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The Relationship between BMI and Onset of Diabetes Mellitus and its Complications

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Abstract

Objective—This study determines effects of elevated body mass index (BMI) on type 2 diabetes mellitus (DM) onset and its complications among U.S. elderly.

Design and Methods—Data came from the Medicare Current Beneficiary Survey (MCBS), 1991-2010. A Cox proportional hazard model was used to assess effects of elevated BMI at the first MCBS interview on DM diagnosis, complications, and insulin dependence onset among Medicare beneficiaries with no prior DM diagnosis and not enrolled in Medicare Advantage (N=14,657).

Results—Among DM-diagnosed individuals, elevated BMIs were associated with progressively higher risk of adverse outcomes. For women, hazard ratio (HR) of insulin dependence ranged from a 1.77 at 25 BMI 27.49 to 3.57 at BMI 40. A similar pattern was observed in risk for cardiovascular (HR=1.34 to HR=2.45), cerebrovascular (HR=1.30 to HR=2.00), renal (HR=1.31 to HR=2.23), and lower extremity complications (HR=1.41 to HR=2.95). In men, increased risks for DM complications occurred at higher BMI (27.5 BMI 29.99) levels than in women. Ocular complications occurred at higher BMI levels than other complication types in both genders.

Conclusions—Having even moderately elevated BMI is associated with increased risk of developing DM complications.

INTRODUCTION

Type 2 diabetes mellitus (DM) is a common disease whose prevalence is expected to double by the year 2030 (1). The mean lifetime risk of developing type 2 DM for individuals born in the U.S. in 2000 was 38.5% for men and 32.8% for women (2). In 2006, the U.S. had a

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crude DM prevalence rate of 12.9% among individuals 20+ years, of whom approximately 40% were undiagnosed (3). The prevalence of DM increases with age and peaks at 60-74. Among elderly aged 60-74, 29.9% have DM, and another 36.85% are considered pre-diabetic, thus yielding a total diabetes and pre-diabetes prevalence rate of 66.7% (3). Currently, diagnosed with type 2 DM, an individual faces a mean duration of disease of 14.9 (men) and 17.0 (women) years, and a reduction in life expectancy of 7.3 (men) and 9.5 (women) years (2).

At the same time, the prevalence of excess body weight has increased dramatically in the U.S. in the past 50 years (4; 5). As of 2010, 69.2 % of the adult U.S population was overweight (body mass index (BMI) 25 – BMI < 30) or obese (BMI ≥ 30) (6). Among adults over age 60 the prevalence of excess weight was even higher, with 76.5% of men and 72.5% of women overweight or obese(6). Adult obesity is forecasted to rise by 33% in the next two decades with severe obesity prevalence rising by 130% (7). Combined with the aging of the baby-boom generation, these projections imply that there will be as many as 65 million more obese adults in 2030 than in 2010, of whom 24 million will be over age 60 (8).

Several studies have reported a strong association between excess weight and increased risk of death, placing the overweight group at a 40% higher and the obese group at up to 300% higher risk of death than individuals whose BMI is normal (18.5 – BMI < 25) (9-11). Excess weight and physical inactivity are also associated with an increased risk of developing various diseases, particularly type 2 diabetes (12-22). Since excess weight is an important predictor of type 2 DM, the term “*diabesity*” was proposed by Astrup and Finer in 2000 (23). Specifically, In comparison to women with normal BMI, overweight, obese class I and II (30 – BMI < 39.99), and class III (BMI ≥ 40) individuals face increased risks of developing type 2 DM with 7.6%, 20.1% and 38.8% greater risk respectively (24).

Moreover, among adults over age 65, the incidence of DM complications has been rising, except for eye-related complications (25). For example, today the risk of acute myocardial infarction (AMI) for individuals with type 2 DM is as high as that for non-diabetic individuals who have previously had an AMI (26). Individuals with DM are also 17 times more likely to have an amputation due to peripheral vascular disease, and are at an increased risk of developing nephropathy, retinopathy, and coronary heart disease among other adverse outcomes (23).

