

Ethnic differences in time trends in asthma prevalence in New Zealand: ISAAC Phases I and III

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SUMMARY

SETTING: The International Study of Asthma and Allergies in Childhood (ISAAC) Phase III survey, New Zealand.

OBJECTIVE: To assess the prevalence of asthma symptoms and time trends by ethnicity between ISAAC Phase I (1992–1993) and Phase III (2001–2003).

DESIGN: Information on asthma symptoms and environmental exposures was collected in children aged 6–7 years ($n = 10\,873$) and adolescents aged 13–14 years ($n = 13\,317$).

RESULTS: In children, the prevalence of current wheeze was 28.5% in Māori (prevalence odds ratio [POR] = 1.49, 95% CI 1.32–1.68), and 25.2% in Pacific Islanders (POR 1.28, 95% CI 1.07–1.54) compared with 20.7% in Europeans/Pakeha. In adolescents, 29.9% of Māori (POR = 1.13, 95% CI 1.03–1.23) and 20.8% of Pacific

Islanders (POR 0.74, 95% CI 0.62–0.87) experienced current wheeze compared to 28.6% of Europeans/Pakeha. Between Phases I and III, the prevalence of current wheeze increased significantly by 0.49%/year in Pacific Islanders, increased non-significantly by 0.12%/year in Māori, and decreased significantly by 0.25%/year in Europeans/Pakeha children. In adolescents, the prevalence of current wheeze increased by 0.05%/year in Pacific Islanders and decreased by 0.33%/year in Europeans/Pakeha and by 0.07%/year in Māori.

CONCLUSION: Ethnic differences in asthma symptom prevalence in New Zealand have increased. The reasons for this are unclear, but may reflect inequalities in access to health services.

KEY WORDS: asthma; ethnicity; prevalence; time trends

THE INTERNATIONAL STUDY of Asthma and Allergies in Childhood (ISAAC) has provided valuable information regarding international prevalence patterns and potential risk factors in the development of asthma, rhinoconjunctivitis and eczema. Six New Zealand centres participated in Phase I during 1992–1993, with an overall participation rate of 91% ($n = 18\,569$) in children aged 6–7 years and 93% ($n = 19\,023$) in adolescents aged 13–14 years.¹ This survey was repeated as ISAAC Phase III in five centres in New Zealand during 2001–2003.²

New Zealand's population of approximately 4 million people comprises indigenous Māori (15%), Pacific Islanders (7%), the majority population of British/European origin (hereafter referred to as 'European/Pakeha'), and 'Other' (mainly Asian).³ Previous studies have reported small ethnic differences in asthma prevalence,^{4,5} but excess asthma morbidity and higher hospital admission rates have been documented for Māori and Pacific Island children.^{4,6} It is unclear

whether these differences in morbidity are due to environmental exposures,^{7–12} or problems of access to asthma care or treatment.^{13–16}

The core ISAAC New Zealand Phase III findings have been reported previously.² This article presents the ethnic differences in Phase III and in the time trends between Phase I and Phase III.

METHODS

The ISAAC Phase I methodology has been described previously.^{17,18} ISAAC Phase III was conducted in 2001–2003 in five centres that had also participated in ISAAC Phase I using the same methodology: Auckland, Bay of Plenty, Christchurch, Nelson and Wellington.^{2,19} Ethical approval was obtained for each centre.

Data collection

ISAAC Phase III involved simple one-page core written questionnaires for both age groups and an asthma

video questionnaire for the 13–14-year-old age group only.¹⁸ The 13–14-year-olds self-completed the written and video questionnaire at school, while the 6–7-year-olds' written questionnaire was completed by the child's parent or caregiver at home.

Ethnicity was self-determined (or parent/caregiver determined) by the question: 'To which ethnic group(s) do you (does your child) belong?' (European/Pakeha, Māori, Pacific Island/specify, Other/specify). This is the same question as used in ISAAC Phase I⁴ and is based on the New Zealand 1991 Census question.²⁰ There was <1% missing ethnicity data in each age group for both ISAAC Phases. As in the Phase I analyses,⁴ where more than one ethnic group was chosen, these have been classified into a single ethnicity, using a prioritised system of 'Māori', then 'Pacific Island', then 'Other', and then 'European/Pakeha'.

The key question used for assessing asthma symptom prevalence, 'current wheeze',²¹ was: 'Have you (has your child) had wheezing or whistling in the chest in the past 12 months?' Asthma severity was assessed by three questions relating to symptoms in the past 12 months: number of attacks of wheezing; sleep disturbed due to wheezing; and wheezing severe enough to limit speech to only one or two words at a time between breaths. The video questionnaire showed five scenes of young people with asthma symptoms: wheezing at rest, wheezing with exercise, waking with wheeze, waking with cough and speech-limiting wheeze.

