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Does risk for childhood diabetes vary by community area in Chicago?*

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EXTENDED ABSTRACT

Background: Distinguishing between the various forms of diabetes mellitus (DM) in young people continues to challenge researchers. Although four prevalent types of DM have been identified in children and adolescents, of particular concern are type 1 and type 2. This is primarily a consequence of the changing profile of the individual with type 2 diabetes, which is no longer limited to the middle-aged and elderly, but increasingly, children and teenagers. Furthermore, extant research suggests that environmental factors influence the incidence of both type 1 and type 2 DM, further complicating the discrimination of the etiology of the disease in youth. Population-based studies exploring the incidence of childhood diabetes and the potential environmental factors influencing the fluctuations in the disease are therefore critical for characterizing the epidemiology of the condition in young people.

Objective: To examine the geographic variation in the incidence of type 1 (T1) and non-type 1 (nT1) diabetes in youth ages 0 - 1 7 in the city of Chicago.

Research Methods and Procedures: Children aged 0 – 17 diagnosed with diabetes between 1994 and 2003 were identified using a city-wide incidence registry. While population-based registries with standard definitions for T1 diabetes have been in existence since the 1980s, there are currently no "gold standard" clinical definitions for type 2 in children and adolescents in the US. Youth were therefore classified as non-type 1 (nT1) if there was a diagnosis or other evidence of type 2, such as a type 2-like clinical course, treatment with pills or no medications, obesity at diagnosis, polycystic ovary

syndrome or acanthosis nigricans. Using capture-recapture methods, case ascertainment was estimated as 85% complete for the years 1994 - 2001. Although 1365 cases were identified, 83 (6.1%) cases with insufficient street address information were excluded from the analysis. The final sample consisted of 1282 youth.

Cases were assigned to one of 77 Chicago community areas based on street address. Counts of children aged 0 - 17 for each of Chicago's 865 census tracts were aggregated to the 77 community areas to provide denominators for the calculation of incidence rates. In order to assess the extent to which the occurrence of incident cases of T1 and nT1 in one community area is influenced by the occurrence of cases in neighboring community areas (spatial autocorrelation), a Moran's I statistic was calculated using the open domain software, *GeoDa*.

Results: Of the 1282 cases included in the analysis, 787 were classified as T1 and 495 were classified as nT1. The overall childhood diabetes incidence rate over the 10 year period was 17 per 100,000 for the city of Chicago (Figure 1). The rate for T1 was higher (10 per 100,000) than nT1 (7 per 100,000). Additionally, the highest rates were observed in non-Hispanic Blacks (20 per 100,000), females (19 per 100,000), and youth aged 10 or older (Figures 2 – 3). In community areas, the incidence rate for T1 ranged from 0 per 100,000 to 36.5/100,000, and 0 per 100,000 to 15.1 per 100,000 for nT1 (figures 4 – 5). The Moran's I statistic was higher for nT1 (.2909, p =.01) than T1 (.0176, p = .001), implicating a greater role for environmental factors in the etiology of nT1.

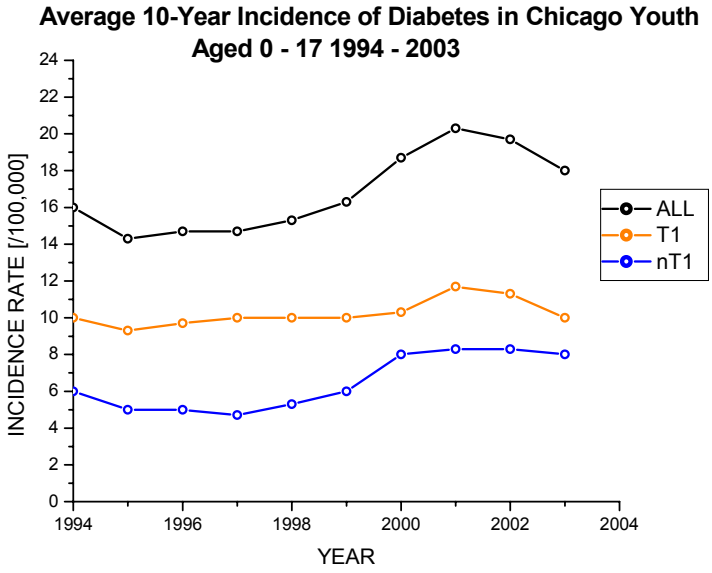
The highest average 10-year incidence rates of nT1 were more likely to occur in areas with higher concentrations of ethnic minorities and higher rates of childhood poverty compared to the rest of Chicago (Table 1). Conversely, areas with the highest T1

