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RESEARCH ARTICLE

High-Deductible Health Plans: Implications for Substance Use Treatment

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Objective. To examine whether high-deductible health plans are related to patient complexity, health services use, and medical care costs among substance use treatment patients.

Data Source/Study Setting. Electronic health record data from Kaiser Permanente Northern California; 2007–2011.

Study Design. Retrospective analysis of electronic health record data of substance use treatment patients ($N = 31,001$). We examined relationship of patient demographics, health comorbidities, and services use and cost to deductible level: none, low (\$1–\$999), and high ($\geq \$1,000$).

Methods. Demographic, membership, diagnostic, and utilization data were merged with cost data. Utilization and costs were summarized into 6-month intervals. Generalized estimation methods for repeated measures with logistic, Poisson, and linear regression were used.

Principal Findings. Substance use patients with deductible plans were younger and had less comorbidity than those without deductibles. Patients with high deductibles had lower emergency room and hospital use 12- to 6-month pretreatment, but rates became similar to other groups in the 6 months immediately prior to treatment; treatment costs were similar.

Conclusion. Immediately prior to entering treatment, substance use patients with and without high deductibles have similar patterns of health services utilization. We discuss implications for health policy and treatment, particularly in an era of health reform.

Key Words. High deductible, substance use, utilization, cost, electronic health record

The number of health benefit plans with deductibles has grown considerably in recent years (Claxton et al. 2013). Of all workers with health insurance coverage, 46 percent in 2015 had a deductible of $> \$1,000$ (up from 27 percent in 2010) (Claxton et al. 2015). A typical deductible for an individual was \$1,318

in 2015, and \$2,400 for a family in 2014 (Claxton et al. 2014, 2015). In 2015, more than half of all firms with 1,000 or more workers offered a high-deductible plan (HDHP, >\$1,000) with a savings option (Claxton et al. 2015). With the implementation of the Affordable Care Act (ACA), the proliferation of benefit plans with high deductibles has become more rapid as the tiered benefit plans on the state exchanges include high deductibles (Claxton, Cox, and Rae 2015). As a result, patients' share of health care costs is considerable and growing (Abelson 2015; Claxton et al. 2015), which has significant implications for health services use.

Health Services Use and HDHPs

Compared to traditional plans, HDHPs have lower premiums but greater patient cost-sharing aimed at controlling health care utilization and costs. Research shows that cost-sharing has reduced inappropriate, but also appropriate health service use (Brook et al. 2006; Buntin et al. 2006; Reddy et al. 2014). Patients tend to postpone preventive services and necessary care that carry out-of-pocket costs (Reed et al. 2009; Beeuwkes Buntin et al. 2011; Waters et al. 2011; Wharam et al. 2011; Galbraith et al. 2012; Fronstin, Sepulveda, and Roebuck 2013). Reductions in emergency department (ED) use have been accompanied by increased inpatient use, suggesting that HDHPs may lead to deferred need and increased downstream health care cost (Swartz 2010; Wharam et al. 2011; Kozhimannil et al. 2013). The effect on utilization varies by demographic subgroups defined by gender, health status, and benefit design (Waters et al. 2011; Kozhimannil et al. 2013).

Substance Use Patients, Health Services, and HDHPs

Research on HDHP's impact on individuals with substance use (SU) problems has been limited (Office of National Drug Control Policy 2004; Mark et al. 2005), although SU disorders are a major public health problem, accounting for a large portion of health and societal costs. Patients with SU disorders are often younger (Compton et al. 2007; Hasin et al. 2007), a group more likely to opt for HDHPs, because they do not expect to be high utilizers of health services (Greene et al. 2006; Barry et al. 2008; Lave et al. 2011).

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However, SU patients entering treatment are complex patients, who often have significant physical and psychiatric health comorbidities (Mertens et al. 2003, 2007), high utilization of health services (particularly injuries and overdose services) (Watt et al. 2004; Cherpitel, Ye, and Bond 2005; Cherpitel and Ye 2008), and high overall costs (Parthasarathy et al. 2001, 2003). These patients often defer SU treatment until their SU problems are serious and they are referred by employers, families, or legal sources (Institute of Medicine 2006; Weisner et al. 2009, 2010). High deductibles may exacerbate this delay, and SU severity and co-occurring medical and psychiatric comorbidities are at risk of worsening (Mertens et al. 2003).

