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The effect of a jail methadone maintenance therapy (MMT) program on inmate recidivism

Garnett P. McMillan, Sandra Lapham & Michael Lackey

Behavioral Health Research Center of the Southwest, Center of the Pacific Institute for Research and Evaluation, Albuquerque, NM, USA

ABSTRACT

Aims To evaluate the effects of a jail-based continuation of methadone maintenance therapy (MMT) on subsequent inmate recidivism risks. **Design** Prospective, longitudinal, observational study. **Setting** A large, Southwestern United States jail that continues MMT for heroin-addicted inmates on MMT at the time of booking. **Participants** A total of 589 inmates booked between 22 November 2005 (the start date for the MMT program) and 31 October 2006. **Measurements** The outcome measure was time from release to subsequent re-booking in the jail. Predictors included binary dosing with methadone in the jail, final dose received (mg), age, gender, race/ethnicity, previous bookings and days in jail. **Findings and conclusions** Random effects Weibull proportional hazards models were fit to the recidivism times to estimate the impact of treatment with MMT in the jail on re-booking risks. There was no statistically significant effect of receiving methadone in the jail or dosage on subsequent recidivism risks (hazard ratio = 1.16; 95% confidence interval = 0.8–1.68). Offering jail-based MMT does not increase recidivism risks by eliminating the deterrent effect of imposed withdrawal, nor does it reduce recidivism in this high-risk population.

Keywords Corrections, drug abuse treatment, drug treatment in jail, recidivism, random effects survival models, methadone maintenance therapy.

Correspondence to: Garnett P. McMillan, Behavioral Health Research Center of the Southwest, Center of the Pacific Institute for Research and Evaluation, 612 Encino Pl NE, Albuquerque, NM 87102, USA. E-mail: gmcmillan@bhrcs.org
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INTRODUCTION

The medical community recognizes heroin addiction widely as a chronic illness. Long-term care that allows the addict to maintain a normal and productive life-style is preferred to short-term treatment that only relieves symptoms of acute withdrawal syndrome [1]. The currently recommended long-term treatment modality is opiate replacement therapy, with methadone [methadone maintenance therapy (MMT)] or buprenorphine [2–4]. The provision of MMT is restricted to private clinics licensed to distribute methadone. However, many heroin addicts eventually spend time in jail because they are buying an illegal drug or are committing crimes to support their drug use. It could be argued that methadone be administered during incarceration to be consistent with clinically recommended, long-term care objectives, but the strategy of continued treatment requires careful attention to the needs and constraints of jail and prison environments.

Contrary to clinical recommendations, treatment for the vast majority of heroin-addicted inmates entering the US criminal justice system is detoxification. This is true even for those enrolled in community-based MMT. A sample of 1737 US jails revealed that only 19% have any funded drug treatment program other than detoxification [5]. Nearly every jail in the United States forces the inmate (other than pregnant women) to discontinue MMT abruptly. A national survey of 500 jails in the United States found that among the 245 jails that responded, only 27% reported that they contacted the methadone programs regarding dose and only 12% continued methadone during incarceration [6]. Symptoms of opiate withdrawal syndrome are treated typically only when the inmate complains. 'Detoxified' inmates are then either released back into the community or are transferred to prison. This almost ubiquitous policy of dealing with inmates enrolled in MMT is consistent with the perspective that opiate addiction be treated as an acute care disorder.

This policy may fail to improve public safety. Heroin addicts who receive MMT in jail are more likely to continue MMT voluntarily upon release [7]. MMT patients are much less likely to use heroin [8,9], and subsequent

arrests may decline because MMT patients no longer need to finance a costly heroin addiction, and because treatment allows many patients to stabilize their lives and obtain legitimate employment. Adopting a long-term care approach to MMT within corrections programs, including continuation of treatment while incarcerated, may therefore reduce inmate recidivism.

Despite evidence that MMT would benefit inmates as a long-term opiate addiction treatment protocol, few judges and prison and jail administrators have embraced providing MMT to incarcerated addicts [10]. Magura *et al.* [11] state: 'The main reasons appear to be political and philosophical oppositions to this treatment modality (an opinion not limited to correctional personnel) and concerns about the feasibility of providing methadone in a prison or jail setting (e.g. diversion of medication, violence, security breaches)'. In fact, a survey of security and clinical staff at a large Southwestern jail, conducted prior to and in planning for the start of jail-based MMT, found that it was believed widely that providing MMT in jails will *increase* recidivism [12]. The staff interviewed suspected that the deterrent effect of abrupt opiate withdrawal in the jail would be lost once a heroin-addicted inmate assumes that he/she will be treated with methadone while in jail. Heroin addicts may see jail as a means of achieving a quick methadone fix, particularly if money for methadone or heroin is unavailable. In addition, methadone outside the jail must be administered in a designated methadone clinic, where injection drug users are regularly in contact with one another. This social environment may introduce possible criminal opportunities, which may increase the risk of recidivism. Increased recidivism risk is the most often-cited rationale behind the strict regulation of methadone prescription and distribution in the United States [13]. These perceptions argue for a potential public safety hazard of jail-based MMT.

In a 1992 National Institute on Drug Abuse report, Peters & May [5] found no published evaluations of jail drug treatment programs on inmate recidivism. Fifteen years later jails offering MMT are still unusual [14], and only one study investigating the impacts of jail MMT on inmate recidivism has been published, with mixed findings [15].

In this study we examine recidivism rates of MMT patients booked into a large detention center (DC) located in a metropolitan community in the Southwestern United States. This DC started an MMT program in November 2005 that allows inmates enrolled previously in a community-based MMT to receive MMT after incarceration. This analysis, restricted to inmates who prior to arrest were MMT patients, compares re-booking rates for those enrolled in the jail-based MMT program to those who were not. The results of the study are used to evaluate the public safety benefit or hazard introduced by such a program.

