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9 ***Title Page***10 **Asian children living in Australia have a different profile of allergy**
11 **and anaphylaxis than Australian-born children: a State-wide survey**

12

13 ***Running title:***14 **Allergy profile of Asian children living in Australia**

15

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35 **Abstract**

36 *Background*

37 Asian children born in Australia have higher rates of eczema and nut allergy than non-Asian
38 children. However, it is not known whether this country of birth differential exists for other
39 allergies or anaphylaxis risk.

40 *Objective*

41 We investigated the influence of maternal and child's country of birth on the prevalence of
42 parent-reported eczema, asthma, food allergy, and being diagnosed by a doctor as being "at
43 risk of anaphylaxis".

44 *Methods*

45 We assessed the relationship between mother and child country of birth and allergies using
46 the 2010 School Entrant Health Questionnaire, completed for 57,005 5-year old children
47 (85.8% response rate) in Victoria, Australia. Analyses were conducted using logistic
48 regression with results presented as odds ratios (OR) with 95% confidence intervals (CIs).

49 *Results*

50 Children born in Australia to Asian-born mothers were more likely to have parent-reported
51 food allergy (OR 2.33, 95%CI 1.96-2.77) and eczema (OR 2.04, 95%CI 1.73-2.41), but not
52 more likely to have asthma (OR 0.87, 95% CI 0.74-1.02) than non-Asian children. By contrast,
53 children born in Asia who subsequently migrated to Australia had a lower risk of food allergy
54 (OR 0.33, 95%CI 0.20-0.55), eczema (OR 0.37, 95%CI 0.24-0.57) and asthma (OR 0.29, 95% CI
55 0.21-0.40).

56 Patterns of anaphylaxis risk differed depending on the trigger. Compared with Australian-
57 born non-Asian children, Australian-born Asian children were more likely to be diagnosed as
58 being at risk of both food-induced and non-food induced anaphylaxis. For children born in
59 Asia, risk was lower for anaphylaxis to milk, peanut and tree nuts compared to non-Asian
60 children, but higher for soy, wheat and non-food triggers.

61 *Conclusions & Clinical Relevance*

62 Patterns of allergy/anaphylaxis risk and their triggers differed according to both ethnicity
63 and country of birth, suggesting a gene-environment factor is in play. The difference in

64 patterns for asthma compared with other atopic diseases is surprising and warrants further
65 exploration.

66 **Keywords:**

67 Anaphylaxis, food allergy, paediatrics, Asian, ethnicity, country of birth

68 **Abbreviations:**

69 FIA: food-induced anaphylaxis; Non-FIA: non-food induced anaphylaxis; VLBW: very low
70 birth weight; SEIFA: Socio-economic Indexes for Areas; OR: odds ratios; CIs: confidence
71 intervals.

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72 **Introduction**

73 The burden of food allergy in children is increasing in terms of prevalence and
74 hospitalizations in both developed and developing countries [1]. We recently reported that
75 10% of infants in Melbourne, Australia had challenge-proven food allergy, the highest food
76 allergy population prevalence yet reported [2]. An increasing trend of anaphylaxis incidence
77 has been consistently reported in various countries [3, 4]. Most studies confirmed food as
78 the major trigger for anaphylaxis in children [4-6] and food allergy, in particular, drove the
79 rapid increase in anaphylaxis admissions in Australian children reported between 1998 to
80 2012 [3].

81 Australia has a high proportion of residents that are of Asian descent and our studies have
82 shown that Australian-born infants with Asian ethnicity were more likely to have nut allergy
83 and eczema compared to Caucasian ethnicity [7] while children born in Asia living in
84 Australia at age 5 years had a lower prevalence of nut allergy compared with Australian-
85 born non-Asian children [8]. This indicates that both genetic and environmental factors
86 likely alter the development of nut allergy. However, less is known about other allergies and
87 anaphylaxis among these groups. Seafood (fish and shellfish) and wheat have been reported
88 to be the main triggers of food allergy and anaphylaxis in some Asian countries [9-13], but
89 little is known about the prevalence of these allergies in Asian children living in other
90 countries.

