Trends in Otitis Media Among Children in the United States

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Pediatrics 2003;112;514-520
DOI: 10.1542/peds.112.3.514

Trends in Otitis Media Among Children in the United States

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ABSTRACT. *Background.* **The prevalence of repeated otitis media (OM) increased during the 1980s, but it is unknown if the increase has continued.**

Objectives. **To determine trends in the prevalence of OM, early-onset OM, and repeated OM among US children from 1988 to 1994 and to identify factors that may explain any observed changes.**

Methods. **The Third National Health and Nutrition Examination Survey was administered in 2 phases: phase I (1988–1991) and phase II (1991–1994), each comprising a national probability sample. OM (ever having had OM), early-onset OM (first episode at <12 months of age), and repeated OM (≥3 episodes) were assessed for 8261 children <6 years of age.**

Results. **After controlling for risk factors for OM, the prevalence of OM from phase I to phase II increased from 66.7% to 69.7% (odds ratio [OR] = 1.1; 95% confidence interval [CI] = .99, 1.1), early-onset OM increased from 41.1% to 45.8% (OR = 1.1; 95% CI = 1.03, 1.2), and repeated OM increased from 34.8% to 41.1% (OR = 1.2; 95% CI = 1.1, 1.4). This observed increase corresponds to 561 000 and 720 000 more children having early-onset OM and repeated OM, respectively. Child care use, early breastfeeding termination, asthma, and access to health care did not significantly increase from phase I to phase II. The prevalence of early-onset OM and repeated OM was higher for affluent children, but the greatest increase in prevalence was among impoverished children. There was an increase in allergic conditions from phase I to phase II for poor children (22.6% to 30.2%).**

Conclusions. **The prevalence of early-onset OM and repeated OM continued to increase among preschool children in the United States. Further research to investigate this increasing prevalence should explore changes in management practice and an increase in prevalence of allergic conditions among poor children.** ***Pediatrics*** **2003; 112:514–520;** ***otitis media, early-onset otitis media, National Health and Nutrition Examination Survey, allergy, epidemiology, pediatric, children.***

ABBREVIATIONS. OM, otitis media; NHANES III, Third National Health and Nutrition Examination Survey; OR, odds ratio; RR, relative risk; CI, confidence interval.

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This work was presented in part at the 39th Annual Meeting of the Ambulatory Pediatric Association; May 1999; San Francisco, CA.

Received for publication Sep 17, 2002; accepted Feb 20, 2003.

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Otitis media (OM) is the most common reason for an illness-related medical visit in preschool age children. In 1990, OM accounted for 24.5 million clinical visits in the United States, with $3 billion to $4 billion spent annually for OM treatment.[1,2] In addition to the economic costs associated with OM, there is controversy over the efficacy of antibiotics for OM. OM is the most frequent diagnosis for which physicians prescribe antibiotic treatment to children.[3,4] Antibiotic use has been shown to encourage the emergence of multidrug-resistant strains of bacterial pathogens including *Streptococcus pneumoniae*, the predominant pathogen in acute OM.[2,5] Finally, some evidence indicates that OM is associated with mild language and behavioral sequelae, particularly for early-onset, recurrent OM.[6–8]

The prevalence of repeated OM increased among US children during the 1980s. We previously reported that this increase was attributable, in part, to the increase in child care use and a higher prevalence of allergic conditions among children.[9] Children who have early-onset OM are also at greater risk for subsequent episodes of OM.[10] It is unclear, however, whether there has been a continued increase in repeated OM in the 1990s or if there was a corresponding increase in ever having had OM and early-onset OM.

The objectives of this study were to determine trends in the prevalence of OM (ever having had OM), early-onset OM (first episode at <12 months of age), and repeated OM (≥3 episodes) among US children over a 6-year period, from 1988 to 1994, and to identify characteristics of children that may explain changes in the prevalence of these outcomes.