HDHPs and SU Treatment

It is widely acknowledged that SU problems are undertreated and, historically, SU benefits have been more limited than general medical benefits (Substance Abuse and Mental Health Services Administration 2010). Older studies found SU benefits to cost as much as 142 percent more than for medical services (Hodgkin et al. 2003) and to be subject to more limitations than general medical care. Copayments resulted in lower use of SU treatment services, and more SU treatment readmissions (Lo Sasso and Lyons 2002, 2004; Stein and Zhang 2003). Effects of deductibles on SU treatment services may be stronger than other services as demand for SU treatment is seen as more price-sensitive than other medical care (Hodgkin et al. 2003; Lo Sasso and Lyons 2004; Swartz 2010).

The Mental Health Parity and Addiction Equity Act (MHPAEA) passed in 2008 mandated that insurers provide group coverage for SU treatment at the same level of benefits as general medical care (although it did not mandate SU coverage). It was expected to have significant impact on access, but findings on access to SU treatment have been mixed (Wen et al. 2013; Busch et al. 2014). The Affordable Care Act went further than the MHPAEA, mandating that all individual and small group benefit plans sold on the state exchanges include SU treatment as an “essential benefit” and comply with the MHPAEA (Beronio, Glied, and Frank 2014; National Committee for Quality Assurance [NCQA] 2014; The White House 2015). High deductibles are a key feature of many of those plans. It is unclear how much increased access to SU treatment will be realized given that high deductibles may discourage treatment-seeking behavior. There have been no recent studies to our knowledge on high deductibles and use of SU treatment services, making this study very timely and informative in this rapidly changing health care landscape.

The Current Paper

This study examines patient complexity and patterns of health services use and costs among patients entering SU treatment, and whether these differ by deductible level (none, low, and high). Specifically, we examined whether those with HDHPs differed from the other two groups in terms of demographic characteristics, medical, and psychiatric comorbidities, and health care services (including SU services) use and cost. Research shows that SU patients have high utilization rates (particularly ED and inpatient services) and high costs in the period immediately preceding SU entry (Parthasarathy and Weisner 2005; Institute of Medicine 2006). Consistent with the literature, we hypothesized that SU patients with HDHPs who entered treatment would have fewer comorbidities, lower utilization, and health care costs 1-year pretreatment compared to those without HDHPs. As SU treatment is typically subject to a deductible and patients may face considerable out-of-pocket costs, we also compared use of SU treatment services and costs.

Study findings fill an important gap in understanding the impact of HDHPs on this complex and often high-need population. Findings have significant implications for improving access to SU treatment, particularly in an ACA era, and for designing health benefit plans that include SU treatment as a high-value health care service with low copayments (Chernew et al. 2010).

Data Sources/Study Setting

Kaiser Permanente of Northern California (KPNC) is a nonprofit, integrated health care delivery system with 3.8 million members who account for 45 percent of the commercially insured population in the region and 31 percent of the regional population. Members are similar to the local and state-wide population with respect to age, sex and race/ethnicity, with slight underrepresentation of those in lower and higher income and education categories (Gordon 2006).

The study used KPNC's electronic health record (EHR) for patients' demographic, health services use (including those external to KPNC facilities), and diagnostic information (primary and multiple secondary ICD-9 diagnoses for each service encounter). This study included all adult KPNC members with a new intake appointment to all regional outpatient SU treatment programs between 2007 and 2010 ($N = 31,001$). The KPNC SU

treatment programs use a group-based approach emphasizing abstinence and are representative of public and private U.S. outpatient treatment programs (Institute of Medicine 2006).

Study Design

This retrospective study used KPNC's EHR data to identify patients who entered SU treatment between 2007 and 2010. Of the 31,001 patients with a SU intake, we identified 3,229 (10.4 percent) patients who had a low- (\$1–\$999, 3.2 percent) or high- ($\geq$ \$1,000, 7.2 percent) deductible plan (Davis et al. 2005; The Henry J. Kaiser Family Foundation 2013); 89.6 percent of new intake appointments had no deductible. The percentage of SU patients enrolled in HDHPs increased from 4.8 percent in 2007 to 15.7 percent in 2010. Although the deductible plan enrollment rates in our study reflect a treatment subsample, this trend is similar to overall enrollment observed at KPNC and nationally during this timeframe (Fronstin, Sepulveda, and Roebuck 2013; Claxton et al. 2015). We also extracted gender (women = 1), age, and length of enrollment in the health plan (summarized in 6-month intervals) to account for varying membership length over the study period. Median household income was geocoded from census data using the member's address and was dichotomized ($1 \leq$ median household salary for the full sample, 0 = above).