91 By using data from the state-wide compulsory School Entrant Health Questionnaire (SEHQ)
92 completed for nearly 60,000 children in 2010 at the time of school entry, we aimed to
93 investigate the influence of maternal and child's country of birth on the prevalence of
94 parent-reported eczema, asthma, food allergy to a range of foods and risk of anaphylaxis by
95 comparing children born in Asia (the largest non-Caucasian immigrant group in Victoria [14]),
96 Australian-born Asian children and Australian-born non-Asian children. We also investigated
97 other demographic and environmental factors associated with the prevalence of food-
98 induced and non-food induced anaphylaxis risk.

99 **Methods**

100 ***Study design and population***

101 This study utilised data from the School Entrant Health Questionnaire (SEHQ), which is a
102 state level questionnaire completed by the parent or guardian of all children entering
103 primary school (preparatory grade students). Children commence school in Victoria at
104 approximately 5 years of age. The survey has been distributed annually to children enrolled
105 in primary schools in Victoria, Australia since mid-1997 [15]. In 2010, the survey included
106 questions on allergy and anaphylaxis which are used in the present analysis.

107 ***Demographic, environmental exposures and confounders***

108 The following variables from the questionnaire were considered in our analysis: mother's
109 country of birth (father's country of birth was not asked in the questionnaire), children's age
110 and gender, child's country of birth (age of migration was not available for children born
111 overseas), whether the child had very low birth weight (less than 1500g) (VLBW), whether
112 the child lives with siblings, postcode of residence, mother's education level, father's
113 education level and region of residence.

114 The socio-economic status for children in our study was calculated using Socio-Economic
115 Indexes for Areas (SEIFA) by matching postcodes of residence with SEIFA data from the
116 Australian Bureau of Statistics. SEIFA takes into account economic and social conditions of
117 people and households within an area, including both relative advantage and disadvantage
118 measures [8].

119 ***Definitions of allergic outcomes***

120 The following food allergy and anaphylaxis questions were asked in the survey:

- 121 1) Has your child ever been told by a doctor that your child has an allergy problem? If
122 yes, parents were instructed to check boxes indicating which food or substance the
123 child was allergic to. Options provided in checkboxes were: milk, eggs, peanuts, tree
124 nuts, soy, wheat, fish/shellfish, bee/insect stings, other.
- 125 2) Have you ever been told by a doctor that your child's allergy may result in
126 anaphylaxis? Parents were also instructed to check boxes indicating which food or
127 substance the child was anaphylactic to (options as defined above).

128 Parent-reported food allergy (hereafter referred to as “food allergy”) was defined as a
129 report of allergy caused by any of the eight listed foods/food groups (milk, eggs, peanuts,
130 tree nuts, soy, wheat, fish, shellfish). These foods collectively account for more than 90% of
131 IgE-mediated food allergies in children [16].

132 A student was defined as being at risk of anaphylaxis if the parent reported being told by a
133 doctor that their child’s allergy may result in anaphylaxis for any of the listed foods or
134 substances. If a food trigger was selected, children were classified as being at risk of food-
135 induced anaphylaxis (FIA). Those at risk of anaphylaxis are likely to be those with IgE-
136 mediated food allergy rather than non-IgE mediated food allergy or intolerances. Non-food-
137 induced anaphylaxis (Non-FIA) was defined as any other trigger (bee/insect sting or other
138 trigger, details of “other” triggers were not available). Separate categories were created for
139 risk of anaphylaxis to bee/insect stings and other triggers.

140 Asthma: An affirmative response to “Have you ever been told by a doctor that your child has
141 asthma”.

142 Eczema: An affirmative response to “Does your child have ongoing eczema (with daily
143 effects)?”

144 No additional information on symptoms of allergy or method of diagnosis was collected. The
145 survey did not collect information on allergic rhinitis or hay fever.

146 ***Definitions of maternal and child country of birth and ethnicity***

147 Parents were asked to indicate where the child was born and where the child’s mother was
148 born. Checkboxes were provided for the following countries: Australia, New Zealand,
149 England, South Africa, China, Philippines, India, USA, South Korea, Hong Kong (SAR of China)
150 and “other”, with answers for other countries recorded in a free text field. Answers
151 recorded in this free text field were not available and individuals who answered “other”
152 were therefore excluded from the analysis.

153 We further classified country of birth as “East Asia” if the mother/child was born in China,
154 the Philippines, South Korea or Hong Kong (SAR of China).

155 For the primary analysis, we combined East Asia and India into a single category (“Asia”). We
156 also conducted a sensitivity analysis which considered East Asia and India as separate
157 categories.

