ORIGINAL RESEARCH ARTICLE

COACTION PUBLISHING

The health of Inuit children under age 6 in Canada

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Objectives. Previous research has suggested that Inuit children experience poor health as compared to their non-Aboriginal counterparts, although social determinants such as family and social conditions, lifestyle or behaviour, and cultural factors may be at play. The purpose of the current study was to examine the parent-reported health of Inuit children under 6 years of age living in Canada.

Study design and methods. Data from the 2006 Aboriginal Children's Survey were used to examine measures of Inuit child health as rated by parents including child health, limitations to physical activity, chronic conditions, ear infections, and dental problems. Associations between social determinants of health and parent-rated Inuit child health were also explored.

Results. Most Inuit children under age 6 were reported by their parents or guardians to be in excellent or very good health. The most common chronic conditions identified were asthma, speech and language difficulties, allergies, lactose intolerance, and hearing impairment. Several social determinants of health were associated with child health, including parental education, household income, breastfeeding, and perceived housing conditions.

Conclusions. The findings show that social determinants of health, including both socio-economic and household characteristics, are associated with Inuit child health.

Keywords: *children*; *Inuit*; *social determinants of health*

Received: 28 September 2011; Revised: 1 March 2012; Accepted: 29 March 2012; Published: 6 June 2012

According to the 2006 Census, just under 1.2 million people in Canada identified themselves as having Aboriginal identity, including about 4%, or 50,485, who reported that they had Inuit identity (1). Young children represent a sizeable number of this population with 12% of Inuit children being under the age of 5, more than double the proportion in the non-Aboriginal population (5%).

Aboriginal children, specifically Inuit children, experience poorer health as compared to their non-Aboriginal counterparts (2–4). Smylie's (5) report on Aboriginal children's health indicated striking Aboriginal/non-Aboriginal health disparities including higher rates of child injury, accidental death, and sudden infant death syndrome. Other studies have documented that Inuit children are at risk for higher rates of *otitis media* (chronic ear infection), respiratory tract infection (6), obesity (7), and dental problems (8) as compared to non-Aboriginal children.

It has been suggested that differences in health between Aboriginal and non-Aboriginal populations may be driven by social, rather than biological, factors (9). Family and social conditions such as low household income (10) and low parental education (11) have been linked to poor child health outcomes (including respiratory illness and asthma) for Aboriginal children in general, and single family structure, smoking in the household (12), and food insecurity (13) for Inuit children specifically. Katzmarzyk (14) found that Aboriginal children were more likely to be obese compared to their non-Aboriginal counterparts, and that lack of physical activity was associated with obesity. Regarding respiratory problems, Bulkow et al. (11) reported that the risk of respiratory viral infection was lower for Alaskan Aboriginal children who were breastfed. Finally, better functional housing conditions (15,16), less overcrowding (12), and better neighbourhood physical conditions (e.g., lower noise level, less need for housing repairs) (17) are associated with better health.

Cultural involvement and identity have also been associated with Aboriginal health and well-being (18), although little information is available on children specifically. King et al. (9) suggested that traditional teachings are associated with positive overall health and

Citation: Int J Circumpolar Health 2012, **71**: 18580 - http://dx.doi.org/10.3402/ijch.v71i0.18580

self-image, with ties to culture and identity being inherently linked with good health. In addition, the conceptualization of health itself is a blend of physical, mental, emotional, and spiritual aspects of self (19), suggesting that good health reflects more than merely the absence of a physical ailment or chronic condition (20).

The purpose of the current study was to examine the parent-reported health of Inuit children under 6 years of age using nationally-representative data. Past research as well as Aboriginal groups and leaders have suggested that distinctions must be made between First Nations, Métis, and Inuit groups rather than considering all Aboriginal peoples a singular group (21). Inuit children are of interest in the current study as there is limited existing nationally-representative information on Inuit children. Research on young Inuit children specifically is important as a large proportion of Inuit children live in a geographically remote area (Inuit Nunangat) and the Inuit population is the youngest of all Aboriginal groups and non-Aboriginal people in Canada (1).

This study uses parent-reported health as a general measure of overall child health. In preliminary analyses an association was found between chronic health conditions and general health, whereby children who had a chronic condition were also more likely to be rated by their parent/guardian as being in poorer health. Moreover, the WHO considers the subjective assessment of health to be a recommended health surveillance tool (22).