In this study, we analyzed the association between the excess weight and the time to first diagnosis of type 2 DM and its complications among elderly individuals, using a nationally representative survey of elderly individuals from the Medicare Current Beneficiary Survey (MCBS) conducted in 1991-2010. Our hypothesis is that excess weight is not only associated with an increased risk of type 2 DM, a relationship well documented in the existing literature, but leads to a greater risk of a variety of DM complications.

METHODS AND PROCEDURES

This study used data from the MCBS merged by a unique identifier with Medicare claims data. Conducted by the U. S. Centers for Medicare and Medicaid Services (CMS), the MCBS collects information on a rotating panel of roughly 12,000 Medicare beneficiaries

one third of who are replaced annually. Each participant is interviewed for four years or until withdrawal from the survey due to death, being rotated out, or not responding to the survey. The survey is administered at four-month intervals to acquire continuous information on expenditures on personal health care services, payments by insurers for care the beneficiary received, insurance coverage other than Medicare, and respondent characteristics including household income, height, and weight. The data are nationally representative of Medicare-covered persons in the U.S. population.

Medicare claims data came from the inpatient, outpatient, Medicare Part B and durable medical equipment claims provided CMS. Claims data were available for 1991-2010. We obtained claims on each respondent for each year the respondent was enrolled in Medicare, even outside the 4-year window during which the person was interviewed by MCBS. Thus, for example, if the respondent was first interviewed in 2001 and was age 77 in that year, we used all available respondent's claims data from 1991 to 2000 for the look back period to determine whether or not the person had been diagnosed with DM prior to entry into the MCBS (baseline) and from 2001 to 2010 or departure from Medicare for any reason, for the follow-up period. The mean number of years for look back periods was 3.96 (standard deviation (std.) 3.56). For follow-up, the mean number of years was 6.68 (std. 4.05). The hazard model accounted for right-censoring of the data. In the construction of the sample, a condition was counted as a DM complication only if the person had a prior a DM diagnosis.

Beneficiaries in our analysis sample were born between 1926 and 1944, were not enrolled in a Medicare Advantage plan, and did not have a DM diagnosis at the time of their first (baseline) MCBS interview. Data on age, race, sex, educational attainment, smoking status, income strata, and BMI were drawn from the MCBS *cost and use* and *access to care* files. Beneficiaries with incomplete information were dropped. After exclusions, our sample size consisted of 14,657 persons. Coding of DM diagnosis and DM complications was based on International Classification of Diseases, 9th Revision Clinical Modification (ICD-9-CM) and Current Procedural Terminology (CPT-4) codes. We identified beneficiaries with a DM diagnosis and a diagnosis of DM complications from Medicare claims data.

We identified the time in 3-month intervals from an individual's first interview to the first DM diagnosis and to each major complication category (Table 1). We focused on common cardiovascular, cerebrovascular, renal, ocular and lower extremity complications. Risks were calculated both for the category as a whole (e.g. any cardiovascular complication) and for specific conditions within each category (e.g., acute myocardial infarction (AMI)).

We calculated the BMI of individuals at the first MCBS interview (baseline). We used a modification of adult overweight (25 ≤ BMI < 29.99) and obesity (BMI ≥ 30) criteria specified by the World Health Organization (27). We classified persons into four BMI categories: BMI between 25 and 27.49; BMI between 27.50 and 29.99; BMI between 30 and 39.99; BMI greater than or equal to 40 adopting additional cut-off criteria from the WHO (27). Normal weight individuals (18.5 ≤ BMI < 25) were used as the reference group. Body mass index was calculated as weight divided by the square of height, based on the self-reported weight and height measures from MCBS. Other control variables included age, income, race, educational attainment (in years), smoking status, hypertension and the year of

the baseline interview to account for secular trends in practice and technology use. Results on explanatory variables other than BMI are not reported to conserve space. We conducted separate analysis for males and females to measure gender-specific differences in time to diagnosis by gender. We estimate the effect of BMI measured at baseline on time to first DM diagnosis and to specific DM complications by calculating hazard ratios using Cox proportional hazards implemented by the *stcox* procedure of Stata 12.0; Statacorp, College Station, TX. The hazard ratios represent how much more likely individuals with elevated BMI are to develop DM or its complications over a short period of time for patients who have not yet develop these conditions. The hazard ratio for the Cox hazard model can be interpreted as a weighted relative risk over the entire study period.

