarda L, Colin P, Boccara F, et al. Myocarditis in patients with clinical presentation of myocardial infarction and normal coronary angiograms. J Am Coll Cardiol. 2001;37:786.
10. Matthias F, Sechtem U, Schulz-Menger J, et al. Cardiovascular Magnetic Resonance in Myocarditis: A JACC White Paper. J Am Coll Cardiol. 2009;53(17):1475-1487.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Fatal food allergy and opportunities for risk minimisation

Jan Sinclair

IgE-mediated food allergy affects up to 6% of children and 2% of adults.[1] Fatal food allergic reactions are rare. Management of food allergy requires accurate identification of allergen(s), risk assessment, education on allergen avoidance / management of allergic reaction, and follow up.[2] A case of fatal allergic reaction to cashew ingestion is reported, illustrating the importance of these aspects of management.

Case report

By age 4 years the child had experienced three allergic reactions. The initial reactions consisted of abdominal pain, urticaria and vomiting, with no cardiorespiratory symptoms, treated with oral antihistamine. Cashew (nut) was the suspected cause, confirmed on testing.

The third reaction included respiratory involvement (a lump in the throat, "asthmatic" cough, and difficulty breathing). Symptoms resolved over 2 hours, treated with oral antihistamine. On paediatric review an adrenaline autoinjector (EpiPen®) was discussed but not specifically recommended, and an allergic reaction plan was not provided. Follow-up was not arranged.

Over the next 3 years the child had problematic asthma, managed with high doses of inhaled steroids, long-acting β_2 sympathomimetics, and occasional courses of oral steroid without good control. Further paediatric review was pending.

At age 8 he had anaphylaxis after eating whole cashew nuts (urticaria, cough, wheeze, dyspnoea and vomiting). He was promptly taken to a medical centre and treated for anaphylaxis, with IM adrenaline and oxygen. Advice was sought from the local hospital emergency department, with antihistamine and corticosteroid advised.

Symptoms worsened, an ambulance was called, and further treatment given (adrenaline IM and salbutamol by inhalation). There was progressive hypoxia, vomiting and probable aspiration, and a seizure. Intubation and CPR were instituted but resuscitation was unsuccessful.

Cause of death was status asthmaticus attributable to cashew nut anaphylaxis.

Discussion

While food allergy is common, fatalities from food allergic reactions are rare. This case tragically illustrates key points on the management of those at risk of severe food allergic reactions, and also the early management of anaphylaxis when it occurs.

Avoidance of specific allergens is the cornerstone of management of patients with food allergy. Accurately identifying allergen(s) necessitates testing, undertaken in this case. Importantly skin prick test or specific IgE results do not predict likelihood of anaphylaxis.

Education on allergen avoidance needs to be provided to parents, caregivers, and patients. Children and young people need age appropriate education to become competent and confident in recognition and avoidance of specific allergens.

A written action plan should be provided for all patients with food allergy. Plans are available from the Australasian Society of Clinical Immunology and Allergy (www.allergy.org.au). The plan should include an adrenaline autoinjector for all patients with a history of food-induced anaphylaxis, as in this case, with definite respiratory symptoms on the third cashew exposure.

Adrenaline autoinjectors should be considered for patients with less severe allergic reactions where there are other risk factors for anaphylaxis (www.allergy.org.au). Additional risk factors for this child include:

- Age, with severe reactions more common in older children/adolescents and young adults.[3,4]
- Asthma, with most fatal food allergic reactions occurring in patients who also have asthma. Recent active asthma may further increase the risk.[3,4]
- Peanut and nut account for a significant proportion of fatalities. Cashew allergy is associated with severe food allergic reactions.[5]

Management of anaphylaxis outside of a hospital setting necessitates administration of adrenaline as soon as possible and ambulance transfer to the nearest hospital emergency department. Antihistamine and corticosteroids are adjuvant and should not be given prior to adrenaline in a patient with anaphylaxis.

Most food induced anaphylaxis resolves with a single dose of IM adrenaline, but some cases progress and need more aggressive therapy. Some anaphylaxis (up to 20%) is biphasic; patients with anaphylaxis need to be observed in hospital for 4–6 hours.[6]

Patients who have had anaphylaxis should be referred for specialist care, either with an allergist/immunologist or paediatrician/physician with an interest in the care of these patients.

Active management of patients with food allergy will minimise the chance of tragic outcomes as in this instance, and requires:

- Identification of trigger(s).
- Education on avoidance, with regular, age appropriate review.
- An allergic reaction plan including an adrenaline autoinjector for those with a past history of anaphylaxis, or those with risk factors for anaphylaxis on further allergen exposure.
- Follow up to ensure appropriate precautions remain in place.
- Optimising asthma control.
- Prompt administration of adrenaline for anaphylaxis, with immediate transfer to a hospital emergency department.

Author information: Jan Sinclair, Paediatric Allergist and Clinical Immunologist, Starship Children's Hospital, Auckland

Correspondence: Dr Jan Sinclair. Starship Children's Hospital, Private Bag 92024, Auckland, New Zealand. Email JanS@adhb.govt.nz

References:

1. Chafen JJ, Newberry SJ, Riedl MA, et al. Diagnosing and managing common food allergies: a systematic review. JAMA. 2010;303(18):1848-56.
2. Boyce JA, Assa'ad A, Burks AW, et al. Guidelines for the diagnosis and management of food allergy in the United States: report of the NIAID-sponsored expert panel. Journal of Allergy and Clinical Immunology. 2010;126(6 Suppl):S1-58.
3. Bock SA, Munoz-Furlong A, Sampson HA. Further fatalities caused by anaphylactic reactions to food, 2001-2006. Journal of Allergy and Clinical Immunology. 2007;119(4):1016-8.
4. Pumphrey RS, Gowland MH. Further fatal allergic reactions to food in the United Kingdom, 1999-2006. Journal of Allergy and Clinical Immunology. 2007;119(4):1018-9.
5. Clark AT, Anagnostou K, Ewan PW. Cashew nut causes more severe reactions than peanut: case-matched comparison in 141 children. Allergy. 2007;62(8):913-6.
6. Simons FER. Anaphylaxis: Recent advances in assessment and treatment. Journal of Allergy and Clinical Immunology. 2009;124(4):625-36.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

A toddler with shortness of breath

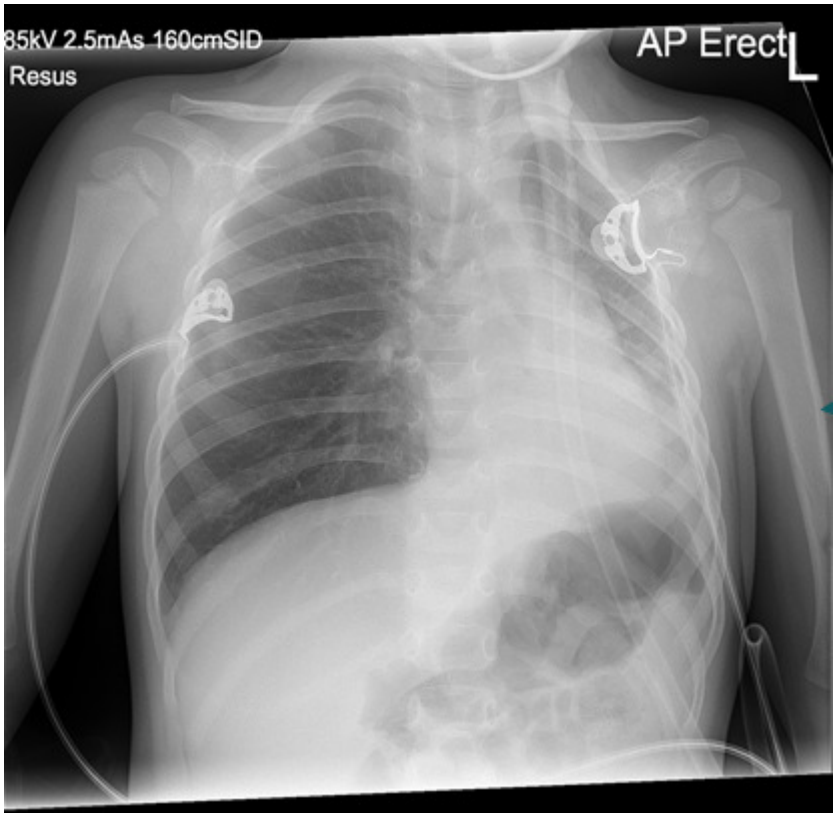
Tilak de Almeida, Alina Harrington, Mathula Hettiarachchi, Jitoko Cama

A 17-month-old girl was brought to our emergency department with shortness of breath of 18 hours' duration. About 6 hours prior to presentation she had been treated at a primary care facility for tonsillitis with antibiotics.

She had an oxygen saturation of 50% in room air with reduced chest movements and reduced air entry on her left chest. High-flow oxygen by face mask corrected the saturation to 90%. There were no wheezes on either side of the chest.

A chest X-ray done soon after arrival is shown below (Figure 1).

Figure 1. Chest X-ray (AP erect view)



In our patient there was no history of choking. In a review of 200 cases of foreign body aspiration only 88% gave a history of choking.[1] She was febrile on arrival with a temperature of 38ºC.

Chest radiograph shows grossly hyper expanded right lung crossing the midline shifting the mediastinum and the cardiac silhouette to left side.

A foreign body aspiration was suspected. Having a suspicion of foreign body aspiration is the most important step in diagnosis. Therefore a bronchoscopy should be done in all cases of suspected foreign body aspiration.

Prompt bronchoscopy by the paediatric surgical team showed three pieces of peanut in the left main bronchus. These were removed and she made an uneventful recovery.

Most objects aspirated by children are not radio opaque, and are not identified by standard radiographs unless there is associated airway obstruction.[2] As a result the clinical history, and not the radiographs, is the main determinant of whether to perform a bronchoscopy.

In our patient it was the radiographic findings not the clinical history that pointed towards a diagnosis of foreign body aspiration.

In young children, pneumonia, asthma, recurrent viral wheeze, and bronchiolitis are the common causes of shortness of breath. Clinicians should consider uncommon causes of shortness of breath when treating young children even in the absence of a suggestive history.

Author information: Tilak de Almeida, Senior Medical Officer in Paediatrics; Alina Harrington, Paediatric Registrar; Mathula Hettiarachchi, Paediatric Surgical Registrar; Jitoko Cama, Paediatric Surgeon; Waikato District Health Board, Hamilton

Correspondence: Tilak de Almeida [FRCP(Edin)FRCP(Glasg) FRCPCH] Department of Paediatrics, Waikato District Health Board, Pembroke Street, Hamilton, New Zealand. Email: tilak.dealmeida@waikatohealth.govt.nz

References:

1. Blazer S, Naveh Y, Friedman A. Foreign body in the airway. A review of 200 cases. Am J Dis Child. 1980 Jan;134(1):68-71.
2. Mu LC, Sun DQ, He P. Radiological diagnosis of aspirated foreign bodies in children: review of 343 cases. J Laryngol Otol. 1990;104(10):778.

