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Differences in patterns of alcohol consumption between Maori and non-Maori in Aotearoa (New Zealand)

Dale Bramley, Joanna Broad, Ricci Harris, Papaarangi Reid and Rod Jackson, for the Alcohol Burden of Disease and Disability Group

Abstract

Aim To describe relative differences in alcohol consumption patterns in Maori and non-Maori from all available large-scale New Zealand surveys.

Methods Data from five New Zealand surveys (national and population specific) conducted since 1988 were made available to the investigators and were re-analysed by sex and age group in Maori and non-Maori using multivariate modelling.

Results There was a total of 44 830 people in the combined study populations, of whom 6926 (15.4%) were Maori. There was significant variation in the populations sampled and instruments used for measuring alcohol; however, the relative differences in consumption patterns between Maori and non-Maori were similar across all studies. In all age groups, and in men and women, non-Maori were more likely to be drinkers. The strength of this relationship increased with age. In all age groups, frequency of alcohol consumption (days a year) was higher for non-Maori, though the relative volume drunk on a usual drinking occasion was consistently around 40% less than for Maori. The averaged daily volume of alcohol consumed was similar between Maori and non-Maori.

Conclusions Maori have markedly different alcohol consumption patterns from non-Maori, which are not apparent when averaged daily alcohol consumption is compared. Frequency of drinking and amount consumed on a typical drinking occasion should be considered when determining the relationship between Maori alcohol consumption and health-related problems.

The relationship of alcohol consumption with morbidity and mortality is well documented and is influenced by the pattern of drinking;¹⁻³ however, no such data exist specifically for Maori.

The intent of this paper is to investigate relative differences in patterns of consumption between Maori and non-Maori rather than to document differences in the prevalence of consumption; therefore, we sought all major available studies whether or not they were based on representative population samples.

The results of this paper will inform future research that examines the association between Maori alcohol consumption patterns and health.

Methods

Surveys Data from five large New Zealand surveys conducted since 1988 were re-analysed by sex and age group to examine differences between Maori and non-Maori. Inclusion criteria for studies included access to the data sets comprising individual records, recording of self-identified ethnicity data, adequate numbers of Maori and standardised reporting of alcohol consumption. As the focus was on relative differences between Maori and non-Maori, it was unnecessary for studies to be based on

representative population samples as long as all Maori and all non-Maori in the study populations selected had equal opportunities for inclusion. Included were two national (New Zealand Health Survey 1997 and the Sleep Survey 1999) and three population-specific studies (Fletcher Challenge /University of Auckland Survey 1992, NZ Blood Donors Health Study 1998–1999 and the Workforce Diabetes Survey 1988–1990). Details of sampling, inclusion criteria, and data collection procedures are available.^{3–8} It is unfortunate that the National Alcohol Surveys conducted by Whariki and the Alcohol and Public Health Research Unit at University of Auckland were not available (see discussion).

Demographic classification All data were collected from the respondents at interview (or, in the case of the Sleep Survey, by self-completed questionnaire). Ethnicity was classified and coded according to self-identified ethnicity. Where more than one ethnic group was recorded the New Zealand Census hierarchical categorisation of ethnic group was used to classify all responses to one prioritised ethnic group.⁹ In all analyses Maori were the reference group to which non-Maori were compared.

Sex and age were recorded at interview/survey. Those aged less than 18 years (because the law does not allow people aged under 18 years to buy liquor) or over 75 years (because numbers of people aged over 75 years were low) were excluded to achieve an age range of 18 to 74 years. In two surveys this age range was further limited by the survey design: the Sleep Survey (30–60 years only) and the Workforce Diabetes Survey (40–74 years only). Results are presented by sex and age group where age groups are defined as 18–34 years, 35–49 years and 50–74 years.

Measures of alcohol consumption Four different measures of alcohol consumption were considered where available. Each survey asked how frequently participants drank alcohol, and provided several response categories. In general, any participant reporting drinking alcohol never or less often than monthly was regarded as a non-drinker, those drinking more often than monthly were classified as drinkers. Participants in the Sleep Survey were classified as non-drinkers if they drank never or less often than once a week, because no longer time category was available. Participants in the New Zealand Health Survey were classified as non-drinkers if they reported not drinking alcohol in the last year.

Based on the reported frequency of drinking, we calculated the number of days a year on which the respondent drank alcohol. Two methods of calculation were employed: in the first we allocated zero days for non-drinkers in order to represent frequency of consumption for all the population; in the second we excluded non-drinkers from analyses in order to represent frequency of consumption for drinkers only.

Where the survey obtained information about volume of alcohol drunk on a typical occasion, we estimated the grams of ethanol consumed per occasion. Where possible, we estimated the quantity of alcohol using listings provided by the New Zealand Department of Food and Agriculture, otherwise we used either 10 or 12 grams per standard drink according to the methods used by the investigators. Volume was not calculated for non-drinkers and they were omitted from these analyses.

Frequency of drinking and typical volume data were not available for those in the Workforce Diabetes Survey. For the few participants in the NZ Health Survey whose consumption information was missing, corresponding data from the National Nutrition Survey has been used.¹⁰

Averaged daily alcohol consumption (in grams) was calculated from the product of the proportion of days on which drinking occurred and the volume consumed on a typical occasion. Again, non-drinkers were omitted.