RESULTS

On average, individuals in the non-DM group were older – 68 vs. 66 years, had a slightly higher mean annual income – \$32,000 vs. \$27,000, slightly lower smoking rates – 66% vs. 68%, higher educational attainment – 74% vs. 65% with at least a high school level education, and were more likely to be white – 90% vs. 84% (Table 2). The non-DM group was less likely to have been diagnosed with hypertension – 58% vs. 61% and to be obese – 18% vs. 31%. Among persons in the DM group, lower extremity and cardiovascular were the most prevalent complications, occurring in 69.5% and 70.3% of such individuals, respectively. Ocular complications were least prevalent, occurring in just 9% of the DM group. Overall, demographic characteristics were similar among the five DM complication groups.

Higher than normal BMI was consistently associated with an increased probability of being diagnosed with type 2 DM (Table 3). Among overweight persons, women were at a greater risk of a DM diagnosis than men. Women became at an increased risk of DM (HR=1.31) when they are just slightly overweight (25 < BMI < 27.49), while men became at an increased risk of DM (HR=1.34) in the upper range of the overweight category (27.5 < BMI < 29.99). The risk of developing DM at 30 < BMI < 39.99 relative to persons with normal BMI was nearly the same for both men and women (HR=1.98 for men vs. HR=1.96 for women). At BMI > 40, the risk of DM was higher among men (HR=2.85 for men vs. HR=2.51 for women).

For women, a slightly overweight status was associated the HR = 1.77 of developing insulin dependence, but was not a significant predictor of insulin dependence for men. Whereas at BMI < 40, the HR increased to 4.62 for men and 3.57 for women relative to a person with 18.5 < BMI < 25.

Elevated BMI was also associated with progressively higher risk for all DM complications (Table 3). The relationship between excess weight and being diagnosed with a DM complication was stronger for women than for men. For women, being just slightly overweight led to a higher risk of cardiovascular (HR=1.34), cerebrovascular (HR=1.30), renal (HR=1.31), and lower extremity (HR= 1.41) complications. For men, a slightly overweight status was not a significant risk factor for developing any DM complications. For women in the upper range of the overweight category, the risk increased for

cardiovascular (HR=1.45), renal (HR=1.55), ocular (HR=1.84), and lower extremity (HR=1.55) complications. Men too became at a greater risk for cardiovascular (HR=1.22), renal (HR=1.30), and lower extremity complications (HR=1.47) relative to men with normal BMI.

The magnitude of hazard ratios continues to increase for both men and women with further increases in BMI. Women with BMI 30 were at an increased risk of cardiovascular (HR=2.04), cerebrovascular (HR=1.70), renal (HR=1.86), ocular (HR=2.02), and lower extremity (HR=2.06); those with BMI 40 had a much greater risk of cardiovascular (HR=2.45), cerebrovascular (HR=2.00), renal (HR=2.23), ocular (HR=1.65), and lower extremity (HR=2.95) relative to women with BMI < 25. At BMI 30, men too were at an increased risk of cardiovascular (HR=1.91), cerebrovascular (HR=1.47), renal (HR=2.13), ocular (HR=2.17), and lower extremity (HR=2.13) complications; and those with BMI 40 were at a much greater relative risk of cardiovascular (HR=2.88), renal (HR=2.56), ocular (HR=4.53), and lower extremity (HR=3.79) relative to men with normal BMI. Figure 1 illustrates the results for both genders by BMI category.

Table 4 reports hazard ratios for select types of cardiovascular (coronary artery disease, myocardial infarction, chronic heart failure, occlusion or stenosis), cerebrovascular (stroke, transient ischemic attack, cerebrovascular carotid bruit), renal (proteinuria, chronic renal failure, end stage renal disease), ocular (background diabetic retinopathy), and lower extremity (ulcer and gangrene) complications.