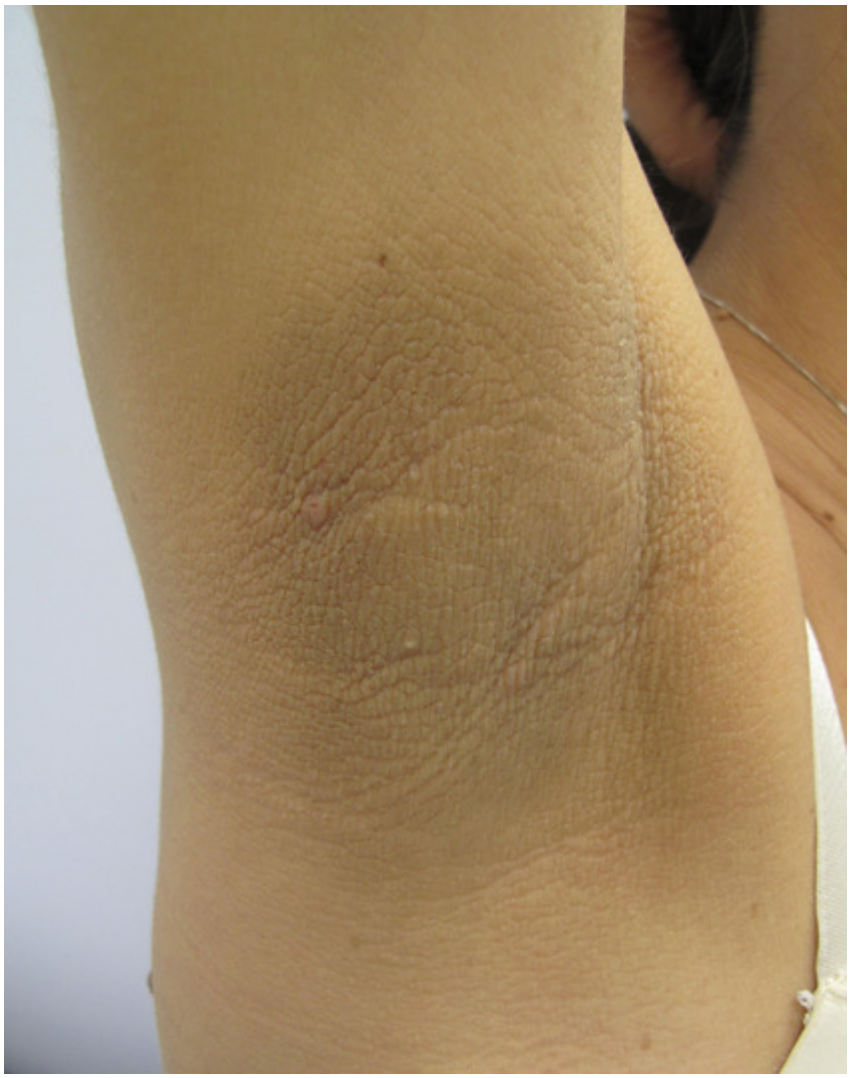
THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Acanthosis nigricans maligna

Mariam Reda, Nadim El Majzoub, Mohamad A Eloubeidi

A 38-year-old female presented to the dermatology clinic with a 3-month history of skin-darkening and discolouration and a 15 kg weight loss. The skin examination revealed dark, thickened and velvety lesions that were grey-brown in colour over the axilla (Figure 1), posterior neck and around the mouth. The findings were consistent with acanthosis nigricans (AN).

Figure 1. Thickened and velvety dark lesions over the axilla



She was then referred for an evaluation of the gastrointestinal tract.

Upper gastrointestinal endoscopy (Figure 2A) revealed thickened and abnormal antrum. Endoscopic biopsies revealed signet ring cells infiltrating the lamina propria (H&E stains 400×) (Figure 2B).

Endoscopic ultrasound (EUS) showed circumferential thickening in the antrum that invaded the muscularis propria to the adventitia (Figure 2C) with a 1 cm peri-tumoural lymph node seen (Stage T3N1).

Figure 2A. Upper gastrointestinal endoscopy showing thickened and abnormal antrum

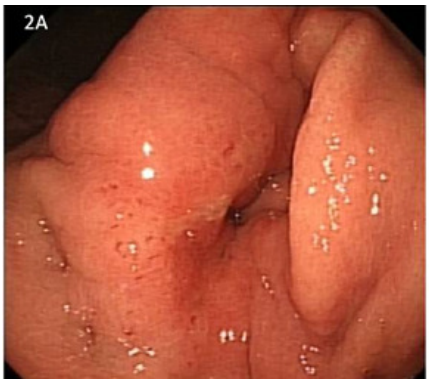


Figure 2B. Endoscopic biopsies showing signet ring cells infiltrating the lamina propria (H&E stain 400×)

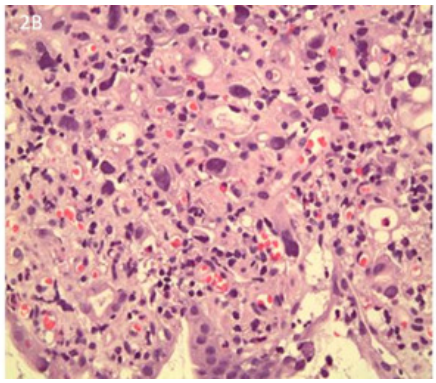
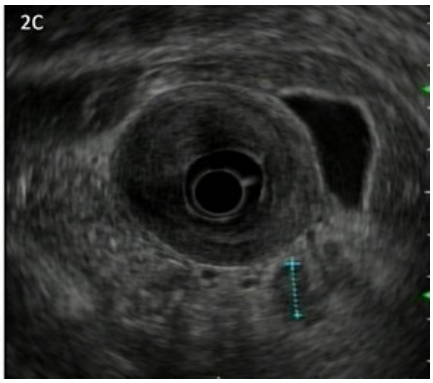


Figure 2C. Endoscopic ultrasound (EUS) showing circumferential thickening in the antrum invading the muscularis propria to the adventitia



A CT scan of abdomen and pelvis showed no liver metastases. Patient underwent a staging laparoscopy and started preoperative chemotherapy. A gastrectomy is planned in the future.

Not only can acanthosis nigricans present in gastric cancer and lymphoma, but it can also be associated with benign disorders such as diabetes mellitus and chronic alcohol intake, and oral contraceptive pill use.[1]

It has been reported that 92% of malignancies associated with acanthosis nigricans are intra-abdominal in origin of which 61% are gastric.[1]

Author information: Mariam Reda, Resident in the Internal Medicine Department; Nadim El Majzoub, Resident in the Pathology and Laboratory Medicine Department; Mohamad A Eloubeidi, Gastroenterologist; American University of Beirut Medical Center, Beirut, Lebanon

Correspondence: Mohamad A Eloubeidi, Professor of Medicine, American University of Beirut Medical Center, P.O. Box 11-0236 Riad El Solh 110 72020 Beirut, Lebanon. Fax: +961 1 366098; email: me75@aub.edu.lb

Reference:

1. Schwartz RA. Acanthosis nigricans. J Am Acad Dermatol 1994;31:1-19; quiz 20-2.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Smoking in children's films—covert tobacco advertising causing smoking uptake or much ado about nothing?

New Zealand has a proud history of tobacco control and was among the first countries to prohibit tobacco advertising in broadcast media.[1] Other protective measures followed quickly; in 1973, the tobacco industry agreed not to advertise their products on billboards or in cinemas,[2] nearly all tobacco sponsorships ended in 1995,[1,2] point of sale displays came down in 2012,[3] and legislation requiring plain packaging is in preparation.

The New Zealand Government, in its response to the findings of the Māori Affairs Select Committee on the tobacco industry has now committed to the goal of making New Zealand a smokefree nation by 2025—this will be the single most important public health achievement in New Zealand—and yet there remain barriers to its successful implementation.

Tobacco control measures have made (and will continue to make) major contributions to reducing smoking prevalence, which, at 17%,[4] is now substantially lower than the more than 50% of men (>35% of women) who smoked during the 1950s and 60s.[1]

Dismantling tobacco marketing in its many guises has greatly reduced youth exposure to smoking and has been associated with rapid reductions in both regular and daily smoking (from 28% in 1999 to under 10% in 2011, and from over 15% in 1999 to under 5% in 2011, respectively, for adolescents aged 14 to 15 years).[5] However, these declines in smoking prevalence have finally stalled[6]. In order to continue this decline in youth smoking to zero it is important to continue to reduce exposure to smoking as much as possible.

The tobacco industry has not observed these measures with any great sanguinity; instead it addressed each new restriction by developing alternative media strategies.[7] Thus, despite increasingly comprehensive marketing restrictions, smoking continues to be widely promoted through media that have strong youth and young adult reach and appeal.

Among other media currently depicting smoking, tobacco promotion occurs through product placement in films. Often arranged through formal contracts with film companies and actors,[8] many films present smoking as a common, normal and even aspirational behaviour, performed by adults (often role models for young people) who rarely, if ever, appear to suffer any ill effects from smoking.[9]

Film producers have argued that smoking contributes to character development and setting ambience, and claim these are artistically necessary.[10] They therefore defend their use of illusory images that present smoking as a badge of maturity and a conduit to aspirational attributes, irrespective of evidence that young people actively draw on these attributes as they define and project their social identity.[11]

Thus, despite highly incongruous instances of smoking in films, such as Sigourney Weaver's *Avatar* character,[12] or cartoon characters, movie producers have claimed

smoking confers realism on their creative product and positions characters' personalities.[13] The argument for realism for a science-fiction fantasy film like Avatar is especially hard to justify, given that the smoking occurred on a space station, a setting where in reality, smoking would be absolutely prohibited due to the risk of explosion.

However, a large body of research evidence investigating the effects of child and adolescent exposure to smoking in films has overwhelmingly concluded that smoking imagery in films increases the risk of initiation and continuation of smoking among youth.

In a recent meta-analysis, exposure of adolescents to smoking in films increased smoking initiation by 113% and established smoking by 68%[14]. Furthermore, there is a clear dose-response relationship: the greater the number of exposures to smoking in movies, the greater the risk of smoking experimentation.[15]

A recent multi-country European Study prospectively followed 10,000 adolescents and showed a 13% increase in smoking onset for every 1,000 smoking images seen, after controlling for age, gender, family affluence, school performance, TV screen time, personality characteristics, and smoking status of peers, parents, and siblings[16].

Summarised in a recent National Cancer Institute monograph,[9] and in the 2012 US Surgeon General's report on Preventing Tobacco Use Among Youth and Young Adults,[17] the evidence shows a clear causal relationship between exposure to smoking in films and both youth smoking uptake and smoking maintenance. The Surgeon General determined that smoking in films was simply another covert (and effective) form of tobacco advertising and the NCI concluded:

> *The depiction of cigarette smoking is pervasive in movies, occurring in three-quarters or more of contemporary box-office hits. Identifiable cigarette brands appear in about one-third of films. The total weight of evidence from cross-sectional, longitudinal, and experimental studies indicates a causal relationship between exposure to depictions of smoking in movies and youth smoking initiation.*[18]

This evidence is alarming and is compounded by the fact that, although the number of tobacco incidents in popular youth-rated US films declined from 2005 to 2010,[19] this trend sharply reversed from 2010 with a 34% increase in tobacco incidents per film in G, PG or PG-13 rated films[20] and a 54% increase in 2012.[21]

As New Zealand youth audiences enjoy many of Hollywood's films, the pattern of exposure is likely to be very similar here and movie-going New Zealand children will be at increased risk of smoking experimentation. In fact, New Zealand children are likely to receive greater exposure to smoking in films, than their US counterparts because of differences in film classification. For example, of the 67 top grossing films in 2012 there were a total of 2619 tobacco incidents. Nearly all of these smoking instances appeared in youth rated or unrestricted films in New Zealand (95%) compared to only 44% in the US.

