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Diabetes, Race, and Functional Limitations in Older U.S. Men and Women

Rita Rastogi Kalyani, MD, MHS[1,2], **Diana C. Rodriguez, MSPH**[3], **Hsin-Chieh Yeh, PhD**[4,5], **Sherita H. Golden, MD, MHS**[1,4], and **Roland J. Thorpe Jr., PhD**[2,6]

[1]Division of Endocrinology, Diabetes & Metabolism, Department of Medicine, The Johns Hopkins University, Baltimore, Maryland [2]Center on Aging and Health, Johns Hopkins Medical Institutions, Baltimore, Maryland [3]Department of International Health, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland [4]Department of Epidemiology and the Welch Center for Prevention, Epidemiology and Clinical Research, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland [5]Division of General Internal Medicine, Department of Medicine, The Johns Hopkins University, Baltimore, Maryland [6]Department of Health, Behavior, and Society, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland

Abstract

Aims—The presence of diabetes is associated with increased odds of difficulties in functional tasks but it remains unclear if the burden is similar by race.

Methods—Our study included 122,004 non-Hispanic Black (NHB) and non-Hispanic White (NHW) adults ≥50 years from the U.S. National Health Interview Survey (2001–2012). Diabetes was defined as self-reported diagnosis or medication use. Functional limitations were defined as any self-reported difficulty in performing mobility tasks, general physical activities (GPA), or leisure and social activities (LSA). Logistic regression models were created to investigate the relationship of race with functional limitations accounting for key covariates, among men and women, by diabetes status.

Results—Among older U.S. adults, NHB versus NHW women without diabetes had a higher odds of limitations in mobility (OR=1.39, 1.30–1.49) and LSA (OR=1.13, 1.05–1.23) without diabetes but a similar odds of these limitations with diabetes by race, adjusting for age, income, education, obesity, arthritis, heart disease, stroke, COPD, and cancer. Interestingly, NHB versus NHW women had significantly lower odds of GPA, irrespective of diabetes status. However, NHB versus NHW men with diabetes had a persistently higher odds for mobility and LSA

Address correspondence to: Dr. Rita Rastogi Kalyani, Division of Endocrinology, Diabetes, & Metabolism, Department of Medicine, Johns Hopkins University School of Medicine, 1830 East Monument Street, Suite 333, Baltimore, Maryland 21287, Tel: (410) 502-6888, Fax: (410) 955-8172, rrastogi@jhmi.edu.

Conflicts of interest

The authors have no conflicts of interest.

limitations with diabetes as follows: mobility (OR=1.30, 1.12–1.51) and LSA limitations (OR=1.07, 1.06–1.34). The interaction of race and diabetes was significant among women for mobility limitations ($p<0.01$), but not men.

Conclusions—The burden of functional limitations differs by race among both men and women with diabetes. Future studies should examine mechanisms underlying these differences to prevent progression to disability in older adults with diabetes.

Keywords

diabetes; race; mobility; physical function; men's health; epidemiology

Introduction

Similar to global estimates, the burden of diabetes in the U.S. is projected to grow over the next few decades, largely attributable to an aging population and rising numbers of high-risk ethnic minority groups [1]. Importantly, diabetes is associated with a two-fold increased risk of functional limitations and disability in adults as they age [2]. This includes limitations in lower extremity mobility tasks, general physical activities, and leisure and social activities but also disability in activities of daily living (ADL) and instrumental activities of daily living (IADL) [3]. Yet, it remains unclear the degree to which functional limitations differ by race in persons with diabetes, though such disparities have been described in persons without diabetes [4–6]. Previous studies have examined race/ethnic differences in diabetic complications and geriatric conditions such as falls, urinary incontinence, polypharmacy, depression, and chronic pain among older adults with diabetes, and found that the burden was heterogeneous across race/ethnicity though the magnitude of the differences was often modest [7]. However, to our knowledge, there have been no studies to date that have specifically investigated race differences in the burden of functional limitations among older persons with diabetes. Identifying populations at high-risk for the presence of functional limitations is particularly important in order to develop appropriate and targeted screening efforts that reduce the societal burden of disability and potentially improve health outcomes for persons with diabetes from diverse racial/ethnic groups as they age.