METHODS

Comorbid Diagnoses

SU problems within 1 year of SU treatment entry were categorized into alcohol only, drug only, and alcohol + drug, with dichotomous indicators. Composite indicators for any chronic medical condition (including arthritis, asthma, chronic pain, congestive heart disease, COPD, diabetes, epilepsy, HIV, hypertension, ischemic heart disease, osteoporosis, Parkinson's, and stroke) (Mertens et al. 2003; Torio and Andrews 2006), and for injuries (common in SU populations) (Ray et al. 2002; Corso et al. 2006) were created. A dichotomous indicator for any psychiatric comorbidity, including depression, anxiety, and major psychosis (1 = present) (Katon, Lin, and Kroenke 2007; Melek and Norris 2008; Young et al. 2015) within 1 year (pre and post) of treatment entry was created.

Health Services Use and Cost

Health services use up to 12 months prior to treatment entry were summarized into 6-month intervals. Six-month intervals (rather than an entire year) allow us to examine with more granularity changes in utilization patterns between the groups that we might not otherwise observe. If those with HDHPs have lower utilization and cost in the first 6-month period (we expect this if health individuals self-select HDHPs), but a steeper increase in the second 6-month period leading up to intake to reach similar costs and utilization as those without deductible, it might suggest “delayed treatment” as one plausible explanation. A dichotomous indicator (12-6 months prior to treatment entry = 1, 6 months prior till treatment entry = 0) denoted the two time periods. Dichotomous indicators for any inpatient and ED services were created for each 6-month time period. We also examined length of stay in days/1,000 member months. We measured primary care (PC) and psychiatric services utilization by the average number of visits per member months during each 6-month period. We also examined the number of SU treatment visits in the 6-month posttreatment entry.

Costs were obtained from the cost management information system by applying unit costs of services (using standard accounting procedures) to actual services used; cost components corresponding to utilization were also obtained. Diagnostic and cost information for services delivered external to KPNC were obtained from claims databases. All costs were converted to constant (2009) dollars using the Medical Care component of the Consumer Price Index.

Statistical Analysis

Patient Complexity. Bivariate analyses examined differences between the three deductible groups in terms of demographic characteristics (age, gender, race/ethnicity, income) and comorbidity (medical and psychiatric comorbidities) and SU (problem substances). Chi-squared tests were used to test discrete measures (e.g., presence of medical comorbidity) and *t*-tests for continuous measures (e.g., age). Significance level (α) was fixed at .05 for all analyses.

Analyses of Health Care Utilization and Costs. We conducted multivariate logistic regressions for dichotomous outcomes (any ED use, any inpatient stays) and Poisson regression for counts (number of inpatient days, PC visits, and psychiatry visits). We corrected for overdispersion in the Poisson regression.

All analyses were performed using *SAS 9.3* (SAS Institute Inc., Cary, NC, USA). To address missing data (<3 percent of the median household income was missing), we implemented multiple imputation methods using SAS[®] (Smolkowski et al. 2010). All models included the following covariates: age, gender, race/ethnicity and income, chronic health conditions, psychiatric conditions, injuries, and SU problems. We examined total cost as well as its components (ED, inpatient, PC, psychiatry, and SU treatment). We used the generalized estimating equations approach (Lin, Lai, and Chuang 2007) to account for potentially correlated repeated measures with appropriate distributions for the various outcomes.

We expected the coefficient of the main effect of time to be positive (increasing trend in cost over the 12-month pretreatment for the no deductible reference group) and the coefficient of the main effects for both the deductible groups to be negative (relative to the nondeductible reference group). We expected the coefficients of the (group $\times$ time) interaction term to be positive implying a steeper increase over time for those with deductibles relative to those without. We included an indicator for employer group size and month of index visit as a proxy for patient out-of-pocket deductible accumulation prior to the index SU visit. Finally, in the multivariate regression model of SU treatment cost, a significant negative coefficient for the low or HDHP group would imply that those enrollees had lower SU treatment costs than those without a deductible plan.

