

# UC Berkeley

## UC Berkeley Previously Published Works

### Title

The Effects of Three Kinds of Insurance Benefit Design Features on Specialty Mental Health Care Use in Managed Care.

### Permalink

<https://escholarship.org/uc/item/18g1j1bf>

### Journal

The Journal of Mental Health Policy and Economics, 22(2)

### ISSN

1091-4358

### Authors

Friedman, Sarah A  
Ettner, Susan L  
Chuang, Emmeline  
[et al.](#)

### Publication Date

2019-06-01

Peer reviewed



Published in final edited form as:

*J Ment Health Policy Econ.* 2019 June 01; 22(2): 43–59.

## The Effects of Three Kinds of Insurance Benefit Design Features on Specialty Mental Health Care Use in Managed Care

Sarah A. Friedman, Ph.D.<sup>1,\*</sup>, Susan L. Ettner, Ph.D.<sup>2</sup>, Emmeline Chuang, Ph.D.<sup>3</sup>, Francisca Azocar, Ph.D.<sup>4</sup>, Jessica M. Harwood, M.S.<sup>5</sup>, Haiyong Xu, Ph.D.<sup>6</sup>, Michael K. Ong, M.D., Ph.D.<sup>7</sup>

<sup>1</sup>Department of Health Policy and Management, Fielding School of Public Health, University of California, Los Angeles, CA; Division of General Internal Medicine and Health Services Research, Department of Medicine, David Geffen School of Medicine, University of California, Los Angeles, CA; School of Community Health Sciences, Division of Health Sciences, University of Nevada, Reno, NV, USA

<sup>2</sup>Department of Health Policy and Management, Fielding School of Public Health, University of California, Los Angeles, CA; Division of General Internal Medicine and Health Services Research, Department of Medicine, David Geffen School of Medicine, University of California, Los Angeles, CA, USA

<sup>3</sup>Department of Health Policy and Management, Fielding School of Public Health, University of California, Los Angeles, CA, USA

<sup>4</sup>Optum<sup>®</sup>, United Health Group, San Francisco, CA, USA

<sup>5</sup>Division of General Internal Medicine and Health Services Research, Department of Medicine, David Geffen School of Medicine, University of California, Los Angeles, CA, USA

<sup>6</sup>Division of General Internal Medicine and Health Services Research, Department of Medicine, David Geffen School of Medicine, University of California, Los Angeles, CA, USA

<sup>7</sup>Division of General Internal Medicine and Health Services Research, Department of Medicine, David Geffen School of Medicine, University of California, Los Angeles, CA; VA Greater Los Angeles Healthcare System, Los Angeles, CA, USA

### Abstract

**Background:** Insurance benefit features play a role in determining access to specialty mental health care. Previous research, primarily examining the effects of copayments, coinsurance, and deductibles in a fee-for-service setting, has concluded that specialty mental health use is highly sensitive to changes in financial requirements. Less is known about the effects of other benefit features and the effects of all of these features in a managed care environment.

**Aims of the Study:** Determine whether increased generosity of three types of benefit features was associated with increases in specialty mental health use and expenditures in a managed care setting. Secondary analyses investigated whether these associations varied by income level.

\* Correspondence to: Sarah A. Friedman, Ph.D., School of Community Health Sciences University of Nevada, Reno, 1664 North Virginia St, Reno, Nevada, 89557, USA. Tel. +1-775-784 1816, sfriedman@unr.edu.

**Methods:** A first-differences design used linked claims, enrollment, and benefit data for 1,242,949 non-elderly adults (aged 18–64) with employer-sponsored insurance, before (2009) and after (2011) national behavioral health parity implementation. The data were provided by a large national managed behavioral health organization. Benefit design features included combined cost sharing from copayment and coinsurance, deductibles, the presence of annual use limits, cost sharing penalties associated with services used without getting required prior-authorization, and provider network. Outcomes included visits/days, total expenditures and patient out-of-pocket expenditures for individual psychotherapy and inpatient use, with separate values for in-network and out-of-network (OON) service use. Ordinary least squares regression was performed on change scores (2011 minus 2009 values) of all outcomes to implement the first-differences study design and normalize distributions of otherwise heavily skewed (towards zero) variables. Regressions stratified by higher income ( $\geq \$75,000$ ) and net worth ( $\geq \$100,000$ ) and lower income/net worth were also conducted.

**Results:** For in-network individual psychotherapy, larger increases in cost sharing from copayment and coinsurance were modestly associated with larger decreases in use and total expenditures ( $\beta_{\text{visits}} = -0.00008$ ,  $p\text{-value} = 0.030$ ;  $\beta_{\text{total expenditures}} = -0.00629$ ,  $p\text{-value} = 0.011$ ), and elimination of treatment limits was associated with larger increases in use ( $\beta = 0.09637$ ,  $p\text{-value} = 0.002$ ) and total expenditures ( $\beta = \$6.57506$ ,  $p\text{-value} = 0.001$ ). These results were observed among all enrollees of plans that covered in-network and out-of-network plans and among a sub-set of these enrollees who did not change plans between 2009 and 2011. Benefit features had fewer associations with inpatient care and OON services.

**Discussion:** Elimination of limits was associated with small average increases in in-network individual psychotherapy utilization and expenditures. Cost sharing sensitivities of individual psychotherapy visits to financial requirements reported here were small, and resembled previous findings based in a managed care setting, which were smaller than findings based on the fee-for-service settings. Cost sharing may not pose a practical barrier to specialty behavioral health for non-elderly adults with employer-sponsored managed care plans. However, the influence of cost sharing may vary by specific healthcare needs, something that should be explored in further research.

## Introduction

The burden of mental health conditions in the U.S. on individuals' well-being, social relationships, and work productivity is high, and access to specialty mental health services provided by a professional with dedicated training in mental health diagnosis and treatment can reduce morbidity and mortality associated with these conditions.<sup>1,2</sup> However, paying out-of-pocket for this care can be costly. Insurance benefits can help to cover some portion of these costs and thus assist with access, depending on the generosity of the benefit design. Insurers have traditionally used three forms of insurance benefit design that limit use of mental health specialty care: (i) Financial requirements (ii) Quantitative treatment limits (QTLs) and (iii) Non-quantitative treatment limits (NQTLs). In order to understand the impact of these benefit features on access to care, it is useful to study the sensitivity of specialty mental health use to changes in these benefit features.

Implementation of a national behavioral health parity law presented an opportunity to study the effect of exogenous change in benefit features (i.e. due to the law) on use and expenditures of specialty mental health care use. The law, the Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act (MHPAEA), passed in 2008, was intended to reduce historical disparities between behavioral health (including mental health and substance use disorder) and medical/surgical insurance benefit generosity. The law applied parity requirements on all three categories of benefit features for plans sponsored by large employers (>50 employees) that cover behavioral health services. Exploiting exogenous benefit change from before and after the parity law was implemented allows this study to mitigate some of the selection bias common to studies of this type due to endogenous insurance selection.

Specifically, this study investigates the degree to which financial requirements, QTLs, and NQTLs affect specialty mental health use and expenditures. Specific research questions addressed in this study ask whether the following changes in benefits are associated with increased use and expenditures: (i) Decreased copayments, coinsurance, and deductibles, (ii) Elimination of QTLs, and (iii) Decreased penalties from failure to obtain required prior authorization. The main hypothesis predicts that the indicated changes in benefits will be associated with increased use and expenditures. However, there is a competing hypothesis that, even without a measurable change in use, more generous benefits will be associated with lower patient expenditures, since lower cost sharing suggests fewer expenditures for the patient. A secondary set of research questions ask whether the relationship between benefits and use and expenditures is stronger among enrollees who report relatively low income/net worth compared to those who report relatively high income/net worth, since enrollees with fewer means may have less flexibility to increase their healthcare spending should benefits become less generous.

Data are drawn from detailed insurance plan benefit design information linked to claims and eligibility records from before and after passage of MHPAEA for U.S. adult enrollees in commercially-insured “carve-in” plans (i.e. plans that administer behavioral health benefits together with medical benefits rather than separately, as “carve-out” plans do) provided by the behavioral health division of Optum (hereafter called Optum Behavioral). Optum Behavioral is a fully owned subsidiary of UnitedHealth Group (UHG) and covers behavioral health accounts for small and large employers across the U.S. During the study period, Optum Behavioral was among the largest managed behavioral health organizations in the country. This study exploits a unique database that contains benefit design data in addition to claims and enrollment data, providing strong measures of the actual benefits faced by a large sample of enrollees. This allows for study of benefit features whose impact on use is largely unknown. Additionally, it leverages information about enrollee income level to more granularly investigate price-sensitivity.

## Literature Review

Financial requirements consist of copayments, coinsurance, and deductibles. Growing plan costs for mental health care in the late 1970’s increased insurance companies’ desire to control utilization and expenditures via cost sharing.<sup>3</sup> Increased cost sharing was believed

to help manage two phenomena that exist in health insurance markets, including the market for coverage for mental health services: moral hazard and adverse selection. In particular, cost sharing was expected to reduce moral hazard risk to insurers while still allowing them to cover mental health in some capacity.<sup>4</sup> Additionally, cost sharing was used to combat adverse selection, whereby patients who were costly to insure enrolled in the most generous plans. Costly populations include patients with mental health conditions, who tend to have higher medical expenditures as well as higher mental health care expenditures.<sup>5,6</sup>

In the existing literature, the strongest evidence of the relationship between insurance generosity and use comes from the RAND Health Insurance Experiment (HIE), a large randomized, multi-site study.<sup>7–9</sup> The RAND HIE found that specialty mental health care is sensitive to changes in cost sharing. For example, one analysis of episodes of specialty mental health services found that patients receiving free care spent four times as much compared to patients responsible for 95% of their total costs.<sup>7</sup> However, the RAND HIE was conducted over 40 years ago, in a fee-for-service environment. It is conceivable that the effects of financial requirements in the fee-for-service environment are larger than they would be in the contemporary managed behavioral health care system, where QTLs and NQTLs may restrict care beyond what the enrollees would prefer in the face of reduced financial requirements.

