Heroin Addiction Treatment Correlates in Maryland

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Acknowledgements

This report is the first in a series exploring whether the expansion of buprenorphine as a strategy for battling opioid addiction is cost-effective. This first report utilizes Medicaid data to examine health care service utilization differences between opioid addicts who were treated for this condition versus addicts who were not. Subsequent reports will include an expanded analysis of cost-effectiveness data pertaining to both Medicaid and private pay clients across Maryland, as well as a secondary source review of the cost-effectiveness literature as it pertains to opioid addiction treatment. The work is being sponsored by the Annie E. Casey Foundation and was performed under a grant with the Baltimore City Health Department. The data utilized in this report was made available with the permission and cooperation of Maryland's Department of Health and Mental Hygiene.

Introduction/Background

The societal burden associated with heroin addiction is substantial. Avoidable financial costs and personal suffering associated with such addiction include increased utilization of emergency health care services, increased crime, lost productivity, and increases in serious illness often leading to premature death. With regard to the financial burden alone, a recent review determined that heroin-associated medical, lost earnings, and illegal activity costs totaled approximately $20 billion per year in the United States alone (Stoller & Bigelow, 2006b).

Combining lifetime prevalence data indicates that approximately 1 percent of the U.S. population over the age of 12 years experience opioid[1] *addiction*-- the most detrimental form of use-- at least once during their life span (Crum, 2006). Annual prevalence figures on opioid addiction further indicate that nearly 1 million individuals in the U.S. face this serious and chronic condition every year (Stoller & Bigelow, 2006a).

Beyond the costs and counts are the people affected by heroin. Poignant testimony was recently made to the U.S. Senate Caucus on International Narcotics Control. One of the young adults who appeared before members of Congress at that hearing said this about her experience with heroin:

> I am 19 years old ... Four years ago, I was a straight-A student and a junior varsity tennis player. Just a few months ago I was living on the streets and physically sick from my drug use…. As soon as I snorted it (heroin), I knew something wasn't right. First, I felt scared, but then I let the feeling take over….I would use it before geometry class and even tennis practice. Sometimes, the drugs would make me so sick that I would throw up mid-court right during a game….My grades went down and I lost interest in sports, and I lost interest in my life. My drug use progressed to a point where I had to steal for my drug money. I stole from my parents and I even pawned my grandmother's ring for $25. Eventually, I was living on the streets. My parents didn't know where I was… (United States. Congress. Senate. Caucus on International Narcotics Control, 2000)

The lurid nature of this story was matched by three other recovering teenage addicts who testified before Congress on that day. It presents a view of the compulsive, downward cycling, anti-social behavior that often accompanies heroin addiction. As a recent publication from the National Institute of Drug Abuse stated:

> Once they are addicted, the heroin abuser's primary purpose in life becomes seeking and using drugs. The drugs literally change their brains and their behavior (National Institute on Drug Abuse, 2005, p.3).

Fortunately, there are treatments available to help individuals withdraw and abstain from heroin and other opioid use. Most common is the opioid agonist (promoter) methadone, but this

[1] Opioids are strong analgesic drugs that act by binding to opiate receptors in the brain and elsewhere. They include naturally occurring agents like morphine, and synthetic ones like methadone or fentanyl.

treatment is imperfect and highly regulated. It is imperfect because, like most treatments, it is far from 100 percent effective; and it is highly regulated because methadone itself is an addictive substance, and because of social stigma that have long been associated with addiction to illegal, intravenous drugs (Curley, 2002; Saxon & McCarty, 2005; Stoller & Bigelow, 2006a). In fact, since the 1970s, methadone therapy has been effectively segregated from other aspects of medical practice by federal regulations that created a closed distribution system for that pharmacotherapy (Saxon & McCarty, 2005).

Such restrictions exist despite studies indicating that methadone is an effective treatment for heroin addiction, and evidence suggesting that only one in four heroin addicts receive opioid agonist treatment (Saxon & McCarty, 2005). Part of this gap in therapy can be covered by other interventions that, unlike methadone, can be prescribed by physicians with fewer limitations because they pose lower risk of addiction. A specific example of such a therapy is buprenorphine. Unlike methadone, which is a *full* opioid agonist, buprenorphine is a *partial* agonist-antagonist, meaning that it not only triggers a weaker physiologic response, it also can act to inhibit the opiate receptor response altogether (Strain, 2006; Walsh & Strain, 2006). Accordingly, it is less addictive than methadone, and thus it has been targeted by many substance abuse providers as an agent that can be used in conventional outpatient settings to treat individuals who, for one reason or another, do not utilized methadone clinics in the United States (Fiellin & Strain, 2006).

