

Effects of High-Deductible Health Plans on Enrollees With Mental Health Conditions With and Without Substance Use Disorders

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Objective: High-deductible health plans (HDHPs) are increasingly common in the U.S. health insurance market and are intended to reduce the use of low-value services, but evidence suggests that HDHP enrollees also reduce the use of high-value services. This study examined the effects of HDHPs on enrollees with mental health conditions, a population with high levels of unmet treatment need, often because of financial barriers. Enrollees with a co-occurring substance use disorder have greater treatment needs and unique barriers to care, perhaps changing their response to an HDHP.

Methods: Commercial health insurance claims data in a difference-in-differences design was used to evaluate the effect of an employer's offer of an HDHP on 6,627,128 enrollee-years among enrollees with mental health conditions, stratified by having a co-occurring substance use disorder or not.

Results: Among enrollees without a co-occurring substance use disorder, an HDHP offer was associated with a 4.8% (95% confidence interval [CI]=2.4%–7.2%) reduction in overall spending on mental health care, despite an 11.3% (95% CI=1.0%–21.6%) increase in spending on mental health-related emergency department visits. Among enrollees with a co-occurring substance use disorder, no significant changes attributable to an HDHP offer were found in most categories of spending on combined mental health and substance use disorder care, apart from a 4.5% (95% CI=1.9%–7.2%) reduction in spending on psychotropic medications.

Conclusions: HDHPs may reduce use of necessary care among enrollees with mental health conditions, which could exacerbate undertreatment in this population and result in adverse health outcomes.

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In 2018, an estimated 19% of U.S. adults reported having a mental health condition in the past year (1). Among them, an estimated 19% also had a substance use disorder (1). The population with mental health conditions and a co-occurring substance use disorder grew by 12% from 2014 to 2018 and tends to include those with more severe mental health conditions and general medical comorbid conditions (1, 2). Mental health conditions and substance use disorders can be effectively managed as chronic conditions, but care is often underutilized and poorly integrated with the broader health care system (3). Only 43% of adults with a mental health condition and 51% of adults with both a mental health condition and a substance use disorder report receiving treatment for either their mental health condition or substance use disorder within a year, and financial barriers are a primary factor contributing to foregone care (1, 4, 5).

High-deductible health plans (HDHPs) comprise an increasing proportion of the employer-sponsored health

insurance market (6). In 2019, nearly 30% of Americans in this market were enrolled in an HDHP, with deductibles in

HIGHLIGHTS

- An employer-offered high-deductible health plan (HDHP) was associated with a 4.8% reduction in spending on mental health care among enrollees with mental health conditions.
- An employer-offered HDHP was associated with a 1.9% reduction in spending on non-mental health care among enrollees with mental health conditions.
- Among enrollees with a mental health condition and a co-occurring substance use disorder, an employer-offered HDHP was associated with a decrease in spending on psychotropic medications but not on medications to treat substance use disorder.

these plans averaging \$2,476 (6). HDHPs are intended to motivate enrollees to control costs by avoiding low-value health care, but enrollees have been shown to cut care indiscriminately (7). For those with chronic conditions, such as mental health conditions, skipping or delaying necessary care could lead to negative health consequences (8–10).

Among commercial health plan enrollees with mental health conditions or substance use disorders, those enrolled in HDHPs tend to have higher out-of-pocket spending on health care costs annually but lower total health care expenditures, compared with non-HDHP enrollees (11–13). Among persons with bipolar disorder, one study found that enrollment in HDHPs was associated with a significant reduction in nonpsychiatrist outpatient mental health visits but not with reductions in psychiatrist visits, medications, hospitalizations, or emergency department care (14). HDHPs might differentially affect those with both a mental health condition and a substance use disorder. Among those with a mental health condition, those with a co-occurring substance use disorder more frequently indicate that their mental health condition interferes with daily activities, and they are more likely than those without a co-occurring substance use disorder to have other conditions requiring medical care, such as heart disease, respiratory disorders, and gastrointestinal disorders (1, 2, 15, 16). Those with co-occurring substance use disorders face unique barriers to accessing care and more often require higher levels of intensive care, such as inpatient and emergency services, that might be less sensitive to cost-sharing (5, 17, 18). The severity and multitude of conditions, the types of care received, and existing barriers to care associated with substance use disorders may contribute to differences in how enrollees with mental health conditions respond to HDHPs.