STUDY RESULTS

Sample Characteristics

Descriptions of baseline characteristics of the HDHP ($N = 2,220$, 7.2 percent), low-deductible ($N = 1,009$, 3.2 percent), and no deductible ($N = 27,772$, 89.6 percent) treatment samples are given in Table 1. HDHP SU patients entering treatment were more likely to be male (64.2 percent vs. 59.5 percent for low deductible and 61.4 percent for no deductible; $p < .01$), younger (54.5 percent under age 40 for HDHP vs. 51.1 percent for low deductible and 48.4 percent for no deductible; $p < .01$). They were less likely to have a chronic medical condition (Weisner et al. 2001) (47.6 percent vs. 52 percent for low deductibles and 55.4 percent in no deductible plans; $p < .01$) or injuries (46.8 percent versus 48.2 percent for low deductible and 51.5 percent for no deductible plans; $p < .05$). There were no significant differences between the groups in psychiatric comorbidity.

Table 1: Demographic Characteristics by Deductible Levels

	<i>None</i> (<i>N</i> = 27,772)	<i>Low (\$1–999)</i> (<i>N</i> = 1,009)	<i>HDHP (≥\$1,000)</i> (<i>N</i> = 2,220)	<i>Overall</i> (<i>N</i> = 31,001)
<i>Gender</i>				
% Women	38.6%	40.5%	35.8%	38.4%**
% Men	61.4%	59.5%	64.2%	61.6%**
<i>Age</i>				
Mean age in years (SD)	40.23 (0.07)	39.31 (0.37)	38.54 (0.25)	39.36 (.07)
% <40	48.4%	51.1%	54.5%	48.9%***
<i>Race/ethnicity</i>				
%White	60.6%	63.9%	67.9%	61.3%***
%Black	8.4%	4.5%	1.9%	7.8%***
%Asian	3.2%	2.8%	3.0%	3.2%***
%American Indian/ Native Alaskan	0.8%	0.8%	0.4%	0.8%***
%Hawaiian/ Pacific Islander	0.3%	0.4%	0.3%	0.3%***
%Hispanic	11.9%	11.1%	8.4%	11.6%***
%Unknown	14.8%	16.6%	18.1%	15.1%***
<i>Median family income</i>	\$66,074	\$67,428	\$70,344	\$66,416***
<i>Medical diagnoses</i>				
Chronic conditions	55.4%	52.0%	47.6%	54.8%***
Psychiatric diagnoses	67.5%	68.1%	65.32	67.4%
Injuries	51.5%	48.2%	46.8%	51.1%***
<i>Substance use</i>				
Alcohol only	27.2%	29.8%	27.3%	27.3%
Drug only	26.1%	25.8%	26.0%	26.1%
Both	45.8%	43.1%	45.5%	45.7%

****p* < .01; ***p* < .05.

Unadjusted Health Care Utilization and Costs Prior to Treatment Entry

Table 2 shows the unadjusted average costs for patients in the three deductible groups prior to treatment entry. In the 12- to 6-month pre-treatment period, HDHPs had lower utilization and average costs per member month than non-HDHP groups in all categories, with more pronounced differences compared to individuals without deductibles. Specifically, HDHP patients had significantly fewer inpatient days per 1,000

Table 2: Unadjusted Utilization and Average Costs by Deductible Level

	12- to 6-month Preintake Deductible Level			6- to 0-month Preintake Deductible Level		
	None N = 27,772	Low (\$999) N = 1,009	HDHP (≥\$1,000) N = 2,220	None N = 27,772	Low (\$999) N = 1,009	HDHP (≥\$1,000) N = 2,220
<i>Utilization</i>						
Any ED use	15.1%	12.4%	11.4%	29.7%	25.4%	27.1%
Any inpatient stay	4.1%	3.1%	2.6%	11.1%	11.4%	10.1%
Number of inpatient days per 1,000 members	49 ^a	24	32 ^a	121	107	100
Primary care visits	0.36 ^a	0.32	0.27 ^a	0.46 ^a	0.43	0.40 ^a
Psychiatry visits	0.12 ^a	0.09	0.09 ^a	0.22	0.21	0.20
<i>Average costs</i>						
ED	\$40.73 (1.11) ^{a,b}	\$25.97 (2.95) ^a	\$29.72 (2.59) ^b	\$82.26 (1.55) ^c	\$69.82 (5.84)	\$66.65 (3.82) ^c
Hospital	\$224.10 (12.55)	\$111.69 (20.68)	\$199.19 (40.52)	\$496.40 (17.92)	\$461.07 (74.92)	\$442.35 (60.91)
Psychiatric services	\$31.65 (0.92)	\$26.76 (4.23)	\$23.91 (2.47)	\$63.33 (1.23)	\$67.53 (7.15)	\$60.00 (4.43)
Primary care	\$115.49 (1.44) ^a	\$105.56 (6.18)	\$89.48 (3.72) ^a	\$148.97 (1.55) ^c	\$143.21 (6.65)	\$136.19 (4.72) ^c
Total	\$492.36 (14.26)	\$333.02 (28.36)	\$397.29 (43.97)	\$981.16 (19.86)	\$901.11 (82.22)	\$872.73 (65.65)

