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Choice of high-deductible health plans among enrollees with a substance use disorder

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Abstract

Introduction: High-deductible health plans (HDHPs) expose enrollees to increased out-of-pocket costs for their medical care, which can exacerbate the undertreatment of substance use disorders (SUDs). However, the factors that influence whether an enrollee with SUD chooses an HDHP are not well understood. In this study, we examine the factors associated with an individual with an SUD's decision to enroll in an HDHP.

Methods: Using de-identified administrative commercial claims and enrollment data from OptumLabs (2007–2017), we identified individuals at employers offering at least one HDHP and one non-HDHP plan. We modeled whether an enrollee chose an HDHP using linear regression on plan and enrollee demographic characteristics. Key plan characteristics included whether a plan had a health savings account (HSA) or a health reimbursement arrangement (HRA). Key demographic variables included age, race/ethnicity, census block income range, census block highest educational attainment, and sex. We separately investigate new enrollment decisions (i.e., not previously enrolled in an HDHP) and re-enrollment decisions, as well as decisions among single enrollees and families of differing sizes. The study also adjusted models for additional plan

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characteristics, employer and year fixed effects, and census division. Robust standard errors were clustered at the employer level.

Results: The sample comprised 30,832 plans and 318,334 enrollees. Among enrollees with new enrollment decisions, 24.6% chose an HDHP; 93.8% of HDHP enrollees chose to re-enroll in an HDHP. The study found the presence of a plan HRA to be associated with a higher probability of new and re-enrollment in an HDHP. We found that older enrollees with SUD were less likely to newly enroll in an HDHP, while enrollees who were non-White, living in lower-income census blocks, and living in lower educational attainment census blocks were more likely to newly enroll in an HDHP. Higher levels of health care utilization in the prior year were associated with a lower probability of newly enrolling in an HDHP but associated with a higher probability of re-enrolling.

Conclusion: Given the emerging evidence that HDHPs may discourage SUD treatment, greater HDHP enrollment could exacerbate health disparities.

1. Introduction

The United States continues to face a drug crisis, with more than 20 million Americans living with a substance use disorder (SUD) (SAMHSA, 2021). The crisis is worsened because less than 10% of individuals with SUD receive needed treatment (SAMHSA, 2021). While various nonfinancial factors influence this treatment gap (e.g., stigma), financial factors, including cost exposure from inadequate insurance coverage, is the most commonly cited barrier to treatment for those that self-identified a need for treatment (SAMHSA, 2021).

High-deductible health plans (HDHPs), which require enrollees to pay the full cost of their health care until the plan deductible is met, have concurrently surged in prevalence (Cohen & Zammiti, 2018). While HDHPs may reduce spending via price shopping in some instances (Zhang et al., 2018), they often result in a reduction in the use of necessary health care services, including preventive care measures and medication adherence (Agarwal, Mazurenko, & Menachemi, 2017; Brot-Goldberg, Chandra, Handel, & Kolstad, 2017; Eisenberg, Matthew D., Haviland, Mehrotra, Huckfeldt, & Sood, 2017; Haviland, Eisenberg, Mehrotra, Huckfeldt, & Sood, 2016). Among families where a member has a chronic condition, HDHP enrollment was found to be associated with delayed or forgone care due to costs (Galbraith et al., 2012). Evidence-based and effective treatment for SUD involves treatment in a chronic disease framework (McLellan, Lewis, O'Brien, & Kleber, 2000), including consistent engagement with the health care system (National Academies of Sciences, Engineering and Medicine, 2019). As such, the HDHP design may interfere with successful initiation and retention in SUD treatment. In fact, emerging evidence indicates that HDHPs are associated with lower utilization of SUD treatment among enrollees with SUD in single coverage and family plans (Eisenberg, M. D. et al., 2022; Meiselbach et al., 2022; Morgan et al., 2022; Schilling et al., 2022).

Despite the concerning evidence thus far that HDHPs may exacerbate the undertreatment of SUD, we know little about the characteristics that may lead an individual with SUD to enroll in an HDHP. Prior work among commercially insured populations has shown that health status, sex, race, and educational attainment are associated with the type of

insurance policies selected by individuals and families (Kullgren, Volpp, & Polsky, 2013; Lave, Men, Day, Wang, & Zhang, 2011a; McDevitt et al., 2014). Further, the choice of whether to enroll in an HDHP may differ between individuals selecting single coverage and those selecting family coverage (Parente, Feldman, & Christianson, 2004). Selection into HDHPs may also occur, in which individuals with better underlying health and lower health care utilization are more likely to select this plan design when offered a choice (Abdus, 2020; Lave et al., 2011a; McDevitt et al., 2014). Consistent with this evidence, research has found a prior psychiatric diagnosis to be associated with choice of enrollment in the lowest deductible plan offered (Keller, Xu, Azocar, & Ettner, 2020). Among enrollees with an SUD specifically, those with high deductible plans are more likely to be younger and have fewer comorbidities than those without deductibles (Parthasarathy & Campbell, 2016). Building on this past literature, this article seeks to understand the role of demographic characteristics, past enrollment decisions, and prior health care utilization in influencing the choice of an HDHP among enrollees with an SUD.

In this article, we examine the characteristics of HDHP choice among privately insured enrollees with an SUD. We investigate the role of demographic characteristics, such as age and family size, and health care utilization in the year prior to enrollment decision. First, we examine factors associated with new enrollment into an HDHP (i.e., individuals not previously enrolled in an HDHP) as opposed to re-enrollment in an HDHP. Then, we examine new enrollment and re-enrollment decisions stratified by family size to assess if distinct factors are associated with the choice of an HDHP among singles compared to couples and families with three or more enrollees.

