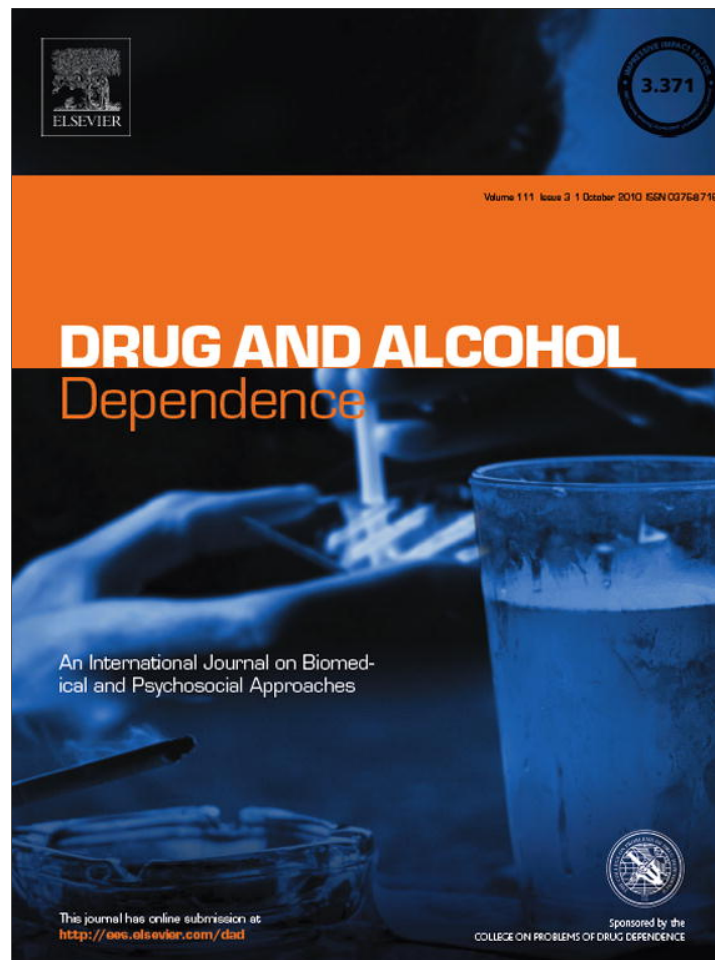


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## Methadone maintenance and the cost and utilization of health care among individuals dependent on opioids in a commercial health plan

Dennis McCarty<sup>a,\*</sup>, Nancy A. Perrin<sup>b</sup>, Carla A. Green<sup>b</sup>, Michael R. Polen<sup>b</sup>, Michael C. Leo<sup>a</sup>, Frances Lynch<sup>b</sup>

<sup>a</sup> Oregon Health & Science University, Portland, OR 97239, United States

<sup>b</sup> Center for Health Research, Kaiser Permanente Northwest, Portland, OR 97227, United States

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### ABSTRACT

**Background:** Few health plans provide maintenance medication for opioid dependence. This study assessed the cost of treating opioid-dependent members in a commercial health plan and the impacts of methadone maintenance on costs of care.

**Methods:** Individuals with diagnoses of opioid dependence (two or more diagnoses per year) and at least 9 months of health plan eligibility each year were extracted from electronic health records for the years 2000 through 2004 (1,518 individuals and 2,523 observations across the study period—some individuals were in multiple years). Analyses examined the patterns and costs of health care for three groups of patients: (1) one or more methadone visits during the year ( $n = 1,298$ ; 51%); (2) no methadone visits and 0 or 1 visits in the Addiction Medicine Department ( $n = 370$ ; 15%); (3) no methadone visits and 2 or more visits in addiction medicine ( $n = 855$ ; 34%).

