Published in final edited form as:

J Addict Med. 2018 ; 12(1): 11–18. doi:10.1097/ADM.0000000000000368.

Effects of global payment and accountable care on medication treatment for alcohol and opioid use disorders

Julie M. Donohue, Ph.D.*,

University of Pittsburgh Graduate School of Public Health

Colleen L. Barry, Ph.D., M.P.P.,

Johns Hopkins Bloomberg School of Public Health

Elizabeth A. Stuart, Ph.D.,

Johns Hopkins Bloomberg School of Public Health

Shelly F. Greenfield, M.D., M.P.H.,

McLean Hospital, Harvard Medical School

Zirui Song, M.D., Ph.D.,

Harvard Medical School, Massachusetts General Hospital

Michael E. Chernew, Ph.D., and

Harvard Medical School

Haiden A. Huskamp, Ph.D.

Harvard Medical School

Abstract

Objectives—The Alternative Quality Contract (AQC) implemented in 2009 by Blue Cross Blue Shield of Massachusetts (BCBSMA) is intended to improve quality and control costs by putting providers at risk for total medical spending and tying payment to performance on specified quality measures. We examined the AQC's early effects on use of and spending on medication treatment (MT) for addiction among individuals with alcohol use disorders (AUD) and opioid use disorders (OUD), conditions not subject to any performance measurement in the AQC.

Methods—Using data from 2006–2011, we use difference-in-difference estimation of the effect of the AQC on MT using a comparison group of enrollees in BCBSMA whose providers did not participate in the AQC. We compared AQC and non-AQC enrollees with AUDs ($n = 37,113$ person-years) and/or OUDs ($n = 12,727$ person-years) on any use of MT, number of prescriptions filled, and MT spending adjusting for demographic and health status characteristics.

Results—There was no difference in MT use among AQC enrollees with OUD (38.7%) relative to the comparison group (39.1%) (adjusted difference=−0.4% (95% CI −3.8% to 3.0%, $p=0.82$). Likewise, there was no difference in MT use for AUD between the AQC (6.3%) and comparison

*Corresponding author: Julie M. Donohue, PhD, Department of Health Policy and Management, 130 DeSoto Street, Crabtree Hall A635, Pittsburgh, PA 15261, (412) 624-3146 (Fax), (412) 624-4562 (office), jdonohue@pitt.edu.

Disclosures

All authors report no competing interests.

group (6.5%) ($p=0.64$). Similarly, we detected no differences in number of prescriptions or spending.

Conclusions—Despite incentives for improved integration and quality of care under a global payment contract, the initial 3 years of the AQC showed no impact on MT use for AUD or OUD among privately-insured enrollees with behavioral health benefits.

Keywords

Payment reform; accountable care organization; medication treatment for addiction; opioid use disorder; alcohol use disorder

Opioid and alcohol use disorders impose a significant economic burden due to premature mortality, health care costs, workplace productivity losses, and criminal justice costs. Estimates indicate that the societal costs of alcohol use disorders (AUDs) are \$191.6 billion while the costs of opioid use disorders (OUDs) exceed \$78 billion (Birnbbaum et al., 2011; Harwood, 2000; Florence et al., 2016). Evidence suggests that the recent increase in mortality among non-Hispanic whites in the US is attributable largely to consequences of substance use and mental disorders (Case A and Deaton A, 2015). Despite the availability of many effective treatments for AUDs and OUDs (Fudula PJ et al., 2003; Volkow ND et al., 2014), fewer than 10% of individuals with OUD and AUD receive any treatment (Substance Abuse and Mental Health Services Administration (SAMHSA) Center for Behavioral Health Statistics and Quality, 2014) for a variety of reasons, including stigma (Olsen and Sharfstein, 2014; Keyes KM et al., 2010; Barry CL et al., 2014), the separation of substance use disorder (SUD) treatment delivery and financing from general medical care (Garfield RL, 2011), and a shortage of SUD treatment providers (Substance Abuse and Mental Health Services Administration (SAMHSA) US Department of Health and Human Services, 2014).

Due to limited availability of specialty care for SUD in many communities (Sigmon, 2014), there has been a concerted effort to expand the role of primary care physicians in screening for and treating AUDs and OUDs. Boosting access to medication treatment (MT) for addiction, has been a key focus of these efforts. In particular, the number of primary care physicians waived to prescribe buprenorphine for OUDs has increased significantly (Stein et al., 2015; Dick et al., 2015), and the federal government recently increased the number of patients each provider is able to treat (Federal Register, 2016). This expansion along with the introduction of new pharmaceutical products to treat AUDs and OUDs, often delivered in primary care settings, were key drivers of the 7.2% annual increase in use of prescription medications to treat SUDs between 2009 and 2012 (Parks Thomas et al., 2016).

