

namely, respiratory syncytial virus, elevated immunoglobulin E levels, and cockroach allergy in the home, that were independently associated with hospitalizations within this group. Emergency department visits were associated with caregivers with a status of single parent or smoker ($P = .037$ for single parent and $P = .034$ for smoker).

Conclusions. The authors concluded that ethnic and immigrant status played significant roles in morbidity related to infant wheezing illness. In addition to respiratory infection, allergic processes and social variables played roles, as evidenced by health care utilization.

Reviewer's Comments. Additional studies of this nature with larger populations, including suburban families, would be of interest to validate these findings. The relationships of ethnic, biological, and social factors to asthma morbidity are certainly consistent, however, with the paradigm of inner-city asthma that has been established for older children and adolescents.

CHRISTOPHER RANDOLPH, MD
Waterbury, CT

A LONGITUDINAL, POPULATION-BASED, COHORT STUDY OF CHILDHOOD ASTHMA FOLLOWED TO ADULTHOOD

Sears MR, Greene JM, Willan AR. *N Engl J Med.* 2003;349:1414–1422

Purpose of the Study. To describe risk factors that may predict the severity and duration of childhood asthma in adult life.

Study Population. A complete birth cohort of 1390 children born between April 1972 and March 1973 in Dunedin, New Zealand, was studied. Of those children, 1037 (91%) were present for the follow-up assessment at 3 years.

Methods. The children were examined every 2 years from 3 to 15 years of age and then at 18, 21, and 26 years. Respiratory questionnaire assessment and pulmonary function testing were performed at ages 9, 11, 13, 15, 18, 21, and 26 years and methacholine challenge testing was performed at all except the 18- and 26-year visits, when bronchodilator responses were studied. Allergic diathesis was measured with immunoglobulin E assays at 11 years, skin tests at 13 years, and both at 21 years.

Results. A total of 613 patients (59%) provided data at every assessment. Seventy-three percent reported ≥ 1 episode of wheezing, whereas 51% reported > 1 episode of wheezing. At age 26 years, 27% of the cohort was currently wheezing, with 15% experiencing persistent symptoms and 12% relapsing after a symptom-free period. The predictors of persistent wheezing included severity of house dust mite sensitivity, increased bronchial hyperreactivity, smoking at 21 years of age, and earlier age of symptom onset. Pulmonary function test results were consistently lower for patients with persistent wheezing and those who experienced relapses. The degree of pulmonary function abnormality was measured as the forced expiratory volume in 1 second (FEV_1)/forced vital capacity (FVC) ratio. Among male patients with persistent wheezing, those who experienced relapses began with a FEV_1/FVC ratio of 82% at 9 years of age, which decreased to $\sim 75\%$ by 26 years of age. Similar but less profound abnormalities were seen in the female cohort. Patients with no wheeze ever, intermittent wheezing, or transient wheezing maintained FEV_1/FVC ratios at or just below 85% through the study.

Conclusions. More than 5% of children who wheezed experienced persistence of symptoms into adulthood. The abnormalities in pulmonary function among patients with persistent wheezing and relapse of wheezing occurred

early in life (< 9 years of age) and persisted throughout life. Patients with transient wheezing or resolved wheezing did not experience progressive loss of lung function.

Reviewer's Comments. These data confirm that early airway damage attributable to infection, allergen exposure, or both may lead to abnormalities in pulmonary function that persist throughout life. The chance to intervene in asthma may well occur before our patients are able to tell us that they have any difficulty breathing.

BRADLEY E. CHIPPS, MD
Sacramento, CA

WHO GETS DIAGNOSED WITH ASTHMA? FREQUENT WHEEZE AMONG ADOLESCENTS WITH AND WITHOUT A DIAGNOSIS OF ASTHMA

Yeatts K, Davis KJ, Sotir M, et al. *Pediatrics.* 2003;111:1046–1054

Purpose of the Study. To evaluate factors related to the failure to make an asthma diagnosis among children with frequent wheezing symptoms and to assess risk factors for frequent wheezing.

Study Population. The study included 122 829 children, 12 to 18 years of age, enrolled in 499 public middle schools in North Carolina during the 1999–2000 school year.

Methods. The study was based on results from the North Carolina School Asthma Survey, a self-reported questionnaire on respiratory disease adapted from the International Study of Asthma and Allergies in Childhood.

