

Aging in Puerto Rico: A Comparison of Health Status Among Island Puerto Rican and Mainland U.S. Older Adults

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Abstract

Objective: To characterize the health status of older island Puerto Ricans, a segment of the U.S. population that has been largely overlooked in aging research. **Method:** Data from the 2002 Puerto Rican Elderly Health Conditions Project and the 2002 Health and Retirement Study are used to examine differences in disease, disability, and self-rated health among island Puerto Ricans and the mainland U.S.-born older adult population. Differences are further examined by gender. **Results:** Island Puerto Ricans were less likely to have heart disease, stroke, lung disease, cancer, activities of daily living (ADL) limitations, and poor self-rated health, but more likely to have hypertension and diabetes. Island Puerto Rican women had worse health relative to island Puerto Rican men. **Discussion:** Recent challenges in the funding and provision of health care in Puerto Rico are worrisome given the large number of aging island adults, many of whom have hypertension and diabetes, two conditions that require long-term medical care.

Keywords

Puerto Ricans, Puerto Rico, Hispanic health, Hispanic aging

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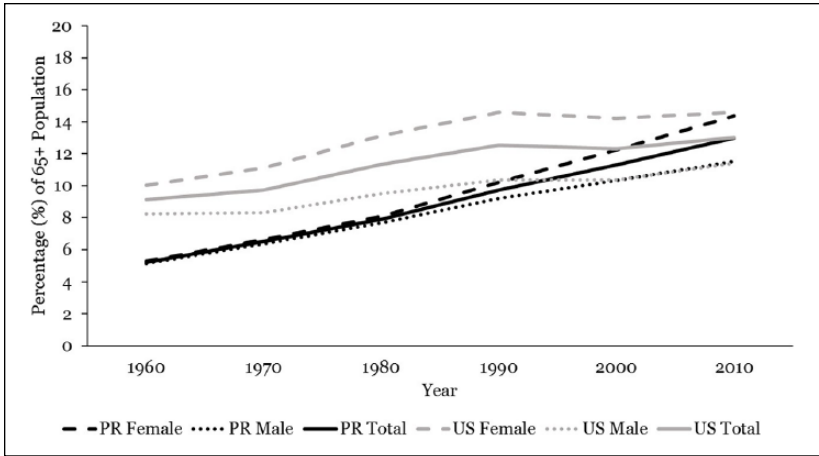


Figure 1. Comparison of the aged 65+ population, Puerto Rico (PR) and the United States (US): 1960-2010.

Source. The World Bank (<http://databank.worldbank.org/data/reports.aspx?source=health-nutrition-and-population-statistics#>)

Note. Using population statistics data from the World Bank, we plotted the percentage of the total, male, and female population that was aged 65 and older in Puerto Rico and the United States from 1960 to 2010. PR = Puerto Rico; US = United States.

Introduction

Research on Hispanic aging has largely overlooked an entire segment of the U.S. Hispanic population: Island Puerto Ricans. The Commonwealth of Puerto Rico is a Caribbean island and territory of the United States. Puerto Ricans born on the island are natural-born citizens of the United States, though as Americans living on the island, they do not have the full set of rights afforded to U.S. citizens. Like the rest of the United States, the population of Puerto Rico is aging rapidly. This segment of the aging U.S. population has received relatively less attention in research on Hispanic aging, despite island-residing Puerto Ricans being part of the U.S. population, having U.S. citizenship, and constituting the third largest U.S. Hispanic group (3.7 million) behind mainland-residing Puerto Ricans (4.7 million) and Mexicans (32.9 million; Motel & Patten, 2012). The objective of the current study is to assess the health status of older island Puerto Ricans and compare their health with that of the mainland U.S.-born older adult population.

Largely a result of the recent, rapid aging of the population, the proportion of older adults in Puerto Rico is approximately equivalent to that of the United States (Werner, 2011). The aging of the population of Puerto Rico over time, compared to that of the mainland United States, is shown in Figure 1. The

proportion of older adults in Puerto Rico was half that of the United States in 1960, only catching up to the United States relatively recently in 2010. The proportion of the male population aged 65 and older in Puerto Rico reached that of the United States even earlier in 2000. The recent rapid growth in the older adult population in Puerto Rico may place strains on the social and health systems on the island. For instance, aging populations have greater rates of morbidity and disability, and these conditions in the context of a growing old age population are seen by some as a looming economic and social burden (Coleman, 2001). Increasing prevalence of chronic diseases such as cardiovascular disease, cancer, and diabetes on the island (García-Palmieri, 2004; Rodríguez Ayuso, Geerman, & Pesante, 2012), which results in part from a rapidly aging population, will require additional health care resources. Puerto Rico faces unique challenges to the health care system, however, including outmigration of physicians to the U.S. mainland (Asociación de Salud Primaria de Puerto Rico, 2014; Kaiser Family Foundation, 2016a) and inadequate health system financing (Mach, 2016; McBean, Bubolz, Conde, & Barosso, 2003). The implications of an aging island Puerto Rican population remain largely unknown, however, as we have limited knowledge of the health status of older adults living on the island.

