



# Among Low-Income Respondents With Diabetes, High-Deductible Versus No-Deductible Insurance Sharply Reduces Medical Service Use

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## OBJECTIVE

To contrast the effect of private insurance and deductibles (by size) on medical service use, health status, and medical debt for adult respondents with diabetes with low and high incomes.

## RESEARCH DESIGN AND METHODS

Using the 2011–2013 Medical Expenditure Panel Survey, bivariate and regression analyses were conducted to compare demographic characteristics, medical service use, diabetes care, and health status among privately insured adult respondents with diabetes, aged 18–64 years ( $N = 1,461$ ) by lower (<200% of the federal poverty level) and higher ( $\geq 200\%$  of the federal poverty level) income and deductible vs. no deductible (ND), low deductible (\$1,000/\$2,400) (LD), and high deductible ( $> \$1,000/\$2,400$ ) (HD). The National Health Interview Survey 2012–2014 was used to analyze differences in medical debt and delayed/avoided needed care among adult respondents with diabetes ( $n = 4,058$ ) by income.

## RESULTS

Compared with privately insured respondents with diabetes with ND, privately insured lower-income respondents with diabetes with an LD report significant decreases in service use for primary care, checkups, and specialty visits (27%, 39%, and 77% lower, respectively), and respondents with an HD decrease use by 42%, 65%, and 86%, respectively. Higher-income respondents with an LD report significant decreases in specialty (28%) and emergency department (37%) visits. Diabetes care measures are similar by income and insurance; there were no changes in physical health status. Medical debt is similar by income, but deferred service use is two times greater for those indebted and with lower income.

## CONCLUSIONS

Private insurance with a deductible substantially and problematically reduces medical service use for lower-income insured respondents with diabetes who have an HD; these patients are more likely to report forgoing needed medical services.

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Most patients with diabetes require continued medical care and treatment. However, private health insurance with high-deductible health plans (HDHPs) discourages medical care use (1–3). It is the explicit intent of HDHPs to reduce the unnecessary service use alleged to occur as a result of the moral hazard of insurance, which reduces out-of-pocket costs of care (4). Chronically ill patients of lower and middle income status and insured by an HDHP are most likely to reduce care with such plans (5).

The proportion of those privately insured with HDHPs for single coverage has steadily increased, accounting for 46% of those with employer-sponsored insurance in 2015 compared with 10% in 2006 (6). Deductible size has increased as well. From 2006 to 2015, the average deductible under employer-based insurance plans with a deductible increased from \$584 to \$1,318 (6). Patients with HDHPs have fewer checkup, primary care, emergency department (ED), and physician visits compared with those with no deductibles (2,7). The effect is greatest for low-income patients (8–10). Chronically ill patients with an HDHP also both have fewer physician visits and use fewer medications (11,12).

For chronically ill patients, reduced service use could be deleterious. A RAND study showed that 1) individuals with hypertension covered under HDHPs had poorer blood pressure control than patients with no out-of-pocket costs, and 2) physician use was reduced by one-third, with low-income patients most affected (9,13).

Like hypertension, diabetes is a treatable chronic disease that is more prevalent among those with low incomes (14). Diabetes afflicts 28.9 million adults in the United States (15). From 1980–2014, the prevalence of diabetes among adults increased from 3.5% to 9.1%, and nearly 86 million Americans above the age of 20 years had prediabetes (15,16). Diabetes treatment reduces complications that are costly to treat and that can cause disability and death (17–19). Haviland et al. (7) found that regardless of income, patients with diabetes who have HDHPs experienced small decreases in appropriate diabetes care.

Low-income patients with diabetes are most likely to have diabetic complications and higher mortality (20,21). Moreover, among patients with diabetes, low-income patients, blacks, and Hispanics are associated with higher complication

rates than others (20). These low-income patients—patients with an income <200% of the federal poverty level (FPL)—have been most affected by health care inflation, which is making insurance less affordable. Further, in contrast to those with a higher income, those with incomes less than 200% of the FPL, who constitute 33% of the population, experienced a decrease in real income from 2007 to 2014 (22); thus, their health care costs account for an increasing proportion of their decreasing incomes.

