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Blood pressure and hypertension in New Zealand: results from the 2008/09 Adult Nutrition Survey

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Abstract

Aims To report the blood pressure results from the 2008/09 New Zealand Adult Nutrition Survey (2008/09NZANS).

Methods Blood pressure measurements were available for 4,407 adults who were part of a survey involving face-to-face interviews with 4,721 New Zealanders aged 15 years and over. Three measurements were taken one minute apart, and the mean of the second and third readings has been used for this analysis. Hypertension was defined as systolic blood pressure (SBP) ≥140 mmHg or diastolic blood pressure (DBP) ≥90 mmHg or self reported use of antihypertensive medications. Comparisons were made with previously published New Zealand population blood pressure estimates.

Results Mean SBP for the New Zealand adult population was 126 mmHg. The prevalence of hypertension was 31%, with 15% reporting taking antihypertensive medication. Mean SBP has increased since 2002/03 for New Zealand European and others (NZEO) aged 35-54 years and Māori aged 35-74 years, reversing a downward trend observed in NZEO between 1982 and 2002.

Conclusions The increasing blood pressure levels are concerning. Given the importance of elevated blood pressure as a risk factor for cardiovascular disease, intensive screening, public health measures aimed at lowering population blood pressure, and further population monitoring are warranted.

In New Zealand current guidelines recommend an assessment and treatment approach based on cardiovascular risk rather than treating blood pressure as an isolated risk factor.[1] Thus, individuals with blood pressures higher than the 140/90mmHg which conventionally defines hypertension,[2] may not be treated with antihypertensive medication because of an five year absolute cardiovascular risk below 15%. However high blood pressure is an important modifiable risk factor for cardiovascular and kidney disease, and has been identified as a leading cause of death worldwide.

The World Health Organization estimated that in 2004 high blood pressure was responsible for 7.5 million (or 12.8%) of deaths.[3] Observational studies of over one million adults show that systolic blood pressures above 115 mmHg, and diastolic blood pressures above 75 mmHg are associated with increasing risk of coronary heart disease and stroke.[4]

Thus public health measures aimed to reduce blood pressure levels in the population at large are required to complement treatment strategies for individuals with hypertension. In most populations, blood pressure rises with increasing age, with more than half of adults aged 60 years or over reported to have high blood pressure in high income countries.[5]

New Zealand cardiovascular disease mortality rates have decreased substantially since the early 1970's. However, ethnic disparities persist, with age-standardised Māori and Pacific mortality rates exceeding those of New Zealand European and Asian rates throughout the period.[6]

In many other high income countries including Scotland, the United States, and Australia there have recently been reports of a flattening of the decline, particularly in relatively young adults of low socioeconomic status.[7]

Recent modelling in New Zealand suggests that rates of ischaemic heart disease mortality are likely to increase in the future as cohorts of people who have grown up in a more 'obesogenic' environment enter adulthood and middle age.[8]

This 'obesogenic' environment results in inadequate levels of physical activity, sedentary behaviour, increased consumption of high fat, salt and sugar foods, and increased prevalence of obesity.[9] Population monitoring of risk factors such as blood pressure is an essential component of a public health approach to cardiovascular risk reduction.

The 2008/09 New Zealand Adult Nutrition Survey (2008/09NZANS) provides an opportunity to assess the current prevalence of high blood pressure in a large, representative cohort of adult New Zealanders.

Methods

A detailed description of the survey methods can be found elsewhere.[10] Briefly, the 2008/09NZANS was a nationally representative, cross-sectional survey of 4,721 New Zealanders aged 15 years and above.

Participants were recruited using a 3-stage, stratified, area-based sampling frame; this involved the selection of 607 geographical areas (meshblocks), followed by the selection of households within each meshblock and then a randomly selected respondent within each household.

The response rate for the 2008/09NZANS was 61%. Increased sampling of Māori and Pacific people and some age groups (15-18 and 71+ years) occurred in order to achieve adequate numbers for producing robust sub-population specific data.