Although a number of studies have documented the health of older U.S. adults, there is very little empirical research on older adults residing on the island of Puerto Rico, and insights from prior studies of health patterns of older mainland U.S. populations may not extend to the island-dwelling older adult population. There are several reasons to expect that the health status of island-dwelling Puerto Ricans differs from the U.S. mainland population. Historically, Puerto Rico has lagged behind the U.S. in economic development and population health. For instance, the U.S. entered the second phase of the demographic transition in the 18th century, but Puerto Rico did not experience the economic development and improved population health characteristic of this stage until the 20th century. Island-residing Puerto Ricans in the early 20th century experienced similar life circumstances and demographic forces as those in other developing Latin American countries, including overpopulation and lower levels of economic development. In addition, the population was predominantly living in rural areas where residents were more likely to be malnourished and exposed to infectious diseases (McEniry, 2014), conditions that have been linked to worse health in late life (Crimmins & Finch, 2006; McEniry & Palloni, 2010; McEniry, Palloni, Dávila, & García, 2008).

Puerto Rico continues to be socioeconomically disadvantaged relative to the United States. The island has more poverty, higher unemployment, and lower levels of educational attainment compared to the United States (Bishaw & Fontenot, 2014; DeNavas-Walt & Proctor, 2015; Kaiser Family Foundation,

2016b). Socioeconomic disadvantage tends to be associated with higher rates of morbidity, disability, and mortality (Adler, Boyce, Chesney, Folkman, & Syme, 1993; Marmot, Ryff, Bumpass, Shipley, & Marks, 1997; Preston & Taubman, 1994; Williams, 1990). Island-residing Puerto Ricans are more likely to report fair-to-poor self-rated health than those living in the mainland United States (35 percent compared to 18 percent) and have higher infant mortality rates (7.1 vs. 6.0 per 100,000 live births) per health surveillance systems and national vital statistics data (Kaiser Family Foundation, 2016b). The relatively disadvantaged social and economic position of Puerto Rico suggests island Puerto Rican older adults should have worse health than their mainland U.S. counterparts.

Despite historically poor social and economic conditions, however, Puerto Rico may provide a more supportive context for healthy aging than in the mainland United States. Despite being one of the richest countries, the United States has relatively worse health compared to other high-income countries (Crimmins, Garcia, & Kim, 2010). This has largely been attributed to Americans having poor health behaviors, more exposure to stressful environments, and growing economic inequality (Crimmins, Preston, & Cohen, 2010; Woolf & Aron, 2013). Residents of Puerto Rico have a strong national identity and are embedded in a collectivist culture that shares the Spanish language, cultural traditions, and an emphasis on familism, an ideology that values the role of family in taking care of the well-being of its members. Evidence suggests that being embedded in these communities is a protective factor for Hispanic health because they provide support and resources for maintaining good health (LeClere, Rogers, & Peters, 1997). Furthermore, familism has been linked to better health behaviors and greater health care utilization among Mexican Americans (Schor, Starfield, Stidley, & Hankin, 1987). The sociocultural resources available to island-dwelling older adults may result in a health advantage of island Puerto Ricans over mainland U.S. older adults.

Examination of the health status of older island-dwelling Puerto Ricans must consider the potential for variation by gender. It has been observed in the United States that older women tend to have higher levels of chronic illness and disability, and are more likely to report worse overall health (Benyamini & Idler, 1999; Gorman & Read, 2006; Idler, 2003). Women tend to utilize health care services (e.g. preventive and diagnostic) more often than men (Bertakis, Azari, Helms, Callahan, & Robbins, 2000; Redondo-Sendino, Guallar-Castillón, Banegas, & Rodríguez-Artalejo, 2006; Vaidya, Partha, & Karmakar, 2012), which may result in higher prevalence of diagnosed disease and conditions in women. Researchers have also found that older women report more functional limitations than men, and that the gap increases with

age (Crimmins, Kim, & Solé-Auró, 2010; Gorman & Read, 2006). Because women are both more likely to have health problems and be aware of their health status, they may also be more likely to report poorer health (Macintyre, Hunt, & Sweeting, 1996; Verbrugge, 1985; Vlassoff, 2007). While gender patterns in health have been established in the older U.S. population, it is not clear whether these gender differences also exist in Puerto Rico.

The objective of the present study is to characterize the health status of aging island Puerto Ricans in the context of other older U.S. adults to fill a critical gap in research on health among aging U.S. Hispanics. We used data on adults ages 60 and older from the 2002 Puerto Rican Elderly Health Conditions Project (PREHCO) and the 2002 Health and Retirement Study (HRS) to analyze the health profiles of older U.S.-born Whites, Hispanics, Blacks, and island-dwelling Puerto Ricans. Puerto Ricans born on the island are U.S. citizens and as such can move freely between the island and the U.S. mainland (Duany, 2002, 2011); Island Puerto Ricans are, therefore, more appropriately compared with U.S.-born populations rather than immigrant populations who do not share this freedom of movement within the United States. Thus, we focus on comparisons of island Puerto Ricans with U.S.-born populations. Using these two population-representative studies, we examine sub-population differences in multiple measures of health, including chronic disease, disability, and self-rated health. Because prior research suggests health status differs between older men and women, we examine health profiles both in the total population and separately by gender.