158 The term “children born in Asia” was applied if the children were born in Asia to Asian-born
159 mothers. “Australian-born Asian children” refers to children born in Australia with Asian-
160 born mothers. “Australian-born non-Asian children” refers to children born in Australia with
161 Australian-born mothers. A combined variable with the categories Australia-Australia, Asia-
162 Australia, Asia-Asia referring to maternal-child country of birth was generated for the
163 analysis.

164 ***Statistical analysis***

165 We described the prevalence of allergic outcomes (food allergy, asthma, eczema, food-
166 induced anaphylaxis, non-food anaphylaxis) within categories of maternal and child’s
167 country of birth (Australia-Australia; Asia-Australia; Asia-Asia) as the observed proportion
168 with 95% confidence intervals (95% CIs) for the population prevalence calculated by using
169 the normal approximation to the binomial distribution.

170 Adjusted logistic regression models were used to examine the association between
171 maternal or child country of birth and allergic outcomes, with results presented as odds
172 ratios (OR) with 95% CIs. Potential confounders considered in our analysis were factors that
173 have been reported to be associated with allergic disease in previous studies [7, 8]. Potential
174 confounders considered in the models were children’s age and gender, region of residence,
175 whether child had very low birth weight (less than 1500g) (VLBW), whether child lives with
176 any siblings, mother’s education level, father’s education level and SEIFA. Each model was
177 adjusted for the potential confounder only if its inclusion in the model altered an OR by
178 greater than 10%.

179 Separate adjusted logistic regression models examined the association between other
180 demographic factors (child’s sex, presence of siblings, region, parental education and
181 socioeconomic status) and allergic outcomes.

182 All data were analysed using Stata version 15.0 (StataCorp, College Station, TX, USA).

183 **Ethics approval**

184 Ethics approval was granted by the human research ethics committees of the Royal
185 Children's Hospital (HREC# 34168) and the Victorian Department of Education and Early
186 Childhood Development.

187 **Results**

188 In 2010, 57,005 of 66,444 (85.8%) eligible children returned the questionnaire and were
189 therefore included in this study. The demographics of these children have been reported
190 elsewhere [8] and are summarized in online repository Table S1. Among participants, the
191 number of Australian-born non-Asian children was 39,585, Australian-born Asian children
192 was 1,657 (representing the largest non-Caucasian ethnic group) and children born in Asia
193 was 1,005. The mean age of participating children was 4.9 years (range 4-7 years).

194 ***Patterns of food allergy, eczema and asthma according to ethnicity and country of birth***

195 The prevalence of food allergy, eczema and asthma by maternal and child country of birth is
196 illustrated in **Figure 1**. Australian-born Asian children were more likely to have food allergy
197 (aOR 2.33, 95%CI 1.96-2.77, $P<0.001$) and eczema (aOR 2.04, 95%CI 1.73-2.41, $P<0.001$), but
198 were not more likely to have asthma (aOR 0.87, 95%CI 0.74-1.02, $P=0.08$) compared to
199 Australian-born non-Asian children (**online repository Table S2**). By contrast, children born
200 in Asia who subsequently migrated to Australia had a lower risk of food allergy (aOR 0.33,
201 95%CI 0.20-0.55, $P<0.001$), eczema (aOR 0.41, 95%CI 0.28-0.62, $P<0.001$) and asthma (aOR
202 0.29, 95%CI 0.21-0.40, $P<0.001$) compared to Australian-born non-Asian children.

203 Among children with Asian-born mothers, those born in Australia had a greatly increased
204 risk of food allergy (aOR 6.97, 95%CI 4.14-11.74, $P<0.001$), eczema (aOR 5.50, 95%CI 3.50-
205 8.66, $P<0.001$) and asthma (aOR 2.99, 95%CI 2.12-4.22, $P<0.001$) compared to those who
206 were born in Asia.

207 ***Patterns of anaphylaxis risk and its triggers according to ethnicity and country of birth***

208 The prevalence of FIA and non-FIA risk by maternal and child country of birth is shown in
209 **Figure 2**. The overall prevalence of FIA, bee/insect stings anaphylaxis and other anaphylaxis
210 risk in our study was 2.81% (95%CI 2.67-2.94), 0.23% (95%CI 0.26-0.35) and 1.31% (95%CI
211 1.21-1.40), respectively. Compared to Australian-born non-Asian children, Asian children

212 were more likely to be diagnosed as at risk of FIA (aOR 1.50, 95%CI 1.16-1.94, P=0.002) if
213 they were born in Australia but they had a lower risk (aOR 0.28, 95%CI 0.14-0.56, P<0.001) if
214 they were born in Asia (**Figure 2, online repository Table S2**). Interestingly, Asian children
215 were more likely than Australian-born non-Asian children to be diagnosed as at risk of
216 anaphylaxis with a non-food trigger regardless of where they were born.