The Baltimore City Health Department commissioned this study to evaluate whether expansion of buprenorphine treatment for heroin addiction would be cost-effective. Clearly, expanding the availability of this treatment would cost money that could be utilized for other public services. Yet, if the expanded administration and delivery of buprenorphine results in commensurate (or greater) offsetting savings elsewhere in the health care system, then an expansion of buprenorphine treatment would be a cost-effective and prudent investment for the Baltimore City Health Department to make.

The focus in Baltimore is well-placed. The prevalence of heroin addiction in Baltimore City is especially high (Maryland Alcohol and Drug Abuse Administration, 2005).[2] In this project, we will consider cost-effectiveness analyses that draw upon administrative data maintained by Maryland's Medicaid and hospital rate setting programs. Both of these systems maintain transaction level data that can be used to assess medical utilization and cost information. This information can further be broken down into correlates directly related to addiction and addiction treatment, and those instead related to common co-morbidities experienced by opioid addicts. For example, it is known that risk of HIV infection and tuberculosis are both elevated substantially in individuals who are addicted to heroin, especially if they inject the drug (Fingerhood, 2006).

[2] In its 2005 annual report, The Maryland Alcohol and Drug Abuse Administration noted heroin addiction as the most commonly treated substance abuse disorder in Baltimore. This contrasts with the rest of the state and most other regions where alcohol dominates. That report also cited federal data showing that 32 percent of Maryland addiction treatment admissions were associated with heroin, whereas nationally only 15 percent were.

This preliminary study will review Maryland Medicaid records in an effort to establish a Treated versus Untreated (case-control) review that compares Medicaid utilization measures and co-morbidities between comparable cohorts of individuals with opioid addiction who are receiving treatment to those who are not. Buprenorphine is not considered directly in this review because 1) its use is currently very low, which is attributable to the fact that it is several times more expensive than methadone, and 2) there are restrictions regarding which physicians may prescribe the drug as well as the number of patients they may treat at one time- restrictions that only recently were expanded by U.S. Federal Law. As such, this review isolates methadone clinical therapy as a proxy for any effective opioid agonist based intervention in an effort to empirically estimate what additional reductions in morbidity might be realized if opioid agonist therapy were expanded with buprenorphine. In this report, the dependent variables under study are indicators of Medicaid utilization (emergency room [ER], inpatient services, and ambulatory visits) as well as a review of co-occurring somatic diseases such as HIV.

Cost-effectiveness analyses will be considered in future reviews of these Medicaid data and in conjunction with reviews of both public and private payer data maintained by the state Health Services Cost Review Commission, which is the hospital rate setting entity in Maryland. Results from both of these studies will eventually be bundled into a final report that will also contain a review of third-party cost-effectiveness studies that compare buprenorphine to methadone, as well as to the absence of pharmacologic treatment for heroin or opioid addiction.

Methods

The current study reviews Maryland Medicaid data from calendar years 2003, 2004, and 2005. Data from each of these years are reviewed separately to identify individuals in Baltimore City and the rest of Maryland who used opioids (including heroin), and then those individuals were divided into the following groups based on their specific International Classification of Disease (ICD-9) codes:[3]

1) Those with opioid "dependence" (Codes beginning with 304)
2) Those in "remission" (Codes also beginning with 304, with distinct extra digits)
3) Those who are "non-dependent" opioid abusers (Codes beginning with 305)

The full cohort of opioid users included all individuals with any (>zero) enrollment months in Medicaid in the given year and any medical transactions where at least one ICD-9 diagnosis (primary or otherwise) indicated some illicit exposure to opioids. Broad categories of medical transactions considered were: inpatient, outpatient, physician, home health, specialty, and long-term care services. Maryland Medicaid administrative data for these categories of service were reviewed in the context of the managed care program known as HealthChoice, and for all other Medicaid enrollees who were covered under a fee-for-service (FFS) system that includes clients in special programs and those dually enrolled in both Medicare and Medicaid.