2. Materials and methods

2.1. Data

We used de-identified administrative claims data from the Optum Labs Data Warehouse for 2007 to 2017 (OptumLabs, 2021). These data include benefit design information, enrollment and demographic information, blinded employer identifiers, as well as medical and pharmacy administrative claims data. The study used blinded employer identifiers, coupled with benefit design information, to identify the unique set of plans that employers offered. In addition, the data included group plan identifiers that allowed us to link policyholders with spouses and/or dependents enrolled in the same plan.

2.2. Study sample

Our study inclusion criteria required enrollees to receive coverage from an employer that offered at least one HDHP and non-HDHP plan option in a year.

We identified enrollees at employers offering HDHPs in two steps. First, we limited our sample of enrollees to those between the ages of 18 and 64 years with at least two years with 11 months in each year of continuous medical, pharmacy, and behavioral health benefit enrollment with valid benefit design data. Next, we calculated enrollment among these enrollees in plans offered by the employer in a given year and included employers with between 5% to 95% enrollment in HDHPs. The minimum threshold of 5% ensured that the

employer offered an HDHP with meaningful enrollment, while the maximum threshold of 95% ensured that non-HDHP plans had meaningful enrollment. Following methods in prior research, we designated plans as HDHPs if they exceeded the deductible threshold set by the IRS for family plans (e.g., \$2,700 in 2017, averaging \$2,427 over study period) (Eisenberg, M. D. et al., 2022; IRS, 2018; Kennedy-Hendricks et al., 2022; Schilling et al., 2022).

We then identified individuals with SUDs among employers offering HDHPs. To identify individuals with an SUD, we required at least one claim associated with an SUD diagnosis in any diagnostic code position (Barry et al., 2015; Busch, Frank, Lehman, & Greenfield, 2006; Eisenberg, M. D. et al., 2022; Schilling et al., 2022). Given the chronic nature of SUD and its underdiagnosis and undertreatment (Barry, Epstein, Fiellin, Fraenkel, & Busch, 2016; McLellan et al., 2000; SAMHSA, 2018; Schuckit, 2016), the study included individuals in the SUD sample for all subsequent years following the initial diagnosis. SUD diagnosis codes included International Classification of Diseases, Ninth Revision, Clinical Modification (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).

2.3. Measures

The key outcome variable in this study was a binary indicator for whether an individual chose an HDHP among the plans that were offered by their employer. We further categorized this measure into new enrollment or re-enrollment decisions. A new enrollment decision included enrollment in an HDHP after no observed enrollment in an HDHP in prior years. The study defined a re-enrollment decision as enrollment in an HDHP following enrollment in an HDHP in the year prior.

The independent variables of interest include HDHP and non-HDHP plan characteristics, enrollee demographic characteristics, and enrollee health care utilization in the previous year. The key plan characteristics of interest were whether the plan was associated with a health savings account (HSA), with a health reimbursement arrangement (HRA), or with neither. Both HSAs and HRAs allow enrollees to pay for health expenditures with pre-tax dollars and are an associated tax benefit of HDHPs. Employers and individuals can contribute to HSAs, which are owned by individuals to be used to pay for health expenditures. HRAs, on the other hand, are employer-funded, can only be used to reimburse the enrollee after they have incurred a qualified medical expense, and can no longer be used after an enrollee leaves the employer. Key enrollee characteristics of interest included documented age (12–18, 18–26, 27–34, 35–44, 45–54, and 55–64), race/ethnicity (Asian, Black, Hispanic, White, or Unknown), Census block income range (<\$40k, \$40–75k, \$75–125k, \$125–200k), Census block highest educational attainment (less than high school, high school, some college, bachelors or more), family size based on the number of covered lives in a policy (single, family of 2, family of 3 or more), and sex (male, female).

Health care utilization measures included 1) whether enrollees had any SUD-related hospitalizations or emergency department (ED) visits in the prior year, 2) whether enrollees had any non-SUD-related hospitalizations or ED visits in the prior year, and 3) the total level of out of pocket expenditures they had in the previous year, not just out of pocket

expenditures related to SUD. SUD-related ED visits were those with a primary diagnosis for an SUD, as defined above, or a diagnosis of an overdose. SUD-related hospitalizations were those with at least 50% of hospital facility claims with a diagnosis for SUD (as specified above) or a diagnosis of an overdose (ICD-9-CM codes 965.00–965.02, 965.09, E850.0–E850.2, and ICD-10-CM codes T40.0–T40.4). Non-SUD-related ED visits and hospitalizations comprised the remaining ED visits and hospitalizations to avoid double-counting. Total out-of-pocket expenditures were summed across all health care settings. In families, out-of-pocket costs were summed across all members. We then calculated the quantile of out-of-pocket expenditures for each enrollee to include in the regression models described below.

2.4. Statistical analysis

First, we present unadjusted descriptive plan characteristics and enrollee characteristics. Plan characteristics were summarized at the plan level, stratified by non-HDHP and HDHP. We summarized enrollee characteristics at the enrollee level, stratified by enrollees who chose a non-HDHP and those who chose a HDHP. For binary and categorical variables, we calculated the count for each and percent of the total sample that it represents. For continuous measures, we calculated the median and interquartile range (IQR).

We then estimated linear probability models to model the binary choice of whether an individual selects an HDHP. We implement linear probability models, as opposed to a nonlinear specification, for ease of interpretation and computational efficiency. We display coefficients along with 95% confidence intervals. Separately, we estimated new enrollment decisions among individuals not previously enrolled in an HDHP, and re-enrollment decisions among individuals enrolled in an HDHP in the prior year. We then stratified the new enrollment and re-enrollment decisions by family sizes of singles, families of two, and families of three or more, based on the number of individuals enrolled in the policy. In addition to the key independent variables referenced in the previous section, we also controlled for employer and year fixed effects, enrollee Census division and additional plan characteristics, including plan funding (fully insured, self-insured), coinsurance rates and copays, and out-of-pocket maxima for both the offered HDHP and non-HDHP plans. Where enrollees were offered multiple HDHPs or multiple non-HDHPs, we averaged plan characteristics across all the plans offered. Robust standard errors were clustered at the employer level. In a sensitivity analysis, we replicated our main regression analysis only among a sample of policyholders, excluding other family members from the regression analysis (Appendix 1).

