

# Black-White Differences in Health Care Utilization Among US Children With Frequent Ear Infections

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**ABSTRACT.** *Objective.* To examine differences in patterns of and barriers to health care utilization between black and white children who have frequent ear infections (FEI).

*Methods.* Analysis was conducted using the 1997 and 1998 National Health Interview Survey-Sample Child Files. Data on 25 497 children under 18 years of age and 1985 who were reported by the parent/guardian to have had "3 or more ear infections during the past 12 months" were analyzed. The data were weighted and analyzed to represent all black and white children nationwide, accounting for the complex survey design.

*Results.* Of white and black children under 18 years of age in the United States, 8.0 and 6.6%, respectively, had FEI in the past year. Among those with FEI, whites and blacks exhibited significantly different patterns in the type of health insurance they had and in the usual source of care. After accounting for sociodemographic factors, health insurance, and usual source of care, there were still significant differences in health care use between whites and blacks. The affected black children had an increased risk of getting delayed care because of transportation problems (odds ratio [OR]: 2.32) and a reduced likelihood of seeing a medical specialist (OR: 0.49) and having surgery (OR: 0.39) in comparison to white children.

*Conclusion.* Although black children with FEI were as likely as white children to be covered by health insurance and have a usual place of health care, they were significantly more likely to face barriers in obtaining the care, especially the more specialized care. *Pediatrics* 2002; 109(5). URL: <http://www.pediatrics.org/cgi/content/full/109/5/e84>; racial disparity; health care utilization; frequent ear infection.

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ABBREVIATIONS. OM, otitis media; FEI, frequent ear infections; NHIS, National Health Interview Survey; OR, odds ratio; CI, confidence interval; NHCS, National Health Care Survey.

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Otitis media (OM) is the most common childhood bacterial infection in the United States,<sup>1</sup> as well as the most frequently diagnosed childhood disease.<sup>2</sup> It has been estimated that by age 3, about 75% of children will have had at least 1 episode of acute OM, and more than one third will have had 3 or more episodes.<sup>3</sup> More recent studies indicate that the cumulative incidence of OM may be even higher, with at least 90% of children having 1 or more bouts of symptomatic or asymptomatic middle ear effusion by the age of 2 years.<sup>4</sup>

Frequent ear infections (FEI) are a special concern because of the potential for long-term consequences to the child, as well as the impact on the health care system. Whether repeated episodes of OM are causally related to future speech and developmental delays or hearing impairments remains unsettled.<sup>5</sup> However, FEI can cause transient hearing loss, with some studies showing effects on speech and language acquisition.<sup>6,7</sup> Moreover, chronic ear infections may be making an increased contribution to serious hearing impairments among children. Two surveillance reports of hearing impairments in metropolitan Atlanta indicated that chronic OM was not a factor for bilateral hearing impairment among children born in the mid-1970s, but was a factor in 6% of cases among children born in the 1980s.<sup>8,9</sup> In terms of the financial impact, the total cost for treatment of OM is an estimated \$5.3 billion annually, with much of that cost attributable to those with FEI.<sup>10</sup>

Several risk factors have been associated with FEI in both epidemiologic and clinical studies. Among the most commonly identified environmental risk factors are child care attendance,<sup>11-14</sup> lack of breastfeeding,<sup>14-16</sup> and parental smoking.<sup>14,17-19</sup> Demographic variables consistently shown to be related to repeated ear infections include male sex, age <3 years, and early age at first episode of OM.<sup>20-24</sup> Observations on whether there are racial differences in the prevalence of OM vary. Although clinic-based research and survey data from national samples indicated that black children were less likely than white children to have either acute OM or FEI,<sup>13,21-23</sup> other researchers, using active surveillance, monthly study visits, and objective diagnostic criteria, found similar rates of OM during the first 2 years of life.<sup>4,25</sup> They speculated that racial disparities observed in other studies may be attributable to differential access to health care, differential rates of detecting OM, or both.<sup>4,24,25</sup>