[3] See also: American Psychiatric Association, Diagnostic and Statistical Manual, 4th Edition, Text Revision, 2000.

For each individual in the full cohort, an electronic record was built that included demographic variables (date of birth, race, gender) as well as year-by-year information corresponding to their addiction treatment history, and their Medicaid enrollment status and service utilization.

Treatment history variables were designed to differentiate between those receiving principally methadone (Treated)[4] and those who were completely naïve to such pharmacological intervention (Untreated) in each of the three calendar years. Psychosocial therapies were not explicitly considered for this investigation, although it is likely that some provision of psychosocial support was part of each methadone clinic-based intervention. Individuals with exposure to other drug therapies for heroin addiction, besides methadone, were flagged using Medicaid pharmacy files for separate consideration. As such, the Treated vs. Untreated comparisons put forth in this investigation may be summarized as contrasts between those who were treated principally by methadone (Treated), and those who received no such intervention (Untreated).

Medicaid status isolated for each subject of this investigation included the number of enrollment months in each calendar year so that adjustments or exclusions could be made based on each individual's coverage span; and Medicaid eligibility status (i.e., TANF, MCHP, SSI, Dual, SOBRA[5])- the latter such that the sample composition could be considered with regards to the reason for entry into the Medicaid program.

Medicaid utilization variables selected were those recording:

1. ER and inpatient use as two indicators of high-intensity, high-cost care that are best avoided, and also that are frequently used to benchmark health care plan performance (National Committee for Quality Assurance, 2005a, 2005b; Volpel *et al.*, 2005).
2. A count of ambulatory visits as an indicator of overall Medicaid utilization outside the context of ER, inpatient clinic, or psychiatric and substance abuse services[6].
3. Women having one or more live births in a given year were flagged in order to quantify the potential for newborn exposure in this population.
4. Breakdowns of total Medicaid costs into those payments corresponding to fee-for-service (FFS) and capitated payments—the latter being a prospective amount paid to a managed care organization (MCO) responsible for somatic and substance abuse services, the former being direct costs incurred principally for specialty mental health services

[4] The approach that was utilized in this study predominantly identifies methadone maintenance and support psychotherapy that was administered by a licensed clinic at a weekly rate of approximately $30 per client (Personal communication, Division of Pharmacy and Clinical Services, Maryland Department of Health and Mental Hygiene), but the codes used may sometimes identify other drug therapies or psychotherapies that are approved to address opioid addiction (Code of Maryland Regulations: §10.47). This comment pertains to the use of the code H0020 for all reviews after June 1, 2003, and the W9993 code for all data considered prior to that date. Note that the CPT code for methadone treatment, specifically (83840), was also used in our case definition.

[5] The abbreviations utilized are defined as follows: Temporary Assistance for Needy Families (TANF); Maryland Children's Health Program (MCHP), Supplemental Security Income (SSI), dually eligible for Medicare and Medicaid (Dual), and pregnant women added under a particular supplemental omnibus budget reconciliation act (SOBRA) of Congress.

[6] These specific ambulatory visit definitions have been applied elsewhere (Maryland Department of Health and Mental Hygiene, 2006) and are adapted from NCQA's HEDIS specifications.

(carved-out from the MCO capitation program), and less frequently for all medical payments for individuals not eligible for managed care (commonly those dually eligible for Medicaid and Medicare, who are occasionally called "dual eligibles").

For inpatient, ER, and ambulatory visits, population prevalence of any occurrence is first presented as percentiles, and then as a measure of utilization intensity. Counts of inpatient days, and ER and ambulatory visits are also presented for those who experience such medical encounters.

Comparisons were made by first reducing the sample down to those with 12 full months of Medicaid coverage in each year; by constraining the age to individuals over 13 years; and by dividing the population into those treated with methadone principally and those completely naïve to any treatment. Basic statistics corresponding to all three years were reviewed and summarized to consider Baltimore City in isolation, and all other regions in Maryland (i.e., counties) combined together.

Results

The full and partial cohorts of substance abusers identified in Maryland's Medicaid data are enumerated by year in **Table 1**. Based on the large numbers of pure dependents, and also on the following definition of non-dependent abuse, only the opioid dependent group is retained for presentation and analysis for the remainder of this preliminary report.