Method

Data

Data on island Puerto Rican older adults come from PREHCO. PREHCO is a two-wave panel survey of the noninstitutionalized population aged 60 and older that began in 2002 with a follow-up interview in 2006. We use the baseline data for this study. The sample is a multistage, stratified sample of older adults residing in Puerto Rico, with oversamples of regions heavily populated by people of African descent and of individuals older than 80. The resident populations of the island municipalities of Culebra and Vieques were excluded from the study. A total of 4,291 face-to-face interviews were conducted in Spanish between May 2002 and May 2003, with an overall response rate of 93.9 percent. The survey was designed to gather quality data on issues related to the health of older adult Puerto Ricans. The questionnaire included modules on demographic characteristics, health statuses, cognitive and functional performance, labor and economic status, income and assets, health insurance and

use of health services, family structure, intergenerational transfers, housing, anthropometric measurements, and physical performance. All interviews were conducted in Spanish. A more detailed description of PREHCO is provided elsewhere (Palloni, Davila, & Sanchez-Ayendez, 2013).

Data on the mainland U.S. older adult population come from the HRS, a population-based longitudinal health interview survey of a cohort of American adults aged 51 and older in the contiguous United States (Juster & Suzman, 1995). The HRS began in 1992, with follow-up interviews occurring approximately every two years. The sample is a multistage area probability sample of U.S. households, with oversamples of African Americans, Hispanics, and Floridians. We use the 2002 HRS and limit the sample to those aged 60 and older to be consistent with the PREHCO study design.

Sample Selection

We restricted our analyses to 3,537 PREHCO respondents and 11,384 HRS respondents who were 60 years or older at the time of the survey. We excluded 157 respondents from PREHCO and 1,334 from HRS who were not U.S. born. We also excluded 531 PREHCO respondents and 1,175 HRS respondents whose proxy completed the survey and were, therefore, missing the cognitive and/or disability assessments. Last, we excluded 66 PREHCO respondents and 48 HRS respondents who were missing on covariates.

Measures

We use a multidimensional model of health that includes chronic disease conditions, disability, and self-rated health. *Chronic conditions*—Respondents reported whether a doctor ever told them that they had any of the following six conditions: (a) high blood pressure or hypertension, (b) heart disease, (c) diabetes, (d) stroke, (e) lung disease, and (f) cancer. *Disability*—We utilize six indicators of problems with activities of daily living (ADLs) including difficulty with (a) bathing, (b) eating, (c) dressing, (d) walking across a room, (e) getting in and out of bed, and (f) using the toilet (Katz, 1983). As would be expected in a noninstitutionalized older adult population, most of the sample did not report having any ADL difficulties. For the purposes of this analysis, we created a dichotomized variable indicating whether the respondent had no disability versus having any disability. *Self-rated health*—HRS respondents were asked, “Would you say your health in general is excellent, very good, good, fair, or poor?” The Spanish translation of this question, which was asked to all PRECHO respondents was, “¿Diría usted que su salud es excelente, muy buena, buena, regular o mala?” Previous researchers

have found evidence that the translation of the English word *fair* into *regular* in Spanish results in Spanish speakers reporting poorer health relative to respondents who take the survey in English (Sanchez & Vargas, 2016; Viruell-Fuentes, Morenoff, Williams, & House, 2011). The word *fair* has a more negative connotation in English compared with the word *regular* in Spanish. To have consistent reporting of poor health regardless of language of interview, self-rated health was recoded as 0 = excellent, very good, good, and fair versus 1 = poor.

Race/ethnicity. Island Puerto Ricans are defined as those who were born in the Commonwealth of Puerto Rico and resided on the island at the time of the PREHCO survey. All other groups were born in one of the 50 U.S. states and resided on the mainland United States at the time of the HRS survey. Mainland Whites are those who self-reported their race as White and did not identify as Hispanic. Mainland Blacks are those who self-reported their race as Black and did not identify as a Hispanic. Mainland Hispanics are those who self-reported that they are of Hispanic origin regardless of racial identification. Approximately 75 percent of the U.S.-born Hispanic sample in this study are of Mexican origin; the origin of the remaining 25 percent is masked in the public-use HRS data.

Covariates. Individual covariates include age, marital status, educational attainment, and insurance status. Age is a continuous variable. Marital status is a dichotomous variable. Educational attainment, a measure of socioeconomic status, is measured by the number of years of schooling completed. Insurance status is determined by whether the respondent has any employer-provided insurance, is covered by a federal government health insurance program, or has private health insurance.

Analytic Strategy

The primary goal of this analysis is to compare the health of island Puerto Ricans to mainland U.S.-born non-Hispanic White, non-Hispanic Black, and Hispanic populations. First, we examined the distribution of sample characteristics by group. Next, we estimated logistic regression models to determine the relative likelihood of reporting a chronic condition or disease, any ADL limitation, and poor self-rated health. All models are adjusted for sociodemographic characteristics. Given expected health differentials for males and females (Manton & Stallard, 1997), all analyses were also conducted separately within gender. We test for gender differences within race/ethnic groups by conducting a comparison of coefficients across the stratified gender models using Stata's

svest command, which allows us to test the hypothesis that the coefficients for men and women across the models are different. We report the *p* value associated with each test. We account for the complex survey design of PREHCO and the HRS by using Stata's *svy* commands, which adjusts for differential sampling probabilities and nonresponse, population stratification, and sample weights. Analyses were conducted using Stata version 14.