Higher rates of diabetes and obesity in Blacks may contribute to the observed disparity in functional limitations and disability among older adults, even after controlling for socioeconomic conditions [4, 8, 9]. Further, sex differences in functional limitations and disability may be present in the general population but have not been consistently reported with diabetes [6, 9–11]. We have reported that older women with diabetes have a high risk of functional limitations [12]. In the present study, we sought to investigate whether the burden of functional limitations differs by race among both men and women with diabetes.

Specifically, we hypothesized that: 1) the prevalence of functional limitations in older adults with and without diabetes has increased over time; 2) the prevalence of functional limitations differs by race and diabetes status among older men and women independent of known confounders; and 3) mobility limitations, which are often related to lower extremity function declines with aging, may have more dramatic differences by race and diabetes status among older men and women.

Subjects, Materials and Methods

Study population

The National Health Interview Survey (NHIS) is a large, cross-sectional survey designed to provide a nationally representative sample of the U.S. civilian non-institutionalized population. The objective of NHIS is to provide information on the health of the civilian non-institutionalized population of the United States. In doing so, NHIS over-samples NHB, Asians, and Hispanics. Sampling weights are used to yield representative population estimates while adjusting for non-response. Additional information regarding NHIS study design and data collection protocol can be found elsewhere (http://www.cdc.gov/nchs/nhis) [13].

The present study was based on NHIS data collected from 2001 to 2012. There were 346,861 NHIS participants who were 18 years of age and older who completed the survey during these years. From these participants, 149,138 adults were 50 years of age and older. We excluded participants who did not report being NHW or NHB (n=23,328), participants who were missing information on diabetes status (unless they reported insulin or diabetes pill use) (n=2,578), and those who were diagnosed with diabetes before age 25 years (n=1,228). Thus, our study sample consisted of 122,004 NHB and NHW adults aged 50 years and older for the present analyses.

Assessment of functional status

The NHIS assessed functional status by asking all participants 18 years or older about difficulties performing certain physical tasks due to any long-term physical, mental, and emotional problems or illness (not including pregnancy). Between 2001 and 2012, a total of 12 routine physical tasks were assessed each year using questions derived from well-validated sources [14]. Participants were asked the following question about each task: “By yourself and without using any special equipment, how difficult is it for you to: 1) walk a quarter of a mile (approximately three city blocks); 2) walk up 10 steps without resting; 3) stand or be on your feet for approximately 2 hours; 4) sit for approximately 2 hours; 5) stoop, bend, or kneel; 6) reach up over your head; 7) use your fingers to grasp or handle small objects; 8) lift or carry something as heavy as 10 pounds such as a full bag of groceries; 9) push or pull large objects like a living room chair; 10) go out to things like shopping, movies, or sporting events; 11) participate in social activities such as visiting friends, attending clubs and meetings, or going to parties; 12) do things to relax at home or for leisure (reading, watching TV, sewing, listening to music)?” Participants were given the option of answering “not at all difficult,” “only a little difficult,” “somewhat difficult,” “very difficult,” “can’t do at all,” “do not do this activity,” and “don’t know.” Functional limitation was defined as any self-reported difficulty in performing a task. Participants who reported “do not do this activity” and “don’t know” were coded as ‘missing.’ The 12 physical tasks were then categorized into four groups based on previous literature [3, 8]. The groups included mobility limitations (walking one-quarter mile and walking up 10 steps); general physical activity (GPA) limitations (stooping/crouching/kneeling, standing for 2 hours, sitting for 2 hours, standing up from an armless chair, reaching overhead, grasping/holding small objects, and lifting or carrying 10 lb); leisure and social activities (LSA)

limitations (going to movies/shopping/events, doing leisure activities at home, and participating in social activities); and having any functional limitations (difficulty performing any of the 12 physical tasks).

Assessment of diabetes and race

Diabetes status was based on self-report of a physician diagnosis of diabetes or use of medications for diabetes. Our focus was on type 2 diabetes, therefore, we excluded participants who were diagnosed with diabetes before age 25 years similar to previous studies [15]. Participants self-reported their race as white or black/African American and their ethnicity as Hispanic or not Hispanic. A variable was created to identify NHW and NHB. The outcome variable was derived from the diabetes status and race into the following groups: NHW without diabetes, NHB without diabetes, NHB with diabetes, and NHB with diabetes.