> "Persons who abuse opioids typically use those substances much less often than do those with dependence and do not develop significant withdrawal symptoms" (DSM-IV-TR, p. 271).

The above characterization makes it uncertain whether or not non-dependent abusers would be candidates for opioid maintenance therapy because their diagnostic record suggests that they have some measure of control over their use. As such, individuals whose Medicaid records suggested *only* abuse and no dependence in a given calendar year where excluded from analysis for that year. This suggests the definition used here represents a conservative (high specificity) approach to case definition. Still, given the tremendous addictive potential of opioids, the "abuse only" individuals will be considered in later analyses as potential future consumers of opioid maintenance therapy.

Finally, as indicated in **Table 1**, the sample was reduced to those individuals at least 13 years of age, and with a full 12 months of Medicaid enrollment in each calendar year. The former adjustment was made to focus on populations where opioid addiction is relevant and heavily concentrated, and the latter adjustment was made to focus upon individuals with continuous coverage under Medicaid. It should also be noted that for this sample of year-long Medicaid beneficiaries, the vast majority of those not dually eligible for Medicare were enrolled in MCOs participating in Maryland's managed care program, known as HealthChoice. As for those dually eligible for Medicare and Medicaid, but who are not eligible for enrollment in HealthChoice,

there were no HealthChoice member months, or a very small number reflecting movement into or out of dual eligibility status. This information is relevant to interpreting expenditure data reported in **Table 1**.

Table 2 provides Treated versus Untreated comparisons in Baltimore City, and the rest of the state corresponding to Medicaid data from calendar year 2005.

Review of the demographic variables indicates only subtle, though statistically significant, differences between the Treated and Untreated groups with regard to age. Females are clearly more prominent in the Treated group both within and outside of Baltimore City, while racial disparities in treatment appear evident outside of the city only- where Blacks are slightly less likely to receive treatment than Caucasians.

The mean number of treatment for opioid addiction transactions is fairly high at 36 and 31 in Baltimore City and the rest of the state, respectively. Assuming that all individuals required therapy during the year, and given they were all enrolled for 12 months, the maximum number of treatment claims should be 52[7]- one for each week of the year. Numbers below 52 likely reflect at least three exceptions: 1) individuals who become opioid addicts during the year, 2) individuals who discontinue treatment, but remain addicts, and 3) individuals who discontinue because their illness enters true remission. The distinctions between these three possibilities cannot be made without more in-depth review of the data, which will be undertaken in subsequent longitudinal analyses. For this report then, case definition is equivalent to an "annual prevalence of any treatment" measure, an estimation which seems reasonable because heroin addiction is typically a chronic medical condition requiring months to years of treatment (Maryland Alcohol and Drug Abuse Administration, 2005).

The coverage group percentiles indicate that duals are more prominent in the Untreated groups, whereas TANF enrollees (most of whom are women and children) are more prominent in the Treated groups. This may indicate that opioid addicts are less likely to enter treatment as they age. The concentration of dual eligibles in the Untreated groups also is likely shifting their overall (FFS+capitated) cost data downward, because Medicare is the primary payer for most inpatient services and ambulatory visits, thereby reducing the count and cost of such Medicaid encounters.

Data on live births show that well under 1 percent of the population became new mothers during the calendar year, and that only subtle differences were apparent between the Treated and Untreated groups. The differences reported here indicate that birth rates were slightly, but not significantly higher in the Untreated groups. To the extent that heroin use is tied to premature and other adverse pregnancy outcomes, the consequences of this difference in birth rate may be extremely important with regard to health outcomes for the newborns of these mothers (Little et al., 2003; Ornoy, 2002). Because live births are not common among the studied population, and yet are so important, it may be worthwhile to focus a future analysis on pregnancies. The co-

[7] A small number of individuals in the original cohort had >54 apparent treatment transactions in a given year. It is currently not clear why this was the case, and it is being investigated further. As such, for this analysis, only individuals with 53 (one extra added) or fewer apparent methadone treatments are included in the final sample.

morbid diagnostic data summarized below indicates that complications of pregnancy are a relatively common medical correlate to heroin addiction.