Results

Descriptive Statistics

Table 1 shows sample characteristics by race/ethnicity and gender. Among island Puerto Ricans, 56 percent of the sample is female, with similar proportions of females as mainland Whites and mainland Hispanics. Island Puerto Ricans were about 70 years old, on average, slightly older than mainland Hispanics. Further, females from all race/ethnic groups were older than their male counterparts. However, island Puerto Rican females were younger compared with mainland White and mainland Black females. The proportion of island Puerto Ricans who were married was lower than that of mainland Whites and Hispanics but higher than the proportion of married mainland Blacks. Island Puerto Ricans, on average, had about 8 years of education, compared with nine, 11, and 13 years of education among Hispanics, Blacks, and Whites, respectively. Women had less education compared with their male counterparts, with the exception of mainland Black women. More than 90 percent of respondents had health insurance, and nearly all island Puerto Ricans had health insurance (98%).

A large proportion of respondents reported hypertension, with rates ranging from 51 to 69 percent. Island Puerto Ricans reported more hypertension than mainland Whites and mainland Hispanics. While heart disease was the second most common chronic condition reported by mainland Whites, island Puerto Ricans, mainland Blacks, and mainland Hispanics reported diabetes as the second most common chronic condition. Stroke, lung disease, and cancer were less common conditions reported across race/ethnic groups. About 20 percent of mainland Black and mainland Hispanic respondents reported any disability; In contrast, only 12 percent of island Puerto Ricans reported any disability. Similarly, mainland Blacks and mainland Hispanics, on average, reported more poor self-rated health than island Puerto Ricans.

Health Profiles of Island Puerto Ricans

Table 2 presents estimates from binary logistic regression models for each health outcome for the total sample by race/ethnicity and by gender, controlling

Table 1. Sample Characteristics by Race/Ethnicity and Gender Presented as Weighted Proportions and Means (Standard Deviation), PREHCO (2002) and HRS (2002).

Measures	Island Puerto Ricans				Mainland Whites				Mainland Blacks				Mainland Hispanics			
	Total	Male	Female	Total	Males	Females	Total	Male	Female	Total	Male	Female	Total	Male	Female	
	(n = 3,537)	(n = 1,417)	(n = 2,120)	(n = 9,394)	(n = 3,965)	(n = 5,429)	(n = 11,564)	(n = 565)	(n = 999)	(n = 426)	(n = 167)	(n = 259)				
Sociodemographics																
Female	.56	—	—	.58	—	—	.62	—	—	.59	—	—	.59	—	—	
Age (years)	70.0 (7.6)	69.9 (7.5)	70.1 (7.7)	71.6 (8.2)	70.9 (7.9)	72.1 (8.3)	70.2 (7.9)	69.8 (7.5)	70.5 (8.2)	69.3 (7.3)	68.0 (6.9)	70.1 (7.5)	69.3 (7.3)	68.0 (6.9)	70.1 (7.5)	
Marital status																
Never married	.08	.10	.06	.03	.03	.03	.05	.05	.05	.02	.02	.03	.02	.02	.03	
Married	.50	.66	.38	.60	.76	.48	.41	.58	.30	.55	.69	.46	.55	.69	.46	
Widowed	.25	.10	.36	.27	.12	.38	.34	.17	.44	.24	.06	.36	.24	.06	.36	
Divorced/separated	.17	.14	.20	.10	.09	.11	.20	.20	.09	.19	.23	.16	.19	.23	.16	
Education (years)	8.3(4.5)	8.5(4.5)	8.2(4.6)	12.6(2.5)	12.9(2.7)	12.4(2.3)	10.9(3.4)	10.5(3.7)	11.1(3.2)	9.5(4.0)	10.1(4.2)	9.2(3.8)	9.5(4.0)	10.1(4.2)	9.2(3.8)	
Has insurance	.98	.97	.98	.96	.96	.96	.94	.95	.93	.91	.92	.90	.91	.92	.90	
Health outcomes																
Hypertension	.58	.53	.62	.51	.49	.53	.69	.65	.72	.51	.49	.53	.51	.49	.53	
Heart disease	.18	.17	.19	.29	.34	.25	.24	.23	.25	.21	.22	.21	.21	.22	.21	
Diabetes	.28	.27	.28	.15	.17	.13	.25	.25	.26	.28	.27	.28	.28	.27	.28	
Stroke	.05	.04	.05	.08	.08	.08	.09	.11	.09	.09	.09	.08	.09	.09	.08	
Lung disease	.08	.07	.08	.09	.10	.09	.05	.06	.05	.04	.05	.04	.04	.05	.04	
Cancer	.09	.09	.08	.15	.16	.15	.11	.16	.08	.09	.06	.10	.09	.06	.10	
Any ADL limitation	.12	.10	.15	.14	.11	.16	.21	.14	.26	.19	.16	.22	.19	.16	.22	
Poor self-rated health	.09	.07	.11	.07	.06	.07	.12	.10	.12	.11	.07	.14	.11	.07	.14	

Note. Ns are unweighted. PREHCO = Puerto Rican Elderly Health Conditions Project; HRS = Health and Retirement Study; ADL = activities of daily living.

Table 2. OR and 95% CI Reported From Condition-Specific, Any ADL Limitation, and Poor Self-Rated Health Logistic Regression Models, PREHCO (2002) and HRS (2002).

