IMPACT OF DIABETES AND OBESITY AMONG THE ELDERLY IN PUERTO RICO

Report from PREHCO Project data

Report prepared for the Governor's Office for Elderly Affairs of the Commonwealth of Puerto Rico (OGAVE)

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Proyecto PREHCO

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Executive Summary

Many countries in the world are experiencing an increase in the prevalence of diabetes and obesity. Both are rapidly becoming important health problems among the elderly posing significant health care costs. This report summarizes preliminary results obtained on elderly in Puerto Rico from the first wave of the PREHCO (Puerto Rican Elderly Health Conditions) study[1]. Our data show relatively high rates of diabetes and obesity, which is an important risk factor for diabetes. Diabetes is more prevalent among obese individuals who also show health problems similar to diabetics. Diabetics tend to have poorer self-reported health, suffer from depression, live with co-morbidities (hypertension, heart disease, stroke and arthritis) and have functional limitations (ADLs/IADLS[2]). Diabetics also tend to use more prescription medicine and make more visits to health care professionals than do non-diabetics. Interestingly enough there appears to be little difference between diabetics and/or the obese and non-diabetics (non-obese) using socioeconomic indicators, implying that the diabetes and obesity epidemics may cut across social class.

Finally, we show evidence that poor early childhood conditions are associated with the later onset of diabetes thus confirming a conjecture that relates early nutritional status and the adult onset of metabolic disorders. It is evident from our findings that there are important health policy considerations regarding the prevention and control of diabetes and obesity among the Puerto Rican elderly, as this group will undoubtedly have a significant impact on the island's health care system.

In the coming months, PREHCO will build upon the preliminary results presented in this report to conduct a special study of those self reporting diabetes to better understand (a) co-morbidities, (b) treatment and (c) secondary consequences for disability. In addition, as data from the second round of data collection become available we will examine health transitions and the impact that diabetes has on mortality. With the richness of data from two rounds of data collection, PREHCO will be able to provide much needed analysis regarding diabetes among the elderly in Puerto Rico.

[1] Appendix A contains a brief description of the PREHCO Project.
[2] See Appendix A for definitions of ADLs (Activities of Daily Living) and IADLs (Instrumental Activities of Daily Living).

Background

The prevalence of diabetes mellitus is increasing throughout the world (Murray & Lopez, 1996; Amos et al., 1997; King et al., 1998). Obesity, an important risk factor for diabetes, is also increasing (Monteiro, 2004). The diabetes epidemic will affect the Latin American and Caribbean region with staggering projected estimated costs for its treatment (Barceló et al.,, 2003). Evidence from previous studies indicates that Puerto Rican elderly tend to have a higher prevalence of diabetes especially among females (Amos et al., 1997; Tucker et al., 2000; Pérez-Cardona et al., 2001). As part of the growing epidemic, one source estimates large increases in the prevalence of diabetes among Puerto Ricans sixty-five years and older from 2000 to the year 2025 (King et al., 1998).

If it is not adequately controlled diabetes is a disease that can produce serious complications. Complications from diabetes include renal failure, blindness, increased circulatory problems (e.g. heart disease, hypertension), increased risk of feet ulcers and decreased vision. Strict control of blood glucose levels can significantly improve quality of life and life expectancy among diabetics (Amos et al., 1997). Therefore, the management of one's diabetes through careful diet, regular exercise and medications is critical for the diabetic.

What we know thus far about the diabetes epidemic is that it will affect both developed and developing countries although there may be differences in the pattern of the disease. In the developed world diabetics tend to be older than sixty-five and this trend is projected to continue, whereas in the developing world diabetics tend to be slightly younger in the middle aged group (45- 64 years) (King et al., 1998) which will signify rising health care costs earlier in life. Prevalence of diabetes will be higher in urban than rural areas (King et al., 1998).

We present in this report a few salient highlights regarding diabetes and obesity retrieved thus far from the PREHCO (The Puerto Rican Elderly Health Conditions) study. PREHCO collected an extensive amount of information on health conditions in addition to other information among a randomly selected group of 4293 Puerto Rican elderly over the age of 60 along with their spouses (Appendix A). We use the main text to convey a few key ideas about the prevalence of diabetes and obesity among the Puerto Rican elderly. We have included appendices for additional and more detailed results that may be of interest to the reader.

Prevalence of diabetes among elderly Puerto Ricans

The overall prevalence of diabetes in the PREHCO study was 28% and women showed slightly higher prevalence then men (Table 1). The rate is similar to prevalence rates obtained from studies of Puerto Ricans living in the U.S. and in Puerto Rico (Melnik et al., 2004; Tucker, 2000; CDC, 2004b) where it is estimated that residents of Puerto Rico are 1.8 times more likely to have diagnosed diabetes than U.S. non-Hispanic whites (ADA, 2002). The PREHCO rate probably underestimates the true prevalence of diabetes because it is based on self-reported diabetes. Diabetes may be undiagnosed in some cases. The true prevalence rate for elderly Puerto Ricans could be higher by as much as 6-12% (Palloni et al., 2004a; Tucker, 2000; Franse et al., 2001) [3].

The prevalence rate for PREHCO elderly is relatively high when we compare Puerto Rico to other Latin American countries and to the U.S. (Figure 1) (Palloni et al., 2004b). We observe a rise in the prevalence of diabetes by age followed by a decline and rise among men. Women show a similar pattern and overall it appears that larger differences between men and women in prevalence of diabetes in older age groups. Women aged 80-84 have a higher prevalence of diabetes then men the same age. If we examine overall prevalence rates by age, gender and race, we observe differences between black/mulattos[4] and all other race categories (Appendix B, Table B1). Non-black/mulatto males under the age of 80 show a higher prevalence of diabetes than do black/mulatto males, contradicting a pattern found among blacks in the U.S. (Harris et al., 1998).[5] This pattern is reversed for women.

Table 1. Prevalence of diabetes among Puerto Rican elderly (60 years and above)

	Proportion	Sample
Overall	0.28	4,281
Male	0.27	1,738
Female	0.28	2,543

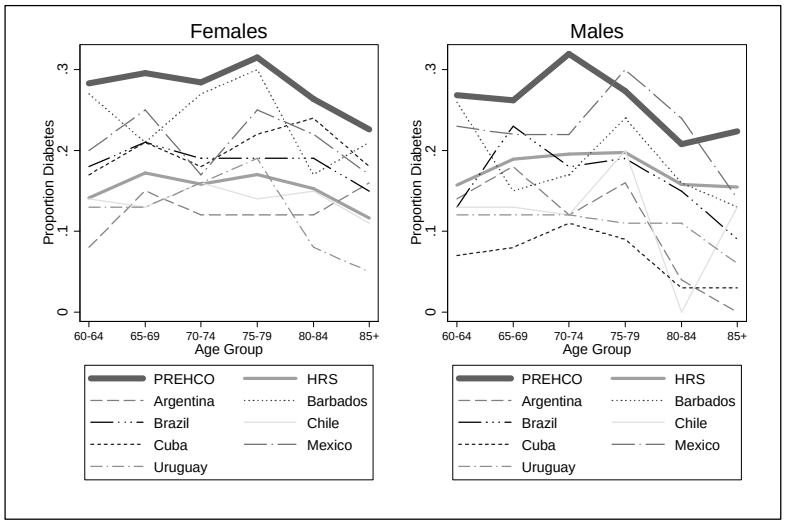
Source: PREHCO 2002-2003. Weighted.

[3] Results from PREHCO support findings from this literature. In the PREHCO study self-reported diabetes and self-reported diabetes-related symptoms agree closely. PREHCO diabetics reported a higher number of symptoms (e.g. excessive thirst, continuous hunger, loss of weight) than did PREHCO non-diabetics (see Appendix B, Figure B1). Nevertheless, we also observe that about 12% of PREHCO non-diabetics reported at least six diabetes-related symptoms, leading us to believe that under reporting of diabetes among the PREHCO sample may be as high as 12%.