A number of studies have highlighted racial dis-

parities in access to care for children. Black children were less likely to have a regular source of care and less likely to have an office-based source of care than white children.<sup>26–29</sup> According to the 1996 Medical Expenditure Survey, black children were less likely than white children to have had any form of health care visits with the exception of an inpatient hospital stay.<sup>30</sup> Although a recent study indicated that white children with FEI were more likely than black children to have had tympanostomy tubes inserted,<sup>31</sup> there has been relatively little work on the issue of racial differences related to various aspects of health care utilization among children with FEI. Because of the high prevalence of this condition, and its repercussions for appropriate treatment, outcomes, and health care costs, there is a need to better understand the gaps in our treatment of children with FEI.

The purpose of this article is to examine patterns of and reasons for racial differences in access to care and use of medical services among children with a common childhood illness using data from the 1997 and 1998 National Health Interview Surveys (NHIS). We provide national prevalence estimates for FEI among children and present a comparison, by race, of various measures of utilization among children with FEI.

## METHODS

### Data

The NHIS is an ongoing annual household survey of the civilian, noninstitutionalized US population, conducted by the National Center for Health Statistics. Households are selected randomly within a multistage probability design involving geographically defined primary sampling units to obtain a nationally representative sample. The latest redesigned version of the NHIS questionnaire began in 1997 and included a randomly selected sample child (if there are children under age 18) from each of the sampled households. Basic health and health care information about the sample child was obtained from a knowledgeable adult in the household, usually the mother. Details of the survey for 1997 and 1998 are available on the respective years' Public Use Data documentation.<sup>32</sup> The overall response rates for the Sample Child questionnaire were 84.3% for 1997 and 82.4% for 1998. All health and health care variables of the sample child and the parents' demographic information were extracted from the Sample Child File, and the health insurance variables were extracted and recoded for the sample child from the Person File which contains health insurance information for all members of the family.

The combined data from 1997 and 1998 had a total of 25 497 black and white sample children under age 18. Of these, 1985 were reported as having FEI, ie, the children "have had 3 or more ear infections during the past 12 months." Although health insurance coverage status was asked as of at the time of the interview, all other health care access and utilization questions were asked retrospectively for the past 12 months.

### Analysis

The data were analyzed using Sudaan,<sup>33</sup> a statistical program for analysis of data with a complex survey design. Annual sample weights from the 2 survey years were divided by 2 to compute average annual estimates for the 2-year period. To measure the extent of racial disparity in health care use associated with FEI, multivariate logistic regressions were run on the sample children with FEI. Various health care utilization outcomes were used as dependent variables, and race was the independent variable of interest. Sudaan Logistic procedure was used for dichotomous outcome variables and Multilog procedure was used for polychotomous outcome variables, namely the health insurance status and the usual source of care. In computing adjusted odds ratios, other potential confounding variables were added as independent

variables. These sociodemographic confounders included age, sex, mother's education level, whether living with both parents or not, family poverty status, geographic region, and metropolitan statistical area designation of the child's residence. None of these variables created any significant multicollinearity problem in the final model. Comorbid conditions were also added to the multivariate model to see their impacts on the health care utilization outcomes. The analysis was conducted for all children under age 18 as well as for a subgroup of children under age 6. Because the results were basically the same other than the magnitude of statistical power, we present the findings for all children, thereby increasing the statistical power.