The role of physicians practicing outside of specialty substance use treatment facilities in addressing underuse of SUD treatment may also expand due to health care delivery and payment reforms. Medicare, Medicaid and private insurance companies have instituted Accountable Care Organization contracts with large provider groups involving the use of incentive payments tied to performance metrics to restrain cost growth and improve quality. The Alternative Quality Contract (AQC) implemented in 2009 by Blue Cross Blue Shield of Massachusetts (BCBSMA) is one such initiative. The AQC pays provider organizations a risk-adjusted prospective payment for all primary and specialty care provided to a specific

population (i.e., the global budget) through, in most cases, a five-year contract. Organizations in the AQC are eligible for bonuses based on performance on 64 outpatient and hospital quality measures. Studies of the AQC over its first few years found that enrollees of AQC provider organizations had lower total spending and improved quality relative to enrollees of provider organizations who did not enter into the AQC (Song et al., 2012; Song et al.).

The AQC was associated with little to no change, however, in the likelihood of any treatment for SUD (including all diagnoses) or spending on SUD treatment in the first three years of the contract (Stuart EA et al., 2016). The effect of the AQC on MT for AUDs and OUDs, specifically, is unknown. Lack of change in spending on SUD treatment overall may mask changes in MT delivered in general medical settings. Primary care providers play a central role in the AQC, and MT, unlike other SUD services, is more likely to be prescribed in general medical settings and does not require referral to, nor availability of, specialty SUD treatment providers. By creating financial incentives for providers to reduce total spending, the AQC may prompt primary care physicians to increase the use of cost-effective interventions such as buprenorphine and naltrexone to patients with OUD and AUD, who have higher health care expenditures on average (Canadian Agency for Drugs and Technologies in Health, 2016; Zarkin GA et al., 2008). We examined the early effects of the AQC on the likelihood and duration of MT for OUD and AUD disorders as well as spending on MT prescribed in outpatient settings and dispensed in retail pharmacies in the first 3 years of the contract. We take advantage of the natural experiment made possible by the AQC's staggered implementation and use difference-in-difference estimation of the effect of the AQC on MT using a built-in comparison group of BCBSMA providers not exposed to the contract.

Methods

Background on AQC

In 2009, BCBSMA, the largest private health insurer in Massachusetts, implemented the AQC. In that first year, 7 provider organizations entered AQC contracts; in 2010 and 2011 4 and 1 more joined, respectively. Our study period corresponds to the first 3 years of implementation (2009–2011), by the end of which included about 430,000 enrollees. Provider groups in the AQC enter a contract with a fixed global budget for a defined patient population. In addition, groups are eligible for bonus payments tied to performance on 64 quality metrics related to chronic care management, adult preventive care, and pediatric care. None of the quality metrics in the first 3 years were specific to AUD or OUD (Appendix).

Data source and study sample

This study uses six years of BCBSMA inpatient, outpatient and pharmacy claims and enrollment data (2006–2011), three years before and three years after the first AQC contracts in 2009. Our study population includes individuals aged 13–64 years who were continuously enrolled in a BCBSMA HMO or POS plan for at least one calendar year during 2006–2011. The unit of observation was the person-year. We included only those person-years with 12 months of enrollment in medical, behavioral, and pharmacy benefits managed by BCBSMA.

All BCBSMA enrollees in HMO and POS plans were required to select a primary care physician upon enrollment with the plan. We identified enrollees as participants in the AQC (or not) based on whether their chosen PCP belonged to an organization that had entered an AQC contract.

Provider organizations entered the AQC on a staggered basis beginning in 2009. We used a difference-in-differences design that included in the comparison group for a given calendar year both patients of provider organizations that, in that year, had not yet entered the AQC but would in a future year, and patients of provider organizations that never entered the AQC. This approach allowed us to account for differences in the characteristics of enrollees in AQC and non-AQC provider organizations as well as secular trends in MT unrelated to implementation of the AQC. We limited our study to the first three years post-AQC implementation in order to preserve an adequate comparison group within the BCBSMA enrollee population.

We employed a common approach to identifying individuals with SUD diagnoses using *International Classification of Diseases, 9th Revision, Clinical Modification* (ICD-9-CM) codes in insurance claims (Goldman HH et al., 2006; Harris et al., 2016). To identify individuals with OUD, we used codes for opioid dependence (ICD 304.00–304.03, 304.70–304.73) or opioid abuse (ICD 305.50–305.53). We included those with either an inpatient stay where the last primary discharge diagnosis and the majority of all primary diagnoses during an inpatient stay were for OUD; OR an outpatient visit in which opioid dependence or abuse was coded in any diagnosis field. To identify individuals diagnosed with AUD, we used a similar approach, including those with inpatient or outpatient claims for alcohol dependence (ICD 303), non-dependent alcohol abuse (305.0) or alcohol-induced mental disorder (ICD 291). For the purpose of analysis, individuals with OUDs who had a co-occurring AUD were included in the OUD group given that the acute risks of OUD severity may drive MT prescribing in patients with both disorders. We explored the possibility of analyzing those with co-occurring AUD and OUD separately, but sample sizes were too small so we included them in the OUD group. Both the OUD and AUD groups could include individuals with other SUDs none of which have approved MTs (e.g., marijuana, cocaine).