Materials and methods

Sample

Data from the 2006 Aboriginal Children's Survey (ACS) were used to examine the health of Inuit children under the age of 6 years. The ACS was developed by Statistics Canada and Aboriginal advisors from across the country and was conducted jointly with Human Resources and Skills Development Canada. The survey was designed to provide data about children's early development and the social and living conditions in which they are learning and growing.

The ACS target population consisted of First Nations children living off reserve, Métis children, and Inuit children living in the 10 provinces as well as all children living in the 3 territories. The sample was selected from households with children from the 2006 Census where the respondent indicated that the child had Aboriginal ancestors; and/or were identified as North American Indian and/or Métis and/or Inuit; and/or had treaty or registered Indian status; and/or had Indian Band membership.

The overall response rate to the ACS was 81.1% (n = 12,845 children, which represents a population of approximately 135,022 Aboriginal children under age 6 in Canada). Further information on the ACS sample and survey is available elsewhere (23). For the current study, only those children having a single or multiple Inuit identity (Inuit, Inuit and First Nations, and Inuit and Métis identity) were included (n = 1693).

Measures

Socio-demographic characteristics

The parent or guardian provided information describing the child's sex and age at the time of interview. The parent or guardian's highest education level, the number of people in the household, the number of times the child had moved, and Inuit region were also reported. Total household income was obtained from responses to the 2006 Census of Canada. The parent/guardian was the biological mother or father for 81% of Inuit children and the adoptive mother or father for 12% of Inuit children. The number of people involved in raising the child (e.g., parents, grandparents, other family members), was categorized as 1, 2, or 3 or more persons.[1] Geography was described in terms of the 4 Inuit land regions: Nunatsiavut, Nunavik, Nunavut, the Inuvialuit region, and outside Inuit Nunangat.[2]

Information was also collected on a number of other factors which may be particularly relevant to child health, including whether or not the child was breastfed, and if so, the number of months he/she was breastfed. Household food security was measured by the question: "How often has the child experienced being hungry because the family has run out of food or money to buy food?" Response options included: "more often than the end of each month", "regularly at the end of the month", "every few months", "occasionally", and "never". For the current study, food insecure households were defined as those where the child experienced hunger due to food unavailability at least occasionally; remaining households were defined as food secure. Information on smoking in the household was collected with the question: "Including both household members and regular visitors, does anyone smoke inside your home every day or almost every day?" ("yes", "no"). The child's level of activity was estimated from a question regarding the frequency of active play ("at least once per day or more", "less than once per day", or "never").[3] Total hours per day in screen time activity (watching television and/or playing video games or computer use) was also reported.

Finally, the parent/guardian was asked a series of questions regarding housing and their community, including their satisfaction with their own housing conditions

[1]The number of people raising the child has been described as a better way of exploring family structure for Aboriginal children than simply looking at single/dual parent families (24).

[2]At the time the Aboriginal Children's Survey data were collected, the term for the Inuit homeland was "Inuit Nunaat". More recently, the term has changed to "Inuit Nunangat" (25).

[3]Active play was excluded from the chi-square and regression analyses due to very little variation in young children's play (i.e., almost all children were reported to engage in active play daily).

Citation: Int J Circumpolar Health 2012, 71: 18580 - http://dx.doi.org/10.3402/ijch.v71i0.18580

(“very satisfied” or “satisfied” versus “dissatisfied” or “very dissatisfied”) and the community as a place with, (a) health facilities, and (b) cultural activities (“excellent”, “very good”, or “good”, “fair”, “poor”).

Indicators of health

As an overall marker of health, the parent/guardian reported the child’s general health as: “excellent” or “very good” versus “good”, “fair”, “poor”. Other health information of interest was whether or not the child had an activity limitation due to a health condition (“yes”, “no”), the number of ear infections the child had in the past year, and whether or not the child had dental problems.[4] Finally, the parent/guardian reported the presence or absence of a series of chronic conditions known to affect children under the age of 6 years, including asthma, allergies, visual/hearing impairment, heart conditions, diabetes, and Fetal Alcohol Spectrum Disorder (see Appendix A for all chronic conditions included on the ACS). If a chronic condition was reported, the parent/guardian was asked whether or not the condition had been diagnosed by a medical professional (“yes”, “no”). If the condition had been diagnosed, the parent/guardian was asked whether or not the child had received treatment for the condition (“yes”, “no”).

The prevalence of reported chronic conditions was examined to determine the most frequently occurring conditions for Inuit children under age 6. Any conditions with a prevalence rate of 5% or greater were retained and all remaining conditions were collapsed into an “other” category. Information on the prevalence of specific long-term chronic conditions (including diagnosis and treatment) in the other category is available in Appendix A.