METHODS

The Third National Health and Nutrition Examination Survey (NHANES III) was conducted by the National Center for Health Statistics to assess the health and nutritional status of children and adults in the United States. This survey is nationally representative of the civilian noninstitutionalized population of the United States. This cross-sectional survey was administered in 2 phases of equal duration and sample size over a 6-year period: phase I, from 1988–1991, and phase II, from 1991–1994, each comprising a national probability sample. Information from personal household interviews and health examinations was collected on ~40 000 individuals who were 2 months of age and older. For this secondary analysis study, we analyzed data from 8261 children <6 years of age whose parent or guardian completed the household interview, which included demographic, socioeconomic, and health history information for each child.[11]

The household interview included questions on the frequency and treatment of ear infections. OM was determined by a positive response from the parent to the question "Did (child's name) ever

have an ear infection or an earache?" If so, they were then asked the questions, "How many times has (child's name) had an ear infection or an earache?" and "How old was (child's name) when (child's name) had the first ear infection or earache?" For these analyses, repeated OM was defined as 3 or more episodes of OM and early-onset OM was defined as having the first episode of OM <12 months of age.

Demographic, household, and health-related characteristics of children obtained in NHANES III and thought to be potentially associated with OM were included in this study. These characteristics were used to adjust for estimated changes in OM and to determine if differences in the prevalence of these characteristics might explain changes in the prevalence of OM between the 2 phases of the survey. Variables included the child's age,[9,12] sex,[9,12,13] race/ethnicity,[9,12,14] family poverty status,[9,14] urban residence,[15] region of the country, head of household education level, maternal age at the child's birth, use of a furnace, space heater, wood stove, or fireplace in the past 12 months, child care attendance,[9,12,14] having allergic conditions in the past 12 months,[9,16] any prenatal smoking,[17,18] current passive smoke exposure in the home,[19,20] dog or cat in the home, early breastfeeding termination,[13,21] child ever having asthma[12] or hay fever, and having a particular place for health care. The child's race/ethnicity was categorized into 4 groups: Hispanic, black, white, and other race. Poverty status was dichotomized as living below the poverty line or at or above the poverty line based on family size and the federal poverty level at the time of the survey. Head of household education level was categorized into 3 groups: less than high school (lower household education), high school graduate, and more than high school (higher household education). Maternal age at the child's birth was dichotomized as ≤16 years or >16 years. Child care use was defined as attending a day care center or nursery school with ≥6 children before the child was 4 years old. Allergic conditions were defined as having a stuffy, itchy, or runny nose or having watery, itchy eyes in the past 12 months. Early termination of breastfeeding included never breastfeeding or discontinuing when the child was ≤3 months of age. Having a particular place for health care was defined as having a particular clinic, health center, doctor's office, or other place that the child usually goes to if he/she is sick, needs advice about health, or for routine care. All of the other variables were used as defined in the survey questionnaire.

Analyses included bivariate comparisons to determine associations between the above demographic, household, and health-related characteristics with OM, early-onset OM, and repeated OM, over the 6 years and from phase I to phase II. Associations in bivariate analyses with P values <.10 were included in logistic regressions to determine if these characteristics remained independently associated with the 3 outcomes. A correction factor was applied to the odds ratios (ORs) derived from logistic regressions to better approximate the true relative risks (RRs), given the high prevalence of OM in the study population.[22] Prevalence of factors found significant in logistic regression analyses were compared by phase of survey to help identify and explain any change in prevalence of OM, early-onset OM, and repeated OM. Attributable fractions were calculated to determine the number of excess children affected attributable to any significant change in the prevalence of these 3 outcomes.[23] Results were weighted to produce appropriate national estimates and SUDAAN software was used to account for the complex sample design of the survey.[24]