Assessment of demographics and comorbidities

Demographic information on age (years), sex, annual household income ($0–$34,999, $35,000–$74,999, > $75,000), and education (greater than, equal to, or less than high school or graduate education degree equivalent) was ascertained from the questionnaire portion of the survey. The presence of obesity, chronic arthritis, any heart problem (including CHD, history of angina, myocardial infarction, or heart attack), stroke, chronic obstructive pulmonary disease (COPD) (including emphysema or chronic bronchitis), and cancer was self-reported. Obesity was based on self-reported height and weight and defined as BMI≥30 kg/m^2.

Statistical Analysis

Sample population characteristics were reported using the mean and standard errors for age and proportions for other binary and categorical variables. These variables were compared across the four categories of participants (NHW without diabetes, NHB without diabetes, NHW with diabetes, and NHB with diabetes) using student t-tests for continuous variables and chi-squared statistics for categorical and binary variables. The prevalence of individual functional limitations and functional limitation categories were then compared across the four race/diabetes categories using chi-squared statistics. Multiple logistic regression analyses were performed, similar to other nationally representative studies [3], to compare the odds of functional limitations in NHB versus NHW (reference) separately for men and women, stratified by diabetes status and controlling for age, survey year, income, education, and individual comorbidities. Additional analyses were performed to determine whether there was an interaction of race and diabetes status on functional limitation groups. Following the procedure recommended by the National Center for Health Statistics, all analyses used Taylor-linearization procedures for the complex multistage sampling design and a population-based weight variable was created (12-year combined weights) to obtain unbiased, nationally representative population estimates [16].

p-values less than 0.05 were considered statistically significant and t-tests were two-sided. All statistical procedures were performed using STATA statistical software, Version 13 (StataCorp LP, College Station, TX).

Results

The overall prevalence of diabetes for U.S. adults during the years 2001–2012 increased from 12.4% (2001–2004) to 14.2% (2005–2008) to 16.1% (2009–2012) in this age group (≥50 years), and increased among both men and women of all races. During the most recent time period (2009–2012), approximately a quarter of older NHB women (24.9%) and NHB men (24.9%) had diabetes, followed by NHW men (17%) and NHW women (13.1%).

NHW women were older, had greater income levels, and higher education than NHB women irrespective of diabetes status (Table 1, all $p<0.001$). There was a higher prevalence of obesity and stroke and lower prevalence of heart problems, COPD, and cancer among NHB compared to NHW women regardless of diabetes status (all $p<0.05$). NHW men were older, had higher income, and greater education compared to NHB men irrespective of diabetes status (all $p<0.001$). There was a higher prevalence of stroke and lower prevalence of chronic arthritis, heart problems, COPD, and cancer among NHB versus NHW men regardless of diabetes status ($p<0.05$). Obesity was more common in NHB among men without diabetes, but more common in NHW among those with diabetes (both $p<0.05$).

Trends in the prevalence of mobility limitations and any functional limitations over time were also explored. While there were some slight increases, the prevalence of mobility limitations among women (Figure 1A) and men (Figure 1B) were relatively stable between 2001–2012, with prevalence estimates for mobility limitations that were generally higher in women compared to men during these years. The overall prevalence of any functional limitations among women (Figure 1C) and men (Figure 1D) has also slightly increased but remained relatively stable over time.

We next examined the prevalence of functional limitation categories by race and diabetes status (Table 2). Overall, among those with no diabetes, the prevalence of mobility and LSA limitations categories was greater in NHB compared to NHW women (both $p<0.001$). Among those with diabetes, the prevalence of GPA and any function limitations was significantly lower, while LSA limitations were significantly higher, in NHB compared to NHW women (all $p<0.05$). Mobility limitations were more common in NHB women compared to NHW women with diabetes with a trend towards statistical significance ($p=0.06$). For men, among those with no diabetes, the prevalence of mobility and LSA limitations categories was greater in NHB men compared to NHW men (both $p<0.001$). The prevalence of GPA and any functional limitations was significantly lower in NHB men compared to NHW men with diabetes (both $p<0.05$). Of note, in the presence of diabetes, NHB and NHW women had a higher prevalence of all categories of functional limitations compared to NHB and NHW men, respectively. The prevalence of individual functional limitations for men and women by race are shown in Appendix Table 1.