Along with decreasing real incomes, the mandate to purchase insurance makes HDHPs an attractive option for low-income patients because of their relatively low premiums. With average family premiums for employer-based insurance increasing (from \$6,438 in 2000 to \$17,545 in 2015), insurers often offer a lower-premium HDHP option with narrower provider networks (6).

In addition to premiums, HDHPs have out-of-pocket costs for deductibles, coinsurance, or copayments when obtaining services, medications, or tests. For many patients with diabetes, the major out-of-pocket cost is the rapidly inflating costs of diabetes medications. From 2010 to 2015, the cost of popular brand-name diabetes drugs more than doubled, and still, no generic insulin is available (23). Not surprisingly, medical debt among insured patients is most common for those with a low income, and medical debt itself is a deterrent to medical service use (24).

In this study we explore the impact of HDHPs, based on deductible size and income, on a nationally representative population of privately insured respondents with diabetes aged 18–64 years. We hypothesize that no differences in medical service use exist among privately insured patients with diabetes by deductible size, insurance type, or income, nor are there differences in diabetes care or health status.

## RESEARCH DESIGN AND METHODS

### Data Source and Study Sample

We conducted a secondary data analysis using 2011–2013 Medical Expenditure Panel Survey (MEPS) data. These data are collected from a civilian, noninstitutionalized U.S. population, with oversampling of Hispanics, blacks, and Asians. In addition to oversampling, Diabetic Care Survey (DCS) sampling weights adjusted for poststratification, clustering, and complex sample

design were used. The analysis was restricted to privately insured enrollees with diabetes, who were asked questions about annual deductibles. Of the 67,024 adults (18–64 years old) in the pooled data, 4,837 reported diabetes. Of these, 1,735 had valid data regarding annual deductibles. We excluded respondents with missing values for 12-item Short Form (SF-12) scores ( $n = 82$ ) and education ( $n = 5$ ). Restricting the sample to privately insured adults with diabetes yielded 1,605 respondents. After adjusting for DCS weights and MEPS survey design variables, our final sample contained 1,461 privately insured adults with diabetes. We categorized the survey sample into two income groups: 1) lower income (<200% of the FPL) and 2) higher income ( $\geq 200\%$  of the FPL). Within groups, we further divided the individuals into three categories based on annual deductible status: 1) no annual deductible (ND), 2) low deductible (LD; <\$1,200 per person/<\$2,400 per family), and 3) high deductible (HD;  $\geq \$1,200$  per person/ $\geq \$2,400$  per family). Those with a health savings account are included in the HD category. In addition, the National Health Interview Survey (NHIS; 2012–2014) was used to examine the presence and effect of medical debt on obtaining needed care among privately insured adults with diabetes with HDHPs, by income category.

## Measures

### Demographic and Health Status

The measures analyzed were age, sex, census region, race/ethnicity, education, and income. For health status, we initially used respondent SF-12 scores (Self-Administered Questionnaire [SAQ]) as physical and mental health measures, and change in physical health measurement at the beginning and end of the 2-year survey period. MEPS SAQ is a paper-and-pencil questionnaire administered to noninstitutionalized and civilian U.S. adults (18 years and older) in English/Spanish. SF-12 version (2) (r) is included as part of the SAQ and includes 12 questions related to physical and physical health status. The scores on these questions are summarized as Physical Component scores and Mental Component scores based on a standard algorithm (25).

### Medical Services

Medical service use included the number of primary care, office, checkup, ED, and hospital visits in a year.

**Diabetes Care**

The number of HbA<sub>1c</sub> tests, feet tests, dilated eye exams, cholesterol tests, flu vaccinations, and diet modifications in a year, as recommended in the American Diabetes Association’s (ADA’s) *Standards of Medical Care in Diabetes—2015*, were used (26). These services, however, may not have been done to ADA-recommended visit specifications.

**Medical Debt**

NHIS data on 1) paying medical bills over time, 2) problems paying medical bills, and 3) inability to pay medical bills were combined to measure medical debt.