	Total		Males		Females		M/F comparison p value
	OR	95% CI	OR	95% CI	OR	95% CI	
Hypertension (referent = Mainland Whites)							
Island Puerto Ricans	1.19**	[1.05, 1.35]	1.17	[0.96, 1.42]	1.23*	[1.04, 1.46]	p < .05
Mainland Blacks	2.12***	[1.86, 2.43]	1.93***	[1.56, 2.39]	2.31***	[1.95, 2.75]	p = .232
Mainland Hispanics	0.96	[0.77, 1.20]	1.01	[0.71, 1.44]	0.89	[0.66, 1.20]	p = .728
Heart disease (referent = Mainland Whites)							
Island Puerto Ricans	0.43***	[0.37, 0.51]	0.36***	[0.28, 0.45]	0.55***	[0.44, 0.68]	p < .001
Mainland Blacks	0.76***	[0.65, 0.88]	0.57***	[0.45, 0.73]	0.91	[0.76, 1.10]	p < .01
Mainland Hispanics	0.63**	[0.48, 0.84]	0.58*	[0.37, 0.91]	0.66*	[0.46, 0.94]	p = .482
Diabetes (referent = Mainland Whites)							
Island Puerto Ricans	1.63***	[1.40, 1.90]	1.56***	[1.24, 1.96]	1.70***	[1.37, 2.11]	p = .089
Mainland Blacks	1.78***	[1.53, 2.06]	1.45**	[1.15, 1.85]	2.03***	[1.68, 2.46]	p < .05
Mainland Hispanics	1.85***	[1.44, 2.38]	1.62*	[1.09, 2.39]	1.95***	[1.40, 2.70]	p = .274
Stroke (referent = Mainland Whites)							
Island Puerto Ricans	0.46***	[0.35, 0.62]	0.40***	[0.26, 0.60]	0.54**	[0.36, 0.81]	p = .179
Mainland Blacks	1.11	[0.88, 1.39]	1.20	[0.84, 1.73]	1.04	[0.78, 1.39]	p = .542
Mainland Hispanics	1.00	[0.67, 1.50]	1.08	[0.59, 1.97]	0.95	[0.55, 1.62]	p = .829

(continued)

Table 2. (continued)

	Total		Males		Females		M/F comparison p value
	OR	95% CI	OR	95% CI	OR	95% CI	
Lung disease (referent = Mainland Whites)							
Island Puerto Ricans	0.37***	[0.29, 0.48]	0.33***	[0.22, 0.50]	0.44***	[0.31, 0.61]	p = .407
Mainland Blacks	0.38***	[0.30, 0.49]	0.36***	[0.24, 0.55]	0.39***	[0.28, 0.53]	p = .699
Mainland Hispanics	0.25***	[0.15, 0.42]	0.28**	[0.13, 0.62]	0.22***	[0.11, 0.46]	p = .546
Cancer (referent = Mainland Whites)							
Island Puerto Ricans	0.64***	[0.53, 0.79]	0.74	[0.55, 1.00]	0.61***	[0.45, 0.81]	p = .189
Mainland Blacks	0.77**	[0.63, 0.93]	1.21	[0.90, 1.61]	0.53***	[0.40, 0.69]	p < .001
Mainland Hispanics	0.64*	[0.44, 0.95]	0.48*	[0.25, 0.93]	0.76	[0.47, 1.23]	p = .291
Any ADL limitation (referent = Mainland Whites)							
Island Puerto Ricans	0.57***	[0.48, 0.69]	0.50***	[0.36, 0.68]	0.62***	[0.48, 0.79]	p = .192
Mainland Blacks	1.37***	[1.17, 1.62]	0.99	[0.73, 1.34]	1.59***	[1.30, 1.94]	p < .05
Mainland Hispanics	1.16	[0.86, 1.57]	1.27	[0.76, 2.10]	1.08	[0.75, 1.58]	p = .714
Poor self-rated health (referent = Mainland Whites)							
Island Puerto Ricans	0.58***	[0.45, 0.75]	0.53**	[0.35, 0.81]	0.61**	[0.44, 0.84]	p < .05
Mainland Blacks	1.25*	[1.01, 1.55]	1.25	[0.85, 1.84]	1.26	[0.97, 1.63]	p = .838
Mainland Hispanics	0.98	[0.67, 1.45]	0.82	[0.42, 1.58]	1.02	[0.63, 1.66]	p = .432

Note. OR = odds ratio; CI = confidence interval; ADL = activities of daily living; PREHCO = Puerto Rican Elderly Health Conditions Project; HRS = Health and Retirement Study.

*p < .05. **p < .01. ***p < .001.

for sociodemographics (model covariates not shown). Odds ratios are presented with 95 percent confidence intervals. Odds ratios between zero and one indicate less risk for having a condition, and ratios greater than one indicate greater risk of having a condition. We also examine differences between the regression coefficients for men and women within each race/ethnic group and report the p value associated with tests of whether each health outcome was worse among women compared with men. The results show that island Puerto Ricans were 19 percent (odds ratio [OR] = 1.19, 95% confidence interval [CI] [1.05, 1.35]) more likely to report hypertension than mainland Whites. Mainland Blacks were twice as likely to report hypertension (OR = 2.12, 95% CI [1.86, 2.43]) than mainland Whites. Mainland Hispanics did not differ from mainland Whites. Gender stratified models revealed no significant differences between Puerto Rican men and mainland White men (OR = 1.17, 95% CI [0.96, 1.42]). Mainland Black men were about twice as likely to report hypertension as mainland White men (OR = 1.93, 95% CI [1.56, 2.39]). Among women, island Puerto Ricans were 23 percent (OR = 1.23, 95% CI [1.04, 1.46]) more likely to report hypertension compared with mainland Whites. Mainland Black women were more than twice as likely to report hypertension as mainland White women (OR = 2.31, 95% CI [1.95, 2.75]). A comparison of coefficients across the gender models revealed that island Puerto Rican women were more likely to report hypertension than island Puerto Rican men ($p < .05$). No gender differences were found within mainland Blacks and Hispanics.