Around the same time as the RAND HIE, several other studies examined the effects of financial requirements, but these studies were subject to limitations. Most were conducted between the late seventies and mid-nineties, few explicitly studied financial requirements in a managed care environment, and none controlled explicitly for other benefit features. Among the earlier studies, Horgan *et al.* used 1978–1979 cross-sectional survey data from the National Medical Care Expenditure Survey to estimate that the coinsurance elasticity for any specialty mental health care was  $-0.27$ , and that, among mental health patients, the out-of-pocket elasticity of the number of services ranged from  $-0.44$  to  $-0.30$ , depending on how out-of-pocket expenses were specified.<sup>10</sup> Haas-Wilson *et al.* used 1979–1981 Blue Cross Blue Shield claims data from a single plan ( $n=497$ ) to examine outpatient mental health episodes before and after the plan's benefit design increased copayments and deductibles. They estimated that the price elasticity of demand for outpatient mental health care during an outpatient-only mental health episode was  $-0.34$ .<sup>11</sup> In addition to using data that are now outdated, these studies did not attempt to address possible insurance selection bias through their study design, although Horgan *et al.*<sup>10</sup> did note that only 20% of the study sample had a choice of insurance plans.

In the mid-nineties, Lo Sasso *et al.* examined changes in mental health care among enrollees in fee-for-services plans for a large U.S.-based company before and after the company implemented reduced cost sharing, promoted in-network specialty providers, and tried to de-stigmatize mental illness.<sup>12</sup> They reported an 18% increase in mental health care initiation,<sup>13</sup> and a 26% increase in depression care initiation associated with the bundle of changes,<sup>14</sup> however, given the simultaneous policy changes, it is difficult to attribute how much of the increases was due to reduced cost sharing alone. More recently, Meyerhoefer and Zuvekas used imputed cost sharing data (1996–2003) to determine that among the privately insured population, outpatient mental health care had an elasticity of  $-0.17$ .<sup>15</sup>

Two studies explicitly applied to a managed care environment. Using data from 1986–1992, Simon *et al.* found that the likelihood of a specialty mental health visit by state government employees enrolled in a staff-model HMO decreased by 16% after a \$20 copayment was first initiated, and the number of visits decreased by 6% after the copayment increased to \$30.<sup>16</sup> These decreases extended beyond decreases observed among a comparison group comprised of federal government employees enrolled in the same HMO (but under different plan contracts). Reliance on bivariate statistics prevents these researchers from further controlling for other aspects of managed care benefit design that may have differed between the treatment and comparison group.

Also examining cost-sensitivity of specialty mental health services in a managed care environment, Lu *et al.* used 1996 Medical Expenditure Panel Survey data to find that utilization of mental health services did not respond to changes in coinsurance rates or deductibles within managed care plans.<sup>17</sup> Even though these results can be generalized to the managed care environment, the study does not control for changes in use of QTLs or NQTLs, benefit features that may be used by the plans they examined, and the estimated effects of cost sharing may be biased as a result.

QTLs have also been used by insurers to limit use of specialty mental health services. Common examples of QTLs include 20 outpatient visits and 30 inpatient days per year, and less commonly, lifetime limits. Researchers surveyed plan benefits in the early 2000s to determine that, nationally, 94% of private plans had annual limits for outpatient mental health services (either visit or dollar limits) and 89% of plans had any annual limit for inpatient mental services (either days or dollar limits).<sup>18,19</sup> By explicitly specifying limits, insurance companies can control the supply of specialty mental health care for which they are financially responsible, as enrollees are responsible for 100% of the costs of care that exceeds the stated limits. QTLs may also have been used to limit adverse selection. Critics of QTLs argue that these limits hinder the ability of insurance coverage to serve one of its primary purposes: Protecting covered individuals from catastrophic financial responsibility for needed care.<sup>20</sup> Indeed, this practice began before the decline of state-owned psychiatric hospitals, so was used under the assumption that patients with catastrophic need would land in a public safety net.<sup>21</sup>

Two studies examine insurer savings predicted under hypothetical use of QTLs. Both studies base their predictions on a small sample (who exceeded the limit during the study period) and limited their generalizability to “carve-out” plans. Neither study incorporates patient expenditures. The first study used a database of United Health data with information from 24 “carve-out” plans in 1995–1996 to estimate the average insurance costs per enrollee per year (\$43.9), and compare this to what the costs would have been if the insurance limited coverage to 30 inpatient days and 20 outpatient visits (\$37.0).<sup>22</sup> A subsequent study used similar methods on a selection of 8 Magellan Behavioral Health “carve-out” plans in 1996.<sup>23</sup> Peele *et al.* concluded that the sample plans could have saved \$421,634 by imposing 30 day and 20 outpatient visit limits, or \$8.46 per enrollee.<sup>23</sup>

NQTLs encompass a variety of strategies used by health plans to slow growing mental health care costs in the 1990’s and 2000’s, including medical necessity policies, network

creation, provider reimbursements, care management, and utilization review. Utilization review is typically conducted internally by insurance company employees with clinical training or by contracted “carve-out” specialty managed care companies. It can require authorization before (prior authorization or precertification) or during (concurrent review) treatment. A survey in the late 1990’s estimated that out of a weighted sample of 6,059 plans, 68% required pre-authorization for regular outpatient mental health services (90% of HMOs, 74% of POSs, and 40% of PPOs) and 80% required concurrent review for regular outpatient mental health care (91% of HMOs, 81% of POSs, 68% of PPOs).<sup>24</sup> In addition to curbing moral hazard and selection by the sickest patients, NQTLs may have been used, in part, due to difficulties of using biomarkers to diagnose mental health conditions,<sup>25</sup> and because, until the 1990’s, mental health treatments lacked well-established guidelines.<sup>4</sup>

There is a small body of literature isolating the effects of prior authorization and concurrent review on specialty mental health utilization and expenditures.<sup>26</sup> Two studies found evidence that prior authorization affects utilization by placing an implied limit on the number of sessions authorized.<sup>27,28</sup> Another study found that implementation of a multi-pronged utilization management program for psychiatric care (including prior authorization, concurrent review, and care management) was associated with a 12% decrease in inpatient days, while patients not exposed to the utilization management program had a 7% decrease in inpatient days over the same period.<sup>29</sup> This may be because reviewers often approve requested care, but at a fraction of the requested duration.<sup>30</sup> None of these studies examine how use is affected by additional penalty cost sharing associated with prior-authorization when it is required but not obtained.

The present study adds to the existing literature in several ways. First, its empirical models include the effects of QTLs and NQTLs on mental health utilization and expenditures. If QTLs and NQTLs are correlated with financial requirements and utilization, omitting QTLs and NQTLs could lead to biased estimates of financial requirements. Additionally, the effects of QTLs and NQTLs are of interest in and of themselves. Second, this study draws on a large sample of enrollees and plans that reflect the contemporary managed care environment among “carve-in” plans. Third, it uses benefit design data drawn directly from a claims processing database rather than imputed benefit design data. Fourth, access to income/net worth data allows this study to compare sensitivity to changes in benefits for enrollees with different levels of economic means. Finally, as explained in greater detail in the next section, this study contributes to the literature by leveraging a policy change to better isolate the effects of exogenous benefit design change on specialty mental health use and expenditures.

## Methods

### Study Design

Linking data describing benefit features with claims and enrollment data in 2009 and 2011 (before and after implementation of a national parity law\*), this study employed a

---

\*In 2010, plans renewing on a calendar-year basis were required to make good-faith efforts at compliance with respect to coinsurance, copayments, combined medical-behavioral health deductibles, and quantitative treatment limits. Starting in 2011, publication of



first-differences study design to assess how changes in benefit design affected specialty mental health utilization and expenditures. This approach reduced insurance selection bias in two ways. First, it implicitly controlled for time-invariant omitted individual predictors of utilization and insurance (e.g. health status), which could otherwise contribute to insurance selection bias. It did this by decomposing the error term into a person-specific, time-invariant error term, and a random error term. Then, by subtracting the 2011 cross-sectional equation from the 2009 cross-sectional equation, the time-invariant error (caused by omitted time-invariant personal characteristics), dropped out. Second, change in benefit design, associated with MHPAEA parity compliance, contributed exogenous variation to the study. This exogenous variation increased confidence that much of the observed variation in benefit features was due to the parity law, and not to omitted time-varying individual characteristics.

## Data

Data on “carve-in” plans were provided by Optum Behavioral. The data used in this study include claims (with information on utilization and expenditures) and enrollment data (allowing us to identify non-users) for a national sample of commercially-enrolled enrollees, along with data on plan benefit features, including financial requirements, QTLs, and NQTLs, derived from a UHC database used to process claims payments. Additionally, categorical data on income/net worth, drawn from consumer marketing data, were obtained from Optum Insight.