**Delayed or Avoided Medical Care**

We combined delayed and avoided necessary care to identify needed care.

**Analysis**

We analyzed the data using Stata 13.1 statistical software, computed descriptive statistics, and reported the number and percentage of the respondents in the

sample (27). To compare demographic differences across deductible categories, we performed bivariate analysis using the  $\chi^2$  test for categorical variables and ANOVA for continuous variables. Using ND as the reference category, we compared the dissimilarities in service use and diabetes care measures for respondents with diabetes across the income groups.

Using NHIS, we computed an average of six prevalent treatable adult chronic diseases based on the study’s lower- and higher-income categories. For those responding “yes” to medical debt questions in the NHIS (paying medical bills over time, problems paying medical bills, and inability to pay medical bills), we conducted a bivariate analysis of delaying or avoiding needed care.

We performed multivariate analysis of medical service and diabetes care measures. For count data (number of primary care visits, office visits, checkups, and

HbA<sub>1c</sub> tests), we estimated Poisson regression models and logistic regression for dichotomous variables. We reported incidence rate ratios (IRRs) and odds ratios (ORs). If the IRR for primary care visits is 0.74 in the LD group compared with the ND group, then, holding other variables constant, the expected reduction in the number of primary care visits by LD respondents is 26% compared with the expected visits for respondents in the ND group.

To obtain valid national estimates for adults with diabetes, we adjusted our analysis for the complex MEPS survey design, using survey commands in Stata and sampling weights for respondents with diabetes derived from the DCS.

**RESULTS**

**Bivariate Analysis**

**Insurance and Demographic Measures**

Of the 1,461 eligible respondents, 17% had a lower income and 83% had a higher

**Table 1—Distribution of demographic characteristics of adults >18–64 years old with a diabetes diagnosis and an annual deductible**

	All (N = 1,461)		ND (n = 448)		LD (n = 670)		HD (n = 343)		P value*
	n	%	n	%	n	%	n	%	
<b>Sex</b>									
Male									
Female	763	47.9	224	44.1	359	50.1	180	47.7	0.489
<b>Age (years)</b>									
18–29	28	1.9	5	1.2	11	1.4	12	3.4	0.308
30–44	281	19.0	77	20.1	145	21.2	59	14.0	0.055
45–64	1,152	79.1	366	78.8	514	77.3	272	82.6	0.277
<b>Education</b>									
<12 years	153	6.7	58	9.1	65	5.9	30	6.0	0.322
Completed 12 years	471	30.8	139	29.0	226	33.8	106	27.2	0.277
>12 years	837	62.4	251	61.9	379	60.3	207	66.8	0.354
<b>Race/Ethnicity</b>									
Non-Hispanic white	683	68.0	153	55.8	327	69.7	203	76.8	<0.001
Non-Hispanic black	359	14.1	126	18.9	172	14.0	61	9.4	0.001
Non-Hispanic other	145	7.3	71	11.1	43	5.6	31	6.5	0.092
Hispanic	274	10.7	98	14.2	128	10.7	48	7.2	0.004
<b>Region</b>									
South	620	44.1	154	38.5	312	46.8	154	44.8	0.229
Northeast	197	13.1	76	17.5	86	12.9	35	9.2	0.161
Midwest	315	24.5	60	15.0	152	24.8	103	33.4	<0.001
West	329	18.3	158	29.0	120	15.5	51	12.7	0.002
<b>Income (% FPL)</b>									
<99	52	2.8	22	3.5	17	1.9	13	4.0	0.369
100–124	28	0.8	6	0.4	19	1.4	3	0.2	0.004
125–199	167	9.4	45	6.2	82	10.8	40	10.0	0.059
200–399	561	34.2	178	35.5	261	35.1	122	31.3	0.577
>400	653	52.7	197	54.4	291	50.8	165	54.5	0.537
Private insurance coverage	1,461	100.0	448	30.7	670	45.9	343	23.4	0.161
Physical Component score	45.8		46.2		45.8		45.6		0.870