Statistical methods Within each survey, the proportion of participants in each sex and age group classified as non-drinkers was reported. Logistic regression was used to estimate the relative odds that non-Maori were drinkers, compared with Maori. Ethnicity (in binary form) and age (as a continuous variable to adjust for the different distributions of age within the surveys) were the only predictors in these regressions. Summary estimates by sex and age group were obtained in similar manner, with the addition of a variable to indicate which survey the individual was from. An interaction term between survey and ethnicity was used to test for heterogeneity, then removed for reporting summary estimates for each sex–age group.

Mean frequency of drinking is reported as mean number of days a year on which alcohol is drunk. To estimate relative frequency of drinking for non-Maori, we used Poisson regression models with an offset of 365 days and scaled for the deviance to correct for slight over-dispersions where present. Summary estimates were obtained in a similar manner, again with the addition of variables to represent sex and age group, age as a continuous variable and which survey the individual was from. Again, an interaction term between survey and ethnicity was used to test for heterogeneity.

For both volume of alcohol (grams) drunk on a typical occasion, and averaged daily volume consumed, means for each group defined by survey, sex and age are shown, together with the relative volume drunk by non-Maori compared with Maori. Log transformations of alcohol measures were modelled using generalised linear regression models to obtain summary estimates, with tests of heterogeneity as above.

The model coefficients for non-Maori relative to Maori, and their 95% confidence limits, were back-transformed to obtain relative estimates of consumption for non-Maori compared with Maori.

In all models, persons with missing data for the variable of interest were excluded from analyses. Results in which the 95% confidence interval does not include 1.00 are regarded as statistically significant. In producing the summary estimates, where significant heterogeneity was found, box-plots for non-Maori and Maori were compared to determine its extent and source.

Results

There was a total of 44 830 people in the combined study population. Of these, 24 484 (54.6%) were males; 13 174 (29.4%) were aged 18–34 years; 18 478 (41.2%) aged 35–49 years; and 13 178 (29.4%) aged 55–74 years.

Of all participants, 6926 (15.4%) were Maori (3535 men) and 37 904 non-Maori (20 949 men). In the 50- to 74-year age group, a smaller proportion was Maori compared with non-Maori (26.2% of Maori compared with 30.0% of non-Maori). Table 1 shows the numbers included from each survey, by ethnicity, sex and age group (see appendix for tables and figures). The largest survey was the NZ Blood Donors Health Study, which contributed 17 437 study participants, 38.9% of the total. The Sleep Survey contributed the largest number of Maori participants (3194).

Figure 1 shows the percentage of participants who were classified as non-drinkers (see appendix for tables and figures). In all age groups, except men aged 18–34 years, a significantly higher proportion of Maori were non-drinkers. Table 2 reports the likelihood of non-Maori participants being drinkers relative to Maori. As age increased, so did the strength of this relationship for both men and women. Among one group at comparatively high risk of heart disease, men aged 50–74 years, non-Maori were about 90% more likely to be drinkers than Maori men (odds ratio = 1.89, 95% confidence interval (CI) 1.55–2.31).

Figure 2 shows the frequency of alcohol consumption (days a year) for Maori and non-Maori, inclusive of non-drinkers. Across all the groups examined, non-Maori were more frequent consumers of alcohol relative to Maori, reporting drinking on over 50% more days of the year. This effect was more marked with increasing age (Table 3), ranging from a low among men aged 18–34 years (relative frequency (RF) = 1.47, 95% CI 1.46–1.49) to a high among women aged 50–74 years of more than double the frequency (RF = 2.27, 95% CI 2.24–2.30).

Table 4 and Figure 3 report frequency of alcohol consumption (days a year) for Maori and non-Maori among drinkers. Again, a similar pattern was seen though there was a lower degree of association.

The volume of alcohol consumed on a typical occasion reported by non-Maori was consistently less than Maori (Table 5, Figure 4). For every study this was apparent in each age group for both sexes; summary measures consistently estimated the size of the difference at 35–42% less. Non-Maori men aged 35–49 years reported drinking about 40% less alcohol on a typical occasion than Maori men in the same age group (relative volume (RV) = 0.59, 95% CI 0.56–0.62).

Regardless of survey, age group and sex, there were few statistically significant differences in average daily consumption between Maori and non-Maori (Figure 5). Table 6 shows average daily consumption of alcohol among non-Maori drinkers relative to Maori drinkers. When all surveys were combined, only two summary estimates reached significance, both for the youngest age group: men (relative daily volume (RDV) = 0.90, 95% CI 0.82–0.98) and women (RDV = 0.73, 95% CI 0.67–0.81).

In many of the models estimating overall effects, there were significant interactions between the variables representing survey and Maori/non-Maori ethnicity, suggesting heterogeneity in the association between Maori and the various measures of alcohol in the different surveys. Generally, this heterogeneity would lead to rejection of summary estimates based on such models. However, examination of plots of alcohol consumption by sex, age group and survey by Maori/non-Maori, showed that almost all such differences were small. Given the narrow confidence intervals about the estimates for all but the final alcohol measure (averaged daily consumption) and the general consistency of the directions of effect, we concluded that large numbers and use of continuous variables were providing power to detect very small differences that could be ignored for the purpose of this paper, ie, to compare consumption between Maori and non-Maori. Consequently, all summary measures have been reported as the best estimate of the relationship between non-Maori and Maori drinking patterns.