RESULTS

The prevalence of ever having an episode of OM from 1988–1994 for children <6 years of age in the United States was 68.2% (95% confidence interval [CI] = 66.3, 70.1), early-onset OM was 43.5% (95% CI = 41.6, 45.4), and repeated OM was 38.0% (95% CI = 35.7, 40.4; Table 1). Children who were older had higher rates of OM and repeated OM, whereas children 1 to 2 years of age had the highest rates of early-onset OM. White children had higher rates for all 3 outcomes and males reported higher rates of repeated OM. The overall prevalence of OM, early-onset OM, and repeated OM also was higher for children who were more affluent. The prevalence of early-onset OM was higher for children above poverty (46.4% vs 37.5%), having a higher household education (47.2% vs 40.4%), and having a usual source of medical care (44.3% vs 28.2%). These associations also were observed for repeated OM, with higher rates for children being above poverty (41.7% vs 31.4%), having a higher household education (41.9% vs 33.6%), and having a usual source of care (38.5% vs 28.8%). Children attending child care, having allergic conditions, and ever having asthma also reported higher prevalence of the 3 outcomes. These differences were all statistically significant ($P < .05$). Variables that were not associated with any of the 3 outcomes ($P > .10$) are not shown.

The prevalence of OM increased from 66.7% to 69.7% ($P = .21$), early-onset OM increased from 44.1% to 45.8% ($P = .03$), and repeated OM increased from 34.8% to 41.1% ($P = .01$) from 1988–1991 to 1991–1994 for children <6 years of age (Table 2). Compared with 1988–1991, we estimate that 561 000 more children had early-onset OM and 720 000 more children had repeated OM in 1991–1994 attributable to this increased prevalence.

After adjusting for potential confounders that were associated with the 3 outcomes in bivariate analyses, including age, sex, race/ethnicity, poverty status, urban residence, region of the country, household education, fireplace use, child care attendance, allergic conditions, exposure to prenatal smoke, breastfeeding duration, ever having asthma, and access to routine health care, the increased prevalence of ever having OM from phase I to phase II was not significant (OR = 1.1; 95% CI = .99, 1.1), whereas the increased prevalence in early-onset OM (OR = 1.1; 95% CI = 1.03, 1.2), and repeated OM (OR = 1.2; 95% CI = 1.1, 1.4) remained significant (Table 2).

In logistic regression models, modifiable risk factors that were independently associated with the 3 OM outcomes included child care use, allergic conditions, early breastfeeding termination, ever having asthma, and access to health care. Allergic conditions and asthma were considered potentially modifiable risk factors for OM in that in addition to being attributed to genetic factors, they are also associated with environmental exposures, which can be altered.[25] Although most showed a slight increase from phase I to phase II, there was no significant increase in prevalence of any of these factors that may have explained the increased prevalence of early-onset OM and repeated OM from phase I to phase II (Table 3).

The overall prevalence of early-onset OM was higher for children with more affluent characteristics. But, the greatest increase in the prevalence of early-onset OM from phase I to phase II was observed among impoverished children. Being below poverty (RR = 1.3; 95% CI = 1.03, 1.6), having a low household education (RR = 1.3; 95% CI = 1.05, 1.6), and not having a usual source of care (RR = 1.7; 95% CI = 0.99, 3.0) were associated with a significant increase in the prevalence of early-onset OM. In contrast, there was no significant change in prevalence of early-onset OM from phase I to phase II for children above poverty, having a higher household ed-

TABLE 1. Prevalence of OM, Early-Onset OM, and Repeated OM, for Select Characteristics, NHANES III, 1988–1994