Data from the MEPS 2011–2013. Please see Supplementary Table 1 for the distribution of demographic characteristics by low income and annual deductible. \* $\chi^2$  test of significance for categorical variables and ANOVA for continuous variables across annual deductible categories.

income. In the lower-income group, 29% had ND, 49% had an LD, and 22% had an HD; in the higher-income group, 31% had ND, 45% had an LD, and 24% had an HD (Table 1). Among respondents across deductible categories, we found statistically significant differences by race and region. Over three-quarters of the respondents in the HD group were white (76.8%). In the lower-income group, other races (15.1%) and Hispanics (32.4%) were significantly more likely to have ND. In the higher-income group, blacks and Hispanics were more likely to have insurance with ND (18.9% and 14.2%, respectively).

#### Medical Service Use

Lower-income respondents with an HD report significantly fewer checkup and specialty visits when compared with respondents with ND (1.3 vs. 2.5 and 3.3 vs. 7.0, respectively) (Table 2). Among those with a higher income, respondents with an LD had significantly fewer specialty visits (2.9 vs. 3.7). There were no significant differences in ED visits or hospital stays by income.

#### Diabetes Care Measures

No statistically significant differences were observed among the diabetes care measures by insurance category and income when compared with the ND group. However, except for diet modification, a higher percentage of respondents with a higher income reported having feet exams, eye exams, cholesterol tests, and flu vaccinations (Supplementary Table 2). Lower-income patients reported a larger mean number of HbA<sub>1c</sub> tests.

#### Chronic Conditions

In the NHIS, the average number of chronic conditions per person was 2.5 for lower-income groups compared with 2.1 in the higher-income groups ( $P < 0.001$ ), but there was no income difference across MEPS study groups.

#### Percentage Who Delay/Avoid Care

Lower-income adult respondents with diabetes who have an HD and medical debt were more likely to delay or avoid needed care compared with those with a higher income (53.0% vs. 28.3%;  $P = 0.007$ ).

#### Regression Analysis

After adjusting for covariates, respondents with diabetes with a lower income and an LD or HD had significantly fewer primary care, checkup, and specialty visits when compared with the ND group. Respondents with diabetes with an HD had significantly fewer primary care, checkup, and specialty visits compared with those with ND (primary care: OR 0.576, 95% CI 0.40–0.83; checkup: OR 0.346, 95% CI 0.20–0.61; specialty visits: OR 0.144, 95% CI 0.05–0.45) (Fig. 1). In comparison, respondents with an HD in the higher-income group reported more primary care visits compared with respondents with ND (OR 1.26; 95% CI 0.89–1.29) (Fig. 1). Among higher-income respondents, those with an LD had fewer ED visits than other deductible categories (OR 0.63; 95% CI 0.41–0.95) (Fig. 2). In both the lower- and higher-income groups, regression models for diabetes care measures and changes in physical health scores did not show statistically significant differences by insurance categories (Supplementary Tables 3 and 4).

#### CONCLUSIONS

This is, to our knowledge, the first study about the effect and outcomes of HDHPs, by deductible size and income, for a single chronic disease—in this case, diabetes. Although those with low incomes (<200% of the FPL) constitute 33% of the population and are known to have higher rates of chronic disease, lower-income respondents with diabetes in our study had rates of other chronic conditions similar to those of higher income respondents. Only 17% of our insured respondents with diabetes had a lower income; many low-income patients are either on Medicaid or uninsured.

