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DISPROPORTIONATE IMPACT OF DIABETES IN A PUERTO RICAN COMMUNITY OF CHICAGO

Steve Whitman, PhD; Abigail Silva, MPH; Ami M. Shah, MPH

ABSTRACT: We assessed the impact of diabetes in a large Puerto Rican community of Chicago by measuring the prevalence of diagnosed diabetes and calculating the diabetes mortality rate. Data were analyzed from a comprehensive health survey conducted in randomly selected households in community areas. Questions on diagnosed diabetes and selected risk factors were asked. In addition, vital records data were analyzed in order to calculate the age-adjusted diabetes mortality rate. When possible, rates were compared to those found in other studies. The diabetes prevalence located in this community (20.8%: 95% CI = 10.1%-38.0%) is the highest ever reported for Puerto Ricans and one of the highest ever reported in the United States for a non-Native American population. For instance, it is twice the prevalence for Puerto Ricans in New York (11.3%) and Puerto Rico (9.3%–9.6%). Diagnosed diabetes was found to be significantly associated with obesity ($p = 0.023$). The prevalence was particularly high among older people, females, those born in the US, and those with a family history of diabetes. Notably, the diabetes mortality rate (67.6 per 100,000 population) was more than twice the rate for all of Chicago (31.2) and the US (25.4). Understanding why the diabetes prevalence and mortality rates for Puerto Ricans in this community are so much higher than those of other communities is imperative for primary and secondary prevention. Collaboration between researchers, service providers and community members can help address the issues of diabetes education, early screening and diagnosis, and effective treatment needed in this community.

KEY WORDS: diabetes; diabetes prevalence; diabetes mortality; puerto Rican health; hispanic health.

INTRODUCTION

The prevalence of diabetes in adults in the United States has been steadily increasing from 4.9% in 1990 to 6.1% in 2004.[1,2] Diabetes

Steve Whitman, PhD, Abigail Silva, MPH, Ami M Shah, MPH, Sinai Urban Health Institute, Mount Sinai Hospital, Chicago, IL, USA.

Requests for reprints should be addressed to Steve Whitman PhD, Sinai Urban Health Institute, Mount Sinai Hospital, California Ave. at 15th Street, K437, Chicago 60608, IL, USA; e-mail: whist@ sinai.org

prevalence is higher in US non-Hispanic Blacks and Hispanics compared to non-Hispanic Whites.[3] Puerto Ricans especially seem to have a particularly high prevalence of diabetes. One report, using a Behavioral Risk Factor Surveillance System (BRFSS) methodology, produced a prevalence estimate of 9.6% for Puerto Rico while a 2000 survey, implemented with a similar methodology, produced an estimate of 11.3% for Puerto Ricans living in New York City.[4,5]

Mortality from diabetes also exhibits substantial racial/ethnic disparities. In 2002, the age-adjusted mortality rates for diabetes were: 25.4 per 100,000 population for the entire US, 22.2 for non-Hispanic White people, 50.3 for non-Hispanic Black people and 35.6 for Hispanic people. Furthermore, the diabetes mortality rate for people living in Puerto Rico was 69.5.[6]

Chicago is home to more Puerto Ricans than any US city other than New York. A recently completed health survey conducted in randomly selected households in Chicago included the largest Puerto Rican community in the city. This report presents the diabetes prevalence rate stratified by various demographic and risk factors. To better assess the impact of diabetes on this community, diabetes mortality rates were also calculated and compared to local and national rates. Finally, the implications of these elevated rates are discussed.

METHODS

Survey

Data analyzed in this report were obtained from the Sinai Health System's ''Improving Community Health Survey''.[7] Chicago is divided into 77 officially designated community areas, which often serve as loci for describing health, delivering health care services and implementing community-based interventions.[8] Six of these community areas were selected for this survey for various planning and policy reasons, but primarily to reflect the diversity of Chicago.

In an effort to obtain a representative sample for each of the selected community areas, a three-stage probability sample design was implemented.[9] First, census blocks were chosen using Probability Proportionate to Size sampling according to the proportion of individuals age 18 and over who lived on each block according to the 2000 Census. Second, households were randomly selected from the blocks. Third, adults within the households were randomly selected (using the Trodhal-Carter-Bryant

methodology[10]). The goal was to obtain approximately 300 surveys from each community area.

A person was eligible for the survey if he or she was between 18 and 75 years of age, spoke either English or Spanish, lived in a residence in one of these six community areas, and was physically and mentally able to participate. All participants signed an informed consent. This project was approved by all relevant institutional review boards.