3. Results

Table 1 displays unadjusted plan characteristics and enrollee characteristics, stratified by HDHP and non-HDHP plans and enrollees. The sample comprised 30,832 plans (15,322 non-HDHPs and 15,510 HDHPs) and 318,334 enrollees (202,676 who did not choose an HDHP and 107,568 who chose an HDHP). The median deductible for HDHPs was \$2,000 (IQR = \$1,500–2,850) compared to \$500 (IQR = \$300–1,000) for non-HDHPs. Median coinsurance rates across all services were similar across HDHPs and non-HDHPs (median

= 20), while non-HDHPs were more likely to have copays for office visits, specialist visits, and urgent care. Most HDHPs had either an associated HRA (7.7%) or HSA (55.5%).

Among enrollees with an SUD offered an HDHP (and at least one other plan) by their employer, 33.7% chose to enroll in an HDHP. Enrollee characteristics were similar overall between those who chose an HDHP compared to those who did not. However, the study did find some exceptions. A higher proportion of HDHP enrollees were Black (10.5% of HDHP enrollees vs. 8.7% of non-HDHP enrollees, p -value < 0.001), whereas a lower proportion were White (69.5% vs. 71.4%, p -value < 0.001). HDHP enrollees were also more likely to be in the lowest income category of <\$40k (16.2% vs. 14.8%, p -value < 0.001) and were more likely to be enrolled in single coverage (30.9% vs. 27.6%, p -value < 0.001). Non-HDHP enrollees had slightly higher rates of hospitalization or ED visits in the previous year for both SUD-related stays/visits (5.3% vs. 5.0%, p -value < 0.001) and non-SUD related stays/visits (33.3% vs. 29.7%, p -value < 0.001).

In Table 2, we assessed the characteristics associated with the decision to enroll in an HDHP for enrollees making a new HDHP enrollment decision vs. a re-enrollment decision. Among 263,086 enrollees with a new enrollment decision, 24.6% chose the HDHP. Among 45,304 enrollees with a re-enrollment decision, 93.8% chose to re-enroll in the HDHP. The study found the presence of an HRA, as opposed to no HSA or HRA, to be significantly associated with a 4.9 percentage point (p.p.) higher probability of newly enrolling in an HDHP (95% confidence interval [CI] = 3.4, 6.3) and a 16.6 p.p. higher probability of re-enrolling in an HDHP (95% CI = 14.5, 18.7).

Older enrollees were less likely to newly enroll in an HDHP monotonically across age categories (i.e., enrollees ages 55–64 were least likely to newly enroll in an HDHP, followed by 45–54, 35–44, 27–34, and 18–26). The study did not find age to be significantly associated with the choice to re-enroll in an HDHP, however. Compared to White enrollees, Asian, Black, and Hispanic enrollees were more likely to newly enroll in an HDHP; on the other hand, only Asian enrollees were more likely than White enrollees to re-enroll, with marginal statistical significance (1.3 p.p., 95% CI = -0.2, 2.8). For new enrollment decisions, higher income levels (relative to incomes <\$40) and higher levels of educational attainment (relative to less than a high school degree) in an enrollee's area were associated with a lower probability of choosing an HDHP. For re-enrollment decisions, higher income categories were associated with a lower probability of choosing an HDHP, but education was not associated with the decision. Similarly, women and families with more enrollees were less likely to newly enroll in an HDHP, whereas neither was associated with re-enrollment in an HDHP. We found regression estimates to be similar in a sample that only included the policyholder for each family in the analysis (Appendix 1).

For enrollees making a new HDHP enrollment decision, health care utilization in the previous year was associated with a lower probability of selecting an HDHP. Having an SUD-related ED visit or hospitalization was associated with a 5.6 p.p. lower probability of selecting an HDHP (95% CI = -6.2, -4.9) while having a non-SUD-related ED visit or hospitalization was associated with a 4.7 p.p. lower probability of selecting an HDHP (95% CI = -5.1, -4.4). Similarly, higher levels of out-of-pocket expenditures in the previous

year were associated with a lower probability of newly enrolling in an HDHP. In contrast, for enrollees making a re-enrollment decision, higher levels of health care utilization were positively associated with the decision to enroll in an HDHP. Having a non-SUD-related ED visit or hospitalization was associated with a 0.7 p.p. higher probability of selecting an HDHP (95% CI = 0.2, 1.2), as were higher levels of out-of-pocket expenditures in the prior year.

Table 3 stratifies new enrollment decisions by family size. The presence of HRAs was found to be positively associated with the decision to enroll in an HDHP across all family sizes (4.1 p.p. [95% CI: 1.1, 7.1], 3.1 p.p. [0.1, 6.2], 6.1 p.p. [4.1, 8.1] in singles, families of two, and families of 3+, respectively), whereas HSAs were only positively associated with the decision among single coverage enrollees (2.6 p.p. [95% CI: 1.4, 5.0]). The study observed similar patterns across age, race, and income categories, where older enrollees, White enrollees (relative to Asian, Black, and Hispanic enrollees), and enrollees in higher income areas were less likely to enroll in an HDHP. Among single enrollees, higher educational attainment in an enrollee's area and female sex were associated with a lower probability of selecting an HDHP, whereas these characteristics were not associated with the HDHP enrollment decision among families. Across all family sizes, a greater degree of health care utilization in the prior year was associated with a lower probability of selecting an HDHP.

