

Prevalence Rates for Diabetes Mellitus in Puerto Rico

The aim of this study was to analyze prevalence data for diabetes mellitus obtained from a household interview of a random sample of the general population by the Department of Health of the Commonwealth of Puerto Rico for the years 1975–1986. Details of the prevalence rate by sex and age were analyzed for the years 1981, 1984, 1985, and 1986 and for the urban and rural population in 1985. The mean prevalence rate of known cases of diabetes showed a tendency to increase from 3.1% in 1975 to 5.1% in 1986. Prevalence rates adjusted for age and sex showed an increase in the mean prevalence for 1986 compared with that of 1981. The prevalence rate was significantly higher for the rural population for the age-group 45–64 yr old and for the urban population for the age-group ≥ 65 yr. The prevalence rate compares with that of Mexican Americans and Puerto Ricans in the New York City area. On the basis of the prevalence data, ~90% of the diabetic population is non-insulin dependent and 10% are insulin dependent. Major risk factors thought to explain the increased prevalence of non-insulin-dependent diabetes are increasing longevity of the Puerto Rican population, genetic predisposition, obesity, and changes in life-styles. In conclusion, Puerto Ricans, as other Hispanic Americans, have a higher prevalence of diabetes than the white American population. *Diabetes Care* 14 (Suppl. 3):676–84, 1991

Chronic diseases are the predominant disablers and killers in Puerto Rico and in the United States. Prevalence for diabetes mellitus is increasing as the population ages. Previously published data have shown an increased prevalence in the urban male population in Puerto Rico (1) and in the Mexican-American population in the U.S. (2,3).

The Department of Health of the Commonwealth of

Puerto Rico has conducted household interviews of the general population since 1963. The prevalence for diabetes mellitus was analyzed with data from such surveys for the years 1975–1986, and details of the prevalence by sex and age-group was analyzed for the years 1981 and 1984–1986. The prevalence for diabetes mellitus for the urban and rural population by age-group and sex was analyzed for the year 1985. The purpose of this study is to report on such findings.

RESEARCH DESIGN AND METHODS

Prevalence rates are based on household interviews of a random sample of the general population. The Household Health Interview Survey is conducted by the Office of Planning, Evaluation, and Reports of the Department of Health of Puerto Rico. It is a continuous study involved in the collection, processing, analysis, and publication of various health topics. The measurement instruments are administered to household samples representative of the population of Puerto Rico. It was started in 1963 and uses a subsample of households furnished by the Bureau of Statistics from the Department of Labor of Puerto Rico. It is a multistage probability sample covering the general population in Puerto Rico. The continuous study collects health information related to the patterns of utilization of medical services. It also measures the acute and chronic morbidity that

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prevails in the population in a determined period and the restrictions caused by this morbidity such as loss of days from work and school. It also provides for the opportunity of including supplementary questionnaires on certain health issues that investigators may want to explore. The program consists of different areas such as field area, coding, and statistics. For the field area, the study has seven interviewers and a supervisor for conducting interviews throughout the island. They are regular and permanent employees of the agency who have college degrees and are specially trained in interviewing techniques for different studies. In the coding area, there are six coders for manual processing. The coding area transcribes the given data and converts to numeric codes in such a way that the statistical tabulations can be prepared. These data are sent to the Department of Health Computer Center to be transcribed to cards or magnetic tapes and are then edited for validity checks for the given information. After these processes the final tabulations are prepared for analysis, interpretation, and publication. In the statistical area, three statisticians analyze and interpret the data. In all respective areas, the continuous study counts on quality-control measurements to guarantee the reliability of the data being produced.