Significant for the overarching purpose of this project to assess the cost-effectiveness of treatment, the Medicaid utilization variables reviewed almost unanimously favor (i.e., indicate better health) for the Treatment groups. Inpatient and ER utilization rates (i.e., those with at least one) and intensities (i.e., the number of treatment days) are consistently and substantially lower for those in the Treatment groups. Ambulatory visit rates (an indicator of "walk-in" medical visits including well-visits) are increased in the Treated groups suggesting higher rates of preventive or maintenance medical care. And finally, total Medicaid and FFS expenditures are consistently and substantially less in the Treated groups (See **Table 2**).

All the utilization indices presented in Table 2 indicate large and statistically significant differences between the Treated and Untreated groups except for two somewhat subtle indicators. First, among those "Outside of Baltimore City" who have ambulatory visits, the mean number of visits is slightly larger in the Untreated group (8.5 vs. 7.3 visits in 2005). This suggests that Untreated individuals who use some ambulatory services rely on such modes of care slightly more frequently than those who are Treated, perhaps because the Untreated group has additional health care needs associated with their addiction, but not severe enough to warrant ER or inpatient services.

Secondly, Table 2 shows that Medicaid capitated dollars are slightly lower in the Untreated group (last row of the table), a result that may at first glance seem somewhat surprising unless one considers the rate-setting system used by HealthChoice. The similarities and differences in rate cells between the Treated and Untreated addicts presented in this investigation are likely tied to the following rate setting parameters: the Treated group is sicker and therefore was placed in higher-acuity (and higher-paid) rate cells; the Treated group has a richer diagnostic profile, by virtue of encountering the medical system more often and receiving active treatment and diagnostic coding by providers, and therefore was placed in the higher rate cells as a result of more extensive diagnostic labels; and/or the Treated group clusters at certain regional providers where the rates are slightly elevated.

As noted at the beginning of this results section, and in strong contrast to the capitated rates that show only subtle treatment group differences, the mean FFS payments are substantially higher in the Untreated group (<$3,000 vs. >$11,000 in 2005). This suggests that the payments (comprised principally of specialty mental health services and partial payments for dually eligible beneficiaries) are substantially higher for Untreated individuals- likely reflecting higher morbidity in both cases. Somewhat contrary to this conclusion is the fact that dual eligibles are more prevalent in the Untreated group and their presence would be expected to *decrease* mean capitation rates and *increase* FFS payments, because dual eligibles are not enrolled in HealthChoice. T-tests comparing FFS payments by treatment group were therefore re-run after excluding all duals from the analyses. The exclusion did not substantively alter the magnitude or statistical significance levels observed previously, thereby adding confidence to FFS pay differences apparent in Table 2.

One additional point about the utilization and expenditure comparisons made in this report, the coefficients of variation (st.dev/mean) are high across all the reported utilization counts and costs (e.g., inpatient days and FFS expenditures), indicating considerable heterogeneity with regard to these important outcome measures. This heterogeneity is certainly tied to the fact that the population includes both those who are high utilizers and those who are not. Accordingly, future outlier analysis may offer valuable information regarding which types of individuals have the worst outcomes- those treated with methadone or otherwise.

Finally, **Table 3** gives a rank-ordered list of other ICD-9 based diagnoses identified from Medicaid transactions in the opioid dependent population under review. These diagnoses excluded co-morbidities in the substance abuse as well as the drug-induced psychoses domains because such inclusion would be redundant with the definition that was used to compose the study population.

As expected, and consistent with other literature (Fingerhood, 2006), substantial co-morbidities are apparent in the following disease categories:

- Sexually and intravenous drug transmittable diseases (HIV and hepatitis)
- Psychiatric diseases, including depression and affective psychosis
- Skin and soft tissue infections related to needle use (cellulitis)
- Metabolic/kidney disease (diabetes, fluid/electrolyte abnormalities)
- Respiratory ailments

Some potentially revealing additional diagnoses that appear in these lists are:

- Hypertension (perhaps linked to age and cardiac stress)
- Complications of pregnancy
- Back disorders (perhaps linked to a history of pain management[8])

The absence of cardiac infections (endocarditis) is also worth noting. A qualitative review of all of the co-morbid diagnoses observed in the sample indicates that endocarditis is apparent in the list of diagnoses, but it is fairly rare and appears well outside of the top ten. The diagnoses revealed in **Table 3** thus may be considered as a descriptive review of co-morbid, somatic conditions associated with heroin addiction, and also as an empirical lead toward disease categories that might be explicitly reviewed (one-by-one) for follow-up cost-effectiveness analyses regarding potential impact of addiction treatment.