Outcome measures

We used pharmacy claims to construct our MT use and spending measures. Prescriptions for the following medications with FDA approval to treat AUD and/or OUD were considered MT: oral naltrexone, disulfiram, acamprosate, or buprenorphine. We did not include methadone administered in opioid treatment programs because our focus was on MT delivered in primary care settings. Nor did we include long-acting injectable naltrexone (Vivitrol®) due to its very low use in our study sample.

We constructed four outcome measures among individuals with AUD or OUD. First, we measured the likelihood of any MT (use of one or more of the medications listed above). Second, we measured the number of prescriptions filled for MT, standardized by a 30-day supply (i.e., a 7-day prescription would count as 0.23 prescriptions). Third, we measured the number of prescriptions filled for MT conditional on having filled any to determine whether the AQC affected duration of use among those who began treatment. Fourth, we measured

spending on MT conditional on any use. Spending was measured in pharmacy claims, which do not incorporate rebates negotiated by the plan, and was adjusted for inflation using the Consumer Price Index.

Covariates

We adjusted analyses for individual-level differences between the AQC group and the comparison group on demographic characteristics and health status. Specifically, we included indicators for sex; age category (13–17, 18–27, 28–37, 38–47, 48–57, or 58–64 years); an interaction term for age and sex; and risk score which is based on the diagnostic-cost-group (DxCg) scoring system developed by Verisk Health.(Pope GK et al., 2004; Hileman et al., 2016) The risk score was calculated annually by BCBSMA from diagnoses recorded in claims (including any comorbid mental health conditions) and demographic information.

Statistical Analyses

We used a difference-in-differences (DD) study design to compare trends in MT use for enrollees with AUD or OUD before and after organizations entered the AQC with trends over the same time period for enrollees in provider organizations that were not participating in the AQC. All analyses were conducted separately for the OUD and AUD cohorts. Logit models were used to examine changes in the odds of any MT in the AQC and non-AQC groups. A negative binomial model was used to examine changes in the number of prescriptions filled in each cohort. Finally, two-part models were used to examine changes in the amount of spending on MT, conditional on any MT use, attributable to the AQC. In the two-part model, the model's first stage used a logistic model while the second stage used a linear model. The linear model compared favorably to alternative model specifications (log transformed and gamma models) based on model fit diagnostics.

Before we estimated these models, we compared AQC and non-AQC enrollees on observable characteristics and baseline trends in our outcomes. The two groups were remarkably comparable with respect to demographic characteristics and risk score (e.g., overall health status). There was no evidence of differences in baseline trends across AQC and non-AQC groups for those individuals with AUD. Among those with OUD there is weak evidence that the rate of increase in spending in the pre-AQC period was higher for those groups that later entered the AQC (vs. those that didn't); however, we note that our analyses take into account these differences in trends during the pre-AQC time period. Nevertheless, we ran models with propensity score weighting to balance the groups on observable characteristics before estimating the effects of the AQC. The use of propensity score weighting did not improve covariate balance between groups or change the estimated coefficients, so we present results without weights.

For each MT-related outcome (any use, number of prescriptions overall and conditional on any use, and spending) and for each condition (alcohol or opioid use disorder) we estimated two models. The primary analysis examined the overall effect of the AQC regardless of time since entering the contract. In a secondary analysis, we examined whether the effect of the AQC depended on how long a provider group had been party to the contract (i.e., years of

experience with the AQC). Models included the key variables for estimating a difference in the differences. Thus, in our primary analysis (any AQC participation), we included an indicator for participation in the AQC (vs. comparison group), a time indicator (pre vs. post-AQC implementation), and an interaction term between AQC and time. In the secondary analysis, we included an indicator of whether the enrollee's provider organization entered the AQC in the first (2009), second (2010) or third (2011) year of the contract (vs. not in the AQC); an indicator for entry into the AQC (pre vs. post-AQC); and interaction terms between AQC Year 1, AQC Year 2, or AQC Year 3 and the AQC indicator. To determine whether our results were sensitive to outliers in number of prescriptions or spending, we also conducted a sensitivity analysis that Winsorized values above the 99th percentile to the 99th percentile. Results were nearly identical and thus we present only the primary analyses including all values as is. All models adjusted for the covariates listed above (sex, age, gender*age interaction terms, risk score) and calendar year. Standard errors accounted for clustering at the practice level. All statistical analyses were conducted using Stata Version 13.1.