217 In **online repository Figure S1**, we show the results with Asia further divided into East Asia
218 and India. Both showed similar patterns although the numbers in some groups were small.

219 Patterns of FIA risk among ethnicity groups differed depending on the food trigger (**Figure 3,**
220 **online repository Table S3**). Australian-born Asian children were more likely to be at risk of
221 anaphylaxis to peanut and tree nuts compared to Australian-born non-Asian children. By
222 contrast, children born in Asia who migrated to Australia were less likely to be at risk of
223 anaphylaxis to peanut, tree nuts and milk compared to Australian-born non-Asian children.
224 Interestingly, Asian children had a higher risk of anaphylaxis to soy, wheat and seafood
225 (fish/shellfish) compared to Australian-born non-Asian children regardless of where they
226 were born.

227 Among Asian children, those born in Australia were more likely to be at risk of anaphylaxis
228 to milk (aOR 3.06, 95%CI 1.17-8.04, P=0.023), peanut (aOR 14.14, 95%CI 3.42-58.46, P<0.001)
229 and tree nuts (aOR 9.43, 95%CI 2.25-39.59, P=0.002) compared to those who were born in
230 Asia.

231 ***The association between demographic factors and anaphylaxis risk***

232 The association between various demographic factors and risk of anaphylaxis (food induced
233 and non-food induced) are summarized in **Table 1**.

234 Boys were more likely to be at risk of FIA than girls, but there was less evidence of a
235 difference in non-FIA between genders (**Table 1**). Children born with very low birth weight
236 (VLBW) were less likely to be at risk of FIA, while there was little evidence of a difference in
237 non-FIA. Living with siblings was associated with less risk of non-FIA while there was no
238 association for FIA. There was little difference between regions, except for a slightly lower
239 rate of FIA risk in Gippsland. Children whose mothers had a higher education level were
240 more likely to be at risk of FIA reported by parents, but less likely to be at risk of non-FIA.

241 **Discussion**

242 In a large state-wide survey of more than 57,000 children entering school (age 5 years), we
243 found children with Asian-born mothers who were themselves born in Australia had a
244 higher prevalence of most food allergies, anaphylaxis risk and eczema compared with
245 Australian-born non-Asian children, whilst children born in Asia had a lower risk. In addition,
246 we found that the patterns of anaphylaxis risk in ethnicity groups differed depending on the
247 trigger. Asian children were more likely than non-Asian children to be at risk of anaphylaxis
248 elicited by soy, wheat, seafood and non-food triggers regardless of whether the Asian child
249 was born in Australia or Asia.

250 The strengths of this study are the large sample size and population-based data set
251 collecting information from 86% of school entrant children in Victoria in a single year. This
252 dataset provides a range of valuable demographics and health status for children across the
253 whole state. Limitations include the use of parent-reported allergy outcomes. The
254 questionnaire captured information on whether the child was ever considered as at
255 potential risk of anaphylaxis, rather than acute anaphylaxis onset. As expected, the
256 prevalence of anaphylaxis in our study is therefore higher than the reported hospital
257 admission rates for anaphylaxis in Australia [3] and in European countries [17]. In a previous
258 study, Loke et al. reported that 1.6% of Victorian government school students in the first
259 year of school were currently at risk of anaphylaxis (from any trigger) in 2010 [18]. In that
260 study, students at risk of anaphylaxis were defined as those prescribed an adrenaline auto-
261 injectors by their doctors and with a current Australasian Society of Clinical Immunology and
262 Allergy Anaphylaxis Management Plan. Factors that may have contributed to the higher
263 prevalence reported by us in comparison to Loke et al. include that our criteria captured
264 past history of anaphylaxis risk as well as current cases and therefore will include a
265 proportion of children who may have outgrown their food allergies early in life. In addition,
266 our questionnaire did not record whether the child carried a current adrenaline auto-
267 injector and over-reporting of anaphylaxis risk in our study is also possible. The relatively
268 high prevalence of “other anaphylaxis” risk in our study might be because this group
269 combined all other triggers together, including medications/drug, serum, latex and other
270 potential triggers. It is also possible that some rare food triggers were misclassified as “other”
271 triggers, although we think this is unlikely to be a large contributor to this group, since the