Conversely, over half of these 67 films (36 or 54%), were adult-rated in the US but only 4 (6%) were adult rated in New Zealand. (personal communication Jonathan Polansky, consultant to UCSF Center for Tobacco Control Research and Education).

However, not only are New Zealand children being harmed by exposure to smoking in films, but New Zealand films are making a substantial national and international contribution to the problem.[22] "The Hobbit" with its unrestricted M-rating, exposed thousands of New Zealand children and millions of children worldwide to frequent smoking scenes.

Although hobbits and elderly magicians are not widely regarded as role models for children, the research evidence shows the most important predictor of smoking initiation is the overall number of smoking incidents to which children are exposed, regardless of the context.

Other recent M-rated films featuring smoking likely to have appealed to youth audiences include "Men in Black 3", "Mission: Impossible - Ghost Protocol", "Skyfall" and "X-Men: First Class". While less common these days, even cartoons have included positive depictions of tobacco use, such as "Rango" (PG, which contained about 60 instances of completely fictional characters smoking). It seems hard to justify the artistic necessity, ambience setting or requirement for realism for a cartoon character to smoke, and indeed, Disney films have now agreed to ban all smoking from their future productions.

In order to be smokefree by 2025 it is clear that New Zealand needs to both continue to support current smokers in their attempts to quit smoking and do everything possible to discourage children and adolescents from starting. Reducing exposure to smoking and to smoking imagery in all media is an important part of that strategy and requires better control of smoking in films, the key loophole through which such exposure is perpetuated.

The key measure required to reduce children's exposure to smoking is to apply adult-ratings to all films which portray smoking. The only exceptions should be films which portray historical characters who were smokers and films which depict, as a major focus, the adverse health effects of smoking.

Such recommendations are supported by the World Health Organization, in its 2011 report on smoking in films "Smoke free movies: from evidence to action":

> *Most youth exposure to on-screen smoking comes from smoking incidents in youth rated films. Because fewer children and adolescents view adult-rated films, official ratings for age appropriateness would be an effective method to reduce adolescent exposure to tobacco use without interfering with movie content.*
>
> *Any future movie with tobacco imagery should be given an adult rating, with the possible exception of movies that unambiguously depict the dangerous consequences of tobacco use or portray smoking by an actual historical figure who smoked. Older films should not be rerated.*

Further, the Framework Convention on Tobacco Control, to which New Zealand is a signatory, recommends adult ratings for films that depict any tobacco or smoking imagery:

> *Implementing a ratings or classification system that takes into account the depiction of tobacco products, use or images in rating or classifying entertainment media products (for example, requiring adult ratings which restrict access of minors) and that ensures that entertainment media aimed at children (including cartoons) do not depict tobacco products, use or imagery.*

Alternative approaches such as editing smoking out of scenes or running banners about the harm associated with smoking (as has recently been implemented in India) would be more difficult, expensive, and detract from the filmgoer's experience. Amongst current smokers some pre-film anti-smoking advertisements may even reinforce smoking behaviour[23].

As more countries adopt adult ratings for films containing smoking, smoking in cartoons and child and adolescent targeted films will rapidly decline given that the film industry will not want such films rated for older audiences with no interest in viewing them. This should lead in turn to a serious review by the film industry of all smoking in all films.

Restricting all smoking to adult rated films would be a simple, evidence-based and inexpensive method of reducing child and adolescent exposure to smoking and would reduce smoking experimentation and initiation in this age group. As such, it would make an important contribution to achieving the Government's goal of a smokefree New Zealand by 2025.

No doubt a few may view such a change as yet another nail in the coffin of free speech or artistic expression; however, we argue that it is no restriction at all in speech or imagery directed at children, that smoking has nothing whatsoever to do with artistic expression and that restricting smoking in films to adults only will help reduce future nails in future coffins of New Zealand children.

Ninya Maubach, Janet Hoek, Richard Edwards, Julian Crane
ASPIRE2025,
University of Otago

Judith McCool
School of Population Health
University of Auckland

References:

1. Thomson G, Wilson N. A Brief History of Tobacco Control in New Zealand. Wellington: University of Otago, 1997.
2. Trainor S. Tobacco Control in New Zealand: A history: Cancer Control Council of New Zealand, undated.
3. Hoek J, Jones A, Edwards R, Maubach N, Crane J, Youdan B. Eliminating tobacco point of sale displays: removing the retail detail from the devil. N Z Med J 2011;124(1345):105. http://journal.nzma.org.nz/journal/124-1345/4960/content.pdf

4. Ministry of Health. The Health of New Zealand Adults 2011/12: Key findings of the New Zealand Health Survey. In: Health Mo, editor. Wellington: Ministry of Health, 2012.
5. ASH New Zealand. National Year 10 ASH Snapshot Survey, 1999-2010: trends in tobacco use by students aged 14-15 years. In: Zealand AN, editor. Report for Ministry of Health, Health Sponsorship Council and Action on Smoking and Health. Auckland: ASH, 2011.
6. Youth Smoking in New Zealand Factsheet 1. (Accessed 3-5-13) http://www.ash.org.nz/research/ ASH (NZ), 2013.
7. Hoek J. Tobacco promotion restrictions: ironies and unintended consequences. Journal of Business Research 2004;57(11):1250-1257.
8. Charlesworth A, Glantz SA. Smoking in the movies increases adolescent smoking: a review. Pediatrics 2005;116(6):1516-1528.
9. Institute NC. The role of the media in promoting and reducing tobacco use. Tobacco Control Monograph. Bethesda (MD): US Department of Health and Human Services, National Institutes of Health, National Cancer Institute, 2008.
10. Sargent JD, Hanewinkel R. [Commentary] Evidence-based policy: an R-rating for movies with smoking. Addiction 2009;104(5):825-827.
11. Carter S. The Australian cigarette brand as product, person, and symbol. Tobacco Control 2003;12:79-86. Tobacco Control 2003;12:79-86.
12. Lyons A, Britton J. Protecting young people from smoking imagery in films: whose responsibility? Thorax 2011;66(10):844-846.
13. Michael Cieply. James Cameron Responds to Critics of Smoking in 'Avatar'. New York Times 2010 January 3.
14. Waylen AE, Leary SD, Ness AR, Tanski SE, Sargent JD. Cross-sectional association between smoking depictions in films and adolescent tobacco use nested in a British cohort study. Thorax;66(10):856-861.
15. Anderson SJ, Millett C, Polansky JR, Glantz SA. Exposure to smoking in movies among British adolescents 2001–2006. Tobacco Control 2010;19(3):197-200.
16. Morgenstern M, Sargent J, Engels R, Scholte R, Florek E, Hunt K, et al. .Smoking in movies and adolescent smoking initiation: longitudinal study in six European countries Am J Prev Med 2013;44(4):338-44.
17. U.S. Department of Health and Human Services. Preventing Tobacco Use Among Youth and Young Adults. In: General ARotS, editor. Atlanta, GA: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health, 2012.
18. National Cancer Institute. The role of the media in promoting and reducing tobacco use. In: Davis RM, Gilpin EA, Loken B, Viswanath K, Wakefield MA, editors. Monograph 19 ed. Bethesda, MD: US Department of Health and Human Services, National Institutes of Health, 2008.
19. Centers for Disease Control and Prevention. Smoking in the movies. Atlanta, GA: CDC, 2013.
20. Glantz SA, Iaccopucci A, Titus K, Polansky JR. Smoking in Top-Grossing US Movies, 2011. Preventing Chronic Disease 2012;9:120170.
21. Polansky JR, Titus K, Lanning N, Glantz SA. Smoking in top-grossing US movies, 2012. San Francisco: University of California San Francisco, 2013.
22. Stone J. The Hobbit under fire for pipe-smoking: Postmedia news, 2013.
23. Edwards C, Oakes W, Bull D. Out of the smokescreen II: will an advertisement targeting the tobacco industry affect young people's perception of smoking in movies and their intention to smoke? Tobacco Control 2007;16:177-81.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Fluoride and children's IQ

The recent article by Choi et al[1] has generated much interest among those following the perennially controversial debate surrounding community water fluoridation (CWF) in New Zealand. The renown of the paper is that the meta-analysis suggests that exposure to fluoride decreases the IQ of children. The validity of that finding has been reinforced by the fact two of authors were from the prestigious Harvard School of Public Health.

A number of validity issues about the study have been overlooked, disregarded, ignored, or misunderstood. The authors themselves were extremely cautious and conservative in the summary of their own analysis. They concluded that 'our results support the possibility of adverse effects', and advocated 'future research to evaluate dose-response relations based on individual-level measures of exposure over time' and 'more precise prenatal exposure assessment'.

The specific studies included in the analysis were all conducted in China and were extremely diverse. The definition of 'high' fluoride levels varied widely between studies while there was also a wide variation in the range of fluoride levels to which the comparison and reference groups had been exposed.

Fluoride exposure came from different sources including drinking water, well water and coal burning. Of the 16 studies which measured fluoride in drinking water, eight reported a statistically significant relationship between high fluoride and lower IQ, in seven IQ was 'lower' but there was no indication of whether this association was statistical significance, and in two studies there was no relationship between fluoride and IQ.

Choi et al acknowledged that the levels of fluoride in the studies involving drinking water, were higher than the levels 'considered acceptable in the US'. They are also much higher than any level likely to be found in New Zealand.

The greatest disservice of Choi et al to the fluoride debate is that their paper did not provide sufficient methodological detail about the individual studies for their validity to be assessed. Choi et al did recognise that 'each of the articles reviewed had deficiencies, in some cases rather serious'.

Many of the studies did not control for the effects of potential confounders such as parental education, and there was a lack of information provided about the selection of the villages or the study populations. As the majority of the papers were ecological in design, the findings from these population groups (e.g. villages) cannot be extrapolated to individuals.

At best, the paper by Choi et al provides nothing more than the merest suggestion of a possible or 'potential' relationship at the population level between children's IQ and fluoride in drinking water at levels much higher than ever likely to occur in New Zealand.

Barry Borman
Associate Professor

Caroline Fyfe
Research Assistant

Centre for Public Health Research
Massey University – Wellington

Reference:

1. Choi AL, Sun G, Zhang Y, Grandjean P. Developmental fluoride neurotoxicity: a systematic review and meta-analysis. Environ Health Perspect 2012;120:1362–1368.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Ageing and ethnicity: identification of inaccuracy in the LiLACS NZ cohort

Background—Self-identification of one's ethnicity in New Zealand is constantly shaped by political, social, economic and health forces.[1–3] At advanced age, that is over 80 years of age for Māori and 85+ for non-Māori, self-identification of ethnicity continues to be an important issue as identification or denial of one's ethnicity in a specific situation is often related to self-esteem or fear of being treated differently.[3]

Collection of accurate ethnic data is important as increasingly both Māori and non-Māori populations are ageing and the oldest old Māori, tangata whenua in New Zealand, are the fastest growing population group.[4]

Reliable and standardised collection of ethnic health data is fundamental for effective health planning and decision making and reviewing the effectiveness of different health interventions, such as admissions into hospital for either acute or elective care.[5,6]

Discrimination by way of ethnicity in New Zealand is now increasingly being recognised. Māori generally at a primary and secondary care level are offered less treatment options and diagnostic assessment.[3,7]

Māori, along with people over 65 years of age, share a similar experience of having twice the risk of adverse health events during inpatient hospital care. Monitoring of all adverse health events and outcomes from health interventions depends on accurate ethnicity recording.[8]

Identification of inaccuracy—Te Puāwaitanga o Ngā Tapuwae Kia Ora Tonu Life and Living in Advanced Age: a Cohort Study in New Zealand (LiLACS NZ) initiated in 2010, enrolled 937 participants aged between 80 to 90 years for Māori and aged 85 years for non-Māori. LiLACS NZ used self-identified ethnicity as per standardised options by Statistics New Zealand.[9]

Written informed consent was sought from participants to be able to access their hospital records through the New Zealand Health Information System (NZHIS) using each individual's unique identifier.

