Letters to the Editor


We read with great interest the article by Demmer et al. (1) recently published in the Journal. We agree that national surveillance efforts for diabetes among this age group are important to assess and monitor the burden of disease.

The National Health and Nutrition Examination Survey (NHANES) allows us to monitor and track the nation’s health. In fact, the Centers for Disease Control and Prevention (Atlanta, Georgia) rely on NHANES for our national estimates of the burden of diagnosed and undiagnosed diabetes among adults in the United States (2, 3). Estimates from NHANES for prevalence of diagnosed and undiagnosed diabetes among youth have not been included as part of the National Diabetes Surveillance System because of concerns with the low absolute number of cases precluding comparisons by demographic groups.

In fact, we are concerned with the reliability of many of the estimates presented by the authors and, subsequently, with many of the inferences the authors draw from the data. The NHANES Analytic Guidelines, published by the National Center for Health Statistics (Hyattsville, Maryland), state, “The minimum sample size is determined by the statistic to be estimated (e.g., mean, total, proportion . . .), the reliability criteria (e.g., 20 or 30 percent relative standard error), the Design Effect for the statistics (DEFF defined as the variance inflation factor), and the degrees of freedom for the standard error estimate” (4, p.10).

The relative standard error is defined as the standard error divided by the prevalence estimate and multiplied by 100%. Based on our own analysis from the interview sample of adolescents for all diabetes and diabetes type as defined in the article, we found that the relative standard error was greater than 30% for many subgroups presented (Table 1). When the more conservative criterion of a relative standard error of less than 20% is applied, virtually all of the estimates are subject to cautious interpretation and inference (Table 1).

We agree with Demmer et al. when they state, “However, neither the sex difference nor the racial/ethnic differences were statistically significant, which makes it possible that these variations were due to chance. Studies with higher numbers of diabetes cases will be required to definitively examine these trends (1, p.6).” Given the poor reliability of the existing data, one could expect no other conclusion.

In addition to these concerns about reliability, we also caution interpretation of any absolute numbers. As the authors state in the methods, “Survey weights are necessary to account for nonresponse and oversampling (1, p.2).” Yet, the authors go on to compare absolute numbers of cases in the results and suggest that the estimates and unweighted numbers are difficult to interpret. On the basis of these concerns, we urge readers to interpret the results and inferences with caution.

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. Conflict of interest: None declared.

REFERENCES


Table 1. Relative Standard Error* for Prevalence Estimates of Self-reported Diabetes Mellitus Among Adolescents Aged 12–19 Years, National Health and Nutrition Examination Survey, 1999–2010

<table>
<thead>
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<th>Characteristic</th>
<th>All DM</th>
<th>T1DM</th>
<th>T2DM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>23</td>
<td>26</td>
<td>40</td>
</tr>
<tr>
<td>Female</td>
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<td>46</td>
<td>31</td>
</tr>
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</tr>
<tr>
<td>Total</td>
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</table>

Abbreviations: DM, diabetes mellitus; T1DM, type 1 diabetes mellitus; T2DM, type 2 diabetes mellitus.

* Relative standard error = (standard error / prevalence) × 100%.

The report by Demmer et al. (1) estimated the prevalence of diagnosed and undiagnosed diabetes in US adolescents. As investigators for the SEARCH for Diabetes in Youth Study (herein, the SEARCH Study), a US population-based registry of diabetes in youth (2), we acknowledge that providing valid estimates of the burden of diabetes in children, overall and by type, is an important and complex endeavor, but we wish to raise several concerns about the validity and representativeness of these findings.

The authors reported a prevalence of self-reported type 1 diabetes mellitus (T1DM) that is approximately 65% higher than that reported by the SEARCH Study in 2001 (3.8/1,000 vs. 2.3/1,000, respectively) (3), which may be explained by temporal trends in T1DM prevalence, but also by unvalidated overreporting, both of which the authors mentioned. Surprisingly, the prevalence of self-reported type 2 diabetes mellitus (T2DM) (1.8/1,000 among those aged 12–19 years) was 4.3 times higher than previously reported by the SEARCH Study (0.42/1,000 for those aged 10–19 years) and much closer to SEARCH Study estimates for American Indian youth (1.7/1,000), the racial group with the highest prevalence of T2DM.

We believe that the small number of adolescents screened, the imprecise case definition, and misclassification of diabetes type may underlie this. The authors defined T2DM on the basis of self-reported diet therapy or use of oral hypoglycemic agents with or without insulin. We agree that true diabetes cases who do not take insulin are likely to have T2DM; however, up to 11% of 8,879 youth with T1DM in the SEARCH Study are taking oral hypoglycemic agents in addition to insulin (4–6). Because cases of T1DM greatly outnumber those of T2DM, even low rates of misclassification of T1DM as T2DM will result in an overestimate of T2DM prevalence. Because insulin use varies among minority groups (4–6), differential misclassification by racial/ethnic group will likely occur.

Even higher estimates were reported in the fasting subsample, all of which were considered to have undiagnosed T2DM. The authors acknowledged that fasting glucose levels are variable in youth, and that a 1-time elevated value would not result in a diagnosis of diabetes; however, the impact of such problems is less well recognized. In the HEALTHY Study (7), only 1 of the original 6 youth with elevated fasting glucose was confirmed for a true prevalence of 1/6,358 = 0.02%. This compares to an unweighted prevalence of elevated fasting glucose of 0.17% in the National Health and Nutrition Examination Survey (NHANES) (1). In the Princeton Study of 2,501 elementary students (8), 7 youth with “near diabetes” were identified (0.28%), but only 1 was confirmed to have T2DM, for a prevalence of 0.04%. Thus, the prevalence of previously known (n = 2) and undiagnosed (n = 1) T2DM was 0.12%; the weighted prevalence reported by Demmer et al. (1) was 3 times higher (0.36%).

The authors make the case that the NHANES population is representative; however, their sample contains no American Indians or Asian/Pacific Islanders, 2 groups with the highest risk of T2DM, so it is unclear how representative the sample is for US youth at risk for diabetes. The explanation provided by the authors for the lower T2DM prevalence in the SEARCH Study (3) versus NHANES is that the SEARCH Study is not a geographically representative sample. The geographical areas included in the SEARCH Study were not based on random sampling; however, the SEARCH Study population is quite representative of the racial/ethnic, sex, education, and income distributions in the United States (9). Importantly, the SEARCH Study prevalence estimates are based on more than 6,000 cases with diabetes identified from a denominator of approximately 3.5 million youth compared with only 58 cases in fewer than 12,000 youth from NHANES.

The authors conclude that “T2DM accounts for approximately half of adolescent diabetes in the United States . . .” (1, p.1). The SEARCH Study recently estimated that 18,919 youth aged 10–19 years in the United States had diagnosed T2DM, and 132,315 youth less than 20 years of age had T1DM, and that T2DM accounts for 12.5% of all diabetes cases in youth (9), which is substantially less than estimated by Demmer et al. (1). Given the small number of cases and the numerous problems with case definitions discussed above, we believe that the estimates provided by Demmer et al. based on NHANES data do not accurately reflect the prevalence of diabetes, especially T2DM, in US adolescents.

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