By contrast, island Puerto Ricans, mainland Blacks, and mainland Hispanics were less likely to have heart disease compared with mainland Whites. Island Puerto Rican men (OR = 0.36, 95% CI [0.28, 0.45]), mainland Black men (OR = 0.57, 95% CI [0.45, 0.73]), and mainland Hispanic men (OR = 0.58, 95% CI [0.37, 0.91]) had lower odds of heart disease compared with their mainland White counterparts. Island Puerto Rican (OR = 0.55, 95% CI [0.48, 0.68]) and mainland Hispanic women (OR = 0.66, 95% CI [0.46, 0.94]) also had lower odds of heart disease compared with their mainland White counterparts. A comparison of coefficients across the gender models revealed that island Puerto Rican women were more likely to report heart disease than island Puerto Rican men ($p < .001$). A similar gender pattern was found among mainland Blacks, with women more likely to report heart disease ($p < .01$). No gender differences were found within mainland Hispanics.

We also find that, compared with mainland Whites, island Puerto Ricans, mainland Blacks, and mainland Hispanics were more likely to report diabetes. Both island Puerto Rican men (OR = 1.56, 95% CI [1.24, 1.96]) and women (OR = 1.70, 95% CI [1.37, 2.11]) had increased odds of reporting diabetes. Similar gender differences were found among mainland Blacks and

mainland Hispanics. Although the gender difference was only marginally statistically significant ($p = .089$), it suggests island Puerto Rican women were more likely to report diabetes than island Puerto Rican men. Similar gender differences were found among mainland Blacks ($p < .05$), with women more likely to report having diabetes. Mainland Hispanic men and women did not differ in reporting diabetes.

Relative to mainland Whites, island Puerto Ricans had reduced odds of reporting a stroke (OR = 0.46, 95% CI [0.35, 0.62]). Mainland Blacks and mainland Hispanics do not differ from mainland Whites in reporting a stroke. Moreover, there were no reported gender differences in stroke within race/ethnic groups.

In addition, the odds of reporting either lung disease or cancer were lower among island Puerto Ricans, mainland Blacks, and mainland Hispanics compared with mainland Whites. There were no gender differences in lung disease within race/ethnic groups. However, gender stratified models revealed that among women, island Puerto Rican (OR = 0.61, 95% CI [0.45, 0.81]) and mainland Blacks (OR = 0.53, 95% CI [0.40, 0.69]) were less likely to report cancer than mainland Whites. Among men, only mainland Hispanics (OR = 0.48, 95% CI [0.25, 0.93]) were less likely to report cancer than mainland Whites. While there were no gender differences in cancer within island Puerto Rican and mainland Hispanics, among mainland Black females, they were more likely to report cancer than their male counterparts ($p < .001$).

Island Puerto Ricans were less likely to report any ADL limitation (OR = 0.57, 95% CI [0.48, 0.69]) compared with mainland Whites. There were no differences between mainland Hispanics and mainland Whites, but mainland Blacks had increased odds of reporting ADL difficulty. Both male (OR = 0.50, 95% CI [0.36, 0.68]) and female (OR = 0.62, 95% CI [0.48, 0.79]) island Puerto Ricans had less functioning problems relative to their mainland White counterparts. In contrast, mainland Black females were more likely to report functioning problems relative to their mainland White counterparts (OR = 1.59, 95% CI [1.30, 1.94]). While there were no gender differences in ADL limitations within island Puerto Rican and mainland Hispanics, among mainland Blacks, women were more likely to report functioning problems ($p < .05$).

Finally, island Puerto Ricans were also less likely to report poor self-rated health than mainland Whites (OR = 0.58, 95% CI, [0.45, 0.75]), whereas no significant differences were found among mainland Hispanics. Mainland Blacks, however, were more likely to report poor self-rated health than mainland Whites (OR = 1.25, 95% CI [1.01, 1.55]). Both male (OR = 0.53, 95% CI [0.35, 0.81]) and female (OR = 0.61, 95% CI [0.44, 0.84]) island Puerto Ricans were less likely to report poor self-rated health relative to their

mainland White counterparts. A comparison of coefficients across the gender models revealed that island Puerto Rican women were more likely to report poor self-rated health than island Puerto Rican men ($p < .05$). There were no reported gender differences in poor self-rated health within mainland Blacks and mainland Hispanics.

We also examined models that included health behaviors such as obesity, smoking, and drinking for each of the health outcomes. Including these variables did not significantly change the results (results available upon request).