DISCUSSION

This study examines the effect of BMI on time to diagnosis of DM and its complications among individuals over age 65. We found excess weight and obesity to be a major contributing factor to type 2 DM and its complications for both men and women. Both men and women in the overweight category (BMI 25–29.99) were at an increased risk of developing DM, with 30% and 10% greater risks respectively. At BMI 30–39.99 both genders were at a 100% greater risk of DM than counterparts with a normal BMI. BMI 40 increases the odds of developing DM by as much as 150% for women and 180% for men. These results suggest a stronger association between BMI and onset of DM than was previously documented in similar studies (24).

For prevention of DM complications, keeping a healthy weight, among other things, may be more important to women than to men at lower levels of excess weight, since for women DM complications are associated even with just slightly overweight status (BMI 25–27.49). For men, however, the increase in risk for DM complications doesn't come until BMI 27.5. Individuals in the obese category (BMI 30) were consistently at greater risk of DM complications—as much as 168% higher for all complication types taken together, irrespective of gender. Moreover, obese men are at a greater risk of developing cardiovascular, renal, ocular, and lower extremity complications in comparison to women with the same level of BMI.

Our results suggest that weight-loss is an important preventive strategy for overweight persons with pre-diabetes, as it may delay the progression to DM. In addition, weight-management is important for prevention of DM-related complications, since BMI even slightly above 25 puts one at a greater relative risk of a complication. Many existing weight-loss programs, including dietary, physical activity and behavioral interventions are successful in long-term weight reduction and lead to a significant decrease in diabetes incidence (28-32). One such program for the elderly, Medical Nutrition Therapy (MNT), provides education, diet and physical activity counseling, and weight-loss prescriptions (in some cases) to reduce the risk of developing diabetes complications (33). However, this program is currently the only one covered by Medicare and other insurers (when administered by a dietician) (34; 35). If the “diabesity” epidemic is to be contained, it may be desirable to expand the coverage to other weight-loss interventions, such as partially reimbursing for gym membership or other fitness-related activities. Such strategies might prove to be a cost-effective in the long – run for managing diabetes mellitus and its complications in elderly individuals (36; 37).

Our study has several important strengths. The analysis was based on nationally representative longitudinal data. The diagnosis of DM, its complications, and insulin dependence is based on a physician report. We employed a look back period with a mean value of nearly 4 years to determine whether or not the person had been previously diagnosed with DM. The follow-up period for monitoring a DM diagnosis and DM complications was nearly seven years on average.

We also acknowledge these study limitations. Most importantly, weight and height were obtained from self-report at MCBS interviews. To the extent that height was overstated and weight understated, the true magnitude of the relationships between excess weight and onset of DM and its complications could be somewhat overstated, especially for the overweight category (38; 39). Medicare claims are filed for administrative purposes not for research, and for this reason, some relevant information, such as laboratory findings and findings from clinical examination more detailed than a diagnosis, are lacking. Persons who did not visit health care professionals would not have received a diagnosis and hence were combined with the non-DM and non-DM complications groups.