The urban zone is defined as a city or town and neighboring areas with a population of ≥ 2500 and the rural zone as a town or village with a population of < 2500 . Every 3 mo ~750 households with ~4 people/household are surveyed. Prevalence rates are based on household interview surveys of 6 and 9 mo. In 1981, the data were used to compare the prevalence of diabetes in Puerto Rico with that in two Mexican communities; 1534 households were interviewed for a sample of 5590 people. In 1984, 1764 households were interviewed for a sample of 6379 people. In 1985, 2274 households were interviewed for a total of 7966 people and in 1986, 2313 households were interviewed for a total of 7721 people. Survey participants are asked whether anyone in the family has diabetes. The data obtained from the sample is inflated to estimates of the general population by age-group and sex. The prevalence rate is obtained by dividing the estimated diabetic population by the total population, and in the case of various age-groups and sex, by dividing the respective diabetic population by the population in that given group or sex.

The 1970 census was used as the sampling frame for the years 1975–1986, except for the year 1984. This 1970 census subsample was updated by various means. New public and private housing construction was taken into consideration in the updating of the segments by the interviewers, and reclassification of the zones (urban versus rural) was made in the field; thus, the subsample used was updated when compared with the original subsample. For the Household Health Interview Survey of 1984, the household sample used was that designed by Valencia (4) for a study of the prevalence of mental health conditions in Puerto Rico, with the use of the 1980 census as a sampling frame. The methodology

used in its design was the same as that used by the Bureau of Statistics of the Department of Labor. For subsequent years until 1987, the Department of Health continued to use the updated 1970 subsample. The Household Health Interview Survey is similar to the National Health Interview Survey of the U.S. National Center for Health Statistics (Appendix 1).

The χ^2 -test was used to determine statistical significant differences ($P = 0.05$) in the prevalence rates, and 95% confidence intervals surrounding prevalence rates was computed. Age- and sex-adjusted prevalence rates were calculated for 1984 and 1986 with the use of the 1981 population as a standard population.

RESULTS

Table 1 shows the figures for the general population, sample population, estimated diabetic population, and prevalence rates for the years 1975–1986, excluding 1979, when the Household Health Interview Survey was not conducted. The prevalence rate increased from 3.1/100 population in 1975, when diabetes was the seventh leading cause of death, to 5.1/100 population in 1986, when diabetes was the fifth leading cause of death (5).

Tables 2–5 show the size of the sample in comparison to the general population and the diabetic population in the sample for both sexes in the various age-groups for the years studied (1981 and 1984–1986). The percentage of distribution of people in the sample by age-group and sex was representative of the population of Puerto Rico in the 4 yr that were studied. No statistical difference was found. The male population was 48.5% of the general population and the female population was 51.5% of the general population for the years 1981,

TABLE 1
Diabetes mellitus prevalence rates in Puerto Rico (1975–1986)

Yr	Population	Diabetic population	Sample population	Rate*
1975	3,101,000	96,249	9803	3.1
1976	3,202,385	113,598	12,212	3.5
1977	3,283,677	119,666	6115	3.6
1978	3,393,195	136,074	12,165	4.0
1980	3,506,512	150,655	7964	4.0
1981	3,246,770	142,787	5590	4.4
1982	3,258,386	154,996	4986	4.8
1983	3,267,683	136,461	2696	4.2†
1984	3,271,481	156,736	6379	4.8‡
1985	3,287,656	168,189	7966	5.2
1986	3,291,550	168,953	7721	5.1

Based on ref. 4.

*Rate per 100 population.

†Rate based on a smaller sample.

‡Based on 1980 census.

TABLE 2
Number and percentage of estimated general population, sample population, and diabetic population (Puerto Rico, 1981)