272 most common foods responsible for IgE-mediated food allergy and anaphylaxis were
273 captured in the food-induced anaphylaxis group. Another potential limitation is that there
274 might be differences in health care utilisation according to maternal country of birth and
275 length of time spent in Australia that could contribute to the differences observed (e.g.
276 families recently migrated from Asia may be less likely to seek medical diagnosis of asthma),
277 but this also seems unlikely to completely explain our findings since the patterns were not
278 the same for all allergic diseases. Another limitation is the use of maternal country of birth
279 as an indirect marker of ethnicity since other information on ethnicity was not collected.
280 However in our previous population-based study in Victoria we found that parental country
281 of birth was highly correlated (more than 93.0%) with genetically-determined Asian or
282 Caucasian ancestry [19].

283 In our study, children born in Asia who subsequently migrated to Australia had a lower risk
284 of food allergy and eczema compared with Australian-born both Asian and non-Asian
285 children. Similar findings have been reported in previous studies from America and the
286 International Study of Asthma and Allergies in Childhood (ISAAC), which found that
287 immigrants had lower risk of eczema and food allergy [20, 21], although no information was
288 provided on the immigrant's country of origin. This could be explained by the hygiene
289 hypothesis that either infections or microbial exposures in early childhood may protect
290 against atopic diseases [20]. Alternatively, higher relative humidity and higher UV exposure
291 in some Asian regions such as Philippines and Hong Kong compared with Victoria, Australia,
292 could have contributed to lower rates of eczema in early life. Subsequently, this may have
293 reduced the likelihood of food sensitisation occurring through the skin and thus reduce the
294 risk of food allergy [22, 23]. Differences in Vitamin D exposure might also contribute to
295 differences in allergy rates between growing up in Asia and those growing up in Australia
296 [24].

297 While both eczema and food allergy were around twice as common in Australian-born Asian
298 children as in non-Asian children, the prevalence of asthma was not similarly increased,
299 suggesting a different pathogenesis between asthma and other allergic diseases. This is
300 consistent with previous study by Buka et al. reporting that rates of asthma were similar
301 between children of South Asian origin and white British populations living in Britain [25].

302 In addition, children born in Asia who migrated to Australia subsequently had a much lower
303 risk of asthma compared with both Australian-born Asian and non-Asian children. Previous
304 studies have suggested that the asthma prevalence of migrants tends to become more
305 similar to the prevalence in the native population over time [21, 26]. Unfortunately, there
306 was no information on the duration of residence time in Australia for the Asian children in
307 our questionnaire although it had to be less than their age which ranged from 4 to 7 years.
308 Therefore, we are unable to comment on the impact of length of stay of the children and/or
309 their adaptation of lifestyle and dietary habits [27]. The difference in asthma prevalence
310 observed in our study may change over time, as the children age and spend a longer time in
311 the Australian environment.

312 Our finding of a higher prevalence of food-induced anaphylaxis risk in Australian-born Asian
313 children is consistent with recently published studies in the US and New Zealand that
314 reported that Asian children had higher rates of hospital presentations for food-induced
315 anaphylaxis [28, 29]. However, these studies did not capture information on place of birth,
316 which we found to be important in determining risk of food-induced anaphylaxis in the
317 Asian population. Previous studies reported wheat and seafood as the most common food
318 to elicit anaphylaxis in Asian countries [12, 13]. In our study, children with Asian ancestry
319 more often reported risk of anaphylaxis triggered by soy, wheat and seafood regardless of
320 where they were born. Reasons for this higher prevalence of anaphylaxis risk to soy, wheat
321 and seafood require further study, but may reflect differences in dietary patterns in the
322 Asian population, including potentially differences in timing of introduction of these foods
323 into the infant diet [30].

324 **Conclusions**

325 In conclusion, we found different profiles of allergy and anaphylaxis risk between children
326 born in Asia, Australian-born Asian children and Australian-born non-Asian children. The
327 observed patterns might be explained by a gene-environment interaction, whereby a risk
328 factor present in the Australian environment has a greater effect on allergy risk among
329 those with an Asian ancestry who are exposed to this risk factor early in life. The different
330 pattern of asthma (lower in Asian children born in Australia) compared with other allergic
331 diseases is surprising and warrants further exploration, while bearing in mind the potential
332 for cultural differences in health seeking behaviour.