[4] Participants classified themselves in one of the following categories: black, mulatto, white, *mestizo* (person of mixed race, particularly of Indian and White parentage) or other.

[5] The implication is that there may be race differentials in misreporting.

Figure 1. Proportion of Self-Reporting Diabetes by Age Group and Sex
in US and Latin American and Caribbean Countries



Source: Palloni et al., 2004b.
Note: HRS stands for the US Health and Retirement Survey

The reasons for a higher rate of diabetes in Puerto Rico are complex and most probably involve environmental, cultural and genetic factors. It is generally believed that increasing prevalence of diabetes is associated with increased urbanization and economic development which has brought about changes in dietary habits to consuming food containing saturated fats and refined carbohydrates and a sedentary lifestyle (Popkin, 1998). There might be additional environmental, cultural or genetic conditions specific to the Puerto Rican experience that explain the higher prevalence of diabetes. Additional research is needed to better understand the underlying reasons for the higher rate of prevalence in Puerto Rico.

Obesity and diabetes

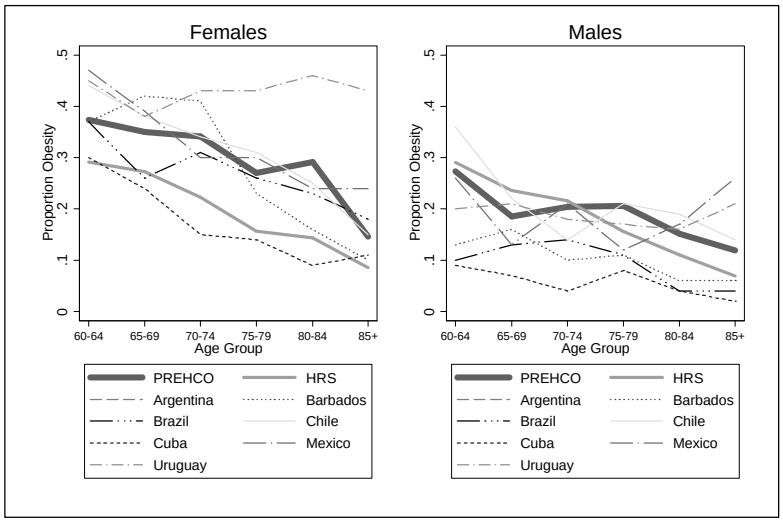
Obesity is a well-recognized risk factor for diabetes (WHO, 2000) and thus, it is not surprising that in the PREHCO data we see a relatively high overall prevalence of obesity (Table 2). This higher rate compares with a similar high rate of obesity in Latin American and Caribbean countries such as Barbados, Brazil, Chile, Mexico and Uruguay (Figure 2). Thus, in this regards, Puerto Rico appears to be no different from obesity trends among the elderly in these countries.

Table 2. Prevalence of obesity among Puerto Rican elderly
(60 years and above)

	Proportion	Sample Size
Overall	0.28	3,746
Male	0.21	1,504
Female	0.33	2,242

Source: PREHCO 2002-2003. Weighted.

Figure 2. Proportion Obese by Age Group and Sex
in US and Latin American and Caribbean Countries



Source: PREHCO 2002-2003. Weighted.
Note: HRS stands for the US Health and Retirement Survey

It is also not surprising to see a strong association between higher prevalence of diabetes and obesity because obesity is an important risk factor for diabetes (Figure 3)[6]. We see that obese men have a higher prevalence of diabetes than do men who are not obese. This is particularly true for men 85 years and older. Obese women also have a somewhat higher prevalence of diabetes than non-obese women. We also see well recognized patterns of decreasing obesity with age.

We again find that women have a much higher prevalence rate then men and this pattern holds across all age groups. Differences do appear between blacks/mulattos and other race in Puerto Rico, but they tend to be more pronounced among women then men (Appendix C, Table C1). Non-black/mulatto females 60-64 years old have a higher prevalence of obesity than black/mulatto females, but black/mulatto females 70-84 years old have a higher prevalence of obesity than non-black/mulatto females of the same age. A similar pattern applies to black/mulatto males.

Profiles of Diabetics and Obese Individuals: Health Conditions

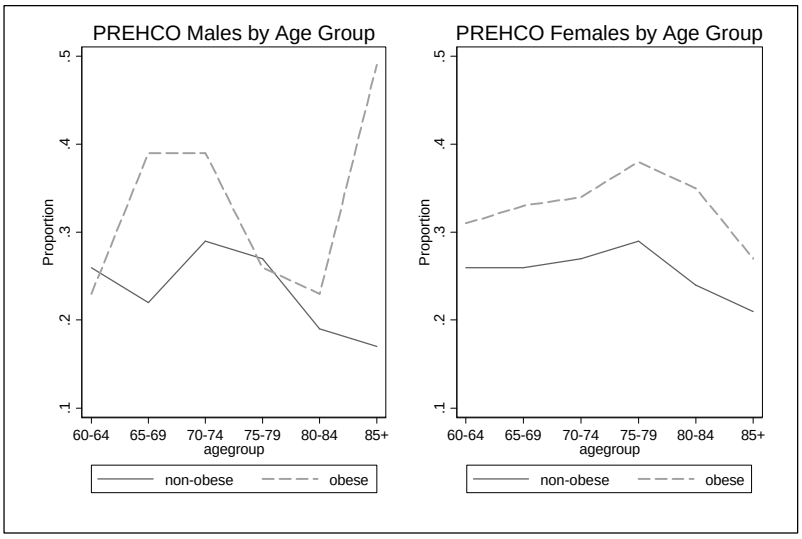
Both diabetes and obesity bring with them major illnesses and complications (ADA, 2002; CDC, 2004a). We observe that PREHCO elderly who have self-reported diabetes tend to be in worse health than those who do not self-report diabetes across several health conditions (Table 3). A similar pattern emerges for obesity. Examining these results in more detail re-confirms our initial observation.

Self-reported health has been consistently shown to be associated with mortality (Idler & Benyami, 1997) and thus is an important health indicator. From the PREHCO study we see that there is a clear relation between those who report being in poor health and diabetes (Figure 4a). Males and females who are non-diabetic tend to report themselves in better health than do males

[6] See Appendix A for an operational definition of obesity.

and females who are diabetic. Women appear to be slightly worse off both among diabetics and non-diabetics. In Figure 4b we observe that morbid obese males and females report poorer health than do other males and females. In the main, morbid obese women report a worst health status than other groups.

Figure 3. Prevalence of Diabetes among Obese and Non-Obese
by Age Group and Sex



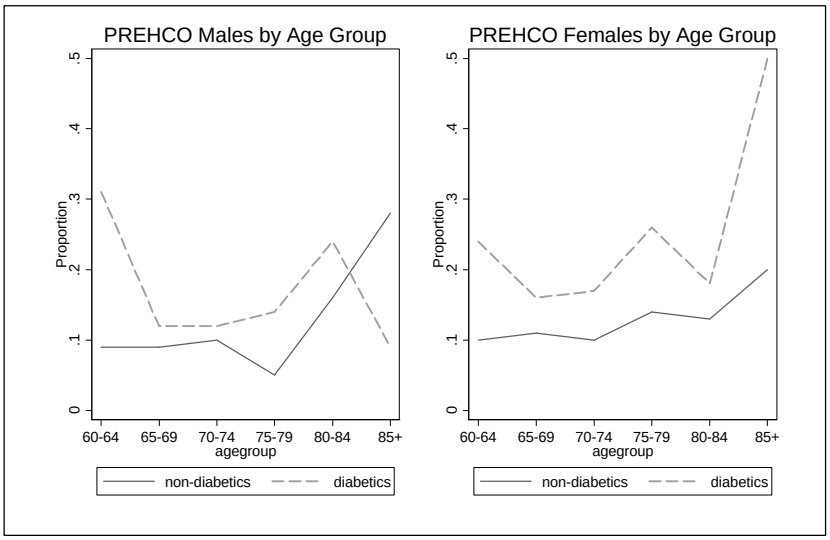
Source: PREHCO 2002-2003. Weighted.