Sex and age-group (yr)	Population estimate*		Sample population†			Diabetic population		
	<i>n</i>	Percentage sex population	Percentage population	<i>n</i>	Percentage sex population	Percentage population	<i>n</i>	%
Both sexes	3,246,770		100.0	5590		100.0	246	100.0
<6	391,832		12.1	634		11.3		
6-13	515,272		15.9	933		16.7	2	0.8
14-24	708,426		21.8	1205		21.6	4	1.6
25-44	795,326		24.5	1380		24.7	27	11.0
45-64	550,282		16.9	950		17.0	112	45.5
≥65	285,632		8.8	488		8.7	101	41.1
Men	1,575,920		48.5	2723	100.0	48.7	103	100.0
<6	201,013	12.7	6.2	358	13.1	6.4		
6-13	264,868	16.8	8.2	495	18.2	8.9	1	1.0
14-24	350,154	22.2	10.8	560	20.6	10.0	1	1.0
25-44	366,669	23.3	11.3	629	23.1	11.3	17	16.5
45-64	256,585	16.3	7.9	455	16.7	8.1	48	46.6
≥65	136,631	8.7	4.2	226	8.3	4.0	36	34.9
Women	1,670,850	100.0	51.5	2867	100.0	51.3	143	100.0
<6	190,819	11.4	5.9	276	9.6	4.9		
6-13	250,404	15.0	7.7	438	15.3	7.8	1	0.7
14-24	358,272	21.4	11.0	645	22.5	11.5	3	2.0
25-44	428,657	25.7	13.2	751	26.2	13.4	10	7.0
45-64	293,697	17.6	9.1	495	17.3	8.9	64	44.8
≥65	149,001	8.9	4.6	262	9.1	4.7	65	45.5

Based on ref. 4.

*The 1970 census was used as a sampling frame. Population estimate from the Department of Labor and Planning Board of Puerto Rico.

†Data of the sample is based on 2 trimesters.

1984, and 1985 and 48.1 and 51.9%, respectively, for the year 1986. Approximately 85% of the diabetic population is found in the age-group that is ≥45 yr of age. There has been an increase in this age-group from 25.7% in 1981 to 27.8% in 1986. The life expectancy for 1970 was 71.97 yr for both sexes and 75.18 yr for women and 68.96 yr for men. The life expectancy for 1986 was 74.7 yr for both sexes and 78.9 yr for women and 70.7 yr for men (5).

Table 6 shows the households in the sample drawn for each of the selected years and the households interviewed. The percentage interviewed varied from 73.4% in 1985 to 85.8% in 1984. Approximately 5% were not interviewed because they refused to give information, there was nobody at home, or the household was not found. Instances in which the lack of an interview did not affect the sample included 1) the household was unoccupied, 2) household was destroyed or in construction, or 3) it had been converted into a shop.

Tables 7 and 8 give estimates for the diabetic population and prevalence rates by age-group and sex for the years 1984-1986. When the prevalence rates for 1984 and 1985 are compared, the χ^2 was significant ($P = 0.05$) for the mean male rate and the male group 25-44 yr of age; no significant difference was found be-

tween the rates of 1985 and 1986 for either sex. Although the mean rate for 1986 was 5.1%, 16% higher than that of 1981, the age- and sex-adjusted rate for 1986 was 4.8%, 9% higher than the rate for 1981. This 7% difference can be explained by the effects of the age and sex structure for this period.

To study whether there was any difference in the prevalence for diabetes between the urban and rural population, the prevalence rates for 1985 were analyzed by age-group, sex, and geographic zones (Table 9). The χ^2 was significantly different ($P = 0.05$) in the age-groups of 45-64 yr and ≥65 yr. The rate was higher for the rural population for the age-groups 45-64 yr and for the urban population for the age-group that was ≥65 yr. Table 10 shows the prevalence and number of diabetic subjects in the sample population in the urban and rural female and male population for 1985. The χ^2 was significantly different in the urban versus rural male population in the age-group ≥65 yr; it was not significant for any of the female age-groups.

Table 11 compares the prevalence rate for diabetes by sex and age for Puerto Rico in 1981 with that of Mexican Americans in Starr County, Texas, for 1981 and Mexican Americans in Laredo, Texas, for 1979 (6,7). In the male population, the prevalence rate is sim-

TABLE 3
Number and percentage of estimated general population, sample population, and diabetic population (Puerto Rico, 1984)