Results

Characteristics of study samples

We identified 12,727 person years with inpatient or outpatient claims for OUD treatment (2,534 in AQC groups and 10,193 in the non-AQC comparison group) and 37,113 person years with claims for AUD (6,422 AQC enrollees and 30,691 comparison enrollees) (see Table 1). The combined prevalence of OUD and/or AUD among BCBSMA enrollees was 1.6% (not shown). There were small age differences between the AQC and non-AQC comparison groups. Within the OUD group, AQC enrollees tended to be slightly younger than comparison group members while AQC enrollees diagnosed with an AUD tended to be slightly older than comparison group members. For both the OUD and AUD groups, the AQC and non-AQC enrollees were similar on sex, risk score, and rates of other SUD (e.g., marijuana, cocaine), with no significant differences on those measures. Of note, the study groups had average risk scores above 3, which for a given individual can be interpreted as implying an expected total health care spending more than 3 times the average of similar commercially-insured individuals by age, sex, and diagnoses. Overall, rates of other SUD were markedly higher in the OUD groups (57.8% and 59.4% in the AQC and non-AQC groups, respectively) than in the AUD only (no opioid) groups (15.5% and 15.9%). The OUD group also had high rates of comorbid AUDs, with 20.1% and 19.4% having alcohol dependence claims, and 14.2% and 15.6% having alcohol abuse claims in the AQC and non-AQC groups, respectively.

Unadjusted outcome measures

Unadjusted MT use during the study period was substantially higher among those with OUD than those with AUD both in the AQC and the comparison groups (Table 2). The most commonly chosen medication for OUD was buprenorphine whereas acamprosate was the most commonly filled medication for AUD (not shown). MT spending among those with any MT use was highly skewed. For example, AQC enrollees with MT use for OUD had a mean of \$3,301 and standard deviation of \$2,938 at the person-year level while AQC

enrollees with MT use for AUD had mean MT spending of \$1,137 (standard deviation 2,768).

Effects of AQC on any use of MT

Table 3 shows the results of the logit models testing for difference-in-differences in the likelihood of any MT use comparing the AQC and comparison group enrollees with an OUD or AUD. There was no statistically significant difference in MT use among enrollees with OUD in the AQC group relative to the comparison group with rates of 38.7% in the AQC and 39.1% in the comparison group during the study period, respectively, for an adjusted difference of -0.4% (95% CI -3.8% to 3.0% , $p = 0.82$). Likewise, there was no effect of the AQC on likelihood of MT use for enrollees with AUD for whom rates of use were 6.3% in the AQC and 6.5% in the comparison group, for an adjusted difference of -0.2% (95% CI -1.3% to 0.8% , $p = 0.64$).

Effects of AQC on number of prescriptions

Consistent with the findings on likelihood of any use of MT, no significant differences between the AQC and comparison group were detected in the number of prescription fills for MT among those with either OUD or AUD (Table 4). The number of prescriptions filled among all enrollees with OUD was 3.10 in the AQC and 3.19 in the comparison group during the study period, for an adjusted difference of -0.09 prescriptions (95% CI -0.63 to 0.44 , $p = 0.73$). The number of prescriptions filled annually among all those with AUDs was identically low in both the AQC (0.64) group and the non-AQC comparison group (0.64). Similarly, there were no differences between the AQC and comparison groups in the number of MT prescriptions filled when limiting to enrollees with any use (Table 4).

Effects of AQC on spending on MT

Table 5 displays the results of two-part models estimating the difference-in-differences in spending on MT among those with OUD and AUD using any MT. We did not detect any differences in spending on MT attributable to the AQC. For those with OUD, average annual spending on MT (conditional on any use) was \$2,807 in the AQC group and \$2,758 in the comparison group during the study period, for an adjusted difference of \$49 (95% CI $-\$227$ to $\$325$, $p = 0.73$). Among those with AUD, spending in the AQC group was \$1,053 vs. \$942 in the comparison group for an adjusted difference of \$111 (95% CI $-\$134$ to $\$356$, $p = 0.37$).

Discussion

Healthcare payers are increasingly reforming provider payment systems from volume- to value-based approaches to encourage more efficient, higher quality care (Burwell SM, 2015). This paper examines the effect of an initiative adopted by BCBSMA, the Alternative Quality Contract. We find that the AQC, which did not include performance measures related to SUD care, had no appreciable effect on likelihood of using MT either for OUD or AUD, on the number of MT prescriptions among those diagnosed with these disorders, or on MT spending during our study period (the first three years of AQC implementation). Our

findings point to the challenges involved in integration of MT and other SUD treatment into broader provider payment reform efforts.

Nationally, in 2013, only 10% of individuals aged 12 or older needing treatment for an illicit drug or alcohol use problem received treatment at a specialty facility (Substance Abuse and Mental Health Services Administration (SAMHSA) Center for Behavioral Health Statistics and Quality, 2014). The most commonly reported reason for not receiving treatment is affordability due to lack of coverage (Substance Abuse and Mental Health Services Administration (SAMHSA) Center for Behavioral Health Statistics and Quality). We expected, and indeed found for OUD, higher rates of treatment in our study population, which was commercially insured and had behavioral health benefits. Our focus was on MT delivered in primary care settings for AUD or OUD, treatment that may be less prone to barriers unique to specialty settings. Our study setting was Massachusetts, where there has been a concerted effort to boost access to buprenorphine (LaBelle et al., 2015) and the state implemented a broad health insurance expansion in 2006. The context of rising mortality rates for OUD coupled with evidence for both short and long term positive outcomes for buprenorphine/naloxone in the treatment of OUD (Weiss RD, 2011; Weiss RD, 2015), may provide an additional explanation for the greater adoption of MT for OUD compared with MT for AUD. While there is clear evidence that MT for AUD can provide additional clinical benefit in improving drinking outcomes especially when added to behavioral treatments, modest effect sizes in a number of trials may nevertheless contribute to low rates of adoption of MT for AUD into clinical practice (Swift RM, 2015; Thomas CP, 2003; Donoghue K, 2015).

