

ᑭᓄᐃᑦᐱᑦ?
Qanuippitaa?
HOW ARE WE?

RESPIRATORY HEALTH:
FREQUENCY OF ASTHMA,
WHEEZING AND ALLERGIES
IN INUIT CHILDREN IN
RELATION TO INDOOR
AIR QUALITY



ᑭᖅ ᓄᐃᑦ ᐱᑦᑦ?
Qanuippitaa?
HOW ARE WE?

RESPIRATORY HEALTH: FREQUENCY OF ASTHMA, WHEEZING AND ALLERGIES IN INUIT CHILDREN IN RELATION TO INDOOR AIR QUALITY

AUTHORS

Pierre Lajoie, Benoit Lévesque and Marc Rhainds
Unité Santé et environnement,
direction Risques biologiques, environnementaux et occupationnels
Institut national de santé publique du Québec

STATISTICAL ANALYSES

Louis Rochette
Unité Connaissance-surveillance,
direction Planification, recherche et innovation,
Institut national de santé publique du Québec



EXECUTIVE DIRECTOR

Danielle St-Laurent
Unité Connaissance-surveillance, direction Planification, recherche et innovation
Institut national de santé publique du Québec

SCIENTIFIC DIRECTORS

Éric Dewailly
Unité de recherche en santé publique, Centre Hospitalier Universitaire de Québec;
Direction Risques biologiques, environnementaux et occupationnels, Institut national de santé publique du Québec

Serge Déry
Direction régionale de santé publique du Nunavik

EDITING AND COORDINATION

Michèle A. Dupont, Élisabeth Papineau and Mélanie Anctil
Unité Connaissance-surveillance, direction Planification, recherche et innovation
Institut national de santé publique du Québec

TRANSLATION

Stevenson & Writers Inc.

LAYOUT

Line Mailloux
Unité Connaissance-surveillance, direction Planification, recherche et innovation
Institut national de santé publique du Québec

PUBLICATION

Institut national de santé publique du Québec
Nunavik Regional Board of Health and Social Services / Régie régionale de la santé et des services sociaux du Nunavik

This document is available in its entirety in electronic format (PDF) on the Institut national de santé publique du Québec Web site at: <http://www.inspq.qc.ca>.

Reproductions for private study or research purposes are authorized by virtue of Article 29 of the Copyright Act. Any other use must be authorized by the Government of Québec, which holds the exclusive intellectual property rights for this document. Authorization may be obtained by submitting a request to the central clearing house of the [Service de la gestion des droits d'auteur of Les Publications du Québec](http://www.droitauteur.gouv.qc.ca/en/autorisation.php), using the online form at <http://www.droitauteur.gouv.qc.ca/en/autorisation.php> or by sending an e-mail to droit.auteur@cspq.gouv.qc.ca.

Information contained in the document may be cited provided that the source is mentioned.

LEGAL DEPOSIT – 3RD QUARTER 2007
BIBLIOTHEQUE ET ARCHIVES NATIONALES DU QUEBEC
LIBRARY AND ARCHIVES CANADA
ISBN 13 : 978-2-550-50448-1 (PRINTED VERSION)
ISBN 13 : 978-2-550-50447-4 (PDF)

©Gouvernement du Québec (2007)

BACKGROUND OF THE NUNAVIK INUIT HEALTH SURVEY

The monitoring of population health and its determinants is essential for the development of effective health prevention and promotion programs. More specifically, monitoring must provide an overall picture of a population's health, verify health trends and how health indicators vary over distance and time, detect emerging problems, identify priority problems, and develop possible health programs and services that meet the needs of the population studied.

The extensive survey conducted by Santé Québec in Nunavik in 1992 provided information on the health status of the Nunavik population (Santé Québec, 1994). The survey showed that health patterns of the population were in transition and reflected important lifestyle changes. Effectively, the Inuit population has undergone profound sociocultural, economic, and environmental changes over the last few decades. The Inuit have changed their living habits as contact with more southerly regions of Quebec increased. A sedentary lifestyle, the switch to a cash-based domestic economy, the modernization of living conditions and the increasing availability and accessibility of goods and foodstuffs imported from southern regions have contributed to these changes. These observations suggest the need for periodic monitoring of health endpoints of Nunavik Inuit to prevent the negative impact of risk factor emergence and lifestyle changes on subsequent morbidity and mortality from major chronic diseases.