Review of data from calendar years 2003 and 2004 indicate similar trends as those reported above for 2005 with only a few exceptions. The number of treatment transactions are noticeably lower in 2003 compared to the latter two years under study (2003 mean ± std. dev. = 28 ± 16 treatments for the Treated Baltimore City residents). It is not immediately clear why this quantity

[8] One recent epidemiologic review emphasized the point that while the life-time prevalence of heroin use has remained flat through the 1990s at well below 3 percent, the analogous prevalence of *non-medical* use of prescription opioids (e.g., OxyContin) has more than doubled from 6 to over 12 percent (Crum, 2006).

may have increased after 2003, but that trend will be investigated further to verify the data, and to ascertain potential causes of that shift upward.

Similarly, frequency counts for all diagnoses represented by the top ten listed in **Table 3** indicate that in 2003 and 2004 the overall counts were markedly lower than in 2005, exceeding differences attributable to increases in the population with time. **Table 4** shows that for two very distinct diagnoses (hepatitis and affective psychosis), annual prevalence rates increased substantially across the three years. This suggests either that the populations have shifted (recall that the samples are cross-sectional pertaining to each year) or that surveillance or case identification has systematically increased- a point that may be relevant for differential diagnoses pertaining to mental disorders such as affective psychosis which can be challenging to distinguish from drug induced or other manifestations of psychoses. Whatever the case, the numbers in **Table 4** suggest that across year comparisons with our data should be made with careful consideration of changes in diagnostic coding that can occur with time. More work remains to be done with these co-morbid diagnostic data, but for the moment, **Tables 3 and 4** are presented as a qualitative review for follow-up and targeted use in the analysis of both Medicaid and hospital rate setting data.

Brief Conclusions and Next Steps

The comparisons reported here offer straightforward indications that opioid-dependent individuals in Baltimore City and the rest of Maryland who receive standard pharmacologic treatment (principally methadone) have lower morbidity than those who do not receive such therapy. The results, in fact, are remarkably consistent and robust across measures and years. Expenditure data clearly indicates that treatment is associated with lower overall expenditures, even when dual eligible data is removed from the analyses. Yet to be carried out are analyses that considers how high-utilizing outliers might be specific drivers of the strong treatment correlates apparent in these cost analyses, and multiple regression analyses that can adjust for group differences (e.g., gender distributions) that may have some impact on outcomes.

In a sense, the data reported here can be characterized as a naturalistic, “intent to treat” study because it offers no information about how long one remains on therapy or how much therapy one receives. Instead, it simply flags those who have received one or more treatments in the years of interest. The assumption that this treatment cohort identification is reasonable is supported by the underlying data, which shows that nearly 50 percent of the study sample received their first treatment in January of the given calendar year, and that the average number of treatments appeared (assuming weekly Medicaid billing as the norm) to be over the 50 percent mark of 26 weeks. Accordingly, a high proportion of the sample received treatment fairly early in the year, and for a long period of time. Still, to validate that our definition of treatment was reasonable, follow-up analyses will look for a “dose-response” by correlating treatment counts and spans to the variables used as proxies for overall medical status in this investigation (inpatient days, etc.).

A major weakness of this investigation is that it represents and naturalistic study in which individuals are not randomized to the Treated and Untreated groups. There are clearly endogenous (unseen) variables that correlate with treatment choice which likely also correlate with Medicaid utilization and outcomes. Though statistical methods exist to test and assign proxies for such endogeneities (Newhouse & McClellan, 1998), they depend on the use of instruments, i.e., variables that at least partially characterize the endogenous factors, and thus far no such variables have been applied to this investigation, nor are they likely to be ascertained from the Medicaid data alone. Accordingly, the results presented represent only *correlations* that differentiate the Treated and the Untreated groups, not associations that can, with a high degree of certainty, be pinned to the consequences of treatment exclusively.

