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Hypertension-Associated Expenditures for Medication Among US Adults

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Abstract

BACKGROUND—We sought to estimate how much the presence of hypertension adds to annual per capita and total expenditures for medication among US adults.

METHODS—The sample included 21,782 civilian noninstitutionalized adults aged ≥18 years who participated in the 2007 Medical Expenditure Panel Survey. Hypertension was defined as having a diagnosis of high blood pressure (except during pregnancy) or taking a blood pressure medication. We used a 2-part model to examine all-cause medication expenditure associated with hypertension.

RESULTS—The prevalence of hypertension was 32.2%. Overall, 66.7% of adults purchased prescribed medications, with this proportion higher among hypertensive (93.0%) than normotensive (54.4%) adults ($P < 0.001$). Hypertensive adults were more likely to have medication expenditures than were normotensive adults (odds ratio (OR) = 6.42; $P < 0.001$). Among hypertensive adults, those aged ≥45 years were more likely to incur medication expenditure than those aged 18–44 years (OR = 3.00, $P < 0.001$ for those aged 45–64 years; OR = 5.95, $P < 0.001$ for those aged ≥65 years), whereas women were 2.91 times as likely as men to have medication spending ($P < 0.001$). Hispanics were less likely than non-Hispanic whites to have such spending (OR = 0.51; $P < 0.001$). Among those purchasing medications, the average cost was $1,510 higher among hypertensive persons ($2,337) than normotensive persons ($827). Hypertension-associated expenditures for medication were estimated at $68 billion in the US civilian non-institutionalized population in 2007.

CONCLUSIONS—The presence of hypertension among US adults is associated with an increase of all-cause expenditures for medication, with this increase varying across groups by age and sex.

Keywords

blood pressure; drug cost; economics; high blood pressure; hypertension

The prevalence of hypertension is high and increasing worldwide.[1–3] During 2005–2008 in the United States, 1 in 3 adults aged ≥18 years (68 million persons) had hypertension, the

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DISCLOSURE

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nation's most common primary diagnosis, and its annual estimated costs (direct plus indirect) were $50.6 billion.[4,5] By 2030, an additional 27 million people could have hypertension if no additional steps are taken, with prevalence up nearly 10% since 2010.[6] Unfortunately, even men and women with normal blood pressure at age 55 or 65 years have a lifetime risk of developing hypertension as high as 90% if they survive to age 80–85 years.[7] Moreover, in the United States, the mortality rate for hypertension increased 20% from 1998 to 2008, and the actual number of deaths that listed hypertension as the primary and secondary causes rose 49.7% during that period.[5] Finally, in the United States, about 8% of adults have hypertension that is undiagnosed.[8] These alarming statistics, combined with our knowledge that two-thirds of strokes and half of all coronary heart disease are attributable to hypertension,[9] suggest a pressing need to prevent and control this disorder. In a 2010 report, the Institute of Medicine released a population-based, systems-change approach to prevent and control hypertension in which it called on public health officials and health-care providers to step up their efforts to reduce Americans' increasing rates of hypertension and to better treat those with the condition.[10]

The literature suggests that in recent years in the United States almost half of total health-care resources were spent on chronic conditions (including hypertension).[11–17] Of such expenditures, the purchase of prescribed medicine represented the largest cost; besides hospital cost and outpatient services, about half of expenditures for hypertension were for medication.[11–18] Even so, to our knowledge, information that focuses on the factors associated with the costs of medication associated with hypertension remains limited. Employing a nationally representative survey and regression modeling, we estimated how much the presence of hypertension added to annual all-cause expenditures for medication among US adults, and we examined the relationship between socioeconomic characteristics and the medication costs associated with hypertension. We were interested in hypertension-associated all-cause medication costs because the complete medication costs of hypertension extend far beyond those related to treating the problem.[17]

METHODS

Data source

We used data from the 2007 Medical Expenditure Panel Survey (MEPS), a nationally representative survey of health status, use of health care, expenditures, payment sources, and health insurance coverage for the US civilian noninstitutionalized population.[19] The 2007 MEPS was sponsored by the US Agency for Healthcare Research and Quality and the Centers for Disease Control and Prevention. Respondents to MEPS were drawn annually from a subsample of households that participated in the immediate preceding National Health Interview Survey, a complex, multistage, probability sample survey conducted by trained interviewers from the US Bureau of Census for the National Center for Health Statistics, Centers for Disease Control and Prevention. The 2007 MEPS was the most recent such survey with full, updated information at the time of this study. From the full-year consolidated data file of the MEPS, we identified 21,782 adults aged ≥18 years, who represented 225 million Americans.