We would expect treatment to decrease among all enrollees with mental health conditions in response to HDHPs. We explored whether enrollees with a co-occurring substance use disorder differ in their response to an HDHP, compared with those with mental health conditions alone. Given their higher care needs and the likelihood of meeting their deductible earlier in the year, enrollees with a co-occurring substance use disorder may decrease utilization to a lesser extent than those with mental health conditions alone. On the other hand, the financial barriers associated with high deductibles combined with existing barriers to treatment may lead enrollees with a co-occurring substance use disorder to reduce their care to a greater extent, compared with those without a co-occurring substance use disorder.

The limited research on the implications of HDHPs for populations with mental health conditions points to potential reductions in service use and heightened financial burden for these populations (11, 14, 19). We built on this literature with a quasi-experimental evaluation of the effect of HDHPs on commercial health insurance enrollees in the United States with a broad range of mental health conditions and explored the extent to which effects differ among those with a co-occurring substance use disorder.

METHODS

In this study, we conducted a difference-in-differences analysis examining the effect of a firm's decision to offer an HDHP to its enrollees on health care spending and utilization among enrollees with mental health conditions, stratified by whether the enrollee had a co-occurring substance use disorder. This study was approved by the Johns Hopkins University Institutional Review Board.

Study Data

We used deidentified employer-sponsored commercial health insurance claims and detailed benefit design data from the OptumLabs Data Warehouse from 2007 to 2017 to analyze enrollee health care spending (20). Insurance claims included enrollee and health plan spending for inpatient, outpatient, and pharmacy services for enrollees in plans with medical, pharmacy, and mental health coverage. Benefit design data included in-network medical deductibles, pharmacy deductibles, and blinded firm-level identifiers.

Analytic Sample

Our analytic sample included enrollees with a mental health condition during the period 2007–2017 at firms that began offering or never offered an HDHP. We defined firms that did not offer an HDHP and then began offering an HDHP as treatment firms and firms that never offered an HDHP during the study period as comparison firms (21).

We excluded enrollee-years with Medicare or without medical, pharmacy, or mental health coverage. We included enrollees ages 12 to 64 who were continuously enrolled and who had valid deductible and demographic information for at least 11 months within a calendar year. Large changes in the number of enrollees at a firm may indicate that enrollees switched to health plans unobserved in the data, so we included only enrollees at firms with stable firm size (<50% change) year over year.

To designate a plan as an HDHP, we used the U.S. Internal Revenue Service's definition of the minimum individual deductible that is allowed for a plan to also have a health savings account, which varies year to year but averaged \$1,214 during our study period. We calculated the proportion of enrollees at the firm enrolled in an HDHP and identified a treatment firm as one that had at least 1 year with none or very few (<5%) of its enrollees enrolled in an HDHP, followed by at least 1 year with a greater share (>5%) of its enrollees enrolled in an HDHP, as in prior literature (22, 23). We designated firms with 0% of enrollees in HDHPs in all years during the study period as comparison firms.

Within these treatment and comparison firms, we restricted our sample to enrollees with a mental health condition. Following other work, we included enrollees in our analytic sample if they had at least one claim with a mental health diagnosis during the current or a previous year, using *ICD-9-CM* codes 295–302 and 306–314 and *ICD-10-CM* codes F20–F69, F84, and F90–F99 (24).

We identified enrollees who also had at least one claim with a substance use disorder diagnosis by using *ICD-9-CM* codes 291, 292, 303, 304, and 305 (excluding 305.1 tobacco use disorder and 305.8 antidepressant abuse) and *ICD-10-CM* codes F10–F19 (excluding F17.2x tobacco use disorder). Enrollees who had both a mental health and a substance use disorder diagnosis at any point during the study period were categorized as having a co-occurring disorder the first year with either a mental health or a substance use disorder diagnosis and in all subsequent years. We ensured that treatment and comparison firms had a similar proportion of enrollee-years included in the sample both before and after the HDHP offer. (Detailed sample selection specifications and criteria are listed in an online supplement to this article.)