Results. Characteristics that were independently related to undiagnosed frequent wheezing, compared with asymptomatic children, included female gender (odds ratio [OR]: 1.45), current smoking (OR: 2.6), exposure to household smoke (OR: 1.6), low socioeconomic status (OR: 1.5), and African American (OR: 1.25), Native American (OR: 1.4), and Mexican American (OR: 1.3) race/ethnicity. There was a minimal negative association with urban residents, with an OR of 0.91. Documentation of allergies was less likely among frequent wheezers (70%), compared with diagnosed asthmatics (86%), but was much higher than among asymptomatic children (36%). Thirty-three percent of children with undiagnosed frequent wheezing reported ≥ 1 physician visits in the previous year for treatment of wheezing or breathing conditions, compared with 71% of children with diagnosed asthma and 4% of asymptomatic children. The prevalence of any inhaled therapy in the previous 12 months was 12% for undiagnosed frequent wheezers, compared with 78% for diagnosed asthmatics.

Conclusions. The authors concluded that undiagnosed frequent wheezing was independently related to female gender, current smoking, exposure to household smoke, low socioeconomic status, and African American, Native American, and Mexican American race/ethnicity. Children with undiagnosed frequent wheezing were not receiving sufficient health care for their asthmatic conditions.

Reviewer's Comments. These are rather striking findings that clearly demonstrate the degree to which asthma is underdiagnosed in some populations.

CHRISTOPHER RANDOLPH, MD
Waterbury, CT

HEALTH CONSEQUENCES ASSOCIATED WITH FREQUENT WHEEZING IN ADOLESCENTS WITHOUT ASTHMA DIAGNOSIS

Yeatts K, Davis J, Peden D, Shy C. *Eur Respir J.* 2003;22:781–786

Purpose of the Study. To evaluate the association between undiagnosed frequent wheezing and health consequences among adolescents.

Study Population. The North Carolina School Asthma Survey population of 122 829 children, 12 to 14 years of age, was studied. The target population was enumerated from 1999–2000 enrollment records maintained by the North Carolina Department of Public Instruction and included 565 public middle schools, with 192 248 children.

Methods. The questionnaire was adapted from the International Study of Asthma and Allergies in Childhood. Three mutually exclusive groups were compared, ie, 1) children with frequent wheezing symptoms and no diagnosis, 2) children who reported wheezing symptoms and a physician diagnosis of asthma, and 3) children with no symptoms or diagnosis ever. A fourth group, defined as infrequent wheezers (children with infrequent wheezing symptoms and no physician diagnosis, $n = 38\,424$), was included for reference. Outcome variables were defined as the numbers of school absences, activity limitations, and sleep disturbances attributable to asthma-like symptoms. Health care utilization variables included the numbers of physician visits, emergency department visits, and hospitalization admissions for treatment of asthma-like symptoms.

Results. The odds of wheezing-related sleep disturbances, limited activities, and missed school were higher among undiagnosed frequent wheezers, compared with diagnosed asthmatics. The frequencies of emergency department visits and hospitalizations did not differ substantially between the undiagnosed wheezing group and the diagnosed asthma group, although the undiagnosed group was less likely to have visited a physician for treatment of wheezing in the previous year. Undiagnosed frequent wheezers were more likely to experience sleep disturbances, limited activities, missed school, and greater health care utilization for treatment of wheezing, compared with asymptomatic children. Compared with asymptomatic children, diagnosed asthmatics were 10 to 24 times more likely to experience limited activities, sleep disturbances, and missed school. They were also 20 times more likely to visit a physician and >9 times more likely to report ≥ 3 emergency department visits or hospitalization for treatment of wheezing, compared with asymptomatic children.

Conclusions. Children with frequent wheezing symptoms but no asthma diagnosis experience substantial illness-related morbidity, similar to that of diagnosed asthmatics. Undiagnosed frequent wheezers require more recognition from primary care physicians and need active disease management to reduce health consequences.

Reviewer's Comments. This study nicely evaluates multiple aspects of functional consequences and health care use among children with undiagnosed frequent wheezing from a population-based sample. This study suggests that undiagnosed frequent wheezers require better recognition by primary care physicians and need active disease management. It also suggests that the effects of asthma in the pediatric population may be underestimated, because of undiagnosed disease.