## Cohort

The study sample originated with a sample drawn for a parent study evaluating the effects of the MHPAEA.<sup>31,32</sup> The parent study sampled enrollees associated with 655 employers with “carve-in” plans (see details in Supplementary Material,\* Table S1) and available benefit design data. The study sample for the present analysis was created in three stages. The first step selects large employers (>50 employees) with contracts in 2009 and/or 2011, without collective bargaining, who renewed their plans on the calendar year cycle. Among plans held by these employers, the second step selected plans offering behavioral health benefits (other than retiree or indemnity coverage) with enrollees residing inside the U.S. Finally, the third step selected adult enrollees enrolled in a plan in both 2009 and 2011.<sup>†</sup> Since claims data do not reliably distinguish between mental health and substance use disorder treatments, and the benefits studied applied to mental health services, enrollees with SUD diagnoses are excluded to increase the likelihood that services measured were for specialty mental health. The resulting sample contained 1,242,949 enrollees. See Supplementary Material, Table S2 and Table S3 for details of study sample creation. All of the sample enrollees were in self-insured plans.\* The majority of these enrollees (~85%) were enrolled in plans that covered in-network (INN) and out-of-network (OON) services (hereafter called the

---

MHPAEA’s Interim Final Rule required legal compliance with MHPAEA provisions as well parity for non-quantitative treatment limits.

\*Supplementary Material freely available online at the website of The Journal of Mental Health Policy and Economics ([www.icmpe.org](http://www.icmpe.org)).

†Complete lists of inclusion criteria, along with the number of observations lost at each step, are reported in sample size flow charts in Supplementary Material, Table S2 and Table S3.

\*Although self-insured status was a criterion for inclusion, no plans were excluded because they did not satisfy this requirement.



INN/OON sample), while the remaining enrollees were in plans that only covered INN services (hereafter called the INN-only sample).

### Outcomes and Predictors

Utilization outcomes measured counts of individual psychotherapy visits and inpatient days. Expenditure outcomes measured total and patient expenditures associated with these two types of care. Expenditures were adjusted for geographic variations in price and for inflation. When taken directly from the claims, expenditures for the same service may vary by geographic region due to differences in area prices. To adjust for differences in area prices, the expenditure measures were standardized to a national average, by multiplying expenditures for enrollees in a given state by a service-specific index value.\* Additionally, medical price inflation may cause raw expenditures for 2011 to be higher than the raw expenditures for 2009. In order to adjust for this, the Consumer Price Index (CPI) for inpatient hospital services and “other medical professionals” were used to adjust 2009 expenditures for inpatient mental health services and individual psychotherapy visits, respectively, to 2011 price levels. INN outcomes were used for both INN/OON and INN-only samples. OON outcomes were used only for the INN/OON samples.

The predictors included the three kinds of benefit features, with separate measures for individual psychotherapy and for inpatient care, and with separate measures for INN and OON benefits. With respect to financial requirements, the original data included copayment and deductible dollar amounts, and patient coinsurance rates. The analysis combined copayment and coinsurance rates into a single patient out-of-pocket cost sharing value. For in-network outcomes, this was calculated as the copayment plus the product of the coinsurance and the average expenditure for individual psychotherapy and inpatient care. QTLs were coded = 1 when QTLs were used and coded = 0 when they were not used. NQTLs were measured in two ways.

First, they were measured as the additional penalty patient coinsurance rates and additional penalty copayment dollar amounts required when prior-authorization is required by the plan but not obtained by the enrollee (e.g. enrollees might have to pay an extra \$100 for an individual psychotherapy visit that required prior authorization if they did not obtain the required authorization). The penalty amounts measure the magnitude of the financial consequence for enrollees who fail to meet the plan’s utilization review requirement. A method similar to the one described above for copayments and coinsurance was used to create one variable describing cost sharing from copayment and coinsurance penalty.

Second, NQTLs were measured as the size of the Optum Behavioral provider network in the state. Provider supply networks measure the degree to which the plan uses reduced provider supply to manage the level of care used. Provider supply was measured as the supply of Optum Behavioral-contracted individual psychotherapy providers (e.g. Ph.D. or

---

\*Each index was calculated by dividing service-specific unit costs for the state by the average service-specific unit costs across all states. Unit costs were derived from the claims using the same codes used to create inpatient and individual psychotherapy utilization variables.

M.S.W.-level providers) in the state per 1,000 enrollees. This measure used data provided by Optum Behavioral, and was included for INN individual psychotherapy-related outcomes.

In order to implement the first-differences study design, all outcomes and predictors were calculated as enrollee-level change scores. For continuous variables, the change scores subtract the 2009 value from the 2011 value. QTLs had a dichotomous change score. Since parity resulted in elimination of QTLs, the QTL change score was coded = 1 when QTLs were used in 2009 and subsequently eliminated in 2011, and coded = 0 when they were not used in either 2009 or 2011. No sample plans newly adopted QTLs between 2009 and 2011. As a result of using the first-differences study design, time-invariant covariates dropped out of the model, which means that the omission of time-invariant covariates did not bias the estimated effects of the benefit features. It should be noted that first differences is statistically equivalent to using individual fixed effects with two time periods.

## Analyses

Descriptive statistics indicated the distribution of both the INN/OON sample and the INN-only sample on a variety of individual, employer, plan, and area characteristics in 2009, and average benefit features in 2009 and 2011. Multivariate analyses report coefficients from linear regression, which can be interpreted as marginal effects. In addition to implementing first-differences, change scores transformed otherwise heavily skewed (towards 0) outcome measures into more normally distributed measures. This allowed for use of Ordinary Least Squares estimation. The models also controlled for non-independent error terms clustered within employer groups, using Generalized Estimating Equations with an independent working correlation matrix.

Regressions were estimated separately for the INN/OON and INN-only samples, to allow for differences in relevant outcomes and predictors. Regressions conducted within the INN/OON sample included both INN and OON benefit features, to control for the possibility that INN and OON services may either serve as substitutes or complements to each other. Many plans have the same benefit features for some INN and OON services, so for regressions with an INN outcome, OON benefit features were only included if they were not highly correlated (and thus causing variance inflation) with the analogous INN benefit feature. This same strategy was used for INN benefit features for regressions with an OON outcome.

A secondary analysis further stratified the INN/OON sample on income/net worth. These analyses compared the relationships between changes in benefit features and utilization and expenditures among those with high income ( $\geq \$75,000$ ) and high net worth ( $\geq \$100,000$ ) ( $n=561,276$ ) to those with lower income and net worth ( $n=111,709$ ). Enrollees missing income/net worth data were excluded from this analysis.

The first-differences study design did not control for omitted time-varying characteristics correlated with both utilization and insurance benefit features. To investigate the degree to which this potential limitation might reduce confidence in the results, one sensitivity analysis examines the results of the main analysis among the sub-set of the INN/OON sample that did not change plans in 2011. By excluding enrollees whose benefit designs

changed over time because the enrollee changed plans, potentially due to changes in omitted time-varying characteristics, the analysis isolated and studied enrollees whose benefit features likely changed exogenously.

Another sensitivity analysis addressed the fact that selection bias might affect results for enrollees able to choose between INN/OON and INN-only plans. The sample for this analysis included employers who offered only INN/OON plans. It excludes people who forwent INN-only plans in favor of INN/OON plans, who may also be sicker individuals seeking more comprehensive coverage (i.e. coverage for both INN and OON providers). We did not have sufficient sample size to analyze enrollees offered only INN-only plans.

## Results

### Describing Sample Characteristics, and Benefit Features

The INN/OON sample contains 1,058,474 enrollees, and the INN-only sample contains 184,475 enrollees. Table 1 reports individual characteristics in 2009. In both samples, enrollees were roughly evenly split between genders and younger vs. older age ranges (42–64 vs. 18–41), and over one third of the individuals were adult dependents of the primary insured person. Among enrollees for whom income and/or net worth were available, the two samples were relatively diverse on these characteristics.

Table 1 also reports diagnostic prevalence in 2009 among enrollees in each sample with any specialty mental health utilization. In both samples, the most common mental health diagnoses were depressive disorder (INN/OON: 46.2%; INN-only: 46.5%), adjustment disorder (INN/OON: 40.6%; INN-only: 41.2%), and generalized anxiety (INN/OON: 23.5%; INN-only: 22.7%). For most conditions, the diagnostic prevalence did not significantly change over time (data not shown in Table 1).

Table 1 also reports employer, plan, and area provider-supply characteristics in 2009. Nearly two thirds of enrollees in both samples were associated with the largest employers (>10,000 employees). In both samples, the finance and insurance industries had the greatest representation (INN/OON: 22.1%; INN-only: 15.8%), although manufacturing was also well represented (INN/OON: 18.9%; INN-only: 22.7%). Geographic representation for the INN/OON sample was spread somewhat evenly across the Middle Atlantic (17.5%), South Atlantic (18.2%), West South Central (16.3%), and East North Central (14.9%) regions, while the INN-only sample was more heavily concentrated in the Middle Atlantic (31.3%). In both samples, nearly all enrollees were enrolled in more managed plans rather than less managed plans. Providers with a master of social work (M.S.W.) were the most commonly available provider type for enrollees in both samples; on average, there were about 3 M.S.W. providers per 1,000 enrollees in the enrollees' state.

Table 2 presents mean values of benefit features in 2009 and 2011 for both samples. Among INN/OON plans, INN individual psychotherapy and inpatient average cost sharing from copayment and coinsurance (hereafter called CFCC) decreased modestly, as did INN inpatient cost sharing from copayment and coinsurance penalties (hereafter called CFCCP) and all limits (which ceased to be used altogether). All other benefit features (including

OON benefits) increased, which means, for all benefit features except for provider supply, benefit features became less generous. Among INN-only plans, INN inpatient CFCCP decreased and all limits were discontinued, while all other benefit features increased.

### Effects of Changes in Benefit Features on Changes in INN Individual Psychotherapy

Table 3 reports the marginal effects and robust standard errors for each benefit feature on INN individual psychotherapy outcomes. Among INN/OON plans, CFCC, deductibles, elimination of limits, and CFCCP all had significant associations with changes in INN individual psychotherapy outcomes. In Columns 2 and 3, the negative coefficients on CFCC ( $\beta_{\text{visits}} = -0.00008$ , p-value=0.030 and  $\beta_{\text{totalexpenditures}} = -0.00629$ , p-value=0.011) and CFCCP ( $\beta_{\text{visits}} = -0.00004$ , p-value=0.029 and  $\beta_{\text{totalexpenditures}} = -0.00283$ , p-value=-0.030) indicate that larger decreases in these benefit features were associated with larger increases in individual psychotherapy visits and total expenditures (and vice versa). However, the magnitude of these effects were small.