Of the 937 enrolled to LiLACS NZ, 877 (94%) gave permission to access their NZHIS health record and 60 (6%) declined. Of those who gave permission, 809 (809/877, 92%) had at least one hospital admission since 1988 and the remaining 68 (68/877, 8%) did not have a record of hospital admission. As per standard admission procedures, ethnicity is recorded on admission to hospital and available in the data supplied by NZHIS.

Of the 809 LiLACS NZ participants who had an admission to hospital between 1988 and 2011 (average of eight admissions per participants), 347 self-identified as Māori and 462 as non-Māori during the LiLACS NZ face-to-face interview.

Reviewing their NZHIS file, it was found that in the earliest (first) admission records of respective participant, only 186 were recorded as being Māori and 587 were recorded as non-Māori and 36 were not stated. This is an inaccuracy of 23% (Table 1). In the latest admission records, the inaccuracy reduced to 15% (Table 2).

Table 1. Self-defined ethnic identity of LiLACS NZ participants compared to earliest ethnicity recorded in NZHIS

NZHIS Ethnicity – *Earlier* admission	LILACS Ethnicity		Total
	Māori	Non-Māori	
Māori	186	–	186
Non-Māori	151	436	587
Not Stated	10	26	36
Total	347	462	809

Table 2. Self-defined ethnic identity of LiLACS NZ participants compared to latest ethnicity recorded in NZHIS

NZHIS Ethnicity – *Recent* admission	LILACS Ethnicity		Total
	Māori	Non-Māori	
Māori	243	–	243
Non-Māori	102	445	547
Not Stated	2	17	19
Total	347	462	809

Discussion—The accuracy of the hospital record in correctly ascertaining ethnicity in older Māori is questioned here. The inaccuracy, although it is improving, is of concern. Counting for nothing or something is an important issue in New Zealand where ethnic data is used for a wide range of purposes, such as, mapping and predicting new health trends, planning and resource allocation decisions, location of services, monitoring of outcomes from services, and meeting Treaty of Waitangi, statute and human rights obligations.[1]

On admission to any hospital in New Zealand, those who administer admissions should not assume individual's ethnic identity, but in a respectful way inquire how that person would like to be defined in terms of their ethnicity. Racism, sexism and ageism affects how people feel about themselves and this occurs at all stage of life.

Treating people with respect and dignity in accordance with the Code of Consumer Rights for Health and Disability Services in New Zealand may be a first step in facilitating accurate recording of ethnicity. Accuracy of hospital ethnicity recording is important for all ethnic groups as hospital admissions are likely to increase with the increasing ageing population and population diversity is increasing. Cultural factors pertaining to ethnicity need to be considered for future health care planning.[10] It is especially important for tangata whenua.

Inaccuracy of hospital record ethnicity will lead to inappropriate health planning, imprecision and underestimation of disparities in outcomes, and potential

embarrassment for patients and confusion for other health professionals in reading the records. We call for greater attention to this issue.

With projections of a greater number of Māori reaching advanced age, this is to be celebrated, to be honoured and to be claimed "*I got there being Māori all of the way*".

Te Puawaitanga o Nga Tapuwae Kia ora Tonu
The blossoming of life

Acknowledgements: Funders for the inception of the LiLACS NZ study: the Health Research Council of New Zealand programme grant (HRC 09/068B; main funding body), Ngā Pae o te Māramatanga (the New Zealand National Centre for Research Excellence for Māori; funded Māori engagement and project management) project grant, National Heart Foundation project grant for investigating cardiac markers. Translation was provided by Rangi McGarvey and refined by the Rōpū Kaitiaki; Hone Kameta, Florence Kameta, Betty MacPherson, Laiana Reynolds, Paea Smith and Te Kaanga Skipper. Elizabeth Robinson provided biostatistical advice for the LiLACS NZ Study.

Ruth Teh
Heart Foundation Research Fellow
Department General Practice and Primary Health Care
Faculty of Medical and Health Sciences

Lorna Dyall
Senior Lecturer
School of Population Health

Ngaire Kerse
Professor General Practice and Primary Health Care

University of Auckland

References:

1. Reid P. Ngā mahi whakaehae. In: Davis P, Dew K, editors. Health and Society in Aotearoa in New Zealand. New York: Oxford University Press; 1999.
2. Carter K, Hayward M, Blakely T, Shaw C. How much and for Whom Does Self-Identified Ethnicity Change over time in New Zealand? Results From A Longitudinal Study. Social Policy Journal of New Zealand / Te Puna Whakaaro. 2009(36):32- 45.
3. Robson B, Harris R, editors. Hauora: Māori Standards of Health IV. A study of the years 2000–2005. Wellington: Te Rōpū Rangahau Hauora a Eru Pōmare; 2007.
4. Statistics New Zealand. Projected Ethnic Population of New Zealand, by Age and Sex, 2006 (base) - 2026 Update. Wellington: Statistics New Zealand; 2012.
5. Cormack D, Mcleod M. Improving and maintaining quality in ethnicity data collection in the health and disability sector. Te Rōpu Rangahau Hauora Erū Pomare www.ethnicity.maori.nz 2010.
6. Ministry of Health. Ethnicity Data Protocols for the Health and Disability Sector. Ministry of Health http://www.moh.govt.nz, 2004.
7. Harris R, Tobias M, Jeffreys K, Waldegrave K, Karlsen S, Nazroo J. Effects of self-reported racial discrimination and deprivation on Maori health and inequalities in New Zealand: cross-sectional study. Lancet. 2006;367(9527):2005-9.
8. Davis P, Lay-Yee R, Dyall L, Briant R, Sporle A, Brunt D, et al. Quality of hospital care for Māori patients in New Zealand: retrospective cross-sectional assessment. Lancet. 2006;367(9526):1920-5.

9. Dyall L, Kepa M, Hayman K, Teh R, Moyes S, Broad JB, et al. Engagement and recruitment of Māori and non-Māori people of advanced age to LiLACS NZ. Australian and New Zealand Journal of Public Health. 2013;37(2):124-31.
10. Kepa M, Kerse N, Dyall L, editors. Te Puāwaitang o Ngā Tapuwae Kia ora Tonu Cultures and Ageing. International Indigenous Development Conference; 2012; Auckland http://www.maramatanga.ac.nz

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Medic-Alert and advanced care directives

I have recently seen a patient who needed to upgrade her Medic-Alert bracelet. She informed them that she had completed an Advanced Care Directive (ACD). Medic-Alert inscribed '**do not resuscitate**' on her new bracelet.

She was understandably upset by the misinterpretation of the meaning of an ACD. She complained and Medic-Alert offered her a new bracelet at no cost.

It is of real concern that Medic-Alert could have failed to understand the meaning of an ACD in such a fundamental way.

Jonathan Simon
General Practitioner
West Auckland

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Annual Meeting at Wanganui, 1913

Published in NZMJ 1913 Feb;12(45):359.

The Annual General Meeting of the BMA just closed, which was held at Wanganui, has been one of signal success. A great deal of very useful work was done in the council meetings, and a number of very interesting papers were read at the general meetings, which elicited very satisfactory and instructive discussions.

The general attendance was very good, upwards of seventy members attending the meeting, and being representative of their Divisions from the Bluff to Auckland. The work of the meeting was very arduous, meetings being held in most cases, morning, afternoon, and evening.

The meetings opened on Monday evening, when an address was given by the President, who took for his subject the educative and social aspects of medicine. This was followed by a very enjoyable evening given up to music and social intercourse.

The work began in earnest on Tuesday, and during the next few days the Council dealt with subjects concerning general medical defence within the Association, the Medical Practitioners' Registration Bill, the Revision of our Scale of Medical fees, the recommendation to urge the appointment of Medical Assessors to sit with magistrates and juries in certain court cases, and the drawing up of a model agreement to obtain generally throughout the Branch in relation to contract practice.

It was decided that our branch should not join the proposed Federation of the Australian Branches at the present time.

Thanks are especially due to Dr. Skerman, who entertained the members and their friends at his picturesque country house at Marton, after a very enjoyable motor run from Wanganui on Tuesday afternoon.

The social aspects of the meeting were well favoured by good weather. The ladies of the Wanganui Division provided a very enjoyable day for the wives of the visiting members up the river, and the members of the Manawatu and West Coast Division and their wives gave a most enjoyable evening of dancing and social intercourse at Castlecliff, where the conditions were ideal.

In addition a pleasant afternoon was spent at the grounds of the local hospital, again under the auspices of the local division.

Altogether, from a business aspect, and also socially, the meeting was very successful.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Proceedings of the Scientific Meetings of the Health Research Society of Canterbury, 4 & 11 May 2012

ASL derived perfusion network shows correlation with saccadic eye movement measures in Parkinson's disease, S.D.W. Feng[1,2], M.R. MacAskill[1,2], T.L. Pitcher[1,2], T.R. Melzer[1,2],C.F. Graham[1,2], J.C. Dalrymple-Alford[1,2,4] ,T.J. Anderson[1,2,3], [1]New Zealand Brain Research Institute, Christchurch; [2]Department of Medicine, University of Otago, Christchurch; [3]Neurology Department, Christchurch Public Hospital, Christchurch; New Zealand [4]Department of Psychology, University of Canterbury, Christchurch, New Zealand

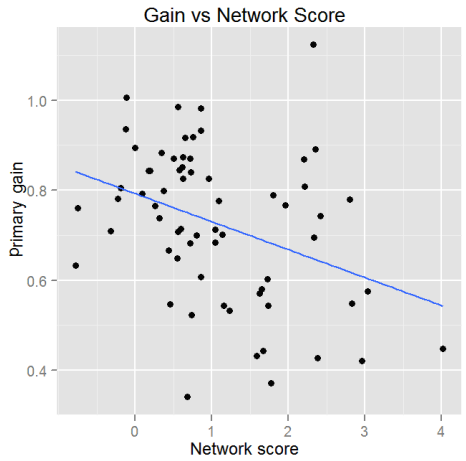
Parkinson's disease (PD) is a progressive neurodegenerative disorder affecting the motor pathway and cognitive function. ASL (arterial spin labelling) blood flow MRI is a commercially available, non-invasive method to assess perfusion changes in the brain. We have previously established that a perfusion network score correlates with cognition (assessed using the Montreal Cognitive assessment; MoCA) and motor impairment in PD (Unified Parkinson's disease rating scale; UPDRS: see Melzer et al, Brain, 2011).

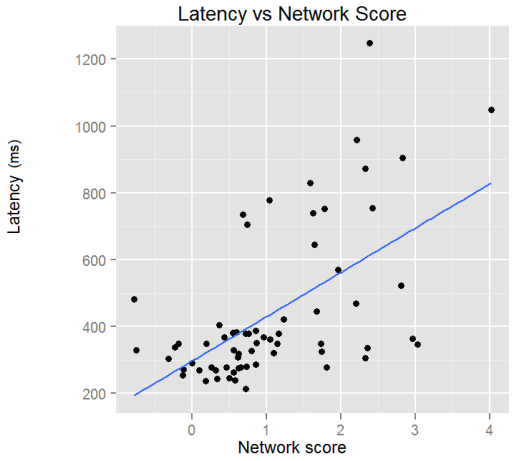
Eye movements show reduced amplitude and prolonged reaction times in PD. To further validate this perfusion pattern as a biomarker of PD status, we aim to assess the ASL network score against eye movement parameters derived from saccadic paradigms for the same subjects.