In logistic regression analyses adjusting for age, income, education, and chronic conditions (obesity, chronic arthritis, heart disease, stroke, COPD, or cancer), NHB women without diabetes had a significantly higher odds of having mobility limitations (adjusted OR=1.39, 1.30–1.49) and LSA limitations (adjusted OR=1.13, 1.05–1.23), but a significantly lower odds of having GPA limitations (adjusted OR=0.92, 0.86–0.99) and any functional

limitations (adjusted OR=0.91, 0.85–0.98), compared to NHW women without diabetes (Table 3). In the presence of diabetes, these differences were attenuated for mobility and LSA limitations such that there were no longer differences by race. However, there remained a significantly lower odds of GPA limitations (adjusted OR=0.71, 0.61–0.83) and any functional limitations (adjusted OR=0.71, 0.61–0.82) among NHB women with diabetes compared to NHW women with diabetes.

For men (Table 3), NHB men without diabetes had a significantly higher odds of having mobility limitations (adjusted OR=1.47, 1.33–1.63) and LSA limitations (adjusted OR=1.18, 1.04–1.33) compared to NHW men without diabetes. There were no significant differences by race for GPA or any functional limitations. In the presence of diabetes, the differences remained significant such that NHB men continued to have a greater odds of mobility limitations (adjusted OR=1.30, 1.12–1.51) and LSA limitations (adjusted OR=1.07, 1.06–1.34) compared to NHW men.

In analyses exploring the presence of an interaction by race and diabetes status on the odds of functional limitations, we found a significant interaction among women (p-value for interaction=0.006) but not among men (p-value for interaction=0.27) for mobility limitations. Similar results were found for GPA limitations (p-value for interaction=0.005 for women and p-value=0.75 for men) and any functional limitations (p-value for interaction=0.008 for women and p-value=0.26 for men). Thus, there was a significant interaction of diabetes status and race on the likelihood of these functional limitation categories among women but not men. However, no significant interaction by race and diabetes status was found for LSA limitations among either men or women.

Discussion

In the present study, we found that the prevalence of functional limitations across a range of tasks has generally remained stable with slight increases over the years 2001–2012 among men and women of different races irrespective of diabetes status. The presence of diabetes did not change the significantly decreased burden of GPA or any functional limitations observed in older NHB compared to NHW women, suggesting that older NHW women with diabetes may be more vulnerable to functional limitations. The presence of diabetes also did not change the significantly increased burden of mobility and LSA limitations observed in older NHB compared to NHW men. These results suggest that older NHB men with diabetes may also be more vulnerable to functional limitations. In general, the presence of diabetes had a more dramatic impact on race differences in functional limitations among women. The implications of our findings are that targeted screening strategies might be considered in the future to prevent the progression to disability in older adults with diabetes.

Previous studies have demonstrated a two-fold higher risk of mobility limitations in the presence of diabetes that was independent of comorbidities in older women [2, 12]. However, to our knowledge, there have been no previous studies that have focused specifically on characterizing if the burden of functional limitations is similar for persons of different races in the presence of diabetes. The findings by Chiu and colleagues (2011) suggest that women with versus without diabetes have greater physical disability compared

to men for whom scores do not differ as greatly by diabetes status [9]. In our study, we similarly found that diabetes was related to a generally increased prevalence of functional limitations in women compared to men. However, we further add to the literature by examining differences by race and demonstrate that although both NHB men and NHB women had higher odds of mobility limitations in the absence of diabetes compared to their NHW counterparts, only NHB men continued to have a higher odds of mobility limitations even in the presence of diabetes; in other words, the increased odds for NHB versus NHW women no longer remained in the presence of diabetes.

Findings from this study add to the literature focusing on race disparities among older adults with diabetes. A recent expert panel identified significant research gaps in available research exploring potential disparities by race for persons with diabetes and disabilities [17]. Blacks have greater muscle mass but poorer lower extremity physical function compared to whites [5, 6, 18], and Black women have greater fat infiltration into the muscle than white women [18]. Greater fat infiltration is associated with poorer lower extremity physical function [18]. Possible explanations for the sex and race differences we observed include differences in age-related effects by sex and race in muscle function; the presence of comorbidities such as obesity or cardiovascular disease that vary by sex and race; or socioeconomic differences. However, we found that the results of our study were independent of age, income, education, and comorbidities. Other possible reasons include divergent effects of sex hormones on muscle function in men versus women; genetic factors that contribute to lower muscle function by sex and race; or differences in physical activity or diet that impact muscle function by sex and race. Inflammatory markers may also differ by sex and race and be related to differences in muscle mass and strength [19].