One way to interpret the magnitudes of these  $\beta$  coefficients is that if enrollee A's cost sharing decreases by \$1 more than enrollee B's, then enrollee A's visits/total expenditures increased by  $\beta$  more than enrollee B's. For example, if enrollee A's CFCC decreased by \$35 (the average change score for this benefit feature) more than enrollee B's, enrollee A's total expenditures would increase by about \$0.21 more for enrollee A than for enrollee B ( $\$35 \times -0.006$ ). This additional increase is a small fraction of the average 2009 individual psychotherapy total expenditures reported in Table 3 (\$15.7), but slightly larger than the average total expenditure change score (\$0.16).

Deductibles had a significant, positive association with individual psychotherapy patient out-of-pocket expenditures ( $\beta = \$0.00042$ , p-value=0.021). The average change in deductibles (\$156) would be associated with an increase in patient expenditures that was \$0.07 more than if deductibles had not changed over time ( $\$156 \times 0.00042$ ). Additionally, elimination of limits was significantly associated with increases in individual psychotherapy visits ( $\beta = 0.09637$ , p-value=0.002) and total expenditures ( $\beta = \$6.57506$ , p-value=0.001). These magnitudes may be economically, as well as statistically, significant. Indeed, eliminating limits was associated with increases in the visit change score and total expenditure change score that were 10x and 41x larger than the average change scores (visits: 0.01 and total expenditures: \$0.16) (Table 3).

The results for INN-only plans (Columns 5–7, Table 3) differ slightly from INN/OON plans for the INN individual psychotherapy outcomes. In this sample, CFCC, rather than deductibles, had a small positive effect on patient out-of-pocket expenditures ( $\beta = \$0.01$ , p-value=0.003), while deductibles, rather than CFCC, had a small significant negative effect on visits ( $\beta = -0.000009$ , p-value=0.018) and total expenditures ( $\beta = -0.00063$ , p-value=0.018). As with INN/OON plans, among INN-only plans, elimination of limits was associated with larger increases in visits ( $\beta = -0.09053$ , p-value=0.023) and total expenditures ( $\beta = \$7.35051$ , p-value=0.011).

### Effects of Changes in Benefit Features on Changes in INN Inpatient Care

Table 4 reports the marginal effects and robust standard errors for each benefit feature on INN inpatient outcomes. Among INN/OON plans (Columns 2–5), none of the benefit features were significant. Among INN-only plans, larger increases in deductibles were associated with larger decreases in INN inpatient days ( $\beta=-0.000003$ ,  $p\text{-value}<0.0001$ ), total expenditures ( $\beta=-\$0.002$ ,  $p\text{-value}<0.0001$ ), and patient expenditures ( $\beta=-\$0.0002$ ,  $p\text{-value}<0.0001$ ). Given the average inpatient deductible change score among these plans, \$358, for the average enrollee, annual reductions in days, total expenditures, and patient expenditure change scores were  $-0.001$  days,  $-\$0.72$ , and  $-\$0.07$ , respectively. Elimination of limits was associated with larger increases in INN inpatient days ( $\beta=0.01081$ ,  $p\text{-value}<0.033$ ) and total expenditures ( $\beta=\$12.15466$ ,  $p\text{-value}<0.010$ ).

### Differential Effects of Changes in Benefit Features by High V. Low Income/Net Worth

As seen in Table 5, compared to the low income/net worth enrollees ( $n=111,709$ ), high income/net worth enrollees ( $n=561,278$ ) more closely resembled the individual psychotherapy analysis among all INN/OON plans (Table 3). As with the full sample of INN/OON plans, among high income/net worth enrollees, CFCC was negatively associated with INN individual psychotherapy visits ( $\beta=-0.00009$ ,  $p\text{-value}=0.039$ ) and total expenditures ( $\beta=-\$0.00695$ ,  $p\text{-value}=0.015$ ), and elimination of limits was positively associated with visits ( $\beta=0.11035$ ,  $p\text{-value}=0.001$ ) and total expenditures ( $\beta=\$7.42$ ,  $p\text{-value}=0.0004$ ). Elimination of limits was also positively associated with patient expenditures in this sample ( $\beta=\$2.95833$ ,  $p\text{-value}=0.044$ ). Unlike in the full INN/OON sample, among the high income/net worth group, deductibles and CFCCP did not significantly impact individual psychotherapy outcomes. Among low income/net worth enrollees, elimination of limits had significant and positive associations with INN individual psychotherapy outcomes ( $\beta_{\text{visits}}=0.08672$ ,  $p\text{-value}=0.0003$ ;  $\beta_{\text{totalexpenditures}}=\$6.36093$ ,  $p\text{-value}<0.000$ ;  $\beta_{\text{patientexpenditures}}=\$2.54328$ ,  $p\text{-value}=0.020$ ), but there were no other significant associations.

Table 6 reports the inpatient analysis stratified by income groups. Associations found in the full INN/OON sample were not found in either income strata. Instead, in the high income/net worth sample, in-network and out-of-network deductibles both had significant positive associations with patient expenditures. None of the benefit features had significant effects among the low income/net worth sample.

### Effects of Changes in Benefit Features on Changes in OON Individual Psychotherapy and In OON Inpatient Care

Compared to the INN benefit features' effects on INN individual psychotherapy and inpatient use and expenditures, OON benefit features' effects on OON use and expenditures were rarely significant (Supplementary Material, Table S4 and Table S5). Deductibles had a significant negative effect on OON individual psychotherapy visits ( $\beta=-0.00001$ ,  $p\text{-value}=0.038$ ). For enrollees with the average OON deductible increase of \$590, this amounts to an annual decrease of six thousandths of a visit ( $-0.0001 \times \$590 = -0.006$ ). Small but significant marginal effects of CFCC ( $\beta=0.00010$ ,  $p\text{-value}=0.047$ ) and in-network

coinsurance ( $\beta=-0.00007$ ,  $p\text{-value}=0.049$ ) on OON inpatient visits were observed, although both marginal effects were in the opposite direction hypothesized.

### Sensitivity Analyses

The first sensitivity analysis examined main analyses among the sub-set of enrollees who were in the same INN/OON plan in 2009 and 2011 ( $n = 827,752$ ), in order to further mitigate selection issues that may bias the results (Supplementary Material, Tables S6–S9). While the CFCC and elimination of limit results from the main analysis for INN individual psychotherapy (INN/OON plans) outcomes were also observed in the sensitivity analysis (Supplementary Material, Tables S5), the effects of deductibles and CFCCPs were not. Supplementary Material, Table S6 shows, unlike the main analysis for INN inpatient care (INN/OON) plans, where none of the benefit features were significant, among people who did not change plans between 2009 and 2011, there were positive associations between in-network deductibles and patient expenditures and between out-of-network deductibles and inpatient days. None of the benefit features were significantly associated with the OON outcomes (Supplementary Material, Tables S8–S9) in this sensitivity analysis.

The second sensitivity analysis examined the main analysis among the sub-set of enrollees who had employers who contracted with only INN/OON plans ( $n = 371,423$ ) (Supplementary Material, Tables S10–S13). The individual psychotherapy main analysis results for elimination of limits and CFCCP resembled those observed in this sensitivity analysis, but the results for deductibles and CFCC did not, as no associations were found in the sensitivity analysis (Supplementary Material, Table S10). Supplementary Material, Table S11 shows that, unlike the main analysis for INN inpatient care (INN/OON) plans, where none of the benefit features were significant, among people whose employers only contracted with INN/OON plans, there were small but significant positive associations between deductible and inpatient visits and patient expenditures, as well as a significant negative association between OON coinsurance and total expenditures. As with the first sensitivity analysis, none of the benefit features were significantly associated with the OON outcomes (Supplementary Material, Tables S12–S13) in this sensitivity analysis.

### Discussion

This paper builds on the literature on the effects of cost sharing on mental health utilization by studying the simultaneous effects of three different kinds of benefit features. It provides the most comprehensive and most contemporaneous study of benefit feature effects currently available. The study presents several findings.

First, there is some evidence that changes in cost sharing from copayments and coinsurance (for INN/OON plans) and deductibles (for INN-only plans) are associated with small decreases in INN individual psychotherapy visits and associated total expenditures.

Second, elimination of limits is consistently linked to increased use of INN individual psychotherapy visits and associated total expenditures (INN/OON and INN-only plans).



Third, changes in cost sharing from copayment and coinsurance penalties are associated with small decreases in INN individual psychotherapy visits and associated total expenditures (for INN/OON), but this result was not significant among people who did not change plans between 2009 and 2011, and may be a by-product of selection bias as people change plans over time.

Fourth, few of the OON benefit features had a significant association with use of OON services, and no patterns emerged from those findings. Fifth, findings for cost sharing from copayments and coinsurance and elimination of limits were significant among the high income/net worth sample but not among low income/net worth sample.

The main results found a significant negative relationship between cost sharing from copayment and coinsurance. This is consistent with both economic theory and the existing empirical literature. However, even once scaled to a typical change in cost sharing from these benefit features, the magnitude of these findings are very small and are unlikely to be practically significant. There are several compelling explanations for very small negative effects in the population studied.