For ISAAC Phase III, an additional environmental questionnaire for each age group was also developed.²² Several variables from this have been used as confounders in the models described below.

Data analysis

The asthma symptom prevalence values by ethnicity in each centre were calculated by dividing the number of positive responses to each question by the number of completed questionnaires for the written and video questionnaires separately. As there was little difference in asthma prevalence between centres, the current paper presents the findings by ethnicity for all centres combined. The ethnic differences in symptom prevalence were analysed using the percentage change per year in asthma symptom prevalence for the time trend data, and prevalence odds ratios (PORs)²³ adjusted for cluster sampling, with centre specified as a stratifying variable and school as a cluster variable,² and age and sex in the initial models. School decile (a measure of socio-economic status, with decile 1 schools being the 10% of schools with the highest proportion of students from low socio-economic communities),^{2,4} centre, age, sex, parental smoking (based on mother smokes [yes/no] and father smokes [yes/no] for the 6–7-year-old age group only), older and younger siblings ('0 siblings', '1 sibling', '>1 sibling'), antibiotic use in the first year of life (6–7-year-old age group only), breastfeeding (6–7-year-old age group only)

and paracetamol use in the first year of life (yes/no, 6–7-year-old age group only) and currently (previous 12 months) were included in the fully adjusted models. The POR was estimated using logistic regression and both STATA (STATA Statistical Software Release 7.0, 2001, StataCorp, College Station, TX, USA) and PC SAS software (SAS, Cary, NC, USA).

RESULTS

The study population comprised 10 873 children from the 6–7-year age group (85.2% response rate) and 13 317 adolescents from the 13–14-year age group (89.2% response rate).

Table 1 describes the characteristics of the study population by ethnicity. For the 6–7-year age group, a similar proportion of children across all ethnic groups had used paracetamol in the first year of life, but Pacific Island children had the highest frequency of monthly paracetamol use in the past year. Antibiotic use in the first year of life was slightly higher in Māori (63.7%) compared to European/Pakeha (59.9%), Pacific Island (57.1%) and 'Other' (51.5%) children. Parental smoking was highest for Māori children and Māori adolescents compared to all other ethnicities for both age groups. There was little difference in paracetamol use in European/Pakeha, Māori and Pacific Island 13–14-year-olds in the past year (50.7%, 48.9% and 49.1%, respectively).

Table 2 presents the findings for asthma symptoms by ethnicity for each age group, initially adjusted for age, sex, school decile and centre and then further adjusted for key environmental exposures. In 6–7-year-olds, the prevalence of current wheeze was 28.5% in Māori (POR = 1.49, 95% confidence interval [CI] 1.32–1.68) and 25.2% (POR 1.28, 95%CI 1.07–1.54) in Pacific Islanders compared with 20.7% in Europeans/Pakeha. Māori and Pacific Island children were more likely to experience severe asthma symptoms including night waking from wheeze and speech-limiting wheeze, compared to European/Pakeha children. Lifetime risk of wheeze was 51.2% in Māori, 37.7% in Pacific Island and 39.5% in European/Pakeha children. Children in the 'Other' ethnic category had a lower prevalence than European/Pakeha children for all asthma symptoms except night cough. For Māori children, there were only small changes to the risk estimates between the initial and fully adjusted models; however, the excess risks in Pacific Island children virtually disappeared for some symptom measures (e.g., current wheeze and night waking from wheeze) when the analyses were adjusted for the environmental exposures.

In 13–14-year-olds, the prevalence of current wheeze was 29.9% in Māori compared with 28.6% in Europeans/Pakeha. Māori had a higher prevalence of almost all severe asthma symptoms compared to European/Pakeha adolescents. Amongst Pacific Island