Further, diabetes is a disease that requires especially demanding skills and knowledge in daily self-management including adherence to lifestyle and medication regimens and may be difficult to optimally manage without proper knowledge. Blacks with diabetes are less likely than their white counterparts to undergo routine primary care visits and laboratory testing and are more likely to have suboptimal glycemic control [20]. One potentially modifiable factor for which racial disparities have been reported--medication adherence--was among the most significant independent predictors of glycemic control. [21]. Hyperglycemia is further related to the development of functional limitations [12]. In addition, women have reported higher levels of social support from their diabetes health care team than men in other studies [22]. Whether social support further moderates the impact of diabetes on functional limitations, however, remains unknown. Potential reasons for the observed sex and race differences should be explored in future studies.

There are several limitations to our study. The NHIS surveys were cross-sectional and causality cannot be inferred. Indeed, the reverse association is possible; persons with functional limitations may be at increased risk of developing diabetes [23]. However, given that we were interested in identifying potential subpopulations at high-risk of functional limitations for possible preventive efforts, this was not the focus of the present study but should be explored in the future. Our assessment of functional limitations was self-reported; although self-reported disability identifies a broad range of disability in older age [24], it is possible that subclinical functional limitations may have been present and the use of

performance-based measures may have provided different results [5, 25]. Also, few studies have explored if the validity of self-reported functional limitations varies by sex or race. Thus, inferences from the present study may change if the tendency for reporting functional limitations differs by these sociodemographic characteristics. We focused on NHB in our study and cannot extrapolate whether similar findings are present in other racial/ethnic groups. Also, NHIS only included the non-institutionalized U.S. population and, consequently, our study may underestimate the burden of functional limitations in older adults. Participants with undiagnosed diabetes may have also been included in the no diabetes group, but this would have overestimated the prevalence of functional limitations in this group, and significant findings by diabetes status were still detected in our study. We were not able to account for access to healthcare or quality of medical services. As a result, there may be residual confounding in our study.

The strengths of our study include the range of functional limitations assessed in comparison to previous studies [9]. We were able to explore differences by both sex and race in our study which have not been previously investigated. Our results accounted for the presence of multiple possible confounders including demographics and chronic conditions. Protocols for NHIS have been well-documented and estimates are nationally representative for the U.S. population. We were also able to explore secular trends in diabetes and functional limitations over more than a decade.

In summary, our study demonstrates that significant differences exist in the burden of functional limitations by race among older men and women with diabetes. Further studies should explore mechanisms underlying the observed sex and race differences in functional limitations among persons with diabetes and whether these differences persist over time or are found in other racial/ethnic groups. The findings of our study should be further extended in future studies examining other race/ethnic groups. Ultimately, such studies can help inform preventive efforts to appropriately reduce the burden of disability in persons with diabetes in the future.

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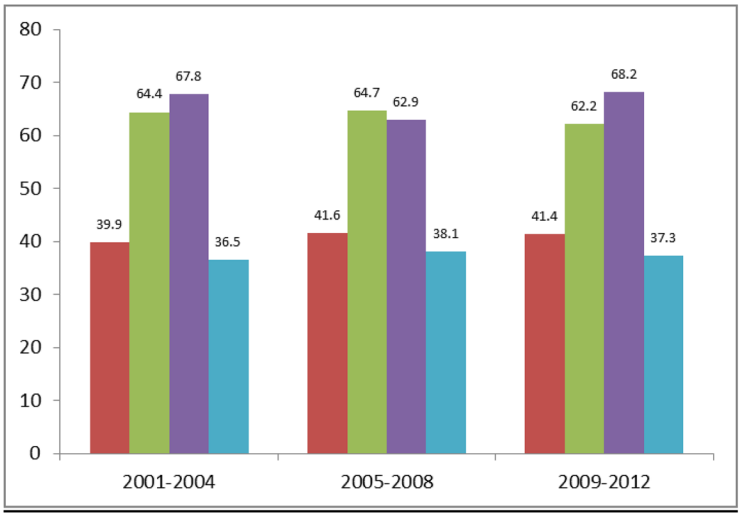
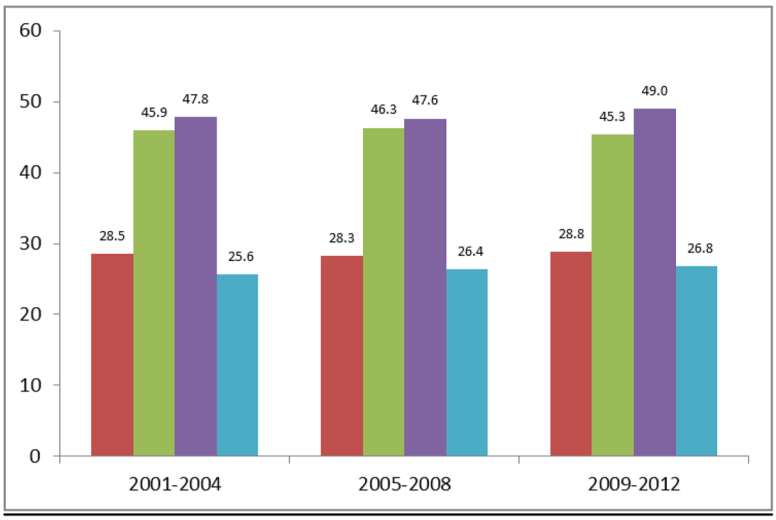
Highlights