Discussion

This research has been undertaken using a kaupapa Maori framework,¹¹ whereby the study analysis was undertaken from a Maori perspective. This is distinct from other methodologies that may 'minoritise' Maori with insufficient data quantity or quality to undertake analyses necessary to inform Maori health development. In this framework, Maori are the reference population and are compared with non-Maori. Where appropriate, this type of analysis enables disparities to be identified and their elimination prioritised. This analytic approach is consistent with a Treaty of Waitangi framework.

This analysis is unique in that it combines data from a number of studies that have been undertaken in Aotearoa in recent years. In total, there were 6926 Maori participants in the studies used for this analysis (and 37 904 non-Maori), and this is therefore the largest published analysis of alcohol consumption in Aotearoa for Maori. Our objective was to describe relative differences in patterns of consumption between Maori and non-Maori so we included all available major studies whether or not they were based on representative population samples. Therefore, the relative differences in drinking patterns identified, but not the absolute levels of consumption, are likely to be generalisable to the population of Aotearoa.

The main findings from this research are that Maori are less likely to drink alcohol, drink less often, but drink more on a typical drinking occasion, when compared with non-Maori. These differences in drinking patterns combine such that average alcohol consumption a day among Maori and non-Maori is similar.

Between all studies, national and non-national, there is marked consistency of results. This has occurred in spite of differences in methodology between individual studies, supporting the validity of the pooled estimates.

Maori, therefore, have markedly different patterns of alcohol consumption to non-Maori. These different patterns of alcohol consumption have implications for health.

Most estimates of this relationship have used measures of average daily alcohol consumption and not pattern of alcohol consumption.¹² Using the average alcohol consumption variable for Maori therefore may not produce accurate associations. Other studies have shown that specific drinking patterns may have independent effects on health that are not explained by total consumption.¹³ This may also be true for Maori. Further research regarding the relationship between Maori alcohol consumption patterns and health risk is therefore needed.

Discussion of alcohol consumption by ethnicity has been a sensitive topic for some years. This has in part been due to a 'victim blaming' interpretation^{14,15} of data that have been published where there is no acknowledgement that risk behaviours of individuals are socially patterned. Such an approach is generally counterproductive to dialogue and progress in reducing harm from alcohol consumption.

Historically, alcohol became readily available to Maori in the early nineteenth century.¹⁶ Maori initially showed a strong aversion to drinking alcohol. Discriminatory legislation regarding consumption of alcohol by Maori was not removed until 1948 with the passage of the Licensing Amendment Act, which repealed the previous law prohibiting consumption of alcohol by Maori in public bars.¹⁶

While this study demonstrates the different drinking patterns between Maori and non-Maori, research from the 1996/1997 New Zealand Health Survey also indicates that Maori adults are more likely than non-Maori to have potentially 'hazardous drinking' patterns.¹⁷ Such patterns carry with them higher risk to physical or mental health. Furthermore, 'hazardous drinking' is socially patterned in that it is associated with socioeconomic gradients that disproportionately affect Maori.¹⁸ Such drinking patterns and their associated health problems are not unique to Maori and are similar among other indigenous populations that have experienced colonisation.^{19,20}

In recent times there have been health promotion initiatives to raise awareness among Maori about the harm associated with hazardous drinking patterns in the expectation that those 'at risk' will change attitudes and behaviours.²¹ These efforts have occurred in an environment of increasing availability of alcohol and re-introduction of multimedia advertising of alcohol. It is not yet known whether these factors are associated with increased uptake of alcohol, especially among younger and more vulnerable populations. At the same time, there has been limited policy development aimed at addressing the socioeconomic gradient that continues to marginalise Maori into the most deprived echelons of our society within which hazardous drinking is more prevalent.

To date, few published studies have compared Maori and non-Maori alcohol consumption patterns. The most comprehensive is Te Ao Waipiro.²² In that study, the median frequency of drinking amongst Maori was lower, and the median annual volume of consumption for Maori males was higher, than for all males. The median quantity consumed per occasion was much higher among Maori than for the total population. Our results are consistent with those study findings, although our analyses differ in that we compared Maori with non-Maori, whilst in Te Ao Waipiro Maori were compared with the total population, which included Maori.

Alcohol data from the National Alcohol Surveys, including the 2000 National Maori Alcohol Survey conducted by the Whariki Research Group and the Alcohol and Public Health Research Unit, were not included in this analysis as the kaupapa of these surveys were to firstly present Maori-specific analyses and then determine further analyses through a process of consultation with Maori. This process was underway, though not complete, at the time of writing this paper.

The 1997 National Nutrition Survey, which used a subset of the participants of the NZ Health Survey plus additional Maori and Pacific people, reported that Maori men had a higher mean daily alcohol intake (25 g) than European and others (19 g). Among women, Maori had similar intakes to European and others (8 g and 9 g respectively).¹⁰ These findings are not directly comparable as they represent alcohol intake over a single 24-hour period and include non-drinkers.

A report from Te Puni Kokiri in 2000, using data from the National Nutrition Survey, stated that Maori are considerably less likely to be moderate drinkers (as opposed to non-drinkers or hazardous drinkers) than non-Maori (46% and 66% respectively) and relatively higher proportions of Maori are either non-drinkers or hazardous drinkers.²³ While our results are not directly comparable, they are broadly consistent.

