Published in final edited form as:
J Pediatr. 2008 June ; 152(6): 753–755. doi:10.1016/j.jpeds.2008.02.004.

Low Prevalence of Pediatric Type 2 Diabetes: Where's the Epidemic?

Michael I. Goran, PhD, **Jaimie Davis, RD, PhD**, **Louise Kelly, PhD**, **Gabriel Shaibi, PhD**, **Donna Spruijt-Metz, PhD**, **S. Monica Soni, BS**, and **Marc Weigensberg, MD**
Departments of Preventive Medicine and Physiology and Biophysics, University of Southern California, Los Angeles, CA

Various reports have documented a dramatic rise in pediatric type 2 diabetes, particularly among minority children, explained, at least in part, by the rising prevalence of childhood obesity.[1,2] These reports have led to numerous commentaries and review articles that have described pediatric type 2 diabetes as a "new," "evolving," or "emerging" epidemic.[3-5] These developments have led to the general perception both in the professional and public media that there is an epidemic of pediatric type 2 diabetes in the United States. However, most of the published estimates of the incidence and prevalence of pediatric type 2 diabetes are derived from clinic-based studies that have documented the rising numbers of children in clinic visits being diagnosed as type 2 as opposed to type 1 diabetes. These estimates could be potentially biased because they are based on the "population" of children who are coming to see their pediatrician presumably with diabetes or other related symptoms. These estimates may also be limited by lack of repeated testing to establish true type 2 diabetes and eliminate the possibility of a false-positive test result.

There are just a few population or community-based studies that have examined the overall prevalence of type 2 diabetes in youth and even fewer data are available on the incidence. In the Third National Health and Nutrition Examination Survey (NHANES III), only 4 of a sample size of 2867 adolescents ages 12 to 19 years were classified as having type 2 diabetes (based on fasting glucose), suggesting a prevalence of 0.14%.[6] Notably, all 4 adolescents were black or Mexican-American. The most comprehensive and current population-based study is the SEARCH for Diabetes in Youth Study Group.[7] This group pooled data from 6 centers across the nation and found an overall prevalence of 0.22 cases per 1000 youth. The majority of these cases were in adolescents ages 10 to 19 years, and the highest prevalence of type 2 diabetes was in minority children. In 1 other community-based study of 1740 8th-grade students in 3 centers across the United States, the prevalence of type 2 diabetes was 0.4%, based on fasting glucose >126 mg/dL, and 0.1%, based on 2-hour glucose >200 mg/dL after an oral glucose load.[8]

We have examined our own data from 401 overweight (body mass index percentile >85th) Hispanic children from East and Central Los Angeles who we have prescreened in various ongoing studies at the USC Health Science over the last 7 years. Because our efforts focused on very high-risk children (overweight, Hispanic, and a positive family history of type 2 diabetes), the cohort was by no means representative of the population at large but rather selected to represent the characteristics of a high-risk subgroup of the population. These subjects were screened with an OGTT between 2000 and 2007 and were being recruited for

Reprint requests: Dr. Michael I. Goran, Departments of Preventive Medicine and Physiology and Biophysics, University of Southern California, 2250 Alcazar Street, Los Angeles, CA 90089-9008. Goran@usc.edu.

ongoing studies from the community surrounding Los Angeles County Hospital in East Los Angeles from pediatric clinics, schools, community centers, word-of-mouth, and local advertising. Most of the subjects studied (89%) had a family history of type 2 diabetes as defined by having at least 1 first-degree relative (parent or grandparent) self-reporting to have type 2 diabetes. The demographics of this group are shown in the Table. Of the 401 children screened, only 5 tested positive for type 2 diabetes, indicating a prevalence of 1.3%. The 5 children testing positive for type 2 diabetes were predominantly female, all ages ≥11 years, had reached a Tanner stage of ≥3, and all had a body mass index >99th percentile. These findings show a relatively low prevalence of type 2 diabetes despite the focus on a high-risk subgroup of the population and do not support the use of the term "epidemic" in reference to type 2 diabetes in adolescents.

The term "epidemic" has various definitions and meanings and may be interpreted differently by different segments of the population (ie, professional versus public). According to *Webster's*, an epidemic is a disease "affecting or tending to affect a disproportionately large number of individuals within a population, community, or region at the same time," or, in other words, a disease that is "excessively prevalent." Most epidemiologists would define "epidemic" as a disease with a prevalence greater than expected by prior experience.[9] In their 2002 Perspective "When Is an Epidemic an Epidemic?", Green et al[9] suggest that when communicating risk of a given disease that "every effort be made to add descriptive terms that characterize the epidemic." Prior reports have termed pediatric type 2 diabetes as an epidemic, including a "new epidemic,"[5] an "emerging epidemic,"[3] and an "evolving epidemic,"[4] but these descriptive approaches fall short of communicating the magnitude or size of the problem. We would argue that none of the published population-based reports nor our own data in a very high risk-group support the use of the term "epidemic" to describe the problem of pediatric type 2 diabetes.

So why characterize pediatric type 2 diabetes as an epidemic? Perhaps it was termed an epidemic because of the unexpected nature of seeing this condition among children and adolescents. Use of the term epidemic also grabs attention and alerts readers to what is a perceived critical change in population health. However, in a classic paper from the 1960s, Paulsen et al[10] observed that 6% of obese children met the criteria for type 2 diabetes, so the recent studies highlighting the emergence of more cases of type 2 diabetes in clinic visits might have been anticipated.