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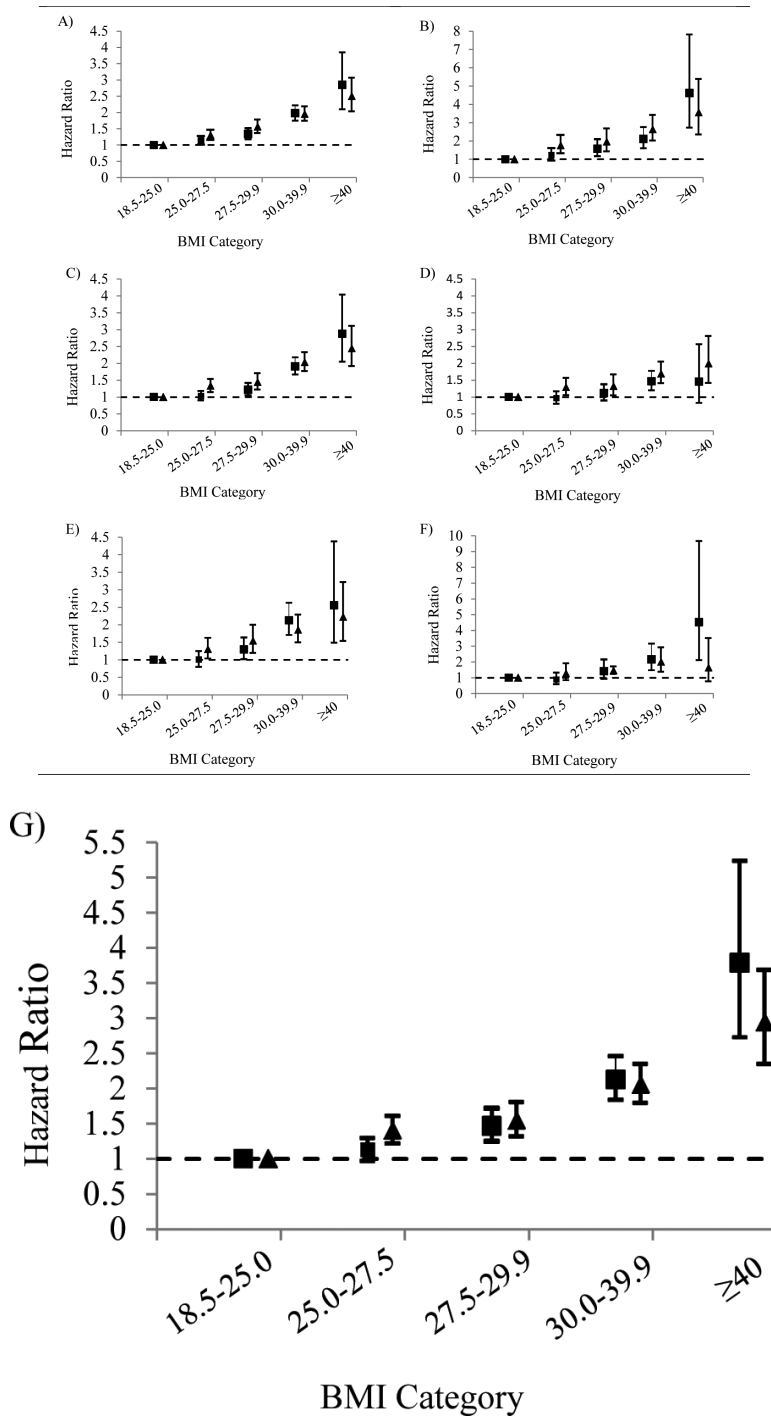


Figure 1. Hazard ratios of type 2 diabetes mellitus (A), insulin dependence (B), cardiovascular (C), cerebrovascular (D), renal E), ocular F), and lower extremity G) complications by body mass index (BMI) among participants of the Medicare Current Beneficiary Survey, United States, 1991-2010. ■ Men over age 65; ▲ women over age 65. Bars represent 95%

confidence intervals. Models were adjusted for race, education, age, age squared, income, marital status, smoking status, hypertension and the survey year.

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TABLE 1

Condition List

Condition	ICD-9-CM* / CPT-4** CODES
Diabetes Mellitus (n=4,542)	
Insulin Dependence	250.xx 250.01, 250.03
Cardiovascular Complication, Any (n=2,194)	
Coronary Artery Disease	411.xx, 413.xx, 414.xx
Myocardial Infarction	410.xx, 412.xx
Congestive Heart Failure	398.91, 402.01, 402.11, 402.91, 404.01, 404.11, 404.13, 404.91, 404.93, 428.0-428.4, 428.9
Occlusion or Stenosis	433.xx, 434.xx
Cerebrovascular Complication, Any (n=1,608)	
Stroke	430.xx, 431.xx, 432.xx, 436.xx
Transient Ischemic Attack	435.xx
Cerebrovascular Carotid Bruit	785.9, 75636
Renal Complication, Any (n=1,305)	
Proteinuria	791.xx
Chronic Renal Failure	404.12, 404.13, 404.92, 403.01, 403.11, 585.xx, 586.xx
Ocular Complication, Any (n=409)	
Diabetic Macular Edema	362.07, 362.53, 362.83
Background Diabetic Retinopathy	362.01
Proliferative Diabetic Retinopathy	362.02
Lower Extremity Complication, Any (n=3,155)	
Ulcer	707.1-707.9
Gangrene	250.7, 440.24, 785.4, 040.0