As noted earlier, the managed care environment of the present study likely reduces the impact of financial requirements compared to the fee-for-service environments common to many of the earlier studies.<sup>7-9,10,11</sup> A high proportion of study enrollees were enrolled in “more managed” plans. These plans are designed, in part, to give the insurer more direct oversight of use decisions, rather than relying on financial requirements to influence these decisions. One study using data drawn from the early part of the “managed care era” found cost sharing to have smaller effects on use compared to studies using older data; Lu *et al.* found that within managed care plans, coinsurance and deductibles were not significant predictors of mental health use.<sup>17</sup> This underscores the value of producing contemporaneous estimates of the effects of financial requirements in a managed care setting. Finally, the most recent work done on this topic, by Meyerhoefer and Zuvekas, found that mental health ambulatory care had a substantially lower price responsiveness than previous studies, including the HIE.<sup>15</sup>

The finding that inpatient care is not sensitive to changes in financial requirements is not surprising. The established literature does not offer evidence about the elasticity of specialty mental health inpatient care. However, it stands to reason that patients (and their doctors) may have less discretion over their use of inpatient care, and thus have less opportunity for their inpatient use to be based on financial requirements.

The small practical effects of financial requirements on specialty mental health services may help to explain findings that MHPAEA had little effect on behavioral health use and spending. Indeed, previous work concluded that MHPAEA was associated with moderate increases in these outcomes among enrollees in both carve-in and carve-out plans.<sup>31,32</sup> Notably, the one group among whom MHPAEA was associated with larger effects on behavioral health spending was enrollees with substance use disorders, a group that was excluded from the present study.<sup>33</sup> It is conceivable that, as a result of the parity law, some insurers made their medical benefits less generous rather than making behavioural health



benefits more generous. Although unavailability of medical benefits and medical claims were not likely to bias the present study, there may be opportunities for further research about the effects of changes in the three types of benefit features on use of medical services.

Elimination of limits has the largest and most consistently significant effects on utilization and expenditures. Elimination of limits primarily impacts two groups of people. The first are those who actually hit their limit in 2009, as these people (assuming their need for mental health services was constant over time) may have desired a higher level of care in 2009, and, in 2011, in the absence of the limit, they were able to attain that level of care. Elimination of limits also may have impacted a group harder to identify in the data: Those who would have hit their limit in 2009, but who constrained their 2009 utilization in anticipation of reaching their limit early in the year and having greater need for services later in the year. This study's ability to observe the effect of eliminating limits may have been enhanced by the fact that this was one of the most dramatic changes in benefit features that occurred over the study period. The magnitude of the effects of eliminating limits reported in this study closely aligns with the magnitudes reported in the literature,<sup>22,23</sup> based on simulation studies among "carve-out" plans.

Based on the measures we were able to examine, there is weak evidence that NQTLs affect use and total expenditures for INN individual psychotherapy, and no evidence that it affects other outcomes. Since the existing literature focuses on the effects of prior authorization requirements, rather than the effects of associated penalties of not getting required prior authorization or of provider supply networks available to enrollees, there are few comparisons to draw from the published literature. The lack of observed effects of prior authorization penalties may be because the process of obtaining prior authorization must pose a sufficiently high administrative burden in order for the associated penalties to affect care decisions. When the administrative burden is high and the penalty level is high, some enrollees may forgo care, rather than pay the high penalty. But if the administrative burden is low, most enrollees will obtain prior authorization, and the penalty level will not impact the care decision. The lack of observed effects of provider supply may stem from using a state-wide measure for a service that is typically sought at a more local level.

Interestingly, use and expenditures of OON services were not significantly affected by the benefit features studied here. Plans sometimes impose higher cost sharing for OON services compared to INN services. Thus, the decision to choose OON services may express lower cost-sensitivity, since enrollees are willing to pay more for the same quantity of care. Additionally, use of OON services may reveal that enrollees have a preference for OON care over INN care, because they perceive that OON care is higher quality, more accessible, or otherwise more valuable than INN care.

This study hypothesized that benefit features would have different effects for enrollees with different levels of income/net worth. For example, lower income individuals might be more sensitive than higher income individuals to increases in financial requirements because they have a smaller budget to work with. However, this is not the pattern that emerges from the data. For example, for INN individual psychotherapy, the main results for cost sharing from copayment and coinsurance and elimination of limit were significant among the high

income/net worth sample but not the low income/net worth sample. Although elimination of limits is significantly associated with larger increases in INN individual psychotherapy among both groups, the magnitude of the effects is higher among high income/net worth individuals.

There are some limitations to this work. As discussed previously, study of the effects of insurance on utilization risks omitted variable bias if time-varying characteristics that predict both insurance selection and utilization, such as worsening health status, are unmeasured. When this occurs, the results would have the predicted sign, but the magnitude of the effect would be overstated. While the observed signs fit the hypotheses, and for the most part, the magnitudes of the effects do not raise obvious concerns about overstated size, the relatively large effects of eliminating limits is a possible candidate for upward bias. However, since the effects of eliminating limits among the sub-population of enrollees who did not change plans in 2011 are of similar magnitude as the effects of eliminating limits among the full sample, endogeneity is an unlikely threat to internal validity in the main analyses.

Despite the unusually detailed nature of the data used, some additional limitations stem from weaknesses in the available measurements. Although the coinsurance value is drawn directly from a claims processing database, and likely represents the true coinsurance value, it is a proxy for the actual cost sharing faced by the patient at any point during the year. This is because enrollees with a deductible do not pay their coinsurance until they reach their deductible threshold,<sup>11</sup> so coinsurance may have less influence on care decisions for enrollees who reach their deductible at the end of the year, compared to enrollees who reach their deductible at the start of the year. Another data limitation is neglect of the full array of strategies that insurers use to manage utilization (i.e. NQTLs), such as narrow networks, coverage denials, and provider reimbursement methods such as capitated payments. Still, NQTL data are rare, and inclusion of the three available measures is a strength of the study. Finally, observed associations between financial requirements and patient expenditures could be explained by simultaneous increases in prices due to parity in reimbursement, rather than increases in financial requirements. However, the average total expenditure for a 50-minute psychiatry visit, one of the most frequently used psychotherapy services, was fairly constant between 2009 and 2011, making the alternative explanation unlikely.

The study's external validity may be affected by use of a convenience sample. The initial sample was constructed by sampling select employer groups with Optum Behavioral contracts (details in Supplementary Material, Table S1). Enrollees were then included in this analysis if they, their plan, and their associated employer met subsequently applied employer, plan and enrollee criteria. This resulted in a sample whose size and employer and enrollee diversity provide some justification that the samples generalize. Still, it should be emphasized that the current findings are likely most relevant to a commercially-insured population, which perhaps has higher average income and greater coverage generosity than the general public. Additionally, the findings are most applicable to use of specialty mental health services (e.g. they do not extend to mental health services provided in primary care) within "carve-in" plans.

## Implications

Several implications for employers and insurers derive from this study. Self-insured employers (i.e. all of the employers in the present analysis) pay the “plan expenditures” portion of the total expenditures. Rising costs of health care may serve as a strong incentive to reduce this financial burden. However, researchers have also documented that untreated mental illness reduces work productivity, pointing to employers’ incentive to providing adequate coverage for these services.<sup>34</sup> The present research suggests that changes to cost sharing via financial requirements do little to reduce total spending for members in employer plans, and thus employer’s expenditures. One implication is that, at least in a managed care environment, increased cost sharing generosity (i.e. lower cost sharing for the enrollees) may make services more affordable for the small proportion of enrollees and dependents with the greatest need, without leading to population-wide increases in cost sharing-induced demand for services and the associated additional expenses for employers.

In the years prior to parity, use of limits may have restricted the level of care sought among the study population to a level below what they would have used in the absence of limits. Since the Affordable Care Act (ACA) extended MHPAEA to individual and small employer group insurance markets, efforts to repeal the Affordable Care Act (ACA) could allow insurers to reinstate limits for specialty mental health services for these populations. In this case, employers and insurers that impose limits can likely expect modest decreases in total expenditures if this utilization management strategy were reinstated. This does not suggest that eliminating limits is unwarranted from the employer’s point of view. This study finds that the annual total spending increase associated with eliminating limits could be as much as \$7 per enrollee annually, on average. However, it may be that this expenditure increase would be much higher among enrollees with serious and persistent mental illness. If so, eliminating limits would be an effective way to ensure that employees or dependents in need of a higher volume of care are able to get it, with a relatively small average increase in the level of mental healthcare expenditures.

The role of enrollees’ awareness of their benefit design should not be neglected. Changes in financial requirements and additional penalty coinsurance and copayments may not lead to significant changes in utilization because most enrollees in the study sample are unlikely to track changes to their benefit features. A 2014 Harris Poll by the American Psychological Association found that only 4% of 1,000 sampled adults were aware of MHPAEA, and about half of those sampled did not think their insurance even covered care from a specialty mental health provider.<sup>35</sup> Outreach campaigns to notify eligible enrollees about mental health parity may boost the longer-term effects of more generous benefit features on access to specialty mental health care. There may be a role for employers to improve enrollee awareness of benefit design changes.

Several implications for policy-makers can also be derived from these findings. First, our findings suggest that imposing limits reduces access to care, and, should ACA provisions currently extending the reach of MHPAEA be repealed and limits reimposed, access could be reduced among employees of small employers, individuals in the individual insurance market, and some Medicaid enrollees. Second, since changes in financial requirements have

been shown in this analysis to have relatively little influence on specialty mental health utilization, at least among commercially-insured adults, policy-makers should investigate other pathways to improve access. For example, addressing gaps in provider supply and the stigma of mental health conditions and treatment may prove more fruitful than improving plan cost sharing generosity alone.