	OM		Early-Onset OM		Repeated OM	
	%	95% CI	%	95% CI	%	95% CI
Overall	68.2	(66.3, 70.1)	43.5	(41.6, 45.4)	38.0	(35.7, 40.4)
Personal characteristics						
Age	*		*		*	
2–11 mo	34.1	(31.7, 36.5)	33.7	(31.3, 36.1)	8.2	(6.9, 9.5)
1 y	71.8	(68.9, 74.7)	56.8	(52.9, 60.7)	36.1	(32.8, 39.3)
2 y	74.7	(72.0, 77.3)	49.3	(45.3, 53.3)	43.0	(38.5, 47.4)
3 y	75.7	(71.8, 79.6)	41.1	(37.1, 45.0)	43.6	(39.3, 48.0)
4 y	70.7	(66.5, 75.0)	36.7	(32.8, 40.6)	44.3	(39.3, 49.3)
5 y	77.2	(73.1, 81.3)	41.4	(35.0, 47.8)	48.8	(43.9, 53.7)
Sex					*	
Male	69.9	(67.2, 72.6)	45.9	(43.4, 48.4)	41.1	(38.2, 44.0)
Female	66.4	(63.8, 69.0)	41.0	(38.5, 43.5)	34.8	(32.1, 37.5)
Race/ethnicity	*		*		*	
White	73.8	(71.6, 76.0)	49.2	(47.0, 51.4)	45.4	(42.3, 48.4)
Black	59.3	(56.5, 62.0)	33.4	(30.4, 36.4)	24.7	(21.6, 27.8)
Other	42.6	(25.3, 60.0)	22.3	(8.6, 36.1)	15.9	(2.3, 29.5)
Hispanic	62.3	(59.4, 65.1)	37.2	(33.9, 40.5)	28.4	(25.4, 31.3)
Household characteristics						
Family poverty status	*		*		*	
Below poverty	61.5	(57.4, 65.7)	37.5	(34.5, 40.6)	31.4	(27.5, 35.3)
At or above poverty	71.6	(69.4, 73.8)	46.4	(44.0, 48.8)	41.7	(39.3, 44.1)
Urban residence						
Urban	66.2	(63.1, 69.3)	40.8	(38.2, 43.5)	35.2	(32.1, 38.2)
Nonurban	70.3	(67.1, 73.4)	46.2	(43.2, 49.2)	40.9	(37.1, 44.7)
Region of the country						
Northeast	71.0	(67.1, 74.8)	43.9	(39.8, 48.0)	40.1	(33.1, 47.1)
Midwest	70.6	(66.8, 74.4)	45.6	(42.8, 48.3)	40.1	(37.3, 42.9)
South	67.4	(64.5, 70.4)	44.1	(40.1, 48.0)	37.3	(33.5, 41.1)
West	64.7	(59.4, 70.0)	40.2	(37.5, 42.9)	35.2	(29.2, 41.2)
Head of household education	*		*		*	
<High school graduate	63.7	(59.6, 67.8)	40.4	(36.5, 44.3)	33.6	(29.3, 38.0)
High school graduate	67.2	(64.2, 70.1)	41.4	(38.7, 44.0)	36.7	(34.0, 39.4)
>High school graduate	71.8	(68.5, 75.0)	47.2	(43.9, 50.4)	41.9	(38.3, 45.4)
Fireplace use past 12 mo	*				*	
Yes	76.0	(72.8, 79.2)	48.2	(43.7, 52.7)	44.3	(40.0, 48.5)
No	66.1	(64.0, 68.1)	42.1	(40.0, 44.2)	36.3	(33.8, 38.8)
Child care attendance	*		*		*	
≥10 h/wk	81.3	(79.2, 83.4)	51.0	(47.2, 54.8)	50.6	(46.9, 54.2)
<10 h/wk	78.2	(72.8, 83.7)	42.2	(34.9, 49.4)	50.9	(42.9, 58.8)
No child care	60.6	(58.2, 63.0)	40.3	(38.2, 42.3)	30.2	(28.4, 32.1)
Health characteristics						
Stuffy, itchy, runny nose past 12 mo	*		*		*	
Yes	74.7	(72.8, 76.6)	48.9	(46.6, 51.1)	43.9	(41.4, 46.5)
No	56.0	(52.4, 59.7)	33.6	(29.7, 37.4)	26.9	(23.3, 30.5)
Watery, itchy eyes past 12 mo	*		*		*	
Yes	77.1	(74.9, 79.3)	51.5	(48.7, 54.4)	47.6	(43.8, 51.4)
No	64.2	(61.9, 66.5)	40.0	(37.6, 42.4)	33.7	(31.3, 36.2)
Smoked during pregnancy					*	
Yes	71.5	(68.2, 74.7)	47.9	(43.6, 52.2)	44.3	(39.7, 48.9)
No	67.2	(64.9, 69.5)	42.3	(40.1, 44.5)	36.2	(33.8, 38.6)
Age stopped breastfeeding			*			
Never breastfed	66.1	(63.4, 68.9)	41.6	(38.9, 44.3)	36.6	(33.2, 40.0)
≤3 mo	69.6	(66.6, 72.7)	48.6	(45.2, 51.9)	38.2	(34.6, 41.8)
>3 mo	71.2	(67.3, 75.1)	42.8	(39.2, 46.4)	40.6	(35.8, 45.3)
Ever have asthma	*		*		*	
Yes	81.8	(76.7, 86.8)	56.1	(49.2, 63.1)	52.1	(45.0, 59.3)
No	67.4	(65.4, 69.4)	42.7	(40.8, 44.6)	37.1	(34.7, 39.5)
Have a particular place for health care	*		*		*	
Yes	69.0	(67.0, 71.0)	44.3	(42.4, 46.2)	38.5	(36.2, 40.8)
No	53.7	(46.7, 60.7)	28.2	(21.8, 34.7)	28.8	(23.0, 34.7)