Participants were drawn from urban and rural regions, but were restricted to persons living in private dwellings. Participation in the survey was voluntary. Informed, written consent was obtained. The New Zealand Health and Disability Multi-Region Ethics Committee granted ethical approval for the survey (MEC/08/04/049).

Data for the 2008/09NZANS were collected between 27 October 2008 and 28 October 2009. During a home-visit, a trained interviewer collected sociodemographic and dietary information using computer-assisted personal interview software.

Ethnicity was self-reported, using the Statistics New Zealand standard ethnicity question from the New Zealand Census 2006. Participants were categorized into 3 ethnic groups: Māori, Pacific and New Zealand European and Others (NZEO), where "Others" includes mainly Asian, Middle-Eastern, Latin-American and African ethnic groups. When multiple ethnic categories were selected (n=450) a single ethnic category was assigned based on the following prioritised order: Maori, Pacific, then NZEO.

Blood pressure was measured in 4,407 participants (93% of respondents) using an automated sphygmomanometer (OMRON HEM 907) with an appropriately sized cuff. Three measurements were taken 1 minute apart, and the mean of the second and third readings were used for this analysis. Using a standard definition initially recommended by the World Health Organization (WHO) and more recently in other national surveys, 'hypertension' has been defined as a systolic blood pressure (SBP) ≥140 mmHg and/or a diastolic blood pressure (DBP) ≥90 mmHg or self reported use of antihypertensive medications.[5 11]

Trained interviewers carried out height and weight measurements in duplicate. If the two measurements of height and weight differed by more than 1%, a third measurement was taken, and the mean of the closest two measurements was used. Standing height was registered to the nearest 0.1 cm using a stadiometer (Seca 214) and weight was assessed using electronic scales to the nearest 0.1 kg (Tanita HD-351, maximum weight 200 kg).

Statistical analysis was undertaken using Stata (version 11.2). Data from each respondent were weighted to account for the different sampling probabilities so that the results can be said to be representative of the New Zealand population.[10] The Stata survey command was used to estimate population means and standard deviations.

Where aged-standardised ethnicity comparisons were made, populations are standardised to the WHO standard population.[12] Differences between subpopulations were evaluated using χ^2 tests and logistic regression, with p values <0.05 deemed to be statistically significant.

Comparisons were made with previously published data in order to estimate trends in mean SBP and DBP and self-reported use of antihypertensive medication. For the NZEO ethnic group, age specific comparisons were made with previously published mean SBP and DBP from four Auckland based population surveys: the Auckland Risk Factor Study (1982),[13] the 1986-1988 Heart Study,[14] the Auckland Heart and Health Study 1993-1994[15] and the Auckland Diabetes Heart and Health survey 2002-2003.[16]

For Māori and Pacific ethnic groups, age specific mean SBP and DBP were compared with published results from the Auckland Diabetes Heart and Health survey(ADHHS) 2002-2003 only,[17] as no other comparable data were available. Both national and Auckland specific results from 2008/09NZANS were compared in order to test the validity of these comparisons.

Results

Mean (standard deviation) SBP for New Zealand adults aged 15 years and over, was 126 mmHg (18); 130 mmHg (16) for men and 122 mmHg (19) for women. Mean DBP was 74 mmHg (12); 75 mmHg (12) for men and 73 mmHg (12) for women (Table 1). Age standardised mean SBP for men was 129 mmHg (95%CI 128, 130), and for women 119 mmHg (95%CI 118, 120). SBP and DBP increased with age, for both men and women.

The prevalence of antihypertensive medication use (self-reported) for New Zealand adults was 15.1% (95%CI 13.6, 16.5); 13.6% (95%CI 11.7, 15.6) for men and 16.3% (95% CI 14.5, 18.2) for women. Use of antihypertensive medication increased significantly with age with 45% of men and 56% of women 70 years of age and over, reporting its use. Use of antihypertensive medication differed by ethnicity.