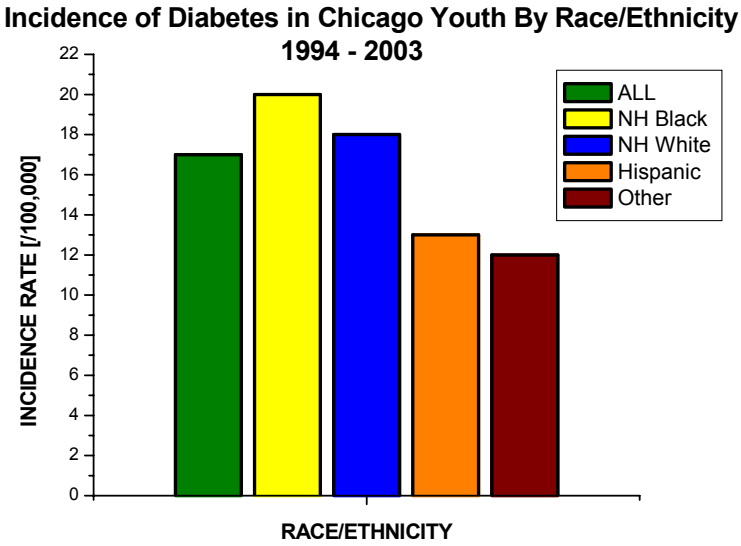
rates were characterized by higher concentrations of Whites, low unemployment rates, and fewer reports of violent crimes (Table 2).

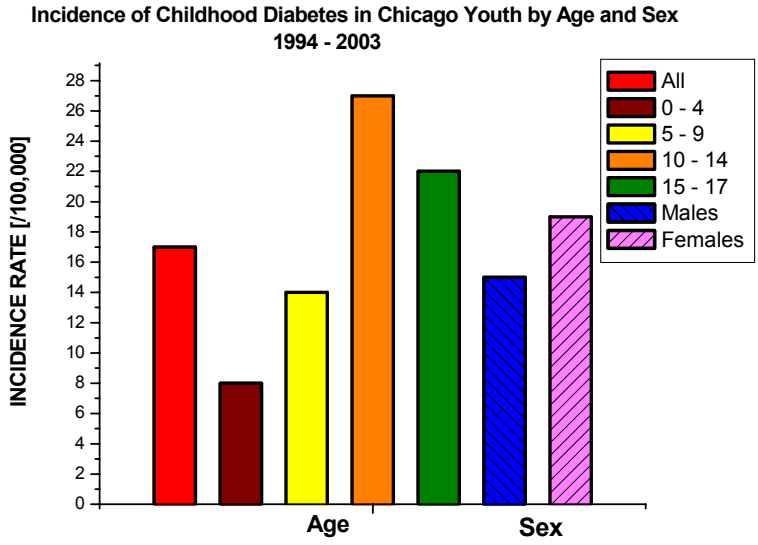
Conclusions: Differences observed in the incidence rates of T1 and nT1 in youth across Chicago community areas may be due to social and environmental risk factors. We plan to conduct additional studies exploring a broader set of individual and community level factors, however, to fully understand these observed differences.

Implications: This study suggests that examining risk factors for childhood diabetes at smaller geographic units of analysis (community areas) may play a critical role in understanding the onset of the disease in youth. By mapping the location of high rates of the disease in children, population-based prevention programs can better target interventions.