Notes. Columns with similar letters denote significant ($p < .05$) effects.

member months (32 vs. 49; $p < .05$), lower PC visits (.27 vs. .36, $p < .05$), and fewer psychiatry visits (.09 vs. .12, $p < .05$) than the nondeductible group. Both deductible groups had significantly lower ED costs (\$25.97 for the low and \$29.72 for HDHP; $p < .05$) compared to those without deductibles (\$40.73). PC costs were lower for HDHPs relative to nondeductibles (\$89.48 vs. \$115.49; $p < .05$). All groups showed an increase in utilization and costs in the 6- to 0-month period immediately prior to treatment entry. There were no differences in ED, inpatient utilization, and psychiatry department visits between the three groups; PC visits continued to be lower for HDHPs relative to the nondeductibles group (.40 vs. .46, $p < .05$). ED costs (\$66.65 vs. \$82.26) and PC costs (\$136.19 vs. \$148.97) remained lower for HDHPs compared to the no deductible group.

Multivariate Analyses of Utilization

Results of multivariate analyses of preindex utilization are shown in Table 3. As expected, the odds ratio (OR) for time (OR = 2.57, $p < .01$) was >1 , implying a significant increase in the likelihood of ED and inpatient services use from 12- to 6-month pretreatment period to the 6- to 0-month pretreatment period for those with no deductibles, adjusting for demographics and comorbidities. The odds of ED use for the HDHP group (OR = .79; $p < .01$) was 21 percent lower at 12- to 6-month pretreatment compared to the no deductible group but the group $\times$ time interaction (OR = 1.23; $p < .01$) implied that the HDHP group had a steeper increase in ED use in the 6 months preceding treatment entry compared to the no deductible group, controlling for patient characteristics. A similar pattern was observed in any inpatient use but not length of stay. Results of the Poisson regression for number of inpatient days showed that the low-deductible plan members had 47 percent fewer inpatient days in the 12- to 6-month pretreatment compared to the no deductible group (RR = .53; $p < .01$), but rates increased in the next 6 months (RR = 2.01; $p < .01$) relative to those with no deductibles. Prevalence of medical conditions and combined alcohol and drug problems were significant predictors of both ED and inpatient services use. The relationship between gender and utilization was mixed with women more likely to use services but not having longer stays; age was positively associated with inpatient use but not ED. Individuals below the median income were higher service utilizers than others.

Table 3: Multivariate Logistic and Poisson Regression Analyses of Health Services Utilization