Information on medication expenditures was obtained from household interviews, with the data obtained subsequently confirmed through physicians' offices, hospitals, and insurance coverage based on actual payment. Medication expenditures were considered the sum of direct payments for prescription drugs purchased during 2007, including out-of-pocket payments and payments by private insurers, Medicaid, Medicare, and other sources. In addition to its detailed information on expenditures, the MEPS contained data on a variety of demographic and socioeconomic variables such as age, sex, race, income, education, and insurance status.

Hypertension was defined as (i) ever having been diagnosed with high blood pressure (other than during pregnancy) by a doctor or another health professional, or (ii) currently taking medication for high blood pressure.[5,20] Information on medications was extracted from the Prescribed Medicine data file of the MEPS. Each record in this event file represented a unique purchase of prescribed medicine. From the 4,380 reported medications in the MEPS, we identified 333 that were used for controlling blood pressure. Because some antihypertensive medications could be prescribed to treat other diseases, we examined the reported medical conditions (up to 3) associated with each prescribed medicine event. If none of the International Classification of Diseases, 9th Revision (ICD-9) codes for these conditions was in the 401–405 range (hypertensive disease including essential hypertension, hypertensive heart disease, hypertension chronic kidney disease, hypertensive heart and chronic kidney disease, and secondary hypertension), we concluded that the medicine purchased was not used to treat hypertension. Employing this approach, we identified 62,221 purchases of blood pressure medicine and 5,711 respondents who were under treatment for hypertension. With this information, we identified an additional 779 hypertensive adults, resulting in a total of 7,108 hypertensive patients.

Statistical analysis

We compared the difference in the medication expenditures between hypertensive and normotensive adults, a differential we defined as the addition to such expenditures due to the presence of hypertension. Exploratory plotting of medication expenditures, however, showed that a significant proportion of the study population purchased no prescribed medicine at all in 2007. In addition, among those who purchased medication, spending was highly skewed to the right. Given these characteristics of the data, ordinary least square methods might lead to biased and inefficient estimation. Thus, we specified a 2-part model for the regression analysis.[21–25] The first part used multivariable logit regression to estimate the probability of incurring some expenditures, whereas the second part used a generalized linear model adjusted for socioeconomic characteristics to estimate by hypertension status the medication expenditures among those who incurred some expenditures (i.e., conditional medication expenditures). We went on to predict the adjusted medication expenditures for each adult in the study population, again by hypertension status, by multiplying the estimated probability of incurring medication expenditures by the predicted conditional medication expenditures; we call these unconditional medical expenditures.

The additional medication expenditures associated with hypertension were calculated subsequent to estimation by assuming that all hypertensive patients had normal blood

pressure, thereby removing the hypertension-related effect. After people with hypertension were recoded as having normal blood pressure to remove the hypertension-related effects on the expenditures, the two-part model was re-run, and predictions for the dependent variables were made again, and the two predictions were multiplied. The individual difference in expenditures between the expenditures prior to recoding and those afterward was considered to be the expected excess expenditure of medication associated with hypertension. Individual excess expenditures were summed to estimate the total excess expenditures of hypertension and also averaged by major demographic characteristics to get population average. Statistical analyses were performed with Stata version 11.[26]

RESULTS

The prevalence of hypertension among US adults in 2007 (MEPS data) was estimated to be 32.2%; women were more likely than men to be hypertensive (Table 1). On average, hypertensive adults were 19.5 years older than normotensive persons. Only 6.3% of normotensive persons were aged ≥65 years, whereas this figure was 38.2% in the hypertensive group. Unlike non-Hispanic whites and non-Hispanic blacks, Hispanics made up a smaller percentage of the hypertensive group (9.3%) than of the normotensive group (15.5%). The proportion of married persons was higher in the hypertensive group (58.1%) than in the normotensive group (52.9%). The body mass index (calculated as the weight in kilograms divided by height in meters squared) averaged 29.5 for hypertensive persons, significantly higher than the 26.4 average for normotensive persons. The proportion of obese (body mass index ≥ 30) persons was 21.1% among normotensive persons, but it was double that (41.2%) among hypertensive persons.