**Results:** Primary care (86%), emergency department (48%) and inpatient (24%) visits were common. Mean total annual costs to the health plan were \$11,200 (2004 dollars) per member per year. The health plan's costs for members receiving methadone maintenance were 50% lower (\$7,163) when compared to those with two or more outpatient addiction treatment visits but no methadone (\$14,157) and 62% lower than those with one or zero outpatient addiction treatment visits and no methadone treatment (\$18,694).

**Conclusions:** Use of opioid maintenance services was associated with lower total costs of care for opioid-dependent members in a commercial health plan.

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### 1. Introduction

Methadone maintenance is the most effective treatment to date for opioid dependence (National Consensus Development Panel on Effective Treatment of Opiate Addiction, 1998). Methadone is a synthetic opioid agonist used as a maintenance medication because it can be taken orally once a day and, in sufficient dosages, relieves craving and withdrawal symptoms (Lowinson et al., 2005). A cochrane review of randomized trials comparing methadone maintenance to treatment without opioid maintenance for opioid dependence found high quality evidence that methadone maintenance improved retention in care and led to greater reductions in the use of heroin and moderate quality of evidence that methadone treatment reduced criminal activity and mortality (Mattick et al., 2009).

There is also reasonably strong evidence that methadone maintenance is cost-effective, from the societal perspective, for treatment of heroin abusing populations (Simeons et al., 2006). Contemporary patient populations, however, may include more individuals dependent on prescription opioids, while most previous studies have focused on low income and uninsured populations. Thus, little evidence is available about the relative costs and cost-effectiveness of opioid maintenance treatment among insured populations or members of commercial health plans. Information on costs from this perspective could improve decisions about covering methadone in private insurance programs and systems.

Despite 40 years of use and overwhelming evidence of effectiveness, opioid maintenance treatments remain controversial (Kleber, 2008), and commercial and Medicaid health plans have been reluctant to include methadone maintenance in their benefit packages (McCarty et al., 1999). Interviews with managers in a commercial health plan disclosed that the health plan does not purchase methadone services because they do not want to attract individuals who require chronic care; members who need methadone maintenance are directed to publicly funded treatment (McCarty et al., 1999). In 2008, however, the United States Congress passed the Paul

\* Corresponding author at: Department of Public Health & Preventive Medicine, CB669, Oregon Health & Science University, 3181 SW Sam Jackson Park Road, Portland, OR 97239, United States. Tel.: +1 503 494 1177; fax: +1 503 494 4981.

E-mail address: [mccartyd@ohsu.edu](mailto:mccartyd@ohsu.edu) (D. McCarty).

Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act. Group health plans are now required to provide mental health and addiction treatment coverage equivalent to the coverage provided for most health problems if the health plan covers behavioral health services. As a result, many health plans may need to reconsider the treatments they offer for opioid dependence.

Concerns that opioid-dependent individuals may use more expensive health care services reflect empirical data showing that abuse of illicit and prescription opioids contributes to elevated rates of hospital admissions and emergency visits. Individuals treated for opioid abuse or dependence in a public hospital in San Francisco, for example, had 2-year mean expenditures (\$13,393) about 2.5 times greater than expenditures for patients not using opioids (Masson et al., 2002). Similarly, an analysis of claims data from 16 self-insured employers, using 6 months of data before and after a first diagnosis of opioid abuse, found the mean per patient 12-month cost of care was eight times greater among opioid abusers (\$15,884) than in a matched comparison group (\$1,830; 2003 dollars) (White et al., 2005).

Treatment participation, conversely, appears to reduce the cost of health care among drug users. A retrospective cohort analysis of New York Medicaid data suggested lower costs for HIV positive and HIV negative drug users who received regular medical care and drug abuse treatment (Laine et al., 2001). Similarly, patients enrolled in a methadone maintenance program had lower hospital and emergency room utilization than a comparison group participating in a needle exchange program (Stein and Anderson, 2003).