The questionnaire was administered face-to-face in either English or Spanish in selected households by trained bilingual interviewers from September 2002 - April 2003. The survey contained 469 questions on health-related topics such as access to health care, diagnosed conditions, and health behaviors. The interview lasted approximately one hour and respondents received a health information packet (in Spanish or English) along with $40 in appreciation for their time.

More details on the survey's methodology and individual community's response and participation rates can be found elsewhere.[11,12]

Study Population

West Town and Humboldt Park were among the six community areas surveyed. These two areas are contiguous and contain about 26,000 Puerto Ricans (23% of Chicago's total Puerto Rican population). These residents view themselves as being part of the same community and are treated as such (West Town-Humboldt Park) in this report.

Data Collected

The race and ethnicity of survey respondents were measured by self-identification. Diagnosed diabetes was measured, consistent with the Behavioral Risk Factor Surveillance System survey, by those responding ''yes'' to ''Have you ever been told by a doctor that you have diabetes?'' Women who had been told that they had diabetes only during a pregnancy were not included among those with diabetes. Body Mass Index (BMI) was calculated by using self-reported height and weight ($BMI = kg/m^2$). Respondents were categorized into: not overweight ($BMI < 25.0$), overweight (25.0 – 29.9) and obese (≥ 30).[13]

Data Analysis

Data for denominators for mortality rates and prevalence proportions were drawn from the US Census 2000 files. Mortality data were

abstracted from Illinois Vital Records Death Files. Deaths from diabetes consisted of all deaths with an underlying cause coded as E10 - E14 under the International Classification of Diseases, 10th Revision.[14] All mortality rates were age-adjusted to the US standard 2000 population.

Consistent with other studies in this literature, the prevalence proportions in this analysis were not age-adjusted. The sampling weights employed in this analysis account for differential probabilities of selection and the post-stratification of the sample to resemble the 2000 Census distribution of the population for each CA. Data were analyzed using STATA v8 to account for the sampling design effects.[15]

The statistical significance between two prevalence proportions or two mortality rates was examined with a t-test. A 95% level of significance was employed for all analyses.

RESULTS

Prevalence

Of 603 people that were interviewed in West Town-Humboldt Park, 595 people had no missing study data, and 104 identified themselves as Puerto Rican.

The Puerto Rican residents of West Town-Humboldt Park tended to be young, female (57.3%), have more than an eighth grade education (82.7%), and be born in Puerto Rico (58.6%) (Table 1).

The risk for diabetes was also high in this community as 33.2% of the residents were found to be obese and 43.2% had a family history of diabetes. The majority of the residents had health insurance (76.7%).

The prevalence of physician-diagnosed diabetes in Puerto Ricans living in this community was 20.8% (Table 1). The prevalence proportions for other people in these two communities were 3.1% for non-Hispanic White people, 14.5% for non-Hispanic Black people and 4.1% for Mexican people (Table 2). The Puerto Rican prevalence was significantly higher than the Mexican ($p = 0.025$) and White proportions ($p = 0.025$).

Table 3 compares the diabetes prevalence found among Puerto Ricans in West Town-Humboldt Park to those found for Puerto Ricans living in other areas. Puerto Ricans in West Town-Humboldt Park report a prevalence (20.8%) about twice as high as Puerto Ricans living in New York City (11.3%) and Puerto Rico (9.6% and 9.3%).[5,4,16]

Diabetes prevalence varied by associated risk factors (Table 1). Prevalence was significantly higher among obese people ($p = 0.02$), and marginally significantly higher among those with a family history of diabetes ($p = 0.06$). It

was also higher (but not significantly) among older people, females, those with fewer years of education, those born in the US, and those with insurance.