Overall, total per capita health-care expenditures were $4,386; $2,541 for normotensive persons and $8,296 for hypertensive persons (difference of $5,755; $P < 0.001$). Per capita medication expenditures were $452 for normotensive persons and $2,067 for hypertensive persons, a difference of $1,615 ($P < 0.001$). Among persons with some medication expenditures, the per capita amount was $832 among normotensive persons and $2,222 among hypertensive persons, a difference of $1,390 ($P < 0.001$).

After controlling for sociodemographic characteristics, hypertensive patients were significantly more likely than normotensive persons to incur a medication expenditure (odds ratio (OR) = 6.42; 95% confidence interval (CI) = 5.52–7.47; $P < 0.001$) (Table 2). Among hypertensive adults, those aged ≥45 years were more likely to incur a medication expenditure than were those aged <45 (OR = 3.00, 95% CI = 2.23–4.02 for those aged 45–64; OR = 5.95, 95% CI = 3.79–9.34 for those aged ≥65; $P < 0.001$ for both). Hypertensive women were more likely to incur a medication expenditure than were their male counterparts (OR = 2.91; 95% CI = 2.25–3.76; $P < 0.001$), whereas obese hypertensive persons were more likely to incur such spending than hypertensive adults who were not obese (OR = 1.44; 95% CI = 1.12–1.85; $P < 0.01$). Among adults with hypertension, Hispanics were less likely than non-Hispanic whites to have a medication purchase (OR = 0.51; 95% CI = 0.35–0.75; $P < 0.001$). For hypertensive persons, being unmarried, having a larger family, being uninsured during all of 2007, and being in excellent or very good health

(based on self-report) were all significantly associated with being less likely than the comparison groups to incur a medication spending.

Among adults incurring any medication expenditures, hypertensive persons spent more than normotensive persons for drugs, as indicated by the positive and statistically significant coefficient (0.49; $P < 0.001$) for hypertension (Table 3). Among hypertensive adults, those aged ≥45 years, women, and obese people spent more than those aged 18–44 years, men, and nonobese people, respectively. Hispanics and non-Hispanic blacks spent less than non-Hispanic whites. Also among hypertensive persons, people living in larger families, those who were uninsured during all of 2007, and those in excellent, very good, or good health (by self-report) spent less on prescribed medicine than those living in smaller families, having insurance, or in fair or poor health, respectively.

On average, hypertensive adults were 66% (or 37 percentage points) more likely than normotensive adults to incur a medication expenditure (93% vs. 56%) (Table 4). Among those incurring an expenditure, hypertensive adults spent an average of $2,337, which was $1,510 or 182% more than the $827 spent by normortensive adults. After accounting for the probabilities that normotensive persons and hypertensive persons would incur an expenditure, hypertension increased per capita overall spending on prescribed medicine by $1,702, from $464 to $2,166.

Greater age significantly predicted a larger differential in spending between normotensive persons and hypertensive persons (Table 4): for people aged 18–44 years, hypertension increased overall spending by $760 ($1,045 ves. $285), whereas for those aged ≥65 this increase was $1,643 ($2,720 vs. $1,077). Among hypertensive persons, women were more likely than men to have a medication expenditure, and on average, women who had such an expenditure spent $396 more than men ($2,519 vs. $2,123). In the total population, hypertension increased all-cause medication spending by $1,558 for men and $1,829 for women (unconditional spending). Significant differences were also found for obesity and having health insurance. The presence of hypertension increased unconditional medication spending by $1,776 for obese people and $1,608 for nonobese people, whereas it increased such spending by $1,730 for those with insurance but only $834 for those without insurance. Applying the national sample weight and summing up the per capita excess expenditure of hypertensive persons, estimated all-cause medication expenditures associated with hypertension were $68.4 billion (i.e., the presence of hypertension added $68.4 billion to annual all-cause medication costs).

DISCUSSION

The estimate from MEPS data that 32.2% of US adults aged ≥18 were hypertensive in 2007 accords nicely with the 31% estimate from the National Health and Nutrition Examination Survey (NHANES) for 2005–2008 and the 33.9% NHANES projection for 2010,[6] but it is much higher than previous estimates using MEPS data of 17.4% for 2001,[16] 13.1% for 2000–2003,[13] and 24% for 2001–2004.[27] The large difference in estimates of high blood pressure from early versions of MEPS may be the result of (i) an increasing prevalence of hypertension over time and (ii) our inclusion of 779 persons (11% of total hypertensive

persons) using antihypertensive medications as hypertensive regardless of their blood pressure status, something that was not done in the previous studies. The substantially lower prevalence rate in these previous studies might lead to the previously estimated expenditures having been underestimated.