Table 3. Percent reporting health conditions by Diagnostic of Diabetes and Obesity

	Diabetes		Obesity	
	Yes	No	Yes	No
Poor health	20	11	14	12
Depressed	29	25	23	26
Moderate or severely depressed	9	6	7	7
Hypertension	72	52	71	53
Heart disease	24	15	20	17
Cancer	7	6	5	7
Arthritis	54	46	57	45
Stroke	10	5	6	4
Respiratory disease	7	8	9	8
Functional limitations (At least one ADL)	16	11	13	10
Functional limitations (At least one IADL)	31	24	29	22
Total sample size	1,198	3,083	1,047	2,699

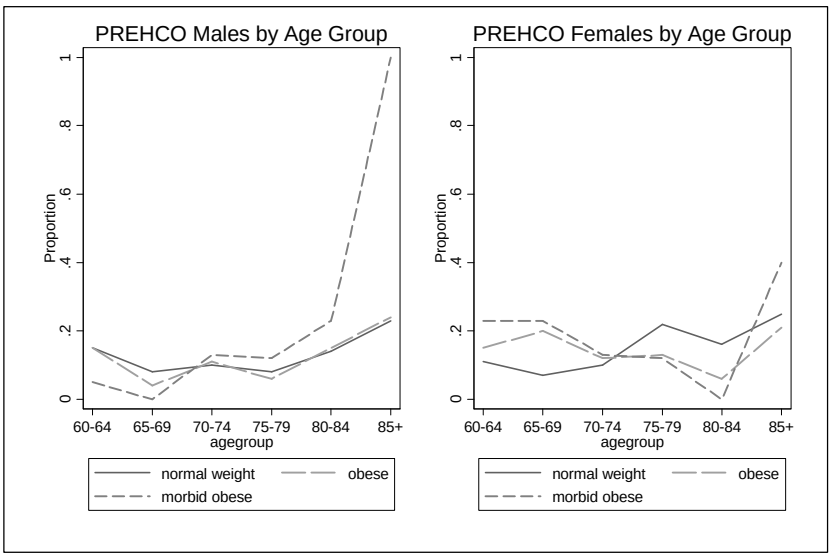
Source: PREHCO 2002-2003. Weighted.
Note: Not everyone had completed information on all health conditions and so sample sizes may vary in table.

Figure 4a. Proportion Self-reporting Poor Health among Diabetics and Non-Diabetics by Gender and Age Group



Source: PREHCO 2002-2003. Weighted.

Figure 4b. Proportion Self-reporting Poor Health among Normal, Obese and Morbid Obese by Gender and Age Group

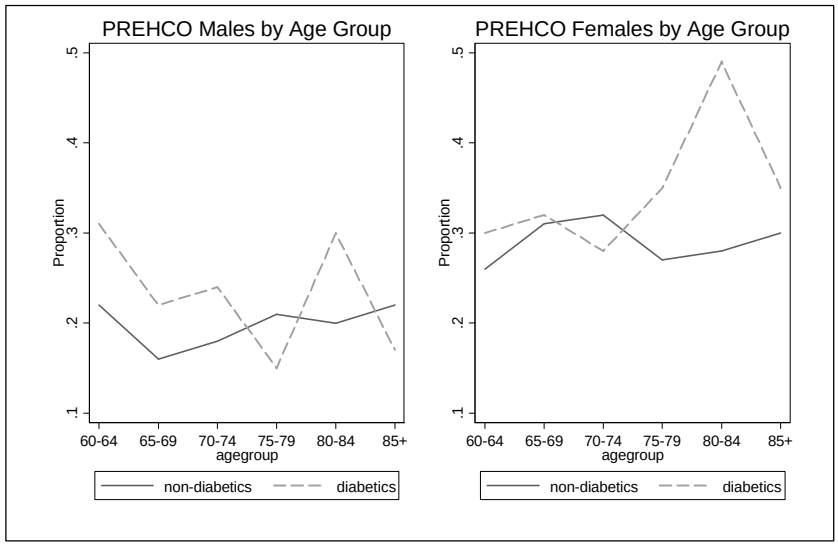


Source: PREHCO 2002-2003. Weighted.

Depression can be either a consequence of diabetes or a risk factor for diabetes (Musselman et al., 2003). The combination of depression and diabetes has also been shown to be associated with poor health outcomes (Black et al., 2003; Egede, 2004). In the PREHCO study we found that diabetic PREHCO males and females had a higher prevalence of depression than did non-diabetic males and females although there are gender differences (Figure 5a). The proportion of diabetic females depressed in their later years is much greater than the proportion of diabetic males of the same age. Non-diabetic females show a higher rater of depression than

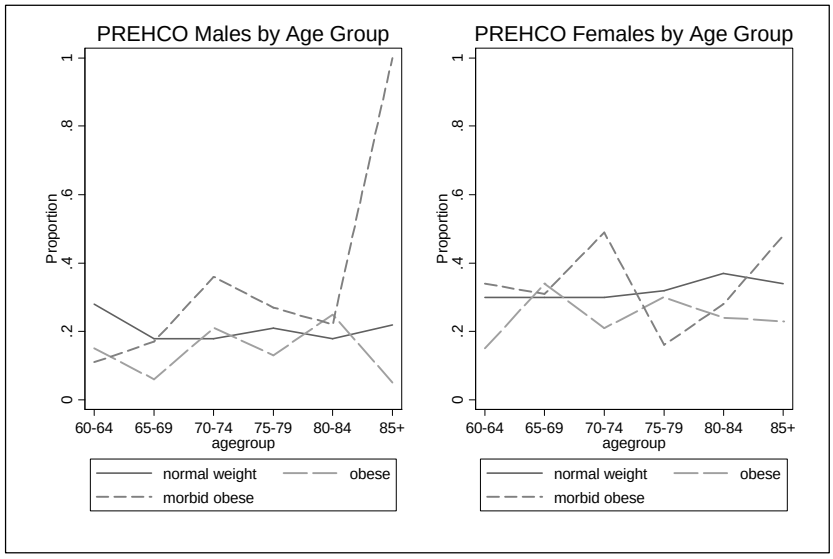
do male non-diabetics. We obtain a less clear picture of the relation between obesity and depression (Figure 5b). We observe that the morbid obese in general are more depressed than obese and those of normal weight, particularly in oldest groups. Women in general are slightly more depressed than men.

Figure 5a. Proportion Depressed among Diabetics and Non-Diabetics by Gender and Age Group.



Source: PREHCO 2002-2003. Weighted.

Figure 5b. Proportion Depressed among Normal, Obese and Morbid Obese by Gender and Age Group.

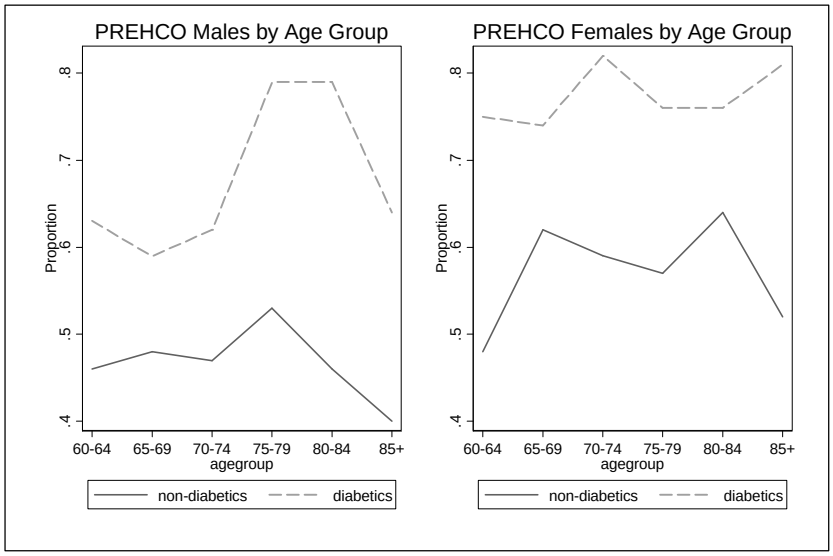


Source: PREHCO 2002-2003. Weighted.