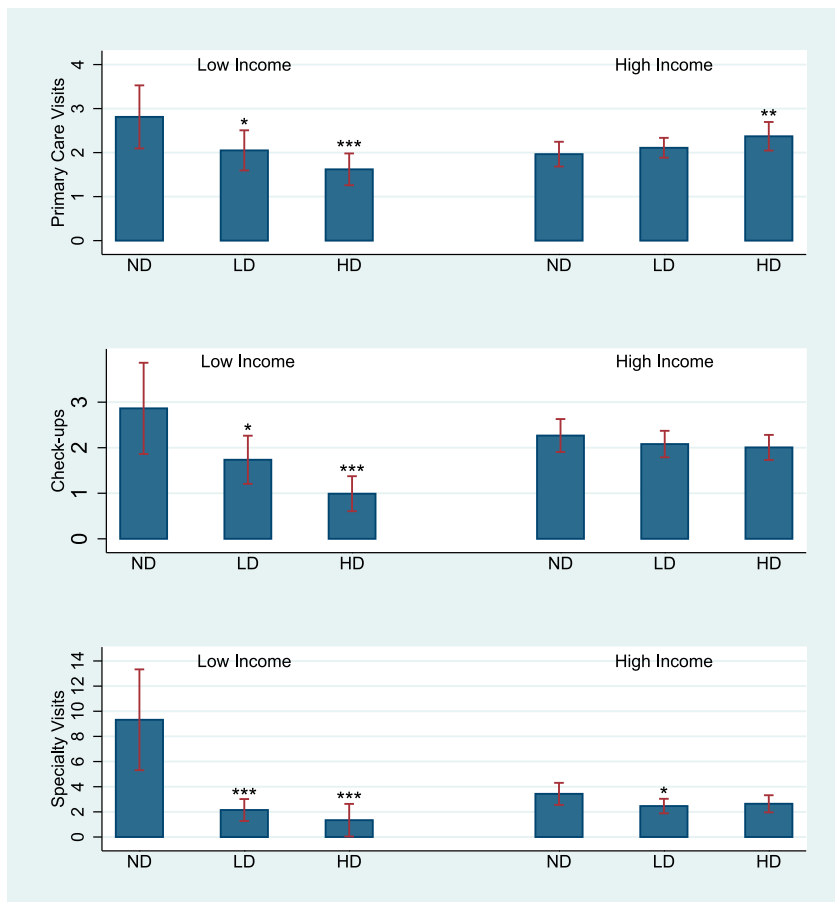
Diabetes care costs are substantial, even for those who are insured. Per capita spending for privately insured patients with diabetes who have employer-sponsored insurance is \$16,021, with average per capita out-of-pocket costs amounting to \$1,944 (28). HDHPs require out-of-pocket payments for office visits, medications, tests, ED visits, or hospitalizations; in addition, there is a risk of balance billing for out-of-network care. Some employers offer HDHPs through which the deductible for primary care and medications, but not for specialty care, is exempt. Other HDHPs limit out-of-pocket expenditures (6). Still, HDHPs require substantial out-of-pocket costs for deductibles and payments for many visits, treatments, testing, and other care (29). Many privately insured low-income patients are underinsured relative to their income, which may further discourage use of care (30).

Lower-income insured respondents with ND used each ambulatory and hospital

**Table 2—Diabetic service use by income and annual deductible categories**

	ND	LD (<\$1,200 per person/ <\$2,400 per family of four)	HD (≥\$1,200 per person/ ≥\$2,400 per family of four)	P value*	
				p1	p2
<b>Lower income (&lt;200% FPL) (n = 247)</b>					
Primary care visits	2.4 (0.30)	2.3 (0.32)	1.8 (0.25)	0.654	0.060
Checkups	2.5 (0.50)	2.3 (0.42)	1.3 (0.17)	0.723	0.025
Specialist visits	7.0 (3.14)	3.4 (0.69)	3.3 (1.22)	0.042	0.112
ED visits, n (%)	20 (22.0)	34 (35.0)	15 (16.0)	0.178	0.551
Hospital stays, n (%)	12 (14.0)	21 (14.0)	7 (7.3)	0.903	0.324
<b>Higher income (≥200% FPL) (n = 1,214)</b>					
Primary care visits	2.0 (0.15)	2.2 (0.12)	2.4 (0.17)	0.354	0.046
Checkups	2.3 (0.21)	2.2 (0.17)	2.2 (0.17)	0.760	0.471
Specialist visits	3.7 (0.47)	2.9 (0.38)	3.2 (0.39)	0.054	0.298
ED visits, n (%)	67 (20.0)	89 (14.0)	46 (15.0)	0.057	0.208
Hospital stays, n (%)	31 (9.9)	47 (10.1)	33 (11.2)	0.946	0.644

Data are mean (SE) unless otherwise indicated. \* $\chi^2$  test of significance for categorical variables and ANOVA for continuous variables; p1, ND vs. LD; p2, ND vs. HD.