## RESULTS

The prevalence of FEI in the last 12 months among children under age 18, as reported by parents, was 8.0% for whites and 6.6% for blacks, differing significantly by race ( $P = .006$ ; Table 1). The prevalence was highest among children <3 years old and significantly decreased with age for both races. For both races, the prevalence was also highest among those who had public health insurance and whose family income was below the poverty threshold. On the other hand, significant racial differences in the prev-

**TABLE 1.** Prevalence of FEI in Children <18 Years of Age by Race According to Selected Characteristics: United States, 1997 and 1998

Selected Characteristics	White ( <i>n</i> = 20 889)		Black ( <i>n</i> = 4608)	
	%	95% CI	%	95% CI
All	8.0	(7.6–8.4)	6.6	(5.6–7.6)*
Gender				
Male	8.1	(7.5–8.7)	7.1	(5.7–8.5)
Female	8.0	(7.4–8.6)	6.1	(4.9–7.3)*
Age				
<3 y	17.1	(15.7–18.5)	14.1	(11.4–16.8)
3–5 y	12.0	(10.6–13.4)	11.9	(8.8–15.0)
6–10 y	6.4	(5.8–7.0)	4.3	(3.1–5.5)*
11 or older	3.6	(3.2–4.0)	3.0	(1.8–4.2)
Has had health problems				
Yes	10.6	(9.8–11.4)	9.8	(8.0–11.6)
No	6.8	(6.4–7.2)	5.0	(4.0–6.0)*
Health insurance				
Private only	7.3	(6.7–7.9)	4.7	(3.7–5.7)*
Public only	11.8	(10.4–13.2)	9.6	(8.0–11.2)
Both private and public	16.9	(11.4–22.4)	7.5	(0.0–15.7)
Uninsured	6.9	(5.7–8.1)	4.1	(2.1–6.1)
Mother's education				
<12 y	7.6	(6.6–8.6)	7.6	(5.1–10.1)
12 y	8.1	(7.3–8.9)	8.0	(6.2–9.8)
13–15 y	8.3	(7.5–9.1)	5.9	(4.5–7.3)*
16+ y	8.2	(7.2–9.2)	4.7	(2.9–6.5)*
Live with both parents				
Yes	7.8	(7.2–8.4)	5.2	(4.0–6.4)*
No	8.7	(7.7–9.7)	7.6	(6.4–8.8)
Family poverty status				
Below poverty threshold	10.5	(8.9–12.1)	9.3	(7.1–11.5)
100% to <200%	8.2	(7.2–9.2)	7.8	(6.0–9.6)
200% or above	8.0	(7.4–8.6)	4.2	(3.2–5.2)*
Region				
Northeast	8.3	(7.3–9.3)	6.5	(4.9–8.1)
Midwest	7.8	(7.0–8.6)	7.5	(5.1–9.9)
South	9.0	(8.0–10.0)	6.4	(5.2–7.6)*
West	6.7	(5.9–7.5)	6.1	(3.4–8.8)
Metropolitan statistical area				
Large†	7.5	(6.9–8.1)	5.8	(4.8–6.8)*
Small	8.3	(7.5–9.1)	8.2	(6.4–10.0)
Nonmetropolitan statistical area	8.7	(7.9–9.5)	6.8	(4.1–9.5)

\*  $P < .05$  for white-black difference.

† Population of 1 000 000 or more.

alence of FEI were noted for the following family characteristics: having private health insurance; mother's education beyond high school; living with both parents; and a family income at or above 200% poverty level. In all of these subgroups, white children had a significantly higher prevalence of FEI than black children. In terms of geographic location, those living in the South region and those in large metropolitan statistical areas exhibited significant racial differences in the prevalence of FEI.

Comorbidity in children with FEI is displayed in Table 2. Chronic/serious conditions included Down syndrome, cerebral palsy, muscular dystrophy, cystic fibrosis, sickle cell anemia, autism, diabetes, arthritis, congenital heart disease, and other heart conditions. For all the comorbid condition types asked, more black children with FEI were affected than white children with FEI, especially by asthma. Twenty-six percent of black children with FEI were reported to have ever had asthma compared with 16% of white children with FEI ( $P = .003$ ).

