

Was There an Epidemic of Diabetes in Nonwhite Adolescents in Allegheny County, Pennsylvania?

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OBJECTIVE — To determine the incidence of IDDM in children aged <20 years at diagnosis in Allegheny County, Pennsylvania, for the period from 1 January 1990 to 31 December 1994 and to compare the incidence between whites and nonwhites in the same area and for the same time period.

RESEARCH DESIGN AND METHODS — All new patients diagnosed between January 1990 and December 1994 who were aged <20 years, on insulin, and residents of Allegheny County at diagnosis were identified from medical records of 23 hospitals in the Allegheny County area. To verify the completeness of the hospitals using the capture-recapture method, pediatricians and diabetologists were used as a secondary source.

RESULTS — A total number of 257 patients were identified. The overall age-standardized incidence rate was 16.7/100,000. Nonwhites had a slightly higher incidence (17.6/100,000) than whites (16.5/100,000). In the 15–19 years age-group, the incidence in nonwhites (30.4/100,000) was almost three times higher than that in whites (11.2/100,000) and more than two times higher than that in the previous period (from 1985 to 1989) (13.8/100,000).

CONCLUSIONS — For the first time in the Allegheny County registry, and in any other registry, nonwhites showed a higher incidence of IDDM than whites. The high incidence in the 15–19 years age-group was responsible for this phenomenon. This epidemic of diabetes in adolescent nonwhites may be the result of a rising incidence of classical IDDM or another type of diabetes. Further studies using population-based registries are needed to determine whether this increase is being seen in other areas and other ethnic groups and to clarify the reasons for the increase in IDDM among blacks.

In the last 10 years, there has been a large increase in the number of registries monitoring the incidence of IDDM in children and adolescents worldwide (1–3). These registries have allowed us to identify variations across geographical areas and to monitor changes over time. Moreover, the data comparing different ethnic populations living in the same place have shown that the incidence of the disease varies between races (4–10). These data are important because they may provide clues into the etiological factors that lead to the development

of the disease. In the U.S., several studies using standardized criteria have consistently found a higher incidence of IDDM in whites when compared with blacks (6–10) (Table 1). Most of these studies have examined a limited time period, usually 5 or 10 years. The Allegheny County, Pennsylvania, IDDM incidence registry includes all patients newly diagnosed since 1965, making it the largest and longest ongoing registry in the U.S. (10). This registry has consistently shown in all previous reports (to 1989) a higher incidence of the disorder

in whites when compared with nonwhites.

Recently, we updated the Allegheny County IDDM registry for the period from 1 January 1990 to 31 December 1994. The purposes of this update were 1) to determine the incidence of IDDM in children aged <20 years at diagnosis for the period 1990–1994 in Allegheny County and 2) to compare the incidence between whites and nonwhites in the same area and for the same time period. A striking rise among African-American children was found.

RESEARCH DESIGN AND METHODS — The Allegheny County IDDM Registry is a population-based registry that includes all children diagnosed with IDDM since 1965 with age at onset <20 years and with residence in Allegheny County, Pennsylvania, at diagnosis. This registry is updated approximately every 5 years (11–13).

For this update, all new IDDM patients diagnosed between 1 January 1990 and 31 December 1994 were included. Case finding was accomplished by retrospective review of discharge indexes of 20 hospitals in the county and 3 hospitals from adjacent counties (Beaver and Butler) that are likely to see IDDM patients living in Allegheny County. Once the eligible patients were identified, the medical records were reviewed. Review of medical records was chosen as a primary source of identifying patients, since almost all patients are still hospitalized when the diagnosis is made or are hospitalized right afterward. The criteria for inclusion were the same as those used for the World Health Organization (WHO) DiaMond Project worldwide (1).

To verify the completeness of the hospitals, pediatricians and diabetologists from Allegheny, Beaver, and Butler Counties were contacted and asked to report patients whom they had seen diagnosed with childhood diabetes. Information was obtained from 65% of the physicians. Once all the information was collected, the capture-recapture method was used to determine the completeness of ascertainment (14).

The denominator data used to calculate the incidence rates were obtained from

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Abbreviations: WHO, World Health Organization.

Table 1—IDDM incidence rate per 100,000 people in white and black populations living in the U.S.

Location	Rate/100,000		Age range (years)	Years
	Whites	Blacks		
Jefferson County, Alabama	15.6	8.1	0–17	1979–1988
Allegheny County, Pennsylvania	14.1	10.3	0–19	1965–1989
Philadelphia, Pennsylvania	13.3	10.9	0–14	1985–1990
U.S. Virgin Islands	28.9	5.9	0–14	1979–1988

Adapted from references 6–10.

the 1990 Census and the Pennsylvania Department of Health (with extrapolations done for the following years). The total population for the county in 1990 was 1,336,449, with 24% (318,744) being <20 years of age. Nonwhites comprised 11% of the total population and 16% of the population <20 years of age.