* P value <.05 for comparison of characteristic with OM, early-onset OM, or repeated OM.

ucation, and having a usual source of care. Similar characteristics were present for the increased prevalence in diagnosis of repeated OM over the 6 years. There was a significant increase in repeated OM for children below poverty (RR = 1.6; 95% CI = 1.2, 2.1) and having a low household education (RR = 1.7; 95% CI = 1.3, 2.1). The increased prevalence of repeated OM for children who reported not having a usual source of care (RR = 1.6; 95% CI = 0.96, 2.7) was not statistically significant, but had a higher RR than children with a usual source of care (Table 4).

Because the greatest increase in early-onset OM and repeated OM occurred among impoverished children, we examined the prevalence of risk factors that may help explain the increased prevalence among these children. Although there were no sig-

TABLE 2. Prevalence of OM, Early-Onset OM, and Repeated OM, by Phase of Survey, NHANES III, 1988–1994

	Phase I (1988–1991)	Phase II (1991–1994)	Unadjusted			Adjusted*		
			RR	95% CI	*P* Value	OR	95% CI	*P* Value
OM	66.7%	69.7%	1.0	(.97, 1.1)	.21	1.1	(.99, 1.1)	.09
Early-onset OM	41.1%	45.8%	1.1	(1.01, 1.2)	.03	1.1	(1.03, 1.2)	.01
Repeated OM	34.8%	41.1%	1.2	(1.04, 1.3)	.01	1.2	(1.1, 1.4)	.003

* Analyses were adjusted for age, sex, race, poverty status, urban status, region, education of head of household, fireplace use, child care attendance, have allergic symptoms, prenatal smoking, breastfeeding, ever have asthma, and have a particular place for health care.

TABLE 3. Prevalence of Independent Risk Factors by Phase of Survey, NHANES III, 1988–1994

	Phase I (1988–1991)	Phase II (1991–1994)	RR	95% CI	*P* Value
Child care use	27.5%	30.6%	1.1	(.9, 1.3)	.22
Stuffy, itchy, runny nose past 12 mo	67.5%	63.0%	0.9	(.8, 1.04)	.17
Watery, itchy eyes past 12 mo	29.8%	31.7%	1.0	(.9, 1.1)	.34
Early breastfeeding termination	72.5%	70.8%	1.0	(.8, 1.1)	.64
Asthma	5.7%	6.1%	1.0	(.9, 1.2)	.62
Access to health care	94.4%	95.4%	1.1	(.8, 1.5)	.44