Discussion

The island Puerto Rican population is aging rapidly, but we know relatively little about the health status of this population and how their health compares with the broader U.S. older adult population. The aim of the current study was to provide insights into the health status of the aging island Puerto Rican population. Our results indicate island Puerto Ricans were less likely to have heart disease, stroke, lung disease, cancer, ADL limitations, and poor self-rated health. However, Puerto Ricans were more likely to have hypertension and diabetes, and these were the most prevalent conditions among older adults in our study. Previous research has found support for a “Hispanic paradox” in which Hispanics fare better on longevity and most health indicators than non-Hispanic Whites, despite their relative socioeconomic disadvantage (Franzini, Ribble, & Keddie, 2001; George, 2013; Ruiz, Hamann, Mehl, & O’Connor, 2016; Scribner, 1996). Some research has shown that this Hispanic health advantage is concentrated among foreign-born Mexicans (Palloni & Arias, 2004). Our results suggest that on several indicators of health, island Puerto Ricans also compare favorably with non-Hispanic Whites, despite their relatively greater levels of socioeconomic disadvantage.

There are several potential explanations for why older island Puerto Ricans have a lower burden of certain diseases, as well as disability, than older adults in the mainland United States. The PREHCO study sample had nearly universal health coverage, the highest of any race/ethnic group, with 98 percent of respondents reporting they had either private insurance or were insured by a federal government health insurance program, such as Medicaid or Medicare. In addition, disadvantaged older Puerto Ricans may have benefited from health care expansion on the island that occurred over a decade prior to the PRECHO study. The 1993 Puerto Rican Health Care Reform increased access to medical, dental, and hospital care for poor and underserved populations, including the elderly (Santos-Lozada, 2013). The uninsured rate in Puerto Rico declined steadily since the mid-1990s (Schin, Sharac, Luis, & Rosenbaum, 2015). This expansion of health insurance likely

resulted in more Puerto Ricans having a usual source of care and access to preventive health care services. These factors are key for disease prevention, health promotion, and achieving health equity and may explain why island Puerto Ricans appear to have a health advantage over the mainland population.

Island Puerto Ricans may also benefit from health-promoting cultural practices observed among other U.S. Hispanic groups. Researchers have found Hispanics have cultural resources that provide protection from the adverse health effects of low socioeconomic status and enable them to maintain good health (LeClere et al., 1997). Individuals who have strong social and community ties have better health compared with those who lack such ties (Berkman & Syme, 1979; Brummett et al., 2001; House, Landis, & Umberson, 1988; Uchino, 2006). The collectivistic values embedded in Puerto Rican culture promote communication and interaction styles that are beneficial for health (Oboler, 1995).

Although we found lower rates of certain diseases among the island Puerto Rican older adult population, our results showed that older Puerto Ricans were considerably more disadvantaged with respect to two key conditions, hypertension and diabetes, which are highly prevalent in the older adult population and are among the leading causes of death in older adults. In fact, hypertension is higher among island Puerto Ricans than U.S. Hispanics (Rodriguez et al., 2016), and diabetes in Puerto Rico is higher than in many other Latin American countries (Salas et al., 2016). The higher levels of hypertension and diabetes observed among the older island Puerto Rican population may pose challenges for caregivers, families, health agencies, and governments in this rapidly aging population (Allende-Vigo et al., 2013).

Hispanics in the United States tend to have higher prevalence of diabetes and earlier risk factors for hypertension compared with Whites (Teeters et al., 2007). One of the main explanations for the higher prevalence of diabetes and hypertension among Hispanics are their higher rates of obesity. In a study of island Puerto Ricans living in the San Juan metropolitan area, Pérez, Sánchez, and Ortiz (2013) found that hypertension and diabetes prevalence was significantly higher among those who were overweight or obese, even after adjusting for sociodemographic characteristics and health behaviors. It is important to note that unlike the other health indicators examined in this study, diabetes and hypertension can be controlled with medications, and thus reports of prior diagnosis of these conditions may have a different meaning for current health status. Analysis of health center outcomes data from the Health Resources and Services Administration suggests higher rates of control in Puerto Rico compared with the rest of the United States; 75% of hypertensive patients had controlled blood pressure in Puerto Rico compared with

63% of other U.S. patients, and 73% of diabetics had HbA1c levels in the “normal” range compared with 68% of other U.S. diabetic patients (Schin et al., 2015). Nonetheless, it is troubling that island Puerto Ricans have much higher rates of hypertension and diabetes compared with their U.S. non-Hispanic White counterparts and higher hypertension than mainland-born U.S. Hispanics.

Although our findings suggest island Puerto Ricans have a lower disease burden compared with the mainland U.S. population, examinations of gender differences indicate this advantage is concentrated primarily among men. Island Puerto Rican women were more likely to report hypertension, heart disease, diabetes, and poor self-rated health than men. Globally, women tend to have worse physical health compared with men (Worall-Carter, Edward, & Page, 2012; World Health Organization, 2009). This is partly due to women’s more disadvantaged social and economic positions relative to men. Puerto Rican women on the island, for instance, have historically been overrepresented among low-income earners. For example, in the post-World War II era of industrialization, many women took jobs in the needle industry where they were paid low wages and worked in harmful conditions (Matos-Rodriguez & Delgado, 1998) that may have had lasting impacts on their health over the adult life course and into older adulthood. In addition, women on the island may be living in more adverse conditions than men. Research has shown that island Puerto Rican women perceive poverty, food insecurity, lack of access to quality education, and unsafe neighborhood environments as significant life stressors (Bermúdez-Millan et al., 2011), and these stressors may get “under the skin” and increase Puerto Rican women’s risk for poor health. In addition, obesity is a risk factor for the health indicators on which Puerto Rican women were more disadvantaged, and thus gender differences on these health outcomes may reflect women’s higher rates of overweight and obesity (Pérez et al., 2013). Further research is needed into the determinants of older island Puerto Rican women’s relatively disadvantaged health status.