Maori men reported significantly higher use of antihypertensive medication than NZEO men (15.5% and 9.9%, respectively; p<0.001), and Māori and Pacific women reported significantly higher use than NZEO women (16.0%, 13.7% and 12.1%, respectively; p<0.05 for comparisons with NZEO). Overall, there was a significant association between use of antihypertensive medication and ethnicity (p<0.001).

The prevalence of adult hypertension (defined as SBP ≥140 mmHg or DBP ≥90 mmHg or self reported use of antihypertensive medications) was 30.8% (95%CI 28.7, 32.9) overall; 33.5% in men and 28.3% in women. The age standardised prevalence of hypertension was 26.4% overall (95%CI 24.6, 28.2) for men was 29.3% (95%CI 26.7, 31.9), and for women was 22.7% (95%CI 20.7, 24.6).

Table 1. Blood pressure (systolic and diastolic), antihypertensive medication use, and hypertension prevalence by age, sex and age standardised ethnicity: population estimates.

Male		Systolic Blood Pressure (mmHg) mean (95%CI)	Diastolic Blood Pressure (mmHg) mean (95%CI)	Self reported use of antihypertensive medication % (95%CI)	p	Hypertension prevalence % (95%CI)	p
Age (years)	15-19	119 (117, 121)	64 (63, 65)	1.5 (0.0, 3.9)	<0.0001	6.6 (1.5, 11.7)	p<0.0001
	20-29	126 (124, 129)	71 (69, 73)	-		16.6 (9.8, 23.3)	
	30-39	127 (125, 128)	74 (72, 75)	3.0 (0.7, 5.4)		18.6 (12.9, 24.4)	
	40-49	130 (128, 132)	80 (78, 81)	6.8 (3.1, 10.5)		27.5 (20.1, 34.8)	
	50-59	135 (132, 139)	81 (79, 84)	20.3 (13.2, 27.3)		49.7 (40.0, 59.6)	
	60-69	138 (134, 141)	77 (75, 79)	32.0 (23.1, 40.9)		59.9 (49.2, 70.6)	
	70+	139 (136, 142)	71 (70, 73)	44.8 (38.7, 50.9)		67.8 (61.5, 74.0)	
Ethnicity*	Māori	132 (130,133)	78 (77, 79)	15.5 (12.7, 18.3)	0.002¶	36.4 (32.4, 40.4)	0.024¶
	Pacific	128 (127, 129)	76 (75, 77)	10.0 (7.6, 12.4)	NS¶	29.4 (25.6, 33.3)	NS¶
	NZEO	129 (128, 130)	74 (73, 74)	9.9 (8.4, 11.4)		28.4 (25.4, 31.4)	
Total male		130 (129, 131)	75 (74, 76)	13.6 (11.7, 15.6)		33.5 (30.4, 36.6)	
Female							
Age (years)	15-19	109 (104, 111)	66 (65, 67)	-	<0.0001	2.3 (0.0, 6.2)	<0.0001
	20-29	110 (108, 112)	70 (69, 72)	-		4.6 (1.6, 7.5)	
	30-39	115 (113, 116)	74 (72, 75)	3.0 (0.8, 5.2)		11.9 (7.2, 16.6)	
	40-49	120 (118, 122)	75 (73, 77)	8.1 (4.0, 12.1)		19.1 (13.1, 25.2)	
	50-59	127 (124, 130)	78 (76, 80)	19.9 (14.0, 25.9)		36.8 (29.1, 44.4)	
	60-69	132 (129, 135)	74 (73, 76)	40.0 (31.6, 47.7)		54.6 (46.3, 62.9)	
	70+	142 (140, 144)	73 (72, 75)	56.4 (51.3, 61.6)		80.0 (75.6, 84.1)	
Ethnicity*	Māori	121 (120, 123)	76 (75, 77)	16.0 (13.6, 18.5)	0.031¶	30.4 (27.1, 33.6)	0.001¶
	Pacific	118 (116, 119)	73 (72, 74)	13.7 (11.2, 16.1)	0.002¶	25.6 (22.4, 28.8)	0.001¶
	NZEO	119 (118, 120)	72 (71, 73)	12.1 (10.6, 13.6)		21.4 (19.2, 23.6)	
Total Female		122 (120, 123)	73 (73, 74)	16.3 (14.5, 18.2)	0.041**	28.3 (30.4, 36.7)	0.008**
Total (M&F)		126 (125, 127)	74 (73, 75)	15.1 (13.6, 16.5)		30.8 (28.7, 32.9)	