**Figure 1**—Adjusted numbers of visits among adults (<65 years) with diabetes by annual deductible, income, and type of medical service. ND is the reference category. \* $P < 0.1$ ; \*\* $P < 0.05$ ; \*\*\* $P < 0.01$ . See Supplementary Tables 3 and 4 for details.

service more than did those with a higher income, though none were used significantly more (Figs. 1 and 2). The reduction in ambulatory visits made by lower-income respondents with ND compared with lower-income respondents with an LD or HD is far greater than for higher-income patients. The reductions are striking for lower-income respondents with an HD: 42% fewer primary care visits, 65% fewer checkups, and 86% fewer specialty visits. The only significant reduction in visits for those by the LD group is 28% for specialty visits by higher-income patients when compared to ND. Higher-income enrollees with an HD plan significantly increased primary care visits by 21%. This increased service use is because health savings accounts are more common among those with higher incomes, many of whom have medical savings to pay out-of-pocket costs.

The substantial reduction in checkup (preventive) and specialty visits by those

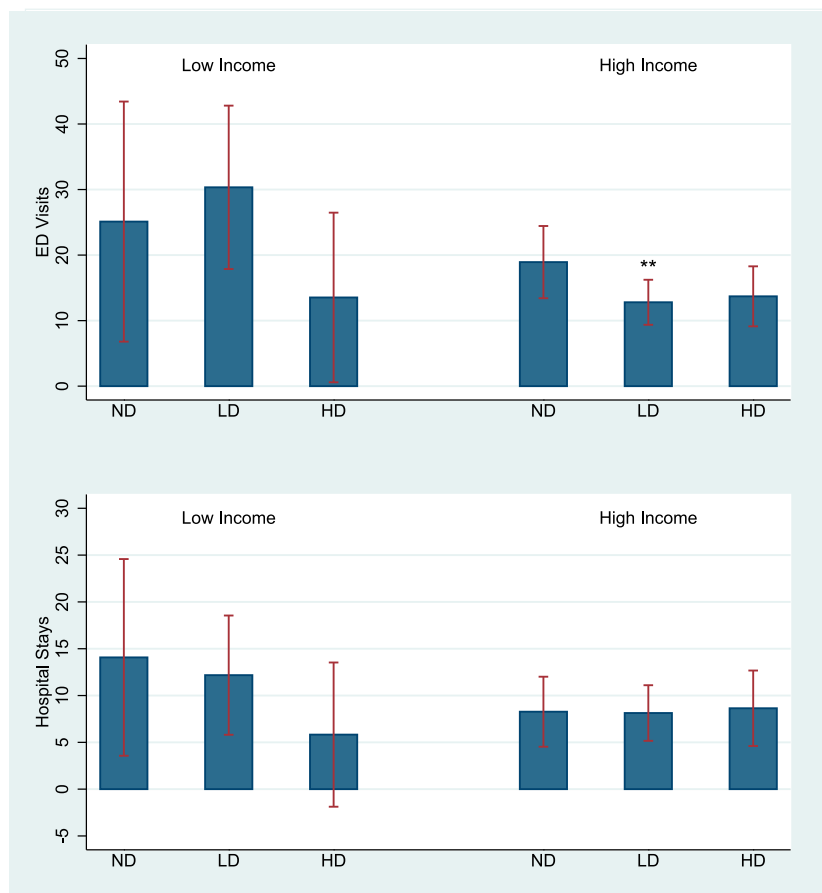
with a lower income who have an HDHP implies a very different pattern of service use compared with lower-income respondents who have ND and with higher-income respondents. Though preventive visits require no out-of-pocket costs, reduced preventive service use with HDHPs is well established and might be the result of patients being unaware of this benefit or their concern about findings that could lead to additional expenses (31). Such sharply reduced service use by low-income respondents with diabetes may not be desirable. Patients with diabetes benefit from assessment of diabetes control, encouragement and reinforcement of behavior change and medication use, and early detection and treatment of diabetes complications or concomitant disease.