Measures

Our outcomes included annual spending on combined mental health and substance use disorder care and annual spending on care for conditions other than mental or substance use disorders. We calculated annual spending on combined mental health and substance use disorder care by summing spending on claims with a primary diagnosis for a mental health condition or substance use disorder and spending on claims for psychotropic medications and medications to treat substance use disorders. We calculated annual spending on non-mental health care and non-substance use disorder care as all other claims. Within the combined mental health and substance use disorder category and the non-mental health care and non-substance use disorder care category for all other conditions, we separately calculated spending associated with inpatient hospitalizations, emergency department use, outpatient evaluation and management (E&M) services, and medications. For enrollees with a co-occurring substance use disorder, we separately calculated spending on medications to treat the substance use disorder and psychotropic medications. We top-coded spending at the 99.9th percentile.

We calculated the total days' supply for psychotropic medications and the average spending per day's supply of psychotropic medication throughout the year. Among enrollees without a co-occurring substance use disorder, we calculated the number of E&M visit days and the average spending per E&M visit day throughout the year for both mental health and non-mental health E&M visits. (Additional details on outcome construction are provided in the online supplement.)

Our main independent variable was a firm-level flag indicating that an enrollee-year was at a treatment firm that was interacted with a flag indicating that the enrollee-year occurred after the HDHP offer (i.e., the "post" period among treatment firms). This interaction provided our estimated effect of the impact of an HDHP offer on outcomes.

Statistical Analysis

We estimated two-way fixed-effects models for enrollees with mental health conditions stratified by the presence of a

co-occurring substance use disorder. Calendar year fixed effects controlled for secular trends, and firm fixed effects controlled for time-invariant firm-level differences. Differences between enrollees at treatment and comparison firms on a range of covariates were minimal (with standardized mean differences below 0.1) (see online supplement), but our models controlled for age, gender, race-ethnicity, census division geography, household income level, median census-block education level, and Chronic Conditions Data Warehouse's chronic medical conditions (25, 26). Ordinary least-squares regression models were used for all outcomes. Standard errors were clustered at the firm level. All analyses were conducted in Stata, version 16 (27).

RESULTS

Sample Characteristics

Table 1 displays unadjusted descriptive characteristics of enrollees with a mental health condition with and without a co-occurring substance use disorder before and after an HDHP offer at treatment and comparison firms. Mean annual total health care spending among enrollees with a co-occurring substance use disorder was \$15,637, nearly twice that of enrollees without (\$7,912). Among enrollees with mental health conditions at firms that offered an HDHP, 43% of enrollees with a co-occurring substance use disorder and 46% of enrollees without, enrolled in an HDHP (see online supplement).

Effects of HDHPs on Health Care Spending

Figure 1 displays estimates of percentage changes in spending on combined mental health and substance use disorder care associated with a firm's decision to offer an HDHP among enrollees with mental health conditions. We estimated that an HDHP offer was associated with a \$40 (95% confidence interval [CI]=\$20–\$59) average annual reduction in spending on all mental health care among enrollees without a co-occurring substance use disorder. Average annual spending on mental health care before an HDHP offer totaled \$821, and this corresponds to a 4.8% (95% CI=2.4%–7.2%) reduction attributable to an HDHP offer. Among enrollees without a co-occurring substance use disorder, we also estimated a 9.1% (95% CI=2.7%–15.4%), or \$7, reduction in spending on mental health outpatient E&M services; a 4.8% (95% CI=2.4%–7.3%), or \$23, reduction in spending on psychotropic medications; and a 11.3% (95% CI=1.0%–21.6%), or \$3, increase in spending on mental health-related emergency department visits.

Adjusted mean annual spending levels for psychotropic medications and medications to treat substance use disorders before and after an HDHP offer among enrollees with a co-occurring substance use disorder are displayed in Figure 2. A 3.7% (95% CI=1.2%–6.2%), or \$34, reduction in combined spending on these medications was driven by a \$25 (95% CI=\$7–\$44) reduction in spending

on psychotropic medications in the year following the HDHP offer that was sustained in the following year. Across all study years following an HDHP offer, we estimated an average 4.5% (95% CI=1.9%–7.2%), or \$35, reduction in annual spending on psychotropic medications among enrollees with a co-occurring substance use disorder. Spending on medications for substance use disorders remained unchanged.