Hypertension is defined as a systolic BP >=140 or a diastolic BP >=90 or self reported use of antihypertensive medications; NZEO= New Zealand European and 'Other' ethnicity; NS=Not significant (p>0.05); * Standardised to WHO standard population; ** compared with 'total male'; ¶ **c**ompared with NZEO ethnicity (logistic regression)

Table 2. Self reported use antihypertensive medication by sex and ethnicity (age standardised to WHO standard population[12])

Variables		1997 National Nutrition Survey[18] % (95%CI)	2008/09NZANS % (95%CI)
Male	Māori	7.5 (5.1, 10.0)	15.5 (12.7, 18.3)
	Pacific	5.4 (3.1, 7.7)	10.0 (7.6, 12.4)
	NZEO	8.5 (7.3, 9.7)	9.9 (8.4, 11.4)
	Total	8.7 (7.5, 9.8)	10.6 (9.2, 12.0)
Female	Māori	10.0 (7.4, 12.5)	16.0 (13.6, 18.5)
	Pacific	11.5 (9.0, 14.1)	13.7 (11.2, 16.1)
	NZEO	108.5 (7.3, 9.7)	12.1 (10.6, 13.6)
	Total	8.9 (7.7, 10.0)	12.7 (11.3, 14.0)

NZEO= New Zealand European and 'Other' ethnicity.

Table 3a. Mean systolic blood pressure New Zealand European and Others group: Auckland Risk Factor Study (1982), the 1986-1988 Heart Study, the Auckland Heart and Health Study 1993-1994 and the Auckland Diabetes Heart and Health survey 2002-2003 [16] and 2008/09NZANS

Systolic blood pressure (mmHg) mean (95%CI)				
Men	**Age group (years)**			
Survey year	35-44	45-54	55-64	65-74
1982	126.6 (124.7, 128.4)	132.9 (131.3, 134.5)	139.9 (137.9, 141.9)	-
1986-8	124.9 (122.6, 127.5)	128.2 (126.0, 130.4)	137.8 (135.5, 140.1)	-
1993-4	121.5 (119.7, 123.3)	124.2 (122.1, 126.3)	135.8 (133.5, 138.1)	143.8 (142.0, 145.8)
2002-2003	118.6 (116.7, 120.4)	123.9 (121.7, 126.2)	130.9 (128.5, 133.4)	141.2 (138.0, 144.3)
2008/09NZANS NZEO: (Auckland)	126.9 (122.8, 131.0)	131.0 (126.5, 135.5)	133.8 (11922.7, 145.0)	141.1 (133.5, 148.8)
2008/09NZANS NZEO	127.3 (125.0, 129.6)	133.8 (130.9, 136.8)	134.1 (130.0, 138.2)	137.8 (133.9, 141.7)
Women				
1982	117.9 (115.9, 119.9)	125.8 123.3, 128.3)	137.8 (135.1, 140.5)	-
1986-8	117.0 (117.7, 122.3)	128.7 (124.7,	139.0 136.1, 141.9)	-
1993-4	111.3 (109.5, 113.1)	123.8 (121.6, 126.0)	135.2 (132.7, 137.7)	144.9 (143.2, 146.7)
2002-2003	105.1 (103.5, 106.8)	116.0 (113.7, 118.3)	122.5 (120.1, 124.9)	133.1 (130.4, 135.8)
2008/09NZANS NZEO: (Auckland)	113.9 (110.3, 117.6)	122.9 (118.1, 127.6)	127.1 (122.3, 131.9)	133.1 (128.3, 138.0)
2008/09NZANS NZEO	115.6 (113.8, 117.5)	123.5 (120.7, 126.4)	130.0 (126.9, 132.9)	135.6 (132.8, 138.3)