The current analysis indicated that children with FEI had better access to health care than the general population of children (data not shown). Although the rate of uninsurance among all children was 12% (same for whites and blacks), it was 10% among children with FEI. Fewer children with FEI did not have a usual source of care (3%) in comparison to 6% of all children (5% for whites and 7% for blacks). Focusing on children with FEI (Table 3), the results show that black children with FEI were as likely as whites to be insured (90% vs 92%) and to have a usual source of care (97% for whites and blacks, similarly). However, the type of health insurance and the place of care differed significantly by race. Black children with FEI were predominantly covered by public health insurance (58%), mostly in the form of Medicaid, whereas white children with FEI were predominantly covered by private health insurance (65%) and went to a doctor's office or health maintenance organization for care (76%). Twice as many black children with FEI (36%) than white children with FEI (18%) went to a clinic or health center when sick. On health care utilization variables, black children with FEI exhibited consistently worse experiences in comparison to white children, with the exception of getting a physical check-up including well-infant care.

The results from logistic regressions on health care access and utilization outcomes are shown in Table 4. Two sets of adjusted odds ratios (OR) are shown—

one controlling for sociodemographic factors and another further controlling for health insurance status and usual source of care. After controlling for sociodemographic factors, black children with FEI were twice as likely as whites to have public health insurance, but significant racial differences in the type of place used by the affected children for medical care disappeared. Adding health insurance status and usual source of care to the model further diminished the differences in health care use between whites and blacks. However, 3 health care use outcomes remained as having significant racial disparities. These were an increased risk of getting delayed care because of transportation problems (OR: 2.32, 95% confidence interval [CI]: 1.14–4.72) and a reduced likelihood of seeing a medical specialist (OR: 0.49, 95% CI: 0.31–0.79) and getting a surgery (OR: 0.39, 95% CI: 0.22–0.70) for black children with FEI in comparison to white children with FEI. Adding comorbid conditions to the model produced very similar results, and thus they are not shown separately.

Because health insurance coverage is an important factor associated with use of health services, health care utilization among children with FEI was examined by race and health insurance status (Fig 1). Having seen a general doctor or having had a physical check-up in the past year did not differ significantly by race nor by health insurance status. Children who were uninsured tended to fare worse on getting specialized care, getting prescription drugs, or getting care on time within each race group; and the black children fared significantly worse than the white children on these outcomes regardless of health insurance status. Black children with FEI who were uninsured, although small in number, were especially at high risk of not getting health care. Virtually none of the affected black children who were uninsured had a surgery in the past year, whether it was for FEI or for some other reason. The impact of having comorbid conditions on getting subspecialty care was also examined although not shown. Having other health conditions in addition to FEI elevated the likelihood of having seen a medical specialist. However, regardless of having comorbid conditions, the white children were more likely to have seen a medical specialist and have had surgery than the black children.

## DISCUSSION

The NHIS's Sample Child files, especially after combining 2 years worth of data, afforded a rich data

**TABLE 2.** Prevalence of Comorbidity in Children <18 Years of Age With FEI: United States, 1997 and 1998

Health Conditions	White ( $n = 1693$ )		Black ( $n = 292$ )	
	%	95% CI	%	95% CI
Chronic/serious condition (ever had)	4.6	(3.2–6.0)	5.9	(2.4–9.4)
Asthma (ever had)	15.7	(13.5–17.9)	26.0	(19.7–32.3)*
Allergies and common infections (past 12 mo)	28.0	(25.5–30.5)	34.4	(27.1–41.7)
A condition for which prescription drug was taken for 3+ mo (currently)	14.6	(12.6–16.6)	18.1	(13.2–23.0)
Any of the above conditions	43.2	(40.5–45.9)	49.6	(42.7–56.5)

\*  $P < .05$  for white-black difference.