Figure 3 displays estimates of changes in spending on non-mental health care and non-substance use disorder care associated with an HDHP offer among enrollees with mental health conditions. Among enrollees without a co-occurring substance use disorder, an estimated 1.9% (95% CI=0.4%–3.3%), or \$128, average annual reduction in spending was detected for non-mental health care. Likewise, among enrollees without a co-occurring substance use disorder, an estimated 2.7% (95% CI=1.1%–4.2%), or \$18, reduction in spending on non-mental health outpatient E&M services was associated with an HDHP offer. Among enrollees with a co-occurring substance use disorder, we detected an estimated 4.7% (95% CI=2.3%–7.0%), or \$39, reduction in annual spending on non-mental health and non-substance use disorder outpatient E&M services.

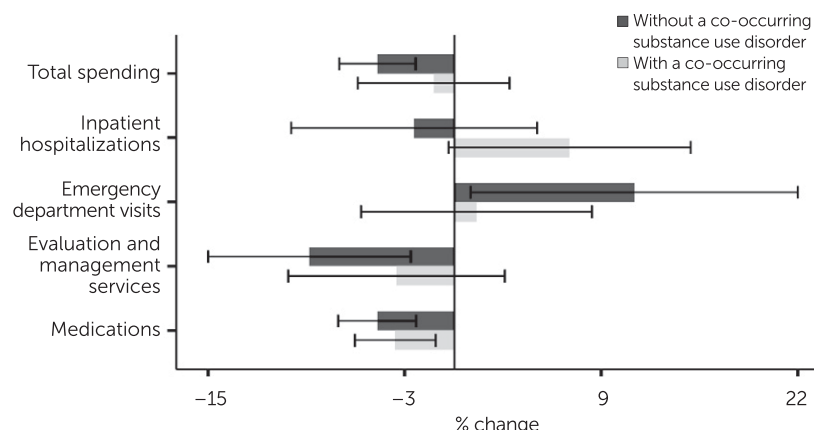
As shown in Figure 4, for enrollees with mental health conditions, the observed reduction in spending on psychotropic medications was driven by a 4.2% (95% CI=0.9%–7.4%), or 8.1-day, reduction in quantity of the days' supply of these medications within a year for those without a co-occurring substance use disorder and a 2.7% (95% CI=0.1%–5.1%), or 7.6-day, reduction for those with a co-occurring substance use disorder. Similarly, among enrollees without a co-occurring substance use disorder, we found a 7.9% (95% CI=3.6%–12.2%), or 0.07-visit-day, reduction in mental health outpatient E&M visits and a 2.4% (95% CI=1.1%–3.6%), or 0.12-visit-day, reduction in non-mental health outpatient E&M visits. We did not detect

TABLE 1. Unadjusted descriptive characteristics of health plan enrollees with mental health conditions offered and not offered an HDHP and with and without a co-occurring substance use disorder before and after the HDHP offer, 2007–2017^a

Characteristic	With a co-occurring substance use disorder				Without a co-occurring substance use disorder				Total sample (N=6,028,578)
	Offered HDHP		Not offered HDHP		Offered HDHP		Not offered HDHP		
	Before (N=127,730)	After (N=204,992)	Before (N=141,209)	After (N=124,619)	Before (N=1,189,147)	After (N=2,041,209)	Before (N=1,524,307)	After (N=1,273,915)	
Age (M±SD)	37.2±14.3	38.1±14.5	37.1±14.2	37.8±14.4	39.7±14.0	40.0±14.4	39.4±14.0	39.5±14.3	39.7±14.2
Sex (%)									
Male	53.0	53.7	54.6	54.7	53.2	53.6	53.8	53.9	53.6
Female	46.9	46.3	45.4	45.3	46.8	46.4	46.2	46.1	46.4
Race-ethnicity (%)									
White	69.8	67.7	69.8	65.9	68.7	66.4	68.3	64.4	67.1
Black	8.7	8.6	7.6	8.1	9.7	9.7	7.5	7.8	8.7
Hispanic	7.1	6.7	7.7	8.2	7.4	7.1	9.1	9.4	8.2
Asian	1.4	1.5	1.3	1.4	2.5	2.7	2.2	2.4	2.5
Missing or unknown	13.0	15.4	13.5	16.3	11.7	14.1	12.9	16.1	13.6
N of chronic conditions (M±SD)	1.0±1.6	1.0±1.6	1.0±1.6	1.1±1.7	.9±1.3	.8±1.3	.8±1.3	.8±1.3	.8±1.3
All health care spending (mean\$)	14,485	16,303	14,922	16,638	7,822	8,089	7,510	8,220	7,912
Mental health and substance use disorder spending (mean \$)									
Total	2,970	3,404	3,143	3,504	823	677	800	766	761
Hospitalizations	800	939	866	971	57	52	52	55	54
Emergency department visits	138	140	186	163	21	15	31	21	23
Outpatient evaluation and management services	155	185	152	184	73	75	71	85	76
Medications	918	834	910	857	476	384	461	421	433