Table 4 stratifies re-enrollment decisions by family size. A strong relationship continued between the presence of an HRA and the decision to re-enroll in an HDHP across all family sizes. When stratified by family size, the age and education level of the individual enrollee were not associated with the decision to re-enroll in an HDHP. Race/ethnicity also generally was not associated with the decision to re-enroll, except among families of two, in which Hispanic enrollees were found to be 3.1 p.p. more likely to re-enroll in an HDHP (95% CI = 1.1, 5.1). Higher levels of income in an enrollee's area were associated with a lower probability of re-enrolling among single enrollees, but not in families with multiple enrollees. Compared to families of three, families of four were 0.9 p.p. more likely to re-enroll in an HDHP (95% CI = 0.2, 1.6). Female single enrollees were found to be 1.5 p.p. less likely to re-enroll in an HDHP (95% CI = -2.5, 0.5), whereas sex was not associated with the decision to re-enroll in families. Similar to the findings in Table 2, greater health care utilization in the previous year was positively correlated with the decision to re-enroll in an HDHP. Across all family size stratifications, having a non-SUD-related ED visit or hospitalization and higher levels of out-of-pocket costs were associated with a greater probability of HDHP re-enrollment.

4. Discussion

This study examined the factors related to the decision to enroll in an HDHP among individuals with an SUD. We found that older enrollees with SUD were less likely to newly enroll in an HDHP, while enrollees that were not White, lived in lower income census blocks, and those who lived in lower educational attainment census blocks were more likely to newly enroll in an HDHP. Higher levels of health care utilization in the prior year were associated with a lower probability of newly enrolling in an HDHP, whereas conversely, greater health care utilization in the prior year was associated with a higher probability of

re-enrolling in an HDHP. We found this to be consistent across different family sizes, based on the number of enrollees covered under the same policy.

We find that 33.7% of enrollees with SUD in our sample who were offered an HDHP by their employer chose to enroll in an HDHP, consistent with the roughly 30% of workers in general that are enrolled in HDHPs (Kaiser Family Foundation, 2022). Given the emerging evidence that HDHPs may discourage treatment among enrollees with SUD (Eisenberg, M. D. et al., 2022; Morgan et al., 2022; Schilling et al., 2022) and the undertreatment of SUD in general (SAMHSA, 2021), we must understand the characteristics of enrollees who choose to enroll in HDHPs. Our findings that non-White enrollees living in areas with lower average levels of educational attainment and income were more likely to newly enroll in an HDHP when it is offered to them could exacerbate documented disparities in access to SUD treatment (Cook & Alegría, 2011). Given the concerning implications of this finding, insurers, employers, and policymakers should consider approaches to mitigate the SUD treatment disincentives of HDHPs, such as zero-cost sharing policies for behavioral health (e.g., New Mexico Senate Bill 317, “No Behavioral Health Cost Sharing”) (Hickey & Steinborn, 2021).

The exposure to out-of-pocket costs introduced by HDHPs could also have a greater impact on lower income enrollees who may be more cost-sensitive, and thus may be more likely to forego health care in the face of these costs. Prior work examining a broader population of HDHP enrollees, however, has generally found income to be positively associated with the choice of an HDHP (Barry, Cullen, Galusha, Slade, & Busch, 2008; Bundorf, 2016; Lave, Men, Day, Wang, & Zhang, 2011b; Parente et al., 2004; Tollen, Ross, & Poor, 2004), though not in adjusted regressions examining family decisions (McDevitt et al., 2014). Further research should investigate why the opposite relationship exists among enrollees with SUD and if HDHPs have a disproportionate impact on the utilization of SUD treatment among enrollees with lower levels of income.

Consistent with prior evidence that enrollees with lower health care spending and use are less likely to enroll in HDHPs (Abdus, 2020; Keller et al., 2020; Lave et al., 2011a; McDevitt et al., 2014; Parthasarathy & Campbell, 2016), we found that higher out of pocket health care spending in the previous year was associated with a lower probability of selecting an HDHP. However, our study produces new evidence that the opposite is true for enrollees re-enrolling in an HDHP: those with higher levels of health care spending in the prior year were more likely to re-enroll. Multiple possible explanations for this exist. One explanation is that enrollees with higher health care utilization may have a greater degree of inertia in their choice of plans (Saltzman, Swanson, & Polsky, 2021). Inertia could be a result of inattention or hassle costs associated with switching, but also may be related to consumer preference for care continuity year to year (Drake, Ryan, & Dowd, 2022). Enrollees with SUD with greater health care utilization may have a stronger preference to remain enrolled in the same plan to maintain continuity in their coverage (e.g., consistent provider networks). We observe a very high re-enrollment rate in HDHPs (93.8% of those enrolled in an HDHP chose to reenroll), even among our sample of enrollees who were offered multiple plans, suggesting that inertia may be a major factor in an enrollee’s re-enrollment decision. Another possible explanation is that enrollees with the highest levels

of health care use may at first find the potential cost exposure from an HDHP to be discouraging, but after a year of enrollment may find that the reduced premiums and the availability of associated HSAs and HRAs actually make HDHPs more affordable than other options (Remler & Glied, 2006).

We also found consistent evidence that HRAs were associated with an increased probability of HDHP enrollment across new enrollment and re-enrollment decisions and across all family sizes. We did not find HSAs, on the other hand, to be strongly associated with the decision to enroll in an HDHP. HRAs are entirely employer-funded, whereas HSAs can include funds contributed by the employer and/or the employee (Aetna, 2009). Therefore, HRAs are more likely than HSAs to be employer funded, which may be attractive to enrollees. On the other hand, HSAs are owned by the individual and can be used to make long-term investments toward health expenditures with pre-tax dollars. However, our findings suggest that employer contribution to HRAs may be more salient than the long-term advantages of an HSA in enrollees with SUD.