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339 **Conflict of Interest**

340 The authors have no conflict of interest to declare.

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443 **Legends to figures**

444 **Figure 1.** Prevalence (% , 95%CI) of food allergy, eczema and asthma categorized by mother’s
 445 versus child’s country of birth.

446 **Figure 2.** Prevalence (% , 95%CI) of food-induced anaphylaxis and non-food anaphylaxis risk
 447 by mother’s versus child’s country of birth.

448 **Figure 3.** Prevalence (% , 95%CI) of individual food triggers for anaphylaxis risk by mother’s
 449 versus child’s country of birth.

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453 **Tables**

454 **Table 1. Association between demographic variables and risk of food-induced and non-**
 455 **food induced anaphylaxis**

Variable category	FIA		Non-FIA	
	Adjusted OR* (95%CI)	P-value [†]	Adjusted OR* (95%CI)	P-value [†]
Sex of child				
Female	<i>reference</i>		<i>reference</i>	
Male	1.31 (1.17, 1.48)	<0.001	1.14 (0.96, 1.34)	0.127
VLBW				
No	<i>reference</i>		<i>reference</i>	
Yes	0.41 (0.20, 0.83)	0.013	0.68 (0.32, 1.45)	0.321
Live with sibling				
No	<i>reference</i>		<i>reference</i>	
Yes	1.02 (0.89, 1.15)	0.83	0.69 (0.56, 0.85)	0.001
Region of residence[‡]				
North	<i>reference</i>		<i>reference</i>	
West	1.01 (0.81, 1.25)	0.939	1.12 (0.84, 1.49)	0.444
South	0.93 (0.77, 1.12)	0.426	0.98 (0.76, 1.27)	0.898
East	0.99 (0.82, 1.20)	0.839	1.11 (0.83, 1.48)	0.492
Barwon South West	0.90 (0.69, 1.17)	0.509	0.85 (0.57, 1.26)	0.425
Gippsland	0.67 (0.47, 0.97)	0.033	1.04 (0.67, 1.61)	0.871
Grampians	1.09 (0.80, 1.48)	0.572	0.76 (0.45, 1.26)	0.281

Hume	0.86 (0.64, 1.20)	0.413	0.78 (0.49, 1.23)	0.280
Loddon Mallee	0.86 (0.64, 1.15)	0.312	0.97 (0.64, 1.46)	0.887
Mother's education				
Some high school	<i>reference</i>		<i>reference</i>	
Completed high school or equivalent	1.28 (1.02, 1.60)	0.034	1.00 (0.78, 1.29)	0.997
TAFE trade certificate or diploma	1.42 (1.13, 1.79)	0.003	0.86 (0.65, 1.14)	0.285
University/tertiary institute degree	1.64 (1.31, 2.05)	<0.001	0.69 (0.52, 0.91)	0.010
Father's education				
Some high school	<i>reference</i>		<i>reference</i>	
Completed high school or equivalent	1.14 (0.92, 1.41)	0.245	0.98 (0.75, 1.27)	0.885
TAFE trade certificate or diploma	1.30 (1.07, 1.58)	0.010	0.90 (0.70, 1.16)	0.406
University/tertiary institute degree	1.20 (0.97, 1.48)	0.096	0.78 (0.59, 1.04)	0.088
SEIFA quintile[^]				
1 (most advantage)	<i>reference</i>		<i>reference</i>	
2	1.03 (0.86, 1.25)	0.732	0.86 (0.67, 1.10)	0.231
3	1.06 (0.86, 1.30)	0.583	1.04 (0.79, 1.35)	0.801
4	1.16 (0.96, 1.39)	0.119	0.89 (0.69, 1.15)	0.373
5 (least advantage)	1.24 (0.97, 1.58)	0.084	0.90 (0.62, 1.31)	0.593

456 *All factors were included in the model simultaneously and models were additionally
457 adjusted for mother and child country of birth and child's age.

458 †P-values <0.05 are highlighted in bold font.

459 ^SEIFA: Socio-economic Indexes for Areas: most disadvantaged = 1, least disadvantaged = 5.

460 ‡ "North" was the baseline category to compare with other regions of residence.