Our results indicated that being a hypertensive adult is associated with an increase in both the probability of spending for prescribed medications and the amount spent among adults having such expenditure. After controlling for many potential confounders, we found that people with hypertension were over 6 times as likely as normotensive persons to have expenditures for prescribed medications. Consistent with the literature, women were more likely to incur such expenditures and they had higher drug expenditures than did men.[27] As expected, age increased the probability of having medication expenditures in both hypertensive perons and those without this problem. However, in people with hypertension, the increase was larger, with an OR of 3.00 for those aged 45–64 and 5.95 for those aged ≥65 when the 18–44 category was the referent vs. ORs of just 1.15 and 1.45, respectively, among normotensive individuals. Also as expected, non-Hispanic whites had higher probability of having medication expenditure and the amount spent by those with such expenditure than non-Hispanic blacks.

As expected, being uninsured was negatively associated with having drug expenditures as well as the expenditure level of this group. That being part of a larger family was associated with a lesser probability of having a medication expenditure and a lower expenditure level might be explained by the necessity for many large families to closely budget their expenditures and thus reduce drug expenses. Poor or fair health status was associated with a greater likelihood of having medication expenditures and a higher level of such expenditures.

An unexpected major finding was that income levels were negatively related to the medication expenditures of the hypertensive population. Among those with some drug expenditures, people of low income spent >$2,500 on medications, whereas high-income persons spent an estimated $2,183. That people with low income spent more than those with a high income suggests that low-income persons might be at poor health status and have higher financial burden for medications.

This study found that the presence of hypertension was associated with an increase in all-cause medication expenditures by $68.4 billion. Previous studies had estimated an expenditure of $130.7 billion for hypertension as a risk factor for cardiovascular diseases, and medication expenditures constitutes about half of treatment expenditures for hypertension.[6,17,28] The high medication expenditures associated with hypertension presented in our study and, particularly, the probabilities of incurring medication expenditures shown for a various population groups should be useful to policy makers in proposing national approaches to hypertension prevention.

Our study had several notable strengths. First, the MEPS provided comprehensive information about health-care expenditures; these expenditures were based on payment rather than charge; and they were obtained by face-to-face interviews and confirmed from

health-care providers and insurance plans. In addition, the study used a nationally representative sample of US adults, and thus our results reflect the expenditure situation among the general population. Second, we used a plausible econometric model to capture the probability of incurring any expenditure and the levels of expenditures while being able to control for various sociodemographic variables. Many previous studies have applied such a model for analysis of medical expenditures, but few researchers have focused on the costs of medication. Finally, we used the Prescribed Medicine data file of the MEPS to identify potential hypertensive cases. Thus our estimate of prevalence was very comparable to that of the NHNES for 2005–2008 as well as the estimated prevalence for 2010 used by the American Heart Association.[4,6] The accurate estimate of prevalence should improve the estimate of medication expenditures in our analysis.

The strengths of this study notwithstanding, some limitations should be considered when interpreting our results. First, hypertension status was based on the MEPS question asking respondents whether a doctor or another health professional had told them on ≥2 different visits that they had hypertension or high blood pressure or a recording of the ICD-9 codes of 401–405 for prescribed medications among the respondents. Although we used the ICD-9 to identify potential hypertension cases, persons with hypertension who never had any physician visits could not be included. Thus, our estimates should be considered conservative. Second, this was a cross-sectional data analysis. We could not claim causal relationships between the medication expenditures and hypertension status. In addition, the medication expenditures associated with hypertension were the total all-cause medication expenditures, and we were unable to separate expenditures for treating hypertension from expenditures for comorbidities, complications, or even expenditures unrelated to hypertension. In fact, hypertension, a key risk factor for heart disease and stroke, should be associated with higher expenditures for medication than simply expenditures to treat the basic problem of high blood pressure.[17] Thus, our expenditure estimate should be interpreted as hypertension-associated expenditures rather than expenditures to treat hypertension per se.