Statistical analyses

Descriptive statistics on the socio-demographic characteristics of the sample and the indicators of child health were performed. Information for Canadian children in general was analyzed from the National Longitudinal Survey of Children and Youth (2006) (27) for some of the markers of health. However, no statistical comparisons were performed between Inuit and Canadian children due to differences in the sample (e.g., age) and/or differences in the questions asked on the two surveys.

Chi-square comparisons and t-tests were calculated to examine significant differences in excellent/very good versus good/fair/poor parent-rated health based on socio-demographic and other characteristics. Dichotomizing self-rated health in this way has been supported in previous health research on Aboriginal children (4,28) and was deemed to be appropriate due to the young age of this sample for whom the majority would be expected to be in excellent/very good health.

As a final step, logistic regression analyses were performed predicting excellent/very good parent-rated child health from the various social determinants found to be significantly different in the univariate results. The purpose of these analyses was to determine if any or all of the associations between child health and social determinants of health remained significant once other determinants of health were also considered (i.e., to take into consideration small correlations between some of the correlates). Only those variables which were significantly associated with the outcome variable at a univariate level were included in the model.

Survey sampling weights were applied to account for the complex survey design and to render the analyses representative of the Inuit population in Canada. Finally, a bootstrapping technique was applied when calculating estimates of variance (29), and the appropriate multiplicative factor (the “Fay adjustment factor”) was applied.

Results

Approximately half of the Inuit sample of children under age 6 was male (51%) and about 41% of these children had a respondent parent with at least a high school education. Approximately 8% were raised by a single person, 26% by 2 people, and 67% by 3 or more people. More than three quarters of Inuit children lived in Inuit Nunangat (i.e., 1 of the 4 Inuit regions). About two-thirds were breastfed (66%), and of those that were breastfed, the mean length was just over 1 year (with 54% being breastfed for 6 months or more). According to the parent/guardian, three quarters (77%) lived in a food secure household. Approximately 1 in 5 children (20%) lived in a home with a regular smoker (i.e., the smoker did so in the home every day or almost every day). In terms of housing conditions, 68% of Inuit children had parents/guardians who were very satisfied or satisfied with their housing conditions whereas 32% had parents who were dissatisfied or very dissatisfied. Almost 80% of Inuit children had parents/guardians who felt that the community was a place with excellent, very good or good health facilities, and 62% had parents who felt that the community was a place with excellent, very good or good cultural activities.

Indicators of health

In general, about 77% of Inuit children were reported by a parent to be in excellent/very good health (see Table I). Six percent of Inuit children were reported to have a health condition that limited their physical activity. While about half (49%) of Inuit children had at least 1 ear infection in their lifetime, of those who had at least 1 ear infection, they experienced an average of 2 ear infections

[4]For the dental questions, only children aged 3 years and over were included in the analysis as current recommendations suggest that children are taken for regular dental check-ups by the age of 2 or 3 (26).

Table I. Health status of Inuit children under age 6

	Inuit (%)		Canadian children (%)[a]
In general, child's health is ...			
Excellent/very good	77.0		90.4
Good, fair, poor	23.0		9.6
Is the child's physical activity limited by a health condition?			
Yes	5.7		
No	94.3		
Has the child ever had an ear infection			
Yes	49.3		40.1[c]
No	50.7		59.9
Mean (SE) number of ear infections in the past year	2.0	(0.1)	
Dental problems[b]			
Yes	44.3		
No	55.7		
Chronic conditions			
Asthma	7.0		
Of those who report % diagnosed		95.7	7.8[d]
Of those diagnosed % received treatment		96.8	
Speech or language difficulties	5.3		
Of those who report % diagnosed		70.8	
Of those diagnosed % received treatment		72.1	
Any allergies	9.7		
Of those who report % diagnosed		71.9	9.3[d]
Of those diagnosed % received treatment		57.3	
Lactose intolerance	4.9		
Of those who report % diagnosed		57.3	
Of those diagnosed % received treatment		43.8[E]	
Hearing impairment	4.5		
Of those who report % diagnosed		75.8	
Of those diagnosed % received treatment		64.5	
Other conditions (e.g., visual impairment, ADHD, heart condition, epilepsy, autism)	19.4		
Of those who report % diagnosed		88.5	
Of those diagnosed % received treatment		84.5	

Source: Aboriginal Children's Survey 2006, Statistics Canada.
[a]Source: National Longitudinal Survey of Children and Youth (2006).
[b]Children aged 36 months and older only.
[c]Children aged 0–3 years only.
[d]Estimate is for condition that has been diagnosed by a health professional.
[E]Interpret with caution.

in the past year. Almost half (44%) of all Inuit children aged 3–5 years were reported to have dental problems.