Through the use of a global budget, the AQC creates financial incentives for provider organizations to identify and improve the management of care for high-cost patients. Studies suggest that privately insured individuals with OUD have excess health care costs ranging from \$14,054 to \$20,546 relative to matched controls (Meyer et al., 2014). In addition, costs are highly concentrated in the 20% of OUD patients who account for two-thirds of excess health care costs associated with the disorder (Shei et al., 2015). These studies, however, typically focus on those with ICD-9 codes for OUD in claims data, implying that they have been recognized as having the disorder. Unfortunately, surveys indicate that the ratio of undiagnosed to diagnosed OUD is as high as 5 to 1 and the costs of undiagnosed individuals who are commercially insured are nearly as high as health care costs of those who have been diagnosed (Kirson et al., 2015). Evidence points to similarly high excess health care costs among those with AUD and low rates of treatment even among those with generous private insurance coverage (Substance Abuse and Mental Health Services Administration (SAMHSA) Center for Behavioral Health Statistics and Quality, 2016).

There are several reasons why the financial incentives in the AQC did not induce a change in MT treatment for addiction in its first few years. First, SUD prevalence was low in AQC groups (<2%). Providers in the AQC groups, especially those with little experience treating SUD who are not waived to prescribe buprenorphine, might be expected to focus on redesigning care for other higher-prevalence chronic conditions. Second, our null findings may stem from the fact that none of the 64 performance measures included in the AQC related to SUD treatment. Findings from the literature on spillover effects on unincentivized

care in pay-for-performance schemes is mixed (Eijkenaar F et al., 2013), and we found neither positive spillovers (i.e., financial incentives improve care across the board) nor negative spillovers (i.e., financial incentives result in diminished quality of care for unincentivized conditions) in our study. Development of quality measures for SUDs has been far slower than for other chronic medical conditions and SUD quality measures, with a lack of consensus specifically on appropriate quality measures for MT (Gordon A et al., 2016). As a result, SUD performance measures were not generally in use in broader payment reform initiatives during our study period. This may change in the future as measures of treatment initiation and engagement are now used by the National Committee for Quality Assurance, and the American Society of Addiction Medicine has released performance measures for addiction medicine physicians (Addiction Specialist Physician Performance Panel, 2014; Parks Thomas et al., 2013). Also, there exist clinical performance measures for physicians that focus on counseling regarding psychosocial and pharmacologic treatments for AUD and OUD, as well as screening and brief intervention for unhealthy alcohol use (Garnick et al., 2012). Notably, Oregon Medicaid's Coordinated Care Organizations, an ACO-type payment system, include a performance measure related to screening, brief intervention and referral to treatment (SBIRT) substance use disorders. (Oregon Health Authority Office of Health Analytics, 2016) Future payment initiatives that specifically reward providers based on addiction treatment performance measures may yield different findings. Finally, since our study period ended, BCBSMA has launched a number of initiatives to expand access to SUD treatment in direct response to the opioid epidemic. Future analyses of the AQC may yield higher overall rates of treatment as a result.

Our findings should be considered in view of some limitations. First, our study of a single payment reform initiative from one insurer in New England may not be generalizable to all other such models implemented by either public or private payers. Second, it is possible there were unobservable differences in the AQC cohort and the comparison groups that may have biased our estimates. Third, our analysis focuses on the first three years post-AQC implementation, so we are unable to examine the long-term impacts of this change. Interviews of AQC organization leadership noted that several AQC organizations initiated efforts to better integrate behavioral health and general medical care after our study period ended (Barry CL et al., 2015). Fourth, we limited analyses to MT measurable in pharmacy claims and therefore did not include methadone or Vivitrol® the latter of which had very low use in our study sample. We note that the data our study are drawn from a single large insurance carrier within which coverage of methadone is constant. Therefore, we do not expect to see systematic differences in methadone access across AQC or non-AQC provider groups that would bias our estimates of the AQC's effects. Finally, claims data, which provide comprehensive information on service use and spending, are limited in their ability to capture clinical detail that may be relevant for understanding quality of care.