Table 3b. Mean diastolic blood pressure New Zealand European and Others group: Auckland Risk Factor Study (1982), the 1986-1988 Heart Study, the Auckland Heart and Health Study 1993-1994 and the Auckland Diabetes Heart and Health survey 2002-2003[16] and 2008/09NZANS

Diastolic blood pressure (mmHg) mean (95%CI)				
Men		**Age group (years)**		
Survey year	35-44	45-54	55-64	65-74
1982	79.5	83.8	83.5	-
	(78.0, 81.0)	(82.7, 84.9)	(82.3, 84.7)	
1986-8	81.5	81.1	82.2	-
	(79.5, 82.5)	(79.7, 82.5)	(80.8, 83.6)	
1993-4	73.3	75.4	76.8	73.5
	(71.8, 74.8)	(74.0, 76.8)	(75.4, 78.2)	(72.4, 74.8)
2002-2003	75.9	78.4	79.2	78.9
	(74.7, 77.1)	(77.1, 79.7)	(77.8, 80.6)	(77.4, 80.4)
2008/09NZANS NZEO: (Auckland)	76.3	78.5	77.9	74.4
	(73.2, 79.5)	(74.8, 82.2)	(71.1, 84.8)	(71.3, 77.6)
2008/09NZANS NZEO	76.9	81.9	78.3	73.9
	(75.0,78.8)	(79.6, 84.1)	(75.6, 81.0)	(71.7, 76.1)
Women				
1982	74.0	78.5	81.5	-
	(72.6, 75.4)	(76.9, 80.1)	(79.8, 83.2)	
1986-8	75.5	79.3	81.3	-
	(72.5, 78.5	(77.1, 81.5)	(79.6, 83.0)	
1993-4	67.1	73.8	73.2	74.4
	(65.6, 68.6)	(72.3, 75.3)	(71.7, 74.7)	(73.3, 75.4)
2002-2003	70.4	74.1	73.8	73.2
	(69.3, 71.5)	(72.8, 75.3)	(72.6, 75.0)	(71.9, 74.5)
2008/09NZANS NZEO: (Auckland)	71.2	77.6	73.2	70.4
	(68.1, 74.3)	(73.4, 81.9)	(69.8, 76.6)	(67.6, 73.1)
2008/09NZANS NZEO	72.5	76.6	76.1	73.3
	(71.0, 74.2)	(74.2, 78.9)	(74.0, 78.2)	(71.7, 75.0)

2008/09NZANS- Adult Nutrition Survey; NZEO- New Zealand European and others.

Table 4. Mean systolic and diastolic blood pressure Māori ethnic group, Auckland Diabetes, Heart and Health Study (2002/03)[17] and 2008/09NZANS