Measure	ED Odds Ratio (CI)	Inpatient Odds Ratio (CI)	No. of Inpatient Days Odds Ratio (CI)	No. of Psychiatry Visits Odds Ratio (CI)	No. of Primary Care Visits Odds Ratio (CI)
<i>Time (ref: 12- to 6-month preintake)</i>					
Six-month preintake	2.57 (2.47–2.68)***	3.03 (2.84–3.24)***	2.43 (2.18–2.72)***	1.76 (1.68–1.85)***	1.22 (1.20–1.24)***
<i>Deductible level (ref: none)</i>					
Low	0.85 (0.70–1.04)	0.82 (0.57–1.18)***	0.53 (0.34–0.81)***	0.76 (0.57–1.00)**	0.92 (0.84–1.02)
HDHP	0.79 (0.68–0.91)***	0.66 (0.50–0.87)	0.71 (0.45–1.12)	0.80 (0.65–0.99)**	0.84 (0.78–0.91)***
<i>Time × Deductible level</i>					
Six months pre × Low ded	1.01 (0.79–1.28)	1.42 (0.95–2.13)	2.01 (1.29–3.14)***	1.30 (1.01–1.67)**	1.08 (0.98–1.19)
Six months pre × High ded	1.23 (1.04–1.45)**	1.47 (1.09–1.98)**	1.18 (0.75–1.86)	1.25 (1.01–1.54)**	1.14 (1.06–1.22)***
<i>Gender (ref: male)</i>					
Women	1.08 (1.03–1.13)***	1.08 (1.01–1.15)**	0.97 (0.86–1.10)	1.86 (1.74–1.99)***	1.52 (1.47–1.57)***
Index age	1.00 (0.99–1.00)	1.02 (1.01–1.02)***	1.01 (1.01–1.02)***	1.00 (0.99–1.00)***	1.01 (1.00–1.01)***
<i>Race/ethnicity (ref: white)</i>					
Black	1.21 (1.12–1.31)***	1.11 (0.98–1.26)	1.43 (1.04–1.97)**	0.97 (0.84–1.11)	0.99 (0.93–1.05)
Asian	1.07 (0.95–1.21)	1.34 (1.11–1.60)***	1.62 (1.20–2.18)***	1.09 (0.91–1.30)	0.96 (0.88–1.03)
Am. Ind./Native Alaskan	1.25 (1.01–1.56)**	0.98 (0.71–1.36)	0.75 (0.53–1.06)	0.90 (0.69–1.18)	1.04 (0.91–1.18)
Hawaiian/Pacific Islander	1.45 (0.94–2.24)	1.95 (1.11–3.41)**	1.59 (0.92–2.76)	0.59 (0.36–0.99)**	1.15 (0.92–1.44)
Hispanic	1.06 (0.99–1.13)	1.09 (0.98–1.21)	1.05 (0.90–1.24)	0.92 (0.83–1.03)	1.13 (1.03–1.23)***
Unknown	0.45 (0.42–0.49)***	0.55 (0.49–0.63)***	0.71 (0.58–0.87)***	1.01 (0.90–1.13)	0.90 (0.86–0.94)***
<Census median income	1.08 (1.03–1.13)***	1.12 (1.04–1.19)***	1.16 (1.04–1.29)***	0.93 (0.86–0.99)**	1.01 (0.97–1.04)
<i>Medical diagnoses (ref: none)</i>					
Chronic conditions	1.75 (1.67–1.83)***	2.21 (2.04–2.39)***	2.54 (2.26–2.85)***	1.13 (1.05–1.22)***	1.87 (1.81–1.94)***
Psychiatric comorbidity	1.66 (1.57–1.74)***	2.18 (2.00–2.39)***	2.17 (1.85–2.54)***	17.41 (15.26–19.86)***	1.41 (1.37–1.46)***
Injuries	2.51 (2.39–2.62)***	2.35 (2.18–2.54)***	2.69 (2.40–3.01)***	1.35 (1.26–1.44)***	1.48 (1.44–1.52)***
<i>Substance use problem (ref: alcohol only)</i>					
Drug diagnosis only	1.14 (1.08–1.21)***	1.09 (1.00–1.19)	1.21 (1.02–1.44)**	1.11 (1.01–1.22)**	1.60 (1.53–1.67)***
Alcohol and drug diagnosis	1.24 (1.17–1.31)***	1.37 (1.26–1.48)***	1.40 (1.25–1.57)***	1.22 (1.12–1.33)***	1.20 (1.16–1.24)***

Note. Model coefficients for the intercept, employer group size and index month are not presented in the table.
*** $p < .01$; ** $p < .05$.

Multivariate Analyses of Costs

Results of multivariate analyses of costs prior to treatment entry are shown in Table 4. Trends in average costs reflected the patterns observed in utilization, although many of the significant findings in utilization were not translated into costs due to greater variability in the cost distributions. The positive main effect for time (e.g., \$40.06 for ED cost) implies that ED costs were significantly higher in the 6 months prior to treatment compared to the 12- to 6-month pretreatment period for those with no deductibles. Similarly, all costs were higher in the 6 months before treatment entry compared to the earlier 6-month period. Main effects for group indicator shows that HDHP group had lower ED ($-\$10.12$, $p < .01$), psychiatry ($-\$6.03$, $p < .05$), and PC ($-\$14.68$,

Table 4: Multivariate Analyses of Average Costs (in Dollars)