Conclusions

We find that the AQC had no impact on MT use for enrollees with AUD or OUD among privately insured individuals with behavioral health benefits in the initial three years after contract implementation. It will be important to study the long-term impacts of the AQC

after nascent efforts to improve integration of behavioral health and general medical care are fully implemented, and SUD performance measures are in more widespread use.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

We gratefully acknowledge funding support from the National Institute on Drug Abuse (R01 DA035214, multi-PI Barry and Huskamp; K24DA019855, Greenfield; P30 DA035772 Brandeis/Harvard NIDA Center to Improve System Performance of Substance Use Disorder Treatment) and the National Institute on Aging (F30-AG039175, Song). The authors thank Dana Gelb Safran, Ph.D. and Kenneth Duckworth, M.D. at BCBSMA and Jeffrey Simmons, M.D., formerly of BCBSMA, for their support of the project, and Christina Fu, Ph.D. and Hocine Azeni, M.A. of Harvard Medical School for expert programming support. The authors also thank Alisa B. Busch, M.D., M.P.H. for her assistance in developing mental health diagnostic cohorts and comorbidity categories, as well as mental health treatment categories derived from procedure codes.

References

- Addiction Specialist Physician Performance Panel. The performance measures for the addiction specialist physician. American Society of Addiction Medicine's Practice Improvement and Performance Measurement Action Group; 2014.
- Barry, Cl, McGinty, Ee, Pescosolido, B., Goldman, Hg. Stigma, discrimination, treatment effectiveness and public policy support: Americans' attitudes toward persons with drug addiction and mental illness. *Psychiatric Services*. 2014; 65:1269–1272. [PubMed: 25270497]
- Barry, Cl, Stuart, Ea, Donohue, Jm, et al. The early impact of the 'alternative quality contract' on mental health service use and spending in massachusetts. *Health Aff (Millwood)*. 2015; 34:2077–2085. [PubMed: 26643628]
- Birnbaum H, White A, Schiller M, Waldman T, Cleveland J, Roland C. Societal costs of prescription opioid abuse, dependence, and misuse in the united states. *Pain Medicine*. 2011; 12:657–667. [PubMed: 21392250]
- Burwell, Sm. Setting value-based payment goals - hhs efforts to improve us health care. *NEJM*. 2015; 372:897–899. [PubMed: 25622024]
- Canadian Agency for Drugs and Technologies in Health. Buprenorphine/naloxone versus methadone for the treatment of opioid dependence: A review of comparative clinical effectiveness, cost-effectiveness and guidelines. CADTH Rapid Response Reports. 2016 Sep.
- Case A, Deaton A. Rising morbidity and mortality in midlife among white non-hispanic americans in the 21st century. *PNAS*. 2015; 112:15078–15083. [PubMed: 26575631]
- Dick A, Pacula R, Gordon A, Et A. Growth in buprenorphine waivers for physicians increased potential access to opioid agonist treatment, 2002–11. *Health Aff (Millwood)*. 2015 Jun.34:1028–34. [PubMed: 26056209]
- Eijkenaar F, Emmert M, Scheppach M, Schoffski O. Effects of pay for performance in health care: A systematic review of systematic reviews. *Health Policy*. 2013; 110
- (SAMHSA), S. A. A. M. H. S. A. & HHS. , editor. Federal Register RaR. Medication assisted treatment for opioid use disorders. 2016.
- Florence C, Zhou C, Luo F, Xu L. The economic burden of prescription opioid overdose, abuse, and dependence in the united states, 2013. *Med Care*. 2016; 54:901–906. [PubMed: 27623005]
- Fudula, Pj, Bridge, Tp, Herbert, S., et al. Office-based treatment of opiate addiction with a sublingual-tablet formulation of buprenorphine and naloxone. *N Engl J Med*. 2003; 349:949–958. [PubMed: 12954743]
- Garfield, Rl. Mental health financing in the united states: A primer. KAISER COMMISSION ON MEDICAID AND THE UNINSURED. , editor. Washington DC: 2011.