Another concern is that underreporting or the presence of nondiagnosed problems might be considerable and lead to substantial underestimates of the expenditures of interest. Fourth, the MEPS was a nationally representative survey of the civilian noninstitutionalized population, but the elderly population suffers disproportionately from hypertension and hypertension-related complications but often resides in nursing homes or other institutions, which are out of reach of MEPS. Thus, our estimate of hypertension-associated expenditures should be interpreted as a conservative estimate. Finally, the data did not allow us to investigate the expenditures associated with prehypertension. The literature has shown that about 30% of adults aged ≥20 years have prehypertension, and prehypertension is associated with increased risk for major cardiovascular diseases across the age spectrum.[29–31] Thus, our study probably further underestimated the medication costs associated with hypertension.

Our study indicates that the presence of hypertension is associated with an increase in the all-cause medication expenditures substantially and differentially across various demographic groups. Further research on the factors influencing the increased expenditures,

such as comorbidities and hypertension-associated sequelae, is needed for developing hypertension interventions.

Acknowledgments

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Table 1

Characteristics of sample population aged ≥18 years by hypertension status, 2007 Medical Expenditure Panel Survey

Variable	Sample mean (SE)			
	Overall (n = 21,782)	Normotensive (n = 14,502)	Hypertensive (n = 7,108)	Mean (hypertensive) – mean (normotensive)
Sex				
Men, %	48.5 (0.3)	49.0 (0.4)	47.3 (0.6)	−1.6*
Women, %	51.5 (0.3)	51.0 (0.4)	52.7 (0.6)	1.6*
Age, years	46.1 (0.2)	39.8 (0.2)	59.3 (0.3)	19.5***
18–44, %	49.1 (0.6)	64.3 (0.6)	17.4 (0.6)	−46.9***
45–64, %	34.3 (0.5)	29.4 (0.5)	44.5 (0.8)	15.1***
≥65, %	16.6 (0.4)	6.3 (0.3)	38.2 (0.8)	31.8***
Race				
Non-Hispanic white, %	68.5 (0.8)	66.7 (0.9)	72.2 (0.9)	5.5***
Non-Hispanic black, %	11.4 (0.5)	10.4 (0.5)	13.5 (0.7)	3.1***
Non-Hispanic Asian, %	4.6 (0.3)	5.3 (0.4)	3.0 (0.3)	−2.4***
Hispanic, %	13.5 (0.6)	15.5 (0.7)	9.3 (0.5)	−6.3***
Other races, %	2.1 (0.2)	2.1 (0.2)	2.1 (0.3)	0.0
Marital status				
Currently married, %	54.6 (0.6)	52.9 (0.6)	58.1 (0.9)	5.2***
Currently nonmarried, %	45.4 (0.6)	47.1 (0.6)	41.9 (0.9)	−5.2***
Years of schooling, mean	12.9 (0.1)	13.0 (0.1)	12.7 (0.1)	−0.4***
Less than high school, %	16.6 (0.4)	16.2 (0.5)	17.5 (0.5)	1.2*
High school, but less than college, %	57.0 (0.5)	55.8 (0.7)	59.6 (0.7)	3.8***
College or higher, %	26.3 (0.6)	28.0 (0.7)	23.0 (0.7)	−5.0***
Region				
Northeast, %	18.7 (0.7)	18.5 (0.8)	19.3 (1.0)	0.9
Midwest, %	21.8 (0.7)	21.9 (0.8)	21.6 (0.8)	−0.3
South, %	36.5 (0.8)	35.5 (0.9)	38.6 (1.0)	3.1**
West, %	23.0 (0.7)	24.2 (0.8)	20.5 (0.9)	−3.7***
Residence in MSA, %	16.1 (0.9)	14.9 (0.9)	18.6 (1.7)	3.6***
Body mass index[a]	27.4 (0.1)	26.4 (0.1)	29.5 (0.1)	3.1***
Underweight, %	1.7 (0.1)	2.0 (0.2)	1.2 (0.2)	−0.8***
Normal weight, %	35.9 (0.5)	41.9 (0.6)	23.1 (0.7)	−18.9***
Overweight, %	34.8 (0.4)	35.0 (0.5)	34.5 (0.7)	−0.5
Obese, %	27.6 (0.4)	21.1 (0.5)	41.2 (0.7)	20.1***
Annual health-care expenditure, $	4,386.2 (101.0)	2,541.2 (87.2)	8,296.2 (246.3.8)	5,755.1***