Most analyses of health services use and costs among opioid-dependent drug users focus on uninsured patients and Medicaid recipients. While one study assessed health care costs within self-insured employer health plans, this analysis included individuals diagnosed with opioid abuse and opioid poisoning in addition to opioid dependence (White et al., 2005). There are relatively few data on health care utilization and cost among opioid-dependent individuals in commercial health plans. Health and health care patterns may differ for opioid-dependent individuals with commercial health insurance compared to those who are uninsured. Prior cost analyses, moreover, focused on costs to society rather than costs to the health plan. Health plans may be reluctant to provide a treatment that reduces criminality but does not reduce costs to the health plan. Thus, utilization and cost data from a commercial health plan that covers methadone maintenance have the potential to inform decisions about providing opioid maintenance medications from the health plan perspective.

This study examines health care use and cost among individuals with diagnoses of opioid dependence in a large not-for-profit, pre-paid, integrated health plan that provides a full range of health care services, including primary care and treatment for alcohol and drug dependence. In addition to comprehensive medical, mental health, and addiction services, the health plan purchases methadone maintenance for members diagnosed with opioid dependence. Membership includes employer groups, individual subscribers, and Medicaid and Medicare recipients.

## 2. Methods

### 2.1. Study setting

The study was conducted within Kaiser Permanente Northwest (KPNW), a not-for-profit pre-paid group-practice-model health maintenance organization serving about 475,000 members in northwest Oregon and southwest Washington State, United States. KPNW uses an electronic medical record comprising several databases, with data linked for each member by a unique health record number. All service use data are derived from health plan records of medical care encounters. Missed visits are not counted as visits. The study was approved and monitored by KPNW's Institutional Review Board for the Protection of Human Subjects.

The health plan's addiction treatment services are provided through the Addiction Medicine Department and are generally group-based, outpatient treatment,

with supportive therapy, education, relapse prevention and family-oriented therapy. Medical assessment and treatment are also included, and individual counseling is provided as needed. When appropriate, methadone maintenance treatment is available through contracts with licensed opioid treatment programs. Addiction medicine visits include both medical and counseling visits.

### 2.2. Study participants

Annual utilization data were extracted for individuals whose electronic medical record included two or more diagnoses of opioid dependence and at least 9 months of health plan eligibility. The analysis was based on calendar years 2000 through 2004. Two or more diagnoses of opioid dependence per year were required to reduce potential false positives.

### 2.3. Study analyses

Analyses examined the use of addiction treatment services, including inpatient and residential treatment, methadone maintenance, and outpatient treatment for alcohol and drug problems. The analysis included general medical services categorized as primary care, inpatient care, and emergency services. The health plan either provided the care or paid for the care.

To assess the effects of addiction treatment services on health care utilization, individuals with opioid dependence diagnoses were categorized into three groups, based on utilization of outpatient addiction treatment services provided by the Addiction Medicine Department (counseling and medical visits): (1) 0–1 outpatient addiction medicine visits and no methadone visits (0 and 1 visits were combined because we consider a single visit minimal treatment and to ensure that we had sufficient cases for analysis), (2) 2 or more outpatient addiction medicine visits and no methadone visits, and (3) 1 or more methadone visits. These categories allowed us to compare individuals who (1) had diagnoses of opioid dependence and were seen by staff in the Addiction Medicine Department but did not engage in treatment, with (2) those individuals who engaged in treatment (attended at least two addiction medicine visits or entered a methadone maintenance program). Because the same individuals could appear in more than 1 year, we used generalized estimating equations (GEE) to test for differences in utilization and costs among the study groups across all years, controlling for age, gender, and Medicaid status. The groups were dummy coded; individuals with 1 or more methadone visits were the reference group. Negative binomial models examined health care utilization variables. Total costs were log transformed and used in a normal distribution GEE model. Cost analyses were adjusted to 2004 dollars. Total costs included addiction treatment services, emergency, inpatient, primary care and pharmacy expenditures.