Statistical analysis

Incidence rates were calculated and 95% CIs around these rates were determined using the Poisson distribution. To be able to compare the data and get age-adjusted rates, the incidence rates were standardized using the direct method, according to the 0–19 years age distribution of the 1990 world population. Differences between incidence rates were tested using the χ^2 statistic. A test for seasonal trends was computed using the method described by Roger (15).

RESULTS — The total number of patients identified as diagnosed with IDDM for the period 1990 through 1994 was 257. The degree of ascertainment for the primary source (hospitals) was 97.3%; for the secondary source, 12.5%; and for the combined sources, 97.7%. These figures are very similar to the ones reported for the last update of the registry, in 1989 (10). The ascertainment by race was 100% for blacks and 97% for whites.

Table 2 presents the number of patients by age, race, and sex. Of these patients, 82% were white and 18% were nonwhite. Of the nonwhite patients, >95% were African-Americans. Of the patients identified, 55% were male and 45% were female. Not unexpectedly, the largest percentage of patients were diagnosed in the 10–14 years age-group (36%), followed by the 5–9 years age-group (30%), the 15–19 years age-group (20%), and the 0–4 years age-group (14%). The number of patients increased from 1990 ($n = 43$) to 1993 ($n = 60$), with

a decrease in 1994 ($n = 56$); none of these changes were statistically significant.

The overall age-standardized incidence rate was 16.7/100,000 (95% CI 14.7–18.8), which was similar to the incidence in the previous period studied (17.1/100,000). There was no statistically significant year-to-year variation (13.4/100,000 [9.7–18.1] in 1990 to 18.5/100,000 [14.2–23.9] in 1993). The incidence rate was higher in males than in females (17.2/100,000 vs. 14.4/100,000, respectively) (NS). The IDDM incidence rates (per 100,000) by race and age-group are presented in Table 3. Surprisingly, for the first time since the start of the registry (Fig. 1), nonwhites had a slightly higher incidence (17.6/100,000 [12.8–23.5]) than whites (16.5/100,000 [14.3–18.8]). This was seen both in male and female patients.

Whites had a higher incidence than nonwhites in the younger age-groups (0–14 years old), but in the older age-group (15–19 years), the incidence was almost three times higher in nonwhites than in whites (Table 3), which was statistically significant ($P = 0.001$). This higher incidence was seen both in male and female patients. This has not been reported previously in other studies, and it is also different from what has been previously reported in Allegheny County (Fig. 2),

where in age-group 15–19 years, for the last 20 years, whites had a higher incidence of diabetes than nonwhites (10). The incidence in the nonwhites aged 15–19 years in the 1990–1994 period (30.4/100,000 [18.3–47.4]) was more than two times higher than in 1985–1989 (13.8/100,000 [6.7–25.7]) and more than three times higher than in 1980–1984 (7.6/100,000 [3.5–16.6]) (Fig. 2).

More of the patients were diagnosed during the colder months (57%) than in the warmer months (43%), which is consistent with observations from other studies worldwide (16). No significant trend was seen for seasonality at time of diagnosis for the total IDDM population diagnosed during the 1990–1994 period ($R = 1.36$, $P > 0.05$) or for each year studied separately. Also, there were no significant differences when analyzed by subgroups of race and sex.

CONCLUSIONS — Surprisingly, for the first time in the Allegheny County registry or other registries, nonwhites had a higher incidence of IDDM than whites. Previous studies in Allegheny County (10–13), as well as in other areas of the U.S. (6–9), had always shown a higher incidence in the white population. The high incidence found in the nonwhites, both males and females, 15–19 years of age was responsible for this phenomenon. Most studies in the U.S. include children diagnosed before age 15 years or before age 18 years (6–9), so they do not include the age-group where the increase in incidence was seen.

The current results cannot be explained by changes in definition or criteria because all the previous updates of the Allegheny County registry have used the same standardized methodology as described in the WHO DIAMOND Project (1). Moreover, some investigators have suggested that an important limitation in research on minori-

Table 2—IDDM patients diagnosed at <20 years of age by race, sex, and age at onset, Allegheny County, Pennsylvania, 1990–1994

Years	White patients		Nonwhite patients		Total
	Male	Female	Male	Female	
0–4	15	18	2	2	37 (14.4)
5–9	34	35	6	3	78 (30.4)
10–14	48	30	8	6	92 (35.8)
15–19	19	12	10	9	50 (19.4)
Total	116 (45.1)	95 (37.0)	26 (10.1)	20 (7.8)	257

Data are n or n (%).

Table 3—IDDM incidence rate per 100,000 people by race and age-group, Allegheny County, Pennsylvania, 1990–1994

	Age (years)			
	0–4	5–9	10–14	15–19
Incidence in whites	9.5 (6.6–13.4)	20.7 (16.2–26.3)	24.9 (19.9–31.3)	11.2 (7.6–15.9)
Incidence in nonwhites	5.2 (1.4–13.4)	13.8 (6.3–26.1)	23.6 (12.9–39.7)	30.4 (18.3–47.4)
Total incidence	8.6 (6.1–11.9)	19.2 (15.3–24.1)	24.3 (19.8–30.0)	12.3 (9.1–16.2)

Data are incidence rates (95% CI).

ties is the question of error in the denominator (4). If there were an undercount of the nonwhite population in Allegheny County, the incidence estimate would be artificially high. The population in this area is relatively stable compared with other parts of the country. Even if the number of people between 15–19 years old has diminished from 1980–1990 according to the census,

blacks still comprised the same percentage (16% in 1990, 15% in 1980). If undercount were the explanation for this increase in incidence, it would have to be of an enormous magnitude.