There are a number of potential sources of bias that may occur with our study methodology. These include combining data from studies conducted during different time periods (1988–2001) and the possibility that drinking patterns may have changed over that period; the use of a mixed group of studies, only some of which were population-based; and the use of different instruments for measuring alcohol consumption. However, the similarity of our results to those from the individual studies is reassuring and suggests that these factors are likely to have caused only minimal bias.

In summary, non-Maori and Maori have markedly different alcohol consumption patterns. This must be considered when determining the relationship between Maori alcohol consumption and health risk or when applying methods of risk estimation based on average consumption levels.

Author information: Dale M Bramley (Nga Puhī), Senior Lecturer; Joanna B Broad, Research Fellow, EPIQ Group, Section of Epidemiology and Biostatistics, School of Population Health, University of Auckland; Ricci Harris (Ngati Kahungunu, Ngati Raukawa, Kai Tahu), Public Health Medicine Registrar; Papaarangi Reid (Te Rarawa), Public Health Physician, Te Ropu Rangahau Hauora a Eru Pomare, Wellington School of Medicine and Health Sciences, University of Otago, Wellington; Rod Jackson, Head of Section of Epidemiology and Biostatistics, School of Population Health, University of Auckland, Auckland. On behalf of the Alcohol Burden of Disease and Disability Group, University of Auckland: Shanthi Ameratunga, Dale Bramley, Joanna Broad, Jennie Connor, Rod Jackson, Patricia Metcalf, Robert Scragg and Sue Wells.

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Correspondence: Dr Dale Bramley, Division of Community Health, University of Auckland, Private Bag 92019, Auckland. Fax: (09) 441 8957; email: dale.bramley@waitematadhb.govt.nz

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Appendix: figures and tables

Figure 1. Percentage of non-drinkers (with 95% error bars, crude (unadjusted) data)

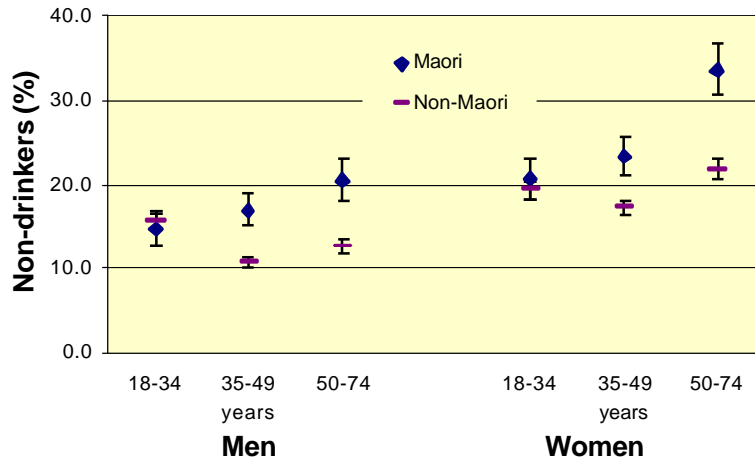


Figure 2. Frequency of drinking including non-drinkers and drinkers (with 95% error bars, crude (unadjusted) data)

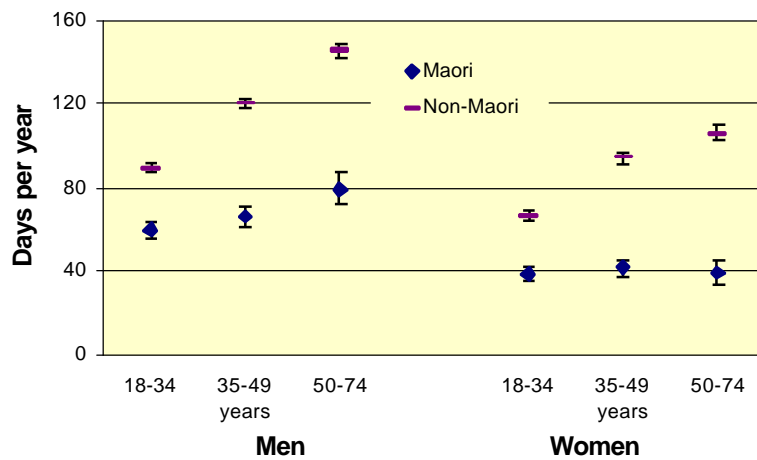


Figure 3. Frequency of drinking among drinkers (with 95% error bars, crude (unadjusted) data)

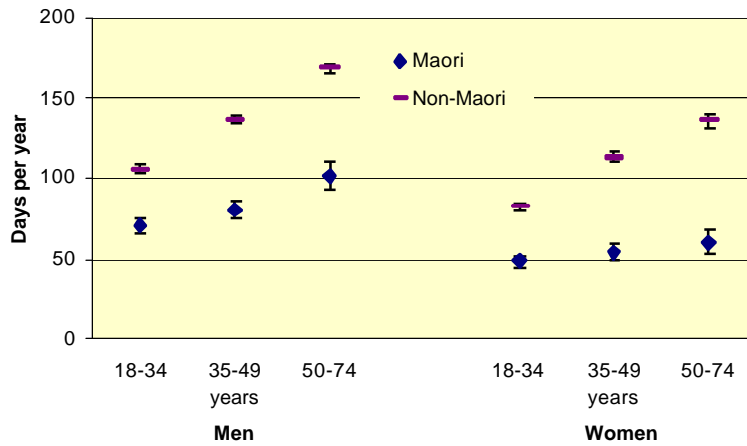


Figure 4. Alcohol drunk on typical occasion (with 95% error bars, crude (unadjusted) data)