- Black men are more likely to have mobility limitations than White men with with or without diabetes.
- Black women are more likely to have mobility limitations than White women without diabetes.
- For women, there are no differences in mobility limitations by race with diabetes.
- Limitations in leisure and social activities are more common in Black men with diabetes.
- Limitations in general physical activities are less common in Black women with diabetes.

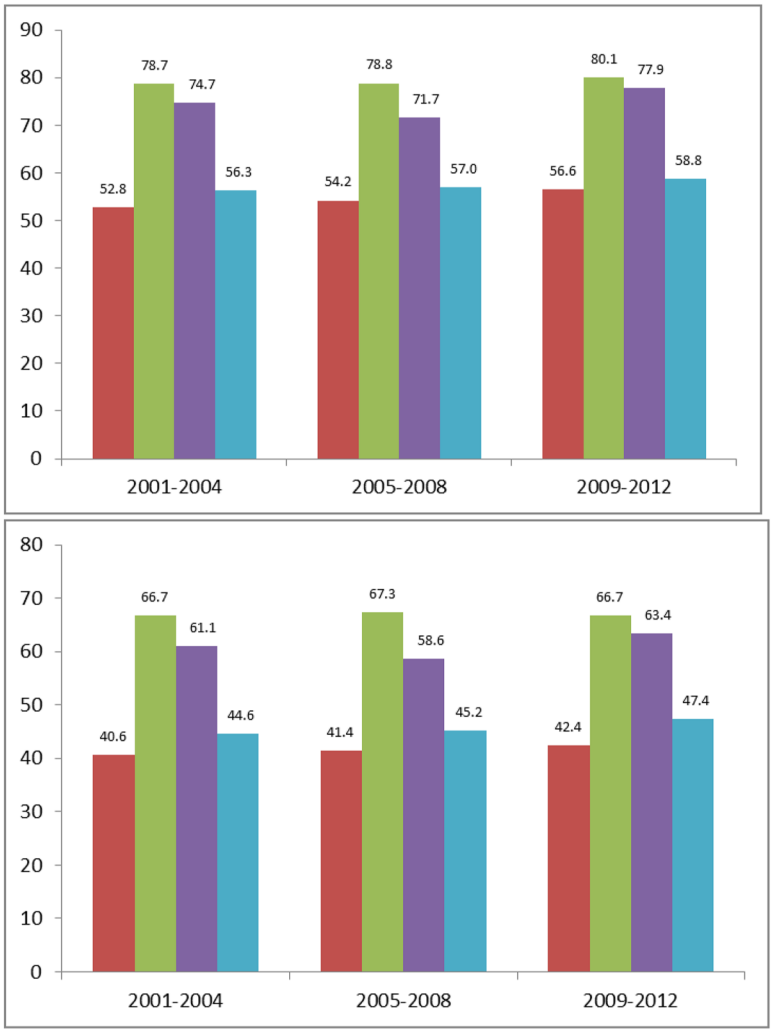
A)





C)

B)



D)

Figure 1.