Mortality

Table 4 presents diabetes mortality rates by area and race/ethnicity. Note that the diabetes mortality rate for Puerto Ricans (67.6 per 100,000

TABLE 1

Non-Gestational Diabetes Prevalence by Risk Factors for Puerto Ricans in West Town-Humboldt Park (n = 108), 2002–2003

Age	*Total (%)*	*Prevalence (%)*	*95% CI*	*P*
18–44	65.0	13.1	(5.4, 28.4)	0.106
45–64	27.7	34.4	(12.2, 66.4)	
65+	7.3	34.5	(10.5, 70.2)	
Gender				
Male	42.7	12.5	(4.8, 28.9)	0.158
Female	57.3	27.1	(11.1, 52.5)	
Education				
< = 8th	17.3	33.6	(16.6, 56.3)	0.126
> = 9	82.7	18.4	(7.7, 37.8)	
Birthplace				
Puerto Rico	58.6	15.7	(9.4, 25.0)	0.383
United States	41.4	25.1	(9.2, 52.3)	
Weight Status				
Obese	33.2	33.4	(18.2, 54.1)	0.023
Non-Obese	66.8	14.8	(5.5, 34.3)	
Diabetes Family History				
Yes	43.2	32.5	(12.9, 61.0)	0.064
No	56.8	12.3	(5.8, 24.0)	
Health Insurance				
Uninsured	23.3	10.8	(2.1, 40.3)	0.357
Insured	76.7	23.0	(10.3, 46.0)	
Total		20.8	(10.1, 38.0)	

TABLE 2

Non-Gestational Diabetes Prevalence in West Town-Humboldt Park, by Race/Ethnicity, 2002–2003

Group	*N*	*Prevalence (%)*	*95% CI*
All	595	9.0	(6.4, 12.7)
Puerto Rican	104	20.8	(10.1, 38.0)
Mexican*	97	4.1	(1.4, 11.4)
Non-Hispanic White*	154	3.1	(0.7, 13.2)
Non-Hispanic Black	163	14.5	(9.4, 21.8)

*The Puerto Rican rate was significantly higher than Mexican ($p = .025$) and non-Hispanic White rates ($p = .025$).

TABLE 3

Non-Gestational Diabetes Prevalence among Puerto Ricans in Recent Years, Various Reports

West Town-Humboldt Park, 2002–03	20.8%
New York City, 2000[5]	11.3%
Puerto Rico, 1999[4]	9.6%
Puerto Rico, 1998–2002[16]	9.3%

TABLE 4

Age-adjusted Diabetes Mortality Rates* by Race/Ethnicity in Recent Years

	Total	*Non-Hispanic White*	*Non-Hispanic Black*	*Mexican*	*Puerto Rican*
West Town-Humboldt Park, 1999–2001	36.1	22.0†	42.2	23.0†	67.6
Chicago 1999—2001	31.2†	23.8†	37.9†	41.7	70.9
United States‡ 2002[6]	25.4†	22.0†	53.4	39.0†	45.4
Puerto Rico 2002[6]	69.5	–	–	–	69.5

* per 100,000 population.
† $p < 0.05$ when compared to the West Town-Humboldt Park Puerto Rican mortality rate.
‡ excludes Puerto Rico.

population) in West Town-Humboldt Park is consistent with the high prevalence. As can be expected, the Puerto Rican mortality rate is significantly higher than the rate for Mexican people ($p = 0.006$) and White

people ($p = 0.002$) and higher than for Black people ($p = 0.11$) in the same community area. The rate is also more than twice the rate for all of Chicago ($p = 0.006$) and the US ($p = 0.002$). While the Puerto Rican rate in West Town-Humboldt Park is similar to that found among Puerto Ricans in the rest of Chicago and Puerto Rico, it is 50% higher than that found in Puerto Ricans living in the US ($p = 0.12$).

DISCUSSION

Although the prevalence of diabetes is consistently found to be much higher for Hispanics than for non-Hispanic Whites, the prevalence in this community of Puerto Ricans in Chicago (20.8%) is the highest diabetes prevalence we have been able to locate for Puerto Ricans, and is twice as high as findings for Puerto Ricans living on the island or in New York City (Table 2).

It is relevant to note that the relationship to virtually every risk factor examined in this report (Table 1) is consistent with findings from other studies which also show increased prevalence among older people, females, those with fewer years of education, those born in the US, obese people, those with a family history of diabetes and those with health insurance.[2,17] The direction of the relationships of these risk factors to diabetes prevalence is also identical with other studies of diabetes among Puerto Ricans.[4,5] Of particular note is the high prevalence of obesity (33.2%) and family history of diabetes (43.2%), both important risk factors for diabetes, found in this community. The prevalence of obesity among Puerto Ricans in this study is higher than that of the US (25%) and may thus be contributing to the increased diabetes prevalence rate.[18]

It is compelling that this elevated prevalence corresponds to a greatly elevated diabetes mortality rate of 68 (per 100,000 population). This is more than twice as high as the rate for Chicago (31.2), and almost three times as high as the rate for Illinois (25.4) and the US (25.4). It is also noteworthy that this Puerto Rican mortality rate is virtually identical to that found in Puerto Rico, but that studies there have found the prevalence to be only about half what has been found in this community.[2,4,6] One plausible hypothesis for the lower prevalence on the island, despite the elevated mortality rate, is disproportionate under-diagnosis. However, we are not aware of evidence to support or contradict this.