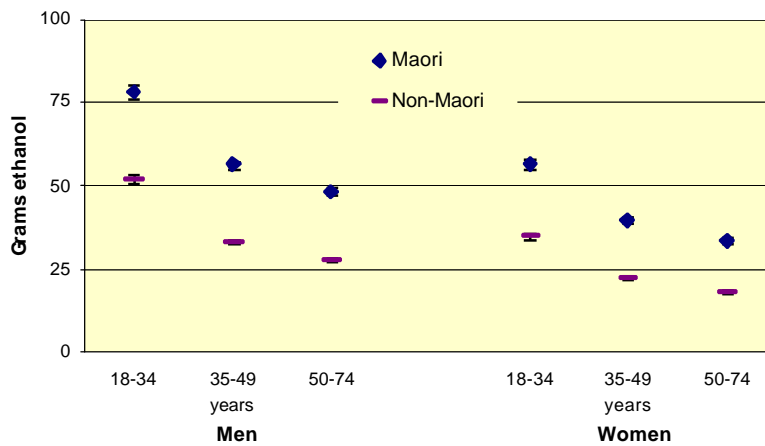


Figure 5. Average volume alcohol drunk per day (with 95% error bars, crude (unadjusted) data)

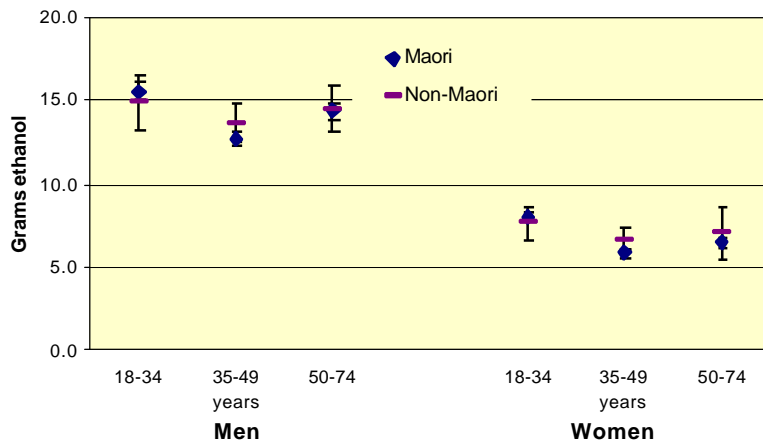


Table 1. Studies used in analyses of alcohol consumption

	Year of fieldwork (approx)	Ref	Total	Maori*				All Non-Maori†			
				18–34	35–49	50–74	Total	18–34	35–49	50–74	Total
Men											
<i>Population-based studies</i>											
NZ Health Survey & National Nutrition Survey‡	1997	4,23	2881	188	143	131	462	724	811	884	2419
Sleep Survey§	1999	5	3177	193	741	529	1463	221	867	626	1714
<i>Studies in selected populations</i>											
Fletcher Challenge/Univ. of Auckland Survey‡	1992	7	6282	411	354	107	872	1956	2357	1097	5410
NZ Blood Donors Health Study¶	1997	8	8072	218	153	60	431	2493	2820	2328	7641
Workforce Diabetes Survey**	1989	6	4072	-	182	125	307	-	2037	1728	3765
All men			24 484	1010	1573	952	3535	5394	8892	6663	20 949
Women											
<i>Population-based studies</i>											
NZ Health Survey & National Nutrition Survey‡	1997	4,23	4028	383	225	146	754	1095	993	1186	3274
Sleep Survey§	1996	5	3751	266	853	612	1731	297	1043	680	2020
<i>Studies in selected populations</i>											
Fletcher Challenge/Univ. of Auckland Survey‡	1992	7	1654	91	54	13	158	729	572	195	1496
NZ Blood Donors Health Study¶	1997	8	9365	382	198	46	626	3527	3079	2133	8739
Workforce Diabetes Survey**	1989	6	1548	-	77	45	122	-	919	507	1426
All women			20 346	1122	1,407	862	3391	5648	6606	4701	16 955
Total			44 830	2132	2980	1814	6926	11 042	15 498	11 364	37 904

*includes all those with any self-reported Maori ethnicity

†includes all those in survey with no mention of Maori ethnicity

‡nationally representative random sample of those aged 15+ years, selected using an area-based sampling frame, face-to-face interviews; linked to data from sub-sample surveyed in nutrition survey, plus additional Maori sample; self-administered food-frequency questions

§National random sample of people aged 30–59 years selected from electoral rolls, postal survey

‡ Fletcher Challenge employees aged 35+ years, interviewed at work sites in Auckland and Tokoroa

¶blood donors throughout NZ, self-administered questionnaire completed during voluntary blood donation visits

**employees aged 40–64 years from work sites in Auckland region, interviewer-administered questionnaire

Table 2. Non-drinkers (%) and the odds ratios (OR) of being a drinker, non-Maori relative to Maori, by gender and age group