**TABLE 3.** Percent Health Care Access and Utilization Among Children <18 Years of Age With FEI by Race: United States, 1997 and 1998

Health Care Access and Utilization Variables	White ( <i>n</i> = 1693)		Black ( <i>n</i> = 292)	
	%	95% CI	%	95% CI
Health care access				
Current health insurance status				
Private only	65.1	(62.2–68.0)	31.9	(26.0–37.8)*
Public only	21.8	(19.3–24.3)	58.1	(51.4–64.8)*
Both	2.9	(1.9–3.9)	2.1	(0.0–4.5)
Uninsured	10.2	(8.4–12.0)	7.9	(4.4–11.4)
Had a gap in health care coverage in past year	6.2	(4.8–7.6)	6.8	(2.9–10.7)
Usual source of care				
Clinic or health center	18.1	(15.7–20.5)	35.8	(28.7–42.9)*
Doctor's office or health maintenance organization	75.8	(73.3–78.3)	56.7	(50.0–63.4)*
Hospital emergency room or other	2.7	(1.7–3.7)	4.7	(2.5–6.9)
No usual source of care	3.3	(2.3–4.3)	2.8	(0.3–5.3)
Health care use during the past 12 mo				
Could not afford prescription medication	3.5	(2.5–4.5)	9.0	(5.3–12.7)*
Got delayed care because				
Could not get through on phone	4.2	(3.0–5.4)	7.7	(4.2–11.2)
Could not get appointment soon enough	6.4	(5.0–7.8)	9.5	(5.4–13.6)
Wait too long in doctor's office	6.0	(4.6–7.4)	10.9	(6.0–15.8)
Not open when you could go	5.5	(4.3–6.7)	6.7	(3.2–10.2)
No transportation	3.1	(2.1–4.1)	13.1	(8.2–18.0)*
Any of the above reasons	13.6	(11.8–15.4)	24.3	(17.8–30.8)*
Has had a physical check-up	84.0	(81.8–86.2)	89.5	(85.0–94.0)
Has seen a general doctor	90.6	(88.8–92.4)	86.6	(81.7–91.5)
Has seen a medical specialist	27.6	(25.2–30.0)	14.4	(9.9–18.9)*
Has had inpatient or outpatient surgery	15.0	(13.2–16.8)	6.6	(3.3–9.9)*

\* *P* < .05 for white-black difference.

**TABLE 4.** OR for Health Care Access and Utilization Among US Children <18 Years of Age With FEI

Health Care Access and Utilization Variables	Odds Ratios for Blacks in Comparison to Whites					
	Unadjusted		Adjusted for [1], [2], [3]		Adjusted for [1], [2], [3], [4]	
	OR	95% CI	OR	95% CI	OR	95% CI
Health care access						
Current health insurance status						
Private only	0.63	(0.37–1.07)	1.07	(0.59–1.96)	—	—
Public (with or without private)	3.14	(1.84–5.35)*	1.90	(1.04–3.49)*	—	—
Uninsured	1.00	—	1.00	—	—	—
Had a gap in health care coverage in past year	1.10	(0.57–2.11)	0.67	(0.29–1.51)	—	—
Usual source of care						
Clinic or health center	1.59	(0.89–2.83)	1.97	(0.99–3.92)	—	—
Doctor's office or health maintenance organization	0.60	(0.37–0.99)*	0.91	(0.48–1.70)	—	—
No usual source of care or emergency room	1.00	—	1.00	—	—	—
Health care use during the past 12 mo						
Could not afford prescription medication	2.72	(1.60–4.65)*	1.73	(0.93–3.19)	1.86	(0.97–3.56)
Got delayed care because						
Could not get through on phone	1.90	(1.05–3.44)*	1.24	(0.63–2.42)	1.18	(0.58–2.40)
Could not get appointment soon enough	1.53	(0.91–2.57)	1.23	(0.68–2.25)	1.15	(0.62–2.12)
Wait too long in doctor's office	1.92	(1.11–3.30)*	1.54	(0.85–2.79)	1.42	(0.77–2.59)
Not open when you could go	1.23	(0.65–2.31)	0.88	(0.42–1.86)	0.86	(0.44–1.79)
No transportation	4.68	(2.63–8.32)*	2.47	(1.23–4.93)*	2.32	(1.14–4.72)*
Any of the above reasons	2.03	(1.36–3.02)*	1.64	(1.04–2.58)*	1.52	(0.96–2.41)
Has had a physical check-up	1.62	(0.97–2.70)	1.89	(1.07–3.33)*	1.81	(0.98–3.32)
Has seen a general doctor	0.67	(0.42–1.09)	0.74	(0.43–1.28)	0.70	(0.40–1.21)
Has seen a medical specialist	0.44	(0.30–0.65)*	0.53	(0.33–0.84)*	0.49	(0.31–0.79)*
Has had inpatient or outpatient surgery	0.40	(0.23–0.71)*	0.42	(0.23–0.76)*	0.39	(0.22–0.70)*