We used ASL to determine cerebral blood flow in 72 PD patients and 30 controls. A perfusion pattern was quantified using PCA and logistic regression and each subject was ascribed a single network score, indicating expression of this perfusion pattern.

Eye movement performance was assessed in the reflexive, predictive, memory guided and anti-saccade paradigms. Reaction time (latency) and initial saccade accuracy (primary gain) were measured for the tasks. The network score was assessed against these measures.

All eight measures correlated significantly with network score (positively for reaction time and negatively for accuracy), with $p<0.05$ and absolute r values ranging from 0.19 (network score vs predictive latency) to 0.57 (network score vs memory-guided latency).





Memory guided task:

Left: Primary gain, or initial saccade accuracy decreases with increased network score

Right: Reaction time or latency increases with increased network score

The ASL perfusion network shows a consistent pattern of correlation with eye movement measures in PD. These findings lend further objective support for the potential of an ASL derived perfusion

Reference

Melzer, T. R., Watts, R., MacAskill, M. R., Pearson, J. F., Rueger, S., Pitcher, T., Livingston, L., Graham, C., Keenan, R., Shankaranarayanan, A., Alsop, D. C., Dalrymple-Alford, J. C. & Anderson, T.J. (2011). Arterial spin labeling reveals an abnormal cerebral perfusion pattern in Parkinson's disease. Brain, 134(3), 845-855.

The trace amine-associated receptor 1 partial agonist, RO5203648, prevents methamphetamine-induced stimulation and methamphetamine self-administration, R Cotter[1], J O'Leary[1], E Pei[1], C Ellis[1], MC Hoener[2], JJ Canales[1]

[1]Department of Psychology, University of Canterbury, Christchurch, New Zealand

[2]F. Hoffmann-La Roche Ltd, Pharmaceuticals Division, Neuroscience Research, Basel, Switzerland

Drug addiction is a debilitating disease of the brain that poses a massive burden to society. There continues to be an enormous unmet need for treatment for drug addiction. Stimulant abuse is particularly challenging according to recent global and national epidemiological studies. The newly discovered trace amine associated receptor 1 (TAAR1) constitutes a novel receptor target for medication development in stimulant addiction. TAAR1 regulates monoamine systems in the brain, especially dopamine, and is activated directly by psychomotor stimulants, including methamphetamine (METH). The aim of the present study was to examine the effects

of the newly developed TAAR1 partial agonist, RO5203648, in rodent models of METH addiction. In experiment 1, rats were administered different doses of RO5203648 (0, 1.67, 5 mg/kg i.p.) followed by METH treatment (0, 0.75, 2 mg/kg i.p.). Locomotor activity was monitored via automatised video tracking system (Viewpoint 2.5, France) in an open field. Results showed that RO5203648 dose-dependently reduced METH-induced locomotor stimulation and prevented the expression of long-term sensitization. In experiment 2, rats were trained on METH self-administration (0.5 mg/kg/infusion) and once a consistent response was obtained, pre-treatment with RO5203648 (0, 3, 10 mg/kg i.p.) was administered. Results revealed that RO5203648 effectively blocked METH self-administration. In experiment 3, different doses of RO5203648 (0.25, 0.5, 1 mg/kg/infusion) were given as a substitute for METH in the self-administration context. Data showed that RO5203648 did not exhibit METH-like properties in this paradigm. Taken together, these findings indicate that RO5203648 is able to attenuate methamphetamine-related behaviours, including locomotor stimulation, sensitization and self-administration, and underline the enormous potential of TAAR1-based medications for the treatment of stimulant abuse and addiction.

Aortic flow energetics in a porcine study of septic shock, JA Revie[1], DJ Stevenson[1], JG Chase[1], BC Lambermont[2], A Ghuysen[2], P Kolh[2], GM Shaw[3], T Desaive[2], [1]Department of Mechanical Engineering, University of Canterbury, Christchurch, [2]Hemodynamic Research Laboratory, University of Liege, Liege Belgium, [3]Department of Intensive Care, Christchurch Hospital, Christchurch.

Aortic pressure can be split into two components representing the storage capacitance of the arterial system, called the reservoir pressure (P_{res}), and flow wave phenomena in the aorta, named excess pressure (P_{ex}). In this model, the arterial system acts as a hydraulic integrator (or reservoir), storing a portion of systolic flow, as volume, for release during diastole. The flow wave component corresponds to pressure generated from resistance aortic flow resistance. In this study, the hydraulic work of the excess (W_{ex}) and reservoir (W_{res}) pressures were calculated using measurements of the aortic pressure waveform (P_{ao}) and stroke volume (SV) from a porcine study of septic shock.

SV, P_{ao}, and left ventricular pressures and volumes were measured in 4 pig trials. A 30 minute endotoxin infusion was used to induce septic shock. Measurements were recorded every 30 minutes for 4 hours. Further details on the experimental procedure can be found in (1).

34 subject-specific aortic models were identified from the measurements. Hydraulic work ($W = \int P.Q dt$) for excess and reservoir pressure were calculated and compared to left ventricular work (W_{lv}), end systolic elastance (E_{es}), afterload (E_a), and ventricular arterial coupling (E_{es}/E_a), calculated from ventricular pressure-volume loop analysis.

Total aortic work ($W_{ex}+W_{res}$) compared well to W_{lv} (R^2=0.88). However, only a weak relationship of $R^2 = 0.24$ was found between ventricular arterial coupling (E_{es}/E_a) and W_{ex}/W_{res}. Although a strong relationship ($R^2 = 0.76$) was noticed between the inverse of afterload ($1/E_a$) and W_{ex}. As septic shock progressed, W_{res} decreased, indicating the arterial system loses its ability to store blood for release during diastole, causing a

flattening of the diastolic pressure. These results indicate that SV and morphological changes in P_{ao} could be used to track important pathological changes that occur during septic shock.

Reference

Lambermont, B. *et al*. (2006) Artificial organs, v30**,** 560-564.

Identification of novel genetic variants as candidate risk factors in BRCAx hereditary breast cancer, NJ Coufal[1], kConFab Investigators[2], LC Walker[1], [1]MacKenzie Cancer Research Group, Department of Pathology, University of Otago Christchurch, [2]Peter MacCullum Cancer Centre, Melbourne, Australia.

A significant proportion of breast cancers arise in a subset of women who inherit genetic changes that increase the risk of developing the disease. However, for most familial breast cancers, there is a lack of understanding of the genetic basis for the disease. DNA copy number variants (CNVs) are a major source of genetic variation and can overlap genes sequences, triggering a range of biological changes from altered gene expression to a variety of human diseases (1, 2). The contribution of rare CNVs to the development of familial breast cancer remains unclear. This study aims to assess whether the number and/or location of germ-line CNVs is associated with disease risk in breast cancer families.

Genome-wide scans for CNVs were performed using Illumina1M SNP data from 1) 26 breast-cancer affected women from families with a history of the disease, but no mutation in the known breast cancer susceptibility genes (BRCAx), 2) 14 healthy control females, and using CNV data available from the Database of Genomic Variants. Novel case-specific CNVs that overlap candidate risk susceptibility genes have been prioritised using microarray expression and pathway analysis.

We show that the average frequency of predicted CNVs in breast cancer cases compared to the controls was increased approximately 1.2-fold. Furthermore, our study showed a significantly greater proportion of rare putative CNVs were found to contain gene coding regions in BRCAx cases compared with those in healthy controls (16% and 3%, respectively; P=0.003). We also identified rare CNVs that overlapped a total of 34 candidate genes, including *ANKRD45, TBC1D5* and *SLC9A11,* that are known to be involved in breast cancer development. CNVs identified as likely candidate moderate risk genetic variants will be validated by QPCR and assessed in family members of each proband carrier identified with the target CNV.

References

1) Schlien, A. *et al*. (2010) Current Opinion in Oncology v22, 55-63.

2) Stranger, B. E. *et al*. (2007) Science v315, 848-853.

Glycaemic control through stochastic forecasting: Implementing STAR as the standard of care in Christchurch Hospital ICU, LM Fisk[1], JG Chase[1], AJ Le Compte, GM Shaw[2], [1] Centre for Bio-Engineering, Dept of Mechanical Engineering, University of Canterbury, Christchurch, [2]Dept of Intensive Care, Christchurch Hospital, Christchurch.

Accurate glycaemic control (AGC) has been achieved in Christchurch Hospital ICU through a model-derived protocol, named SPRINT. Incidence of hypoglycaemia has been significantly reduced, with the added benefit of reduced morbidity and mortality. Stochastic TARgeted (STAR) glycaemic control forecasts changes in model-based insulin sensitivity to calculate a range of glycaemic outcomes for a treatment, creating a risk framework targeting blood glucose (BG) to 4.4-8.0 mmol/L with the aim of improving safety and performance.

Development of STAR was carried out through clinically validated virtual trials, utilizing 371 virtual patients (39,841 hours) from the SPRINT cohort. Performance was compared to clinical SPRINT and was measured as time within target glycaemic bands, and nursing workload was assessed through BG measurement frequency. Number of patients with severe (BG < 2.2mmol/L) and degree of mild (%BG < 4.0mmol/L) hypoglycaemia were used as safety metrics. On the basis of these results, a clinical pilot trial comprising 10 patients (1,486 hours) was carried out.

Incidence of severe hypoglycaemia was reduced from 14 patients in the clinical SPRINT data to 4 in the virtual trial. None were recorded during the clinical trial. Mild hypoglycaemia was reduced from 2.9% to 1.0% (virtual trial), and 1.5% (clinical trial). 91.6% BG in target range in virtual trial and 89.4% in clinical trial showed increased performance (86.0% for SPRINT results) with a reduced workload (16.0 measures/day reduced to 12.0 and 13.5 in the virtual and clinical trials, respectively). The algorithm achieving these results simply ensured the predicted risk of BG<4.4mmol/L was below 5% for a given treatment, while restricting chance of BG rising above 8.0mmol/L to 5% when. With clinical applicability tested, and the expected safety and performance benefits realised in the trial, Christchurch Hospital is implementing STAR as the standard of care in the ICU.

Neopterin synthesis in macrophage derived multinucleated giant cells, HM Burrowes[1], BW Hicks[2], SP Gieseg[1], [1]University of Canterbury, Christchurch, New Zealand, [2]Deparment of Chemistry, US Air Force Academy, Colorado, USA.

Macrophages form multinucleated giant cells when confronted with foreign particles such as aggregated LDL. These giant cells, produced by the fusion of both macrophages and monocytes, can contain up to 100 nuclei. Giant cells have been shown to be present in atherosclerotic plaques, particularly around cholesterol crystals, which they appear to be endocytosing. In the laboratory, conversion of macrophages and monocytes to giant cells using IL-4 and α-tocopherol causes a 200% increase in neopterin release from γ-interferon stimulated cells. Neopterin is the oxidation product of 7,8-dihydroneopterin which is synthesised in interferon-gamma stimulated human macrophage cells. Plasma neopterin levels are strongly correlated

in clinical studies with the degree of cardiovascular disease (CVD) within patients. Our laboratory has previously shown that 7,8-dihydroneopterin is a potent intracellular antioxidant and down-regulator of the oxLDL binding scavenger receptor CD36.