WANDA PHIPATANAKUL, MD
Boston, MA

LOWER PHYSICIAN ESTIMATE OF UNDERLYING ASTHMA SEVERITY LEADS TO UNDERTREATMENT

Wolfenden LL, Diette GB, Krishnan JA, Skinner EA, Steinwachs DM, Wu AW. *Arch Intern Med.* 2003;163:231–236

Purpose of the Study. To determine how physician estimates of patients' underlying asthma severity affect asthma care.

Study Population. A total of 4005 adult asthma patients enrolled in managed care organizations and the physicians who were primarily responsible for their asthma care were studied.

Methods. Patient- and physician-reported data were used to examine the relationship between physician estimates of underlying asthma severity and asthma care. Asthma patients were asked about asthma symptoms and asthma medical care. Asthma care questions included questions regarding medication use, self-monitoring, self-management, and allergy history and treatment. The physicians were instructed to evaluate the severity of their patients' asthma, and 4005 patients had complete physician estimates of underlying severity. Relationships between physician severity classifications, patient-reported symptoms, and asthma care were examined, and multivariate logistic regression analyses were used to adjust for age, gender, race, and education.

Results. The mean age of the respondents was 44.8 years; 83.5% were white and 70.1% were female. Almost 40% of respondents reported moderate symptoms and 50.1% reported severe symptoms, but 44.6% of physicians classified their patients' underlying asthma severity as mild and 44.5% as moderate. After adjustment for patient-reported symptoms, the odds of receiving each component of asthma care were greater when the physician estimate of severity was moderate (odds ratio: 1.92; 95% confidence interval: 1.65–2.22) or severe (odds ratio: 4.97; 95% confidence interval: 3.58–6.89) than when the physician estimate was mild. The more severe the patient-reported symptoms, the more likely patients were to receive inhaled corticosteroids and peak flow meters but the less likely they were to have self-management knowledge, even after adjustment for physician estimates of severity. Physician-estimated severity was a stronger predictor of asthma care than were patient-reported symptoms.

Conclusions. In a population of adult asthmatic patients, physician estimates of asthma severity determined the asthma care reported by patients but physicians might underestimate asthma severity, resulting in suboptimal care.

Reviewer's Comments. These results suggested that physician underestimation of asthma severity may lead to the delivery of asthma care that is not consistent with national guidelines. Because the participants were predominantly white female adults, these results may not be applicable to other populations. In addition, physician estimates of underlying severity were obtained 1 to 6 months after patients reported symptoms, resulting in a time lag that might explain at least some of the discrepancy between patient-reported symptoms and physician estimates of underlying severity. Studies of pediatric asthmatic patients are needed, to determine the prevalence of physician underestimation of asthma severity and its effects on asthma care and ultimately on asthma outcomes.

ELIZABETH C. MATSUI
Baltimore, MD

HOSPITAL READMISSIONS FOR CHILDHOOD ASTHMA

Bloomberg GR, Trinkaus KM, Fisher EB, Music JR, Strunk RC. *Am J Respir Crit Care Med.* 2003;167:1068–1076

Purpose of the Study. To determine the magnitude of readmissions for children with asthma and to examine

HEALTH CONSEQUENCES ASSOCIATED WITH FREQUENT WHEEZING IN ADOLESCENTS WITHOUT ASTHMA DIAGNOSIS

Wanda Phipatanakul
Pediatrics 2004;114:533

Updated Information & Services	including high resolution figures, can be found at: /content/114/Supplement_1/533.3.full.html
Subspecialty Collections	This article, along with others on similar topics, appears in the following collection(s): Allergy/Immunology /cgi/collection/allergy:immunology_sub Asthma /cgi/collection/asthma_sub
Permissions & Licensing	Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at: /site/misc/Permissions.xhtml
Reprints	Information about ordering reprints can be found online: /site/misc/reprints.xhtml

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2004 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

HEALTH CONSEQUENCES ASSOCIATED WITH FREQUENT WHEEZING IN ADOLESCENTS WITHOUT ASTHMA DIAGNOSIS

Wanda Phipatanakul
Pediatrics 2004;114;533

The online version of this article, along with updated information and services, is
located on the World Wide Web at:
/content/114/Supplement_1/533.3.full.html

PEDIATRICS is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. PEDIATRICS is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 2004 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 0031-4005. Online ISSN: 1098-4275.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