The most common chronic conditions reported by parents/guardians of Inuit children were allergies (10%), asthma (7%), speech/language difficulties (5%), lactose intolerance (5%), and hearing impairment (5%). Other chronic health conditions, including heart conditions and FAD/FASD were reported for 19% of Inuit children (see Appendix A for detailed results).

Of those with the chronic condition, the proportion diagnosed by a health professional ranged from 57% (lactose intolerance) to 96% (asthma). Finally, of those who had been diagnosed with the chronic condition, treatment was received by 57% of those with allergies, 65% with a hearing impairment, 72% with speech or language difficulties, 85% with other conditions, and 97% of those with asthma.

Social determinants of health

As shown in Table II, significant differences in health were found based on several socio-demographic and other characteristics of Inuit children under age 6. Girls were more frequently reported as having excellent/very good health than boys. Children with a parent/guardian who had completed at least a high school education were more likely to be in excellent/very good health. Those

Citation: Int J Circumpolar Health 2012, **71**: 18580 - http://dx.doi.org/10.3402/ijch.v71i0.18580

Table II. Social determinants of parent-rated health, Inuit children under age 6

	Excellent/very good (%)	Good/fair/poor (%)	χ^2/t	p
Sex				
Male	74.2	25.8	9.0	<0.01
Female	79.9	20.1		
Age group				
0–23 months	76.5	23.5	0.3	ns
2 and 3 year olds	78.0	22.0		
4 and 5 year olds	76.7	23.3		
Parent/guardian education				
Less than high school	71.1	28.9	59.9	<0.001
High school graduation or higher	85.9	14.1		
Number of people raising the child				
1	65.5[a]	34.5	7.7	<0.001
2	82.3[b]	17.7		
3 or more	76.9[c]	23.1		
Geographic region				
Nunatsiavut	89.6[c]	10.4	47.4	<0.001
Nunavik	63.6[a]	36.4		
Nunavut	75.6[b]	24.4		
Inuvialuit	86.4[c]	13.6[E]		
Outside Inuit Nunangat	87.8[c]	12.2[E]		
Number of people in the household (mean, SE)	5.2 (0.1)	5.7 (0.1)	–5.1	<0.001
Household income (mean, SE)	67082.0 (1332.0)	61834.0 (2009.0)	2.2	<0.05
Was the child ever breastfed?				
Yes	79.3	20.7	12.1	<0.001
No	72.2	27.8		
Food security				
Food secure household	80.1	19.9	19.0	<0.001
Food insecure household	69.9	30.1		
Smoking				
No regular smoker in the home	77.4	22.6	0.0	ns
Regular smoker in the home	77.1	22.9		
Total hours per day screen time (mean, SE)	2.9 (0.1)	2.9 (0.1)	0.2	ns
Housing conditions				
Very satisfied/satisfied	81.8	18.2	39.9	<0.001
Dissatisfied/very dissatisfied	68.7	31.3		
Place with health facilities				
Excellent/very good/good	78.7	21.3	3.7	0.055
Fair/poor	73.8	26.2		
Place with cultural activities				
Excellent/very good/good	75.7	24.3	4.3	<0.05
Fair/poor	80.0	20.0		

Source: Aboriginal Children's Survey 2006, Statistics Canada.
Differences in superscripts indicate significant differences in proportions.
[E]Interpret with caution.

who were raised by 2 people were significantly more likely to be reported to be in excellent/very good health as compared to those raised by 1 person or by 3 or more people, and being raised by 3 or more people was associated with greater health than was being raised by a single person. Overall, children living in Nunavik were less likely to be reported by their parents to be in excellent/very good health as compared to children living outside Inuit Nunangat and in the other Inuit regions. In addition, children living in Nunavut were less likely to be in excellent/very good health relative to those living in Nunatsiavut, the Inuvialuit region, or outside Inuit

Nunangat. Children who were reported to be in excellent/very good health lived in households with fewer people and with a higher mean household income. Inuit children who had been breastfed and who were living in a food secure household were more likely to be in excellent/very good than good/fair/poor health. Community perceptions were also significantly related to health; parents/guardians who were very satisfied or satisfied with their housing conditions were more likely to rate the child as being in excellent/very good health, yet those who perceived the community as a place with excellent, very good or good cultural activities had lower ratings of child health.