## Conclusion

Historically, policy makers have focused on insurance generosity to improve access to specialty mental health care. As this study found that changes in benefit features do not appear to lead to substantial changes in specialty mental healthcare use and expenditures, exclusive focus on insurance generosity may not be warranted. This may be particularly true among commercially insured enrollees in “carve-in” plans associated with large employers, who may be more financially secure than individuals nationally. It is also important to consider that many enrollees in this sample, and in the general population, are not cognizant of incremental changes (e.g. copayments decreasing from \$25 to \$20) in their plan benefits. Efforts targeting other potential barriers to specialty mental health care, such as provider supply (improving provider reimbursement, increasing the number of trained professionals etc.) and stigma associated with mental health care may yield greater benefits.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgements

This work was also made possible by Optum staff members who have contributed their knowledge of the data to this project, including Amber Thalmayer, Laura Lambert Johnson, Brent Bolstrom, and Nghi Ly. Tami Mark provided thoughtful feedback on this work as a discussant at the Academy Health Annual Research Meeting in New Orleans, Louisiana, June 2017. The academic team members analyzed all data independently and retained sole authority over all publication-related decisions throughout the course of the study.

## Source of Funding:

This work is supported by UCLA CTSI Grant (TL1TR000121), AHRQ (R36 HS 24866 – 01), and the National Institute on Drug Abuse (1R01DA032619–01).

## References

1. Kessler RC, Demler O, Frank RG, Olfson M, Pincus HA, Walters EE, et al. Prevalence and treatment of mental disorders, 1990 to 2003. *N Engl J Med* 2005; 352(24): 2515–2523. [PubMed: 15958807]
2. Kessler RC, Heeringa S, Lakoma MD, Petukhova M, Rupp AE, Schoenbaum M, et al. Individual and societal effects of mental disorders on earnings in the United States: results from the national comorbidity survey replication. *Am J Psychiatry* 2008; 165(6): 703–711. [PubMed: 18463104]
3. Fronstin P Issues in mental health care benefits: the costs of mental health parity. EBRI issue brief / Employee Benefit Research Institute. 1997; (182): 1–14.
4. Mechanic D, Schlesinger M, McAlpine DD. Management of mental health and substance abuse services: state of the art and early results. *Mil Q* 1995; 73(1): 19–55.
5. Gameroff MJ, Olfson M. Major depressive disorder, somatic pain, and health care costs in an urban primary care practice. *J Clin Psychiatry* 2006; 67(8): 1232–1239. [PubMed: 16965201]

6. Katon WJ, Lin E, Russo J, Unutzer J. Increased medical costs of a population-based sample of depressed elderly patients. *Arch Gen Psychiatry* 2003; 60(9): 897–903. [PubMed: 12963671]
7. Keeler EB, Manning WG, Wells KB. The demand for episodes of mental health services. *J Health Econ* 1988; 7(4): 369–392. [PubMed: 10312840]
8. Manning WG Jr, Wells KB, Duan N, Newhouse JP, Ware JE, et al. How cost sharing affects the use of ambulatory mental health services. *JAMA* 1986; 256(14): 1930–1934. [PubMed: 3761499]
9. Wells KB, Manning WG, Duan N, Newhouse JP, Ware JE. Cost-sharing and the use of general medical physicians for outpatient mental health care. *Health Serv Res* 1987; 22(1): 1–17. [PubMed: 3106267]
10. Horgan CM. The demand for ambulatory mental health services from specialty providers. *Health Serv Res* 1986; 21(2 Pt 2): 291–319. [PubMed: 3721874]
11. Haas-Wilson D, Scheffler R, Cheadle A. Demand for Mental Health Services: An Episode of Treatment Approach. [Online] University Library of Munich, Germany. Report number: 19862, 1989 [Accessed: 15th January 2014]. Available from: <http://ideas.repec.org/p/pramprapa/19862.html> [Accessed: 15th January 2014]
12. Lindrooth RC, Lo Sasso AT, Lurie IZ. The Effect of Expanded Mental Health Benefits on Treatment Initiation and Specialist Utilization. *Health Serv Res* 2005; 40(4): 1092–1107. [PubMed: 16033494]
13. Lo Sasso AT, Lurie IZ, Lee JU, Lindrooth RC. The effects of expanded mental health benefits on treatment costs. *J Ment Health Policy Econ* 2006; 9(1): 25–33. [PubMed: 16733269]
14. Lo Sasso AT, Lindrooth R, Lurie I, Lyons J. Expanded Mental Health Benefits and Outpatient Depression Treatment Intensity. *Med Care* 2006; 44(4): 366–372. [PubMed: 16565638]
15. Meyerhoefer CD, Zuvekas SH. New estimates of the demand for physical and mental health treatment. *Health Econ* 2010; 19(3): 297–315. [PubMed: 19350688]
16. Simon GE, Grothaus L, Durham ML, VonKorff M, Pabiniak C. Impact of visit copayments on outpatient mental health utilization by members of a health maintenance organization. *Am J Psychiatry* 1996; 153(3): 331–338. [PubMed: 8610819]
17. Lu C, Frank RG, McGuire TG. Demand response of mental health services to cost sharing under managed care. *J Ment Health Policy Econ* 2008; 11(3): 113–125. [PubMed: 18806301]
18. Hodgkin D, Horgan CM, Garnick DW, Merrick EL. Benefit Limits for Behavioral Health Care in Private Health Plans. *Admin Policy Ment Health* 2009; 36(1): 15–23.
19. Salkever DS, Shinogle J, Goldman H. Mental health benefit limits and cost sharing under managed care: a national survey of employers. *Psychiatr Serv* 1999; 50(12): 1631–1633. [PubMed: 10577886]
20. Frank RG, McGuire T. A review of studies of the impact of insurance on the demand and utilization of specialty mental health services. *Health Serv Res* 1986; 21(2 Pt 2): 241–265. [PubMed: 3522485]
21. Goldman HH, Taube CA. High users of outpatient mental health services, II: Implications for practice and policy. *Am J Psychiatry* 1988; 145(1): 24–28. [PubMed: 3337289]
22. Sturm R How expensive is unlimited mental health care coverage under managed care? *JAMA* 1997; 278(18): 1533–1537. [PubMed: 9363977]
23. Peele PB, Lave JR, Xu Y. Benefit limits in managed behavioral health care: do they matter? *J Behav Health Serv Res* 1999; 26(4): 430–441. [PubMed: 10565103]
24. Merrick EL, Horgan CM, Garnick DW, Hodgkin D. Managed care organizations' use of treatment management strategies for outpatient mental health care. *Admin Policy Ment Health* 2006; 33(1): 104–114.
25. Boksa P A way forward for research on biomarkers for psychiatric disorders. *J Psychiatry Neurosci* 2013; 38(2): 75–77. [PubMed: 23422052]
26. Hodgkin D The impact of private utilization management on psychiatric care: a review of the literature. *J Ment Health Adm* 1992; 19(2): 143–157. [PubMed: 10121507]
27. Liu X, Sturm R, Cuffel BJ. The impact of prior authorization on outpatient utilization in managed behavioral health plans. *Med Care Res Rev* 2000; 57(2): 182–195. [PubMed: 10868072]

28. Howard R The sentinel effect in an outpatient managed care setting. *Professional Psychology - Research and Practice* 1998; 29(3): 262–268.
29. Gotowka TD, Smith RB. Focused psychiatric review: impacts on expense and utilization. *Benefits Q* 1991; 7(4): 73–81. [PubMed: 10170927]
30. Wickizer TM, Lessler D, Travis KM. Controlling inpatient psychiatric utilization through managed care. *Am J Psychiatry* 1996; 153(3): 339–345. [PubMed: 8610820]
31. Ettner S, Harwood J, Thalmayer A, Ong M, Xu H, Bresolin M, et al. The Mental Health Parity and Addiction Equity Act evaluation study: Impact on specialty behavioral health utilization and expenditures among “carve-out” enrollees. *J Health Econ* 2016; 50: 131–143. [PubMed: 27736705]
32. Harwood J, Azocar F, Friedman S, Ong M, Thalmayer A, Tseng C-H, et al. The Mental Health Parity and Addiction Equity Act Evaluation Study: Impact on Specialty Behavioral Healthcare Utilization and Spending Among Carve-In Enrollees. *Medical Care (In Press)*. 2016;
33. Friedman S, Xu H, Harwood JM, Azocar F, Hurley B, Ettner SL. The Mental Health Parity and Addiction Equity Act evaluation study: Impact on specialty behavioral healthcare utilization and spending among enrollees with substance use disorders. *J Subst Abuse Treat* 2017; 80: 67–78. [PubMed: 28755776]
34. Broadhead WE, Blazer DG, George LK, Tse CK. Depression, disability days, and days lost from work in a prospective epidemiologic survey. *JAMA* 1990; 264(19): 2524–2528. [PubMed: 2146410]
35. American Psychological Association. 2014 Mental Health Parity Survey. 2014. Available from: <http://www.apa.org/helpcenter/parity-survey-2014.pdf>.

**Table 1.** Descriptive Statistics of Enrollees by Individual Sociodemographic, Employer, Plan, and Area Provider-Supply Characteristics, and by Network Status (INN/OON vs. INN-only), 2009.

