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Influence of Type II Diabetes and High Depressive Symptoms on the Likelihood for Developing Activities of Daily Living (ADL) Disability and Mortality in Older Puerto Ricans

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Abstract

Objectives—To examine the development of ADL disability and mortality according to diabetes and high depressive symptoms among Puerto Rican adults aged 60 and older.

Methods—Data came from Wave I and Wave II of the Puerto Rican Elderly: Health Conditions Study (n=3,419). Logistic regression was used. Using insulin and receiving psychiatric treatment were proxy measures of disease severity for diabetes and depressive symptoms, respectively.

Results—High depressive symptoms at baseline were associated with developing ADL disability (OR=2.21; 95% CI=1.68-2.91). Diabetes at baseline was associated with mortality at follow-up (OR=1.72; 95% CI=1.34-2.19). Baseline diabetes was associated with developing ADL disability but only for those who reported using insulin (OR=1.69; 95% CI=1.08-2.61). Participants with comorbid diabetes and high depressive symptoms had the highest odds for developing ADL disability and mortality.

Discussion—Diabetes and high depressive symptoms are risk factors for developing ADL disability and mortality for older Puerto Ricans.

Introduction

The Commonwealth of Puerto Rico is a territory of the U.S. with a total population of approximately 3.5 million (U.S. Census Bureau, 2015). Puerto Rico has a rapidly aging population. The percentage of the total population aged 65 and older increased from 14.6% in 2010 to 18.0% in 2015 (U.S. Census Bureau, 2015). The growth of the older adult

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population in Puerto Rico is largely due to declining birth rates and poor economic conditions contributing to young adults leaving for the U.S. mainland to seek employment opportunities (Abel & Deitz, 2014).

The growing number of older adults in Puerto Rico has placed considerable strain on the Puerto Rican healthcare system. Puerto Ricans are U.S. citizens, which makes them eligible for Medicare insurance after the age of 65. In 2015, nearly 75% of Medicare-eligible Puerto Ricans were enrolled in Medicare Advantage (MA) plans (Centers for Medicare & Medicaid Services, 2015). MA plans are healthcare plans offered by private companies that have been approved by Medicare and provide many of the same benefits as traditional Medicare plans. MA plans are a vital part of the Puerto Rican healthcare system, but Puerto Rican MA beneficiaries receive poorer quality of care when compared to Hispanics living in the mainland U.S. and non-Hispanic Whites (Rivera-Hernandez, Leyva, Keohane, & Trivedi, 2016). These issues are compounded by the increasing shortage of physicians, in particular those trained in geriatrics (Roman, 2015), and payment reductions to Puerto Rican MA plans (Rivera-Hernandez et al., 2016).

While the older adult population in Puerto Rico has increased, research on the health of Puerto Rican older adults is lacking. Mortality and disability in activities of daily living (ADLs) are two measures that can provide insight into the overall health of a population (Parrish, 2010). Life expectancy in Puerto Rico has steadily increased and is approximately 74 years and 82 years for men and women, respectively. Prior research has estimated that 14% of Puerto Ricans have self-reported limitations in one or more ADLs (Payne, 2015).

Identifying health conditions associated with mortality and disability can provide additional insight into the health of a population (Parrish, 2010). Diabetes is a highly prevalent health condition in Puerto Rico and is a leading cause of death (Murphy, Kochaneck, Xu, & Heron, 2015). Approximately 14% of adults aged 20 and older have been diagnosed with diabetes (Tierney et al., 2013) and 32% of adults 65 and older are living with diabetes (Salas et al., 2016). Diabetes has been associated with decreased physical function for older Puerto Ricans (Castaneda-Sceppa et al., 2010), but these findings were based on Puerto Rican populations living in the mainland U.S.