Sex and age-group (yr)	Population estimate*			Sample population†			Diabetic population	
	<i>n</i>	Percentage sex population	Percentage population	<i>n</i>	Percentage sex population	Percentage population	<i>n</i>	%
Both sexes	3,271,481		100.0	6379		100.0	290	100.0
<6	354,441		10.8	669		10.5	3	1.0
6-16	716,026		21.9	1496		23.5	9	3.1
17-24	494,450		15.1	953		14.9	3	1.0
25-44	812,062		24.8	1624		25.5	32	11.0
45-64	577,921		17.7	1084		17.0	138	47.6
≥65	316,581		9.7	554		8.7	105	36.2
Men	1,585,314	100.0	48.5	3114	100.0	48.8	100	34.5
<6	184,685	11.6	5.7	357	11.5	5.6	1	1.0
6-16	365,549	23.1	11.2	777	25.0	12.2	4	4.0
17-24	244,831	15.4	7.5	498	16.0	7.8	2	2.0
25-44	371,256	23.4	11.3	720	23.1	11.3	8	8.0
45-64	268,422	16.9	8.2	505	16.2	7.9	46	46.0
≥65	150,571	9.5	4.6	257	8.3	4.0	39	39.0
Women	1,686,167	100.0	51.5	3265	100.0	51.2	190	65.5
<6	169,756	10.1	5.2	312	9.6	4.9	2	1.1
6-16	350,477	20.8	10.7	719	22.0	11.3	5	2.6
17-24	249,619	14.8	7.6	455	13.9	7.1	1	0.5
25-44	440,806	26.1	13.5	904	27.7	14.2	24	12.6
45-64	309,499	18.4	9.4	578	17.7	9.0	92	48.4
≥65	166,010	9.8	5.1	297	9.1	4.7	66	34.8

Based on ref. 4.

*The 1970 census was used as a sampling frame.

†Data of the sample is based on 2 trimesters.

ilar to that of the Mexican Americans in Starr County for the age-group that was 45-64 yr old and that of Laredo for the group ≥65 yr old. In the female population, the rates are similar to those of Laredo. In the age-group that was ≥65 yr old, the prevalence rates are much higher in Puerto Rico and Laredo than those reported for Starr County (i.e., 24.8% for Puerto Rico and 27.7% for Mexican Americans from Laredo).

CONCLUSIONS

The prevalence of diabetes among people in Puerto Rico can be compared to rates of known cases of diabetes among Puerto Ricans in the New York City area as determined in the Hispanic Health and Nutrition Survey of 1982-1984 (Table 12). When compared to the rates of 1984, rates are similar at <65 yr of age in the combined male and female groups, and there is a distinct excess of diabetes in mainland Puerto Ricans who were ≥65 yr of age. In both groups, the rate is higher in the female population. The combined prevalence of diagnosed and undiagnosed diabetes in the same study has been shown to be higher in Hispanic Americans than in whites (8). The Puerto Ricans in this study had a com-

bined prevalence that was higher than that in Cuban and Mexican Americans in the New York City area.

The factors that have been associated with higher prevalence rates for diabetes are age, race, family history of diabetes, and obesity (9-11).

The life expectancy of the Puerto Rican population has been increasing steadily. It is projected that by the year 2000, 11.9% of the female population and 9.5% of the male population will be ≥65 yr of age (12). Thus, the increasing longevity of our population can explain in part the increasing prevalence of diabetes.

The genetic composition of the Puerto Rican is an admixture of Amerindian, European, and African stock. The Taínos, original inhabitants of Boriquén, as the island of Puerto Rico was known to them, have been traced back to the northern coast of South America. They succeeded the Igneri Indians who had in turn conquered earlier Archaic Indians who arrived in Puerto Rico hundreds of years before Christ. The Taínos were of Arawak stock and settled in various parts of the Caribbean (Hispaniola, Jamaica, the eastern part of Cuba, and the Bahamas). In 1493, the Spanish conquistadors came along with Columbus and settled on the island in the quest for gold. In ~34 years (1508-1542), the Indian population shrank from an estimated 40,000 to 60. This

TABLE 4
Number and percentage of estimated general population, sample population, and diabetic population (Puerto Rico, 1985)