Both macrophages and giant cells were prepared from monocytes isolated from whole human blood. Cholesterol was dissolved in 65°C ethanol and left to cool forming crystals. Neopterin and total neopterin was measured by HPLC.

When given cholesterol crystals, both giant cells and macrophages were observed to dissolve the insoluble 10-50 μm cholesterol crystals over a 24 period. The cholesterol crystals did not cause a significant loss in cell viability as measured by MTT reduction and trypan blue exclusion but did appear to cause an increase in cellular oxidant production. *De novo* synthesised 7,8-dihydroneopterin was observed to be rapidly oxidised directly to neopterin suggesting a different oxidation mechanism to that previous described with known intracellular oxidants such as peroxides. This ongoing study suggests that a significant amount of the neopterin detected in the plasma of CVD patients may be a result of macrophage interaction with cholesterol crystals.

Parental experiences in the neonatal intensive care unit, A Montgomery-Honger[1], V E Pritchard[12], C Spencer[1], N Austin[1], E Ballenden[1], L Woodward[12], [1]Canterbury Child Development Research Group, Department of Psychology, University of Canterbury, [2] Van der Veer Institute for Parkinson's and Brain Research, New Zealand.

Many parents experience high levels of stress after the birth of a very preterm infant admitted to the neonatal intensive care unit (NICU) given the often fragile status of their infant and the numerous medical interventions necessary to stabilize the infant. However, little is known about the role of stressors external to the NICU environment and the perceptions of NICU staff. The aims of the study were: 1) to compare sources of NICU stress between mothers and fathers of VPT infants, 2) to identify daily hassles outside of the NICU, and 3) to describe staff perceptions of NICU stress.

Eleven mothers and 10 fathers of very preterm infants (<32 weeks) admitted to a level III NICU, Christchurch Women's Hospital, and 23 NICU nurses were interviewed. The Parental Stressors Scale: NICU (PSS: NICU) determined sources of stress among parents. NICU nurses completed an adapted version of the PSS: NICU measured nursing staffs' perceptions of parents' experiences. Parents and staff provided information about stressors outside of the NICU that exacerbated the level of stress relating to the NICU experience, such as finances, transport and work.

Mothers reported significantly higher levels of NICU stress than fathers on the "sights and sounds", "infant appearance", "loss of parental role" subscales on the PSS: NICU. The most stressful item on the external stressors scale reported by parents was "fitting in everything else I have to do". Staff perceptions differed from parents', with NICU nurses perceiving parental experience in the NICU to be more stressful than was actually reported by parents. Findings emphasize the need for increased awareness of NICU-specific and NICU-external factors contributing to parental NICU stress.

Research into the extent to which staff perceptions of parent experiences may affect the quality of staff-parent relations in the NICU is also warranted.

Identification of rare DNA copy number variants overlapping mismatch repair pathway genes in endometrial cancer patients and their potential contribution to disease risk, GL Moir-Meyer[1], F Lose[2], JF Pearson[1], Y Tan[2], The Australian National Endometrial Cancer Study Group[2], Studies of Epidemiology and Risk Factors in Cancer Heredity[3], DJ Thompson[4], PD Pharoah[3,4], AM Dunning[3], DF Easton[3,4], AB Spurdle[2], LC Walker[1], [1]Department of Pathology, University of Otago, Christchurch, [2]Genetics and Population Health Division, Queensland Institute of Medical Research, Queensland, Australia[3] Department of Oncology, University of Cambridge, Strangeways Research Laboratory, Cambridge, UK, [4] Department of Public Health and Primary Care, University of Cambridge, Strangeways Research Laboratory, Cambridge, UK.

Endometrial cancer is the most common gynaecological cancer in New Zealand and the incidence is increasing as the population ages[1]. Genetic predictors of endometrial cancer risk that allow early detection of the disease are important for prevention and improved management strategies. Mutations in the mismatch repair genes *MLH1*, *MSH2*, *MSH6* and *PMS2* are known to confer increased risk in a proportion of endometrial cancer cases, and the mutation spectrum includes copy number variants (CNVs). There are several other genes encoding proteins that act in the mismatch repair pathway, but to date the evidence for their involvement in endometrial cancer predisposition is limited. We have utilised an existing large genetic dataset to screen for CNVs in all genes for which there is evidence for a role in the mismatch repair pathway.

Genome-wide scanning of CNVs was performed using Illumina610k single nucleotide polymorphism data from a large cohort of ~1300 endometrioid endometrial cancer cases. Fine-mapping of CNVs was carried out using four CNV calling algorithms (cnvPartition, QuantiSNP, PennCNV and GNOSIS) to increase both sensitivity and specificity of predictions. Novel CNVs were validated by quantitative PCR.

By interrogating the array data, we identified and confirmed deletions that disrupted known endometrial cancer susceptibility genes, *MSH2* and *MSH6*. This genetic information can now be used to facilitate counselling and clinical management of these families. We also identified novel variants in several other mismatch repair pathway genes, including duplications overlapping *TGFBR3* and *MUTYH*, and a deletion in *RPA3*, that are predicted to disrupt the coding sequence of *TGFBR3* and *RPA3*. Further work is required to establish whether the CNVs are associated with risk of disease. In summary, we have identified novel aberrations in mismatch repair pathway genes that fall outside the standard testing panel for hereditary endometrial cancer.

References:

1. Ferlay, J. et al. (2010) Cancer Incidence in Five Countries, v I-IX. IARC CancerBase No.9, Lyon, France: International Agency for Research on Cancer. Available from: http://ci5.iarc.fr.

2. Win, A. K. et al. (2012) Journal of Clincial Oncology, v30, 958-964.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Proceedings of the Scientific Meetings of the Health Research Society of Canterbury, 3 & 10 May 2013

Use of the DISST model to predict insulin pharmaco-kinetics during the oral glucose tolerance test and reduce the cost of deriving the Matsuda index, SM Davidson[1], PD Docherty[1], JG Chase[1], JE Berkeley[2]; [1]Centre for Bioengineering, University of Canterbury, [2]Canterbury District Health Board (CDHB)

Early detection of Type 2 Diabetes, through the determination of an individual's insulin sensitivity *(SI)* has the potential prompt intervention that may reduce the incidence of type 2 diabetes and ameliorate the considerable financial strain it places on global health care. Reducing the cost of *SI* measurements such as the Matsuda and HOMA should allow more widespread screening for pre-diabetes. The goal of this research was to use a model based approach to reduce the number of insulin samples and therefore the cost required to provide an accurate Matsuda index.

The Dynamic Insulin Sensitivity and Secretion Test (DISST) model was used with the glucose and basal insulin measurements from an oral glucose tolerance test (OGTT) protocol to predict patient insulin responses (N=50). The insulin response to the OGTT was determined via population based regression analysis that incorporated the 60-minute glucose and basal insulin values.

The proposed method derived accurate and precise Matsuda indices as compared to the fully sampled Matsuda using only the basal assay insulin level data and four glucose measurements (R = 0.951). Using a model employing the basal insulin allows for determination of the 1-day HOMA value. The simulated Matsuda index had a median error of 16.5%, minimum of 0.07 % and maximum of 41.9 %. A Bland-Altman Analysis showed no systematic bias in the method's outputs.

The DISST model successfully predicted the participants' insulin response to the OGTT. In turn, this enabled highly accurate and precise estimation of Matsuda indices using only the glucose and basal insulin assays. As insulin assays account for the majority of the cost of the Matsuda index, this approach offers a significant reduction in assay cost.

Calcium role in oxLDL mediated cell death in human monocytes: Possible mechanism in the progression of atherosclerotic plaque, MI Othman, and SP Gieseg, School of Biological Sciences, University of Canterbury, Christchurch

Cardiovascular disease is progressive inflammatory disease characterised by the formation of atherosclerotic plaques made up of lipid load macrophages, lipid deposits, fibrous protein and dead cells within the arterial walls. The death of these lipid loads cells by oxidised low density lipoprotein (oxLDL) causes plaque instability, leading to both plaque growth and plaque rupture. The cell death is caused by severe oxidative stress triggered by the oxLDL. The cell death is also associated

with a rise in intracellular calcium. This study is examining the source of the calcium rise and whether it is a cause or consequence of the oxidative stress.

Human monocytes were used to study the role of calcium in oxLDL-mediated cytotoxicity. Cells were pre-incubated with fluorescent calcium binding probe – Fluo 3-AM before treated with oxLDL. Selected calcium channel blockers specific for plasma membrane, endoplasmic reticulum, mitochondria as well as calcium chelator were tested for their effects on the oxLDL mediated cell death process. The movement of calcium into the cytoplasm and changes in intracellular calcium was measured by flow cytometer using the Fluo 3-AM probe. Cell viability was determined by spectrophotometric measurement of MTT reduction and propidium iodide staining by flow cytometry.

Human monocytes treated with oxLDL caused increasing intracellular free calcium. Cells incubated in calcium free media as well as media with calcium developed similar patterns of cell death. Blocking the calcium channels by incubating the cells with different types of inhibitors did not prevent cell death. However, inhibition of the calcium rise by a calcium chelator – EGTA, was able to impede intracellular calcium rise but not cell death.

Are you managing your mechanical ventilator correctly? A model-based answer to an on-going question, D Redmond[1], S Davidson[1], H Laing[1], R White[1], F Radzi[1], N Wang[2], S Poole[1], R Fernando[1], J. Williams[1], L Badcock[1], E van Drunen[1], NS Damanhuri[1], YS Chiew[1], PD Docherty[1], GM Shaw[2], JG Chase[1]; [1]Centre of Bioengineering, University of Canterbury, Christchurch, [2]Department of Intensive Care, Christchurch Hospital, Christchurch.

Ventilation dyssynchrony risks inadequate oxygenation, ventilator associated lung injury, and cardiovascular events. This study analyses the outcome of continuous model-based estimates of patient-specific elastance. Spikes in time-varying respiratory elastance (*Edrs*) which indicate patient-ventilator dyssynchrony are presented.

Retrospective analysis of pressure-volume (PV) data of MV patients in the Christchurch Hospital intensive care unit (ICU) was carried out. Model-based time-varying respiratory elastance (*Edrs*) was estimated for each breath over 5-48 hours and plotted for the analysis to assess patient-ventilator interaction and quality of MV care. The study and use of the data was approved by the Upper South A Regional Ethics Committee.

8 patients were included for the study with median of 17,721 [Interquartile range (IQR): 10,255 - 25,035] breathing cycles analysed. A median of 1,569 (11.3%) [IQR: 941 (3.8%) - 3,582 (15.3%)] of total breathing cycles per patient, were identified as asynchrony events, where significant pressure-volume mismatch occurs. The figure shows periods or events of sharply increased *Edrs* values randomly occurring throughout the data for an indicative patient. The irregular *Edrs* values indicate significant asynchrony events.

Edrs maps provide clinically useful information in monitoring patient-ventilator interaction. As the *Edrs* map of a sedated patient is assumed smooth, frequent *Edrs*

spikes indicate patients who might benefit more if sedated and synchronised with the ventilator. Patient-specific model-based MV monitoring could significantly impact how MV care is delivered.

Simultaneous discrimination of multiple intrinsic bio-markers in excised atheroma with spectral molecular imaging. RK Panta[1], CJ Bateman[1], J Healy[2], JL Mohr[1], N de Ruiter[1], AP Butler[1,3] NG Anderson[1], SP Gieseg[2]; [1]Department of Radiology, University of Otago, Christchurch, New Zealand, [2]Free Radical Biochemistry Laboratory, School of Biological Sciences, University of Canterbury, Christchurch, New Zealand, [3]European Organisation for Nuclear Research (CERN), Geneva, Switzerland.