Hypertension is a risk factor for heart disease and diabetes tend to be more at risk for heart disease (ADA, 2002). PREHCO data show that diabetics have a higher prevalence of hypertension than do non-diabetics placing them at higher risk (Figure 6a). Females appear to

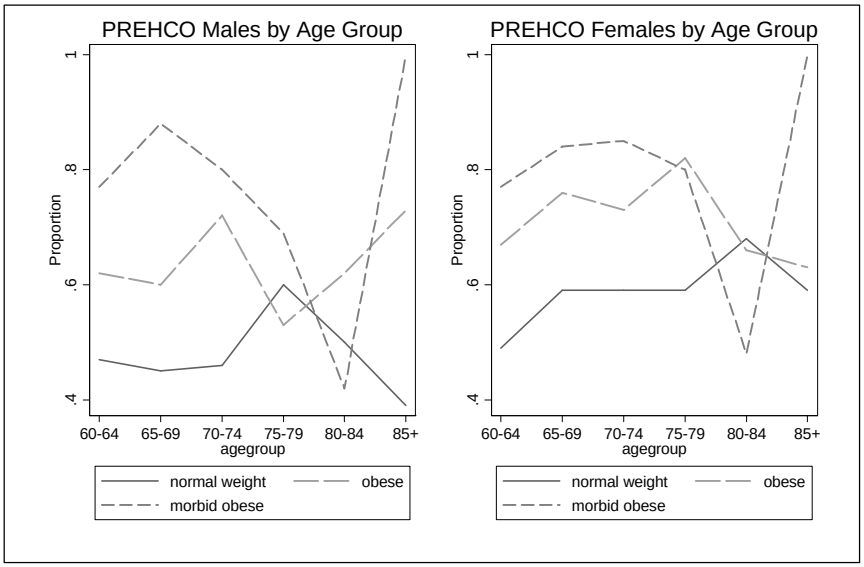
have a higher rater of hypertension than do males. This pattern is also true for those females and males of normal weight who have a lower prevalence of hypertension (Figure 6b).

Figure 6a. Proportion with Hypertension among Diabetics and Non-Diabetics by Gender and Age Group



Source: PREHCO 2002-2003. Weighted.

Figure 6b. Proportion with Hypertension among Normal, Obese and Morbid Obese by Gender and Age Group

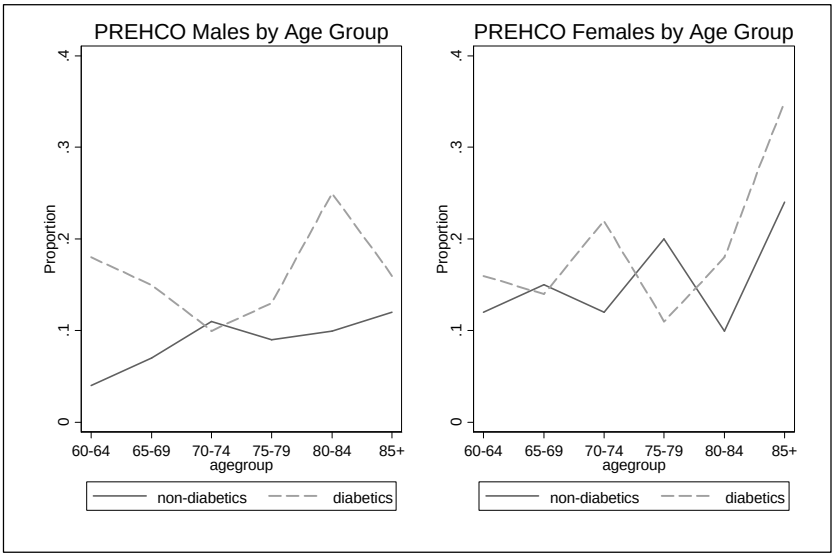


Source: PREHCO 2002-2003. Weighted.

We know that as people age, ***functional limitations*** increase. However, research has shown that diabetic individuals have more functional limitations than do non-diabetics (Ryerson et al., 2003; Stewart et al., 1999). Indeed, in the PREHCO study, we found that diabetics have higher levels of functional limitations than non-diabetics as measured by ADL's (Activities of Daily Living) and IADL's (Instrumental Activities of Daily Living). With the exception of the

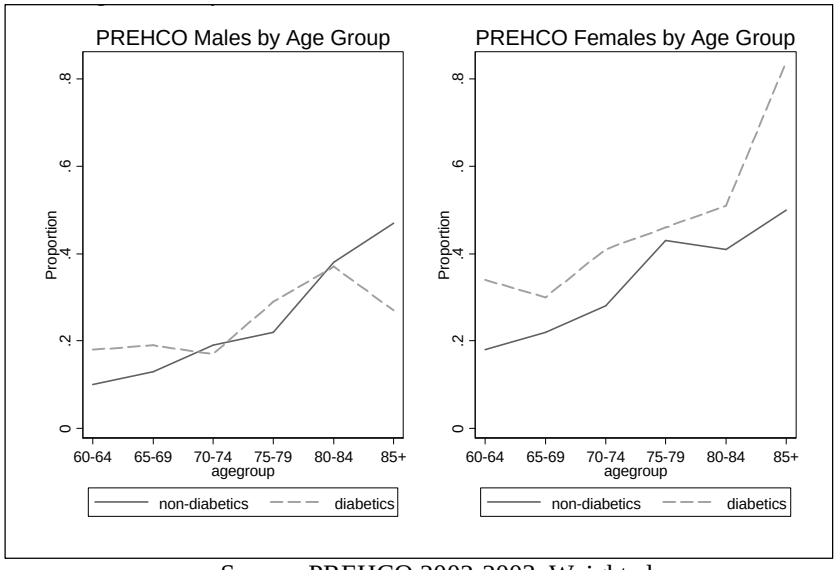
80-84 age group, the proportion of diabetic women with, at least, one limitation in ADL's is greater than the proportion of diabetic men (Figure 7a). In general, the proportion of women with, at least, one limitation is greater than the proportion of men. There is a slightly higher prevalence of IADL's among diabetics than among non-diabetics regardless of gender and age group (Figure 7b). In both, ADL's and IADL's, we see that the proportion of persons with at lest one functional limitation increase with age, which is to be expected. When we look at obesity (Figures 8a and 8b), we observe similar patterns.

Figure 7a. Proportion with at least one ADL among Diabetics and Non-Diabetics by Gender and Age Group



Source: PREHCO 2002-2003. Weighted.

Figure 7b. Proportion with at least one IADL among Diabetics and Non-Diabetics by Gender and Age Group

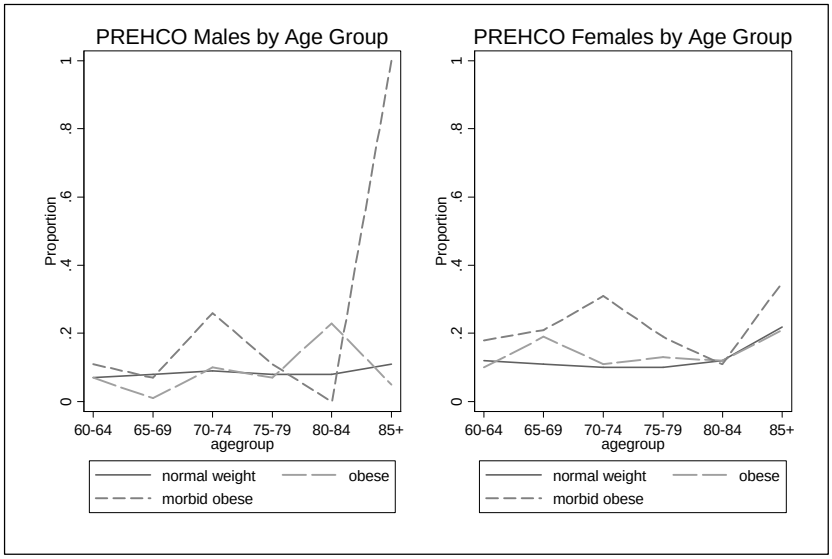


Source: PREHCO 2002-2003. Weighted.