Figures 1 - 3


Average 10-Year Incidence of Diabetes in Chicago Youth
Aged 0 - 17 1994 - 2003
INCIDENCE RATE [/100,000]
YEAR
ALL
T1
nT1


Incidence of Diabetes in Chicago Youth By Race/Ethnicity
1994 - 2003
INCIDENCE RATE [/100,000]
RACE/ETHNICITY
ALL
NH Black
NH White
Hispanic
Other


Incidence of Childhood Diabetes in Chicago Youth by Age and Sex
1994 - 2003
INCIDENCE RATE [/100,000]
Age
Sex
All
0 - 4
5 - 9
10 - 14
15 - 17
Males
Females

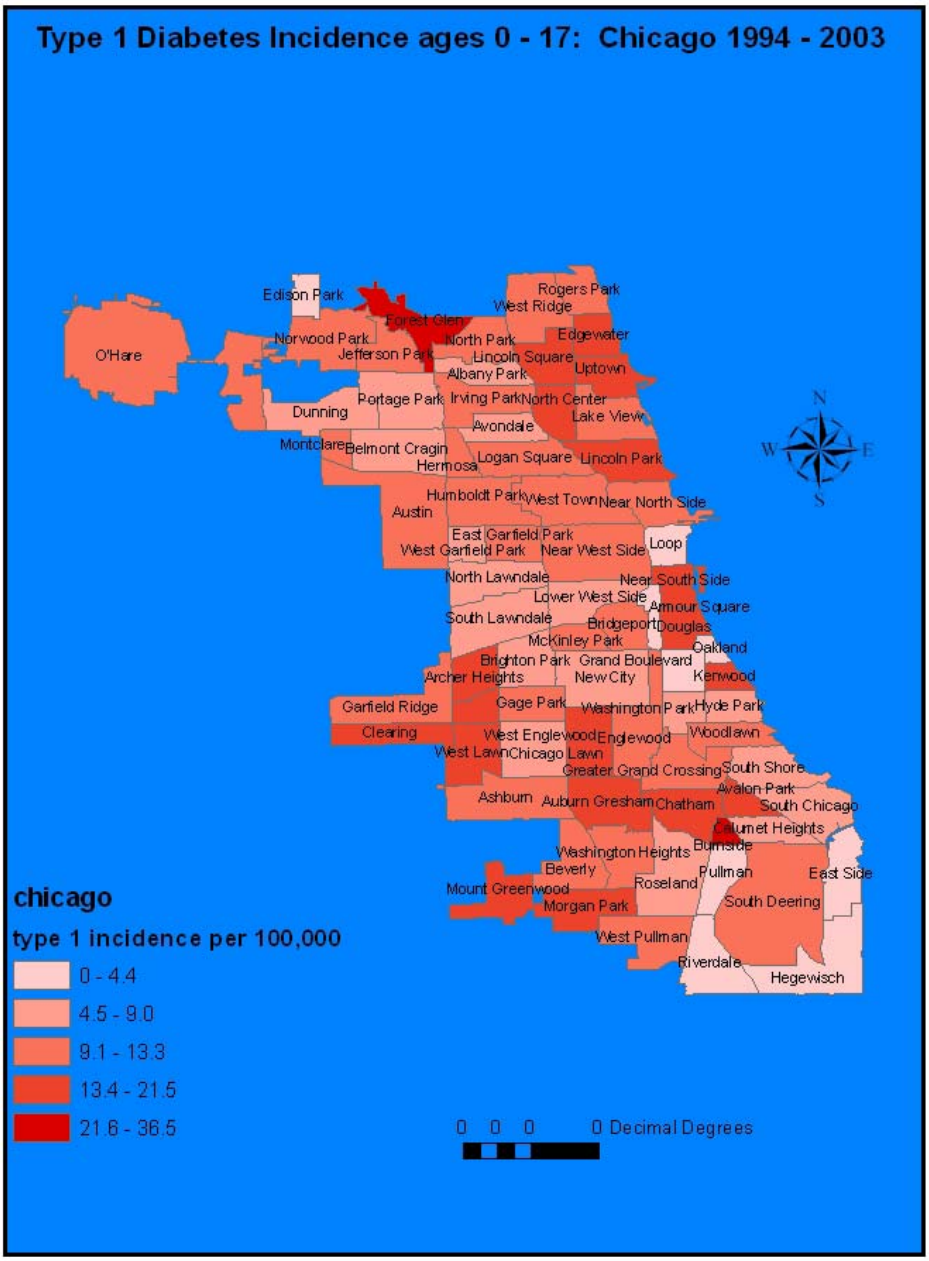

Type 1 Diabetes Incidence ages 0 - 17: Chicago 1994 - 2003
Edison Park
Rogers Park
West Ridge
Forest Glen
Norwood Park
North Park
Edgewater
O'Hare
Jefferson Park
Lincoln Square
Albany Park
Uptown
Portage Park
Irving Park
North Center
Dunning
Lake View
Avondale
Montclare
Belmont Cragin
Logan Square
Lincoln Park
Hermosa
Humboldt Park
West Town
Near North Side
Austin
East Garfield Park
Loop
West Garfield Park
Near West Side
North Lawndale
Near South Side
Lower West Side
Armour Square
South Lawndale
Bridgeport
Douglas
McKinley Park
Oakland
Brighton Park
Grand Boulevard
Archer Heights
New City
Kenwood
Garfield Ridge
Gage Park
Washington Park
Hyde Park
Clearing
West Englewood
Englewood
Woodlawn
West Lawn
Chicago Lawn
Greater Grand Crossing
South Shore
Avalon Park
Ashburn
Auburn Gresham
Chatham
South Chicago
Calumet Heights
Washington Heights
Burnside
Beverly
Pullman
East Side
Roseland
Mount Greenwood
South Deering
Morgan Park
West Pullman
Riverdale
Hegewisch
N
W
E
S
chicago
type 1 incidence per 100,000
0 - 4.4
4.5 - 9.0
9.1 - 13.3
13.4 - 21.5
21.6 - 36.5
0 0 0 0 Decimal Degrees