In 2003, the Nunavik Regional Board of Health and Social Services (NRBHSS) decided to organize an extensive health survey in Nunavik in order to verify the evolution of health status and risk factors in the population. The NRBHSS and the Ministère de la Santé et des Services sociaux (MSSS) du Québec entrusted the Institut national de santé publique du Québec (INSPQ) with planning, administering and coordinating the survey. The INSPQ prepared the survey in close collaboration with the Unité de recherche en santé publique (URSP) of the Centre hospitalier universitaire de Québec (CHUQ) for the scientific and logistical component of the survey. The Institut de la statistique du Québec (ISQ) participated in methodology development, in particular the survey design.

The general aim of the survey was to gather social and health information on a set of themes including various

health indicators, physical measurements, and social, environmental and living conditions, thus permitting a thorough update of the health and well-being profile of the Inuit population of Nunavik. The survey was designed to permit a comparison of the 2004 trends with those observed in 1992. Data collected in 2004 also allowed researchers to compare the Inuit to other Quebecers.

Target population

The health survey was conducted among the Inuit population of Nunavik from August 27 to October 1, 2004. According to the 2001 Canadian census, the fourteen communities of Nunavik have a total of 9632 inhabitants, 91% of whom identified themselves as Inuit. The target population of the survey was permanent residents of Nunavik, excluding residents of collective dwellings and households in which there were no Inuit aged 18 years old or older.

Data collection

Data collection was performed on the Canadian Coast Guard Ship Amundsen, thanks to a grant obtained from the Canadian Foundation for Innovation (CFI) and the Network of Centres of Excellence of Canada (ArcticNet). The ship visited the fourteen villages of Nunavik, which are coastal villages. The study was based on self-administered and interviewer-completed questionnaires. The study also involved physical and biological measurements including clinical tests. The survey was approved by the Comité d'éthique de la recherche de l'Université Laval (CERUL) and the Comité d'éthique de santé publique du Québec (CESP). Participation was voluntary and participants were asked to give their written consent before completing interviews and clinical tests. A total of 677 private Inuit households were visited by interviewers who met the household respondents to complete the identification chart and the household questionnaire. A respondent was defined as an Inuit adult able to provide information regarding every member of the household. The identification chart allowed demographic information to be collected on every member of the household. The household questionnaire served to collect information on housing, environment, nutrition and certain health indicators especially regarding young children.

All individuals aged 15 or older belonging to the same household were invited to meet survey staff a few days later, on a Canadian Coast Guard ship, to respond to an interviewer-completed questionnaire (individual

questionnaire) as well as a self-administered confidential questionnaire. Participants from 18 to 74 years of age were also asked to complete a food frequency questionnaire and a 24-hour dietary recall, and to participate in a clinical session. The individual questionnaire aimed to collect general health information on subjects such as health perceptions, women's health, living habits and social support. The confidential questionnaire dealt with more sensitive issues such as suicide, drugs, violence and sexuality. During the clinical session, participants were invited to answer a nurse-completed questionnaire regarding their health status. Then, participants had a blood sample taken and physical measurements were performed including a hearing test, anthropometric measurements, an oral glucose tolerance test (excluding diabetics) and toenail sampling. Women from 35 to 74 years of age were invited to have a bone densitometry test. Finally, participants aged 40 to 74 could have, after consenting, an arteriosclerosis screening test as well as a continuous measure of cardiac rhythm for a two-hour period.

Survey sampling and participation

The survey used a stratified random sampling of private Inuit households. The community was the only stratification variable used. This stratification allowed a standard representation of the target population. Among the 677 households visited by the interviewers, 521 agreed to participate in the survey. The household response rate is thus 77.8%. The individual response rates are obtained by multiplying the household participating rate by the individual collaboration rate since the household and individual instruments were administered in sequence. The collaboration rate corresponds to the proportion of eligible individuals who agreed to participate among the 521 participating households. In this survey, about two thirds of individuals accepted to participate for a response rate in the area of 50% for most of the collection instruments used in the survey. A total of 1056 individuals signed a consent form and had at least one test or completed one questionnaire. Among them, 1006 individuals answered the individual questionnaire, 969 answered the confidential questionnaire, 925 participated in the clinical session, 821 had a hearing test, 778 answered the food frequency questionnaire, 664 answered the 24-hour dietary recall, 282 had an arteriosclerosis test, 211 had a continuous measure of their cardiac rhythm for a two-hour period and 207 had a bone densitometry test. More details on the data processing are given in the Methodological Report.