This study is subject to limitations. First, the data we used in this study come from a single national insurer. While these data represent a large swath of commercially insured patients, we do not observe the presence of outside plan options that may be offered by the same employer under a different insurer. While we control for employer fixed effects that account for time-invariant differences in the plan options, we may not observe the characteristics in the full choice set for some enrollees. We also may not observe enrollees at employers in our sample who enrolled in plans offered under a different insurer. Relatedly, we do not observe health care utilization that is not covered by health insurance (e.g., self-pay treatment). Second, we are unable to precisely account for the premium contributions associated with each plan, which are likely to influence an individual's choice of plan. Instead, we control for all observable plan and geographic characteristics, with the goal of adjusting for differences in the premium contribution. However, other components are likely, such as provider networks and differences in employer contributions to premiums, for which we cannot control. Third, we estimated enrollee education attainment and income based off of the median levels in an enrollees' census block. While these characteristics are likely strongly correlated with enrollee characteristics over the study sample, the information may not align with an individual's true level of education and income in all cases. Finally, we define family sizes based on the number of covered lives enrolled in a policy. However, enrollees may have family members enrolled in other policies (e.g., those enrolled in a plan offered by a different employer).

5. Conclusion

Among enrollees with a SUD, enrollees that were non-White, resided in lower income census blocks, and resided in lower educational attainment census blocks were more likely to enroll in an HDHP. Given the emerging evidence that HDHPs may discourage SUD treatment, greater enrollment in HDHPs among these groups that already face greater hurdles to SUD treatment access could exacerbate health inequities.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights:

- HRAs strongly associated with HDHP enrollment in enrollees with SUD
- Non-White and lower education/income enrollees with SUD more likely to choose HDHP
- Prior health care use linked with less new enrollment, more re-enrollment in HDHP
- HDHPs could exacerbate health disparities in SUD treatment

Table 1:

Unadjusted Descriptive Characteristics of High-Deductible Health Plans (HDHP) vs. Non- HDHPs and Enrollees, 2007–2017

Panel A: Plan characteristics			
	Non-HDHP (N=15,322)	HDHP (N=15,510)	
	500 (300, 1000)	2,000	
Deductible level (\$), median (IQR)		(1,500, 2,850)	
In-network coinsurance level (%), median (IQR)	20 (10, 20)	20 (0, 20)	
In-network copay, ER (\$), median (IQR)	0 (0, 0)	0 (0, 0)	
In-network copay, office visit (\$), median (IQR)	150 (100, 200)	0 (0, 150)	
In-network copay, specialist (\$), median (IQR)	20 (20, 25)	0 (0, 25)	
In-network copay, urgent care (\$), median (IQR)	30 (20, 40)	0 (0, 30)	
Out-of-network coinsurance level (%), median (IQR)	50 (35, 75)	0 (0, 50)	
Out-of-network deductible (\$), median (IQR)	60 (50, 70)	60 (50, 70)	
Out-of-network OOP maximum (\$), median (IQR)	1,000 (500, 2,000)	4,000 (3,000, 5,000)	
HRA/HSA, n (%)			
HRA	0 (0.0%)	1,198 (7.7%)	
HSA	0 (0.0%)	8,614 (55.5%)	
No HRA/HSA	15,322 (100.0%)	5,698 (36.7%)	
Panel B: Documented enrollee demographics			
	Did not choose HDHP (N=202,676)	Chose HDHP (N=107,568)	Row % that Chose HDHP
Documented age, n (%)			
Age 18–26	54,310 (26.8%)	30,245 (28.1%)	35.8%
Age 27–34	24,738 (12.2%)	14,155 (13.2%)	36.4%
Age 35–44	39,540 (19.5%)	20,292 (18.9%)	33.9%
Age 45–54	46,696 (23.0%)	24,012 (22.3%)	34.0%
Age 55–64	37,392 (18.4%)	18,864 (17.5%)	33.5%
Documented race/ethnicity, n (%)			
Asian	4,065 (2.0%)	2,230 (2.1%)	35.4%
Black	17,556 (8.7%)	11,268 (10.5%)	39.1%
Hispanic	18,483 (9.1%)	9,793 (9.1%)	34.6%
White	144,749 (71.4%)	74,786 (69.5%)	34.1%
Unknown	17,823 (8.8%)	9,491 (8.8%)	34.7%
Income			
<\$40k	29,949 (14.8%)	17,410 (16.2%)	36.8%
\$40-\$75k	52,432 (25.9%)	26,938 (25.0%)	33.9%
\$75k-\$125k	57,382 (28.3%)	28,936 (26.9%)	33.5%
\$125k-\$200k	31,650 (15.6%)	16,694 (15.5%)	34.5%
>\$200k	23,034 (11.4%)	12,754 (11.9%)	35.6%
Unknown	8,229 (4.1%)	4,836 (4.5%)	37.0%

Panel A: Plan characteristics

Education			
Less than high school	1,151 (0.6%)	738 (0.7%)	39.1%
High school	52,688 (26.0%)	28,356 (26.4%)	35.0%
Some college	108,519 (53.5%)	56,581 (52.6%)	34.3%
Bachelors or more	39,927 (19.7%)	21,639 (20.1%)	35.1%
Unknown	391 (0.2%)	254 (0.2%)	39.4%
Number of family members, n (%)			
1	55,991 (27.6%)	33,279 (30.9%)	37.3%
2	45,392 (22.4%)	21,663 (20.1%)	32.3%
3	34,583 (17.1%)	18,142 (16.9%)	34.4%
4	38,855 (19.2%)	20,194 (18.8%)	34.2%
5	18,133 (8.9%)	9,609 (8.9%)	34.6%
6	9,722 (4.8%)	4,681 (4.4%)	32.5%
Any SUD-related hospitalization or ED visit in year prior to choice, n (%)	10,839 (5.3%)	5,400 (5.0%)	33.3%
Any non-SUD-related hospitalization or ED visit in year prior to choice, n (%)	67,523 (33.3%)	31,993 (29.7%)	32.1%
Quartile of total out of pocket costs in previous year, n (%)			
First	47,794 (23.6%)	30,284 (28.2%)	38.8%
Second	57,565 (28.4%)	20,383 (18.9%)	26.1%
Third	53,447 (26.4%)	24,031 (22.3%)	31.0%
Fourth	43,870 (21.6%)	32,870 (30.6%)	42.8%

Notes: Includes plan characteristics, stratified between non-HDHPs and HDHPs, and enrollee characteristics, stratified between enrollees that did not choose an HDHP and did choose an HDHP. All measures were constructed from the OptumLabs Data Warehouse for the years 2007 to 2017.