TABLE 4. Prevalence of Early-Onset OM and Repeated OM, by Protective Factors, by Phase of Survey, NHANES III, 1988–1994

	% Early-Onset OM		RR	95% CI	*P* Value	% Repeated OM		RR	95% CI	*P* Value
	Phase I (1988–1991)	Phase II (1991–1994)				Phase I (1988–1991)	Phase II (1991–1994)			
Poverty status										
Below poverty	32.5%	41.7%	1.3	(1.03, 1.6)	.03	23.7%	37.8%	1.6	(1.2, 2.1)	.002
Above poverty	44.7%	48.0%	1.1	(.96, 1.2)	.20	39.9%	43.4%	1.1	(.96, 1.2)	.17
Education of head of household										
<High school	34.8%	45.5%	1.3	(1.05, 1.6)	.02	24.9%	41.7%	1.7	(1.3, 2.1)	.001
High school graduate	41.1%	41.6%	1.0	(.9, 1.2)	.88	36.7%	36.7%	1.0	(.8, 1.2)	.98
>High school graduate	44.8%	49.5%	1.1	(.9, 1.3)	.26	38.8%	45.0%	1.2	(.97, 1.4)	.11
Have a usual source of care										
Yes	42.2%	46.3%	1.1	(.99, 1.2)	.06	35.5%	41.3%	1.2	(1.03, 1.3)	.02
No	21.1%	36.2%	1.7	(.99, 3.0)	.04	22.5%	36.2%	1.6	(.96, 2.7)	.06

nificant increases in prevalence for any of the risk factors in the overall sample, there was a significant increase in the report of watery, itchy eyes in the past 12 months from phase I to phase II for children below poverty (22.6%–30.2%; $P = .002$). No other recognized risk factors significantly increased for these children (Table 5).

DISCUSSION

These data indicate that there has been an 11% increase in the prevalence of early-onset OM (first episode at <12 months of age) and an 18% increase in the prevalence of repeated OM (≥3 episodes) among children <6 years of age in the United States from 1988–1991 to 1991–1994. This increased prevalence translates to an excess of 561 000 children with early-onset OM and 720 000 children with repeated OM in 1991–1994. Although there is controversy over the treatment and adverse consequences of OM, the observed increase in prevalence emphasizes the importance of improving our understanding of the epidemiology, diagnosis, and treatment of this common pediatric infection.

This study identified several characteristics of children that are associated with increased risk of OM, early-onset OM, and repeated OM. In particular, age, being male, white race, using child care, having allergic conditions, and ever having asthma were independently associated with these outcomes. These findings are consistent with previous studies.[9,12–14,16,21] We also found that having a particular place for health care was independently associated with higher rates of these 3 outcomes. We did not find breastfeeding to be protective against OM and there have been other studies that also have not found such an effect.[26–28] The fact that we did not

TABLE 5. Prevalence of Risk Factors for Children Below Poverty, by Phase of Survey, NHANES III, 1988–1994

	Phase I (1988–1991)	Phase II (1991–1994)	RR	95% CI	*P* Value
Child care use	17.2%	21.9%	1.1	(.9, 1.4)	.19
Stuffy, itchy, runny nose past 12 mo	56.8%	54.0%	1.0	(.8, 1.1)	.52
Watery, itchy eyes past 12 mo	22.6%	30.2%	1.2	(1.1, 1.3)	.002
Early breastfeeding termination	84.2%	82.4%	0.9	(.7, 1.2)	.68
Asthma	8.4%	9.1%	1.0	(.9, 1.2)	.64
Access to health care	89.2%	92.0%	1.2	(.8, 1.7)	.36

find breastfeeding to be protective for OM may be attributable in part to our broad categorical definition of breastfeeding. Given that almost half of the children in the study were never breastfed, we chose to categorize the variable to account for the skewness of the data.