INTRODUCTION¹

Respiratory symptoms are common in childhood, particularly in developed countries. In 1988 in Canada, the prevalence of persistent wheezing reported by Dales et al. (1994) among the 5-8 age group from the greater Quebec region was 11.6%. The 1998 Health and Social Survey of Quebec Children and Youth, conducted on representative samples of children 9, 13 and 16 years old, showed prevalence rates for reported lifetime asthma between 14% and 15% depending on the age group (Levesque et al., 2004). The prevalence of wheezing in the previous year was between 7% and 8%, while severe wheezing, indicating poorly controlled asthma, varied from 2.4% to 4.4%. In general, it is recognized that atopy² plays a major role in the incidence and severity of respiratory symptoms in childhood (Institute of Medicine, 2000). Exposure to allergens in indoor air, particularly from house dust mites, cockroaches and pets is recognized as an important environmental factor. However, key inhaled allergens such as dust mites, cat dander and cockroaches are infrequently found in the North. Exposure to environmental tobacco smoke and to certain chemicals, for example formaldehyde, is also associated with the development and exacerbation of asthma and is likely more pertinent to the Inuit milieu.

Acute Lower Respiratory Tract Infections (LRTIs) are a major health concern for Canadian Inuit infants as well as for Greenland Inuit, American Indian and Alaska native children (Dallaire et al., 2006; Jenkins et al., 2003; Koch et al., 2002; Peck et al., 2005). LRTIs are characterized by rapid respiratory rate, laboured breathing and cough, rales, stridor, and wheezing. Dallaire et al. (2006) show high incidence rates of outpatient visits and hospitalizations for LRTIs in Nunavik. Admission for LRTI was up to 10 times more frequent in Nunavik compared to other Canadian populations. Previous studies also showed hospitalization rates for bronchiolitis in

¹ For ease of readability, the expression "Inuit" is used throughout the theme paper to define the population under study even though a small percentage of individuals surveyed identified themselves as non-Inuit. Refer to "Background of the Health Survey" for further details regarding the definition of the target population.

² Atopy is generally defined as the state of having one or more of a defined group of diseases (allergic rhinoconjunctivitis, allergic asthma, and atopic dermatitis) that are caused by the genetic propensity to produce IgE antibodies to environmental allergens (pollens, molds, dust mites, animals and foods). For epidemiological surveys, atopy is sometimes defined solely by the presence of IgE antibodies or of a positive skin prick test to one or more allergens (Pope et al., 1993).

Nunavut Inuit children (Banerji, 2001; Banerji et al., 2001; Orr et al., 2001). Asthma has been reported to be quite unusual in Inuit children. Airflow obstruction, however, is found much more frequently among them than in children in Montréal (7.7% versus less than 1%), from a study conducted in Salluit among 120 children in grades 2 to 6, and this likely has implications for the development of chronic obstructive lung disease in later life (Hemmelgarn et al., 1995). Wheezing in the previous 12 months was present in 6.0% of children 9 years of age (Hemmelgarn & Ernst, 1997). Atopy was uncommon, with only 5.3% of children positive for at least one allergen; specific sensitization to house dust mites was very unusual. However, the frequency of atopy substantially increased in all age groups of Greenlanders between 1987 and 1998, especially among teenagers (Krause et al., 2002). Some risk factors for acute respiratory infections have been identified in Greenlandic children aged 0-2 (Koch et al., 2003). Risk factors associated with upper respiratory tract infections were attending a childcare centre and sharing a bedroom with adults. Risk factors for LRTIs were being a boy, attending a childcare centre, exposure to passive smoking and sharing a bedroom with children aged 0-5. Breastfeeding tended to be a protective factor. In Nunavut, Kovesi et al. (2006) identified exposure to environmental tobacco smoke as a potential risk factor for viral LRTI in Inuit infants. Hemmelgarn and Ernst (1997) reported high LRTI rates in young Inuit children.

The goal of the respiratory health survey of the Inuit of Nunavik was to ascertain the prevalence of asthma and allergies among Inuit children aged 0-14, in relation to exposure to various obtainable indoor environmental characteristics. It also aimed to determine the prevalence of reported Chronic Obstructive Pulmonary Disease (COPD) and allergies, as well as the use of asthma medication in the general Inuit population.