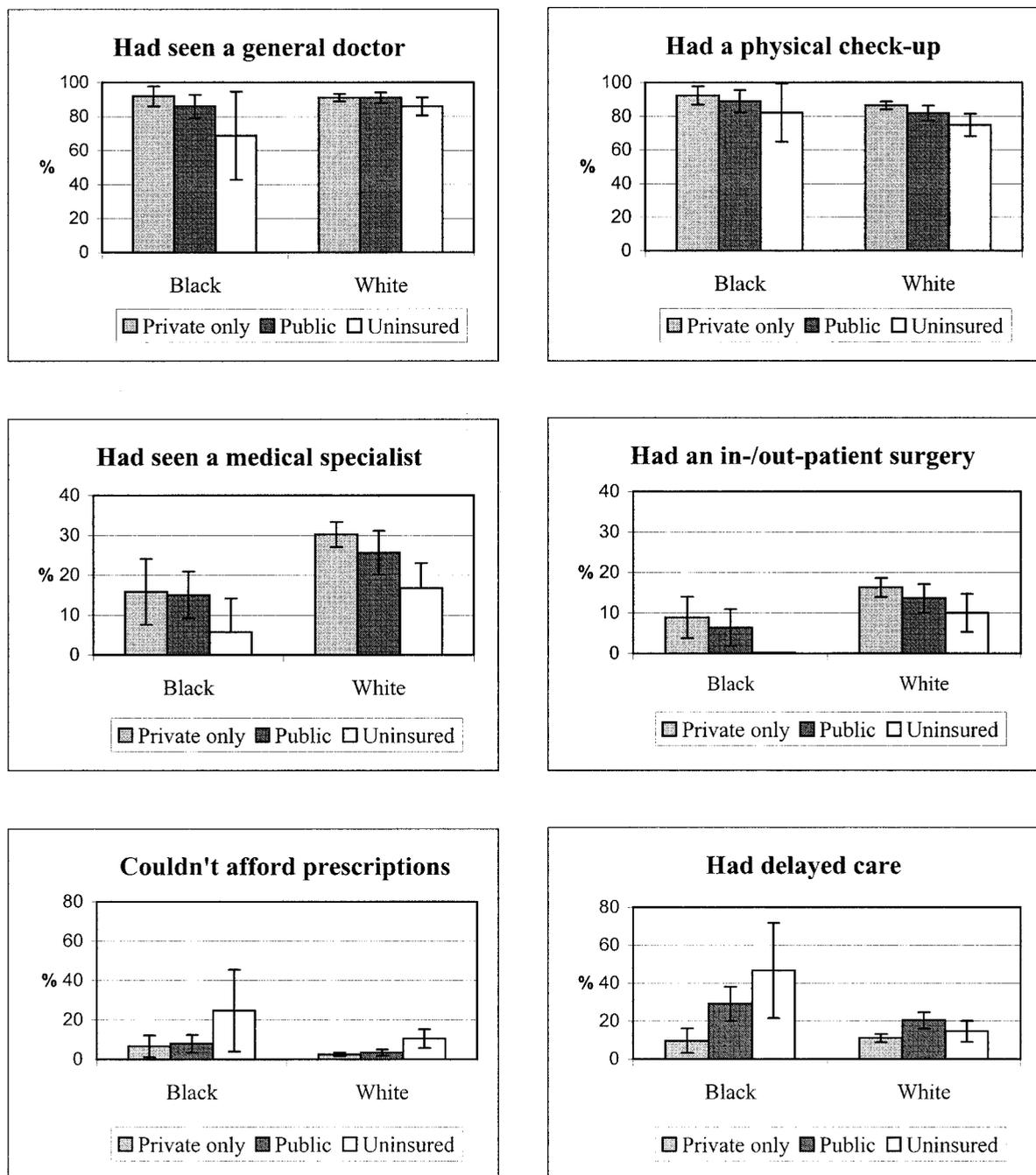
[1] Age, sex; [2] mom's education, have both parents or not, poverty status; [3] geographic region, MSA; [4] health insurance, usual source of care.