Table 2:

Predictors of HDHP Choice among Enrollees Offered HDHP and Non-HDHP Plans Overall, New Enrollment, and Re-Enrollment Decisions, 2007–2017

	(1) New enrollment	(2) Re-enrollment
Characteristics of HDHPs HSA/HRA (reference = no HSA/HRA)		
HSA	0.00605 (−0.00614, 0.01825)	0.00733 (−0.01324, 0.02790)
HRA	0.04861 *** (0.03393, 0.06328)	0.16624 *** (0.14520, 0.18728)
Documented enrollee demographics Age (reference = 18–26)		
27–34	−0.05858 *** (−0.06781, −0.04936)	−0.00055 (−0.01709, 0.01599)
35–44	−0.09475 *** (−0.10399, −0.08551)	0.00982 (−0.00673, 0.02637)
45–54	−0.11255 *** (−0.12178, −0.10332)	0.01143 (−0.00507, 0.02792)
55–64	−0.13112 *** (−0.14055, −0.12169)	0.01486 * (−0.00184, 0.03157)
Race/Ethnicity (reference = White)		
Asian	0.02131 *** (0.01106, 0.03156)	0.01296 * (−0.00237, 0.02829)
Black	0.02151 *** (0.01630, 0.02672)	0.00164 (−0.00618, 0.00946)
Hispanic	0.00777 *** (0.00250, 0.01303)	0.00274 (−0.00579, 0.01127)
Unknown	0.00016 (−0.00506, 0.00537)	0.00667 * (−0.00081, 0.01414)
Income (reference = <\$40k)		
\$40–\$75k	−0.01564 *** (−0.02029, −0.01099)	−0.00402 (−0.01123, 0.00319)
\$75k–\$125k	−0.01800 *** (−0.02282, −0.01318)	−0.00926 ** (−0.01667, −0.00186)
\$125k–\$200k	−0.01057 *** (−0.01626, −0.00488)	−0.00613 (−0.01469, 0.00243)
>\$200k	−0.00642 * (−0.01304, 0.00020)	−0.00013 (−0.00990, 0.00963)
Unknown	0.00746 * (−0.00053, 0.01546)	−0.01079 * (−0.02344, 0.00186)
Education (reference = less than high school)		
High school	−0.03927 *** (−0.05769, −0.02085)	0.02336 (−0.00769, 0.05441)
Some college	−0.04183 *** (−0.06024, −0.02341)	0.02357 (−0.00751, 0.05464)
Bachelors or more	−0.03434 *** (−0.05311, −0.01556)	0.02584 (−0.00566, 0.05735)
Unknown	−0.03783 ** (−0.07528, −0.00038)	0.03307 (−0.01965, 0.08579)
Family size (reference = 1)		
2	−0.01072 *** (−0.01542, −0.00602)	0.00362 (−0.00370, 0.01093)
3	−0.00518 * (−0.01039, 0.00003)	−0.00364 (−0.01159, 0.00430)
4	−0.00033 (−0.00561, 0.00495)	0.00582 (−0.00228, 0.01392)
5	0.00089 (−0.00552, 0.00731)	0.00361 (−0.00606, 0.01328)
6+	−0.01042 ** (−0.01837, −0.00246)	0.00333 (−0.00879, 0.01546)
Sex (reference = Male)		
Female	−0.00544 *** (−0.00844, −0.00244)	−0.00296 (−0.00747, 0.00156)

	(1) New enrollment	(2) Re-enrollment
Unknown	0.42117 ^{***} (0.14898, 0.69336)	0.02223 (-0.28779, 0.33225)
Health care utilization in year prior to choice		
SUD-related hospitalization or ED	-0.05579 ^{***} (-0.06229, -0.04929)	0.00192 (-0.00543, 0.00926)
Non-SUD-related hospitalization or ED	-0.04744 ^{***} (-0.05101, -0.04387)	0.00709 ^{***} (0.00230, 0.01188)
Quartile of total out of pocket costs in previous year (reference = first)		
Second	-0.12004 ^{***} (-0.12435, -0.11572)	0.04041 ^{***} (0.03092, 0.04990)
Third	-0.09662 ^{***} (-0.10131, -0.09192)	0.02859 ^{***} (0.01905, 0.03814)
Fourth	-0.05654 ^{***} (-0.06178, -0.05131)	0.02667 ^{***} (0.01693, 0.03642)
Observations	263,086	45,304
R-squared	0.28941	0.18839

Notes: The relationship between the choice of an HDHP and plan and enrollee characteristics using a linear probability model are shown, with coefficients and 95% confidence intervals in parentheses. We separately estimate new enrollment decisions among enrollees with no previous enrollment in an HDHP and re-enrollment decisions among enrollees enrolled in an HDHP in the previous year. In addition to displayed characteristics, models also control for employer and year fixed effects, the enrollee's Census division and additional plan characteristics, including plan funding (fully insured, self-insured), coinsurance rates and copays, and out-of-pocket maxima for both the offered HDHP and non-HDHP plans. Robust standard errors are clustered at the employer level.

^{***}
p<0.01,

^{**}
p<0.05,

^{*}
p<0.1.