Individual characteristics	INN/OON		INN-only	
	N	%	N	%
Total N	1,058,474		184,475	
Male (vs. female)	520,596	49.2	84,294	45.7
42–64 years old (vs. 18–41)	552,858	52.2	92,316	50
Dependent (vs. primary insured person)	372,491	35.2	66,949	36.3
Income and net worth				
income un-coded, net worth <150K	42,434	4	14,494	7.9
income un-coded, net worth ≥150K	56,390	5.3	15,361	8.3
income <75K, net worth <25K	65,593	6.2	10,301	5.6
income <75K, 25<net worth <100K	46,116	4.4	7,259	3.9
income <75K, net worth ≥100K	81,905	7.7	11,529	6.2
75<=income <150K, net worth <100K	44,307	4.2	6,479	3.5
75<=income <150K, 100<=net worth <250	66,576	6.3	8,917	4.8
75<=income <150K, net worth ≥250K	119,794	11.3	13,486	7.3
income≥150K, net worth <500K	58,968	5.6	7,085	3.8
income≥150K, net worth ≥500K	90,902	8.6	7,717	4.2
missing income and net worth	385,489	36.4	81,847	44.4
Any mental health diagnosis	32,050	3.0	5,793	3.1
Mental health condition diagnoses among those with any specialty mental health utilization				
Any adjustment disorder	13,253	40.6	2,425	41.2
Any post-traumatic stress disorder	1,502	4.6	260	4.4
Any generalized anxiety	7,652	23.5	1,338	22.7
Any obsessive-compulsive disorder	719	2.2	127	2.2
Any panic disorder	1,493	4.6	267	4.5
Any phobia	434	1.3	75	1.3
Any cognitive disorder	200	0.6	45	0.8
Any bipolar disorder	2,302	7.1	416	7.1



	INN/OON		INN-only	
	N	%	N	%
Any depressive disorder	15,057	46.2	2,738	46.5
Any personality disorder	400	1.2	80	1.4
Any psychotic disorder	515	1.6	84	1.4
Any other psychiatric disorder	2,803	8.6	459	7.8
Employer characteristics				
Employer group size				
>40,001	192,371	18.2	11,868	6.4
10,001–40,000	459,023	43.4	95,601	51.8
5,000–10,000	225,678	21.3	34,556	18.7
51–4,999	181,402	17.1	42,450	23
Industry				
Mining	24,136	2.3	26,804	14.5
Utilities	72,999	6.9	3,348	1.8
Construction	21,461	2	5,405	2.9
Manufacturing	199,701	18.9	41,855	22.7
Wholesale Trade	27,559	2.6	2,761	1.5
Retail trade	46,020	4.3	884	0.5
Transportation and warehousing	131,427	12.4	5,072	2.7
Information	62,956	5.9	11,718	6.4
Finance and insurance	234,145	22.1	29,065	15.8
Real Estate Rental and Leasing	15,528	1.5	2,786	1.5
Professional, Scientific, and Technical Services	119,772	11.3	13,101	7.1
Management of Companies and Enterprises	2,662	0.3	15	0
Administrative and support and waste management and remediation services	1,254	0.1	–	0
Educational services	5,527	0.5	3,238	1.8
Health care and social assistance	27,595	2.6	25,285	13.7
Arts, Entertainment, and Recreation	38,974	3.7	6,025	3.3
Accommodation and Food service	4,265	0.4	7,079	3.8
Other services (except public administration)	12,197	1.2	34	0
Public administration	10,296	1	–	0

	INN/OON		INN-only	
Census Division				
New England	71,612	6.8	963	0.5
Middle Atlantic	185,398	17.5	57,798	31.3
East North Central	157,186	14.9	18,436	10
West North Central	74,361	7	951	0.5
South Atlantic	192,272	18.2	23,086	12.5
East South Central	36,837	3.5	2,766	1.5
West South Central	172,447	16.3	52,359	28.4
Mountain	65,215	6.2	13,647	7.4
Pacific	103,146	9.7	14,469	7.8
Plan characteristic	N	%	N	%
More managed plan type (e.g. EPO, POS, HMO) vs. less managed (PPO, HDHP)	1,007,864	95.4	161,211	87.4
Provider Supply	Mean	SD	Mean	SD
Number of MSW providers per 1000 members	2.6	3.3	2.7	3.4
Number of PhD providers per 1000 members	1	1	0.9	1

Notes:

INN/OON: Plans that cover in-network and out-of-network services; INN-only: Plans that cover in-network services.

EPO: Exclusive provider organization; POS: Point of service; HMO: Health management organization; PPO: Preferred provider organization; HDHP: High deductible health plan; MSW: Masters of Social Work; PhD: Doctor of Philosophy

**Table 2.** Descriptive Statistics of Individual Psychotherapy and Inpatient In-Network and Out-Of-Network Benefits, 2009 and 2011.

	INN/OON plans (n=1,058,474) INN-only plans (n=184,475)			
	2009	2011	2009	2011
	Mean (SD)			
<b>Individual psychotherapy (in-network)</b>				
Cost sharing from copayment and coinsurance*	\$167 (212)	\$132 (138)	\$97 (132)	\$94 (110)
Deductible	\$1231 (1104)	\$1387 (1183)	\$690 (1602)	\$1048 (2305)
Cost sharing from copayment and coinsurance penalty*	\$54 (263)	\$415 (362)	\$75 (318)	\$ 486 (708)
Outpatient provider supply <sup>†</sup>	3.6 (4.0)	4.1 (4.3)	3.6 (4.2)	4.1 (4.4)
<b>Visit limit<sup>††</sup></b>				
	Proportion yes			
	78% (0.4)	0% (0)	75% (0.4)	0% (0)
<b>Individual psychotherapy (out-of-network)</b>				
Mean (SD)				
Cost sharing from coinsurance*	\$541 (114)	\$548 (111)		
Deductible	\$1722 (1664)	\$2312 (2039)		
Cost sharing from copayment and coinsurance penalty*	\$47 (234)	\$125 (206)		
<b>Inpatient (in-network)</b>				
Cost sharing from copayment and coinsurance*	\$242 (151)	\$234 (143)	\$230 (152)	\$241 (185)
Deductible	\$1235 (1103)	\$1398 (1214)	\$690 (1602)	\$1048 (2305)
Cost sharing from copayment and coinsurance penalty*	\$596 (392)	\$478 (261)	\$610 (480)	\$ 388 (468)
<b>Day limit<sup>†††</sup></b>				
	Proportion yes			
	69% (0.5)	0% (0)	71% (0.5)	0%
Mean (SD)				

	INN/OON plans (n=1,058,474)		INN-only plans (n=184,475)	
	2009	2011	2009	2011
	Mean (SD)			
Inpatient (out-of-network)				
Cost sharing from coinsurance *	\$38 (8)	\$39 (8)		
Deductible	\$1722 (1664)	\$2313 (2038)		
Cost sharing from copayment and coinsurance penalty *	\$225 (307)	\$257 (256)		

\* Cost sharing from copayment and coinsurance calculated by adding the regular copayment to the product of the regular coinsurance and average total expenditures for individual psychotherapy or inpatient care. Cost sharing from copayment and coinsurance penalty is calculated by adding the penalty copayment to the product of the penalty coinsurance and average total expenditures for individual psychotherapy or inpatient care. Penalty copayment is the additional dollar amount that patients pay above their regular copayment when prior authorization is required but not obtained. Penalty coinsurance is the additional percent that patients pay above their regular coinsurance when prior authorization is required but not obtained.

<sup>†</sup>Number of PhD and MSWs in Optum Behavioral networks per 1,000 Optum Behavioral enrollees in state.

<sup>††</sup>Day and visit limits apply to both in-network and out-of-network services.

**Table 3.**

Marginal Effects of Changes in Benefit Features on Changes in INN Individual Psychotherapy Utilization and Expenditures, Enrollees in INN/OON and INN-only Plans.

	INN/OON plans (n=1,058,474)			INN-only plans (n=184,475)		
	Individual psychotherapy visits	Individual psychotherapy, total expenditure	Individual psychotherapy, patient out-of-pocket expenditures	Individual psychotherapy visits	Individual psychotherapy, total expenditure	Individual psychotherapy, patient out-of-pocket expenditures
Cross sectional sample, 2009, mean (SD)	0.2 (2)	\$15.7 (158)	\$6.3 (62)	0.2 (2)	\$16.2 (159)	\$5.7 (57)
Change scores, mean (SD)	0.01 (3)	\$0.16 (188)	\$-0.5 (73)	0.003 (3)	\$-0.3 (181)	\$-0.6 (63)
	Coefficients / (Robust Standard Error)					
Change in in-network benefits						
Cost sharing from copayment and coinsurance	-0.00008*	-0.00629*	-0.00105	-0.00004	-0.00369	0.00528**
	(0.00004)	(0.00244)	(0.00135)	(0.00007)	(0.00520)	(0.00176)
Deductible	-0.00001	-0.00014	0.00042*	-0.000009*	-0.00063*	-0.00018
	(0.000006)	(0.00056)	(0.00018)	(0.000004)	(0.00026)	(0.00011)
Elimination of limit	0.09637*	6.57506*	2.48004	0.09053*	7.35051*	1.84270
	(0.0301)	(1.89810)	(1.30807)	(0.03956)	(2.86995)	(1.03689)
Cost sharing from copayment and coinsurance penalty	-0.00004*	-0.00283*	0.000005	.00002	0.00101	0.00014
	(0.00002)	(0.00130)	(0.00064)	(.00001)	(0.00092)	(0.00039)
Outpatient provider network <sup>††</sup>	-0.00274	0.02397	0.05267	-0.00725	-0.5025468	0.08588
	(0.00401)	(0.27336)	(0.11198)	(0.00778)	(0.53956)	(0.22535)
Change in out-of-network benefits						
Coinsurance	0.00312	0.23747	0.06261			
	(0.00193)	(0.14239)	(0.04551)			
Additional coinsurance	0.00073	0.03916	.01050			

	INN/OON plans (n=1,058,474)		INN-only plans (n=184,475)	
	Individual psychotherapy visits	Individual psychotherapy, total expenditure	Individual psychotherapy, patient out-of-pocket expenditures	Individual psychotherapy, total expenditure
Y-intercept	(0.00071) -0.05037	(0.04755) -4.32286	(.01963) -2.56451	-5.80709
R-squared	0.0004	0.0004	0.0004	0.0004
Range of variance inflation factors	1.00–1.15	1.00–1.15	1.00–1.15	1.03–1.09

\* p<0.05

<sup>†</sup> Coefficients represent marginal effects. These were estimated using a linear regression on change scores, which, for continuous variables, was the 2011 value minus the 2009 value. Change score for elimination of limits was coded = 1 if plan eliminated limit, = 0 if plan never had a limit. Standard errors were calculated using GEE with an independent correlation matrix to adjust for clustering at the employer level.