\* *P* < .05.

set on a nationally representative sample of children containing a number of sociodemographic variables and health care access and use variables not available in clinical data sets. Because blacks were oversampled, our analysis was able to investigate racial disparities in health care utilization for a specific

condition—FEI—with statistical reliability. The NHIS has a known high response rate, and the survey weights used in the analysis adjust for nonresponse to remove some of the nonrespondent bias.

Despite the existence of a rich literature on OM and the recognition that OM is the most common



Note: I indicates 95% confidence intervals.

Fig 1. Percentage of children with FEI who experienced these 6 health care events during the past 12 months, by race and health insurance status.

childhood infection, there are very few reports on the population-based prevalence of the disease. Most reports of prevalence or incidence of OM come from clinical settings of selectively defined subgroups of children and in the form of cumulative incidence of episodes or cumulative percent of days affected. About the only source of recent population-based prevalence estimates of OM known to the authors is the NHIS.

As such, the annual prevalence of FEI in the United States in 1997 and 1998, estimated by the NHIS, was 8% for children under age 18 and 14% for

children under age 6. This indicates a decrease in the prevalence from 1988, again estimated by the NHIS at 9% for children under age 18<sup>34</sup> and 17% for children under age 6.<sup>11</sup> As had been reported by many studies, we found a higher prevalence of FEI among whites than blacks. On the other hand, the current data reveals that for children with FEI, comorbid conditions as a group were slightly more prevalent among black children than white children, with asthma being significantly higher among the black children. The current analysis as well as an earlier analysis of the 1981 and 1988 NHIS data<sup>23</sup> also reveal

that FEI is much more frequent in children with comorbidity than in those without. These observations, combined with the finding that black children were significantly less likely to have FEI than white children only when unaffected with comorbidity, seem to support the notion that the lower prevalence estimates of FEI among black children may be attributable to differential rates of access to health care, indicating the need for a diagnostic visit to elicit reports.

As mentioned earlier, racial disparities in access to, and use of, health services among the general population of children are well-documented. Numerous studies have reported that black children are more likely than white children to lack a usual source of care and less likely to have an office-based source of care.<sup>26–29</sup> The Medical Expenditure Panel Surveys and the National Health Care Surveys (NHCS) have shown that black children visit doctor's offices and other ambulatory care settings less frequently than white children.<sup>30,35</sup> Ambulatory health care visits for middle ear infections, specifically, were also reported to occur at a higher rate among white children (39%) than black children (20%) according to the NHCS' medical records-based surveys.<sup>35</sup> However, probably not well-represented by these NHCS of ambulatory care physicians are public health clinics, to which a sizable proportion of black children go as a usual source of care.

Our findings on children with FEI indicate that black children were as likely as white children to be covered by health insurance and have a usual place of health care. In fact, a higher proportion of black children with FEI have had a physical check-up or well- infant care in the past year than white children with FEI. Despite such similar accessibility to care, black children with FEI faced greater difficulty in almost all other forms of getting health care, including getting prescription drugs, getting care quickly, and getting care from general doctors or from specialists. Most significantly, unexplained by any of the independent variables examined in this analysis including health insurance, black children with FEI were more than twice as likely as white children not to have seen a specialist and not have gotten a surgery.