Table 1 ISAAC Phase III participant characteristics, by ethnicity

	6–7-year-olds				13–14-year-olds			
	European/ Pakeha <i>n</i> (%)	Māori <i>n</i> (%)	Pacific Island <i>n</i> (%)	Other <i>n</i> (%)	European/ Pakeha <i>n</i> (%)	Māori <i>n</i> (%)	Pacific Island <i>n</i> (%)	Other <i>n</i> (%)
Sex								
Male	3141 (51.3)	1298 (50.3)	392 (47.9)	624 (47.7)	3592 (48.2)	1173 (46.9)	693 (42.4)	851 (52.1)
Female	2977 (48.7)	1280 (49.7)	426 (52.1)	683 (52.3)	3857 (51.8)	1328 (53.1)	939 (57.5)	782 (47.9)
Age, years								
<6	165 (2.7)	109 (4.2)	56 (6.8)	47 (3.6)				
6	2908 (47.5)	1202 (46.6)	393 (48.0)	613 (46.9)				
7	2835 (46.3)	1170 (45.4)	348 (42.5)	593 (45.4)				
>7	210 (3.4)	97 (3.8)	21 (2.6)	54 (4.1)				
<13					52 (0.7)	40 (1.6)	27 (1.7)	37 (2.3)
13					3074 (41.3)	1016 (40.6)	727 (44.5)	648 (39.7)
14					3636 (48.8)	1186 (47.4)	722 (44.2)	767 (46.9)
>14					688 (9.2)	259 (10.4)	157 (9.6)	182 (11.1)
Antibiotics in year 1								
Yes	3663 (59.9)	1642 (63.7)	467 (57.1)	673 (51.5)				
No	2244 (36.7)	803 (31.1)	295 (36.1)	588 (45.0)				
Paracetamol in year 1								
Yes	5310 (86.8)	2224 (86.3)	718 (87.8)	963 (73.7)				
No	755 (12.3)	321 (12.5)	74 (9.0)	330 (25.2)				
Paracetamol in last year								
Never	442 (7.2)	171 (6.6)	37 (4.5)	170 (13.0)	576 (7.7)	257 (10.3)	174 (10.7)	315 (19.3)
At least once a year	4492 (73.4)	1625 (63.0)	381 (46.6)	831 (63.6)	2968 (39.8)	958 (38.3)	635 (38.9)	723 (44.2)
At least once a month	1094 (17.9)	704 (27.3)	365 (44.6)	271 (20.7)	3780 (50.7)	1222 (48.9)	802 (49.1)	547 (33.5)
Older siblings								
0	2367 (38.7)	815 (31.6)	223 (27.3)	548 (41.9)	2562 (34.4)	639 (25.5)	349 (21.4)	633 (38.7)
1	2217 (36.2)	688 (26.7)	245 (30.0)	484 (37.0)	2460 (33.0)	635 (25.4)	365 (22.4)	563 (34.5)
>1	1473 (24.1)	1040 (40.3)	330 (40.3)	249 (19.1)	2223 (29.8)	1117 (44.7)	834 (51.1)	366 (22.4)
Younger siblings								
0	3069 (50.2)	1094 (42.4)	314 (38.4)	723 (55.3)	2809 (37.7)	616 (24.6)	336 (20.6)	687 (42.0)
1	2300 (37.6)	911 (35.3)	282 (34.5)	457 (35.0)	2710 (36.4)	718 (28.7)	436 (26.7)	561 (34.3)
>1	695 (11.4)	537 (20.8)	203 (24.8)	100 (7.7)	1766 (23.7)	1084 (43.3)	788 (48.3)	316 (19.3)
Breastfeeding								
Yes	5125 (83.8)	2008 (77.9)	628 (76.8)	937 (71.7)				
No	911 (14.9)	505 (19.6)	158 (19.3)	329 (25.2)				
Maternal smoking								
Yes	1225 (20.0)	1324 (51.4)	217 (26.5)	114 (8.7)	1573 (21.1)	1291 (51.6)	537 (32.9)	170 (10.4)
No	4853 (79.3)	1196 (46.4)	578 (70.7)	1174 (89.8)	5801 (77.9)	1145 (45.8)	1077 (66.0)	1429 (87.5)
Paternal smoking								
Yes	1222 (20.0)	1098 (42.6)	249 (30.4)	338 (25.9)				
No	4766 (77.9)	1334 (51.7)	532 (65.0)	933 (71.4)				

ISAAC = International Study of Asthma and Allergies in Childhood.

13–14-year-olds, a reduced risk was seen for current wheeze, ever wheeze and ever asthma compared to Europeans/Pakeha. Only small changes were seen in the risk estimates for Māori and Pacific Island compared to European/Pakeha 13–14-year-olds when adjusted for the environmental exposures.

For the video questionnaire responses (Table 2) in all categories, Māori adolescents had a higher prevalence of asthma symptoms compared to Europeans/Pakeha. Pacific Island adolescents reported an increased prevalence for some asthma symptoms (e.g., current wheeze and night waking from wheeze) compared to European/Pakeha adolescents. Adjustment for school decile (in addition to age, sex and centre) produced only small changes in some PORs, and there was no consistent pattern of changes (not shown in Table). For example, the POR for wheezing in the last 12 months in 6–7-year-olds changed from 1.53 (95%CI

1.38–1.70) to 1.49 (95%CI 1.32–1.68) when adjusted for school decile, that for 13–14-year-olds changed from 1.06 (95%CI 0.95–1.19) to 1.13 (95%CI 1.03–1.23), and that for the video questionnaire changed from 1.80 (95%CI 1.55–2.08) to 1.70 (95%CI 1.45–2.00; not shown in Table).