Sex and age-group (yr)	Population estimate*		Sample population†			Diabetic population		
	n	Percentage sex population	Percentage population	n	Percentage sex population	Percentage population	n	%
Both sexes	3,287,656		100.0	7966		100.0	414	100.0
<6	336,924		10.2	788		9.9		
6-16	719,271		21.9	1732		21.7	9	2.2
17-24	486,072		14.8	1215		15.3	8	1.9
25-44	828,747		25.2	1956		24.6	45	10.9
45-64	586,927		17.9	1484		18.6	200	48.3
≥65	329,715		10.0	791		9.9	152	36.7
Men	1,593,337	100.0	48.5	3782	100.0	47.5	170	100.0
<6	174,215	10.9	5.3	407	10.8	5.1		
6-16	372,467	23.4	11.3	868	23.0	10.9	5	2.9
17-24	239,772	15.0	7.3	569	15.0	7.1	2	1.2
25-44	381,216	23.9	11.6	894	23.6	11.3	22	12.9
45-64	269,872	16.9	8.2	679	18.0	8.5	81	47.7
≥65	155,795	9.8	4.8	365	9.6	4.6	60	35.3
Women	1,694,319	100.0	51.5	4184	100.0	52.5	244	100.0
<6	162,709	9.6	4.9	381	9.1	4.8		
6-16	346,804	20.5	10.6	864	20.7	10.8	4	1.6
17-24	246,300	14.5	7.5	646	15.4	8.1	6	2.5
25-44	447,531	26.4	13.6	1062	25.4	13.3	23	9.4
45-64	317,055	18.7	9.6	805	19.2	10.1	119	48.8
≥65	173,920	10.3	5.3	42	10.2	5.3	92	37.7

Based on ref. 4.

*The 1970 census was used as sampling frame.

†Data of the sample is based on 3 trimesters.

prompted importation of African blacks, especially from eastern and middle Africa (13). The contribution that each group made on modern Puerto Ricans can only be inferred through indirect means such as blood groups and HLA typing. Of the two studies on HLA typing, there are intrinsic limitations due to publication biases, because one study deals with kidney transplants and the other with paternity suits (14,15). They show that our genetic composition consists mostly of European white and African black influences with limited contributions by genes traditionally linked to the Indian population of North, Central, and South America (14). The HLA typing of 453 Puerto Ricans, where the antigens of the A and B loci were determined, showed a 43% similarity with the Mexican population, a 35% European influence, and relatively high frequencies of A19 (36%) and Bw17 (18%), which demonstrated a genetic influence from African blacks. The similarity with the Native American and Mongoloid population was 9%. Because the similarities were still <50%, the authors concluded that there is a unique genetic pattern in the Puerto Rican population (15). Mexican Americans and blacks in the U.S. have been shown to have an increased prevalence of diabetes. The prevalence rate of diabetes in Puerto Rico is similar to that of these ethnic groups. Therefore,

our genetic composition is another factor that can be linked as contributing to the increasing prevalence of diabetes.

In 1966, Fernández et al. (16) conducted an island-wide nutrition survey in a representative sample of the Puerto Rican population. One of the salient findings of this survey was a high prevalence of overweight and obesity in the Puerto Rican population. Overweight was defined as 10-20% over the standard weight and obesity as 20% over the standard body weight. Twenty-eight percent of women and 12% of men ≥19 yr old were obese. Women aged 40-59 yr showed the highest prevalence, with 38% being obese or overweight. Among men, overweight and obesity were common in the 19- to 39-yr-old age-group. Obesity was more prevalent in urban people but among young adults 19-39 yr old, the frequency was about the same in both the rural and urban areas. School children, adolescents, and subjects >60 yr of age from urban areas showed a much higher prevalence of obesity than their counterparts in the rural areas. Among adults the mean percentage of standard weight and the occurrence of obesity were positively correlated with income up to \$7000. Above that income level a decrease in both was observed.