<sup>††</sup> Number of PhD and MSWs in Optum Behavioral networks per 1,000 Optum enrollees in state.

**Table 4.**

Marginal Effects of Changes in Benefit Features on Changes in INN Inpatient Utilization and Expenditures, Enrollees in INN/OON and INN-only Plans.

	INN/OON plans (n=1,058,474)				INN-only plans (n=184,475)			
	Inpatient days	Inpatient, total expenditure	Inpatient, patient out-of-pocket expenditures	Inpatient days	Inpatient, total expenditure	Inpatient, patient out-of-pocket expenditures	Inpatient, total expenditure	Inpatient, patient out-of-pocket expenditures
Cross sectional sample, 2009, mean (SD)	0.01 (0.4)	\$10.5 (424)	\$1.3 (46)	0.01 (0.4)	\$11.3 (510)	\$0.9 (31)		
Change scores, mean (SD)	0.002 (0.7)	\$0.9 (732)	\$0.03 (65)	0.03 (43)	\$-1.3 (615)	\$0.03 (43)		
Coefficients <sup>†</sup> (Robust Standard Error)								
Change in in-network benefits								
Cost sharing from copayment and coinsurance	0.000005 (0.00001)	0.00131 (0.00829)	0.00093 (0.00062)	-0.00001 (0.0000142)	-0.00139 (0.00785)	0.00099 (0.00104)		
Deductible	0.000001 (0.000001)	0.00023 (0.00058)	0.00024 (0.00010)	-0.000003*** (0.0000005)	-0.00178*** (0.00036)	-0.00021*** (0.00003)		
Elimination of limit	0.00410 (0.00257)	3.85292 (2.11779)	.35327 (0.23239)	0.01081 * (0.0050337)	12.15466** (4.65277)	0.41694 (0.22580)		
Cost sharing from copayment and coinsurance penalty	0.000003 (0.000002)	0.00200 (0.00201)	.0002175 (0.00023)	-0.000004 (0.000006)	-0.00201 (0.00373)	-0.00053 (0.00039)		
Change in out-of-network benefits								
Coinsurance	-0.00024 (0.00018)	-0.26940 (0.16632)	-0.00139 (0.01403)					
Deductible	0.0000004 (0.0000003)	0.00057 (0.00028)	0.00006 (0.01403)					
Y-intercept	-0.00044 (0.00000)	-1.75797 (0.00000)	-0.25869 (0.00000)	-0.0060582 (0.00001)	-9.72054 (0.00001)	-0.3193675 (0.00001)		
R-squared	1.01-1.20	1.01-1.20	1.01-1.20	1.03-1.16	1.03-1.16	1.03-1.16		

\* p<0.05



Coefficients represent marginal effects. These were estimated using a linear regression on change scores, which, for continuous variables, was the 2011 value minus the 2009 value. Change score for elimination of limits was coded = 1 if plan never had a limit. Standard errors were calculated using GEE with an independent correlation matrix to adjust for clustering at the employer level.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

**Table 5.**

Marginal Effects of Changes in Benefit Features on Changes in INN Individual Psychotherapy Utilization and Expenditures, Enrollees in INN-00N Plans, by Income Level.

	Low income/net worth <sup>§</sup>				High income/net worth <sup>§</sup>			
	Individual psychotherapy visits	Individual psychotherapy, total expenditure	Individual psychotherapy, patient out-of-pocket expenditures	Individual psychotherapy visits	Individual psychotherapy, total expenditure	Individual psychotherapy, patient out-of-pocket expenditures	Individual psychotherapy visits	Individual psychotherapy, total expenditure
Change in in-network benefits								
Cost sharing from copayment and coinsurance	-0.00050 (0.00029)	-0.00351 (0.00182)	-0.00032 (0.00087)	-0.00009* (0.00004)	-0.00695* (0.00284)	-0.00134 (0.00164)	-0.00009* (0.00004)	-0.00695* (0.00284)
Deductible	-0.000004 (0.000008)	-0.00017 (0.00061)	0.00044 (0.00029)	-0.0000145 (0.000009)	-0.00040 (0.00071)	0.00044 (0.00027)	-0.0000145 (0.000009)	-0.00040 (0.00071)
Elimination of limit	0.08672*** (0.02382)	6.36091*** (1.48786)	2.54328* (1.08964)	0.11035*** (0.03290)	7.42310*** (2.04990)	2.95834* (1.46347)	0.11035*** (0.03290)	7.42310*** (2.04990)
Cost sharing from copayment and coinsurance penalty	-0.000006 (0.00002)	-0.00040 (0.00140)	0.00098 (0.00089)	-0.00004 (0.00002)	-0.00304 (0.00170)	0.00049 (0.00096)	-0.00004 (0.00002)	-0.00304 (0.00170)
Outpatient provider network &	-0.00108 (0.000623)	-0.06263 (0.45205)	-0.05138 (0.17889)	-0.00065 (0.00450)	0.17492 (0.32587)	0.08459 (0.14051)	-0.00065 (0.00450)	0.17492 (0.32587)
Change in out-of-network benefits								
Coinsurance	0.00149 (0.00189)	0.13547 (0.13961)	0.04526 (0.05778)	0.004340 (0.00246)	0.31542 (0.18333)	0.05668 (0.06167)	0.004340 (0.00246)	0.31542 (0.18333)
Additional coinsurance	0.00047 (0.00169)	-0.00072 (0.13900)	0.00717 (0.03781)	0.00037 (0.00084)	0.01634 (0.05805)	-0.00117 (0.02481)	0.00037 (0.00084)	0.01634 (0.05805)
Y-intercept	-0.05200 (111,709)	-4.12177 (111,709)	-2.26662 (111,709)	-0.06624 (561,278)	-5.19120 (561,278)	-3.39830 (561,278)	-0.06624 (561,278)	-5.19120 (561,278)
N	111,709	111,709	111,709	561,278	561,278	561,278	561,278	561,278
R-squared	0.0004	0.0004	0.0003	0.0005	0.0005	0.0003	0.0005	0.0005

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

<sup>\*</sup> p<0.01  
<sup>\*\*</sup> p<0.01  
<sup>\*\*\*</sup> p<0.001

<sup>7</sup> Marginal effects were estimated using a linear regression on change scores, which, for continuous variables, was the 2011 value minus the 2009 value. Change score for elimination of limits was coded = 1 if plan eliminated limit, = 0 if plan never had a limit. Standard errors are calculated using GEE with an independent correlation matrix to adjust for clustering at the employer level.

<sup>77</sup> Number of PhD and MSW's in Optum Behavioral networks per 1,000 Optum Behavioral enrollees in state.

<sup>8</sup> High income/net worth (Income: >=\$75,000 & net worth: >=\$100,000) and low income/net worth (Income: <\$73,000 & net worth: <\$100,000).

**Table 6.**

Marginal Effects of Changes in Benefit Features on Changes in INN Inpatient Utilization and Expenditures, Enrollees in INN-OON Plans, by Income Level.

	Low income/ net worth <sup>††</sup>			High income/ net worth <sup>††</sup>		
	Inpatient days	Inpatient, total expenditures	Inpatient, patient out-of-pocket expenditures	Inpatient days	Inpatient total expenditures	Inpatient, patient out-of-pocket expenditures
Coefficients <sup>†</sup> (Robust Standard Error)						
Change in in-network benefits						
Cost sharing from copayment and coinsurance	0.00003 (0.000002)	0.01554 (0.01472)	0.00124 (0.00193)	0.000009 (0.00001)	0.00516 (0.01422)	0.00147 (0.00085)
Deductible	-0.000000007 (0.0000002)	-0.00046 (0.00139)	0.00059 (0.00035)	0.000002 (0.000001)	0.00144 (0.00090)	0.00023* (0.00010)
Elimination of limit	0.00001 (0.000505)	4.499727 (3.21839)	0.53587 (0.46046)	0.00508 (0.00299)	3.93170 (2.66691)	0.33531 (0.24875)
Cost sharing from copayment and coinsurance penalty	0.00001 (0.000006)	0.00503 (0.00494)	0.00063 (0.00062)	0.000003 (0.000004)	0.00103 (0.00328)	0.00021 (0.00042)
Change in out-of-network benefits						
Coinsurance	-0.00017 (0.00038)	-0.06937 (0.31043)	0.02031 (0.04750)	-0.00036 (0.00028)	-0.40797 (0.28549)	-0.00764 (0.01615)
Deductible	0.0000001 (0.000001)	-0.00003 (0.00058)	0.00007 (0.00011)	0.0000001 (0.0000005)	0.00028 (0.00035)	0.000074* (0.00003)
Y-intercept	0.00439	-1.07564	-0.13806	-0.00128	-2.03836	-0.37192
N	111,709	111,709	111,709	561,278	561,278	561,278
R-squared	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000

\* p<0.05

\*\* p<0.01

\*\*\* p<0.001

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Marginal effects were estimated using a linear regression on change scores, which, for continuous variables, was the 2011 value minus the 2009 value. Change score for elimination of limits was coded = 1 if plan eliminated limit, = 0 if plan never had a limit. Standard errors were calculated using GEE with an independent correlation matrix to adjust for clustering at the employer level.

High income/net worth (Income:  $\geq$ \$75,000 & net worth:  $\geq$ \$100,000) and low income/net worth (Income:  $<$ \$75,000 & net worth:  $<$ \$100,000).