Systolic Blood Pressure (mmHg) mean (95%CI)					
Age group (years)	**35-44**	**45-54**	**55-64**	**65-74**	**Total 35-74**
Men					
2002/03 DHHS	123.8 (119.7, 127.9)	127.3 (123.8, 138.8)	131.3 (125.0, 137.6)	139.1 (134.8, 143.4)	130.0 (127.8, 132.2)
2008/09NZANS- Māori (Auckland)	130.6 (125.7, 135.6)	129.4 (121.9, 136.0)	152.3 (138.4, 166.1)	147.1 (128.4, 165.8)	135.8 (130.4, 141.3)
2008/09NZANS Māori	131.8 (127.4, 136.2)	135.9 (130.2, 141.6)	142.1 (135.6, 148.7)	140.3 (130.3, 150.3)	135.7 (132.7, 138.7)
Women					
2002/03 DHHS	110.4 (107.8, 113.0)	116.9 (110.9, 122.9)	132.3 (127.4, 137.2)	144.9 (141.3, 148.5)	120.5 (118.3, 122.7)
2008/09NZANS Māori (Auckland)	117.9 (114.2, 121.7)	135.7, (122.6, 148.7)	122.8 (115.9, 129.7)	154.9 (135.6, 174.3)	125.0 (119.6, 130.4)
2008/09NZANS Māori	121.3 (118.5, 124.2)	134.5 (128.5, 140.5)	130.2 (123.1, 137.3)	139.5 (132.0, 147.0)	128.1 (124.7, 131.5)
Diastolic Blood Pressure (mmHg) mean (95%CI)					
Men					
2002/03 DHHS	80.4 (76.0, 84.8)	80.7 (78.3, 83.1)	81.5 (78.1, 84.9)	79.0 (76.8, 81.3)	81.1 (79.6, 82.6)
2008/09NZANS-Māori (Auckland)	83.4 (78.8, 88.0)	80.1 (73.5, 86.7)	88.9 (81.1, 96.7)	80.3 (74.7, 85.8)	82.8 (79.7. 85.9)
2008/09NZANS Māori	83.4 (79.4, 87.4)	83.9 (80.0, 87.8)	85.1 (78.7, 91.5)	79.2 (74.9, 83.6)	83.4 (81.2, 85.6)
Women					
2002/03 DHHS	73.9 (72.0, 75.8)	75.8 (71.6, 80.0)	80.0 (76.3, 83.7)	82.1 (80.3, 83.9)	76.2 (74.7, 77.7)
2008/09NZANS- Māori (Auckland)	73.6 (66.5, 80.7)	85.8 (76.9, 94.7)	74.4 (70.6, 78.2)	82.0 (73.9, 90.1)	77.1 (72.0, 82.3)
2008/09NZANS Māori	78.3 (75.1, 81.6)	84.6 (80.8, 88.4)	79.1 (74.4, 83.7)	80.6 (75.6, 85.5)	80.4 (77.8, 83.0)

2008/09NZANS- Adult Nutrition Survey; DHHS- Diabetes, Heart and Health Study.

There was a statistically significant increase in the prevalence of hypertension with increasing age (p <0.001), and men had a significantly higher prevalence of hypertension than women (p=0.01). For men, Māori (but not Pacific) had a statistically significantly higher prevalence of hypertension than NZEO (p=0.024), and for women both Māori and Pacific ethnic groups had statistically significant higher prevalence of hypertension than NZEO (p=0.001 for both).

Table 2 compares self-reported prevalence of use of antihypertensive medication by sex and ethnicity reported in a population based survey in 1997 and in the 2008/09NZANS. Prevalence has increased across all ethnic groups in both men and women.

Table 3 shows mean SBP and DBP compared to previously published estimates for the NZEO ethnic group. For men in the younger age-groups, mean SBP in 2008/09 was higher than reported in previously published studies, with mean SBP at 127.3 mmHg for those 35-44 years, 133.8 mmHg for 45-54 years and 134.1 mmHg for those 55-64 years. Similarly, for women, mean SBP from 2008/09NZANS was 115.6 mmHg for those 35-44 years, 123.5 mmHg for 45-54 years, and 130.0 mmHg for those 55-64 years is higher than previous estimates. A similar pattern is shown for DBP.

For Māori, comparisons with age-specific mean SBP and DBP from Auckland Diabetes Heart and Health Survey 2002-2003 (Table 4) shows that for men aged 35-74 years, the mean SBP from 2008/09NZANS was 135.7 mmHg (95%CI 132.7, 138.7), compared with 130.0 mmHg (95%CI 127.8, 132.2) in 2002/03. For women mean SBP in the 2008/09NZANS was 128.1 mmHg (95%CI 124.7, 131.5) compared with 120.5 mmHg (95%CI 118.3, 122.7) in 2002/03. There was no apparent difference in average SBP between the 2008/09NZANS and 2002/03 ADHHS for Pacific men and women aged 35-74 years.