The Puerto Rico Heart Health Program made urban-

TABLE 5
Number and percentage of estimated general population, sample population, and diabetic population (Puerto Rico, 1986)

Sex and age-group (yr)	Population estimate*			Sample population†			Diabetic population	
	<i>n</i>	Percentage sex population	Percentage population	<i>n</i>	Percentage sex population	Percentage population	<i>n</i>	%
Both sexes	3,291,550		100.0	7721		100.0	408	100.0
<6	334,900		10.2	759		9.8		
6-16	712,212		21.6	1635		21.2	4	1.0
17-24	470,529		14.6	1095		14.2	4	1.0
25-44	849,402		25.8	1997		25.9	51	12.4
45-64	590,334		17.9	1463		18.9	190	46.6
≥65	325,173		9.9	772		10.0	159	39.0
Men	1,584,575	100.0	48.1	3726	100.0	48.3	174	100.0
<6	170,887	10.8	5.2	375	10.1	4.9		
6-16	369,909	23.3	11.2	863	23.2	11.2	3	1.7
17-24	235,228	14.8	7.1	552	14.8	7.1	2	1.2
25-44	385,336	24.3	11.7	903	24.2	11.7	21	12.1
45-64	271,399	17.1	8.3	664	17.8	8.6	82	47.1
≥65	151,816	9.6	4.6	369	9.9	4.8	66	37.9
Women	1,706,975	100.0	51.9	3995	100.0	51.7	234	100.0
<6	164,013	9.6	5.0	384	9.6	5.0		
6-16	342,303	20.1	10.4	772	19.3	10.0	1	0.4
17-24	244,301	14.3	7.4	543	13.6	7.0	2	0.9
25-44	464,066	27.2	14.1	1094	27.4	14.2	30	12.8
45-64	318,935	18.7	9.7	799	20.0	10.3	108	46.2
≥65	173,357	10.2	5.3	403	10.1	5.2	93	39.7

Based on ref. 4.

*The 1970 census was used as a sampling frame.

†Data of the sample is based on 3 trimesters.

rural comparisons in 1969 of the prevalence of diabetes in a cohort of 2567 rural and 6190 urban male participants aged 45-64 yr (1). Enumeration districts were classified as urban if they contained a cluster of ≥25 dwelling units, otherwise they were classified as rural. Diabetes was diagnosed if the subject gave a history of this disease or if a random whole-blood glucose level was ≥0.436 mM by the Somogyi-Nelson method. The prevalence rate in rural men was 3.5% and 9% in urban men. The prevalence of diabetes in this study population increased with age, a family history of diabetes, and increase in relative body weight. It was associated with

elevations of serum cholesterol, serum triglycerides, and blood pressure. In obese men, the urban and rural prevalence rates were the same but among relatively lean men the prevalence in urban men was twice that of rural men. Analysis of the prevalence data for the male population in 1985 shows a higher prevalence of diabetes in the male urban population in the age-group that was

TABLE 7
Estimates of diabetic population by age and sex (Puerto Rico, 1984-1986)

Age-group (yr)	1984		1985		1986	
	F	M	F	M	F	M
<6	1088	517				
6-16	2437	1882	1606	2146	443	1286
17-24	549	983	2288	843	900	852
25-44	11,703	4125	9692	9381	12,726	8961
45-64	49,263	24,450	46,869	32,194	43,110	33,516
≥65	36,891	22,849	37,560	25,610	40,005	27,154
Total	101,931	54,806	98,015	70,174	97,184	71,769

Based on ref. 4.

TABLE 6
Household Health Interview Survey

Yr	Households in sample	Households interviewed (%)
1981	1957	1534 (78.4)
1984	2056	1764 (85.8)
1985	3097	2274 (73.4)
1986	3104	2319 (74.7)

Based on ref. 4.

TABLE 8
Sex-specific prevalence rates of diabetes mellitus (Puerto Rico, 1984–1986)

Age-group (yr)	1984			1985			1986		
	Rate	F	M	Rate	F	M	Rate	F	M
<6	0.5	0.6	0.3						
6–16	0.6	0.7	0.5	0.5	0.5	0.6	0.2	0.1	0.3
17–24	0.3	0.2	0.4	0.7	0.9	0.4	0.4	0.4	0.4
25–44	1.9	2.7	1.1	2.30	2.2	2.5	2.6	2.7	2.3
45–64	12.8	15.9	9.1	13.50	14.8	11.9	13.0	13.5	12.3
≥65	18.9	22.2	15.2	19.2	21.6	16.4	20.6	23.1	17.9
Mean	4.8	6.0	3.5	5.2	5.8	4.5	5.1	5.7	4.5
95% confidence interval	0.044–0.053	0.052–0.068	0.029–0.041	0.048–0.056	0.056–0.060	0.045–0.059	0.046–0.056	0.038–0.052	0.050–0.064

The 1980 census was used as a sampling frame for 1984 and 1970 census was the sampling frame for 1985 and 1986. Based on ref. 4.