METHODOLOGICAL ASPECTS

Data on chronic health problems and on the use of asthma medication in the general population, as well as on respiratory symptoms, was collected using an interviewer-administered household questionnaire. In most cases, the household respondent was a parent. Data on respiratory symptoms and asthma among 0-14 years old was collected using questions about asthma from the International Study of Asthma and Allergies in Childhood (ISAAC) questionnaire. This questionnaire was developed

and validated in English (Jenkins et al., 1996). We used a shortened (five questions on asthma) translated version of the questionnaire (Table A1, Appendix). The section on allergic rhinitis was not used because of the low frequency of this disease among Inuit people. Current and lifetime asthma were defined as positive answers to questions 4 and 5 and were documented only for children with wheezing. For respondents who had reported wheezing in the past 12 months, two indices were created: persistent wheezing, when awakening with wheezing was reported, and severe wheezing, when awakening one or more nights per week or changes in speech with wheezing were reported (Mintz, 2004). Data on home and environmental variables was collected through the household questionnaire: passive smoking (based on the reported restriction against smoking in the home), overcrowding (based on the number of persons per bedroom (P/B)) and sibship size (based on the number of children in the household aged 0-14 (C/H)).

➤ Data analysis

The age distribution of the individuals surveyed was as follows: 13.6% aged 0-4 years, 26.4% aged 5-14 years, 45.8% aged 15-44 years and 14.2% aged 45 years and over. Considering that asthma and wheezing during childhood are complex entities, presenting different characteristics at different ages, we analyzed the data separately for two age groups of children, those aged 0-4 and those aged 5-14. The prevalence rates of current and lifetime asthma, as well as wheezing were examined in relation to allergy status and exposure to environmental variables, such as passive smoking, overcrowding and sibship size. The presence of COPD was verified among those aged 45 years and over. Chi-square test with a correction for design effect was used to compare proportions. Statistical analyses for comparisons have been conducted at a threshold of $\alpha = 0.05$.

➤ Accuracy of estimates

The data used in this module comes from a sample and is thus subject to a certain degree of error. The coefficient of variation (CV) has been used to quantify the accuracy of estimates and the Statistics Canada scale was used to qualify the accuracy of estimates. The presence of an “E” footnote next to an estimate indicates a marginal estimate (CV between 16.6% and 33.3%). Estimates with unreliable levels of accuracy (CV > 33.3%) are not presented and have been replaced by the letter “F”.

Scope and limitations of the data

This survey of respiratory symptoms in the Inuit population has certain limitations. We have no data on the prevalence of asthma in the general population, based on a diagnosis made by a health professional. Data on the prevalence of asthma is available only from individuals who responded “yes” to the question on wheezing. Spirometric testing was not part of the survey. The sample size was small, given that wheezing in the past 12 months was reported for only 72 individuals, limiting the number of potential stratifications. Information concerning active smoking among 0-14 years old, which may be very prevalent, was not available. Information on passive smoking relies solely on the home smoking restrictions reported for each household and data on the number of cigarettes smoked daily in each household is incomplete.

RESULTS

Table A2 (Appendix) describes the prevalence of reported asthma and wheezing by age group. The prevalence of wheezing among the 0-14 years old population in the previous 12 months was 7.2%. The prevalence was more than four times higher among 0-4 years old (14.5%) than among 5-14 years old (3.4%^E). The proportions of children suffering from persistent and severe wheezing, indicating poorly controlled respiratory symptoms, were 4.6% and 3.8% respectively in the 0-14 years age group, the highest proportions being 9.2% and 7.3%^E among 0-4 years old. The prevalence of current and lifetime asthma among children with reported wheezing was 27.2% and 55.8% respectively.

The prevalence of reported allergies was 7.8% in the entire Inuit population and 5.6% among children aged 0-14. The prevalence of allergies was significantly associated with current asthma ($p = 0.0002$), persistent wheezing ($p = 0.0087$) and severe wheezing ($p = 0.0088$). It was not associated with wheezing. The prevalence of COPD in group aged 45 years and over was 7.4%^E.

The prevalence of the use of asthma medication was 5.3% in the general Inuit population (adults and children combined). It varied significantly with age ($p < 0.0001$), being 8.6%, 2.4%^E, 2.5% and 16.6% in the 0-4, 5-14, 15-44, and 45 years and over age groups, respectively. Table A3 (Appendix) describes the prevalence of the use of medication for asthma, during the two days prior to the survey, among children aged 0 to 14 years suffering from

asthma and wheezing. The prevalence of the use of asthma medication in children with wheezing was 47.4% compared to 63.6% in those with severe wheezing. Fifty-seven per cent (57.4%) of adults suffering from COPD reported using asthma medication in the two days prior to the study.

Concerning data on home and environmental variables, smoking restrictions in the home were present in 84.1% of the Inuit homes surveyed. In 8.5% of the homes with no smoking restrictions, the number of cigarettes smoked per day by daily smokers was 40 cigarettes or more. The prevalence of asthma, wheezing and allergies was not statistically associated with passive smoking. However, between 35% and 45% of children with asthma or wheezing problems live in homes with overcrowding, defined as two persons or more per bedroom, while more than 60% of children with asthma or wheezing live in homes in which three or more children aged 0-14 reside.