To explore possible differences in health conditions across groups, all diagnoses for each member, in each year, were categorized using the Kaiser permanente clinical-behavioral disease classification system (CBC) (Hurtado and Greenlick, 1971), updated for ICD-9-CM codes. This system organizes health problems into groups that share important dimensions, including severity, etiology, duration, and anticipated use of medical care resources. The system has 19 primary categories (e.g., chronic disease, serious, microorganism, and less serious) with 118 subgroups. All disease codes and V codes are assigned to a single appropriate category, simplifying diagnosis-related analyses. For each clinical-behavioral classification category, GEE logistic models tested whether the three groups differed on having at least one diagnosis within the categories, controlling for age, gender, and Medicaid status.

## 3. Results

Over the 5-year study period, 2,523 observations were identified with two or more diagnoses of opioid dependence in any year among 1,518 unique individuals (some individuals appeared in two or more years). Most opioid-dependent health plan members received addiction treatment services: 51% received methadone (the mean annual days of methadone among individuals receiving methadone was  $257 \pm 117$  days), 34% had two or more outpatient addiction treatment visits (mean annual visits =  $21 \pm 50$ ), and 15% had one or no outpatient addiction treatment visits (mean annual visits =  $0.3 \pm 0.5$ ). Table 1 summarizes available demographic information and patterns of services used for each study group.

Over 99% of individuals had health care costs during the year. Although the distribution of total costs was skewed (skewness = 5.81, kurtosis = 67.66), log costs were normally distributed (skewness = 0.17, kurtosis = 2.99). Annual use of primary care services was common (86%), and about half of the individuals (48%) had annual visits for emergency services. Each year, about one in four (24%) opioid-dependent individuals received inpatient care. The three comparison groups differed on gender, age, and Medicaid status. Men accounted for 53% of the methadone group,

**Table 1**  
Demographics and annual health care utilization for members with two or more opioid diagnoses between 2000 and 2004.

Health plan	Overall	Any methadone	No methadone, 0–1 addiction medicine visits	No methadone, 2+ addiction medicine visits
Opioid patients (2 or more diagnoses in a year)	N = 2523	N = 1298	N = 370	N = 855
Demographics				
Age mean years (SD)	41.74 (10.78)	42.55 (9.53)	42.74 (13.03)	40.07 (11.30)*
Gender				
Female	51.5%	46.8%†	58.4%	55.7%
Male	48.5%	53.2%	41.6%	44.3%
Medicaid	13.9%	17.1%	15.4%	8.3%**
Addiction treatment services <sup>a</sup>				
Outpatient treatment in %	74.6%	69.6%	31.1%	100%
Mean outpatient visits (SD)	9.07 (31.66)	3.52 (12.78)	0.32 (0.47)	21.28 (49.83)
Inpatient detoxification in %	16.6%	7.9%	9.5%	33.0%
Mean inpatient stays (SD)	0.20 (0.51)	0.10 (0.39)	0.09 (0.29)	0.41 (0.66)
Residential treatment in %	9.4%	2.8%	4.3%	21.8%
Mean residential stays (SD)	0.10 (0.34)	0.03 (0.18)	0.04 (0.20)	0.24 (0.49)
Methadone in %	51.5%	100%	0%	0%
Mean methadone days (SD)	132.40 (153.68)	257.35 (117.21)	N/A	N/A

\* Any methadone group had significantly fewer females than the other two groups ( $p < 0.05$ ).

\*\* No methadone, 2+ addiction medicine visits group was significantly less likely to be on Medicaid than the other two groups ( $p < 0.001$ ).

<sup>a</sup> Differences between the groups on the chemical dependency and addiction treatment services were not tested as these variables were used to form the groups.