Table 3:

Predictors of New HDHP Choice among Enrollees Offered HDHP and Non-HDHP Plans by Family Size, 2007–2017

	(1) Single	(2) Family of 2	(3) Family of 3+
Characteristics of HDHPs			
HSA/HRA (reference = no HSA/HRA)			
HSA	0.02572 ^{**} (0.00137, 0.05007)	-0.01957 (-0.04413, 0.00500)	0.01067 (-0.00640, 0.02773)
HRA	0.04089 ^{***} (0.01118, 0.07060)	0.03143 ^{**} (0.00105, 0.06182)	0.06099 ^{***} (0.04102, 0.08095)
Documented enrollee demographics Age (reference = 18–26 for single)			
27–34	-0.05597 ^{***} (-0.06794, -0.04401)	-0.02558 ^{**} (-0.05002, -0.00115)	-0.02799 ^{**} (-0.05044, -0.00554)
35–44	-0.10359 ^{***} (-0.11592, -0.09127)	-0.04977 ^{***} (-0.07406, -0.02549)	-0.04495 ^{***} (-0.06770, -0.02220)
45–54	-0.12176 ^{***} (-0.13414, -0.10938)	-0.07358 ^{***} (-0.09756, -0.04960)	-0.06212 ^{***} (-0.08498, -0.03926)
55–64	-0.14528 ^{***} (-0.15801, -0.13254)	-0.09038 ^{***} (-0.11440, -0.06635)	-0.05925 ^{***} (-0.08294, -0.03557)
Race (reference = White)			
Asian	0.00708 (-0.01281, 0.02698)	-0.01173 (-0.03545, 0.01198)	0.03721 ^{***} (0.02321, 0.05121)
Black	0.02789 ^{***} (0.01840, 0.03737)	0.02775 ^{***} (0.01698, 0.03852)	0.00891 ^{**} (0.00112, 0.01670)
Hispanic	0.02053 ^{***} (0.01056, 0.03049)	0.01609 ^{***} (0.00435, 0.02783)	-0.00290 (-0.01035, 0.00454)
Unknown	-0.00251 (-0.01277, 0.00776)	0.01070 [*] (-0.00043, 0.02183)	-0.00084 (-0.00811, 0.00644)
Income (reference = <\$40k)			
\$40–\$75k	-0.01464 ^{***} (-0.02261, -0.00667)	-0.01663 ^{***} (-0.02621, -0.00704)	-0.01041 ^{***} (-0.01776, -0.00305)
\$75k–\$125k	-0.02561 ^{***} (-0.03432, -0.01690)	-0.01466 ^{***} (-0.02462, -0.00469)	-0.00803 ^{**} (-0.01542, -0.00064)
\$125k–\$200k	-0.01711 ^{***} (-0.02851, -0.00572)	-0.02149 ^{***} (-0.03350, -0.00948)	0.00103 (-0.00725, 0.00931)
>\$200k	-0.02406 ^{***} (-0.03895, -0.00917)	-0.00801 (-0.02298, 0.00695)	-0.00062 (-0.00980, 0.00856)
Unknown	0.01463 ^{**} (0.00072, 0.02854)	0.02357 ^{***} (0.00570, 0.04145)	-0.00292 (-0.01490, 0.00906)
Education (reference = < high school)			
High school	-0.04509 ^{***} (-0.07488, -0.01530)	-0.02779 (-0.06685, 0.01127)	-0.02557 [*] (-0.05577, 0.00464)
Some college	-0.05260 ^{***} (-0.08240, -0.02280)	-0.02488 (-0.06396, 0.01420)	-0.02554 [*] (-0.05572, 0.00465)
Bachelors or more	-0.05031 ^{***} (-0.08091, -0.01970)	-0.02496 (-0.06492, 0.01500)	-0.01418 (-0.04479, 0.01644)
Unknown	-0.02801 (-0.11835, 0.06233)	-0.10650 ^{***} (-0.18459, -0.02841)	-0.00265 (-0.05335, 0.04804)
Family size (reference = 3)			

	(1) Single	(2) Family of 2	(3) Family of 3+
4			0.00542 ^{**} (0.00069, 0.01015)
5			0.00768 ^{**} (0.00179, 0.01358)
6			-0.00257 (-0.01004, 0.00489)
Sex (reference = Male)			
Female	-0.00845 ^{***} (-0.01474, -0.00215)	-0.00516 (-0.01142, 0.00110)	-0.00222 (-0.00645, 0.00201)
Unknown	0.54425 (-0.21424, 1.30274)	0.45276 ^{**} (0.05383, 0.85168)	0.28650 (-0.11870, 0.69169)
Health care utilization in year prior to choice			
SUD-related hospitalization or ED	-0.05078 ^{***} (-0.06672, -0.03485)	-0.04596 ^{***} (-0.06072, -0.03121)	-0.05784 ^{***} (-0.06584, -0.04984)
Non-SUD-related hospitalization or ED	-0.03391 ^{***} (-0.04171, -0.02612)	-0.04668 ^{***} (-0.05410, -0.03926)	-0.05145 ^{***} (-0.05619, -0.04670)
Quartile of total out of pocket costs in previous year (reference = first)			
Second	-0.12051 ^{***} (-0.12787, -0.11315)	-0.10258 ^{***} (-0.11173, -0.09342)	-0.12095 ^{***} (-0.12772, -0.11417)
Third	-0.09516 ^{***} (-0.10469, -0.08563)	-0.09383 ^{***} (-0.10362, -0.08403)	-0.09000 ^{***} (-0.09670, -0.08331)
Fourth	-0.09810 ^{***} (-0.11049, -0.08571)	-0.05728 ^{***} (-0.06824, -0.04632)	-0.04134 ^{***} (-0.04843, -0.03425)
Observations	76,173	57,520	129,393
R-squared	0.32588	0.33740	0.31472

Notes: The relationship between the choice of an HDHP and plan and enrollee characteristics using a linear probability model are shown, with coefficients and 95% confidence intervals in parentheses. We separately estimate new enrollment decisions among enrollees with single coverage, in family plans with two enrollees, and in family plans with three or more enrollees. In addition to displayed characteristics, models also control for employer and year fixed effects, the enrollee's Census division and additional plan characteristics, including plan funding (fully insured, self-insured), coinsurance rates and copays, and out-of-pocket maxima for both the offered HDHP and non-HDHP plans. Robust standard errors are clustered at the employer level.