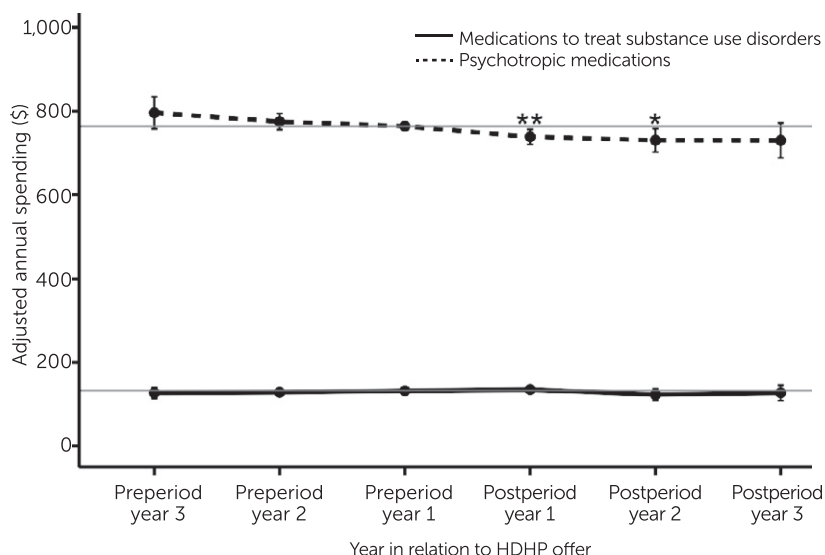
^a HDHP, high-deductible health plan. Comparison group means were constructed by using the weighted average of comparison group characteristics across calendar years weighted by the proportion of which those calendar years appear in the treatment sample during the preperiod and the postperiod. Chronic conditions were derived from the Chronic Conditions Data Warehouse. Count of chronic conditions excludes all mental health–related and substance use disorder–related conditions and ranges from 0 to 21. All health care spending includes spending on mental health care, substance use disorder care, and all other health care spending. (Full sample characteristics and covariate balance statistics are presented in the online supplement.)

FIGURE 1. Estimated percentage change in spending for mental health and substance use disorder care attributable to an HDHP offer among enrollees with mental health conditions with and without a co-occurring substance use disorder, 2007–2017^a



^a HDHP, high-deductible health plan. Total spending refers to all spending for mental health and substance use disorder care. Spending subcategories (inpatient, emergency department, outpatient evaluation and management, and medications) are not exhaustive and do not sum to total combined mental health and substance use disorder care spending. To obtain percentage changes, ordinary least-squares model coefficients, representing changes in dollar amounts, were divided by preperiod mean spending levels at treatment firms. Covariates included age, gender, nine-level census division, race-ethnicity indicators, household income, median education at the census-block level, chronic medical condition indicators, calendar year fixed effects, and firm fixed effects (for full model results see online supplement). Horizontal lines represent 95% confidence intervals.

FIGURE 2. Adjusted annual spending on psychotropic medications and medications to treat substance use disorders among enrollees with mental health conditions and a co-occurring substance use disorder 3 years before and after an HDHP offer, 2007–2017^a



^a HDHP, high-deductible health plan. Medication spending includes pharmacy spending and medications administered by a clinician. Ordinary least-squares model covariates included age, gender, nine-level census division, race-ethnicity indicators, household income, median education at the census-block level, indicators for chronic medical conditions, calendar year fixed effects, and firm fixed effects (for full model results see online supplement).

* $p < .05$, ** $p < .01$

changes in the cost per unit of these medications or services associated with an HDHP offer. (Full model results for Figures 1–4 are included in the online supplement.)