Figure 4

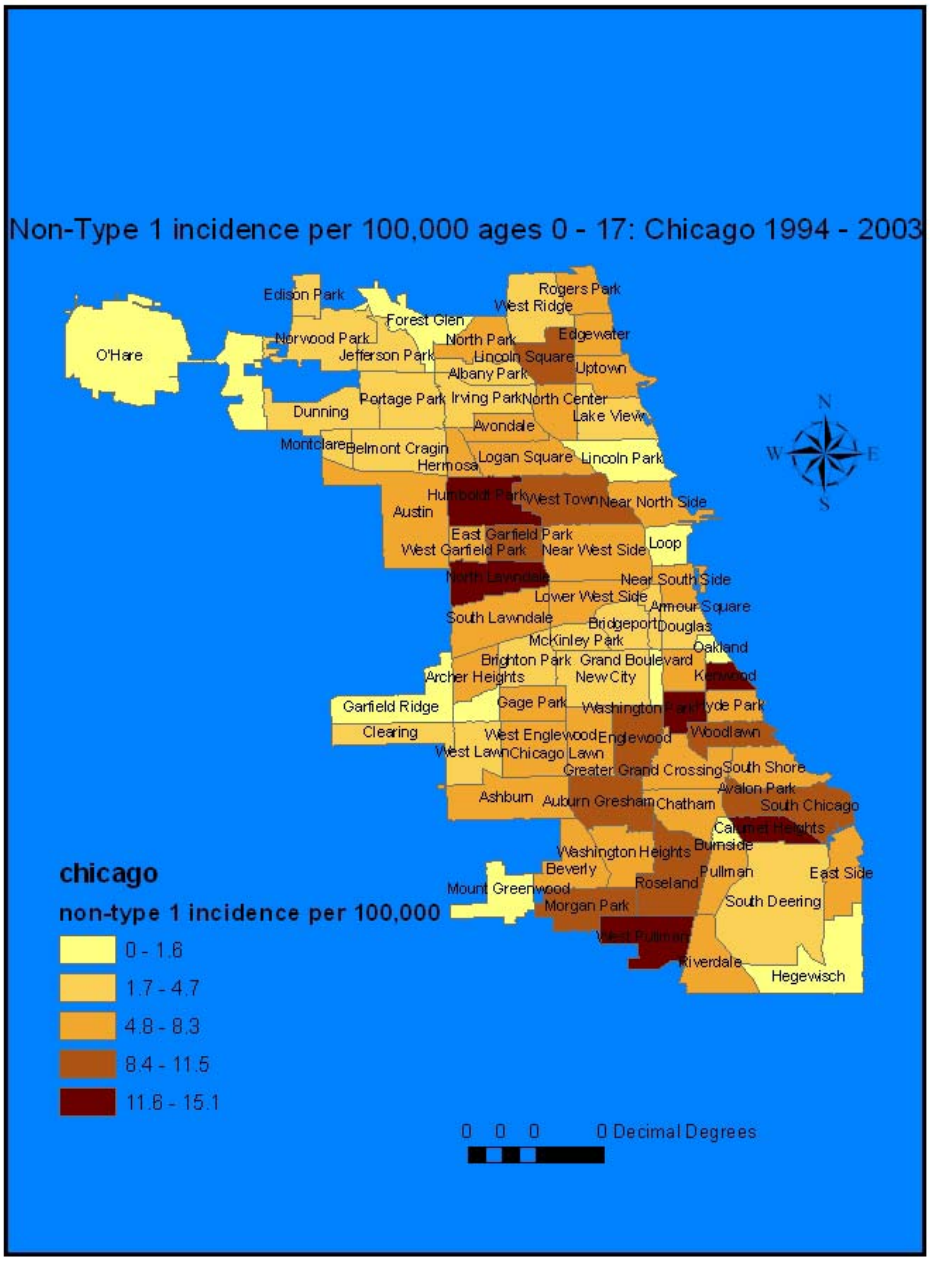


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Figure 5

Table 1. Comparison of Mean Socio-Demographic Characteristics Between Chicago Community Areas with the Highest and Lowest 10-year Incidence Rates of non-Type 1 Diabetes, 1994 - 2003*

	Average Incidence Rate	African American Residents (%)	White Residents (%)	Hispanic Residents (%)	Childhood Poverty (%)	Median Income ($)	Unemployed (%)	High School Graduates (%)	Violent Crimes Reported by Square Mile**
Highest rates (n=10)	$13.0/10^5$	85.8	5.74	6.93	36.7	32,561	16.5	70.1	291.1
Lowest rates (n=10)	$1.2/10^5$	32.8	50.1	12.4	19.4	43,251	9.85	78.1	119.6

* 2000 Census estimates; **Chapin Hall Center for Children, University of Chicago

Table 2. Comparison of Mean Socio-Demographic Characteristics Between Chicago Community Areas with the Highest and Lowest 10-year Incidence Rates of Type 1 Diabetes, 1994 - 2003*

	Average Incidence Rate	African American Residents (%)	White Residents (%)	Hispanic Residents (%)	Childhood Poverty (%)	Median Income ($)	Unemployed (%)	High School Graduates (%)	Violent Crimes Reported by Square Mile**
Highest rates (n=10)	$20.1/10^5$	20.39	55	18.2	14.1	49,373	7.11	79.5	103.9
Lowest rates (n=10)	$3.7/10^5$	41.3	32.3	17.4	30	34,678	14.1	70.4	198.3

* 2000 Census estimates; **Chapin Hall Center for Children, University of Chicago, 2000