Depression is a common comorbid health condition among older adults with diabetes. Less research has been conducted on the prevalence of depression in Puerto Rico, but recent reports indicate 10.6% of older Puerto Ricans have depressive symptoms consistent with clinical depression (Guerra et al., 2016). Older adults with diabetes are more likely to report high depressive symptoms (Chau et al., 2011) and are at a greater risk for depression (Nouwen et al., 2010; Rotella & Mannucci, 2013) compared to older adults without diabetes. Mechanisms that contribute to the increased risk for depression associated with diabetes are unclear, but this relationship may be due to the role of diabetes in the onset of cerebrovascular disease (Taylor, Aizenstein, & Alexopoulos, 2013), the detrimental effects of diabetes on a person's emotional, psychological, and social well-being (Peyrot, Rubin, & Siminerio, 2006; Stuckey et al., 2014), and the potential for emotional distress in response to being diagnosed with diabetes (Karlsen, Oftedal, & Bru, 2012).

Prior research has identified depression and diabetes to be associated with several adverse health outcomes. Older adults with depression or diabetes are more likely to report having ADL limitations and experience higher rates of mortality compared to older adults without depression or diabetes (Boyle, Thompson, Gregg, Barker, & Williamson, 2010; Geerlings, Beekman, Deeg, Twisk, & Van Tilburg, 2001; Kalyani, Saudek, Brancati, & Selvin, 2010; Unutzer, Patrick, Marmon, Simon, & Katon, 2002). Furthermore, older adults who use insulin to manage their diabetes have been shown to have higher risk for mortality and ADL disability compared to diabetics who do not report using insulin (Downer, Rote, Markides, & Al Snih, 2016). This increased risk may reflect greater disease severity for older adults who use insulin to manage their diabetes (Nahin, Byrd-Clark, Stussman, & Kalyanaraman, 2012). There is also evidence for an additive effect of comorbid depression and diabetes whereby older adults with comorbid depression and diabetes are at an increased risk for ADL disability and mortality compared to older adults with depression or diabetes alone (Egede, 2004; Hofmann, Kohler, Leichsenring, & Kruse, 2013).

The objective of the present analysis is to examine the relationship between diabetes, high depressive symptoms and the likelihood for developing ADL disability and mortality using data from a cohort of older Puerto Rican adults. Based on evidence from existing research, we hypothesize that self-reported diabetes and high depressive symptoms will be associated with significantly higher odds for developing ADL disability and mortality. Additionally, we hypothesize participants with diabetes who report using insulin and participants with high depressive symptoms who report receiving psychiatric treatment will have the greatest odds for developing ADL disability and mortality.

Methods

Puerto Rican Elderly: Health Condition (PREHCO) Study

The present study used data from the Puerto Rican Elderly: Health Condition (PREHCO) Study. The overall design, sampling procedures, and survey instruments of PREHCO have been previously described (McEniry & Palloni, 2010; Palloni, Davila, & Sanchez-Ayendez, 2013). PREHCO is a representative longitudinal study of aging in Puerto Rico. A total of 4,291 adults aged 60 and older were interviewed during the baseline observation in 2002-03. A follow-up observation wave that included 3,483 participants was completed in 2006-2007. The response rates for Wave I and Wave II were each over 90%. Both waves of data collection included detailed measures of sociodemographic characteristics, employment history, health, physical functioning, living arrangements, and childhood living conditions. Mortality status at Wave II was determined by reports from a family member.

A summary of the selection of the final analytic sample is presented in Figure 1. The final sample included participants who were directly interviewed during Wave I, were not missing data for baseline covariates (see Measures), and were not lost to follow-up at Wave II. The 3,419 participants included in the final sample were used to examine the relationship between diabetes, high depressive symptoms, and mortality. The analysis that examined the relationship between diabetes, depressive symptoms, and incident ADL disability excluded participants who at Wave II were deceased, interviewed by proxy, could not complete a

direct interview, or who reported being unable to independently perform one or more ADLs at baseline (n=2,175).