Differences in Effect of HDHP Offer

We compared the percentage change in health care spending associated with an HDHP offer among enrollees with mental health conditions without a co-occurring substance use disorder to the percentage change in health care spending associated with an HDHP offer among enrollees with mental health conditions with a co-occurring substance use disorder (displayed in Figures 1 and 3) and found these changes to be largely similar.

Sensitivity Analyses

We conducted a number of sensitivity analyses varying firm-level thresholds used in identifying treatment firms, sample specifications, top-coding thresholds, and modeling approaches and found that these results were qualitatively similar to the results presented above in all specifications (see online supplement).

DISCUSSION

In this study, we explored how HDHPs affected enrollees with mental health conditions with and without a co-occurring substance use disorder. We found that all enrollees with mental health conditions reduced spending in some treatment categories when offered an HDHP, primarily for outpatient E&M services and psychotropic medications. These findings are largely consistent with those of previous studies evaluating HDHPs that have demonstrated reductions in office visits and medication use for other chronic conditions (22, 28–30).

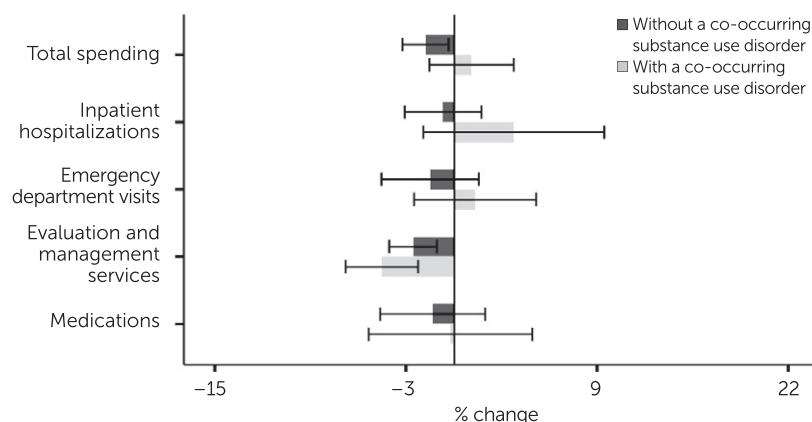
It is not clear why an HDHP offer was associated with reductions in spending on psychotropic medications but not with reductions in spending on medications for substance use disorders or other medical conditions. Our estimate of a reduction in psychotropic medication spending associated with an HDHP offer differs from one recent HDHP study, which found no decrease in utilization of medications for the treatment of bipolar disorder (14). It is possible that the decreases in spending we

observed were driven by medications for less severe mental health conditions. Other work has shown cost-sharing-induced reductions in the utilization of antidepressants and has documented greater price responsiveness for antidepressants, compared with medications to treat serious mental illness (31, 32).

Prior literature exploring HDHPs has primarily suggested reductions or no changes in the utilization of emergency department services, but some studies have found increases in emergency department utilization among sicker and less wealthy enrollees (7, 10, 33, 34). In this study, we found a decrease in spending on outpatient E&M services and psychotropic medications coupled with an increase in spending on mental health-related emergency department visits, suggesting that an HDHP offer may be associated with foregoing or limiting necessary mental health care, possibly resulting in adverse events. This is potentially worrisome and needs further study.