This elevated diabetes mortality carries with it an alarming observation. For example, if this mortality rate of 68 prevailed for the United States as a whole, then diabetes would be the second leading cause of death

in the country, trailing only heart disease but well ahead of all separate types of cancers (e.g., lung, breast, colorectal) and cerebrovascular diseases.[6] Given the already extraordinary – and growing – burden of diabetes in this country, it is a sobering thought that in this Puerto Rican community the impact may be three times greater than it is for the country as a whole.[19,20]

We also further investigated the lower than expected prevalence among Mexican people in this community. None of the demographic variables examined in Table 1 for Puerto Ricans (including insurance status) showed a significant relationship to prevalence among Mexican people. This may be due to small numbers.

Methodological Issues

There are important methodological issues to consider when examining the results from this study. First, consistent with virtually all the other literature in this field, we did not age-adjust our prevalence estimates. Our own data, along with that from the Centers for Disease Control and Prevention (CDC), suggest that such adjustments generally increase prevalence by about 10%, though this estimate is quite variable.[18] For example, if we had age-adjusted our estimates (to the 2000 standard US population) the prevalence for Puerto Ricans would have risen from 20.8% to 22.6%, an increase of 8.7%.

Second, our sample did not include residents over the age of 75. Because diabetes generally increases with age, this may bias the prevalence estimates. However national data show that the prevalence is similar for those ages 65–74 and those ages 75 and over.[21] Therefore, the bias may be minimal.

Third, it is well established that self-report of physician diagnosis underestimates the true prevalence of diabetes by 33% to 40%.[3,22,23] Using the 33% adjustment, an estimate of the *actual prevalence* of diabetes among Puerto Ricans in this Chicago community could be as high as 31% for adults between the ages of 18 and 75.

Fourth, since one must see a physician to obtain a physician diagnosis of diabetes, lack of insurance would tend to minimize the prevalence estimates derived in this study. Indeed, 24% of the Puerto Ricans in the survey were without insurance and these uninsured individuals had a diabetes prevalence that was less than one-third of those with insurance. This dynamic would serve to even further elevate the estimate of the *actual prevalence* of diabetes among Puerto Ricans in this community.

Finally, due to the small sample size (n = 104) the confidence limits around our estimates were wide. However, in order to determine statistical

significance we did not employ overlapping confidence intervals because this technique is more conservative (i.e., rejects the null hypothesis less often). Rather, we used the z-test in testing all the comparisons in this analysis.[24] Despite this effort, due to a small sample size, we failed to see some statistically significant differences that we otherwise may have obtained.

Implications

The disparities in diabetes prevalence and mortality demonstrated here are inconsistent with the national initiative to reduce disparities in general and for diabetes in particular.[25,26] These disparities exist despite continued calls for improvement in screening and treatment for diabetes.[27,28] As the prevalence increases and more people become obese and acquire the disease earlier in life, diabetes-related complications and mortality will only increase. Of paramount concern would be the upstream issue of prevention. As McGinnis has aptly noted in his foreword to a supplementary issue of the *American Journal of Preventive Medicine* devoted to diabetes control: ''. . . as perhaps with no other disease is the importance of the link between clinical and community interventions so clear. The potential for gain against the toll of diabetes is great, but only if we pair aggressive clinical interventions with equally aggressive community action fundamental to broad lifestyle changes''.[29]

The elevated prevalence and mortality from diabetes in Puerto Ricans have by and large gone unnoticed in the literature. Understanding why the diabetes prevalence and mortality rates for Puerto Ricans in West Town-Humboldt Park are twice as high as those of other communities is imperative. Almost certainly, the answer to this question will include reducing the prevalence of obesity, increasing diabetes education and early screening and diagnosis, and providing *effective* treatment.

This paper has revealed local level disparities in diabetes prevalence and mortality and thus offers an opportunity to improve the situation. Established guidelines and resources already exist that can improve the quality of diabetes care.[30,31,32] We hope that researchers, service providers and community members will work collectively to seize this opportunity and make important contributions that will improve the quality of life for people living in West Town-Humboldt Park and other communities like it across the United States.

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