Still with regard to cost-effectiveness analyses, these data will be useful to consider the potential impact of expanded opioid maintenance therapy (including buprenorphine) on Maryland residents with continuous enrollment in the Medicaid system- a system that not only covers over 600,000 individual lives each year, but one that also requires several billion dollars in state and federal support. Finally, coupling Medicaid data with that from the Health Services Cost Review Commission (hospital rate setting data) will furthermore provide information regarding the impact of expanded opioid treatment on all consumers of hospital-based services throughout Maryland.

Table 1. Full cohort populations corresponding to opioid dependence, past use, or non-dependent abuse, stratified by calendar year. These cohorts were determined by ICD-9 diagnosis matching to Maryland's Medicaid Management Information System (MMIS2).

	2003	**2004**	**2005**
Opioid dependent*	7,972 (1.9%**)	8,660 (2.0%**)	8,922 (2.0%**)
In remission***	9	24	31
Non-dependent abuser***	2,331	2,654	2,699
Study cohort******	4,324	4,695	5,034

*Across all years over 79% of these addicts had two or more separate Medicaid transactions endorsing this diagnosis.

**Calculated annual prevalence rate for opioid dependence for individuals ≥13 years old and enrolled in Maryland's Medicaid program for at least 1 month during the year. This figure is roughly two-fold the estimates for the general population (Crum, 2006).

***no indication of 'dependence' in the calendar year.

****Individuals with opioid maintenance (principally methadone) treatment exclusively, or those receiving no treatment; and also only those ≥13 years old and with 12 months of Medicaid coverage in the given calendar year. Exclusions include those with pharmacy records indicating any prescription exposure to one of the following agents: L-alpha-acetyl-methadol, lofexidine, clonidine, naltrexone, morphine, meperidine, or buprenorphine—all agents that are sometimes used to treat heroin addiction.

Table 2. Calendar year 2005 demographic, treatment, and utilization/outcome information corresponding to heroin dependence in Maryland's Medicaid system. For individuals with 12 months of Medicaid enrollment, and those who are 13 years of age or older. Presented statistics compare Treated vs. Untreated for each measure by region.

Region	***Baltimore City***			***Outside Baltimore City (Rest of State)***	
Variable	**Treated**	**Untreated**		**Treated**	**Untreated**
Total n	2335	1325		796	578
No. of treatment trans-actions* (mean± sd)	36±17	0		31±18	0
Age (mean± sd)	45±9	43±10		38±10	36±12
		t=6.2, $p<0.001$			t=3.2, $p<0.002$
Percent females	64	51		76	66
		$X^2=59$, $p<0.001$			$X^2=30$, $p<0.001$
Racial percents					
Caucasian	17	16		75	68
Blacks	80	82		22	28
Hispanic	0.30	0.38		0.63	1.0
Other	2.6	2.2		2.8	3.6
		$X^2=1.6$, $p=0.66$			$X^2=8.0$, $p<0.05$
Coverage Group percentiles					
SSI	57	64		41	41
TANF	34	18		45	26
MCHP	0.0	0.38		0.63	1.2
SOBRA	0.17	0.38		2	2.5
Duals	7.8	12		6.4	16
Other	1.5	4.7		7	15
		$X^2=135$, $p<0.001$**			$X^2=88$, $p<0.001$

Table continued on next page

Table 2. (Continued)					
Inpatient utilization					
Percent with any	10	40		11	51
		X^2=454, p<0.001			X^2=259, p<0.001
Count where days>0 (mean±sd)	10±24	18±47		8.9±11	36±104
		t=-2.7, p=0.0068			t=-4.4, p<0.001
ER visits					
Percent with any	55	73		50	75
		X^2=116, p<0.001			X^2=84, p<0.001
Count where visits>0 (mean±sd)	2.7±3.4	5.5±9.5		2.9±3.5	5.4±7.8
		t=-8.7, p<0.001			t=-5.9, p<0.001
Ambulatory visits					
Percent with any	72	65		76	63
		X^2=22, p<0.001			X^2=28, p<0.001
Count where visits>0 (mean±sd)	7.2±7.7	7.1±6.8		7.3±7.5	8.5±7.2
		t=0.40, p=0.69			t=-2.5, p<0.012
Live births					
Percent with any	0.090 (n=2)	0.38 (n=5)		0.25 (n=2)	0.87 (n=5)
		X^2=3.8, p=0.53**			X^2=2.5, p=0.93**