≥65 yr old but no significant difference in the age-group that was 45–64 yr old, which was the age-group studied by the Puerto Rico Heart Health Program. Thus, much of the urban-rural difference no longer exists.

Puerto Rico has changed in the past four decades from an agricultural to an industrialized society. The life-styles of the rural population have also changed and are not much different from those of the urban population. The social problems that affect our society are the same in the urban and rural zones. The nutrition of the people has improved as their income and educational levels have improved, especially with the availability of food stamps for the past 20 yr.

A change from a more traditional life-style to a modern one, including diet, obesity, and sedentary activity, has been suggested as the major contributing cause in the increasing prevalence of non-insulin-dependent diabetes mellitus (9–11). If we estimate that the diabetic population of those ≤24 yr of age, 33% of the age-group 25–44 yr and 2% of the remaining two groups are insulin-dependent diabetic subjects, 10% of our population is insulin dependent and 90% are non-insulin dependent (17).

The undiagnosed prevalence rate for diabetes has

been found to be equal to the diagnosed rate (17). This would increase the prevalence rate in Puerto Rico to 10.2%.

The Hispanic population merits further study for it may shed some light on the understanding of the pathogenesis of non-insulin-dependent diabetes mellitus.

In Puerto Rico, we need to stress community-based education and prevention programs for proper intervention in the care of the diabetic population.

APPENDIX 1: HOUSEHOLD HEALTH INTERVIEW SURVEY

The sample used in the Household Health Interview Survey is a subsample of a larger sample used by the Bureau of Labor Statistics of the Department of Labor. The sample is drawn from the general population. The 1970 census was used as a sampling frame.

For stratification purposes, the island was divided into seven geographical areas: San Juan metropolitan area, Ponce metropolitan area, northern coast, eastern and southern coast, southwestern coast, west central area, and east central area. Each area was then subdivided into two zones; urban and rural. Thus, 14 original strata

TABLE 9
Prevalence rate and number of diabetic subjects by age-group and sex in urban and rural populations (Puerto Rico, 1985)

Age-group (yr)	Total rate	Female		Male		Urban		Rural	
		rate	n	rate	n	rate	n	rate	n
< 6	0.00	0.00	0	0.00	0	0.00	0	0.00	0
6–16	0.50	0.50	9	0.60	5	0.60	6	0.80	3
17–24	0.70	0.90	8	0.40	2	0.70	5	0.60	3
25–44	2.30	2.20	45	2.50	22	2.50	30	2.00	15
45–64	13.5	14.8	200	11.9	81	12.0	115	16.3	85
≥65	19.2	21.6	152	16.4	60	21.9	106	15.0	46
Mean rate	5.2	5.8		4.5		5.4		4.9	
Total			414		170		262		152

Rate per 100 population. Based on ref. 4.

TABLE 10
Prevalence rate and number of diabetics by age-group and sex in urban and rural population (Puerto Rico, 1985)

Age-group (yr)	Urban female	n	Rural female	n	Urban male	n	Rural male	n
< 6	0.00	0	0.00	0	0.00	0	0.00	0
6-16	0.40	2	0.50	2	0.80	4	0.30	1
17-24	1.30	5	0.40	1	0.00	0	0.90	2
25-44	2.20	15	2.0	8	2.8	15	1.90	7
45-64	12.7	69	19.0	50	11.0	46	13.5	35
≥65	23.0	64	18.9	28	20.3	42	11.4	18
Mean rate	5.9		5.6		4.8		4.1	
Total		155		89		107		63

Rate per 100 population. Based on ref. 4.

were created. Besides these strata one special stratum was set up (stratum 15) consisting of private and public housing projects in urban and rural communities. It was established after April 1970, the date of the census. This is an open stratum for the addition of new areas when they are formed.