**Table 2**  
Parameter estimates and associated significance levels for GEE models.

	Emergency room visits <sup>a</sup>	Primary care visits <sup>a</sup>	Other visits (non-addiction medicine) <sup>a</sup>	Inpatient stays	Mean yearly total cost <sup>b</sup>
Gender	0.116 $p = 0.375$	0.524 $p < 0.001$	0.491 $p < 0.001$	0.344 $p = 0.002$	0.365 $p < 0.001$
Age	-0.004 $p = 0.323$	0.005 $p = 0.014$	0.017 $p < 0.001$	0.016 $p < 0.001$	0.017 $p < 0.001$
Medicaid status	0.458 $p = 0.003$	0.252 $p < 0.001$	-0.255 $p = 0.010$	0.248 $p = 0.087$	0.139 $p = 0.021$
No methadone and 0 or 1 outpatient addiction medicine visits versus any methadone	1.024 $p < 0.001$	0.804 $p < 0.001$	0.911 $p < 0.001$	1.469 $p < 0.001$	0.837 $p < 0.001$
No methadone and 2+ outpatient addiction medicine visits versus any methadone	0.720 $p < 0.001$	0.669 $p < 0.001$	0.649 $p < 0.001$	0.926 $p < 0.001$	0.723 $p < 0.001$

<sup>a</sup> Results based on a negative binomial model.

<sup>b</sup> Results based on the natural logarithm of total costs.

42% of the no methadone and 0–1 addiction medicine treatment visit group, and 44% of the no methadone and 2 or more addiction treatment visits group. Fewer individuals in the 2 or more addiction treatment visits group (8.3%) were on Medicaid than the methadone (17.1%) and no methadone plus 0–1 addiction treat-

ment visit groups (25.4%). The group with 2 or more addiction medicine visits was also slightly younger than the other groups.

Table 2 presents the results of the GEE models. Gender was significantly related to primary care visits, other non-addiction medicine visits, inpatient visits and total costs, with women having

**Table 3**  
Annual utilization and costs adjusted means (standard deviations) by addiction medicine treatment groups.

2000–2004	N	Emergency room visits <sup>a</sup>	Primary care visits <sup>a</sup>	Other visits (non-addiction medicine) <sup>a</sup>	Inpatient stays <sup>a</sup>	Mean yearly total cost <sup>b</sup>
Treatment type						
Any methadone use	1298	1.32 (0.30)	3.79 (1.08)	4.38 (1.27)	0.24 (0.06)	\$7,163.08 (\$2,130.57)
No methadone and zero or one outpatient addiction medicine visits	370	3.69* (0.83)	8.96* (2.43)	11.77* (4.04)	1.08* (0.30)	\$18,694.82* (\$2,723.57)
No methadone use and two or more outpatient addiction medicine visits	855	2.63* (0.45)	7.47* (2.01)	8.65* (2.72)	0.58* (0.15)	\$14,157.05* (\$2,590.07)

Note: n = number of occurrences across the 5-year time period. Expected counts and mean yearly costs are adjusted for age, gender, and Medicaid status.

\* Indicates difference from comparison group (any methadone use group) at  $p < 0.001$ .

<sup>a</sup> Results based on a negative binomial model.

<sup>b</sup> Results based on the natural logarithm of total costs.

more visits and higher costs. Primary care visits, other non-addiction medicine visits, inpatient visits and total costs increased with age. Those receiving Medicaid had more emergency room visits, primary care visits, and fewer visits to other (non-addiction medicine) departments than those not receiving Medicaid. Medicaid was also associated with higher costs. After controlling for age, gender, and Medicaid status, the three addiction treatment categories varied in use of health care. Table 3 presents the adjusted means for each group. Individuals with one or more methadone visits had significantly fewer emergency room visits, primary care visits, inpatient stays, and other non-addiction treatment visits than members with zero or one outpatient addiction treatment visits and no methadone treatment. Members receiving methadone also had fewer emergency room visits, primary care visits, inpatient stays, and other non-addiction treatment visits than those with two or more outpatient addiction treatment visits and no methadone treatment.