This epidemic of diabetes in older nonwhites may be the result of a rising incidence of classical IDDM or of another type of diabetes. It has been suggested that dia-

betes in black children and adolescents is more diverse in its etiology and pathogenesis than in young whites. Apart from the classical IDDM, other atypical presentations have been described. These include a syndrome initially named maturity-onset diabetes of the young (17), which has an acute onset, is insulin requiring at diagnosis, and displays modest insulinopenia and episodic ketosis (18). Another form was initially described in Jamaica (19) and was characterized by being ketosis-resistant, displaying phasic insulin dependence, and being associated with malnutrition. Furthermore, a more recent study described the presence of ketosis in black adolescents diagnosed with NIDDM (20). The increase in the incidence has to be related to a recent change in environmental etiological factors, which may be different if these patients truly have IDDM (i.e., brought on by infectious agents) or some other type of diabetes syndrome (e.g., brought on by obesity). Some of these nonwhite adolescents might be gaining weight, increasing the demand for insulin and overworking the pancreas, leading to overt disease.

Further studies, using population-based registries, are needed to determine whether this increase is being seen in other areas and other ethnic groups, and to clarify the reasons for it. We are currently expanding our research (21) to include onset characteristics, family history, genetic and autoimmune markers, and clinical course to clarify the reasons for this epidemic of diabetes in nonwhite adolescents.

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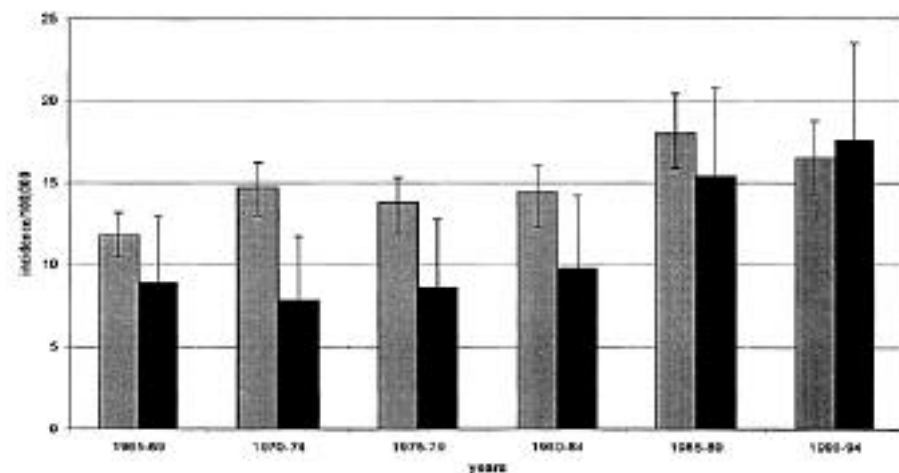


Figure 1—IDDM incidence by period and race (black, white), Allegheny County, Pennsylvania, 1965–1994, 0–19 years age-group.

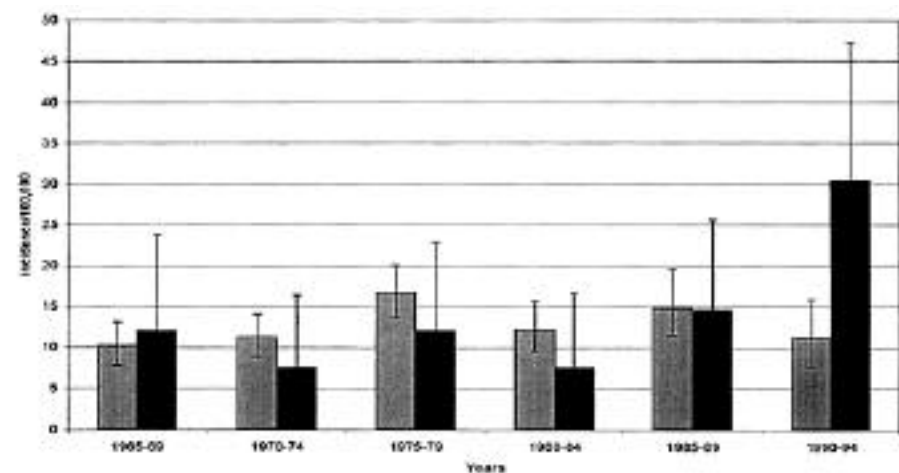


Figure 2—IDDM incidence rates by period and race (black, white), Allegheny County, Pennsylvania, 1965–1994, 15–19 years age-group.

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