Spectral molecular imaging is a new x-ray based 3D imaging modality which can specifically identify and measure components of biological tissues due to its high energy and spatial resolution. This high resolution imaging modality can be used for characterisation of human vulnerable plaque by identifying and quantifying its natural biological hallmarks. We aimed to simultaneously discriminate multiple intrinsic biomarkers in ex-vivo vulnerable plaque in the diagnostic energy range (30 keV to 120 keV).

A MARS^{TM} small animal spectral molecular imaging scanner incorporating Medipix3RX energy resolved (spectral) photon counting x-ray detectors bonded to GaAs sensor layer with a pixel pitch of 110 µm was used to acquire energy resolved images of the intact plaques. Multiple projections, with eight lower threshold energies of 30, 35, 40, 45, 50, 60, 70 & 80 KeV at 120 kVp x-ray tube voltage were acquired by placing the Al filter (10 mm) at exit window of x-ray tube. Images were reconstructed with algebraic reconstruction methods. Quantification of calcium deposits and soft tissue components (water-like and lipid-like) were performed by analysing their spectral attenuation profiles using a previously validated constrained least squares material decomposition technique.

Calcium and iron, lipid-like, and water-like components of plaque have distinguishable and quantifiable energy responses to x-rays in diagnostic energy range, visible on spectral molecular imaging at 110 µm spatial resolution.

We have demonstrated that multiple intrinsic biomarkers of intact excised vulnerable atherosclerotic plaque can be quantified simultaneously using spectral x-ray molecular imaging at high spatial resolution in the diagnostic energy range. The imaging technique and methodology is likely to be applicable for human imaging. When spectral molecular imaging is available clinically, it could be used to detect vulnerable plaque and to monitor the efficacy of different treatment regimens.

Can this cool new glycaemia metric tell me if my critical care patients are going to live or die? **F Thomas[1], M Signal[2], G M Shaw[3], J G Chase[4]; [1]Department of Mechanical Engineering, University of Canterbury, New Zealand, [2]Department of Mechanical Engineering, University of Canterbury, New Zealand, [3]Department of Intensive Care, Christchurch Hospital, Christchurch School of Medicine and Health Science, University of Otago, New Zealand, [4]Department of Mechanical Engineering, University of Canterbury, New Zealand**

Critically ill patients often experience stress-induced hyperglycaemia, which may negatively impact outcomes. Continuous glucose monitoring (CGM) devices measure blood glucose (BG) every 5 minutes and allow researchers to investigate high frequency dynamics, such as glucose complexity.

Current theories contend that a healthy glucose regulatory system will make many small adjustments to keep glucose concentration within a normal range, increasing the complexity of CGM data [2, 3]. Two studies have investigated glucose complexity in critically ill patients using Detrended Fluctuation Analysis (DFA) to quantify glucose complexity. Both studies concluded increased complexity was associated with reduced mortality.

CGM data from 10 patients admitted to the Christchurch Hospital Intensive Care Unit. Each participant was monitored using 3 CGM devices: 2 located on the patient's abdomen, of which 1 was connected to a Medtronic Guardian Real-Time monitor and one connected to a Medtronic iPro2 recorder; and a third located on the patient's thigh and connected to a Medtronic iPro2 recorder. This configuration of sensors/devices allowed inter-site and inter-device comparisons. Glucose complexity was quantified using DFA. For a self-similar time series, the scale invariant structure can be described by $X(ct) = c^H X(t)$, where the power law exponent (H) describes the scaling. As in the other published studies, the power law exponent was used as the basis for comparison, where a lower value indicates greater complexity.

Retrospectively calibrated iPro2 CGMs reported significantly higher scaling exponents:1.56 [1.46 – 1.60] compared to Guardian Real-Time devices: 1.43 [1.37 - 1.48] ($p = 0.03$). Scaling exponents of patients who lived were 1.51[1.46 – 1.57] versus 1.47[1.39 – 1.59] for patients who died ($p = 0.5$). Using prior study results to segregate mortality showed that none of the 8 patients had all 3 CGM devices indicating a single, or correct, outcome.

These results show a more significant association between glucose complexity and sensor/device type than between glucose complexity and patient outcome. Further investigations of glucose complexity are required before solid conclusions can be drawn.

The impact of physiological levels of vitamin C on tumour growth and HIF-1 activation in the *Gulo*$^{-/-}$ mouse. E J Campbell[1], A Dyer[2], BA Robinson[3, 4], MCM Vissers[1], GU Dachs[1].[1]Department of Pathology, University of Otago, Christchurch, [2] CARA Research Facilities, Department of the Dean, University of Otago, Christchurch, [3] Canterbury Regional Cancer and Blood Service, CDHB, Christchurch, [4] Department of Medicine, University of Otago, Christchurch.

Vitamin C (ascorbate) is an important co-factor for the hydroxylase enzymes that regulate the transcription factor hypoxia-inducible factor-1 (HIF-1). HIF-1 controls the expression of hundreds of genes involved in tumour growth and spread. Adequate supplementation of cells with ascorbate has been shown to reduce HIF-1 activation *in vitro*, and a similar activity could affect tumour growth *in vivo*. This study investigated the effect of physiological ascorbate intake on tumour growth in the *Gulo*$^{-/-}$ knockout mouse, a model of the human ascorbate deficiency condition.

C57BL6 Gulo$^{-/-}$ mice were supplemented with optimal (3300 mg/L), medium (330 mg/L) or low (33mg/L) ascorbate in their drinking water for one month before subcutaneous tumour implantation with B16-F10 melanoma cells (1x10^6 /mouse), and for the duration of the experiment. Tumour growth was monitored and tumours were excised when they reached ~1000mm^3. HIF-1 activation was analysed by western blotting of tissue extracts and ascorbate concentrations in tumours, normal tissues and plasma were analysed using HPLC.

Ascorbate concentrations in plasma, tumour and normal tissues were significantly different across the three ascorbate loading treatments. B16-F10 tumours showed no difference in the time taken for tumours to appear from implantation between ascorbate treatments. However, in mice supplemented with optimal ascorbate these tumours grew significantly slower during the log phase compared to tumours grown in mice supplemented with medium or low ascorbate. Tumours grown in mice supplemented with optimal ascorbate had reduced HIF-1 levels compared to medium and low dose tumour-bearing mice. Therefore, this *in vivo* study suggests that maintenance of tissues at optimal physiological levels of ascorbate is associated with reduced HIF-1 levels and tumour growth in the *Gulo*$^{-/-}$ mouse model.

Cost-effective hemodynamic monitoring of critically ill patients via model-based analysis of aortic pressure measurements. S Kamoi[1], D Squire, JG Chase[1], PD Docherty[1], T Desaive[2], [1]Centre for Bioengineering, University of Canterbury, Christchurch, [2]Faculty of Medicine, University of Liege, Belgium.

There are many hemodynamic monitoring systems currently used in the intensive care unit from non-invasive device such as USCOM to semi-invasive device such as PiCCO. These devices are expensive and require frequent repositioning or calibration and thus, introduce clinical burden. These devices determine cardiac output values based on pulse-pressure measurements and patient-specific anatomic parameters. These assumptions lead to ambiguous population-driven estimation of hemodynamic parameters that may not be indicative of the patient state and thus could lead to sub-optimal clinical decisions.

Aortic pressure waveforms contain important diagnostic/physiological information and model based analysis of the contour could potentially determine, accurate and reliable continuous stroke volume. To validate the model-based stroke volume form aortic pressure approach, porcine experiments were undertaken by the Medical Faculty at the University of Liege. Anesthetised pig underwent recruitment manoeuvres and had acute respiratory distress syndrome induced via lavage of the lung. Aortic pressure and ventricle volume were measured at 200Hz for 2.5 hours. The Levenberg-Marquardt method was used to identify parameters in the 3-element Windkessel model of aortic pressure-flow dynamics.

Bland-Altman analysis between model-based output and measured data shows 95% of the model output results agreed within 11ml with the experimental data with a mean bias of 1ml.

Our pulse pressure estimation of stroke volume accurately captured the trends that would be needed to optimise therapy in a critical care setting. Furthermore, the outcomes were entirely data-driven, without the need for population-based anatomic parameters. It is expected that further investigation of the model in post-hoc human data will reveal further insight into the mechanical relationships between resistance and compliance, and would thus, further improve the robustness of our stroke volume estimation.

Redirection of steroid biosynthetic flux from testosterone to cortisol in cultured Leydig cells exposed to dibutylphthalate, A D Ridden, I C Shaw, Department of Chemistry, University of Canterbury, Christchurch.

NZ Malayan veterans exposed to dibutylphthalate (DBP) during the Malayan Emergency have a higher incidence of cryptorchidism and hypospadias than the general New Zealand population. This might involve epigenetic control of genes that code for enzymes in the testosterone synthetic pathway. In our study we investigated the effect of DBP on R2C rat Leydig cells in culture to determine whether reduced testosterone synthesis might contribute to the developmental effect seen in the veterans.

R2C cells were cultured in phenol red-free Eagle's Minimum Essential Medium containing 17.5% stripped fetal bovine serum. They were grown to cell concentration 10^5/mL and exposed to DBP (0.1, 1.0, 5.0, 10.0 µg/mL) in triplicate. The culture medium containing un-adhered cells was centrifuged and the supernatant (30 mL) extracted with diethyl ether (3 x 60mL). The ether was evaporated in a flow of N_2. The residue was dissolved in methanol (1.5 mL) and analysed by high performance liquid chromatography (HPLC). HPLC conditions: C_{18} reverse phase 5µm column. Mobile phase: stepped gradient; solvent A (0.05% (aq.) w/v trifluoroacetic acid), solvent B (acetonitrile). Gradient details: start 90% A, 10% B (2 min), increased to 45%A, 55% B (2-18 min), held to 34 min. V_Rs were determined for steroids, including cortisol and testosterone.

R2C cells do not synthesise testosterone, but synthesise the metabolic intermediates up to and including progesterone. Exposure of R2C cells to DBP resulted in the synthesis of the glucocorticoid, cortisol in a dose related manner. These results show that DBP causes cortisol biosynthesis in R2C cells which suggest that the steroid

biosynthetic flux in DBP-exposed Leydig cells shifts from testosterone to cortisol. This might have significant implications in growth and development in exposed males and could explain the increased incidence of gonadal developmental disorders in DBP exposed veterans.

Evaluating *BRCA1* and *BRCA2* sequence variants that modulate isoform expression, V Lattimore[1], M Currie[1], B Robinson[1,2], KConFab investigators[3], A Spurdle[4], L Walker[1]; [1]Mackenzie Cancer Research Group, Department of Pathology, Otago University Christchurch, New Zealand, [2]Department of Medicine, University of Otago, Christchurch and Oncology Services, Christchurch Hospital, Christchurch, New Zealand. [3]Peter MacCallum Cancer Centre, St Andrews Place, East Melbourne, Victoria, Australia, [4]Genetics and Computational Biology Division, Queensland Institute of Medical Research, Queensland, Australia.

Routine diagnostic *BRCA1* and *BRCA2* gene screening is typically performed for individuals from high-risk breast-ovarian families. *BRCA1/2* sequence variants in or near splice sites and splicing regulatory regions may result in a disruption of the mRNA splicing process. However, the relative level to which mRNA splicing is modulated by common or rare DNA sequence variants in *BRCA1/2* has yet to be ascertained. Splicing assays commonly undertaken in the clinical setting to assess the clinical relevance of rare sequence variants in these genes are able to detect the presence of aberrant isoforms and/or the absence of naturally occurring isoforms. However, these assays are limited in their ability to quantify allele-specific expression changes in *BRCA1/2* isoforms that may be associated with cancer risk. Our study aims to generate a comprehensive expression profile of *BRCA1/2* isoforms and use these data to measure allele-specific expression changes of risk-assessed rare and common variants in *BRCA1/2*.