<i>Measure</i>	<i>ED</i>	<i>Inpatient</i>	<i>Psychiatry</i>	<i>Primary Care</i>	<i>Total</i>
<i>Time (Ref: 12- to 6-month preintake)</i>					
Six-month preintake	40.06***	277.76***	30.98***	31.20***	491.40***
<i>Deductible level (ref: none)</i>					
Low	-5.77	-50.26**	-4.85	-2.55	-70.70**
HDHP	-10.12***	-29.40	-6.03**	-14.68***	-76.52
<i>Time $\times$ Deductible level</i>					
Six months pre $\times$ Low ded	2.47	76.41	8.94	4.27	77.23
Six months pre $\times$ High ded	-3.59	-17.64	5.20	11.78**	-1.92
<i>Gender (ref: male)</i>					
Women	10.51***	-63.23***	29.76***	56.62***	26.62
<i>Age</i>					
	0.35***	6.52***	-0.32***	1.48***	9.24***
<i>Race/ethnicity (ref: white)</i>					
Black	23.72***	17.86	-5.17	-7.64	20.90
Asian	7.19	201.78**	5.76	-1.06	225.33**
Am. Ind/Native Alaskan	25.57	-48.57	-5.69	35.78	114.68
Hawaiian/Pacific Is.	49.00	114.39	-15.28**	31.36	176.07
Hispanic	7.25***	48.07	-2.32	12.18**	72.79
Unknown	-21.80***	-73.74***	0.20	-7.23**	-106.08***
<i><Census median income</i>					
	7.61***	63.65***	-4.37**	3.42**	74.74***
<i>Medical diagnoses (ref: none)</i>					
Chronic conditions	36.24***	303.80***	5.79***	74.46***	485.48***
Psychiatric comorbidity	23.61***	117.95***	56.84***	35.87***	277.24***
Injury/poisoning	44.62***	392.54***	14.06***	47.72***	588.98***
<i>Substance use problem (ref: alcohol only)</i>					
Drug diagnosis only	23.95***	76.62**	5.02**	60.12***	199.52***
Alcohol and drug diagnosis	21.89***	87.97***	12.40***	22.45***	161.21***

Note. Model coefficients for the intercept, employer group size and index month are not presented in the table.

*** $p < .01$; ** $p < .05$.

$p < .01$) costs compared to those without deductibles in the 12 to 6 months prior to treatment. Comparing those with low deductibles to the noneductible group, significant main effects were observed in average inpatient ($-\$50.26$, $p < .05$) and total health care costs ($-\$70.70$, $p < .05$) during the reference period. Examining the group $\times$ time coefficients, the only significant increase over time was in PC costs among individuals in the HDHP group ($\$11.78$, $p < .01$). As with utilization, presence of comorbidities and combined alcohol and drug problems were positively related to costs for those with income below the median.

SU Treatment Costs

We examined the relationship between deductible status and SU treatment visits and costs in the 6 months after treatment entry (results not shown). Average number of visits per member month was 5.05, 5.03, and 4.69 for the no deductible, low, and HDHP groups, respectively; corresponding average cost/member month was $\$411.11$, $\$414.68$, and $\$386.19$, respectively. There were no significant differences between the three deductible groups in either average SU treatment visit/member month or average treatment costs.

Post Hoc Analyses. We also examined the role of prior SU treatment on health services use and cost as this may translate into more stable periods of recovery and perhaps lower medical costs. For these analyses, we included those members who had continuous membership (67 percent) during this 24-month time period (12-month study window and the 12 months prior to that during which they might have had a previous SU treatment episode). As only 6 percent of this sample had prior SU treatment in the year before the study period, we created a dichotomous indicator of prior SU treatment and reanalyzed the model for the smaller sample but our substantive conclusions did not change.

DISCUSSION

In this study we examined patient complexity and patterns of utilization and cost among SU patients without deductibles, with low deductibles, and with HDHPs. Consistent with the literature on other health conditions, SU patients with HDHPs who entered treatment were younger, more likely to be male

and less likely to have medical comorbidities. They also had lower use of ED and inpatient services in the 12–6 months prior to entering treatment, which was maintained in multivariate analyses that adjusted for demographic differences. The low-deductible group had shorter lengths of inpatient stays compared to patients without deductible plans. Taken together, these results provide support for the argument that young, healthy individuals self-select into deductible plans. Individuals with HDHPs may not factor in the likelihood of future SU problems and related consequences for health when choosing a health plan (if given a choice), do not anticipate a need for SU treatment in the immediate future, or may not be aware that SU treatment is subject to a deductible. Median income for this sample is relatively high among those with deductibles. Thus, it suggests that affordability may not explain individuals choosing HDHP plans, at least in this sample. Individuals may be either self-selecting based on their health status or due to availability of plan choices, especially for those employed in small businesses.