Profiles of Diabetics and Obese Individuals: Treatment and Use of Health Services

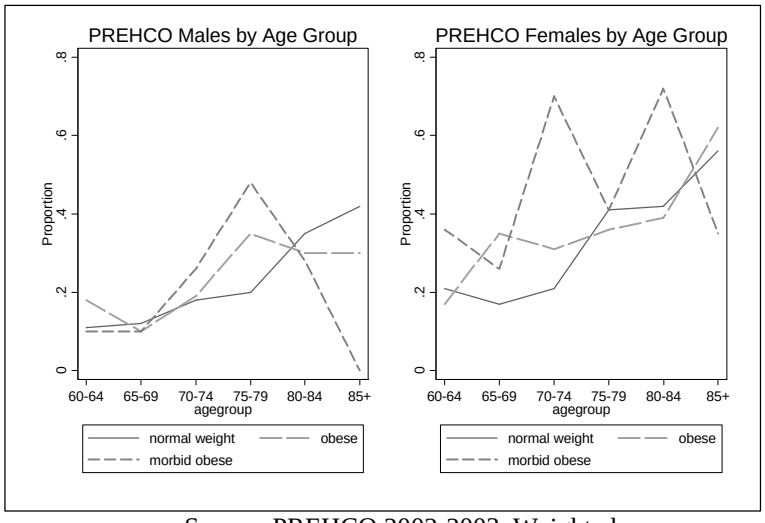
The average age at diagnosis for diabetes among the PREHCO sample was 59 years (standard deviation of 13.73). While there is now evidence suggesting that diabetes is becoming more prevalent among the middle-aged (King et al., 1998), the PREHCO sample does not provide us with strong clues that this shift is occurring in the Puerto Rico population.

Figure 8a. Proportion with at least one ADL among Normal, Obese and Morbid Obese by Gender and Age Group



Source: PREHCO 2002-2003. Weighted.

Figure 8b. Proportion with at least one IADL among Normal, Obese and Morbid Obese by Gender and Age Group



Source: PREHCO 2002-2003. Weighted.

When we examine the type of treatment among the PREHCO elderly, we find a pattern that is similar to that reported in the U.S. among adults with diagnosed diabetes (Table 4).

Fourteen percent (14%) of PREHCO diabetics reported that they do not take medication or use insulin. These individuals may be cases for whom the disease is less severe.

Table 4. Percent of diabetics in treatment

	PREHCO	U.S.
Oral medication only	56%	53%
Insulin only	15%	19%
Both	15%	12%
No treatment	14%	15%

Source: PREHCO 2002-2003. Weighted.
ADA 2002. Adults diagnosed with diabetes.
Note: 1,198 diabetics in PREHCO study.

Complications for diabetes can often be serious and management of diabetes is thus critical. In the U.S. heart disease is the leading cause of diabetes-related death; and diabetes is the leading cause for new cases of blindness, treated end-stage renal disease, and non-traumatic lower-limb amputations (ADA, 2002). When we examine the percent of PREHCO diabetics with complications (Table 5), we note that most of the complications are from those who are in some type of treatment which suggests that these individuals may experience the disease most severely. While we are also led to question the type of management that people use for their diabetes, we cannot as of yet draw conclusions without further analysis. We do not know the timing of the onset of treatment for diabetes and therefore cannot distinguish if management of diabetes is an indicator that reflects higher complications or if later diagnosis of diabetes when complications were already present is a factor explaining a higher number of complications.

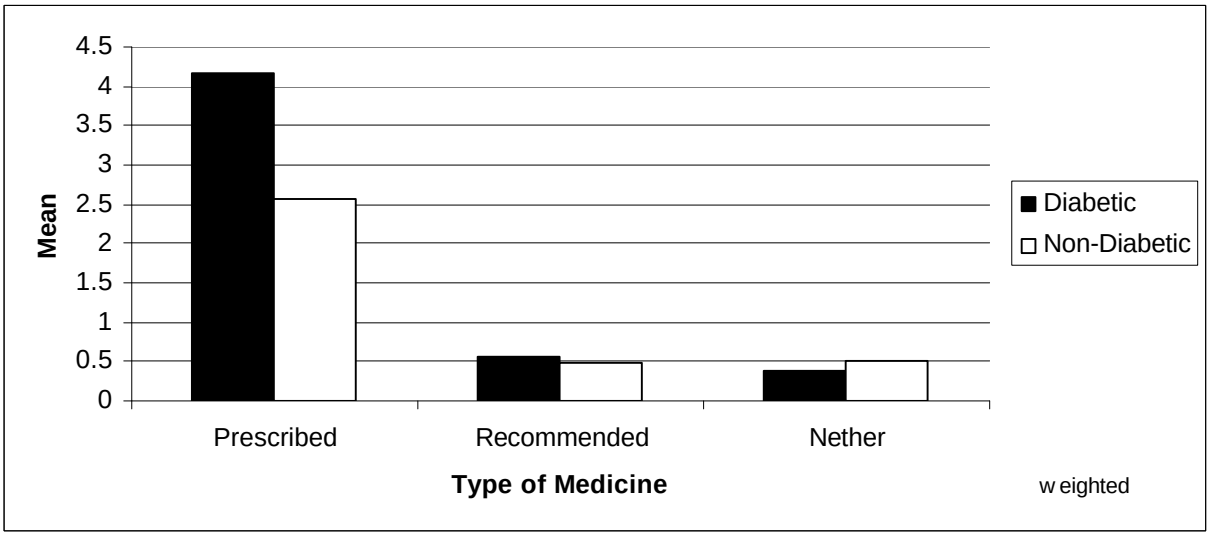
Table 5. Percent of diabetics with self-reported complications by treatment

	Overall (1)	No treatment (2)	Oral only (3)	Insulin only (4)	Both (3 & 4)
Kidney failure	10%	6%	8%	15%	21%
Amputation	2%	3%	1%	3%	4%
Circulatory	47%	30%	42%	65%	63%
Vision	58%	43%	51%	80%	80%
Ulcers on feet	11%	6%	9%	16%	16%
Total number	1,197	168	664	183	182

Source: PREHCO 2002-2003. Weighted.
Note: 1,198 diabetics in PREHCO study. Sample size varies as not all questions had complete information.

Health care costs account for approximately 70% of the costs of diabetes in the U.S. (ADA, 2003) and can be very high (ADA, 2002; ADA, 2003; Barceló et al., 2003). Costs from obesity are also estimated to be high in the U.S. (CDC, 2004a). The preliminary evidence from the PREHCO sample on the utilization of health services shows that on average diabetics take more prescribed medication than do non-diabetics (Figure 9). On average diabetics visit a health care professional more than do non-diabetics (Figure 10, upper left graph). Diabetics also use health services more than non-diabetics (Figure 10, lower left graph). If we examine these figures broken down by diabetics with and without treatment (graphs on upper and lower right), we observe an expected pattern, namely, that those with treatment use health services more than those without treatment.