Time trends

Table 3 presents the time trends by ethnicity for each age group. The prevalence of current wheeze increased non-significantly by 0.12%/year (95%CI –0.14–0.37) in Māori, and increased significantly by 0.49%/year (95%CI 0.09–0.88) in Pacific Island children, but decreased by 0.25%/year (95%CI –0.39–0.11) in Europeans/Pakeha. Both Māori and Pacific Island children had quite marked increases in wheeze ever and asthma ever. European/Pakeha children showed either no change or small decreases in

Table 2 Prevalence odds ratio (95%CI) of asthma symptom prevalence by ethnicity, ISAAC Phase III

	European/Pakeha				Māori				Pacific Island				Other			
	n (%)	POR*	n (%)	Adjusted [†] POR (95%CI)	POR (95%CI)	n (%)	Adjusted [†] POR (95%CI)	POR (95%CI)	n (%)	Adjusted [†] POR (95%CI)	POR (95%CI)	n (%)	Adjusted [†] POR (95%CI)	POR (95%CI)	n (%)	Adjusted [†] POR (95%CI)
6–7-year-olds[‡]																
Wheezing ever	2416 (39.5)	1.0	1319 (51.2)	1.57 (1.42–1.74)	1.45 (1.28–1.66)	308 (37.7)	0.93 (0.80–1.07)	0.85 (0.73–0.98)	360 (27.5)	0.60 (0.51–0.70)	0.65 (0.55–0.76)					
Current wheeze	1267 (20.7)	1.0	734 (28.5)	1.49 (1.32–1.68)	1.40 (1.22–1.61)	206 (25.2)	1.28 (1.07–1.54)	1.08 (0.89–1.30)	202 (15.5)	0.72 (0.60–0.86)	0.77 (0.64–0.94)					
≥4 wheezing attacks	417 (6.8)	1.0	241 (9.3)	1.36 (1.11–1.65)	1.32 (1.06–1.63)	58 (7.1)	1.03 (0.76–1.38)	0.82 (0.60–1.11)	65 (5.0)	0.73 (0.56–0.97)	0.75 (0.56–1.01)					
Night waking from wheeze	738 (12.1)	1.0	442 (17.1)	1.34 (1.15–1.56)	1.23 (1.04–1.45)	134 (16.4)	1.28 (1.05–1.57)	1.02 (0.82–1.27)	117 (9.0)	0.72 (0.59–0.87)	0.74 (0.61–0.90)					
Speech-limiting wheeze	177 (2.9)	1.0	161 (6.2)	1.96 (1.52–2.51)	1.69 (1.28–2.21)	42 (5.1)	1.58 (1.07–2.35)	1.27 (0.83–1.94)	26 (2.0)	0.69 (0.46–1.03)	0.66 (0.42–1.02)					
Asthma ever	1776 (29.0)	1.0	1001 (38.8)	1.53 (1.35–1.74)	1.43 (1.25–1.65)	216 (26.4)	0.89 (0.76–1.03)	0.79 (0.66–0.94)	278 (21.3)	0.68 (0.58–0.80)	0.71 (0.60–0.85)					
Exercise wheeze	893 (14.6)	1.0	546 (21.2)	1.47 (1.28–1.68)	1.31 (1.12–1.52)	145 (17.7)	1.20 (0.98–1.47)	0.96 (0.78–1.18)	148 (11.3)	0.75 (0.61–0.92)	0.81 (0.66–1.00)					
Night cough	1566 (25.6)	1.0	879 (34.1)	1.40 (1.23–1.60)	1.27 (1.09–1.49)	287 (35.1)	1.48 (1.27–1.73)	1.32 (1.10–1.59)	335 (25.6)	1.02 (0.89–1.16)	1.09 (0.94–1.26)					
13–14-year-olds[§] (written)																
Wheezing ever	3589 (48.2)	1.0	1244 (49.7)	1.16 (1.03–1.30)	1.19 (1.05–1.34)	576 (35.3)	0.67 (0.57–0.77)	0.72 (0.61–0.84)	559 (34.2)	0.58 (0.48–0.69)	0.68 (0.57–0.82)					
Current wheeze	2129 (28.6)	1.0	747 (29.9)	1.13 (1.03–1.23)	1.12 (1.03–1.22)	339 (20.8)	0.74 (0.62–0.87)	0.77 (0.66–0.91)	325 (19.9)	0.64 (0.52–0.77)	0.77 (0.63–0.93)					