	Sample mean (SE)			
Variable	**Overall (n = 21,782)**	**Normotensive (n = 14,502)**	**Hypertensive (n = 7,108)**	**Mean (hypertensive) – mean (normotensive)**
Annual medication expenditure, $	969.3 (22.9)	452.4 (18.3)	2,067.3 (48.2)	1,614.9***
Annual medication expenditure for those with expenditure >$0, $	1,453.2 (60.1)	831.9 (32.0)	2,222.3 (50.4)	1,390.3***
Proportion of persons with medication expenditure >$0, %	66.7 (0.5)	54.4 (0.6)	93.0 (0.4)	0.4***

A person was defined as being hypertensive if he/she had a diagnosis of high blood pressure or was taking drugs for that problem. The sum of hypertensive and normotensive adults does not equal the total population because the hypertension status of some respondents was missing.

Abbreviation: MSA, Metropolitan Statistical Area.

[a] Body mass index (BMI) derived by dividing weight (kg) by squared height (m^2). Underweight, BMI < 18.5; normal weight, BMI 18.5–24.9; overweight, BMI 25—29.9; obese, BMI ≥ 30.

* $P < 0.05$

** $P < 0.01$

*** $P < 0.001$.

Table 2

Odds ratios (95% confidence interval) of incurring expenditures for medications among adults aged 18 years or older, 2007 Medical Expenditure Panel Survey

Variable	Overall (n = 19,052)	Hypertensive (n = 6,096)	Normotensive (n = 11,853)
Age, years			
45–64	1.27*** (1.14–1.41)	3.00*** (2.23–4.02)	1.15* (1.03–1.29)
≥65	1.93*** (1.56–2.39)	5.95*** (3.79–9.34)	1.45*** (1.15–1.82)
18–44	Referent	Referent	Referent
Women	2.38*** (2.17–2.61)	2.91*** (2.25–3.76)	2.33*** (2.11–2.57)
Region			
Midwest	1.08 (0.93–1.26)	0.76 (0.50–1.16)	1.12 (0.94–1.33)
South	1.15 (1.00–1.32)	0.89 (0.60–1.33)	1.18* (1.01–1.38)
West	0.79** (0.68–0.91)	0.54** (0.34–0.86)	0.82* (0.70–0.97)
Northeast	Referent	Referent	Referent
Residence in MSA	0.99 (0.87–1.12)	0.92 (0.66–1.28)	0.99 (0.87–1.14)
Race			
Non-Hispanic black	0.55*** (0.49–0.62)	0.79 (0.60–1.04)	0.52*** (0.45–0.60)
Hispanic	0.57*** (0.50–0.65)	0.51*** (0.35–0.75)	0.58*** (0.51–0.67)
Non-Hispanic Asian	0.46*** (0.37–0.56)	0.68 (0.34–1.36)	0.44*** (0.35–0.55)
Other races	0.84 (0.64–1.10)	1.14 (0.45–2.86)	0.82 (0.62–1.09)
Non-Hispanic white	Referent	Referent	Referent
Currently unmarried	0.77*** (0.69–0.86)	0.68** (0.50–0.90)	0.77*** (0.68–0.86)
Family size, No. of persons	0.88*** (0.85–0.91)	0.87** (0.79–0.96)	0.88*** (0.85–0.91)
Obese, body mass index ≥ 30	1.21** (1.07–1.37)	1.44** (1.12–1.85)	1.19** (1.04–1.37)
With hypertension	6.42*** (5.52–7.47)	—	—
Current smoker	0.81*** (0.72–0.91)	0.64** (0.48–0.84)	0.86* (0.75–0.98)
Uninsured during all of 2007	0.33*** (0.29–0.37)	0.26*** (0.19–0.36)	0.34*** (0.30–0.39)
Health status			
Excellent	0.22*** (0.18–0.27)	0.25*** (0.17–0.38)	0.21*** (0.17–0.26)
Very good	0.32*** (0.27–0.39)	0.41*** (0.28–0.60)	0.30*** (0.24–0.36)
Good	0.52*** (0.43–0.62)	0.73 (0.52–1.01)	0.46*** (0.37–0.58)
Poor/Fair	Referent	Referent	Referent
Education			
High school, but less than college	1.11 (0.98–1.25)	1.20 (0.83–1.72)	1.11 (0.97–1.26)
College or higher	1.26** (1.07–1.47)	1.36 (0.92–2.01)	1.28** (1.08–1.50)
Less than high school	Referent	Referent	Referent

A person was defined as being hypertensive if he/she had a diagnosis of high blood pressure or was taking drugs for that problem. Abbreviation: MSA, Metropolitan Statistical Area.