* International Classification of Diseases, 9th Revision Clinical Modification administrative code.

** Current Procedural Terminology administrative code.

TABLE 2

Sample Characteristics at Baseline

	Group		Complication Groups (within DM Group)				
	Non-DM	DM	Cardio-vascular	Cerebro-vascular	Renal	Ocular	Lower Extremity
Panel A :							
White	90.79	83.78	84.40	83.08	81.84	79.21	84.24
Black	6.39	11.40	11.15	12.75	13.87	14.43	11.13
Other	2.82	4.82	4.45	4.17	4.29	6.36	4.63
Male	47.28	49.43	51.60	49.63	50.04	50.12	47.07
Female	52.72	50.57	48.40	50.37	49.96	49.88	52.93
High-school education	74.35	64.82	62.68	61.75	59.46	62.35	63.99
Ever smoked	66.25	68.12	72.04	71.21	71.72	65.28	67.80
Smokes now	16.84	19.04	20.51	21.64	22.99	18.38	19.68
Hypertension	57.60	61.12	63.56	64.24	65.44	51.10	62.41
BMI < 25.00	42.19	29.35	29.00	31.03	28.20	27.63	27.95
BMI 25.00-27.49	25.29	23.45	23.07	23.51	21.99	20.05	23.17
BMI 27.50-29.99	14.59	16.42	15.62	15.61	16.32	18.09	16.32
BMI 30.00-39.99	16.66	27.21	28.52	26.43	29.58	30.32	28.15
BMI 40.00	1.27	3.57	3.79	3.42	3.91	3.91	4.41
Panel B :							
Age	68.17 (5.32)	66.24 (5.41)	65.96 (5.53)	65.67 (5.43)	65.79 (5.58)	65.18 (5.12)	65.86 (5.55)
Income ('000s)	31.86 (26.28)	26.81 (24.47)	25.73 (24.25)	24.49 (22.91)	23.95 (22.42)	25.98 (24.04)	26.01 (24.42)
Sample size	10,115	4,542	3,194	1,608	1,305	409	3,155

* Percentage of sample.

** Mean (standard deviation).

TABLE 3
Hazard Ratios for Diabetes Mellitus and Common Complications by Body Mass Index and Gender*