The total mean yearly costs (including addiction treatment visits and prescriptions) were significantly lower for opioid-dependent members who received one or more methadone visits (\$7,163) compared to (a) members with no methadone and zero or one outpatient addiction treatment visits (\$18,694) and (b) those with no methadone and two or more outpatient addiction treatment visits (\$14,157). Total costs for individuals with any methadone use were (a) 50% less than costs for those with no methadone use and two or more outpatient addiction treatment visits and (b) 62% less than costs for those with no methadone use and zero or one outpatient treatment visits.

The analysis of the diagnosis-based clinical-behavioral classification (CBC) system categories examined possible differences in the drivers of these costs, by group. Table 4 presents the percent of patients in each group who had one or more diagnosis in each CBC category. It also provides the effect sizes associated with differences between the methadone group and the comparison groups. The number needed to treat (NNT) is a measure of effect size. NNT is the number of patients who need to receive the intervention in order to reduce the number of adverse outcomes by 1. Smaller NNT's represent stronger effects. If NNT is 1, then for every additional patient receiving the intervention, an adverse event would be averted. In this case, NNT is the number of patients who need to receive methadone to get one less case in a given diagnosis category. NNT less than 2.3 are considered large effects, 3.6 are moderate or typical effects, and values greater than 8.9 are small effects (Kraemer et al., 2003). The CBC categories with moderate and large effects sizes are the primary drivers of group differences.

The largest difference between groups was for the miscellaneous CBC category, a category that includes ICD-9-CM diagnoses that are either not elsewhere classified (NEC) or not otherwise specified (NOS). Methadone patients (43%) were less likely to have miscellaneous diagnoses than individuals with one or zero addiction treatment visits (73%) and those with two or more addiction treatment visits (87%). The most frequent miscellaneous diagnoses included other counseling, physical therapy NEC, surgery follow-up, stomach function disease NEC, and personal history of tobacco. Large differences between the groups were also found for the miscellaneous categories of acute non-microorganism and unspecified disease and symptoms. Examples of the most frequent diagnoses in acute non-microorganism include carpal tunnel syndrome, sciatica, and non-infectious gastroenteritis NEC. A lower percent of methadone patients (23% versus 50% for those with 0–1 addiction medicine visits and 40% for those with 2 or more addiction medicine visits) were treated for these conditions. Examples of the unspecified disease and symptoms category include backache, headache, and unspecified abdominal pain. Once again the methadone group had the lowest percentage of patients with these conditions. Mod-

erate differences were observed in several other CBC categories (see Table 4 for detail). Within every CBC category, patients receiving methadone were less likely to have included diagnoses. All analyses were adjusted for differences in age, gender and Medicaid status.

#### 4. Discussion

Analyses of data from a pre-paid integrated health plan perspective found a large number of members diagnosed with opioid dependence, whose service use and costs varied by type and amount of addiction treatment. Opioid-dependent individuals had high proportions of primary care visits (about 90%), visits to emergency departments (about 50%), and inpatient stays (about 25%). Compared to the average health plan member (based on health plan reports of average service use), use of emergency and inpatient care was much greater among individuals with diagnoses of opioid dependence. The average health plan member had 0.10 emergency visits per member per year compared to 1.35 emergency visits per member per year for methadone patients and 3.61 emergency visits for individuals who had 0 or 1 visit for outpatient addiction counseling. The average inpatient stay per member per year was 0.04 days compared to 0.24 inpatient days per member per year among methadone patients and 1.00 inpatient days per member per year for individuals with 2 or more visits for outpatient addiction counseling.