≥4 wheezing attacks	510 (6.8)	1.0	158 (6.3)	0.93 (0.76–1.13)	0.93 (0.76–1.12)	61 (3.7)	0.56 (0.42–0.76)	0.52 (0.37–0.74)	92 (5.6)	0.83 (0.62–1.13)	0.99 (0.74–1.33)					
Night waking from wheeze	738 (9.9)	1.0	398 (15.9)	1.63 (1.38–1.94)	1.58 (1.29–1.92)	210 (12.9)	1.19 (0.98–1.44)	1.21 (0.98–1.51)	133 (8.1)	0.81 (0.62–1.06)	0.98 (0.75–1.29)					
Speech-limiting wheeze	433 (5.8)	1.0	194 (7.8)	1.35 (1.09–1.66)	1.31 (1.05–1.65)	118 (7.2)	1.18 (0.86–1.60)	1.21 (0.86–1.71)	76 (4.7)	0.81 (0.59–1.11)	1.03 (0.77–1.37)					
Asthma ever	2551 (34.2)	1.0	940 (37.6)	1.15 (1.02–1.31)	1.20 (1.05–1.37)	403 (24.7)	0.61 (0.49–0.77)	0.68 (0.55–0.85)	396 (24.2)	0.60 (0.49–0.74)	0.66 (0.53–0.83)					
Exercise wheeze	2946 (39.5)	1.0	993 (39.7)	1.03 (0.92–1.16)	1.04 (0.92–1.17)	545 (33.4)	0.81 (0.71–0.92)	0.86 (0.75–0.99)	478 (29.3)	0.65 (0.57–0.75)	0.77 (0.66–0.89)					
Night cough	1943 (26.1)	1.0	918 (36.7)	1.49 (1.32–1.67)	1.48 (1.29–1.69)	606 (37.1)	1.43 (1.21–1.68)	1.53 (1.28–1.83)	360 (22.0)	0.82 (0.71–0.95)	0.97 (0.84–1.11)					
13–14-year-olds[§] (video)																
Current wheeze	718 (9.7)	1.0	399 (16.2)	1.70 (1.45–2.00)	1.62 (1.35–1.94)	210 (12.9)	1.29 (1.05–1.57)	1.29 (1.04–1.61)	138 (8.5)	0.89 (0.70–1.13)	1.08 (0.86–1.36)					
Night waking from wheeze	1328 (18.0)	1.0	607 (24.7)	1.45 (1.24–1.68)	1.42 (1.22–1.65)	367 (22.6)	1.14 (0.95–1.38)	1.17 (0.95–1.43)	246 (15.2)	0.82 (0.67–1.02)	0.98 (0.79–1.21)					
Speech-limiting wheeze	536 (7.2)	1.0	236 (9.6)	1.29 (1.09–1.53)	1.26 (1.07–1.48)	113 (6.9)	0.90 (0.70–1.15)	0.89 (0.69–1.14)	94 (5.8)	0.84 (0.68–1.05)	0.98 (0.79–1.22)					
Exercise wheeze	1175 (15.9)	1.0	449 (18.2)	1.11 (0.95–1.29)	1.08 (0.92–1.27)	270 (16.6)	0.95 (0.79–1.15)	0.97 (0.79–1.18)	192 (11.8)	0.71 (0.59–0.86)	0.83 (0.70–1.00)					
Night cough	1328 (18.0)	1.0	607 (24.7)	1.45 (1.24–1.68)	1.42 (1.22–1.65)	367 (22.6)	1.14 (0.95–1.38)	1.17 (0.95–1.43)	246 (15.2)	0.82 (0.67–1.02)	0.98 (0.79–1.21)					

* Reference category.

[†] POR adjusted for age, sex, centre and school decile.[‡] POR (6–7-year-olds) adjusted for age, sex, centre, school decile, parental smoking, breastfeeding, older siblings, younger siblings, antibiotic use in first year of life and paracetamol use (in first year of life and currently).[§] POR (13–14-year-olds) adjusted for age, sex, centre, school decile, parental smoking, younger siblings and current paracetamol use.

CI = confidence interval; ISAAC = International Study of Asthma and Allergies in Childhood; POR = prevalence odds ratio.