- Garnick D, Horgan C, Acevedo A, Mccorrey F, Weisner C. Performance measures for substance use disorders - what research is needed? *Addiction Science & Clinical Practice*. 2012;7. [PubMed: 23186245]
- Goldman, Hh, Frank, Rg, Burnam, Ma, et al. Behavioral health insurance parity for federal employees. *N Engl J Med*. 2006; 354:1378–1386. [PubMed: 16571881]
- Gordon A, Lo-Ciganic Wh, Cochran G, Gellad Wf, Cathers T, Donohue Jm. Treatment quality for buprenorphine care: The pot at the end of the rainbow. *J Addict Med*. 2016; 10:210–1. [PubMed: 27223837]
- Harris A, Weisner C, Chalk M, Capoccia V, Chen C, Parks Thomas C. Specifying and pilot testing quality measures for the american society of addiction medicine's standards of care. *J Addict Med*. 2016; 10:148–155. [PubMed: 26933875]
- Harwood, H. Updating estimates of the economic costs of alcohol abuse in the united states: Estimates, update methods, and data. NATIONAL INSTITUTE ON ALCOHOL ABUSE AND ALCOHOLISM. , editor. Washington, DC: 2000.
- Hileman, GR., Mehmud, SM., Rosenberg, MA. Risk scoring in health insurance. Socieity of Actuaries Health Section; 2016.
- Keyes, Km, Hatzenbuehler, MI, Mclaughlin, Ka, et al. Stigma and treatment for alcohol disorders in the us. *Am J Epidemiology*. 2010; 172:1364–1372.
- Kirson N, Shei A, Rice J, et al. The burden of undiagnosed opioid abuse among commercially insured individuals. *Pain Medicine*. 2015; 16:1325–1332. [PubMed: 25929289]
- Labelle C, Choongheon S, Bergeron A, Samet J. Office-based opioid treatment with buprenorphine (obot-b): State-wide implementation of the massachusetts collaborative care model in community health centers. *Journal of Substance Abuse Treatment*. 2015; 60:6–13. [PubMed: 26233698]
- Meyer R, Patel A, Rattana S, Quock T, Mody S. Prescription opioid abuse: A literature review of the clinical and economic burden in the united states. *Population Health Management*. 2014; 17:372–387. [PubMed: 25075734]
- Olsen Y, Sharfstein J. Confronting the stigma of opioid use disorder—and its treatment. *JAMA*. 2014; 311:1393–4. [PubMed: 24577059]
- Oregon Health Authority Office of Health Analytics. Technical specifications and guidance documents for cco incentive measures [web site]. Available at: <http://www.oregon.gov/oha/analytics/Pages/CCO-Baseline-Data.aspx>. [Accessed Access Date, Access Year]]
- Parks Thomas C, Garnick D, Horgan C, Miller K, Harris A, Rosen M. Establishing the feasibility of measuring performance in use of addiction pharmacotherapy. *Journal of Substance Abuse Treatment*. 2013; 45:11–18. [PubMed: 23490233]
- Parks Thomas C, Hodgkin D, Levit K, TI M. Growth in spending on substance use disorder treatment services for the privately insured population. *Drug and Alcohol Dependence*. 2016; 160:143–150. [PubMed: 26781063]
- Pope, Gk, Kautter, J., Ellis, Rp, et al. Risk adjustment of medicare capitation payments using the cms-hcc model. *Health Care Financing Review*. 2004; 25:199–141.
- Shei A, Rice J, Kirson N, et al. Characteristics of high-cost patients diagnosed with opioid abuse. *J Manag Care Pharm*. 2015; 21:902–912.
- Sigmon S. Access to treatment for opioid dependence in rural america: Challenges and future directions. *JAMA Psychiatry*. 2014; 71:359–360. [PubMed: 24500040]
- Song Z, Rose S, Safran D, Landon B, Day M, Chernew M. Changes in health care spending and quality 4 years into global payment. *N Engl J Med*. 371:1704–1714.
- Song Z, Safran D, Landon B, Et A. The 'alternative quality contract,' based on a global budget, lowered medical spending and improved quality. *Health Aff (Millwood)*. 2012; 31:1885–1894. [PubMed: 22786651]
- Stein B, Pacula R, Gordon A, Et A. Where is buprenorphine dispensed to treat opioid use disorders? The role of private offices, opioid treatment programs, and substance abuse treatment facilities in urban and rural counties. *Milbank Q*. 2015 Sep.93:561–83. [PubMed: 26350930]
- Stuart, Ea, Barry, CI, Donohue, J., et al. Effects of accountable care and payment reform on substance use disorder treatment: Evidence from the initial three years of the alternative quality contract. 2016 under review.

- Substance Abuse and Mental Health Services Administration (Samhsa) Center for Behavioral Health Statistics and Quality National survey on drug use and health (nsduh), 2010 to 2013
- Substance Abuse and Mental Health Services Administration (Samhsa) Center for Behavioral Health Statistics and Quality. The nsduh report: Substance use and mental health estimates from the 2013 national survey on drug use and health: Overview of findings. Rockville, MD: 2014.
- Substance Abuse and Mental Health Services Administration (Samhsa) Center for Behavioral Health Statistics and Quality. National survey on drug use and health (nsduh) series [web site]. Available at: <https://www.icpsr.umich.edu/icpsrweb/ICPSR/series/64>. [Accessed Access Date, Access Year]]
- Substance Abuse and Mental Health Services Administration (Samhsa) Us Department of Health and Human Services. Report to congress on the nation's substance abuse and mental health workforce issues [web site]. Jan 24. 2014 Available at: <http://store.samhsa.gov/shin/content/PEP13-RTC-BHWORK/PEP13-RTC-BHWORK.pdf>. [Accessed Access Date, Access Year]]
- Volkow, Nd, Frieden, Tr, Hyde, Ps, Cha, Ss. Medication-assisted therapies - tackling the opioid-overdose epidemic. N Engl J Med. 2014; 370:2063–2066. [PubMed: 24758595]
- Zarkin, Ga, Bray, Jw, Aldridge, A. Cost and cost-effectiveness of the combine study in alcohol-dependent patients. Arch Gen Psych. 2008; 65:1214–1221.