As a result of elevated rates of health care use, the mean annual total cost of care across opioid-dependent individuals was substantial (\$11,200). Those receiving methadone maintenance had much lower costs (\$7,163) and those with no substantive addiction treatment (0 or 1 addiction treatment visits) had the highest costs (\$18,694). Those receiving 2 or more treatment visits had costs between these two groups (\$14,157). These cost differences reflect differences in the types of services used. Individuals who received two or more outpatient treatment visits had lower primary care and inpatient utilization than those with one or no visits. Individuals receiving methadone maintenance services had significantly lower utilization of emergency services, primary care visits, other medical services, and inpatient visits. The chronic disease classification data suggest that individuals receiving methadone maintenance treatment had fewer health problems across several dimensions, including fewer trauma-related diagnoses and fewer chronic and acute conditions, including serious conditions. Interestingly, some of the largest differences between groups occurred in categories that grouped conditions not otherwise specified or not elsewhere classified (NOS/NEC). This may indicate that clinicians were struggling to understand presenting problems that may have been related to opioid misuse or drug seeking without knowledge of patients' underlying opioid dependence. Most importantly, estimated costs to the health plan were 50% lower among individuals receiving methadone treatment. Our data suggest that it may be advantageous for commercial health plans to consider purchasing methadone maintenance services for members with opioid addiction.

While other investigations have demonstrated the cost-effectiveness of opioid maintenance therapy, they emphasized costs to society rather than the health plan and were either based on data from Australia (Doran et al., 2003; Harris et al., 2005) and the Netherlands (Dijkgraaf et al., 2005) or modeling (Barnett, 1994; Zaric et al., 2000). Most U.S. studies, moreover, are based on unemployed and Medicaid populations using heroin (Simeons et al., 2006) and the results may not be applicable within commercial health plans serving employed individuals. Our study may be more useful for health plans as they grapple with access to maintenance medications under the requirements for parity.

**Table 4**

Patients with at least one diagnosis within each clinical-behavioral disease classification (CBC) category (in percent), adjusted for age, gender, and Medicaid status and sorted from largest difference to smallest difference between groups for methadone versus 0–1 addiction medicine visits.

Clinical-behavioral disease classification category	Any methadone N = 1298	No methadone, 0–1 addiction medicine visits N = 370	No methadone, 2+ addiction medicine visits N = 855	p-Value	NNT methadone versus 0–1 addiction medicine visits	NNT methadone versus 2+ addiction medicine visits
Miscellaneous <sup>a</sup>	42.9	73.5	86.9	<0.001	3.3	2.3
Acute non-microorganism <sup>b</sup>	23.3	50.1	40.8	<0.001	3.7	5.7
Unspecified disease and symptoms <sup>c</sup>	60.6	86.2	83.0	<0.001	3.9	4.5
Other serious diagnosis	20.6	44.6	33.8	<0.001	4.2	7.6
Chronic disease—other	39.6	62.9	59.6	<0.001	4.3	5.0
Less severe trauma, adverse effects of external causes	28.9	45.1	48.5	<0.001	6.2	5.1
Routine examinations, screenings and immunizations	55.6	71.2	76.0	<0.001	6.5	4.9
Chronic condition with continued care required	18.3	33.3	28.6	<0.001	6.7	9.7
Microorganism-related diseases	58.5	68.1	65.8	0.002	10.5	13.8
Allergy, asthma, skin contact reactions	11.0	19.9	19.7	<0.001	11.3	11.5
Serious trauma and effects of external causes	4.7	13.1	9.3	<0.001	11.9	21.6
Less serious congenital problems, perinatal disease and birth injuries	2.6	7.58	4.76	0.001	19.9	45.2
Chronic disease, deterioration expected when treated	9.2	13.2	13.3	0.032	25.1	24.4
Less serious reproductive conditions, births, birth control, sterilization	5.5	8.4	5.3	0.052	34.5	–454.5
Serious congenital problems, perinatal disease and birth injuries	0.6	2.9	1.2	0.007	42.6	161.3
Serious malignancy	1.4	3.1	1.5	0.100	61.0	909.1
Serious complications of pregnancy (among females and fetuses)	1.5	2.2	0.8	0.163	128.2	–161.3
Diagnoses leading to need for total or supervisory care, including blindness, deafmutism	0.1	0.2	0.1	0.146	526.3	100000
Emotional and behavioral disorders	99.5	99.7	99.4	0.775	370.4	–333.3

Note: NNT is number needed to treat, in this case, the number of patients on methadone needed to get one less case within a given diagnosis category. Smaller NNT's represent larger effect sizes.