Although the prevalence of pediatric type 2 diabetes among the high-risk population that we studied was lower than expected, and would not, in our opinion, justify the continued use of the term "epidemic," there can be no question from the reported experience of pediatricians and the pediatric endocrine community that there has been an increased prevalence. This threatens to take a significant toll in terms of morbidity and mortality on this generation of overweight youth. Our claim that this is not an "epidemic" may be seen as mostly a semantic argument but is nonetheless worth making to balance the realities of the situation. The use of the word "epidemic" may result in the effect of needlessly instilling fear, hysteria, and stigmatization into an already fearful population of children and families, who may, in fact, never develop diabetes. This is particularly true because our ability to predict which overweight youth will develop diabetes, and therefore our ability to prevent the disease, remains extremely poor. Pediatric endocrine clinics, which serve high-risk populations such as our own, are clearly filling with type 2 pediatric patients, which was not the case in decades past. However, brandishing such loaded terms as "epidemic" without adequate epidemiologic justification could lead to a rash of public health, educational system, and societal policy changes and effects that could, in term, cause unintended harm. There is clearly a need for balance and reasoned scientific, epidemiologic, and clinical behavior to guide our approach to this significant health issue.

In addition to the discussion of whether pediatric type 2 diabetes should be considered an epidemic, data on the likely prevalence are important to guide the design of future studies attempting to select for cases of pediatric type 2 diabetes. Future studies attempting to identify cases, for example, might want to focus on the heaviest of the heavy and limit screening to children with a body mass index >99th percentile, based on CDC standards and/or older children further along in puberty.

There is no question that pediatric type 2 diabetes is a serious medical issue, but data from population-based studies and our experience in overweight Hispanic children do not support the notion of an epidemic. Because the general population may interpret the communication of an "epidemic" differently than that intended, the pediatric community should use caution when describing the scope of the problem and bear in mind the weight of the evidence from population-based studies. There is, however, an epidemic of childhood obesity and obesity-related disorders, some of which may be more common than type 2 diabetes, such as hypertension, lipid abnormalities, and fatty liver disease. Therefore, when evaluating overweight children, pediatricians and primary care physicians should therefore be considering the broader metabolic picture beyond type 2 diabetes and consider whether interventions beyond weight loss would be appropriate to reduce the ongoing and cumulative risk of the metabolic conditions associated with childhood obesity.

Acknowledgments

Supported by a grant from the National Institutes of Health (RO1 DK 59211) and in part by grants from the Donald E. and Delia B. Baxter Foundation and the Dr Robert C. and Veronica Atkins Foundation.

References

1. American Diabetes Association. Type 2 diabetes in children and adolescents. Pediatrics 2000;105:671–80. [PubMed: 10699131]
2. Pinhas-Hamiel O, Dolan LM, Daniels SR, Standiford D, Khoury PR, Zeitler P. Increased incidence of non-insulin-dependent diabetes mellitus among adolescents. J Pediatrics 1996;128:608–15.
3. Rosenbloom AL, Joe JR, Young RS, Winter WE. Emerging epidemic of type 2 diabetes in youth. Diabetes Care 1999;22:345–54. [PubMed: 10333956]
4. Bloomgarden ZT. Type 2 diabetes in the young: the evolving epidemic. Diabetes Care 2004;27:998–1010. [PubMed: 15047665]
5. Kaufman FR. Type 2 diabetes in children and young adults: a "new epidemic". Clin Diabetes 2002;20:217–8.
6. Fagot-Campagna A, Flegal KM, Saaddine JB, Beckles GLA. Diabetes, impaired fasting glucose, and elevated HbA1c in US adolescents: the third national health and nutrition examination survey. Diabetes Care 2001;5:837.
7. Group SfDiYS. The burden of diabetes mellitus among US youth: prevalence estimates from the SEARCH for Diabetes in Youth Study. Pediatrics 2006;118:1510–8. [PubMed: 17015542]
8. Baranowski T, Cooper DM, Harrell J, Hirst K, Kaufman FR, Goran M, et al. Presence of diabetes risk factors in a large US eighth-grade cohort. Diabetes Care 2006;29:212–7. [PubMed: 16443862]
9. Green MS, Swartz T, Mayshar E, Lev B, Leventhal A, Slater PE, et al. When is an epidemic an epidemic? Isr Med Assoc J 2002;4:3–6. [PubMed: 11802306]
10. Paulsen EP, Richenderfer L, Ginsberg-Fellner F. Plasma glucose, free fatty acids and immunoreactive insulin in sixty-six obese children. Diabetes 1968;17:261–9. [PubMed: 5648368]

Glossary

NHANES III	Third National Health and Nutrition Examination Survey

Table

Subject characteristics based on type 2 diabetes status

	Subjects negative for type 2 diabetes (n = 396)	Subjects positive for type 2 diabetes (n = 5)	*P* value for difference
Age (y)	12.6 ± 2.5	14.6 ± 2.5	.08
Sex	190 boys 206 girls	1 boy 4 girls	>.1
Tanner stage	3.0 ± 1.5	4.2 ± 0.8	.08
Height (m)	1.55 ± 0.12	1.65 ± 0.10	.05
Weight (kg)	74.1 ± 23.1	122.5 ± 27.9	<.001
Body mass index (kg/m^2)	30.3 ± 6.2	44.8 ± 9.0	<.001
Body mass index percentile	97.3 ± 2.9	99.5 ± 0.31	<.001
Fasting glucose (mg/dL)	91.6 ± 6.6	130.4 ± 21.3	<.001
2-Hour glucose (mg/dL)	125.5 ± 19.3	230.0 ± 13.8	<.001