Table 3 Percentage change per year (95%CI) in asthma symptom prevalence between ISAAC Phase I and ISAAC Phase III, by ethnicity

	European/Pakeha change/year (95%CI)*	Māori change/year (95%CI)*	Pacific Island change/year (95%CI)*	Other change/year (95%CI)*
6–7-year-olds				
Wheezing ever	0.06 (–0.10–0.23)	0.60 (0.32–0.89)	0.54 (0.09–0.99)	–0.23 (–0.66–0.21)
Current wheeze	–0.25 (–0.39–0.11)	0.12 (–0.14–0.37)	0.49 (0.09–0.88)	–0.49 (–0.86–0.12)
≥4 wheezing attacks	–0.17 (–0.26–0.08)	0.03 (–0.13–0.19)	–0.03 (–0.28–0.21)	–0.26 (–0.49–0.02)
Night waking from wheeze	–0.23 (–0.35–0.12)	–0.12 (–0.33–0.10)	–0.12 (–0.48–0.23)	–0.39 (–0.69–0.08)
Speech-limiting wheeze	–0.13 (–0.19–0.07)	–0.07 (–0.21–0.07)	–0.31 (–0.54–0.07)	–0.11 (–0.26–0.05)
Asthma ever	0.51 (0.36–0.66)	0.84 (0.58–1.11)	0.68 (0.28–1.08)	0.20 (–0.18–0.58)
Exercise wheeze	–0.12 (–0.24–0.00)	0.28 (0.05–0.50)	0.38 (0.03–0.73)	–0.31 (–0.63–0.01)
Night cough	–0.16 (–0.31–0.01)	0.35 (0.09–0.62)	0.37 (–0.08–0.81)	0.02 (–0.40–0.43)
13–14-year-olds (written)				
Wheezing ever	0.17 (0.00–0.33)	0.42 (0.13–0.72)	0.07 (–0.32–0.45)	–0.16 (–0.57–0.24)
Current wheeze	–0.33 (–0.48–0.18)	–0.07 (–0.35–0.20)	0.05 (–0.28–0.37)	–0.31 (–0.66–0.04)
≥4 wheezing attacks	–0.43 (–0.52–0.33)	–0.30 (–0.46–0.14)	–0.18 (–0.35–0.01)	–0.27 (–0.49–0.05)
Night waking from wheeze	–0.14 (–0.24–0.03)	0.13 (–0.09–0.34)	0.11 (–0.15–0.38)	–0.08 (–0.32–0.16)
Speech-limiting wheeze	–0.24 (–0.32–0.15)	–0.07 (–0.23–0.09)	–0.03 (–0.24–0.18)	–0.20 (–0.39–0.00)
Asthma ever	1.02 (0.87–1.17)	1.42 (1.15–1.70)	0.64 (0.31–0.97)	0.49 (0.14–0.84)
Exercise wheeze	–0.24 (–0.40–0.07)	–0.07 (–0.36–0.22)	0.19 (–0.19–0.56)	–0.35 (–0.75–0.04)
Night cough	–0.07 (–0.21–0.08)	–0.07 (–0.36–0.21)	0.62 (0.24–1.00)	–0.69 (–1.06–0.32)
13–14-year-olds (video)				
Current wheeze	–0.86 (–0.97–0.75)	–0.60 (–0.83–0.37)	–0.60 (–0.90–0.31)	–0.82 (–1.10–0.53)
Night waking from wheeze	–0.73 (–0.81–0.64)	–0.73 (–0.91–0.55)	–0.67 (–0.91–0.44)	–0.68 (–0.91–0.45)
Speech-limiting wheeze	–0.68 (–0.78–0.58)	–0.51 (–0.71–0.32)	–0.44 (–0.67–0.21)	–0.45 (–0.69–0.22)
Exercise wheeze	–1.78 (–1.91–1.64)	–1.23 (–1.48–0.98)	–0.89 (–1.21–0.56)	–1.75 (–2.10–1.41)
Night cough	–0.42 (–0.55–0.29)	–0.38 (–0.64–0.12)	–0.15 (–0.49–0.19)	–0.41 (–0.73–0.08)

* Adjusted for clustering by school.

CI = confidence interval; ISAAC = International Study of Asthma and Allergies in Childhood.

prevalence for most asthma symptoms, but an increase in asthma ever. For the 13–14-year-olds (Table 3), the prevalence of current wheeze increased by 0.05%/year (95%CI –0.28–0.37) in Pacific Island children and decreased in both Europeans/Pakeha (0.33%/year, 95%CI –0.48–0.18) and Māori (0.07%/year, 95%CI –0.35–0.20). Between Phases I and III, an increase in asthma ever was seen in all ethnic groups, most markedly in Māori adolescents. The time trend data for the video questionnaire responses indicated an overall reduction in the prevalence of asthma symptoms in all ethnic groups (Table 3).