Table A4 (Appendix) describes the prevalence of asthma, wheezing and allergies in relation to overcrowding and sibship size. A statistically significant negative association was found between the number of persons per bedroom (overcrowding) and the prevalence of persistent wheezing ($p = 0.0293$). We found no statistically significant association between the prevalence of asthma or wheezing and sibship size.

DISCUSSION

The prevalence of lifetime or current asthma among Inuit children aged 5-14 was almost double that of the 0-4 age group. The prevalence of wheezing, persistent wheezing and severe wheezing was three to four times higher in the 0-4 age group, which may indicate that a substantial proportion of wheezing cases don't lead to asthma or that some cases of asthma are undiagnosed in Nunavik. Wheezing is common throughout childhood, although it decreases as children age (Wright, 2002). Transient early wheezing predominates during the first years of life and is relatively benign. Lower Respiratory Infection (LRI) with respiratory viruses, such as in bronchiolitis, is a known risk factor. This form of wheezing is associated with exposure to cigarette smoke, exposure to other children and not being breastfed, but is unrelated to atopy in children. Children who wheeze persistently by six years of age are more likely to be atopic and to be diagnosed as asthmatic.

The prevalence of wheezing among 5-14 years old Inuit is about half of the prevalence of wheezing found in children of southern Quebec aged 9 and 13 (Lévesque et al., 2004). The prevalence of severe wheezing appears slightly lower than in Quebec. The results of the ISAAC study showed striking international differences in the prevalence of wheezing within the previous 12 months, varying from 0.8% to 32.1% for the 6-7 years old group and from 1.6% to 36.7% for 13-14 years old children (Beasley et al., 2003). The prevalence of parent-reported wheezing in the 5-14 Inuit age group is thus low, similar to the prevalence in countries at the low extremity of the worldwide distribution of asthma prevalence. Data on the prevalence in younger age groups comes from cohort or descriptive studies other than ISAAC (Pin et al., 1999). The prevalence of wheezing varies from 15.6% to 33.6% in infants. The prevalence of wheezing in the past 12 months found in 0-4 years old Inuit children (14.5%) is higher than the prevalence found by Stoddard & Miller (1995) in the United States in 1995 (8.5% in 0-2 years old and 12.5% in 3-5 years old). The significant associations between allergies and current asthma, as well as persistent and severe wheezing in Inuit children, suggest that diagnosed and more severe cases are probably clinically different from benign, transient, early wheezing cases.

About 50% of children suffering from wheezing and adults suffering from COPD had taken asthma medication in the two days prior to the survey, which could indicate difficulty in achieving adequate control of respiratory symptoms. However, a more detailed description of asthma medication and disease burden would be necessary to estimate the adequacy of asthma control in this population (Lozano et al., 2003).

According to some researchers, there is little evidence that established risk factors like mites, atopy and genetic predisposition can account for the global prevalence increases or the international prevalence patterns that have been observed (Pearce & Douwes, 2006). More global changes related to “Westernization”, including changes in maternal diet, smaller family size, reduced infant infections, and increased use of antibiotics, have been associated with an increased risk of childhood asthma. The negative association between overcrowding and persistent wheezing is complex, likely a chance finding or due to differences in allergies. There is some evidence that respiratory syncytial virus bronchiolitis may increase the risk of persistent wheezing and asthma-like symptoms in childhood (Martinez, 2003). Night-time overcrowding parameters, such as the number of children aged 0-5 and

adults sleeping in the same room as the child, are known potential risk factors for Upper and Lower Respiratory Track Infections (URTI and LRTI) in young Inuit children (Koch et al., 2003). Other overcrowding parameters, including the number of persons per room or per household are not associated with a higher risk of infections. Koch et al. (2003) found a statistically significant association between two persons per room and a lower risk of URTI in children.

CONCLUSION

A respiratory health survey on a representative sample of 0 to 14 years old Inuit children was undertaken for the first time in Nunavik. The data on respiratory symptoms and asthma were obtained from a household respondent, usually a parent, by means of the standardized ISAAC questionnaire. Questions were asked about various home and environmental variables. The prevalence of wheezing in the previous 12 months was 14.5% and 3.4%^E in the 0-4 and 5-14 age groups, respectively. In comparison with the prevalence found in southern Quebec and in many countries, the prevalence of wheezing in younger Inuit children is relatively high; it is relatively low among older children. The proportions of children suffering from persistent and severe wheezing were 9.2% and 7.3%^E respectively in 0-4 years old, which may indicate a difficulty in controlling respiratory symptoms. About 50% of children with wheezing took asthma medication in the two days prior to the survey. The prevalence of allergies in children was 5.6%. Allergies are associated with a higher risk of current asthma, persistent and severe wheezing.