Measures

Type II diabetes—Participants who reported having been told by a doctor that he/she had diabetes or high levels of sugar in the blood were classified as having diabetes. Diabetes treatment was used as a proxy measure of disease severity. Diabetes treatment was determined according to participant response to using insulin to control diabetes. Participants were categorized into the following groups: [1] no diabetes; [2] diabetes but not using insulin; and [3] diabetes and using insulin.

Depressive symptoms—Depressive symptoms were assessed using a short form of the Geriatric Depression Scale (GDS-SF) (Yesavage & Sheikh, 1986). The GDS-SF is a 15-item assessment that measures self-rated symptoms of depression. The GDS-SF has a maximum possible score of 15 points and higher scores are indicative of more severe depressive symptoms. We calculated a Cronbach's alpha for the GDS-SF to be 0.86. A score of five points or higher on the GDS-SF is a frequently used cut-off value to screen for clinically significant depressive symptoms (D'Ath, Katona, Mullan, Evans, & Katona, 1994) and was used to define high depressive symptoms in the current study. Among those with high depressive symptoms, mild/moderate depressive symptoms were defined as scoring between 5 and 11 points, and severe depressive symptoms were defined as scoring 12 points or higher on the GDS-SF. An additional measure for severity of depressive symptoms was if the participant reported that he/she was receiving any psychiatric or psychological treatment for depression. The total score on the GDS-SF and receiving psychiatric or psychological treatment were used to categorize participants into three groups: [1] non-depressed; [2] high depressive symptoms but not receiving treatment; and [3] high depressive symptoms and receiving psychiatric treatment.

Activities of daily living—During Wave I, participants were asked if he/she has difficulty eating, dressing, toileting, walking, getting up or laying down in bed, or bathing due to a health problem. Participants were asked to not consider difficulties or limitations that he/she expected to last fewer than three months. Participants who responded as *yes* or *cannot do* were determined to have a limitation in the particular ADL. Participants who reported having a limitation or being unable to complete one or more ADLs were categorized as having ADL disability.

Covariates—All covariates were selected from the baseline observation wave. Covariates included age, gender, marital status (married, not married, widowed), years of education completed, insurance status, race/ethnicity, and self-reported health conditions. Insurance status was categorized as Government Plan, Medicare Part A or Part B, other (private plan, teacher, police, federal employee, etc.), or uninsured. Race/ethnicity categories were defined as Black, White, and multiracial (Trigueño, Mezclado, Mulatto, Mestizo, and other). Self-reported health conditions included arthritis, hypertension, heart attack, and stroke. Cognitive function has was assessed by the Mini-Mental Cabán (MMC) (Sanchez-Ayendez et al., 2003). The MMC is similar to the Mini Mental Status Examination (Folstein, Folstein,

& McHugh, 1975) and includes items for orientation (day of week, date), verbal memory (immediate and delayed recall of three words), visual memory (immediate recall; draw complex figure after viewing for 15 seconds), executive function (clock drawing, abstraction), and comprehension (follow three-step command). The MMC has been shown to have better sensitivity and specificity than the MMSE for detecting dementia in a study of older adults in Puerto Rico (Sanchez-Ayendez et al., 2003). We calculated a Cronbach's alpha of 0.66, which is similar to previous studies (Sanchez-Ayendez et al., 2003).

Statistical analysis—Descriptive analyses according to comorbid diabetes status and high depressive symptoms at baseline were conducted using analysis of variance and chi-square tests for continuous and categorical variables, respectively. Multivariable logistic regression models were used to estimate the odds for developing ADL disability and mortality at follow-up according to diabetes and high depressive symptoms at baseline. All analyses controlled for age, gender, marital status, education, insurance status, race/ethnicity, self-reported health conditions, and cognitive function.