Regression model

Finally, in the logistic regression model (see Table III), several social determinants of health remained significant predictors of excellent/very good health over and above other socio-demographic factors. For example, Inuit boys and those children being raised by a single person were less likely to be reported as being in excellent/very good health as compared to girls and children being raised by 2 people. Children living in Nunavik also had lower odds of excellent/very good health compared to children living outside Inuit Nunangat. Children whose parent/guardian had at least a high school education, those living in a household with a higher income, and those who were breastfed were more likely to be in excellent/very good health as compared to those with a parent who had not graduated from high school, those living in a household with lower income, and those not breastfed. Children whose parent/guardian perceived that were very satisfied or satisfied with their housing conditions were also more likely to be reported as being in excellent/very good health.

Discussion

The findings revealed that 77% of Inuit children were reported by their parent or guardian to be in excellent or very good health, a figure that is lower than the 90% of Canadian children in general (according to data from the NLSCY 2006). This study also shows that the most common chronic conditions reported by parents/guardians of Aboriginal children under age 6 were asthma, speech and language difficulties, allergies, lactose intolerance, and hearing impairment. In addition, almost half of Inuit children were reported to ever have had an ear infection and/ or a dental problem. Comparative

Table III. Logistic regression predicting parent-rated excellent/very good child health (n = 1408)

	Odds ratio	95% Confidence interval	
Male	**0.75**	0.59	0.96
Female	1.00		
Parent/guardian education (less than high school)	1.00		
Parent/guardian education (high school graduation or higher)	**1.66**	1.25	2.20
One person raising the child	**0.56**	0.34	0.93
Two people raising the child	1.00		
Three or more people raising the child	0.91	0.67	1.24
Household size	0.95	0.89	1.01
Household income	**1.04**	1.01	1.08
Nunatsiavut	1.77	0.97	3.23
Nunavik	**0.43**	0.26	0.70
Nunavut	0.66	0.40	1.11
Inuvialuit	1.13	0.61	2.11
Outside Inuit Nunangat	1.00		
Child was breastfed	**1.34**	1.04	1.72
Not breastfed	1.00		
Food insecure household	0.95	0.73	1.24
Food secure household	1.00		
Very satisfied or satisfied with housing conditions	**1.66**	1.28	2.14
Dissatisfied or very dissatisfied with housing conditions	1.00		
Excellent/very good/good health facilities	1.36	0.97	1.92
Fair/poor health facilities	1.00		
Excellent/very good/good cultural facilities	0.85	0.64	1.14
Fair/poor cultural activities	1.00		

Source: Aboriginal Children's Survey 2006, Statistics Canada.
Notes: Significant odds ratios ($p < 0.05$) indicated in bold.

Citation: Int J Circumpolar Health 2012, **71**: 18580 - http://dx.doi.org/10.3402/ijch.v71i0.18580

national-level information for non-Aboriginal children would be of interest but was not available. Results from the Inuit Child Health Survey found that 36% of Inuit children in Nunavut had at least 1 ear infection, and allergies (5%) and asthma (4%) were less commonly reported (28).

Several social determinants of health were found to be associated with excellent/very good health for Inuit children under the age of 6. For example, an independent association of the parent/guardian having less than high school education (as compared to high school education or more) was significant, indicating that children with parents with less formal education are less likely to be rated as being in excellent/very good health. This is particularly concerning as almost 60% of Inuit children had parents who reported less than high school education. In addition, similar to previous research (18), income was positively associated with health. One way in which this may be manifested is through food security; poverty has been directly linked to food insecurity (30,31). Lack of availability and access to nutritional foods, including traditional foods, may serve as barriers to health (32,33). Although food security was not found to be significantly associated with health in multivariate analyses in the current study, further research focusing on food security using a nationally representative sample of Inuit children is warranted.

Interestingly, significant differences in child health were also found based on the parent/guardian's perceptions of the community. The odds of being reported as being in excellent/very good health were higher if the parent/guardian was very satisfied or satisfied with housing conditions. Housing conditions, in particular overcrowding, has been argued to be of concern for Inuit children's health (34,35). Overcrowding is often associated with poor health outcomes, including higher rates of respiratory tract infections (12,36). Poor housing conditions may be associated with poor air quality, unsanitary water and waste facilities, and mould, all of which impact child health (37).