A substantial proportion of children with asthma or wheezing live in homes with overcrowding, defined as two persons per bedroom or more. We found no significant association between asthma or wheezing and passive smoking. A significant negative association was found between overcrowding and persistent wheezing; an association that requires further analysis to explain.

From a public health perspective, these results are quite encouraging. In fact, we found a low frequency of asthma symptoms in 5 to 14 years old children, a high level of smoking restriction in Inuit homes and the absence of a documented negative effect of overcrowding on Inuit children. However, the results concerning the relatively high frequency of wheezing in the 0-4 age group, the proportion of children with persistent and severe

wheezing, and the frequent use of asthma medication could suggest difficulty in controlling respiratory symptoms. Lower respiratory tract infections may play a major role. More research is needed to evaluate the clinical aspects of wheezing episodes and to estimate the adequacy of asthma control in this population.

KEY ISSUES

- ↪ The prevalence of lifetime or current asthma among Inuit children aged 5-14 was almost double that of the 0-4 age group while the prevalence of wheezing, persistent wheezing and severe wheezing in the 0-4 age group was three to four times higher than that of older children.
- ↪ The prevalence of wheezing among 5-14 years old Inuit is about half of the prevalence of wheezing found in children of southern Quebec aged 9 and 13. The prevalence is similar to the prevalence in countries at the low extremity of the worldwide distribution of asthma prevalence.
- ↪ The prevalence of the use of asthma medication was 5.3% in the general Inuit population (adults and children combined). About 50% of children with wheezing took asthma medication in the two days prior to the survey.
- ↪ The prevalence of allergies in children was 5.6%. Allergies are associated with a higher risk of current asthma and persistent and severe wheezing.
- ↪ Smoking restrictions were present in 84.1% of Inuit homes. No significant association was found between asthma or wheezing and passive smoking.
- ↪ Between 35% and 45% of children with asthma or wheezing problems live in homes with overcrowding. A statistically significant negative association was found between the number of persons per bedroom and the prevalence of persistent wheezing.
- ↪ The prevalence of asthma or wheezing was not statistically associated with the number of children aged 0 to 14 years in the household.

ACKNOWLEDGEMENTS

The Nunavik Inuit Health Survey could not have been undertaken without the financial support of the ministère de la Santé et des Services sociaux du Québec, the Nunavik Regional Board of Health and Social Services, the Department of Indian and Northern Affairs of Canada, the Canadian Foundation for Innovation (CFI), the Network of Centres of Excellence of Canada (ArcticNet), the Nasivvik ACADRE Inuit Centre and the Canadian Institutes of Health Research. The valuable assistance of Inuit representatives – both members of the survey advisory committee and Inuit leaders from each community – is gratefully acknowledged. We are also grateful to all of the professionals, technicians, students, interviewers and clerical staff who worked at each stage of the survey process. Our gratitude is also extended to the staff of the Canadian Coast Guard Ship Amundsen. Thanks to Pierre Ernst (Division of Clinical Epidemiology, Royal Victoria Hospital) who reviewed the draft manuscript for this booklet and provided valuable insights and suggestions for further analysis. Finally, we wish to thank the Inuit of Nunavik for their extensive cooperation with this survey.