For Pacific men, mean SBP in 2002/03 was 132.6 mmHg (95%CI 130.2, 135.0), and in 2008/09 131.6 mmHg (95%CI 129.1, 134.1). For Pacific women, mean SBP in 2002/03 was 123.0mmHg (95%CI 120.6, 125.4), and in 2008/09 124.9mmHg (95%CI 121.9, 127.9).

Discussion

This study provides the first nationally representative data on blood pressure levels and hypertension prevalence for the New Zealand adult population. Previous estimates have either relied on self reported hypertension prevalence,[19] used regional (Auckland) populations,[16] or not included sufficient numbers of participants from important population groups (such as Pacific people).[18]

Mean systolic blood pressures in the New Zealand population are comparable with the most recent published nationally representative estimates from the United States (US) 1999-2004 National Health and Nutrition Examination Survey (NHANES). The age standardised mean SBP for New Zealand men at 129 mmHg is slightly higher than for US men over 18 years of 124 mmHg; however for women it is slightly lower at 120 mmHg for New Zealand women, compared with 122 mmHg for US women.[20] Age standardised prevalence of hypertension for New Zealand adults was 26% overall, slightly lower than the 1999-2004 NHANES prevalence of 29%.[20]

Comparisons with previously published age specific population estimates suggest that for New Zealand Europeans, mean SBP and DBP have increased among younger age groups since 2002/03, after a steady decline between 1982 and 2002 for New Zealand Europeans. For Māori, only one previously published data set was available, for 2002/03. This shows an increase in mean blood pressure in a 6 year period for adults 35-74 years of age.

Although we had no reason to believe that blood pressure levels from the Auckland population would differ from national results, we repeated the analyses using 2008/09NZANS data only from the Auckland urban area (Tables 3 and 4), and found no appreciable difference. We believe therefore that this represents a real increase in blood pressure amongst younger age groups for Māori and NZEO ethnic groups. Furthermore, the increase in blood pressure is consistent with observed international trends from similar countries.

In the US, for example, age standardised prevalence of hypertension increased by 18% between 1999 and 2004, from 24% to 28%.[20] However, as the data are obtained from different surveys, at least some of this apparent increase may be attributable to biases associated with different methodology used. For example, response rates varied across the surveys from around 80% in 1982, to 61% in 2008/09NZANS.

The Auckland surveys recruited participants from the electoral roll, whereas 2008/09NZANS recruited participants using a stratified, area-based sampling frame based on mesh-blocks. Finally blood pressures were measured differently in the surveys: the three Auckland surveys used mercury sphygmomanometers and measured blood pressure twice taking the average of the two measurements, whereas 2008/09NZANS participants had their blood pressure measured using an automated sphygmomanometer and three measurements were undertaken with the average of the second and third measure used in this analysis.

However the standardised measurement of the Auckland surveys, and the use of a randomized sphygmomanometer should have minimized investigator bias in the Auckland studies, and the observation that the first blood pressure reading is likely to be higher than subsequent readings[21,22] means that the increase observed is likely to have been under- rather than overestimated in this instance.

The increase in blood pressure amongst younger New Zealand adults is likely to be at least partly explained by the observed New Zealand population changes in known risk factors for preventable hypertension, particularly for obesity.[23]

Findings from the 2008/09NZANS confirm the alarming recent increase in the prevalence of obesity in New Zealand, with the age standardised adult population prevalence of obesity at 27% in 2008/09 compared with 19% in 1997.

Overweight and obese adults now form the majority of the New Zealand adult population at 62%. The greatest increases in obesity rates since 1997 were observed in NZEO men (13% to 25%), Māori women (36% to 49%) and NZEO women (18% to 23%)[24]; these are the same population groups that have demonstrated an increase in blood pressure in the present analysis.