Given that the prevalence of early-onset OM and repeated OM remained statistically significant even after controlling for identifiable risk factors suggests that there are reasons for the increases in prevalence other than the known risk factors that we studied. This was verified by the fact that the prevalence of risk factors for OM, specifically child care use, having allergic conditions, lower breastfeeding duration, asthma, and access to care did not increase from 1988–1991 to 1991–1994.

The overall prevalence of early-onset OM and repeated OM was higher for children with more affluent characteristics, but these data indicate that the differences in the prevalence of these outcomes by socioeconomic status are diminishing. The greatest increases in prevalence of early-onset OM and repeated OM from phase I to phase II occurred among children from a lower socioeconomic status. Although most studies have found a lower rate of OM among children from a lower socioeconomic status, Paradise et al[14] reported that lower socioeconomic status was a risk factor for middle ear effusion in a prospective cohort study. Thus, the lower rate of OM observed in earlier studies could be attributable to underdiagnosis or underreporting in poor children. If so, the increasing rates of OM observed among children from lower socioeconomic status may be attributable to an increasing recognition of OM by their parents and practitioners. This increase may reflect a lag in the increase observed earlier among higher socioeconomic children.[9] There also was a significant increase in the prevalence of reported allergic conditions (watery, itchy eyes) among these children that may have contributed to an increase in these outcomes.

The increased prevalence may also be attributable to a change in management practice among physicians, particularly for those providing care to less affluent children. Pediatricians have reported parental pressure as a major contributor to the unnecessary prescribing of antibiotics and encourage parental education about the appropriate indications for antibiotics.[29] Physicians practicing in lower income settings may be experiencing increasingly greater time pressures that encourage prescribing antibiotics under parental pressure or may have other barriers to convincing families that antibiotics may not be appropriate. Edwards et al[30] reported that parents in urban settings were more likely to have their child discharged by a physician without antibiotics only to go soon afterward to another health facility to obtain antibiotics, suggesting that although some physicians may avoid prescribing antibiotics for children, parents are persistent in their search. Alternatively, prescribing practices common among more affluent families may be becoming more common among impoverished families.

Although the Centers for Disease Control and Prevention antibiotic use guidelines for acute OM were not published until 1999,[31] a recent study has shown that population-based antibiotic prescription rates have decreased during the 1990s;[32] however, an upward trend in more expensive, broad-spectrum antimicrobial drugs occurred from 1980 to 1992, during the time which most of the NHANES III survey was conducted.[33] Because OM is the most frequent diagnosis for which physicians prescribe antibiotics to children, misdiagnosis or overdiagnosis may have significant consequences for patients. These may include increasing rates of antibiotic-resistant bacterial pathogens, reduced effectiveness of antibiotics for OM and other infections, and unnecessary medical costs. Although there is no data showing that a shift in diagnostic practice has occurred over these 6 years, if true, these findings emphasize the need to examine and improve the current diagnostic and management practices for OM among physicians providing care to children in these settings.

We identified an increase in allergic conditions (watery, itchy eyes) among poor children as a possible explanation for the increased prevalence of OM. There is no apparent reason for this increase, but it is likely to result from the same factors that led to the increasing prevalence of asthma among poor minority children, including environmental exposures to allergens and pollutants, changing patterns of medication, and psychosocial stresses of living in poor inner-city neighborhoods.[34] Although this study did not find a significant increase in the report of ever having asthma, several studies have found an increase nationally in the prevalence of asthma over the past 3 decades.[35–37]