DISCUSSION

This is the first report of ethnic-specific time trends of asthma prevalence within a country using the ISAAC data. The overall findings indicate a higher prevalence of asthma symptoms in Māori compared to Europeans/Pakeha for both children and adolescents. In some cases, these differences are quite marked, particularly in children, and the pattern of differences appear consistent across the age groups and the written and video questionnaires.

This contrasts with findings from previous studies²⁴ and those for ISAAC Phase I,⁴ where the ethnic differences in asthma prevalence were generally less than observed here. Ethnic differences have thus increased, particularly between Māori and European/Pakeha children, primarily because symptom prevalence has fallen in the latter group but has increased slightly in Māori children.

We adjusted for some key environmental exposures, including parental smoking,⁷ breastfeeding,⁸ family size,^{10,11} paracetamol use¹² and antibiotic use in childhood.²⁵ Adjusting for various environmental exposures changed the POR minimally for current wheeze or asthma ever in Māori, suggesting that the environmental exposures measured in the Phase III survey explain little of the difference in asthma prevalence between Māori and Europeans/Pakeha. On the other hand, the excess risks in Pacific Island children virtually disappeared for some symptoms when the analyses were adjusted for the environmental exposures.

We found Māori and, to a lesser extent, Pacific Island children and adolescents, to have significantly higher prevalences of severe asthma symptoms. This is consistent with previously reported differences in asthma severity between Māori and non-Māori children.^{6,14,28,32}

A population may have a high prevalence of asthma because of high exposure to factors that induce asthma or, for those already with the disease, excess exposure to factors that incite, exacerbate or prolong symptoms (or a reduced access to factors that may reduce symptoms).^{26,27} Differences in asthma prevalence and severity in Māori may therefore not be due to a higher incidence but rather to a longer duration of the condition resulting from reduced access to care. Treatment issues, factors mediated through socio-economic status and/or the availability and location of health services have been found to be important determinants of access to care both in New Zealand and overseas.^{13–15,30–32} Asthma may be prolonged in Māori for

a range of reasons, including inappropriate treatment,^{13,14} inability to afford the medicines that are prescribed,^{13,32} or inadequate advice on how to manage the condition,^{13–15} resulting in more frequent and prolonged asthma symptoms and, therefore, increased asthma symptom prevalence as well as severity.¹⁶

Time trends

The initial analyses of worldwide time trends using ISAAC Phase I and Phase III data³³ indicate a reduction internationally in asthma symptom prevalence and, specifically, decreases in areas with a previously high prevalence (English-speaking countries and Western Europe) and a corresponding increase in regions that showed a low prevalence when surveyed during ISAAC Phase I. In the core ISAAC Phase III analyses for New Zealand,² there was a significant increase in the reporting of asthma ever among both children and adolescents ($P < 0.001$ and $P < 0.001$, respectively) between the Phase I and III surveys, while the overall prevalence of current wheeze appeared to remain relatively stable over that time period.

In the current study, the time trend data for Māori children and adolescents indicate little change in the prevalence of current wheeze, but a large increase in wheeze ever and asthma ever. The time trend data for Pacific Island children indicate large increases for wheeze ever, current wheeze and asthma ever, while adolescents show an increase for asthma ever but little change in the prevalence of wheeze ever or current wheeze.

Mitchell and Asher suggest that underdiagnosis in general practice is common and that the prevalence of physician-diagnosed asthma may be substantially lower than the prevalence of asthma symptoms in the community.³⁴ Increases in reported asthma and wheezing for Māori and Pacific Island children and adolescents found in the current study may reflect greater awareness and changing patterns of medical practice with regard to diagnosis in conjunction with improved access to care²⁶ or, alternatively, it may reflect poorer access to services, resulting in more frequent and prolonged asthma exacerbations. Whatever the explanation, the time trend data confirm that asthma severity for Māori continues to be disproportionately greater than that for Europeans/Pakeha, and that it is now also greater for Pacific Island children.

Some limitations to the study should be noted. The ISAAC survey is based on self-reported or parent-reported asthma symptoms. The ISAAC questionnaires have previously been validated in New Zealand and elsewhere, and appear to have good validity for measuring the prevalence of current asthma symptoms. However, the absolute prevalence levels in the two age groups cannot be compared directly because of differing reporting methods. This may account for the consistently lower prevalence levels in 6–7-year-olds found in the ISAAC studies,²¹ as parents are unlikely

to observe all episodes of wheezing in their children. Equally, the absolute prevalence values cannot be directly compared between the written and video questionnaires for the 13–14-year age group. Nonetheless, changes in asthma prevalence over time can be assessed because the same methodology has been used in each age group in the Phase I and Phase III surveys.