<sup>a</sup> Frequent miscellaneous diagnoses included other counseling, physical therapy NEC, surgery follow-up, stomach function disease NEC, and personal history of tobacco.

<sup>b</sup> Frequent acute non-microorganism diagnoses included carpal tunnel syndrome, sciatica, and non-infectious gastroenteritis NEC.

<sup>c</sup> Frequent unspecified disease and symptoms included backache, headache, and unspecified abdominal pain.

#### 4.1. Study limitations

Analyses are based on observations of natural variation in the use of medical services among individuals in one health plan. The data base is the health plan's electronic medical record and reflects the care delivered to members with diagnoses of opioid dependence. Patient needs and health care practitioners influence the care provided. From the data, we cannot be certain it was optimal care.

The study was not a controlled trial with random assignment to receive methadone maintenance or other services. The ability to assess and control for factors that might vary with use of methadone maintenance, therefore, is limited. Analyses adjusted for differences in age, gender, and Medicaid status, but it is likely that individuals in the three groups varied on other, unmeasured, dimensions. The high rates of emergency visits, primary care visits, and inpatient stays nonetheless suggest that men and women not taking methadone may have greater

medical complexity. It is also plausible that medical complexity may be reduced among methadone patients because of the methadone maintenance treatment, or that medical problems may go undiagnosed because individuals who have the burden of daily methadone visits avoid other health care. Although such avoidance of care may play a role in the patterns found, differences in more serious conditions, less likely to go untreated, suggest that this is not the only reason for the observed differences.

#### 4.2. Implications for policy and practice

In the more than 45 years since Dole and Nyswander's initial report on the effectiveness of methadone maintenance (Dole and Nyswander, 1965), opioid addiction remains a persistent medical challenge. Despite the controversial nature of maintenance treatment (Kleber, 2008), our analyses suggest that its value in commercial and public health plans is strong. In addition, federal parity

legislation may lead to more health plans in the U.S. covering opioid maintenance medications.

Treatment for opioid dependence in the United States, moreover, is changing. In 2002, the U.S. Food and Drug Administration (FDA) approved two sublingual preparations of buprenorphine hydrochloride (buprenorphine) as Schedule III medications for treatment of opioid dependence: buprenorphine alone, and a combination of buprenorphine and naloxone. The Drug Addiction Treatment Act of 2000 (DATA 2000) permits physicians who meet the DATA 2000 qualifications and register with the Center for Substance Abuse Treatment to prescribe buprenorphine in either formulation for the treatment of opioid dependence. Opioid-dependent patients, therefore, can seek agonist therapy from primary care physicians rather than attending a licensed opioid treatment program. These changes may promote greater integration of primary care and addiction treatment services, benefiting patients, physicians and their health plans, and potentially reducing health care costs among people who are unable or unwilling to accept methadone maintenance treatment.

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### Contributors

The authors certify that they contributed substantially to the conceptualization, design, analysis or interpretation of the data. Dennis McCarty was the Principal Investigator. Nancy Perrin led the data analysis with support from Michael Leo. Carla Green and Michael Polen participated in the conceptualization, design, analysis and interpretation of data. Frances Lynch led the cost analysis. Each author contributed to development of the manuscript and approved the paper before its submission. Dennis McCarty prepared an initial draft of the manuscript. Nancy Perrin drafted tables, described analyses, and outlined results. Drs. Green, Polen, Lynch and Leo reviewed and contributed to successive drafts of the manuscript.

### Conflict of interest statement

Drs. Green and McCarty have a non-disclosure agreement with Purdue Pharma. Dr. McCarty has been a consultant for Purdue Pharma.

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