Some of the limitations and caveats of the dataset and analysis need to be mentioned. The NHIS is a cross-sectional survey that collected data retrospectively from the general population. For our sample children, the information was collected from the most knowledgeable adult in the family, predominantly the mothers. Parental report of FEI may not have the accuracy of clinical diagnosis, especially the asymptomatic ones. Validity studies have shown varying correlations between parental report of OM and the medical record based diagnosis owing to different methodologies used.<sup>36–38</sup> It seems that FEI would underestimate the prevalence of recurrent OM, because parents may not be able to notice asymptomatic OM. On the other hand, parent-reported FEI may include other types of ear infection such as external otitis, known as "swimmer's ear," especially among older children. However, the bulk

of FEI would be OM rather than external otitis because OM is much more prevalent than external otitis in terms of doctor visits (7:1 ratio for 5- to 14-year-olds), according to a national ambulatory care survey.<sup>35</sup>

Other than the "current" health insurance information collected, most other health-related information was based on a 12-month recall, including FEI. Thus, it is likely that the prevalence estimates on health conditions and use of health services suffer from recall errors. However, there is no reason to suspect a recall bias by race, and thus the analysis into racial disparities would not have been affected much by the limitations of retrospective reporting.

Some important risk factors of FEI were not included in the analysis, such as age at first occurrence of ear infection, exposure to tobacco smoke, and attendance at day care because they were not available in the data set used for the study. However, because this study focused on racial disparities in health care access and utilization attributable to FEI, not having a complete profile of risk factors of FEI would not limit the study findings. Perhaps the biggest limitation of the current analysis is the lack of a direct link between the measures of health care use and the occurrence of ear infection. However, regression models with and without comorbid conditions produced the same results.

The lowered likelihood of black children with FEI receiving surgery found in this study is consistent with previous reports of a lowered likelihood of black children with OM getting a tympanostomy tube inserted in comparison to white children.<sup>31,39</sup> Recent studies have reported wide variations in the rates of tympanostomy tube insertion by area<sup>40</sup> and in the pattern of referrals by general practitioners to ear, nose, and throat specialists for otitis media with effusion.<sup>41</sup> They found that referral for otitis media with effusion depends on the opinion of the doctor, ie, his/her interest, and diagnostic competence, which in turn depends on the availability of diagnostic equipment and on information elicited from parents. Therefore, differences in access to physicians who could diagnose asymptomatic OM would not only lead to differential prevalence rates but could further accentuate disparity in treatments. As evidenced by a large prospective study in Pittsburgh,<sup>4,25</sup> when both black and white infants were subjected to the same clinical team for detection and treatment of OM, there were no differences in the incidence rates nor the tympanostomy tube insertion rates by race.

Given these observations, it seems that the underlying reasons for racial disparities in subspecialty care for FEI include factors that have not been usually collected from health surveys such as physician/practice characteristics and patient's medical knowledge and beliefs. In their meta-analysis of race/ethnic differences in health care utilization of cardiovascular procedures, Ford and Cooper<sup>42</sup> concluded that subtle personal factors, including physician bias and the willingness of patients to accept referral for subspecialty care, may be important in explaining health care disparities. Rose-Lee et al<sup>43</sup> also asserted that persistent economic, social, and

political discrimination will continue to create barriers even if financial access is assured through the public health insurance system.

Given the view that access to subspecialty care is a critical indicator of health care access and quality,<sup>44</sup> black children with FEI seem to be at a significant disadvantage in getting quality health care, based on the findings of this study. Policy implications related to the equitable provision of care should first include a wide dissemination of diagnostic and treatment guidelines for ear infection to the frontline medical care providers including pediatricians, family practitioners, general internists, and nurse practitioners, with guidelines on referral for subspecialty care as well. Second, public information and education materials on ear infection should also be widely disseminated, especially to parents of young children, so that the condition can quickly and appropriately come to the attention of medical care providers. Finally, transportation and wait time for appointments should also be considered in setting health care policies and funding.

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