In summary, ethnic differences in asthma prevalence in New Zealand have increased, particularly because symptom prevalence has fallen among European/Pakeha children and adolescents, but has changed little or even increased in Māori and Pacific Island children and adolescents. Inequalities in access to care may be an important contributing factor in ethnic differences. Environmental exposures assessed in the Phase III survey appear to explain few of the differences in asthma prevalence or severity between Māori and European/Pakeha children and adolescents, but may account for some of the excess risks in Pacific Island children.

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R É S U M É

CONTEXTE : La Phase III de l'enquête « International Study of Asthma and Allergies in Childhood » (ISAAC) en Nouvelle-Zélande.

OBJECTIF : Evaluer la prévalence des symptômes d'asthme et leur tendance au fil du temps en fonction de l'ethnie, entre la Phase I (1992 à 1993) et la Phase III (2001 à 2003) de l'ISAAC.

SCHEMA : On a recueilli des informations sur les symptômes asthmatiques et sur les expositions environnementales chez les enfants âgés de 6 à 7 ans ($n = 10\,873$) et chez les adolescents de 13 à 14 ans ($n = 13\,317$).

RÉSULTATS : Chez les enfants, la prévalence de sifflement présent a été de 28,5% chez les Māoris (POR = 1,49 ; IC95% 1,32–1,68) et de 25,2% chez ceux des Iles Pacifique (POR = 1,28 ; IC95% 1,07–1,54) par comparaison avec une prévalence de 20,7% chez ceux d'origine européenne/Pakeha. Chez les adolescents, 29,9% des Māoris (POR = 1,13 ; IC95% 1,03–1,23) et 20,8%

de ceux des Iles Pacifique (POR = 0,74 ; IC95% 0,62–0,87) ressentent des sifflements présents par comparaison avec 28,6% de ceux d'origine européenne/Pakeha. Chez les enfants, la prévalence du sifflement présent a augmenté entre les Phases I et III de manière significative de 0,49% par an chez ceux des Iles Pacifique, augmentant de manière non significative de 0,12% par an chez les Māoris et diminuant de manière significative de 0,25% par an chez ceux d'origine européenne/Pakeha. Chez les adolescents, la prévalence du sifflement présent a augmenté de 0,05% par an chez ceux des Iles Pacifique, a diminué de 0,33% par an chez ceux d'origine européenne/Pakeha et de 0,07% par an chez les Māoris.

CONCLUSION : Les différences ethniques dans la prévalence des symptômes d'asthme ont augmenté en Nouvelle-Zélande. Les raisons en sont peu claires et pourraient refléter des inégalités en matière d'accessibilité des services de santé.

RESUMEN

MARCO DE REFERENCIA : Informe sobre la Fase III del Estudio internacional del asma y las alergias en la niñez (ISAAC) en Nueva Zelanda.

OBJETIVO : Evaluar la prevalencia de síntomas según las etnias y su tendencia a lo largo del tiempo, entre la Fase I (de 1992 a 1993) y la Fase III (de 2001 a 2003) del estudio ISAAC.

MÉTODOS : Se recogió información sobre los síntomas de asma y la exposición ambiental de niños de 6 a 7 años ($n = 10\,873$) y adolescentes entre 13 y 14 años ($n = 13\,317$).

RESULTADOS : En los niños, la prevalencia de estertores sibilantes frecuentes fue de 28,5% en la población maorí (POR = 1,49 ; IC95% 1,32–1,68) y de 25,2% en la población de las Islas Pacíficas (POR = 1,28 ; IC95% 1,07–1,54) en comparación con 20,7% en la población europea o de origen europeo (Pakeha). En los adolescentes, 29,9% de Maoríes (POR 1,13 ; IC95% 1,03–1,23)

y 20,8% del Pacífico (POR 0,74 ; IC95% 0,62–0,87) refirieron sibilancias frecuentes, en comparación con 28,6% de los Europeos/Pakeha. Entre las Fases I y III, la prevalencia de sibilancias frecuentes aumentó en forma significativa un 0,49% por año en la población del Pacífico, aumentó sin significación estadística un 0,12% por año en los Maoríes y disminuyó significativamente un 0,25% por año en los niños europeo/pakeha. En los adolescentes, la prevalencia de sibilancias frecuentes aumentó un 0,05% por año en la población del Pacífico y disminuyó un 0,33% por año en los Europeos/Pakeha y un 0,07% por año en los maoríes.

CONCLUSIÓN : En Nueva Zelanda, han aumentado las diferencias étnicas en la prevalencia de los síntomas del asma. Las razones de esta situación no son claras, pero podrían reflejar las desigualdades del acceso a los servicios de salud.