	Non-drinkers						Non-Maori drinkers relative to Maori [†]					
	Maori*			All Non-Maori [†]			18-34		35-49		50-74	
	18-34	35-49	50-74	18-34	35-49	50-74	OR [‡]	95% CI [§]	OR [‡]	95% CI [§]	OR [‡]	95% CI [§]
	%	%	%	%	%	%						
Men												
<i>Population-based studies</i>												
NZ Health Survey & National Nutrition Survey	11.7	16.8	34.4	12.6	12.2	14.3	0.93	0.57-1.54	1.45	0.89-2.37	3.18	2.11-4.79
Sleep Survey	16.1	17.9	20.4	8.6	9.1	10.5	2.00	1.09-3.68	2.18	1.62-2.94	2.09	1.49-2.91
<i>Studies in selected populations</i>												
Fletcher Challenge/Univ. of Auckland Survey	10.9	14.1	15.0	9.3	10.0	13.7	1.22	0.87-1.73	1.47	1.06-2.04	1.14	0.65-1.99
NZ Blood Donors Health Study	23.4	22.2	18.3	22.2	13.2	13.6	1.03	0.74-1.44	1.88	1.26-2.79	1.45	0.75-2.82
Workforce Diabetes Survey	-	14.3	12.0	-	8.4	10.4	-	-	1.81	1.16-2.82	1.19	0.68-2.08
All men	14.8	17.0	20.5	15.6	10.8	12.6	1.13	0.93-1.39	1.79	1.52-2.10	1.89	1.55-2.31
Women												
<i>Population-based studies</i>												
NZ Health Survey & National Nutrition Survey	17.8	24.9	46.6	21.1	19.4	26.1	0.82	0.61-1.11	1.37	0.98-1.93	2.63	1.85-3.75
Sleep Survey	13.5	20.8	31.7	13.1	14.9	17.5	1.02	0.62-1.66	1.50	1.18-1.90	2.22	1.71-2.89
<i>Studies in selected populations</i>												0.99-13.01
Fletcher Challenge/Univ. of Auckland Survey	15.4	29.6	30.8	9.9	9.3	12.8	1.70	0.91-3.16	4.13	2.15-7.93	3.58	
NZ Blood Donors Health Study	30.1	33.3	32.6	21.4	17.9	21.9	1.58	1.24-2.00	2.28	1.67-3.11	1.79	0.96-3.36
Workforce Diabetes Survey	-	16.9	20.0	-	20.1	21.3	-	-	0.80	0.43-1.49	0.95	0.44-2.03
All women	20.8	23.3	33.6	19.4	17.2	21.9	1.20	1.01-1.42	1.63	1.40-1.91	2.17	1.79-2.62

*includes those with self-reported Maori ethnicity, the referent group in OR calculations

[†]includes all those in survey with no mention of Maori ethnicity

[‡]OR = odds ratio of being a drinker for this age-sex group, vs Maori, calculated by logistic regression with adjustment for age as a continuous variable

[§]95% CI = 95% confidence intervals about the estimate

Table 3. Frequency of alcohol consumption (days a year) and ratio of frequency of drinking among all respondents, non-Maori relative to Maori, by gender and age group

	Mean days a year alcohol consumed*						Relative frequency of drinking by non-Maori vs Maori [‡]					
	Maori [†]			All Non-Maori [‡]			18–34		35–49		50–74	
	18–34	35–49	50–74	18–34	35–49	50–74	Ratio [§]	95% CI	Ratio [§]	95% CI	Ratio [§]	95% CI
	%	%	%	%	%	%						
Men												
<i>Population-based studies</i>												
NZ Health Survey & National Nutrition Survey	51.7	66.0	49.0	87.5	100.3	126.2	1.67	1.63–1.70	1.49	1.45–1.52	2.56	2.49–2.62
Sleep Survey	48.1	58.3	76.4	78.7	108.0	128.1	1.62	1.58–1.66	1.86	1.83–1.88	1.68	1.66–1.70
<i>Studies in selected populations</i>												
Fletcher Challenge/Univ. of Auckland Survey	62.1	76.8	103.4	101.4	122.1	138.6	1.63	1.61–1.66	1.56	1.54–1.58	1.34	1.31–1.36
NZ Blood Donors Health Study	71.5	77.0	125.5	80.6	128.5	160.1	1.10	1.09–1.12	1.65	1.62–1.68	1.27	1.24–1.30
Workforce Diabetes Survey	-	-	-	-	-	-	-	-	-	-	-	-
All men	59.5	65.8	79.2	89.0	120.4	145.2	1.47	1.46–1.49	1.69	1.67–1.70	1.65	1.64–1.67
Women												
<i>Population-based studies</i>												
NZ Health Survey & National Nutrition Survey	27.7	33.0	31.0	47.0	69.4	75.2	1.70	1.67–1.74	2.09	2.04–2.14	2.45	2.37–2.53
Sleep Survey	35.2	38.5	37.5	47.1	72.9	88.2	1.34	1.30–1.37	1.90	1.87–1.92	2.35	2.32–2.39
<i>Studies in selected populations</i>												
Fletcher Challenge/Univ. of Auckland Survey	44.4	53.4	50.5	79.4	109.2	118.7	1.78	1.73–1.84	2.04	1.97–2.12	2.36	2.19–2.56
NZ Blood Donors Health Study	48.7	57.4	76.6	70.5	105.8	126.9	1.44	1.41–1.46	1.80	1.77–1.84	1.66	1.60–1.71
Workforce Diabetes Survey	-	-	-	-	-	-	-	-	-	-	-	-
All women	38.0	41.0	38.8	65.9	93.8	105.7	1.51	1.50–1.53	1.91	1.89–1.93	2.27	2.24–2.30