Results

Sample characteristics

A total of 1,893 participants (55.4%) had neither diabetes nor high depressive symptoms, 619 (18.1%) had diabetes only, 625 (18.3%) had high depressive symptoms only, and 282 (8.2%) had both diabetes and high depressive symptoms. Table 1 presents the descriptive characteristics of the 3,419 participants included in the final sample according to comorbid diabetes status and high depressive symptoms at baseline. Participants with no depression or diabetes completed more years of education, were more likely to be male, married, were less likely to have a government provided health plan, had higher cognition, and were less likely to have hypertension, history of heart attack or stroke, or arthritis compared to participants with diabetes and high depressive symptoms. Of the 907 total participants with high depressive symptoms at baseline, 130 reported receiving psychiatric treatment. Also, 278 of the 901 participants with diabetes at baseline reported using insulin.

A total of 943 participants were excluded from the ADL onset analysis because they were either deceased at follow-up, required a proxy follow-up interview, were unable to complete the follow-up interview and thus had no ADL information. An additional 301 participants who were ADL disabled at baseline were also excluded. Excluded participants were significantly older and had lower education, were more likely to be widowed, have a government provided health insurance plan, hypertension, diabetes, stroke, heart attack, and arthritis, and had lower cognition compared to the 2,175 participants used for the ADL analysis.

Diabetes and high depressive symptoms

Diabetes at baseline was associated with higher odds for mortality but not for developing ADL disability at follow-up (Table 2). Participants with diabetes had 1.72 higher odds for being deceased at the follow-up observation than participants without diabetes at baseline. High depressive symptoms at baseline were associated with developing ADL disability, but

not mortality, at follow-up. Participants with high depressive symptoms at baseline had 2.21 higher odds for developing ADL disability at follow-up. The association between high depressive symptoms and developing ADL disability at follow-up showed overlapping confidence intervals for participants with mild/moderate depressive symptoms (OR=2.16, 95% CI=1.62-2.87) and severe depressive symptoms (OR=2.69, 95% CI=1.32-5.26).

Additional baseline characteristics associated with increased odds for developing ADL disability or mortality included older age, not being married, and history of heart attack, arthritis, and hypertension (Table 2). Greater education was associated with lower odds for developing ADL disability and mortality. Female gender was associated with higher odds for developing ADL disability but lower odds for mortality. Participants who reported having health insurance through Medicare Part A or Part B, or other form of health insurance had lower odds for developing ADL disability compared to participants with a government health plan.

Additional analyses were conducted to determine if participants with comorbid diabetes and high depressive symptoms at baseline had higher odds for developing ADL disability or mortality at follow-up relative to participants with high depressive symptoms only or diabetes only (Table 3). Participants with both diabetes and high depressive symptoms had higher odds for developing ADL disability compared to participants with diabetes only (OR=2.23; 95% CI=1.36-3.63) but not compared to participants with high depressive symptoms only (OR=1.32; 95% CI=0.81-2.15). Participants with comorbid diabetes and high depressive symptoms had higher odds for mortality relative to participants with high depressive symptoms only (OR=1.76; 95% CI=1.17-2.65), but not compared to those with diabetes only (OR=1.28; 95% CI=0.85-1.91).

Severity of diabetes and high depressive symptoms

The regression models that included variables that reflected the severity of diabetes are presented in Table 4. Participants with diabetes who reported using insulin had 1.69 higher odds for ADL disability and 2.32 higher odds for mortality compared to participants without diabetes. Compared to participants with no diabetes, those with diabetes who were not using insulin had higher odds for mortality (OR=1.49), but not for developing ADL disability at follow-up (OR=1.18).

High depressive symptoms at baseline were associated with higher odds for ADL disability at follow-up regardless of severity status. Participants who reported receiving psychiatric treatment had 3.93 higher odds of becoming ADL disabled, whereas those who reported not receiving treatment had 2.00 higher odds of becoming ADL disabled compared to participants who did not have high depressive symptoms at baseline. High depressive symptoms at baseline were not associated with mortality status for participants who reported receiving psychiatric treatment or for those who did not report receiving psychiatric treatment.