Because visits by lower-income patients with diabetes who have an HD are so few, it is incumbent on clinicians to use their visits to fully assess diabetes

status and reinforce recommendations for behavior change and adherence to medication. The benefits of preventive visits should be stressed. Our NHIS analysis shows that lower-income patients with diabetes were more likely to have medical debt, and those with medical debt were 2.5 times more likely to delay or avoid care compared with those without debt. Knowing many with a lower income have difficulty affording medications, physicians should consider prescribing cheaper drugs and referring to sources of free or reduced-cost medications. Others researchers have shown that 53% of those with a low income report unaffordable health care costs, and 51% cannot afford their deductible (32).

Despite the substantial reduction in office-based visits by lower-income patients with diabetes who have an HDHP, no deleterious effects of reduced care were apparent during the reporting period in either measures of diabetes care or physical health status by insurance type or income group. Perhaps the reporting time was too brief to realize changes in diabetes status and care. A longer follow-up, more detailed evaluation of changes in disease status, and confirmation of our findings are desirable to ascertain whether reduced visits are pervasive or associated with adverse outcomes.

Having any health insurance is more desirable than having no insurance (33). Mandating insurance that thereby reduces preventive care, nearly eliminating specialty care and predisposing some patients to medical debt, is problematic. Full implementation of the Affordable Care Act's health exchanges, which provide income-related private insurance subsidies, was projected to increase the number of low-income, privately insured patients with diabetes who have very high deductibles. Myerson and Laiteerapong (34) estimate that 2.3 million of the 4.6 million patients with undetected diabetes, most of whom were previously uninsured, could be detected through the implementation of the Affordable Care Act. In 2015, the average deductible for plans selected by more than 85% of newly insured enrollees was in excess of \$2,500 (35). Premiums are a recurring annual cost—\$23,540 for single coverage or \$48,500 for a family of four in 2015 (36). Although low-income health exchange enrollees have an income-related



**Figure 2**—Adjusted percentages of ED visits and hospital stays among adults (<65 years) with diabetes by annual deductible and income. ND is the reference category. \*\* $P < 0.05$ . See Supplementary Tables 3 and 4 for details.

out-of-pocket expenditure cap, enrollees with diabetes are at risk for spending to this cap and accruing medical debt.

As of early 2016, 12.7 million Americans were insured through the exchanges (37). An additional 8% of all nonelderly adults, some receiving insurance through employer-sponsored health exchange insurance, are also now insured (38,39). Most newly insured patients with diabetes in the health exchanges select HDHPs. Some have unmet medical needs in addition to diabetes. Undertreated diabetes may occur under HDHPs in the form of deferred necessary visits and reduced medication use, potentially predisposing patients to costly medical consequences of amputations, kidney failure, blindness, and cardiac disease.

While the medical consequences of fewer visits are uncertain and adverse consequences are yet to be shown, the fiscal consequences of medical debt associated with HDHPs for low-income patients with

diabetes are more certain. Not only is their fiscal well-being compromised by premiums, deductibles, and out-of-pocket costs, but patients' family members also forgo medical care. Policy changes to encourage value-based insurance without copayments for disease-related medications or ambulatory care, or income-related cost-sharing for care related to treatable chronic diseases such as diabetes should be implemented. Without such modifications, HDHPs for low-income patients with diabetes is problematic mandated insurance.

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**Author Contributions.** D.L.R. designed the concept, wrote the manuscript, and researched data. A.J. analyzed the data, interpreted results,

and wrote the RESEARCH DESIGN AND METHODS and RESULTS sections of the manuscript. S.P. designed the study, reviewed and interpreted the results, and reviewed and edited the manuscript. Z.S. and A.F. reviewed the literature, included references, and reviewed and edited the manuscript. D.L.R. is the guarantor of this work and, as such, had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

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