*means and regressions models included all responders

[†]includes all those with any mention of self-reported Maori ethnicity – the reference group in modelling of frequencies

[‡]includes all those in survey with no mention of Maori ethnicity

[§]ratios were calculated using a Poisson regression model for each sex and age group, adjusting for age as a continuous variable within age group, and for survey in summary estimates

^{||} 95% CI = 95% confidence intervals about the estimate

Table 4. Frequency of alcohol consumption (days a year) and ratio of frequency of drinking among drinkers, non-Maori relative to Maori, by gender and age group

	Mean days a year alcohol consumed*						Relative frequency of drinking by non-Maori vs Maori [‡]					
	Maori [†]			All Non-Maori [‡]			18–34		35–49		50–74	
	18–34	35–49	50–74	18–34	35–49	50–74	Ratio [§]	95% CI	Ratio [§]	95% CI	Ratio [§]	95% CI
	%	%	%	%	%	%						
Men												
<i>Population-based studies</i>												
NZ Health Survey & National Nutrition Survey	58.8	79.8	75.6	100.4	114.6	148.0	1.66	1.63–1.70	1.41	1.38–1.44	1.94	1.89–1.99
Sleep Survey	57.3	71.1	96.2	86.2	118.9	143.2	1.50	1.46–1.54	1.67	1.65–1.69	1.50	1.48–1.51
<i>Studies in selected populations</i>												
Fletcher Challenge/Univ. of Auckland Survey	69.9	89.7	121.6	111.9	135.8	160.8	1.60	1.58–1.62	1.48	1.46–1.50	1.31	1.29–1.34
NZ Blood Donors Health Study	93.6	99.2	154.9	104.0	148.3	185.6	1.08	1.06–1.10	1.48	1.45–1.51	1.20	1.17–1.23
Workforce Diabetes Survey	-	-	-	-	-	-	-	-	-	-	-	-
All men	70.0	79.8	101.5	105.8	136.2	167.9	1.44	1.43–1.46	1.55	1.54–1.56	1.46	1.45–1.48
Women												
<i>Population-based studies</i>												
NZ Health Survey & National Nutrition Survey	33.8	44.3	62.0	59.8	86.5	103.1	1.77	1.73–1.81	1.93	1.89–1.98	1.67	1.62–1.73
Sleep Survey	40.8	48.7	55.2	54.2	85.7	106.9	1.34	1.30–1.37	1.76	1.74–1.79	1.93	1.90–1.96
<i>Studies in selected populations</i>												
Fletcher Challenge/Univ. of Auckland Survey	52.7	76.5	72.9	88.1	120.4	136.1	1.68	1.62–1.73	1.57	1.51–1.63	1.84	1.70–1.99
NZ Blood Donors Health Study	69.9	86.1	114.9	90.0	129.1	163.3	1.27	1.25–1.29	1.47	1.44–1.50	1.42	1.37–1.47
Workforce Diabetes Survey	-	-	-	-	-	-	-	-	-	-	-	-
All women	48.1	53.9	59.9	81.9	112.8	136.2	1.44	1.42–1.46	1.70	1.68–1.71	1.81	1.79–1.83

*means and regressions models included drinkers only

[†]includes all those with any mention of self-reported Maori ethnicity – the reference group in modelling of frequencies

[‡]includes all those in survey with no mention of Maori ethnicity

[§]ratios were calculated using a Poisson regression model for each sex and age group, adjusting for age as a continuous variable within age group, and for survey in summary estimates

^{||} 95% CI = 95% confidence intervals about the estimate

Table 5. Volume of alcohol consumed on a typical occasion (mean, gm) among drinkers, and ratio of volume reportedly consumed on usual occasion, non-Maori relative to Maori, by gender and age group