Nationally representative estimates among U.S. adults aged 50 years and over are provided by race and diabetes status during the time periods 2001–2004, 2005–2008, and 2009–2012 for: mobility limitations in women (A), mobility limitations in men (B), any functional limitations in women (C), and any functional limitations in men (D). The prevalence estimates (%) for different groups are indicated as follows: NHW without diabetes (blue), NHB without diabetes (red), NHW with diabetes (green), and NHB with diabetes (purple). The exact prevalence estimates for each group are indicated numerically above each bar.

Table 1

Nationally representative estimates for demographic and clinical characteristics of U.S. adults by race, diabetes status and sex, NHIS 2001–2012

	No Diabetes			Diabetes		
	NH-White	**NH-Black**	***p-value***	**NH-White**	**NH-Black**	***p-value***
Women						
n*	51,422	9,140		7,005	2,832	
Age (years)**	64.6 ± 0.1	62.1 ± 0.1	*<0.001*	67.0 ± 0.2	65.0 ± 0.3	*<0.001*
Annual household income (%)			*<0.001*			*<0.001*
$0–$34,999	29.9	45.1		44.9	56.9	
$35,000–$74,999	25.5	22.3		24.6	18.4	
> $75,000	15.2	8.1		8.8	5.3	
Not reported	29.4	24.6		21.8	19.5	
Education (%)			*<0.001*			*<0.001*
< High school	12.9	25.8		21.7	37.7	
High school	33.9	30.2		39.3	27.8	
> High school	53.2	44.0		39.0	34.5	
Chronic conditions (%)						
Obesity	26.8	43.5	*<0.001*	56.7	61.3	*<0.001*
Chronic arthritis	44.2	43.6	*0.35*	61.0	61.3	*0.83*
Any heart problem	17.4	15.4	*<0.001*	34.8	31.3	*0.01*
Stroke	4.3	5.8	*<0.001*	11.1	12.9	*0.04*
Chronic obstructive pulmonary disease	8.7	7.1	*<0.001*	14.5	10.6	*<0.001*
Cancer	16.8	6.8	*<0.001*	21.2	10.6	*<0.001*
Men						
n*	37,230	6,053		6,553	1,769	
Age (years)**	63.0 ± 0.1	60.9 ± 0.2	*<0.001*	66.0 ± 0.1	63.1 ± 0.3	*<0.001*
Annual household income (%)			*<0.001*			*<0.001*
$0–$34,999	23.7	40.3		31.1	44.9	
$35,000–$74,999	27.5	25.4		30.4	26.7	
> $75,000	19.4	11.9		13.1	10.7	

	No Diabetes			Diabetes		
	NH-White	**NH-Black**	***p-value***	**NH-White**	**NH-Black**	***p-value***
Not reported	29.4	22.4		25.3	17.8	
Education (%)			*<0.001*			*<0.001*
< High school	12.4	27.6		18.3	32.7	
High school	28.2	31.4		31.6	29.3	
> High school	59.3	41.0		50.1	38.0	
Chronic conditions (%)						
Obesity	25.7	27.5	*0.02*	50.7	44.9	*<0.001*
Chronic arthritis	33.3	30.2	*<0.001*	48.3	42.0	*<0.001*
Any heart problem	22.5	15.0	*<0.001*	44.3	29.9	*<0.001*
Stroke	4.3	5.5	*0.001*	10.5	12.8	*0.02*
Chronic obstructive pulmonary disease	7.1	5.4	*<0.001*	10.5	6.4	*<0.001*
Cancer	16.4	8.4	*<0.001*	21.6	12.3	*<0.001*

* unweighted sample size;

** mean ± SE.

Table 2

Nationally representative prevalence estimates (%) of functional limitation categories*, by race and diabetes status in U.S. women and men aged ≥50 years

	No Diabetes			Diabetes		
	NH-White	NH-Black	p-value	NH-White	NH-Black	p-value
Women						
Mobility Limitation	32.5	41.0	<0.001	63.6	66.3	0.06
GPA Limitation	53.2	53.7	0.53	78.8	74.2	<0.001
LSA Limitation	18.1	21.8	<0.001	38.2	42.2	0.005
Any Functional Limitation	54.2	54.7	0.48	79.3	75.0	0.001
Men						
Mobility Limitation	22.0	28.5	<0.001	45.7	48.3	0.115
GPA Limitation	40.6	39.6	0.27	65.1	60.5	0.003
LSA Limitation	11.9	14.9	<0.001	26.2	26.9	0.632
Any Functional Limitation	42.1	41.6	0.57	66.9	61.3	<0.001