Discussion

This analysis detected that older Puerto Ricans with diabetes were more likely to develop ADL disability whereas those with high depressive symptoms had higher mortality over a 4-year period compared to older Puerto Ricans without these conditions. We also found that older Puerto Ricans with high depressive symptoms had higher odds of being deceased at the follow-up observation. The association between high depressive symptoms and increased mortality has also been observed in Mexican Americans (Downer, Rote, Markides, & Snih, 2016) and non-Hispanic White populations (Schulz et al., 2000). Contrary to prior research (Mehta, Yaffe, & Covinsky, 2002; Penninx et al., 1998), we did not observe that participants with high depressive symptoms at baseline had significantly higher odds of developing ADL disability compared to participants without high depressive symptoms at baseline.

We also found evidence for an additive effect of comorbid diabetes and high depressive symptoms on developing ADL disability and mortality. Specifically, comorbid diabetes and high depressive symptoms were associated with higher odds for developing ADL disability and mortality relative to participants with diabetes alone or high depressive symptoms alone, respectively. High depressive symptoms can contribute to the worsening of diabetes by limiting an individual's ability to manage his/her diabetes (Pouwer, Nefs, & Nouwen, 2013). This can contribute to an increased risk for diabetes-related complications among older adults with high depressive symptoms (Williams et al., 2011).

Our findings highlight the importance of considering diabetes and depression severity when studying ADL disability and mortality. Consistent with previous research using data from older Mexican Americans (Downer, Rote, Markides, & Snih, 2016), we observed that the odds for ADL disability were greatest for older Puerto Ricans with diabetes who reported using insulin. However, Puerto Ricans with diabetes who did not use insulin did not have higher odds for ADL disability compared to non-diabetics. Diabetes was associated with increased mortality and high depressive symptoms were associated with increased odds for developing ADL disability, but the associations were strongest for Puerto Ricans who reported using insulin and receiving psychiatric treatment, respectively. These findings can be informative for identifying older Puerto Ricans who may be at the greatest risk for poor health outcomes and for determining which individuals are in the most need for interventions.

Since this analysis was based on outcomes collected approximately a decade ago, the findings may not necessarily reflect the current older adult population in Puerto Rico. The prevalence of diabetes in Puerto Rico has remained consistent over the past ten years and continues to be a major public health concern. Preventing or managing diabetes and high depressive symptoms may be an effective strategy for limiting the future burden of ADL disability and mortality in Puerto Rico. However, the current shortage of healthcare professionals and limited financial resources for health care will make it increasingly difficult for the aging population in Puerto Rico to receive appropriate preventive care. Furthermore, the lack of funds for government-sponsored support programs for older adults will place greater demands on families to provide direct care for aging family members. Some older adults may not be able to rely upon family for direct support because of the

increase in young and middle-aged adults who have left Puerto Rico to pursue employment opportunities on the U.S. mainland.

This study has limitations. First, PREHCO relies upon self-reported information for diabetes and other health conditions. This requires the participant to have been diagnosed with diabetes by a physician and undiagnosed cases of diabetes will not be identified. The prevalence of undiagnosed diabetes in Puerto Rico has been estimated to be 11.6% (Salas et al., 2016). The inability to account for undiagnosed diabetes may lead to the strength of the relationship between diabetes, ADL disability, and mortality to have been underestimated in this analysis. The PREHCO questionnaire also does not differentiate between Type I and Type II diabetes. Although, the prevalence of Type I diabetes is low for older adults (Schutt et al., 2012), which makes it unlikely that the results of this analysis were influenced by older adults with Type I diabetes. Finally, mortality status was determined by family-based reports. Although, proxy reports have been shown to be a reliable source of mortality information (Halanych et al., 2011).