Furthermore, mean population sodium intake has been shown to exceed the recommended Upper Level of intake for adults (of 2300 mgs/day) in a number of

surveys[25,26] with younger New Zealanders aged 15-44 years of age having higher urinary sodium excretion (and thereby higher dietary intake) than those aged 45 years and over in analysis of spot urinary sodium results from 2008/09NZANS.[27]

The increased blood pressure shown among younger age groups is of particular concern. Although ischaemic heart disease mortality has decreased substantially in New Zealand since the late 1960s, recent modelling of cohort effects suggests that for men born after 1956, and for women born after 1961, ischaemic heart disease mortality is predicted to increase.[8]

The increased mean systolic blood pressures demonstrated in this analysis among Māori and NZEO New Zealanders aged 35-54 years of age include cohorts from 1954 to 1973, and add weight to evidence of an increasing risk of ischaemic heart disease mortality among these age groups. The increased prevalence of obesity is likely to be driving this change.

Further monitoring of measured population blood pressure is required, especially for Māori and Pacific New Zealanders for whom fewer comparative datasets are available, in order to plan public health and health service initiatives to reverse this trend.

Use of antihypertensive medication has increased since 1997, particularly for Māori men and women, Pacific men, and NZEO women. In 2008/09, fifteen percent of New Zealand adults reported taking anti hypertensive medication.

The difference between prevalence of antihypertensive medication use and prevalence of hypertension was greater in men than in women, with only 14% of men reporting use of antihypertensive medication, while 34% of men are defined as hypertensive. For women 16% reported the use of antihypertensive medication, while 28% were hypertensive. While this may represent under-treatment of elevated blood pressure, it is not necessarily the case.

Current New Zealand guidelines recommend that individuals are assessed for cardiovascular risk using charts based on Framingham data modified for use in the New Zealand population.[1] On an individual level, therefore, blood pressure or hypertensive status is not assessed in isolation, but rather in the context of a range of potential risk factors including age, sex, ethnicity, smoking and diabetic status, and serum lipids. However, the increases demonstrated in blood pressure among younger age groups is likely to impact on overall population cardiovascular risk, since the greatest increases were observed in younger New Zealanders, many of whom are below the age where cardiovascular risk assessment is recommended in current guidelines.

Current guidelines recommend screening in asymptomatic people from the age of 45 years for men and 55 years for women, and 35 and 45 years respectively in people with known higher risk (including Māori, Pacific and people of Indo-Asian ethnicity).

Given the apparent increase in blood pressure among younger New Zealanders, earlier screening may be required in the future if this trend is confirmed. However, further reductions in population cardiovascular disease mortality are only possible if public health measures to reduce known hypertension risk factors are strengthened. These

include measures to increase physical activity, improve nutrition (including lowering population dietary salt intake) and reduce prevalence of overweight and obesity.[2]

Strengths and limitations—The 2008/09NZANS provides the first nationally representative blood pressure data. Measured blood pressure – rather than self-reported diagnosis of hypertension or antihypertensive medications - is important in order to identify trends in mean SBP as well as to estimate prevalence of hypertension. The blood pressure measurements in the 2008/09NZANS were made on a single occasion, and for individual blood pressure assessment repeated measures on different occasions are indicated. However the methods used are consistent with international best practice for population blood pressure surveys, and so results are comparable with international assessments. A particular strength of the survey is that sufficient sampling of important populations groups (Māori, Pacific, and older New Zealanders) has been undertaken to enable reliable ethnic and age specific comparisons.

Conclusions—This survey represents the first nationally representative blood pressure data on adult New Zealanders. Although mean SBP and hypertension prevalence are similar to United States estimates, increasing blood pressure levels and apparently low treatment rates are concerning. Given the importance of hypertension as a risk factor for cardiovascular disease morbidity and mortality, intensive screening, public health measures aimed at lowering population blood pressure, and further population monitoring are warranted.

Competing interests: Nil.

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