REFERENCES

- Banerji, A. (2001). High rates of hospitalization for bronchiolitis in Inuit children on Baffin Island. *International Journal of Circumpolar Health*, 60 (3), 375-379.
- Banerji, A., Bell, A., Mills, E.L., McDonald, J., Subbarao, K., Stark, G., Eynon, N., & Loo, V.G. (2001). Lower respiratory tract infections in Inuit infants on Baffin Island. *Canadian Medical Association Journal*, 164 (13), 1847-1918.
- Beasley, R., Ellwood, P., & Asher, I. (2003). International patterns of the prevalence of pediatric asthma. The ISAAC program. *Pediatric Clinic of North America*, 50, 539-553.
- Dallaire, F., Dewailly, E., Vézina, C., Bruneau, S., & Ayotte, P. (2006). Portrait of outpatients visits and hospitalizations for acute infections in Nunavik preschool children. *Canadian Journal of Public Health*, 97 (5), 362-367.
- Dales, R.E., Raizenne, M., El-Saadany, S., Brook, J., & Burnett, R. (1994). Prevalence of childhood asthma across Canada. *International Journal of Epidemiology*, 23 (4), 75-781.
- Hemmelgarn, B., & Ernst, P. (1997). Airway function among Inuit primary school children in far northern Quebec. *American Journal of Respiratory and Critical Care Medicine*, 156, 1870-1875.
- Hemmelgarn, B., Loozen, E., Saralegui, S., Chatwood, S., & Ernst, P. (1995). Airways hyperresponsiveness and atopy: a comparison of Inuit and Montréal schoolchildren. *Canadian Respiratory Journal*, 2, 92-96.
- Institute of Medicine (IOM), Committee on the Assessment of Asthma and Indoor Air. (2000). *Clearing the air: asthma and indoor air exposures*. Division of Health promotion and Disease Prevention. ISBN 0-309-06496-1.
- Jenkins, A., Gyorkos, T., Culman, K., Ward, B., Pekeles, G., & Mills, E. (2003). An overview of factors influencing the health of Canadian Inuit infants. *International Journal of Circumpolar Health*, 62 (1), 17-39.
- Jenkins, M.A., Clarke, J.R., Carlin, J.B., Robertson, C.F., Hopper, J.L., Dalton, M. F., Holst, D.P., Choi, K., & Gilles, G.G. (1996). Validation of Questionnaire and Bronchial Hyperresponsiveness against Respiratory Physician Assessment in the Diagnosis of Asthma. *International Journal of Epidemiology*, 25, 609-616.
- Koch, A., Molbak, K., Homoe, P., Sorensen, P., Hjulær, T., Olesen, M.E., Pejł, J., Pedersen, F. K., Olsen, O. R., & Melbye, M. (2003). Risk factors for acute respiratory infections in young Greenlandic children. *American Journal of Epidemiology*, 158, 374-384.
- Koch, A., Sorensen, P., Homoe, P., Molback, K., Pedersen, F. K., Mortensen, T., Elberling, H., Eriksen, A.M., Olsen, O.R., & Melbye, M. (2002). Population-based study of acute respiratory infections in children, Greenland. *Emerging infectious diseases*, 8 (6), 586-593.
- Kovesi, T., Creery, D., Gilbert, N.L., Dales, R., Fugler, D., Thompson, B., Randhawa, N., & Miller, J.D. (2006). Indoor air quality risk factors for severe respiratory tract infections in Inuit children in Baffin region, Nunavut: a pilot study. *Indoor Air*, 16, 226-275.
- Krause, T.G., Koch, A., Friborg, J., Poulsen, L.K., Kristensen, B., & Melbye, M. (2002). Frequency of atopy in the Arctic in 1987 and 1998. *Lancet*, 360, 691-692.
- Levesque, B., Rhainds, M., Ernst, P., Grenier, A.M., Kosatsky, T., Audet, N., & Lajoie, P. (2004). Asthma and allergic rhinitis in Quebec children. *Canadian Respiratory Journal*, 11, 343-348.
- Lozano, P., Finkelstein, J., Hecht, J., Shulruff, R., & Weiss, K.B. (2003). Asthma medication use and disease burden in children in a primary care population. *Archives of Pediatric and Adolescent Medicine*, 157, 81-88.
- Martinez, F.D. (2003). Respiratory syncytial virus bronchiolitis and the pathogenesis of childhood asthma. *Pediatric Infectious Diseases Journal*, 22 (2 Suppl), S76-82.
- Mintz, M. (2004). Asthma update: Part I. Diagnosis, monitoring and prevention of disease progression. *American Family Physician*, 70 (5), 893-898.
- Orr, P., Macdonald, S., Milley, D., & Brown, R. (2001). Bronchiolitis in Inuit children from a Canadian central arctic community, 1995-1996. *International Journal of Circumpolar Health*, 60, 649-658.
- Pearce, N., & Douwes, J. (2006). The global epidemiology of asthma in children. *International Journal of Tuberculosis and Lung Disease*, 10 (2), 125-132.

Peck, A.J., Holman, R.C., Curns, A.T., Lingappa, J.R., Cheek, J.E., Singleton, R.J., Carver, K., & Anderson, R.J. (2005). Lower respiratory tract infections among American Indian and Alaska native children and the general population of U.S. children. *Pediatric Infectious Diseases Journal*, 24, 342-351.

Pin, I., Pilenko-McGuigan, C., Cans, C., Gousset, M., & Pison, C. (1999). Épidémiologie de l'allergie respiratoire de l'enfant. *Archives of Pediatric and Adolescent Medicine*, 6, Suppl 1, 6-13.