Another potential limitation is severity of diabetes and high depressive symptoms were determined according to using insulin and receiving psychiatric treatment. Using treatment as a proxy measure for disease severity may be problematic because not receiving treatment may also reflect limited access to healthcare resources or delays in seeking medical treatment. Thus, not receiving treatment may not reflect symptom severity in all instances. PREHCO also does not include data for glycogenated hemoglobin (HbA1c) or other biomarkers for blood sugar concentration. HbA1c or related biomarker could be used to identify undiagnosed cases of diabetes as well as better assess diabetes severity and glycemic control. Finally, participants with low cognitive function during the baseline or follow-up interviews were required to have a proxy complete the interview or, if a proxy was unavailable, received a shortened version of the questionnaire. The proxy interview does not include the core questions on ADL limitations or depressive symptoms. Therefore, participants with cognitive impairment had to be excluded from the analysis. This may have lead to us underestimating the strength of the association between diabetes, depressive symptoms, ADL limitations, and mortality since the analytic sample had healthier characteristics than the full PREHCO sample. This may also limit the generalizability of our findings to all older Puerto Ricans.

Despite these limitations, the results of this study make an important contribution to the existing literature on health outcomes of older Puerto Ricans with diabetes and high depressive symptoms. Aging research involving Puerto Rico is limited and research has focused on older Puerto Ricans living on the U.S. mainland. Research on aging in Puerto Rico is necessary given that there are likely important differences in the sociodemographic, health, and behavioral characteristics of older Puerto Ricans living on the U.S. mainland versus those living in Puerto Rico. Future research is needed to identify additional characteristics associated with developing disability and mortality among older Puerto Ricans in order to advance understanding of the overall health of this population.

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Figure 1. Selection of Analytic Sample

Table 1
Descriptive Characteristics of Final Sample According to Baseline Diabetes Status and High Depressive Symptoms (N=3,419)

Baseline characteristics	Diabetes and High Depressive Symptoms at Baseline			P value
	Neither	Diabetes, no depression	No diabetes, high depressive symptoms	
Age, mean (SD)	71.5 (8.4)	70.0 (7.0)	71.3 (8.6)	< 0.01
Yrs. Education, mean (SD)	8.6 (4.5)	8.4 (4.5)	7.3 (4.6)	0.02
Gender				< 0.01
Male	821 (43.4)	268 (43.3)	192 (30.7)	
Female	1072 (56.6)	351 (56.7)	433 (69.3)	
Marital status				< 0.01
Married	823 (43.5)	295 (47.7)	192 (30.7)	
Not married	454 (24.0)	133 (21.5)	184 (29.4)	
Widowed	616 (32.5)	191 (30.9)	249 (39.8)	
Race / Ethnicity				0.62
White	8273 (46.1)	279 (45.1)	264 (42.2)	
Black	111 (5.9)	36 (5.8)	35 (5.6)	
Multiracial	909 (48.0)	304 (49.1)	326 (52.2)	
Health insurance plan				< 0.01
Government	735 (38.8)	256 (41.4)	335 (53.6)	
Medicare Part A or B	665 (35.1)	234 (37.8)	195 (31.2)	
Other	423 (22.3)	117 (18.9)	87 (13.9)	
Uninsured	70 (3.7)	12 (1.9)	8 (1.3)	
Hypertension				< 0.01
No	915 (48.3)	189 (30.5)	268 (42.9)	
Yes	978 (51.7)	430 (69.6)	357 (57.1)	
Heart attack				< 0.01
No	1751 (92.5)	545 (88.0)	554 (88.6)	
Yes	142 (7.5)	74 (12.0)	71 (11.4)	
Stroke				< 0.01
No	1835 (96.9)	577 (93.2)	581 (93.0)	
Yes	58 (3.1)	42 (6.8)	44 (7.0)	

Baseline characteristics	Diabetes and High Depressive Symptoms at Baseline			P value
	Neither	Diabetes, no depression	No diabetes, high depressive symptoms	
Arthritis				< 0.01
No	1069 (56.5)	313 (50.6)	251 (40.2)	
Yes	824 (43.5)	306 (49.4)	374 (59.8)	
Cognition, mean (SD)	16.8 (2.4)	17.0 (2.3)	16.2 (2.5)	16.2 (2.4)

Percentages are based on column total.