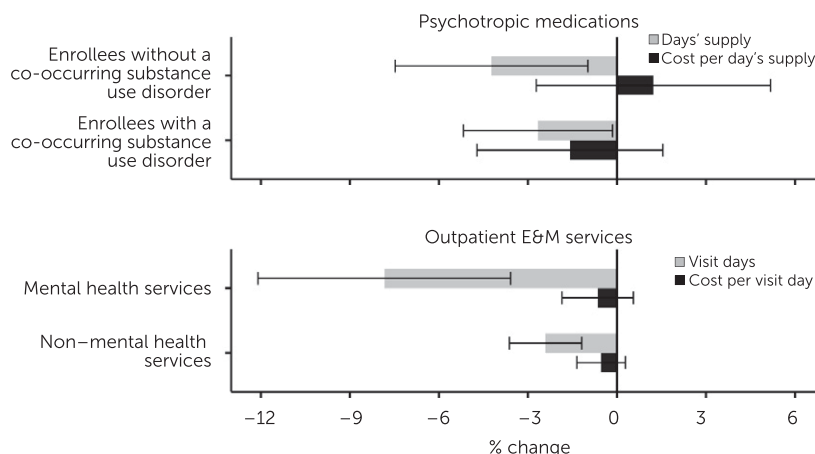
Our study had several important limitations. First, despite the rigorous quasi-experimental study design, the study was observational, and enrollees were not randomly assigned to HDHP and non-HDHP plans. Because the decision by an enrollee to select an HDHP is not random and is likely associated with other characteristics of the enrollee, we instead focused on the employer's choice to offer an HDHP in order to mitigate this selection bias. Additionally, the likelihood of receiving mental health or substance use disorder care, and thus the likelihood of entering the sample, might have been influenced by enrollment in an HDHP. To mitigate any potential biases, we ensured that our clinical criteria were balanced across treatment groups (see online supplement) and conducted sensitivity analyses requiring enrollee-level fixed effects (see online supplement), which produced consistent findings. Second, our analytic strategy relied on the assumption that outcome trends at comparison firms were an appropriate approximation for what would have happened at firms that offered an HDHP had they not offered an HDHP. This cannot be directly tested, but outcome trends tested by using event study models were generally parallel in the years directly preceding an HDHP offer, with few exceptions (e.g., psychotropic medications).

FIGURE 3. Estimated percentage change in spending for non-mental health and non-substance use disorder care attributable to an HDHP offer among enrollees with mental health conditions with and without a co-occurring substance use disorder, 2007–2017^a



^a HDHP, high-deductible health plan. Total spending refers to all non-mental health and non-substance use disorder spending. Spending subcategories (inpatient, emergency department, outpatient evaluation and management, and medications) are not exhaustive and do not sum to total non-mental health and non-substance use disorder spending. To obtain percentage changes, ordinary least-squares model coefficients, representing changes in dollar amounts, were divided by preperiod mean spending levels at treatment firms. Covariates included age, gender, nine-level census division, race-ethnicity indicators, household income, median education at the census-block level, chronic medical condition indicators, calendar year fixed effects, and firm fixed effects (for full model results see online supplement). Horizontal lines represent 95% confidence intervals.

FIGURE 4. Estimated percentage change in the quantity and price of psychotropic medications and in outpatient evaluation and management (E&M) visits attributable to an HDHP offer among enrollees with mental health conditions, 2007–2017^a



^a HDHP, high-deductible health plan. Top: percentage change of the quantity of days' supply within a year and the total cost per day's supply of psychotropic medications among enrollees with and without a co-occurring substance use disorder. Bottom: percentage change in the number of visit days for outpatient E&M services among enrollees without a co-occurring substance use disorder and the cost per the associated claims on those visit days. Costs included the amounts paid out of pocket by the enrollee and by the health plan. To obtain percentage changes, ordinary least-squares model coefficients, representing changes in either quantity or cost per quantity (price) were divided by preperiod means. Models measuring changes in price did not include enrollee-years that did not have any care in the corresponding category. Covariates included age, gender, nine-level census division, race-ethnicity indicators, household income, median education at the census-block level, chronic medical condition indicators, calendar year fixed effects, and firm fixed effects (for full model results see online supplement). Horizontal lines represent 95% confidence intervals.

Findings were also consistent in these event study models (see online supplement).

Third, with a somewhat higher proportion of enrollees in the South and Central regions, our results may not be generalizable to the broader employer-sponsored health insurance market. Fourth, the data used in this study did not capture services for which enrollees paid cash only, and not all substance use disorder treatment may be accompanied by a diagnosis code, potentially affecting sample selection. A sensitivity analysis that used alternative criteria (35) for selection of the substance use disorder sample yielded consistent results (see online supplement). Finally, this study focused on the impact of deductible levels only and did not account for other cost-reduction tools that might have been implemented by the employer at the time of the HDHP offer. Although other studies have incorporated other tools into analyses for a small number of employers, our study has the benefit of examining a large and heterogeneous group of employers over a long study period (8).

CONCLUSIONS

Our findings suggest that HDHPs lead those with mental health conditions to reduce the use of needed medications and outpatient care. Policy makers, employers, clinicians, and health systems should consider the ways in which insurance design leads enrollees with mental health conditions to restrict care, with potentially detrimental health consequences.

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- Incorporating voices of lived experience in care
- Effects of federal, state, and local policies on people with serious mental illness
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