To divide each area into zones, the definition used was that of the 1970 census, which defines urban populations as consisting of all people living in places of ≥2500 inhabitants, identified as cities, towns, or villages and other territory in urbanized areas (central cities and the densely populated surrounding areas). The remainder, excluding these, are rural towns with <2500 inhabitants and open country.

This is an area probability sample where the sampling unit is the cluster or segment.*

*Cluster or segment is a group of ~6 dwelling units in the urban zone and 12 in the rural zone.

TABLE 11
Prevalence by age-group and sex in Puerto Ricans and Mexican Americans

	Laredo (1979)	Puerto Rico (1981)	Starr County (1981)
Men (yr)			
45-64		10.5	
45-54	8.1		7.4
55-64	16.7		12.9
≥65		15.9	
65-74	16.7		13.3
≥75			11.8
Women (yr)			
45-64		12.9	
45-54	7.5		8.3
55-64	12.9		18.3
≥65		24.8	
65-74	27.7		10.6
≥75			6.0

Based on refs. 4,6,7.

The selection of clusters was conducted in three stages. In the first stage, a systematic selection of enumeration districts within each stratum, in the second stage a selection of a block within each enumeration district, and in the third stage a selection of segments within each block was drawn.†‡ For the selection of enumeration districts, these were arrayed in descending order of size. For the selection of urban strata (cities and towns), these were arrayed in descending order of size (population). Within cities and towns, enumeration districts, were placed in the numerical order given by the census, which represents the geographic order. In rural strata, municipalities were first placed in geographic order. Within each municipality, incorporated places (towns classified as rural) were placed in descending order of size. Second, nonincorporated places were ordered according to size. Third, rural communities were ordered according to size. Finally, the remainder of rural enumeration districts (nonurbanized areas) were placed in geographic order throughout the stratum. After or-

†Enumeration district is the area covered by a field worker during the census period.

‡Block is the area bounded by well-defined limits (streets, roads, rivers).

TABLE 12
Prevalence rates of diagnosed diabetes mellitus by age and sex for Puerto Ricans in New York City (1982-1984)

Age-group (yr)	Percentage of people		
	Women	Men	Both sexes
12	NA	NA	NA
12-24	0.8	0.4	0.6
25-44	3.0	1.6	2.4
45-64	13.3	11.0	12.4
65-74	28.6	13.6	23.7

Based on Hispanic Health and Nutrition Examination Survey (M.I. Harris, unpublished observations). Includes New York City and bordering counties in New York, New Jersey, and Connecticut. NA, not available.

dering the enumeration districts, a measure of size was computed for each one (dividing by 6 the number of dwellings in the urban areas and by 12 in the rural zone). Therefore, the size of an enumeration district is the number of segments into which it might be divided.

Within each stratum, the sizes were accumulated and a systematic sample was selected with a sampling interval of 100. Therefore, the probability of a selection for an enumeration district was proportional to its measure of size but for a segment it was always 1%.

The Household Health Interview Survey consists of two parts or types of segments. Approximately half of the sample is constituted by new segments selected from those already discarded by the Department of Labor (type 1) and the other half is composed of segments that were visited the previous year (type 2). In both types of the sample, half of the dwelling units included in the segments are selected at random to be interviewed. After the segments were visited for a second time these were discarded. With this method, ~800 dwelling units are interviewed each quarter. These representative and cumulative samples produce statistics based on ~3000 dwelling units after excluding vacant households and those in which no one was at home. The quarterly samples can also be tested as individual samples for special studies. Sample size tends to increase due to new constructions.

The segments in these samples are selected with a probability of 1 of 800 dwellings quarterly and 1 of 200 annually.

In both types of samples, families living in the selected households should be interviewed independent of the name of the family head appearing in the listing because it is a household sample.

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