Island Puerto Rican women were also more likely to report hypertension than mainland White women, suggesting a health disadvantage relative to both Puerto Rican men and mainland U.S. women. This finding is consistent with evidence from Teeters and colleagues (2007), who analyzed a sample of 79 Hispanic women and 91 White women and found that Hispanic women were more likely to have pre-hypertension, and develop heart disease earlier than their White counterparts. This suggests that Hispanic women are at higher risk for developing early onset hypertension, and there is reason to believe that this finding may extend to island Puerto Rican women. A study of Puerto Rican adults in San Juan finds that women in the study had a higher age-adjusted prevalence of metabolic syndrome (36.4%) than U.S. White

women (31.5%), which may increase their risk of developing hypertension (Pérez et al., 2008). Older island Puerto Rican women had health profiles that were more consistent with U.S. mainland Blacks. Some have argued that Black women experience an accelerated biological aging, or weathering, due to cumulative lifelong exposure to social and economic stressors and their unique experience as the primary provider of social and economic support in their families and communities (Geronimus et al., 2010; Warren-Findlow, 2006). Additional research is needed that explores the role of acute and chronic stressors in the health of island Puerto Rican women.

To date, most research on the health of the adult Puerto Rican population has been limited to Puerto Ricans living on the mainland. Research has consistently shown that Puerto Rican adults living in the United States have the worst health profiles among not only their Hispanic peers but also compared with non-Hispanic Whites (Lucas, Freeman, & Adams, 2016; Zsembik & Fennell, 2005). It has also been found that island-born Puerto Ricans living in the United States have worse health than their U.S.-born Puerto Rican counterparts (Morales, Lara, Kington, Valdez, & Escarce, 2002). The healthy migrant effect, in which migrants to the United States are selectively healthier than the general population, has been used to explain why Hispanics appear to have a health advantage. This effect does not extend to island-born Puerto Ricans living in the mainland. As U.S. citizens, island-born Puerto Ricans are allowed to move freely between the island and the mainland, known as circulatory migration, and thus do not need to be in good health to move to the United States. Moreover, there is no evidence that unhealthy Puerto Ricans return to the island in old age. Palloni, McEniry, Davila, and Garcia Gurucharri (2005) have previously used the PREHCO data to show that island-born Puerto Ricans who were longtime residents in the mainland United States and then returned to the island did not do so for health reasons, and in fact had similar health profiles as Puerto Ricans who never left the island. Our findings suggest there may be significant health differences between island and mainland population Puerto Rican older adult populations. These differences merit further research attention.

The current study's findings should be viewed in light of several limitations. Health data for this study are obtained from self-reports, which may introduce bias, because we do not know if there is differential reporting between island Puerto Ricans and mainland Americans. We did, however, account for known differential reporting on self-rated health due to English/Spanish translation (Sanchez & Vargas, 2016; Viruell-Fuentes et al., 2011). Conditions are based on diagnosis and thus require interaction with the health care system. There may also be differences in use of health care among island Puerto Ricans and the mainland U.S. population.

The vast majority of respondents in our study, however, had health insurance, though having insurance may not result in greater interaction with the health care system. In addition, the analytic sample likely represents a relatively healthier segment of the older adult population. The PREHCO sample consisted of only community-dwelling older adults and excluded people living in nursing facilities who likely are in poorer health. For comparison purposes, older adults living in nursing homes were also excluded from the HRS sample, and interviews were only conducted with surviving sample members so the HRS sample also likely reflects a selectively healthier older adult population.

We used two population representative studies to provide the first examination of the health of older island Puerto Ricans in the context of the mainland U.S. older adult population. This comparison enabled both an absolute and relative assessment of older adult health in Puerto Rico. We found that older adults living in Puerto Rico are healthier than older adults in the mainland United States on several health indicators, but that this health advantage is enjoyed primarily among island men, who are relatively healthier than their female counterparts and that there is a Puerto Rican disadvantage on hypertension and diabetes. These study findings should be considered in light of the major social, economic, and health care changes that have taken place in Puerto Rico since the 2002 PRECHO data were collected. The island is currently in the midst of a US\$72 billion debt crisis, cuts to health care spending, and loss of physicians migrating from the island to the mainland United States. According to census data, there has been a 10 percent decline in Puerto Rico's total population and a 22 percent increase in the 65 and older population from 2006 to 2014 (Kaiser Family Foundation, 2016a). This increase in the proportion of older adults on the island is occurring as the health care system faces major financing and staffing challenges. As early as 2012, the Puerto Rico College of Physicians and Surgeons, along with other physician organizations, have reported significant outmigration of health care workers from the island, attributing this migration to low Medicare reimbursement payments (Pierluisi, 2012). This is in addition to inadequate funding for health care. Additional studies should be conducted that provide updated information about the health of the older population in Puerto Rico given recent major economic, population, and health care changes.

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