Association between Self-Reported Diabetes and High Depressive Symptoms at Baseline and Developing ADL Disability and Mortality at Follow-up.

Table 2

Characteristic	ADL Disability (N=2,175)			Mortality (N=3,419)		
	Odds Ratio	95% CI		Odds Ratio	95% CI	
Diabetes	1.31	0.99 – 1.74		1.72	**	1.34 – 2.19
High depressive symptoms	2.21	**	1.68 – 2.91	1.24		0.97 – 1.60
Age	1.05	**	1.03 – 1.07	1.08	**	1.07 – 1.10
Female gender	1.69	**	1.24 – 2.30	0.57	**	0.44 – 0.73
Yrs. education	0.96	*	0.93 – 0.99	0.95	**	0.93 – 0.98
Not married	1.13		0.81 – 1.58	1.53	**	1.13 – 2.07
Widowed	0.87		0.62 – 1.22	1.06		0.78 – 1.45
Black race	0.76		0.41 – 1.32	1.06		0.65 – 1.68
Multiracial	0.84		0.65 – 1.09	0.88		0.70 – 1.12
Medicare Part A or B	0.74	*	0.55 – 0.99	0.91		0.70 – 1.18
Other insurance	0.61	*	0.40 – 0.91	0.77		0.52 – 1.12
Uninsured	1.18		0.46 – 2.57	1.80		0.93 – 3.28
Hypertension	1.35	*	1.03 – 1.77	1.09		0.86 – 1.39
Heart attack	1.80	**	1.19 – 2.66	1.86	*	1.36 – 2.53
Stroke	1.16		0.61 – 2.08	1.44		0.92 – 2.20
Arthritis	1.82	**	1.40 – 2.38	0.86		0.68 – 1.08
Cognition	1.04		0.98 – 1.10	0.98		0.93 – 1.03

*
 $p < 0.05$;**
 $p < 0.01$

Comorbid Diabetes and High depressive symptoms on Odds for Onset of ADL Disability and Mortality Relative to Diabetes Only and High depressive symptoms Only.

Table 3

Health Condition	ADL Disability (N=2,175)		Mortality (N=3,419)	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Diabetes and high depressive symptoms				
Diabetes only (ref)	2.23	* 1.36 – 3.63	1.28	0.85 – 1.91
High depressive symptoms only (ref)	1.32	0.81 – 2.15	1.76	* 1.17 – 2.65

* $p < 0.05$;

** $p < 0.01$

All models controlled for age, gender, education, marital status, race/ethnicity, insurance status, hypertension, heart attack, stroke, arthritis, and cognition

Table 4

Association between Severity of Diabetes and Depressive Symptoms at Baseline and Developing ADL Disability and Mortality at Follow-Up.

Health Condition	ADL Disability (N=2,175)		Mortality (N=3,419)	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Diabetes (ref = no)				
Yes, not using insulin	1.18	0.85 – 1.62	1.49	** 1.12 – 1.97
Yes, using insulin	1.69	* 1.08 – 2.61	2.32	** 1.61 – 3.30
High depressive symptoms (ref = no)				
Yes, no psychiatric treatment	2.00	** 1.49 – 2.67	1.22	0.94 – 1.58
Yes, psychiatric treatment	3.93	** 2.17 – 6.96	1.45	0.75 – 2.59

* $p < 0.05$;

** $p < 0.01$

All models controlled for age, gender, education, marital status, race/ethnicity, insurance status, hypertension, heart attack, stroke, arthritis, and cognition