	Mean volume consumed on typical occasion*						Relative volume drunk by non-Maori vs Maori [‡]					
	Maori [†]			All Non-Maori [‡]			18–34		35–49		50–74	
	18–34	35–49	50–74	18–34	35–49	50–74	Ratio [§]	95% CI ⁱ	Ratio [§]	95% CI ⁱ	Ratio [§]	95% CI ⁱ
	%	%	%	%	%	%						
Men												
<i>Population-based studies</i>												
NZ Health Survey & National Nutrition Survey	68.6	45.4	43.1	50.8	33.4	28.7	0.74	0.65–0.84	0.77	0.68–0.88	0.72	0.63–0.83
Sleep Survey	54.4	53.0	47.2	33.3	33.3	31.3	0.56	0.46–0.68	0.54	0.49–0.59	0.63	0.56–0.71
<i>Studies in selected populations</i>												
Fletcher Challenge/Univ. of Auckland Survey	89.8	69.2	59.4	52.9	37.6	30.7	0.61	0.56–0.67	0.58	0.53–0.63	0.58	0.50–0.66
NZ Blood Donors Health Study	87.2	54.2	47.2	53.8	29.0	25.2	0.69	0.61–0.78	0.63	0.56–0.71	0.65	0.55–0.78
Workforce Diabetes Survey	-	-	-	-	-	-	-	-	-	-	-	-
All men	78.4	56.5	48.4	52.1	33.1	27.8	0.65	0.61–0.69	0.59	0.56–0.62	0.64	0.60–0.68
Women												
<i>Population-based studies</i>												
NZ Health Survey & National Nutrition Survey	61.0	40.7	33.6	34.1	23.6	18.4	0.58	0.53–0.63	0.65	0.59–0.72	0.66	0.60–0.72
Sleep Survey	46.9	39.4	35.7	24.7	21.8	19.5	0.47	0.40–0.55	0.52	0.47–0.58	0.55	0.48–0.62
<i>Studies in selected populations</i>												
Fletcher Challenge/Univ. of Auckland Survey	51.5	46.2	27.1	31.8	22.9	19.5	0.68	0.58–0.80	0.52	0.43–0.63	0.75	0.52–1.07
NZ Blood Donors Health Study	62.7	39.4	24.3	37.3	22.0	17.8	0.67	0.61–0.73	0.69	0.62–0.76	0.81	0.68–0.95
Workforce Diabetes Survey	-	-	-	-	-	-	-	-	-	-	-	-
All women	57.0	39.9	34.7	35.1	22.4	18.4	0.59	0.56–0.63	0.58	0.55–0.61	0.59	0.55–0.63

*means and regression models included only those where recorded volume of alcohol drunk on usual occasion was >0

[†]includes all those with any mention of self-reported Maori ethnicity – the reference group in modelling of frequencies

[‡]includes all those in survey with no mention of Maori ethnicity

[§]regression coefficients were calculated using linear regression model with log link, for each sex and age group, adjusting for age as a continuous variable within age group, and for survey in summary estimates

ⁱ 95% CI = 95% confidence intervals about the estimate

Table 6. Averaged daily volume of alcohol consumed (mean, gm) among drinkers, and ratio of averaged daily volume reportedly consumed, non-Maori relative to Maori, by gender and age group

	Mean volume consumed on typical occasion*						Relative volume drunk by non-Maori vs Maori [‡]					
	Maori [†]			All Non-Maori [‡]			18-34		35-49		50-74	
	18-34	35-49	50-74	18-34	35-49	50-74	Ratio [§]	95% CI	Ratio [§]	95% CI	Ratio [§]	95% CI
	%	%	%	%	%	%						
Men												
<i>Population-based studies</i>												
NZ Health Survey & National Nutrition Survey	12.1	9.9	10.0	13.7	10.5	12.1	1.15	0.91-1.46	1.17	0.90-1.53	1.42	1.02-1.98
Sleep Survey	7.9	9.9	12.3	7.7	11.2	12.7	0.80	0.59-1.09	0.95	0.81-1.13	1.06	0.85-1.31
<i>Studies in selected populations</i>												
Fletcher Challenge/Univ. of Auckland Survey	18.6	16.3	18.6	15.7	13.6	13.7	1.33	1.10-1.60	1.29	1.07-1.56	0.90	0.64-1.27
NZ Blood Donors Health Study	20.0	14.0	15.2	15.3	11.7	12.9	0.78	0.64-0.94	1.01	0.82-1.26	0.79	0.57-1.11
Workforce Diabetes Survey	-	17.8	21.7	-	18.3	18.8	-	-	1.09	0.85-1.38	0.85	0.63-1.15
All men	15.6	12.7	14.4	14.9	13.6	14.5	0.90	0.82-0.98	0.98	0.90-1.06	0.91	0.83-1.01
Women												
<i>Population-based studies</i>												
NZ Health Survey & National Nutrition Survey	6.2	4.8	7.0	5.9	5.3	5.3	0.89	0.76-1.05	1.15	0.93-1.43	0.99	0.71-1.39
Sleep Survey	5.0	5.0	5.2	3.7	4.9	6.4	0.60	0.46-0.77	0.88	0.75-1.03	1.00	0.80-1.24
<i>Studies in selected populations</i>												
Fletcher Challenge/Univ. of Auckland Survey	8.6	9.5	6.7	7.6	7.6	7.2	1.34	0.90-1.99	1.04	0.58-1.86	1.13	0.29-4.30
NZ Blood Donors Health Study	12.7	9.2	6.9	8.7	7.5	8.2	0.83	0.72-0.96	0.96	0.78-1.18	1.34	0.88-2.05
Workforce Diabetes Survey	-	9.0	19.5	-	7.3	7.5	-	-	0.85	0.57-1.28	0.77	0.43-1.36
All women	8.0	5.9	6.5	7.7	6.7	7.1	0.73	0.67-0.81	0.90	0.81-1.00	1.06	0.91-1.24

*means and regression models included only those where recorded volume of alcohol drunk on usual occasion was >0

[†]includes all those with any mention of self-reported Maori ethnicity – the reference group in ratio calculations

[‡]includes all those in survey with no mention of Maori ethnicity

[§]regression coefficients were calculated using linear regression model with log transformation, for each sex and age group, adjusting for age as a continuous variable within age group, and for survey in summary estimates

^{||} 95% CI = 95% confidence intervals about the estimate