Furthermore, in the current study, geographic region was significantly associated with health, such that more children living in Nunavik were rated as being in poorer health as compared to those living outside Inuit Nunangat. Crowded housing and housing being in need of repairs have been shown to be more common in Nunavik than other Inuit Nunangat regions (38). Differences in food security have also been shown between Inuit regions (39) although the Nunavik region was not included some of these previous studies (i.e., the Inuit Health Survey).

Finally, Inuit children who were breastfed were more likely to be in excellent or very good health than were children who were not breastfed. Rates of initiation of breastfeeding among Inuit mothers are reportedly lower than for non-Aboriginal Canadian children (40). Inuit children who are breastfed have been suggested to be at lower risk of hospitalization due to respiratory tract infection (36). However, breastfeeding has not necessarily been associated with other health outcomes such as obesity (7). The fact that in the current study breastfeeding was associated with more positive parent-rated health adds to the evidence supporting an association between breastfeeding and Inuit children's health.

Limitations and future directions

Several limitations of the current study should be noted. Despite a large and representative sample of Inuit children, the measures were parent-reported and are correlational in nature as the measures of health and social determinants of health were taken at one time point only. Longitudinal data would be advantageous in order to better understand the nature of the relationship between social conditions, health behaviours, and health outcomes for Inuit children.

A cautionary note should also be placed on the interpretation of "health". The focus of the current study was on children's physical health and may or may not include mental health, depending on the parent/guardian's perceptions of health. The majority of health conditions listed in the survey are physical conditions. Furthermore, the descriptors of health provided in the current study may not fully reflect an Inuit approach to child health which may include physical, mental, emotional, and spiritual aspects of life (9,19,41,42).

In conclusion, the current study provides evidence of, (a) disparities in health for Inuit children under age 6, (b) chronic conditions commonly experienced by Inuit children, and (c) a number of social determinants of health for Inuit children, including parental education, the number of people raising the child, geographical location, breastfeeding, and perceptions of housing conditions. The results have implications for identifying and addressing the relevant social determinants of health and thereby recognizing inequities in health that exist for Inuit children. Future work is warranted to examine further markers and predictors of Inuit child health.

Acknowledgements

The authors wish to acknowledge the Aboriginal Children's Survey Technical Advisory Group (TAG), which consisted of educators, researchers and other professionals in the field of Aboriginal research and early childhood development, who provided guidance for the development of the survey as well as ideas for research and the dissemination of the results. The authors also wish to acknowledge input from the Social and Aboriginal Statistics Division, and thank the parents or guardians of Inuit children who responded to the survey.

Conflict of interest and funding

The authors have not received any funding or benefits from industry or elsewhere to conduct this study.

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Citation: Int J Circumpolar Health 2012, **71**: 18580 - http://dx.doi.org/10.3402/ijch.v71i0.18580

Presentation at: International Congress of Circumpolar Health; 2009 July 14; Yellowknife, Canada.
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Appendix A. Prevalence of chronic conditions, diagnosis and treatment, Inuit children under age 6

Condition	%	Of those who report % diagnosed	Of those diagnosed % received treatment
Asthma	7.0	95.7	96.8
Speech or language difficulties	5.3	70.8	72.1
Lactose intolerance	4.9	57.3	43.8[E]
Food or digestive allergies	4.8	58.7	50.8[E]
Respiratory allergies	1.8[E]	67.3	85.4
Other allergies	4.6	83.0	56.9
Hearing impairment	4.5	75.8	64.5
Anaemia	4.4	93.9	96.5
Heart condition or disease	3.4	98.8	50.6
Visual impairment	2.8	93.3	79.9
Chronic bronchitis	2.5[E]	90.2	100.0
FAS/FASD[a]	0.9[E]	[F]	[F]
Epilepsy	0.9[E]	78.4[E]	91.6
Hypoglycemia or low blood sugar	0.8[E]	[F]	[F]
ADD/ADHD[b]	0.8[E]	[F]	[F]
Kidney condition or disease	0.7[E]	[F]	[F]

Source: Aboriginal Children's Survey 2006, Statistics Canada.
[a]FAS/FASD Fetal Alcohol Syndrome, Fetal Alcohol Effect or Fetal Alcohol Spectrum Disorder.
[b]Attention Deficit Disorder with or without hyperactivity.
Note: Estimates for other conditions, including Anxiety or Depression, Autism, Cerebral Palsy, Tuberculosis, Diabetes, Down Syndrome, and Spina Bifida too unreliable to publish.
[E]Interpret with caution.
[F]Estimate too unreliable to publish.