	Body Mass Index							
	25.00-27.49		27.50-29.99		30.00-39.99		40.00	
	Women	Men	Women	Men	Women	Men	Women	Men
Diabetes Mellitus	1.31 (1.16-1.47) [0.00]	1.14 (1.01-1.28) [0.02]	1.57 (1.37-1.79) [0.00]	1.34 (1.18-1.52) [0.00]	1.96 (1.75-2.19) [0.00]	1.98 (1.75-2.22) [0.00]	2.51 (2.04-3.07) [0.00]	2.85 (2.10-3.85) [0.00]
Insulin Dependence	1.77 (1.33-2.33) [0.00]	1.23 (0.93-1.61) [0.15]	1.97 (1.44-2.69) [0.00]	1.58 (1.17-2.10) [0.00]	2.65 (2.03-3.43) [0.00]	2.11 (1.60-2.76) [0.00]	3.57 (2.36-5.39) [0.00]	4.62 (2.73-7.82) [0.00]
Complications:								
Cardiovascular	1.34 (1.15-1.54) [0.00]	1.03 (0.90-1.18) [0.66]	1.45 (1.22-1.71) [0.00]	1.22 (1.05-1.42) [0.01]	2.04 (1.77-2.33) [0.00]	1.91 (1.67-2.18) [0.00]	2.45 (1.92-3.11) [0.00]	2.88 (2.05-4.04) [0.00]
Cerebrovascular	1.30 (1.06-1.57) [0.01]	0.97 (0.80-1.17) [0.77]	1.33 (1.05-1.67) [0.02]	1.12 (0.90-1.38) [0.29]	1.70 (1.41-2.05) [0.00]	1.47 (1.20-1.78) [0.00]	2.00 (1.42-2.81) [0.00]	1.46 (0.83-2.57) [0.19]
Renal	1.31 (1.04-1.63) [0.02]	1.01 (0.80-1.25) [0.95]	1.55 (1.20-2.0) [0.00]	1.30 (1.02-1.64) [0.03]	1.86 (1.50-2.29) [0.00]	2.13 (1.71-2.63) [0.00]	2.23 (1.54-3.22) [0.00]	2.56 (1.49-4.38) [0.00]
Ocular	1.29 (0.85-1.92) [0.22]	0.89 (0.59-1.33) [0.58]	1.84 (1.18-2.83) [0.01]	1.43 (0.94-2.16) [0.09]	2.02 (1.39-2.93) [0.00]	2.17 (1.48-3.17) [0.00]	1.65 (0.77-3.52) [0.19]	4.53 (2.12-9.67) [0.00]
Lower Extremity	1.41 (1.22-1.61) [0.00]	1.13 (0.97-1.30) [0.11]	1.55 (1.32-1.81) [0.00]	1.47 (1.25-1.72) [0.00]	2.06 (1.80-2.35) [0.00]	2.13 (1.84-2.46) [0.00]	2.95 (2.35-3.69) [0.00]	3.79 (2.73-5.24) [0.00]

Note: the hazard ratio estimates are based on Cox proportional hazard model controlling for race, education, age, age squared, income, marital status, smoking status, hypertension and the survey year. Statistically significant coefficients are in bold, 95% confidence intervals are in parenthesis, p-values reported in square brackets.

* Statistics presented are hazard ratios.

TABLE 4
 Hazard Ratios of Select Diabetes Mellitus Complications by Body Mass Index and Gender*