* $P < 0.05$

** $P < 0.01$

*** $P < 0.001$.

Table 3

Generalized linear model estimates of regression coefficients for medication expenditures among adults aged ≥18 years, 2007 Medical Expenditure Panel Survey

Variable	Overall (n = 11,925)	Hypertensive (n = 5,650)	Normotensive (n = 6,275)
Age, years			
45–64	0.59***	0.46***	0.66***
≥65	0.68***	0.61***	0.67***
18–44	Referent	Referent	Referent
Women	0.15***	0.11**	0.20**
Region			
Midwest	0.01	0.10	−0.08
South	−0.08	0.03	−0.18
West	−0.08	−0.06	−0.13
Northeast	Referent	Referent	Referent
Residence in MSA	−0.05	−0.08	−0.03
Race			
Non-Hispanic black	−0.17*	−0.15*	−0.17
Hispanic	−0.34***	−0.17*	−0.46***
Non-Hispanic Asian	−0.27	−0.18	−0.31
Other races	0.09	0.10	0.11
Non-Hispanic white	Referent	Referent	Referent
Currently unmarried	0.01	−0.04	0.05
Family size, No. of persons	−0.07***	−0.09***	−0.06*
Obese, body mass index ≥ 30	0.11*	0.17***	0.07
High blood pressure diagnosis	0.49***	—	—
Currently smoking	−0.04	−0.02	−0.07
Uninsured during all of 2007	−0.59***	−0.67***	−0.56***
Health status			
Excellent	−1.22***	−1.02***	−1.43***
Very good	−0.94***	−0.81***	−1.13***
Good	−0.54***	−0.44***	−0.71***
Poor/Fair	Referent	Referent	Referent
Education			
High school, but less than college	−0.02	−0.05	0.01
College or higher	0.10	0.07	0.12
Less than high school	Referent	Referent	Referent
Constant	7.37***	7.85***	7.50***

A person was defined as being hypertensive if he/she had a diagnosis of high blood pressure or was taking drugs for that problem. Abbreviation: MSA, Metropolitan Statistical Area.

* $P < 0.05$

** $P < 0.01$

*** $P < 0.001$.

Table 4

Predicted probabilities of incurring and amount of medication expenditures by hypertension status

	Predicted probability of incurring any expenditures for medication		Predicted per capita expenditures for medications of those incurring any such expenditures, $ (conditional)		Predicted per capita expenditures for medications for the total population, $ (unconditional)	
Variable	**Normotensive**	**Hypertensive**	**Normotensive**	**Hypertensive**	**Normotensive**	**Hypertensive**
Total adults aged ≥18 years	0.56	0.93	827.46	2,337.29	464.04	2,166.13
Age						
18–44	0.50	0.88	565.74	1,217.27	284.50	1,045.43
45–64	0.63	0.93	1,143.45	2,302.61	719.71	2,136.02
≥65	0.77	0.96	1,416.78	2,807.97	1,076.69	2,720.19
Men	0.45	0.9	765.67	2,122.97	339.84	1,897.76
Women	0.66	0.96	867.00	2,518.83	580.84	2,409.62
Family income						
Low income	0.49	0.93	845.86	2,539.98	429.96	2,351.29
Near poor or low income	0.50	0.93	828.61	2,601.16	414.85	2,394.37
Middle income	0.54	0.93	794.40	2,308.33	433.49	2,131.29
High income	0.6	0.93	844.05	2,183.25	512.74	2,034.05
Nonobese, body mass index < 30	0.55	0.93	796.10	2,221.40	437.69	2,045.85
Obese, body mass index ≥ 30	0.60	0.94	930.43	2,496.90	558.72	2,334.40
Uninsured during all of 2007	0.30	0.81	455.18	1,209.96	136.60	970.27
Insured, at least for some part of 2007	0.61	0.94	869.41	2,412.67	536.84	2,266.62

A person was defined as being hypertensive if he/she had a diagnosis of high blood pressure or was taking drugs for that problem.