As in previous studies (Holder and Blose 1991; Parthasarathy et al. 2001), all three groups showed an increase in service use in the 6 months immediately prior to SU treatment entry compared to the earlier 12- to 6-month period. This increase is likely because outpatient SU treatment is often initiated following a critical event leading to ED use or hospitalization. However, we found that the differences between those with deductibles and those without deductibles narrowed immediately prior to SU treatment entry. Furthermore, the sign and magnitude of the interaction effect suggests that the low-deductible group had a steeper increase in inpatient length of stay, whereas the HDHP group had steeper increases in ED and inpatient use compared to those with no deductible. These steeper increases in utilization may provide some support for the argument that SU patients with deductibles delayed seeking treatment for SU problems more so than those without deductibles.

Overall, medical costs were lower for those with deductibles compared to those without deductibles. Significantly lower inpatient costs for the low-deductible group and lower ED, psychiatry and PC costs for the HDHP group compared to those without deductibles was as expected. The increase in ED and inpatient cost between the two 6-month periods were not significant. This may be due to the deductible groups being younger and healthier in general but having an event that resulted in ED care. We note that findings from cost analyses do not always show corresponding differences as those observed in utilization analyses due to the greater variability in cost distributions (Parthasarathy et al. 2001). Although modest, the cost findings offers new insight to

SU health services research. We typically expect HDHPs to have a stronger (negative) impact on SU patients than those with other chronic conditions such as diabetes and hypertension where seeking medical treatment is not as sensitive to deductible levels. As such, it is encouraging to note that despite deductibles, individuals do seem to receive treatment for their SU problems when prompted by a critical need. It is particularly striking that the HDHP group had a steeper increase in PC utilization and costs compared to the no deductible group. This may hint at escalating comorbid health issues that may be directly or indirectly related to their SU.

Analyses of SU treatment utilization and cost provide further understanding of service use patterns by deductible levels. In the 6 months after treatment entry, all the deductible groups have similar rates of SU treatment utilization and cost. This suggests that once SU problems reach a critical stage that necessitates treatment initiation, services use patterns are not only determined by deductible levels.

Limitations

Self-selection is an important element of patient choice, particularly in the context of current health policy, and this observational study cannot establish causality. Nevertheless, observational studies often are the only feasible study design when cost, effort and ethical considerations come into play (Berger 2011). We have addressed confounding, consistency and generalizability—main concerns in leveraging observational studies for health policy decisions—in our multivariate analyses. Our models controlled for demographic and comorbidity differences in comparing service use patterns between HDHPs and non-HDHPs. Our findings regarding differences between the two groups are consistent with the literature on individuals with and without deductibles. Availability of choice in benefit plans may also confound findings and we do not have information on whether individuals had a choice of plans. We tried to put our results into context by examining services use and adjusting for employer group size as small groups may not have access to the same portfolio of benefit plans that large groups have.

Policy Implications

Findings suggest that among those entering SU treatment, having deductible plans may be related to how services are utilized prior to entering specialty SU services. The lower utilization and costs among deductible plan members

followed by a steeper increase leading up to treatment entry might suggest “delayed treatment,” although we cannot rule out that they may have been healthier, and did not need treatment. PC services use patterns suggest an opportunity for early identification and referral to specialty SU treatment, but high deductibles may act as a barrier to seeking needed care for SU problems in a timely manner. In addition to individual health consequences, this has important cost implications for health systems and for high-value benefit designs. The ACA is expected to increase enrollment of patients with SU disorders who need services into health systems, but this increased access may be tempered by the high deductibles included in the plans on the state exchanges. This study is timely and relevant for understanding the interplay between increasing access to SU treatment and high out-of-pocket expenses. Study findings will inform future research examining the success of the ACA in meeting its goal of improving overall health care access and in particular for SU patients. While this study did not see an effect on SU treatment, as patients’ share of the costs continue to grow, more research is critical for understanding to what extent the essential benefits and other mechanisms to improve access for individuals with SU problems post-ACA and parity legislation are fully realized. In addition, while SU outcomes were not available in this study, the impact of HDHPs on SU outcomes is an important question for future research.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article:

Appendix SA1: Author Matrix.