Figure 9. Medication use by Diabetics and Non-Diabetics and Type of Medication

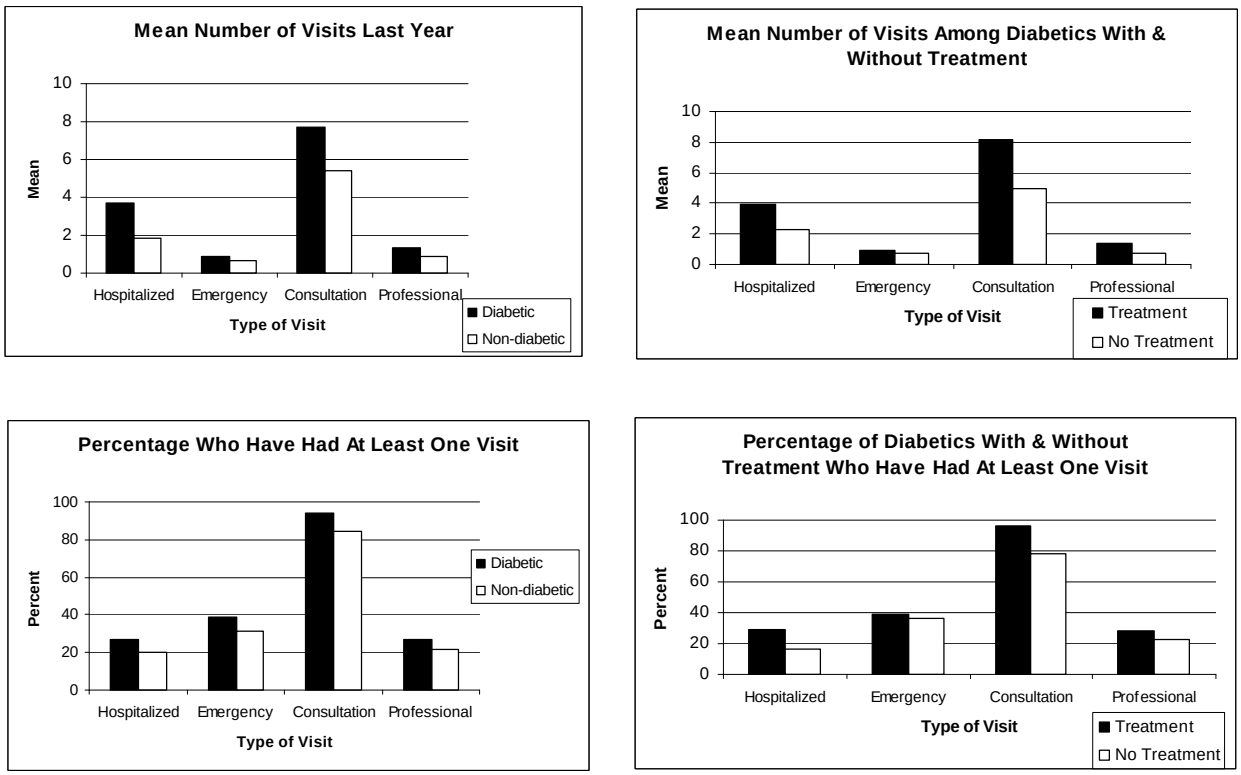


Source: PREHCO 2002-2003. Weighted.

Determinants of Diabetes: Socioeconomic Status

It is generally believed that in the developed world, higher socioeconomic status means better health (Marmot et al., 1997) and that in the developing world this pattern is reversed for chronic conditions (Aboderin, 2002). Surprisingly, in the PREHCO study, we found no consistent and dramatic differences in prevalence of diabetes and obesity by educational level (Table 6). Inequalities appear to be fairly trivial. This also proved to be the case when we examined educational level by gender, although females do appear to have a sharper gradient than males and at lower educational levels females have a higher prevalence of diabetes (Appendices B, Table B2). The same overall pattern of trivial differences between educational level, age and gender appeared with a couple of notable differences. Males 60-74 years old with no schooling have a higher prevalence of diabetes as compared with males at different educational levels. Females 75 years and above also follow this pattern (Appendix B, Table B3).

Figure 10. Utilization of Health Services by Diabetics and Non-Diabetics



Source: PREHCO 2002-2003. Weighted.

Note: Hospitalized: Number of nights spent in a hospital in the past year.
Emergency: Number of visits to an emergency room in the past year.
Consultation: Number of visits to receive a medical consultation in the past year.
Professional: Number of visits to other medical professionals in the past year.

For obesity we observe a different pattern because as educational level increases, so does the prevalence of obesity (Table 6). When we examine educational level by gender (Appendix C, Table C2), females have a higher prevalence of obesity than do males. However, differences among educational levels within each gender group appear to be small. When we examine educational level by gender and age group, we note that differences within each age group and gender appear to be small with the exception of the group with no schooling. Males 60-74 years old with no schooling had a much lower prevalence of obesity than did other males of similar age. Likewise, females aged 75 years and above had a much lower prevalence of obesity (Appendix C, Table C2). These rather surprising results may reflect the confounding influence of selective survival of diabetics across different social classes (Palloni et al., 2004b). Interestingly, other studies have shown the absence of socioeconomic differences in the prevalence of diabetes for Puerto Ricans living in the U.S. (Tucker et al., 2000).

Table 6. Prevalence of Diabetes and Obesity by Educational Level

Education	Diabetes	Obesity
No schooling	0.33	0.21
Elementary	0.29	0.28
Secondary	0.26	0.28
Higher	0.26	0.29

Source: PREHCO 2002-2003. Weighted.

Determinants of Diabetes: Early Childhood Conditions

There is growing evidence that adverse childhood conditions increase the risk of elderly morbidity and mortality (Aboderin et al., 2002). Poor early nutritional status and/or socioeconomic conditions can affect growth and lead to high risks of obesity and diabetes. In the PREHCO sample we used knee height (an indicator of early childhood nutritional status and stunting) and a series of questions asking respondents about their early childhood health and economic conditions to predict the probability of being diabetic. We also used waist-hip ratio (WHR), an indicator of adult central obesity to predict the probability of being diabetic.

When we estimated simple logistic models for the probability of self-reporting diabetes as a function of a number of control variables (age, gender, and education), we found that both knee height and WHR exert powerful effects (Palloni et al., 2004b). We estimate that people with low knee height have a 0.30 probability of developing diabetes. In contrast, those with normal or above normal knee height have a 0.26 probability of developing diabetes (Table 7, Knee Height Model). Likewise, we estimate that people with high WHR have a 0.34 probability of developing diabetes. In contrast, those with normal or below normal WHR have a 0.25 probability of developing diabetes (Table 7, WHR Model).[7]

Table 7. Predictions for having diabetes using two different models

	Knee Height Model		WHR Model	
	No	Yes	No	Yes
Low knee height	0.26	0.30		
High WHR			0.25	0.34
Obesity	0.25	0.32	0.25	0.32
Poor childhood health	0.26	0.30	0.26	0.30

Source: PREHCO 2002-2003. Weighted.

[7] While these differences may not seem large, they are far from trivial. For example, we estimate that "eliminating" short knee height could reduce diabetes prevalence among females in the 60-69 group by about seven to ten percent (Palloni et al., 2004). Eliminating WHR above the cutting point would reduce diabetes in the same group anywhere between thirteen and seventeen percent. Theses are not staggering amounts, but would probably suffice to remove the distinction of Puerto Rico as the country where elderly experience the highest prevalence of self-reported diabetes in Latin America.

Conclusions

Findings from the PREHCO data confirm the importance of diabetes and obesity among the elderly in Puerto Rico. There is a high prevalence of diabetes and obesity among Puerto Rican elderly. Diabetics clearly report poorer self-reported health, higher rates of depression, co-morbidities and functional limitations. A similar pattern emerges for obesity. Diabetics take more prescription medications and use health services more frequently than do non-diabetics. Interestingly enough, the diabetes and obesity epidemics appear to affect all social classes. Final, we suggest that early poor childhood nutrition may later impact on the risk of diabetes. The results have clear policy implications in planning for the prevention of these conditions and the care of this population.

This preliminary report highlights some of the salient features of diabetes in PREHCO. However, it is a first step, along a series of many leading to a more detailed understanding of diabetes and its impact on the Puerto Rican elderly. For example, we need to answer questions such as: What are the estimated health care costs for diabetes in Puerto Rico? What types of prevention and control programs would be effective for Puerto Rican elderly? How do co-morbidities impact diabetes? How do early childhood conditions impact elderly diabetes? What are other consequences of diabetes? What are the conditions that explain the differing patterns of diabetes and obesity different among the Puerto Rican elderly?