Pope, A.M., Patterson, R., Burge, H. (ed.) (1993). *Indoor Allergens: assessing and controlling health effects*. Committee on the health effects of indoor allergens, Institute of medicine. National Academy Press, Washington.

Stoddard, J.J., & Miller, T. (1995). Impact of parental smoking on the prevalence of wheezing respiratory illness of children. *American Journal of Epidemiology*, 141, 96-102.

Santé Québec, Jetté, M. (ed.) (1994). *A Health Profile of the Inuit; Report of the Santé Québec Health Survey Among the Inuit of Nunavik, 1992*. Montréal: Ministère de la Santé et des Services sociaux, Government of Québec.

Wright, A.L. (2002). Epidemiology of asthma and recurrent wheeze in childhood. *Clinical Reviews in Allergy and Immunology*, 22 (1), 33-44.

APPENDIX

Table A1

The English version of the ISAAC questionnaire ASTHMA (ADAPTED)

1.	Has your child had wheezing or whistling in the chest <u>in the last 12 months</u> ? If you have answered NO please skip to question 6.	Yes <input type="checkbox"/>
		No <input type="checkbox"/>
2.	<u>In the last 12 months</u> , how often, on average, has your child's sleep been disturbed due to wheezing?	
	• Never woken with wheezing	<input type="checkbox"/>
	• Less than one night per week	<input type="checkbox"/>
	• One or more nights per week	<input type="checkbox"/>
3.	<u>In the last 12 months</u> , has wheezing ever been severe enough to limit your child's speech to only one or two words at a time between breaths?	Yes <input type="checkbox"/>
		No <input type="checkbox"/>
4.	Does your child currently have asthma?	Yes <input type="checkbox"/>
		No <input type="checkbox"/>
5.	Has your child <u>ever</u> had asthma?	Yes <input type="checkbox"/>
		No <input type="checkbox"/>

Adapted from the ISAAC questionnaire.

Table A2

Prevalence of asthma and wheezing by age group (%), children aged 0 to 14 years, Nunavik, 2004

Age group	Asthma		Wheezing		
	Lifetime ^a asthma	Current ^a asthma	Wheezing	Persistent wheezing	Severe wheezing
0-4 years	45.2	20.6 ^E	14.5	9.2	7.3 ^E
5-14 years	86.0	40.1 ^E	3.4 ^E	2.3 ^E	2.0 ^E
Total	55.8	27.2	7.2	4.6	3.8
P-value	0.003	0.083	< 0.0001	< 0.0001	< 0.0001

^a Prevalence of asthma reported among children with reported wheezing.

^E Interpret with caution.

Source: Nunavik Inuit Health Survey 2004.

Table A3

Prevalence of use of asthma medication during the two days prior to the survey by asthma and wheezing (%), children aged 0 to 14 years, Nunavik, 2004

	Asthma				Wheezing					
	Lifetime ^a asthma		Current ^a asthma		Wheezing		Persistent wheezing		Severe wheezing	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Use asthma medication	38.6 ^E	29.5 ^E	92.5	31.7	47.4	1.2 ^E	50.2	2.2 ^E	63.6	2.2 ^E
P-value	0.444		< 0.0001		< 0.0001		< 0.0001		< 0.0001	

^a Prevalence of asthma reported among children with reported wheezing.

E Interpret with caution.

Source: Nunavik Inuit Health Survey 2004.

Table A4

Prevalence of asthma, wheezing and allergies in relation to overcrowding and sibship size (%), children aged 0 to 14 years, Nunavik, 2004

	Asthma		Wheezing			Allergy
	Lifetime ^a asthma	Current ^a asthma	Wheezing	Persistent wheezing	Severe wheezing	
Overcrowding						
Less than 2	60.1	35.2 ^E	8.3	6.1 ^E	4.5 ^E	6.7
2 or more	51.4 ^E	F	6.1 ^E	3.2 ^E	3.1 ^E	4.5 ^E
P-value	0.5012	0.1117	0.1746	0.0293	0.2687	0.1049
Sibship size						
2 or less	49.8 ^E	F	7.9 ^E	4.9 ^E	3.5 ^E	6.7 ^E
3 or more	59.6	30.5 ^E	6.8	4.4 ^E	3.9 ^E	5.0
P-value	0.4678	0.4540	0.5259	0.7692	0.7428	0.2316

^a Prevalence of asthma reported among children with reported wheezing.

E Interpret with caution.

F Unreliable estimate.

Source: Nunavik Inuit Health Survey 2004.

ᑭᓂᓃᓂᓃᓂᓃ?

Qanuippitaa?

HOW ARE WE?