	Body Mass Index							
	25.00-27.49		27.50-29.99		30.00-39.99		40.00	
	Women	Men	Women	Men	Women	Men	Women	Men
Coronary Artery Disease	1.30 (1.10-1.53) [0.00]	1.05 (0.90-1.22) [0.50]	1.50 (1.24-1.81) [0.00]	1.19 (1.05-1.42) [0.04]	2.00 (1.77-2.33) [0.00]	1.90 (1.67-2.18) [0.00]	2.49 (1.92-3.26) [0.00]	2.15 (1.43-3.21) [0.00]
Myocardial Infarction	1.20 (0.89-1.61) [0.21]	1.47 (1.15-1.85) [0.00]	1.37 (0.97-1.92) [0.07]	1.56 (1.20-2.03) [0.00]	2.03 (1.54-2.64) [0.00]	2.50 (1.97-3.16) [0.00]	1.72 (1.02-2.90) [0.04]	3.46 (2.00-5.97) [0.00]
Chronic Heart Failure	1.19 (0.97-1.45) [0.09]	1.16 (0.96-1.38) [0.12]	1.56 (1.24-1.94) [0.00]	1.35 (1.10-1.65) [0.00]	2.16 (1.80-2.59) [0.00]	2.41 (2.01-2.87) [0.00]	3.19 (2.38-4.25) [0.00]	4.95 (3.38-7.22) [0.00]
Occlusion or Stenosis	1.17 (0.95-1.44) [0.14]	0.93 (0.75-1.13) [0.47]	1.20 (0.92-1.53) [0.16]	1.03 (0.81-1.30) [0.78]	1.38 (1.12-1.70) [0.00]	1.42 (1.14-1.75) [0.00]	1.60 (1.08-2.37) [0.02]	1.43 (0.77-2.64) [0.25]
Stroke	1.22 (0.92-1.60) [0.16]	0.96 (0.75-1.23) [0.76]	1.06 (0.74-1.49) [0.76]	0.98 (0.73-1.29) [0.88]	1.54 (1.17-2.01) [0.00]	1.42 (1.10-1.83) [0.00]	2.17 (1.39-3.39) [0.00]	1.89 (0.98-3.61) [0.05]
Transient Ischemic Attack	1.16 (0.86-1.55) [0.32]	1.02 (0.75-1.36) [0.91]	1.36 (0.97-1.89) [0.08]	1.22 (0.88-1.68) [0.23]	1.28 (0.95-1.71) [0.10]	1.39 (1.02-1.89) [0.04]	1.89 (1.14-3.13) [0.01]	0.70 (0.22-2.24) [0.55]
Cerebrovascular Carotid	1.17 (0.87-1.57) [0.29]	0.71 (0.51-0.98) [0.04]	1.30 (0.91-1.82) [0.14]	1.08 (0.77-1.50) [0.65]	1.79 (1.35-2.35) [0.00]	1.27 (0.92-1.74) [0.13]	1.61 (0.92-2.80) [0.09]	1.17 (0.42-3.20) [0.77]
Bruit	1.40 (1.00-1.94) [0.05]	0.99 (0.68-1.43) [0.67]	1.54 (1.05-2.26) [0.03]	1.09 (0.71-1.65) [0.87]	1.98 (1.44-2.71) [0.00]	2.23 (1.57-3.17) [0.13]	1.78 (0.95-3.32) [0.37]	0.89 (0.21-3.68) [0.77]
Chronic Renal Failure	1.19 (0.87-1.61) [0.29]	1.01 (0.75-1.37) [0.67]	1.54 (1.05-2.26) [0.03]	1.31 (0.92-1.86) [0.08]	1.88 (1.35-2.61) [0.00]	2.11 (1.44-3.13) [0.13]	2.20 (1.44-3.32) [0.37]	2.87 (1.77-4.61) [0.77]

		Body Mass Index							
		25.00-27.49		27.50-29.99		30.00-39.99		40.00	
		Women	Men	Women	Men	Women	Men	Women	Men
		(0.90-1.57)	(0.79-1.29)	(1.13-2.08)	(1.00-1.71)	(1.46-2.42)	(1.66-2.67)	(1.42-3.41)	(1.61-5.13)
		[0.22]	[0.91]	[0.01]	[0.04]	[0.00]	[0.00]	[0.00]	[0.00]
Background Diabetic		1.22	0.98	2.01	1.96	2.21	2.58	1.69	4.92
Retinopathy		(0.72-2.04)	(0.57-1.69)	(1.19-3.38)	(1.16-3.29)	(1.40-3.47)	(1.56-4.23)	(0.69-4.10)	(1.86-12.96)
		[0.45]	[0.96]	[0.00]	[0.01]	[0.00]	[0.00]	[0.25]	[0.00]
Ulcer		1.41	0.91	1.56	1.33	1.79	1.75	3.34	4.97
		(1.01-1.95)	(0.64-1.27)	(1.06-2.28)	(0.93-1.89)	(1.29-2.46)	(1.26-2.43)	(2.04-5.45)	(2.76-8.95)
		[0.04]	[0.58]	[0.02]	[0.11]	[0.00]	[0.00]	[0.00]	[0.00]
Gangrene		1.25	1.03	1.52	1.81	1.98	2.68	3.42	5.42
		(0.81-1.93)	(0.69-1.52)	(0.93-2.45)	(1.22-2.67)	(1.33-2.94)	(1.87-3.83)	(1.92-6.10)	(2.72-10.80)
		[0.30]	[0.87]	[0.09]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]

Note: the hazard ratio estimates are based on Cox proportional hazard model controlling for race, education, age, age squared, income, marital status, smoking status, hypertension and the survey year. Statistically significant coefficients are in bold, 95% confidence intervals are in parenthesis, p-values reported in square brackets.

* Statistics presented are hazard ratios.