* Mobility limitation includes any difficulty walking or climbing. GPA limitation includes any difficulty standing, sitting, stooping, bending, kneeling, reaching, grasping, carrying, pushing, or pulling. LSA limitation is defined as having difficulty shopping, socializing, or relaxing. Any functional limitation includes difficulty with any of the individual limitations

Table 3

Adjusted odds of functional limitation categories by race and diabetes status in U.S. women and men aged ≥50 years

	No Diabetes		Diabetes	
Functional Limitation Category	**NH-White**	**NH-Black**	**NH-White**	**NH-Black**
Women				
Mobility Limitation	1.00	1.39 (1.30–1.49)	1.00	1.08 (0.94–1.24)
GPA Limitation	1.00	0.92 (0.86–0.99)	1.00	0.71 (0.61–0.83)
LSA Limitation	1.00	1.13 (1.05–1.23)	1.00	1.11 (0.98–1.27)
Any Functional Limitation	1.00	0.91 (0.85–0.98)	1.00	0.71 (0.61–0.82)
Men				
Mobility Limitation	1.00	1.47 (1.33–1.63)	1.00	1.30 (1.12–1.51)
GPA Limitation	1.00	0.96 (0.88–1.05)	1.00	0.91 (0.79–1.04)
LSA Limitation	1.00	1.18 (1.04–1.33)	1.00	1.07 (1.06–1.34)
Any Functional Limitation	1.00	0.97 (0.89–1.06)	1.00	0.87 (0.76–1.00)

Data are presented as odds ratios (OR) and 95% confidence intervals (CI). Models were adjusted for age, income, education, obesity, chronic arthritis, heart disease, stroke, chronic obstructive pulmonary disease, or cancer.

Appendix Table 1

Nationally representative prevalence estimates (%) of individual functional limitations by race and diabetes status in U.S. Women and Men Aged ≥50 years

	No Diabetes			Diabetes		
	NH-White	**NH-Black**	**p-value**	**NH-White**	**NH-Black**	**p-value**
Women						
Individual Functional Limitations						
Difficulty Walking	28.6	35.1	<0.001	58.4	60.0	0.27
Difficulty Climbing	22.6	32.8	<0.001	49.3	56.4	<0.001
Difficulty Standing	32.9	36.3	<0.001	60.6	58.7	0.24
Difficulty Sitting	16.2	19.4	<0.001	26.5	28.9	0.06
Difficulty Stooping, Bending, Kneeling	40.3	41.4	0.13	67.4	63.1	0.001
Difficulty Reaching	14.7	19.5	<0.001	27.5	32.5	<0.001
Difficulty Grasping	15.5	15.6	0.83	27.0	26.7	0.81
Difficulty Carrying	20.3	27.0	<0.001	39.6	46.9	<0.001
Difficulty Pushing or Pulling	27.3	30.5	<0.001	49.6	52.1	0.11
Difficulty Shopping	16.1	19.3	<0.001	35.6	38.8	0.02
Difficulty Socializing	12.1	15.9	<0.001	27.2	32.5	<0.001
Difficulty Relaxing	5.8	8.0	<0.001	12.6	13.3	0.43
Men						
Individual Functional Limitations						
Difficulty Walking	20.1	25.7	<0.001	42.5	43.5	0.521
Difficulty Climbing	13.8	21.0	<0.001	31.7	36.2	0.004
Difficulty Standing	24.2	26.5	0.005	46.8	46.0	0.62
Difficulty Sitting	11.1	14.3	<0.001	19.1	21.1	0.114
Difficulty Stooping, Bending, Kneeling	31.0	30.2	0.34	54.0	50.0	0.013
Difficulty Reaching	10.6	12.9	<0.001	20.5	21.6	0.384
Difficulty Grasping	10.1	11.1	0.06	20.8	19.7	0.428
Difficulty Carrying	09.0	15.1	<0.001	20.4	23.9	0.004
Difficulty Pushing or Pulling	14.6	18.5	<0.001	28.7	30.4	0.251
Difficulty Shopping	10.1	12.9	<0.001	22.9	23.3	0.750

	No Diabetes			Diabetes		
	NH-White	NH-Black	p-value	NH-White	NH-Black	p-value
Difficulty Socializing	7.8	10.9	<0.001	18.0	20.2	0.080
Difficulty Relaxing	4.0	5.7	<0.001	8.6	9.1	0.598