

An Epidemiologic Profile of Children With Diabetes in the U.S.

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The incidence of both type 1 and type 2 diabetes in children appears to be increasing in the U.S. (1–4), likely attributable, at least for type 2 diabetes, to the emerging epidemic of childhood obesity. Unfortunately, national prevalence estimates of children with diabetes, and nationally representative data about the demographic characteristics of children with diabetes, are limited. One study, based on just 13 cases, reported the prevalence of diabetes among adolescents aged 12–19 years to be 4.1 per 1,000 (5). We used recently released data from the National Survey of Children's Health (NSCH) to determine the prevalence of diabetes in U.S. children based on parental report and to examine the association between the presence of obesity and diabetes.

RESEARCH DESIGN AND METHODS

The NSCH was a population-based cross-sectional household telephone survey sponsored by the Maternal and Child Health Bureau, the National Center for Health Statistics, and the Centers for Disease Control and Prevention (6). The NSCH used random-digit dialing to recruit and survey households with children <18 years of age. One child in each household was randomly selected to be the subject of the survey, and the respondent for the interview was the parent or guardian who was most familiar with the child's health and health care. Estimates reported here are based on parental interviews regarding 102,353 children,

which were completed from January 2003 through July 2004.

The prevalence of diabetes was calculated based on the parent's or guardian's affirmative response to the question: "Has a doctor or health professional ever told you that your child has diabetes?" The type of diabetes (type 1 or type 2) was not specified. There were 352 individuals who responded affirmatively, and this number is the basis for calculating the prevalence within the study population.

Poverty status was defined as household income <200% of the poverty level based on the federal poverty guidelines (7), and variables for geographic regions of the U.S. (Northeast, Midwest, South, and West) were defined by census guidelines (8). BMI was calculated based on the child's parent-reported weight and height. Using the 2000 Centers for Disease Control and Prevention Growth Charts (9), children in this study were stratified into three groups based on age- and sex-specific BMI: not overweight if BMI was <85th percentile, overweight if BMI was \geq 85th percentile and <95th percentile, and obese if BMI was \geq 95th percentile.

All analyses were conducted using Stata 8 (Stata, College Station, TX) to apply sampling weights and account for the complex sampling design and to allow for extrapolation to national population estimates. The prevalence of diabetes by each demographic variable of interest was assessed, including χ^2 tests of association for each variable. The relative odds of hav-

ing diabetes in school-age children (ages 6–11 and 12–17) was calculated from a logistic regression model that included weight status, sex, and race. The number of children with reported diabetes in the 0- to 5-year-old age-group was not sufficient for reliable statistical estimates within that group.

RESULTS

Prevalence estimates

The estimated prevalence of diabetes among U.S. children <18 years of age was 3.2 per 1,000 (95% CI 2.6–3.7), representing an estimated 229,240 children nationally. Table 1 shows prevalence rates by demographic characteristics. Statistical differences were observed for age and race but not for sex, poverty status, family structure, or geographic region. Prevalence of diabetes increased with increasing age ($P < 0.001$) and differed by race ($P = 0.04$), in that non-Hispanic white children had a substantially higher prevalence of diabetes (3.8/1,000) compared with other racial and ethnic categories (2.2/1,000).

Weight status

Although diabetes prevalence was not statistically associated with BMI distribution ($P = 0.17$; Table 1), there was a higher relative odds of diabetes with higher weight status for children in the 6- to 11- and the 12- to 17-year-old age-groups after adjusting for sex and race. Children who were obese (BMI \geq 95th percentile for age and sex) had more than twice the odds of having diabetes compared with those who were not overweight (BMI <85th percentile), with a similar magnitude of association in the 6- to 11-year-old age-group (odds ratio [OR] 2.67 [95% CI 1.57–4.56]) and in the 12- to 17-year-old age-group (2.45 [1.31–4.60]).

CONCLUSIONS— This analysis provides a nationally representative prevalence estimate of 3.2 diabetes cases per 1,000 children, type 1 and type 2 combined, and may serve as a baseline estimate for future studies and for public health planning. We found that obese children were over twofold more likely to have diabetes than children of normal

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A table elsewhere in this issue shows conventional and Système International (SI) units and conversion factors for many substances.

Abbreviations: NSCH, National Survey of Children's Health.

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Table 1—Prevalence of diabetes among children in the U.S., from the National Survey of Children's Health, 2003–2004

	Diabetes prevalence	P value for χ^2 test	Distribution among those with reported diabetes (%)	Distribution among all children in the sample (%)
Overall	3.2 (2.6–3.7)			
Age		<0.001		
0–5 years	1.3 (0.1–1.9)		13	33
6–11 years	2.5 (1.8–3.2)		26	33
12–17 years	5.6 (4.3–6.9)		61	34
Sex		0.37		
Male	3.4 (2.6–4.2)		55	51
Female	2.9 (2.1–3.7)		45	49
Race		0.04		
Non-Hispanic white	3.8 (3.0–4.6)		73	61
African American	2.2 (1.2–3.2)		10	14
Hispanic	2.2 (0.9–3.6)		12	18
Other/multiracial	2.2 (1.0–3.4)		5	7
Poverty status*		0.96		
>200% of poverty level	3.2 (2.4–4.0)		60	59
≤200% of poverty level	3.2 (2.3–4.0)		40	41
Family structure		0.43		
Single parent	3.5 (2.5–4.5)		27	25
Two parent	3.0 (2.4–3.7)		73	75
Region		0.43		
Northeast	2.8 (1.6–3.9)		15	18
Midwest	3.9 (2.8–5.1)		28	22
South	2.8 (2.1–3.5)		32	36
West	3.2 (1.7–4.8)		25	24
Weight status		0.17		
BMI <85th percentile	3.4 (2.4–4.3)		53	61
85th ≤ BMI < 95th percentile	4.3 (2.8–5.9)		17	15
BMI ≥95th percentile	4.7 (3.3–6.1)		30	24

Data are diabetes prevalence (95% CI) per 1,000 children unless otherwise indicated. *Excludes unknown income.

weight, offering evidence that obesity may be a significant contributing factor to the development of childhood diabetes. If the association between obesity and diabetes in children is indeed causative, then public health strategies to prevent and treat obesity in children may help to reduce the future burden of diabetes in the U.S.

Because the NSCH is cross-sectional, and because we could not differentiate between type 1 and type 2 diabetes, we were unable to address the important issues related to changing diabetes rates over time.

In addition, the NSCH is limited by the unvalidated nature of parental reported data, including weight and height used to calculate BMI, and diabetes. Finally, as in any nonclinical study, it is likely that the prevalence of type 2 diabetes is underestimated due to undiagnosed or presymptomatic disease.

These data provide further evidence of the association between obesity and diabetes in children in the U.S. and suggest cause for concern from the obesity epidemic from a clinical, public health, and health resources perspective.

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