In the coming months, PREHCO will build upon the preliminary results presented in this report to conduct a special study of those self reporting diabetes to better understand (a) co-morbidities, (b) treatment and (c) secondary consequences for disability. In addition, as data from the second round of data collection become available we will examine health transitions and the impact of diabetes on mortality. With the richness of data from two rounds of data collection, PREHCO will be able to provide much needed analysis regarding diabetes among the elderly in Puerto Rico.

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APPENDIX A
PREHCO STUDY AND DEFINITIONS

Study

The Puerto Rican Elderly: Health Conditions (PREHCO) project was designed to gather quality baseline data on issues related to the health of elderly Puerto Ricans. The data collected offers a substantial amount of information within the limits permitted by face to face interviews in a cross section. PREHCO (http://prehco.rcm.upr.edu/) is a cross-sectional survey of the non-institutionalized population age 60 and over and their surviving spouses who were resident of the island as of June 1st, 2000. The sample is a multistage, stratified sample of the elderly population residing in Puerto Rico with oversamples of regions heavily populated by population of African descent and of individuals aged over 80. The data was gathered through face-to-face interviews with elderly adults, including those with cognitive limitations who required the presence of a proxy to provide information, and with their surviving spouses, regardless of age. The field work consisted of interviews conducted with laptop and specialized anthropometric measurement and physical performance. More than 20,600 households were visited in 233 sample sections. A total of 4,293 in-home face-to-face target interviews were conducted between May 2002 and May 2003, averaging 114 minutes in length. In addition 1,444 spouses were interviewed, 1,043 of them 60 or older. The fraction on interviews requiring a proxy was 12.4%. The overall response rate was 93.9%. The questionnaire includes modules on demographic characteristics, health status and conditions, cognitive and functional performance, labor and economic status, income and assets, health insurance and use of health services, family structure, transfers, housing, anthropometric measurements and physical performance. The second wave of the National Institute of Health funding awarded in 2004 has now begun with completion date expected to be Fall 2008.

Definitions

We use a self-reported diabetes question to measure the prevalence of diabetes among the elderly. The question reads, "Has a doctor ever told you that you had diabetes?" Based on this response we identify prevalence of diabetes. From other studies we know that such measures, while they may understate the prevalence of diabetes, do provide reasonably good estimates of the prevalence of diabetes in the absence of the ability to conduct expensive clinical studies.

To measure obesity, we used the measurements of height and weight that were obtained through trained surveyors to first calculate body mass index (BMI) which is defined as the weight in kilos divided by the height squared in meters. We used the internationally recognized definition of obesity as of having a BMI greater than or equal to 30. Morbid obesity we defined to be as having a BMI greater than or equal to 36.

We also collected several measures on self-reported health, other self-reported chronic conditions (e.g. heart, respiratory, cancer, arthritis, stroke) and functional limitations (ADL's and IADL's). Self-reported health asked respondents to rate their health on a 5-point scale from poor to excellent. Chronic conditions were measured in a way similar to asking about diabetes. ADL's and IADL's were defined as follows:

ADLs	Walking across the room Dressing Bathing Eating Getting in and out of bed Using bathroom
IADLs	Preparing meals Managing money Difficulty with getting to places (only in SABE) Buying food or clothing Using the phone (in SABE only for those with a phone) Doing heavy housework Taking medicine(s)

We constructed a diabetes index based on physical symptoms that have been associated with diabetes using a series of yes/no questions: Excessive thirst, drinks a lot of liquids, always hungry, easily lost more than 10 pounds, urinates frequently, blurry vision, tires easily, hands and feet fall asleep, skin or gun infections. In addition, we assigned a higher score if the respondents had family members who were diabetic. The diabetes index ranged in value from 0 to 9 (the higher number meaning presence of more symptoms or conditions associated with being diabetic).

APPENDIX B
ADDITIONAL DATA ON DIABETES

Table B1. Prevalence of diabetes by age group, gender and race

	Gender and Race			
	Male		Female	
Age group	All other	Black/Mulatto	All other	Black/Mulatto
60-64	0.22 (183)	0.28 (194)	0.25 (258)	0.31 (280)
65-69	0.29 (193)	0.22 (147)	0.29 (273)	0.29 (240)
70-74	0.36 (152)	0.28 (107)	0.25 (220)	0.32 (212)
75-79	0.29 (119)	0.27 (78)	0.27 (148)	0.41 (145)
80-84	0.19 (95)	0.22 (79)	0.27 (136)	0.22 (104)
85+	0.12 (62)	0.35 (43)	0.24 (67)	0.16 (90)

Source: PREHCO 2002-2003. Weighted.
Note: sample sizes appear in parentheses below the numbers showing the proportion of diabetics

Table B2. Prevalence of diabetes by educational level and gender

Education	Male	Female
No schooling	0.27 (92)	0.36 (149)
Elementary	0.26 (625)	0.32 (1021)
Secondary	0.27 (704)	0.26 (897)
Higher	0.28 (293)	0.24 (444)

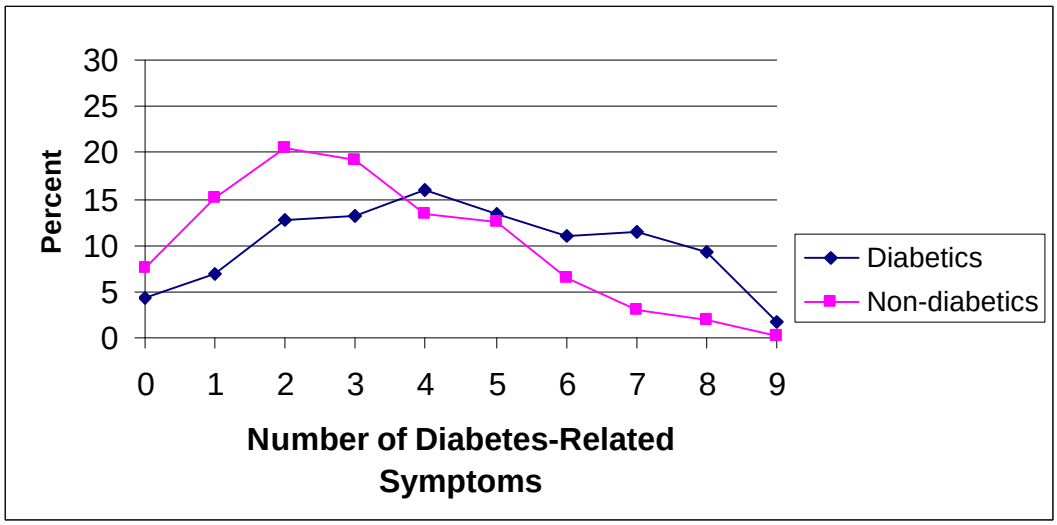
Source: PREHCO 2002-2003. Weighted.
Sample sizes appear in parentheses.

Table B3. Prevalence of Diabetes by Educational Level, Gender and Age Group

	Age Group and Gender			
	60-74		75+	
	Male	Female	Male	Female
No schooling	0.43	0.30	0.11	0.44
Elementary	0.26	0.35	0.25	0.26
Secondary	0.28	0.25	0.24	0.28
Superior	0.27	0.25	0.31	0.21

Source: PREHCO 2002-2003. Weighted.
Note: sample sizes are not shown. Example: The prevalence of diabetes among males, 60-74 years old with no schooling was 0.43 as compared with females in the same age group and educational level who had a prevalence of 0.30.