Table 1

Descriptive characteristics of opioid use disorder and alcohol use disorder at the person-year level among ACQ and comparison group enrollees, 2006–2011

	Opioid use disorder		Alcohol use disorder only ⁽¹⁾	
	AQC	Comparison	AQC	Comparison
N (person-years)	2,534	10,193	6,422	30,691
Age categories				
13–17	1.1 ***	1.3	2.0 ***	3.3
18–27	32.9	29.7	19.3	19.2
28–37	23.8	22.2	12.3	12.4
38–47	19.8	22.6	22.2	24.3
48–57	17.3	19.2	29.7	28.0
58–64	5.0	5.0	14.5	12.9
% Male	66.8	66.9	63.5	64.3
Risk Score	3.5	3.6	3.1	3.1
Comorbid other substance use disorder	57.8	59.4	15.5	15.9
Opioid use disorder diagnosis (%) (¹)				
% Opioid dependence	94.9	94.7	—	—
% Opioid abuse	20.2	21.3	—	—
Alcohol use disorder (%) (²)				
% Alcohol dependence	20.1	19.4	51.0	51.4
% Alcohol abuse	14.2	15.6	70.4	69.7
% Alcohol induced mental disorder	4.0 ***	6.2	9.8 **	10.8

Source: BCBOSMA claims data

Notes

*** statistically significant difference between AQC and comparison group at p<0.001 level

** statistically significant differences between AQC and comparison group at p<0.01 level

¹ Alcohol use disorder group does not include enrollees with opioid use disorder but does include some enrollees with other comorbid substance use disorder.

² Percentages for abuse vs. dependence exceed 100% indicating that some enrollees have claims with both abuse and dependence diagnoses during the year.

Table 2

Unadjusted measures of medication treatment (MT) for addiction at the person-year level among enrollees with opioid and alcohol use disorders, 2006–2011

	Opioid use disorder (OUD)		Alcohol use disorder (AUD)	
	AQC	Comparison	AQC	Comparison
N	2,534	10,193	6,422	30,691
Any MT Prescription Fill (%)	42.0%	38.3%	5.3%	6.7%
No. MT Prescriptions annually, mean (SD) among all enrollees with OUD or AUD	4.15 (6.85)	2.94 (5.16)	0.39 (2.47)	0.48 (2.61)
No. MT Prescriptions annually, mean (SD), among enrollees with any MT use	9.88 (7.42)	7.68 (5.75)	7.21 (8.00)	7.10 (7.33)
MT prescription spending, mean (SD), among enrollees with any MT use	\$3,301 (2,938)	\$2,623 (2,409)	\$1,137 (2,768)	\$928 (1,088)

Source: BCBSMA claims data

Notes: Prescriptions were standardized to a 30-day supply. Prescription drug spending was measured using pharmacy claims, and were adjusted for inflation using the Consumer Price Index. Opioid use disorder sample (n = 12,727) includes some enrollees who have co-occurring alcohol use disorder.

Adjusted annual changes in any use of medication treatment for addiction among adults with opioid use and alcohol use disorders

Table 3

	AQC	Comparison	Difference	95% CI	p-value
Adjusted Rates of use					
Opioid Use Disorder	38.7%	39.1%	-0.4%	-3.8 – 3.0%	0.82
Alcohol use disorder only	6.3%	6.5%	-0.2%	-1.3 – 0.8%	0.64

Source: BCBSMA claims data.

Notes: Results estimated from logistic regression models using person-year as the unit of analysis and adjusting for age, sex, age*sex interaction terms, risk score, year, and AQC cohort. Difference-in-differences estimation used to account for secular trends. CI is confidence interval.

Adjusted annual changes in number of 30-day prescriptions for medication treatment for addiction for adults with opioid use disorders and alcohol use disorders

Table 4

Full sample	AQC	Comparison	Difference	95% CI	p-value
Number of prescriptions filled					
Opioid Use Disorder	3.10	3.19	-0.09	-0.63 – 0.44	0.73
Alcohol use disorder only	0.64	0.64	0.00	-0.18 – 0.18	0.97
Only enrollees with any use					
Number of prescriptions filled					
Opioid Use Disorder	9.10	8.99	0.11	-0.57 – 0.80	0.75
Alcohol use disorder only	6.98	7.28	-0.30	-1.37 – 0.75	0.57

Source: BCBSMA Claims data

Notes: Results estimated from negative binomial regression models using person-year as the unit of analysis and adjusting for age, sex, age*sex interaction terms, risk score, year, and AQC cohort. Difference-in-differences estimation used to account for secular trends. CI is confidence interval.

Adjusted annual changes in spending on medication treatment conditional on any use for adults with opioid use disorders and alcohol use disorders

Table 5

	AQC	Comparison	Difference	95% CI	p-value
Annual spending					
Opioid Use Disorder	\$2,807	\$2,758	\$49	−\$227 – 325	0.73
Alcohol use disorder only	\$1,053	\$942	\$111	−\$134 – 356	0.37

Source: BCBSMA claims data.

Notes: Results estimated from two-part regression models using person-year as the unit of analysis and adjusting for age, sex, age*sex interaction terms, risk score, year, and AQC cohort. Difference-in-differences estimation used to account for secular trends. CI is confidence interval. Costs adjusted for inflation.