We have performed bioinformatic splicing analysis on all common single nucleotide polymorphisms across *BRCA1/2* using tools including Human Splicing Finder, MaxEnt and ESE Finder. We also performed these analyses on 84 rare variants that were submitted for assessment of breast cancer risk to the large Collaborative Oncological Gene-environment Study (COGS). Twenty lymphoblastic cell lines (LCLs) carrying high risk variants predicted to alter splicing, 20 (LCLs) carrying no/low risk variants predicted to alter splicing and 20 (LCLs) from healthy individuals are being identified for *in vitro* splicing analysis using targeted RNA-seq and qPCR. mRNA isoforms from *BRCA1/2* will be comprehensively profiled and the allele-specific expression of each common and rare variant will be measured and correlated with the bioinformatic predictions. This study is designed to better assess *BRCA1/2* sequence variants that modulate isoform expression, and elucidate the contribution of *BRCA1/2* mRNA isoform dysregulation to breast cancer susceptibility.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Work stress and risk of cancer

Work-related stress is associated with many adverse health outcomes, such as coronary heart disease and depression. This meta-analysis evaluates the possibility that such stress might increase the risk of the common cancers. Data from 12 independent studies carried out in several European countries over a period of 23 years were incorporated.

The total included population comprised 116,056 men and women aged 17–70, who were free from cancer at study baseline. All participants had complete data on job strain, age, sex, socioeconomic position, body mass index (BMI), smoking, alcohol intake, and incident cancer outcomes. Median follow-up was 12 years. 5700 cancers were noted during the follow-up. Estimates were adjusted for cancer risk factors such as smoking. The researchers conclude that there is no relationship between work stress and the incidence of colorectal, lung, prostate or breast cancer.

BMJ 2013;346:f165.

Bowel cleansing before colonoscopy

Adequate bowel preparation for colonoscopy is essential to achieve adequate visualisation of the colonic mucosa. This study aimed to determine whether the interval between the end of bowel preparation and the start of colonoscopy influences preparation quality. 1785 colonoscopies were retrospectively analysed. The quality of bowel cleansing was compared between those who had a less than 8-h interval between the start of the procedure versus those who had a greater than 8-h interval.

The researchers report that “a shorter (<8 h) interval between end of bowel preparation and start of colonoscopy yielded better bowel cleansing than a longer (>8 h) interval. Adequate bowel preparation led to improved caecal intubation rates.”

Internal Medicine Journal 2013;43:162–68.

Fibrinolysis or primary percutaneous coronary intervention (PCI) in ST-segment elevation myocardial infarction

PCI is recognised as the preferred reperfusion strategy for ST segment elevation myocardial infarction. However, many patients cannot have timely (within 1 hour) PCI as they do not live close enough to a PCI-capable hospital. This study involves 1892 such patients who were randomised to either primary PCI or fibrinolytic therapy. The conclusions reached in this study from Belgium were that prehospital fibrinolysis with timely coronary angiography resulted in effective reperfusion in patients who could not undergo primary PCI within 1 hour after the first medical contact. However, fibrinolysis was associated with a slightly increased risk of intracranial bleeding.

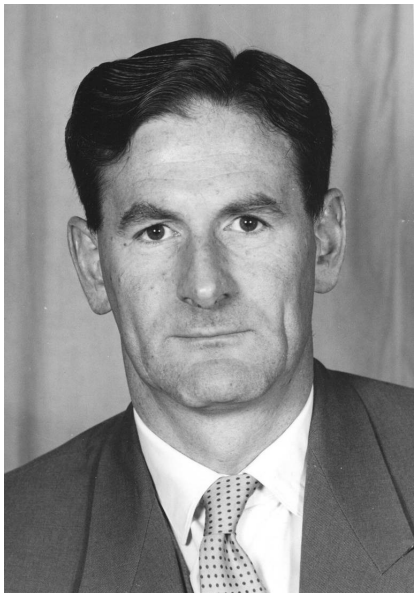
N Engl J Med 2013;368:1379–87.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Guy Pieremont Hallwright

b 22 Aug 1919 d 4 Feb 2013; ED (1968), MB ChB NZ (1941), MRACP (1948), FRACP (1958), MRCP Lond (1949), FRCP Lond (1968)

Guy Pieremont (Ponty) Hallwright was born in Wairoa, the son of Matthew Leslie Guy Hallwright, surgeon and his wife Ethel Pieremont. He died in Wellington on 4 February 2013, aged 93 yrs.



There was a strong medical heritage. His paternal grandfather Matthew practiced medicine in Birmingham, England.

Matthew had two medical sons, Francis who also practiced in Birmingham, and Matthew Leslie Guy Hallwright, Ponty's father. He was a surgeon who had practiced in British Honduras before coming to NZ, initially to Westport and then to Wairoa. Ponty's brother William is a retired Auckland surgeon, and his daughter Susan is an Otago medical graduate.

In 1946, Ponty married Hilda (Min) Barrowclough, a secondary school teacher, and they had three sons and a daughter. That marriage was dissolved, and in 1966, he married Mary Wood, a nurse.

He was educated at Huntley School (Marton) and at Wanganui Collegiate School. At the age of 16 years, in possession of an Exhibition Scholarship, he moved to Dunedin to study medicine.

He graduated in 1941 with distinction in Medicine and was awarded the NZ Medical Graduates' Medal in Clinical Medicine and the Marjorie McCallum Medal in Medicine.

He proceeded to Wellington Hospital to be house physician during 1942. Many of the medical staff were away on active service. In 1943 Ponty was appointed Assistant Pathologist and would remain in this role for 2 years. He was able to join the 2 N.Z.E.F. in 1945, once his brother Bill returned from overseas service, replacing him in the Pathology Department.

He served in Egypt, Italy and in Japan as Pathologist and Medical Officer, in 2, 3, 5, and 6 NZ General Hospitals. He returned to Wellington Hospital as medical registrar for 1947 and 1948. He then headed for England for postgraduate studies. In 1949 he was RMO to Professor John McMichael at Hammersmith Hospital, and the following year was RMO at the National Heart Hospital.

There he developed a reputation as the hardest working and best RMO that the consultant staff had seen at the Heart Hospital and for many years afterwards his performance was held up as the benchmark for subsequent holders of that position. In

1951 he became Chief Assistant to the Professorial Medical Unit at St Bartholomew's Hospital.

Returning to Wellington Hospital in 1952, he took up a full-time assistant physician role and was Medical Tutor. The following year he became part-time and established a private consulting practice. He was involved in some of the earliest cardiac catheterisations done at Wellington Hospital, and continued to participate in this area until 1964. In 1955 he was appointed visiting physician to the newly created hypertension clinic. This would be the main focus of his hospital practice until he retired.

Following Sir Charles Burns retirement, Ponty was appointed visiting physician to the cardiology department and was made Head of that service in 1960. He handed over that role to Peter Leslie in 1979 and fully retired in 1985. He is remembered as a hard-working clinician with high standards, especially in regard to the recording of blood pressure. He published a paper on that subject, 'Recording the Blood Pressure – who, when and how' in the *NZMJ* in 1988. He was a champion for the accurate documentation of patient history and examination findings.

Apart from his clinical duties he participated in a remarkable range of professional activities. He was chairman of the Wellington Hospital Medical Staff and of the combined Medical Staffs of the Wellington Hospital Board.

He was an external examiner for the University of Otago, and was the last Sub-Dean Wellington Branch Faculty of Medicine before the creation of the Wellington Clinical School.

He was a member of the founding committee that met to establish the National Heart Foundation of NZ, and served periods as a Councillor and as a member of the Scientific Committee. He was chairman of the Wellington Regional Committee for some years.

He was chairman of the NZ Committee of the Cardiac Society of Australia and NZ 1967–72.

Within the Royal Australasian College of Physicians, he was a member of the NZ Committee, a member of the NZ Board of Censors and chairman of the NZ Specialist Advisory Committee, Cardiology.

In 1953, he rejoined the territorial RNZAMC and rose to the rank of Brigadier. He was assistant DMS Army 1966–72, and DGMS Defence 1972–74. He was made Colonel Commandant, RNZAMC 1975–80.

His extracurricular interests included golf, wine and bridge.

He is survived by his wife Mary and his four children and is remembered by many as a wise mentor, a valued colleague and a good friend.

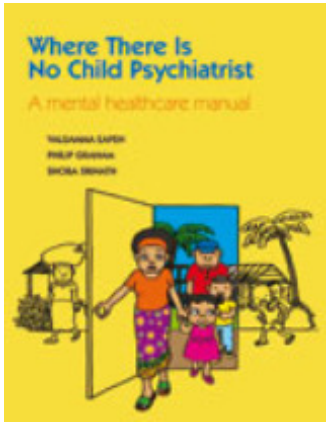
Dr Ron Easthope (a friend and former colleague of Dr Hallwright) wrote this obituary.

THE NEW ZEALAND MEDICAL JOURNAL
Journal of the New Zealand Medical Association

Where there is no child psychiatrist: a mental healthcare manual

Valsamma Eapen, Philip Graham, Shoba Srinath. Published by Royal College of Psychiatrists, 2012.
ISBN: 9781908020482. Contains 214 pages. Price: £10.00+P&P

This slim paperback with its bright friendly cover belies the comprehensive guide to investigation and management of community childhood and adolescent psychological problems that lie within. It is aimed at health workers in low and middle income countries where there is no child psychiatrist.



Despite the authors being three eminent academic child psychiatrists from around the globe, they clearly draw on a wealth of clinical experience and with their jargon free language their style is highly accessible. Each topic starts with information about the condition followed by 'how to find out about it' and then 'how to help'. In particular, the management options are simply described, practical and based on current best practice. Special attention is paid to ensuring that the local cultural beliefs and values are taken into account, especially those of child rearing practices, beliefs about cause of illness and beliefs about treatment.

As well as the range of typical child psychiatry presentations, emphasis is given to the frequently seen physical presentations of psychological distress seen in the community such as stomach aches and fatigue.

There is also a very helpful section on how to ask the right questions about whether family stress such as bereavement or parental relationship strain may be impacting on the child. There is an appropriate emphasis on the psychological aspects of children with chronic physical illness and disability. There are lovely sections on developmental and habit disorders which I will be giving to psychiatric registrars in training.

Mental health promotion is seen as an integral part of the health professional's role and there is information on how to tackle bullying in schools (even cyber bullying) and how to work with teachers. Information on public heath prevention strategies such as the importance of maternal health and nutrition in pregnancy and immunisation in childhood is emphasised.

I was initially surprised to see the section on medication, but on the role of medication is firmly grounded in a stepped care approach and there is clear information on how and when to use medication and on the child and adolescent dose ranges used in real world practice.

I particularly liked the section on emotional abuse. Hints on when and how to consider this guide the reader through what to do- and this is the manual's strength in

that it shows the reader not only how to think about problems, but practical and effective ways to dealt with them.

This manual covers the wide range of presentations of child developmental and psychological problems so well that it also has a place in primary care settings in developed countries.

Stephanie Moor
Senior Lecturer in Child Psychiatry
University of Otago, Christchurch, NZ