There are limitations to this study that need to be addressed. The diagnosis of OM was based on parental report of physician's diagnosis. Recall bias is always a potential factor in survey questionnaires, and although unavoidable, we tried to minimize this by limiting the analyses to <6 year olds. Prior studies have shown parental agreement with the child's medical records to be fairly accurate with a κ statistic of .55 to .69 and over half of parents surveyed reporting within ± 1 episode of the number reported for otitis in the child's medical record.[38,39] Parents tend to overestimate the number of OM episodes when reporting 6 or more episodes compared with the medical record, whereas those who report fewer episodes underestimate the number.[38,40] Still, we do not suspect this to significantly affect our conclusions unless there were differences in reporting by the 2 phases of the survey. Given that the questions were worded identically between the 2 phases, this is unlikely. Another limitation is that earaches were included in our definition of OM because the wording of the question to parents did not differentiate ear infections from earaches. This may result in overestimating the reported prevalence of our outcomes for both phases of the survey, but this would not alter our findings of an increase in early-onset OM and repeated OM from phase I to phase II. Also, potential sampling variability from phase I to phase II may introduce some error and result in lower or higher estimates of prevalence. Lastly, we identified allergic

conditions broadly as having a stuffy, itchy, or runny nose or having watery, itchy eyes in the past 12 months. Although it would have been preferable to have skin test results, these were not available in this survey for children <6 years. It is less clear for younger children, but older children with allergic rhinitis or asthma are significantly more likely to have skin test hypersensitivity.[41] Despite these potential limitations, this study is consistent with other research that has shown an increase in clinic visits for OM through the 1980s.

Studies that examine and compare diagnostic and management practices of OM by physicians in lower income and more affluent settings may help explain some of the findings of this study. Although these data do not help us clearly understand the reasons for the increased prevalence of early-onset OM and repeated OM, the fact that there was an increase over contiguous time periods with two 3-year intervals is important. We had shown previously that the national prevalence of repeated OM increased through the 1980s and this study indicates that the prevalence has continued to increase through the 1990s as well as the prevalence of early-onset OM.

It should be recognized that this study was conducted before more widespread use of vaccines that may be efficacious against OM, particularly the pneumococcal and influenza vaccines. The rate of OM is likely to change following widespread immunization of children with these vaccines.[42–44] Indeed, this survey may be suited to provide national estimates of any reductions in OM following the introduction of vaccines that lower the rate of OM.

CONCLUSIONS

There has been a significant increase in the prevalence of early-onset OM and repeated OM among children <6 years of age in the United States. Further research to investigate a change in management practice or an increase in allergic conditions among poor children may help explain the change in prevalence of early-onset OM and repeated OM and needs to be closely examined.

ACKNOWLEDGMENTS

This work was funded, in part, by the Institutional National Research Service Awards (1T-32 PE-10027 and 2T-32 PE-12002) from the Bureau of Health Professions, Health Resources and Services Administration, Public Health Service, Department of Health and Human Services.

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DOCTORS-IN-TRAINING ORGANIZE UNION

"Many residents and interns, the hospital's doctors-in-training, say the pressure to do more with less is compromising their medical education and patient care, and they are trying to unionize, still an extreme rarity in American hospitals.

Officials at Montefiore (Medical Center in the Bronx) dispute the complaints, and unlike the handful of other hospitals around the city where doctors have organized in recent years, Montefiore is waging an aggressive campaign against the union drive. . . The idea of a union remains alien to most doctors and hospitals. . . Until recently, the National Labor Relations Board viewed interns and residents as students more than employees. As a result, they did not have the rights that federal law grants almost all worker groups: to unionize by a majority vote, in an election overseen by the board, with management obliged to recognize and bargain with the resulting union. Residents' and interns' only real leverage to force management's recognition was to strike, an almost unheard-of step.

Then, in 1999, in a case involving Boston Medical Center, the labor board overturned its policy, and ruled that residents and interns were entitled to the same protections as other employee groups. Since then, those doctors have unionized at only about a dozen hospitals around the country, half of them in New York City, according to the Committee of Interns and Residents, an arm of the Service Employees International Union."

Perez-Pena R. *New York Times*. March 31, 2003

Noted by JFL, MD