^{***}
p<0.01,

^{**}
p<0.05,

^{*}
p<0.1.

Table 4:

Predictors of Re-Enrollment HDHP Choice among Enrollees Offered HDHP and Non-HDHP Plans by Family Size, 2007–2017

	(1) Single	(2) Family of 2	(3) Family of 3
Characteristics of HDHPs HSA/HRA (reference = no HSA/HRA)			
HSA	0.01214 (−0.02778, 0.05206)	−0.03443 (−0.07823, 0.00937)	0.00359 (−0.02551, 0.03270)
HRA	0.13262 ^{***} (0.08448, 0.18075)	0.17913 ^{***} (0.13485, 0.22342)	0.18426 ^{***} (0.15677, 0.21175)
Documented enrollee demographics			
Age (reference = 18–26)			
27–34	−0.00373 (−0.02565, 0.01818)	0.03019 (−0.01946, 0.07985)	0.00595 (−0.03712, 0.04901)
35–44	0.00712 (−0.01531, 0.02956)	0.02357 (−0.02636, 0.07350)	0.03354 (−0.01042, 0.07750)
45–54	0.01101 (−0.01130, 0.03332)	0.01734 (−0.03202, 0.06670)	0.03762 [*] (−0.00642, 0.08166)
55–64	0.01076 (−0.01192, 0.03344)	0.02112 (−0.02827, 0.07052)	0.04312 [*] (−0.00164, 0.08789)
Race (reference = White)			
Asian	0.01195 (−0.02160, 0.04551)	−0.01107 (−0.04947, 0.02733)	0.01800 [*] (−0.00185, 0.03784)
Black	−0.00782 (−0.02248, 0.00684)	0.00859 (−0.00821, 0.02539)	0.00681 (−0.00482, 0.01844)
Hispanic	−0.00271 (−0.01942, 0.01400)	0.03059 ^{***} (0.01093, 0.05025)	−0.00343 (−0.01560, 0.00875)
Unknown	0.00669 (−0.00940, 0.02279)	0.01054 (−0.00584, 0.02691)	0.00518 (−0.00485, 0.01522)
Income (reference = <\$40k)			
\$40–\$75k	−0.00752 (−0.02019, 0.00515)	−0.00576 (−0.02118, 0.00965)	−0.00080 (−0.01223, 0.01063)
\$75k–\$125k	−0.01502 ^{**} (−0.02891, −0.00113)	−0.00843 (−0.02420, 0.00733)	−0.00414 (−0.01544, 0.00716)
\$125k–\$200k	−0.00777 (−0.02580, 0.01027)	−0.01051 (−0.02948, 0.00846)	−0.00147 (−0.01378, 0.01085)
>\$200k	−0.02236 [*] (−0.04628, 0.00156)	0.00634 (−0.01661, 0.02930)	0.00470 (−0.00868, 0.01809)
Unknown	0.00303 (−0.02056, 0.02661)	−0.03114 ^{**} (−0.06034, −0.00194)	−0.01551 [*] (−0.03398, 0.00296)
Education (reference = < high school)			
High school	−0.01586 (−0.06803, 0.03631)	0.02458 (−0.04146, 0.09062)	0.04004 (−0.01299, 0.09307)
Some college	−0.00293 (−0.05528, 0.04941)	0.01670 (−0.04936, 0.08276)	0.03673 (−0.01629, 0.08974)
Bachelors or more	−0.00681 (−0.06036, 0.04674)	0.02726 (−0.04011, 0.09463)	0.03668 (−0.01673, 0.09009)
Unknown	−0.05128 (−0.18864, 0.08609)	0.03863 (−0.08191, 0.15916)	0.05487 (−0.01797, 0.12771)
Family size (reference = 3)			
4			0.00939 ^{***} (0.00255, 0.01624)
5			0.00755 [*] (−0.00097, 0.01606)
6			0.00792 (−0.00316, 0.01901)
Sex (reference = Male)			
Female	−0.01479 ^{***} (−0.02493, −0.00464)	0.00370 (−0.00613, 0.01354)	0.00214 (−0.00399, 0.00826)
Unknown		−0.00351 (−0.41730, 0.41028)	0.02165 (−0.39900, 0.44229)

	(1) Single	(2) Family of 2	(3) Family of 3
Health care utilization in year prior to choice			
SUD-related hospitalization or ED	-0.00252 (-0.02050, 0.01546)	-0.00735 (-0.02537, 0.01067)	0.00178 (-0.00720, 0.01076)
Non-SUD-related hospitalization or ED	0.01060* (-0.00032, 0.02152)	0.01238** (0.00185, 0.02291)	0.00427 (-0.00197, 0.01051)
Quartile of total out of pocket costs in previous year (reference = first)			
Second	0.01821** (0.00386, 0.03255)	0.04321*** (0.02132, 0.06511)	0.08398*** (0.06658, 0.10139)
Third	0.00435 (-0.01154, 0.02024)	0.03214*** (0.01047, 0.05381)	0.07035*** (0.05366, 0.08703)
Fourth	0.00651 (-0.01139, 0.02440)	0.02651** (0.00469, 0.04833)	0.06683*** (0.05038, 0.08329)
Observations	12,592	9,149	23,563
R-squared	0.26818	0.33056	0.21724

Notes: The relationship between the choice of an HDHP and plan and enrollee characteristics using a linear probability model are shown, with coefficients and 95% confidence intervals in parentheses. We separately estimate re-enrollment decisions among enrollees with single coverage, in family plans with two enrollees, and in family plans with three or more enrollees. In addition to displayed characteristics, models also control for employer and year fixed effects, the enrollee’s Census division and additional plan characteristics, including plan funding (fully insured, self-insured), coinsurance rates and copays, and out-of-pocket maxima for both the offered HDHP and non-HDHP plans. Robust standard errors are clustered at the employer level.

p<0.01,

**
p<0.05,

*
p<0.1.

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