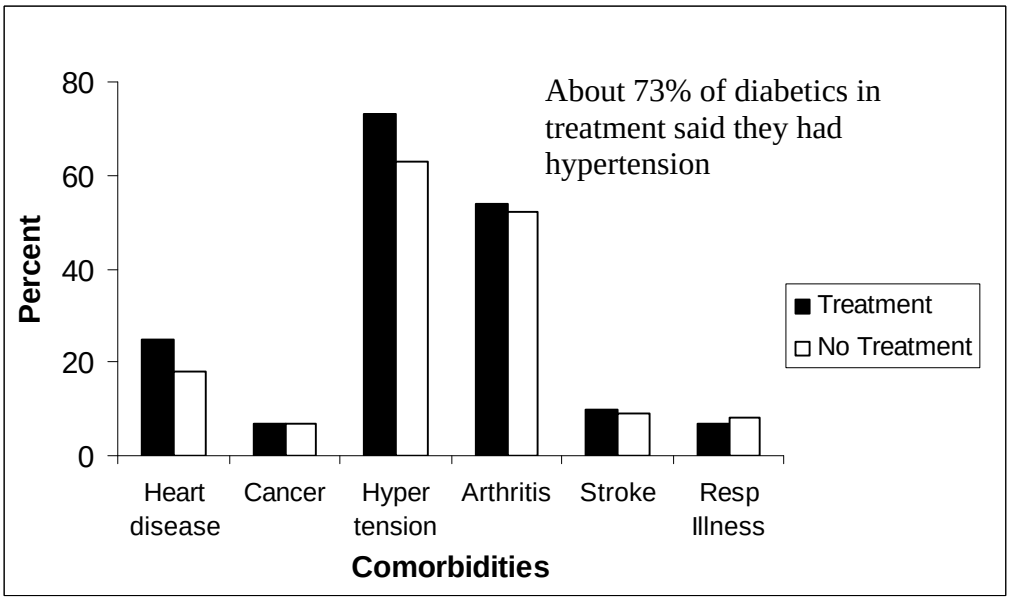
Figure B1. Percent of Diabetics and Non-Diabetics by Number of Diabetes-Related Symptoms



Source: PREHCO 2002-2003. Weighted.

Figure B1 shows the relationship between self-reported diabetes and physical symptoms that are often associated with diabetes such as excessive thirst, drinks a lot of liquids, always hungry, easily lost more than 10 pounds, urinates frequently, blurry vision, tires easily, hands and feet fall asleep, skin or gun infections (see Appendix A). We would expect that a higher percent of diabetics would report more diabetes-related symptoms than non-diabetics. The chart above confirms our expectation, although we observe that there are non-diabetics who also report a higher number of symptoms. This may indicate that some people have undiagnosed diabetes.

Figure B2. Percent of Diabetics in Treatment with Comorbidities



Source: PREHCO 2002-2003. Weighted.

APPENDIX C
ADDITIONAL DATA ON OBESITY

Table C1. Prevalence of Obesity by age group, gender and race

	Gender and Race			
	Male		Female	
Age group	All other	Black/Mulatto	All other	Black/Mulatto
60-64	0.31 (176)	0.24 (187)	0.40 (247)	0.34 (270)
65-69	0.19 (176)	0.18 (138)	0.36 (258)	0.35 (234)
70-74	0.20 (143)	0.20 (103)	0.29 (199)	0.44 (198)
75-79	0.18 (112)	0.29 (73)	0.29 (127)	0.30 (136)
80-84	0.18 (85)	0.13 (74)	0.23 (125)	0.29 (97)
85+	0.10 (56)	0.21 (38)	0.24 (58)	0.14 (80)

Source: PREHCO 2002-2003. Weighted.
Note: sample sizes appear in parentheses below the numbers showing the proportion obese

Table C2. Prevalence of diabetes by educational level and gender

Education	Male	Female
No schooling	0.14 (77)	0.25 (120)
Elementary	0.21 (530)	0.33 (896)
Secondary	0.22 (628)	0.33 (815)
Higher	0.22 (257)	0.34 (400)

Source: PREHCO 2002-2003. Weighted.
Sample sizes appear in parenthesis

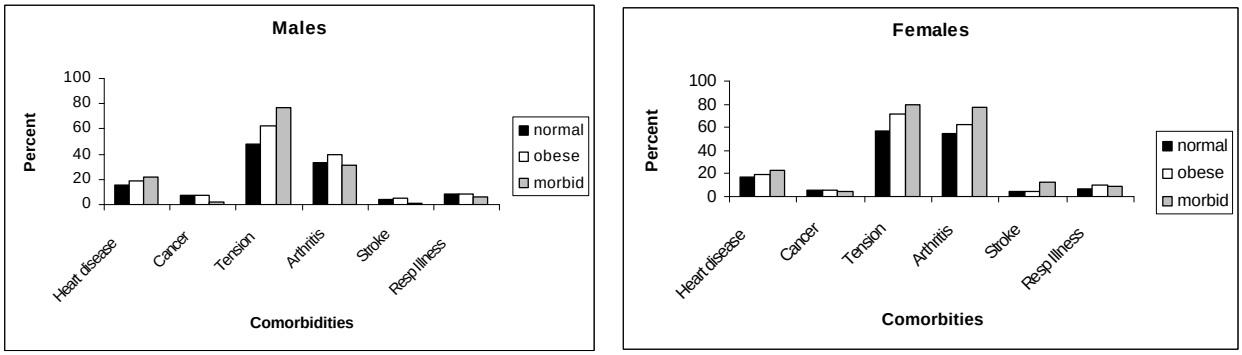
Table C3. Prevalence of Obesity by Educational Level, Gender and Age Group

	Age Group and Gender			
	60-74		75+	
	Male	Female	Male	Female
No schooling	0.04	0.34	0.20	0.12
Elementary	0.23	0.37	0.18	0.25
Secondary	0.24	0.34	0.13	0.31
Superior	0.21	0.37	0.25	0.22

Source: PREHCO 2002-2003. Weighted.

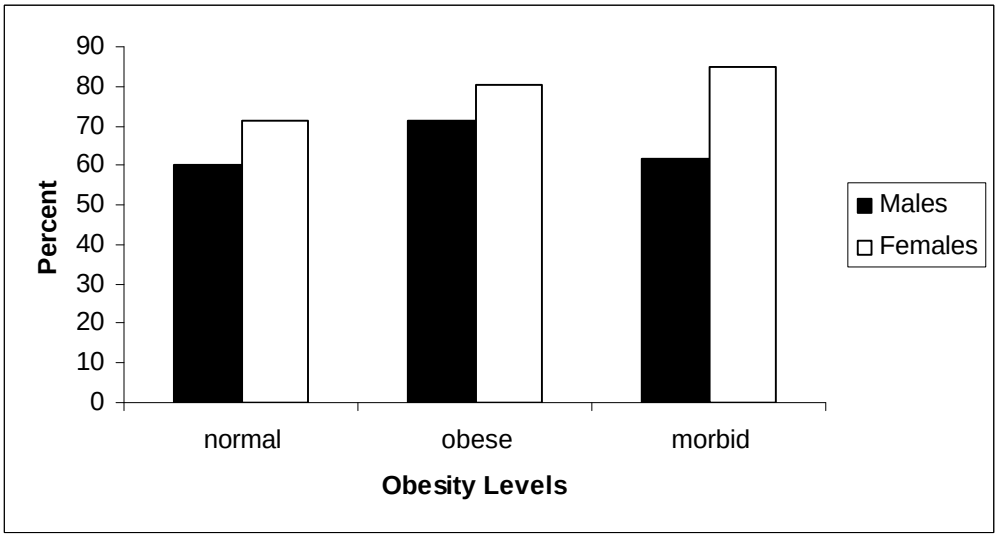
Note: sample sizes are not shown. Example: The prevalence of obesity among males, 60-74 years old with no schooling was 0.04 as compared with females in the same age group and educational level who had a prevalence of 0.34.

Figure C1. Percent of Obese People with Chronic Diseases



Source: PREHCO 2002-2003. Weighted.

Figure C2. Percent of Obese Males and Females who Report at least One Chronic Condition



Source: PREHCO 2002-2003. Weighted.

Note: Normal indicates that a person is in the normal weight range and is defined by a body mass index of less than 30. Obese is defined by a body mass index which is 30 or greater. Morbid is defined by a body mass index which is 36 and greater.