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Total Medicaid Dollars* (mean ± sd)**	$15,034 ±16,351	$21,416 ±25,075		$10,740 ±9,954	$20,425 ±27,402
		t=-9.8, p<0.001			T=-9.2, p<0.001
Medicaid FFS Dollars (mean ± sd)	$2,755± 11,351	$11,286± 24,260		$2,155± 5,772	$13,178± 27,037
		t=-14., p<0.001			T=-9.6, p<0.001
Medicaid Capitated Dollars (mean ± sd)	$12,279± 12,340	$11,532± 11,635		$8,585± 8,213	$7,247± 8,299
		t=1.8, p<0.074			t=3.0, p<0.004

* Principally methadone, but may include psychosocial or other pharmacologic treatment dispensed at methadone clinics.
** Fisher's Exact probability value
***Sum of capitated payments and FFS dollars

Table 3. Calendar year 2005 data showing the top ten co-morbid* diagnoses by frequency (*f*) across individuals. In each column, the top ten diagnoses for each of the four subgroups are sorted by their prevalence in the opioid dependent population under study. Counts of unique individuals with each diagnosis are reported to the right of each diagnostic label. The numbers are for individuals with opioid addiction and 12 months of Medicaid enrollment in 2005. "Treated" individuals are those receiving some methadone therapy during the year, whereas those untreated were completely naïve to any pharmacotherapy.

BALTIMORE CITY				REST OF STATE			
TREATED		UNTREATED		TREATED		UNTREATED	
Diagnosis	***f***	**Diagnosis**	***f***	**Diagnosis**	***f***	**Diagnosis**	***f***
VIRAL HEPATITIS	164	AFFECTIVE PSYCHOSES	199	AFFECTIVE PSYCHOSES	51	AFFECTIVE PSYCHOSES	115
HIV DISEASE	110	VIRAL HEPATITIS	152	VIRAL HEPATITIS	50	VIRAL HEPATITIS	47
ESSENTIAL HYPERTENSION	83	HIV DISEASE	110	COMPLICATIONS IN PREGNANCY	43	DEPRESSIVE DISORDER	41
CELLULITIS/ ABSCESS	70	ESSENTIAL HYPERTENSION	74	GENERAL SYMPTOMS	22	COMPLICATIONS IN PREGNANCY	39
FLUID/ ELECTROLYTE DISEASE	69	SCHIZOPHRENIC DISORDERS	72	CELLULITIS/ ABSCESS	20	NEUROTIC DISORDERS	32
AFFECTIVE PSYCHOSES	68	GENERAL SYMPTOMS	69	FLUID/ ELECTROLYTE DISEASE	19	BACK DISORDER	27
ASTHMA	64	CELLULITIS/ ABSCESS	68	DEPRESSIVE DISORDER	19	CELLULITIS/ ABSCESS	26
GENERAL SYMPTOMS	55	DEPRESSIVE DISORDER	63	NEUROTIC DISORDERS	17	FLUID/ ELECTROLYTE DISEASE	24
DIABETES MELLITUS	49	FLUID/ ELECTROLYTE DISEASE	54	OUTCOME OF DELIVERY	11	GENERAL SYMPTOMS	24
RESPIRATORY/ CHEST SYMPTOMS	48	ASTHMA	51	DIABETES MELLITUS	10	ASTHMA	23

*These co-morbidities exclude other substance abuse disorders such as alcohol abuse. It also excludes drug induced psychoses.

Table 4. Review of select-disease annual prevalence rates across calendar years 2003-2005. Both of these diseases appear in the top fifteen list of co-morbid disorders (top six list for 2004 and 2005) when the population is stratified by region (Baltimore City and rest of state) and by Treatment experience (methadone vs. no treatment).

		Year		
Disorder	**Measure**	**2003**	**2004**	**2005**
Viral Hepatitis	**Raw counts**	219	303	413
	Percent of Sample	5.1%	6.5%	8.2%
Affective Psychosis	**Raw counts**	93	297	433
	Percent of Sample	2.2%	6.3%	8.6%

*With counts of individuals with opioid dependence as the denominator

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