METHODS

Data sources

Three sources of data contributed to this program evaluation. These were the DC booking database, the DC medical triage database and the DC's methadone dosage database.

DC booking database

The DC booking database identifies everyone booked in the DC, which has a design capacity of 2236 inmates. The booking database is updated automatically when new inmates are booked into the jail, and includes personal identifiers, charges and booking officer information. Every inmate is assigned a unique identification (ID) number that is re-used at subsequent re-bookings. This allows us to construct a booking history for each inmate. The inmate identifier, date of birth, gender, race, booking date and release date were extracted for all bookings that occurred between 1 May 2003 and 31 October 2006.

Triage database

All inmates are required to go through medical triage at the time of booking, which includes a brief medical examination and interview. Inmates are queried on medications (including methadone), medical conditions and drug and alcohol use. Inmates claiming to be on methadone at the time of booking must identify their private methadone clinic and dosage, which is verified subsequently by jail clinic staff. The inmate ID and booking date of all inmates claiming to be on methadone during triage between 1 May 2003 and 31 October 2006 were extracted from the triage database.

Dosing database

The DC public health clinic maintains records of all inmates given continued MMT in the jail. Once an inmate's treatment status is verified, the clinic staff submits a request to the jail pharmacy to have a methadone dose prepared. In some cases, inmates are released before receiving their first dose, due usually to delays in verifying and processing the correct dosage. The inmate ID, initial dose date and final dose (mg) were extracted from the dosing database for all inmates treated between 22 November 2005 (the start date for the MMT program) and 31 October 2006.

A master database was created by merging these data sources. Inmates who were less than 18 years old on 1 May 2003 were excluded, as were inmates who never

identified themselves as MMT patients during any medical triage. An additional 17 inmates of the 'other' and 'black' race categories were not included, so that analyses could be restricted to Hispanic, non-Hispanic white and Native American groups that dominate the state's demographics. Inmates who were never booked since the DC's MMT program began were excluded so that we could restrict our analyses to MMT patients who had an opportunity to receive continued MMT. The master database identifies whether or not the inmate was enrolled in a community-based MMT program at the time of booking, and whether or not the inmate was given methadone while in the jail. The master database also includes the age of the inmate at the time of booking, gender, race and length of stay in the jail. Finally, we summarized each inmate's booking record from 1 May 2003 to 22 November 2005 to determine the inmate's average annual booking rate prior to the start of the DC's MMT program. This measures the degree to which the inmate is a chronic offender, at least up to 2 years prior to the start of the MMT program, and is an important predictor of recidivism rates [16,17].

An analysis database consisting of 'inmate-intervals' documenting the time between release from jail and a subsequent re-booking event was constructed from the master database. Each inmate-interval begins with a release date and ends at either a re-booking date or the end of the observation period on 31 October 2006. The booking whose release date signals the beginning of each inmate-interval is referred to as the 'index booking'. The index booking provides information on whether the inmate was on MMT at the time of booking, whether the inmate was dosed with methadone in the jail and the length of stay in the jail. Intervals that began with release following an index booking during which the inmate was in the jail-based MMT program was defined as a 'dosed' inmate-interval. Intervals beginning with an index booking during which the inmate was not given continued MMT were defined as 'undosed'. These factors, along with demographic characteristics of the inmate and previous annual booking rates, are hypothesized to determine subsequent recidivism rates. The final database consisted of 727 inmate-intervals from 589 inmates. Each inmate contributed between one and four inmate-intervals to the database, with a mean of 1.2 intervals per inmate. The repeated measures structure of the data set requires statistical procedures, such as random effects models, that adjust appropriately for variable recidivism risks among inmates.

There were 536 dosed inmate-intervals and 191 undosed inmate-intervals. Males comprised the majority of undosed inmate-intervals ($n = 383$; 71.5%) and dosed inmate-intervals ($n = 129$; 67.5%), and there was no statistically significant difference between the two groups ($P = 0.31$). The majority of undosed inmate-intervals were among Hispanic inmates ($n = 431$; 80.4%), followed by non-Hispanic whites ($n = 90$; 16.8%) and Native Americans ($n = 15$; 2.8%). Similarly, dosed inmate-intervals were mainly Hispanic ($n = 149$; 78.0%), followed by non-Hispanic whites ($n = 40$; 20.9%) and Native Americans ($n = 2$; 1.0%). There was no statistically significant association between dosing and ethnicity ($P = 0.19$). Mean age at the beginning of the undosed inmate-interval was 37.7 [standard deviation (SD) = 9.9] and was 38.5 (SD = 10.0) among dosed inmate-intervals. Average annual bookings among inmate-intervals prior to the start of the MMT program was 0.99 (SD = 0.99) among undosed intervals and 1.08 (SD = 0.88) among dosed intervals. Average previous annual bookings were higher among inmates dosed in the jail than undosed inmates (Wilcoxon's test $P = 0.04$). The average length of incarceration during the index booking was significantly longer for dosed inmate-intervals (mean = 42 days for dosed inmate-intervals, SD = 46.9 versus 23 days for undosed inmate-intervals, SD = 43.6; Wilcoxon's test $P < 0.0001$). This was not surprising, as clinic staff require some time to verify that the treatment status and dosage with the inmate's private clinic. Length of incarceration is typically an indicator of the severity of charges and chronic offender status. For this reason it is critical that jail time, as well as previous incarceration rates, is adjusted for in multivariate statistical analysis.

Data analysis

The dependent variable for this analysis was the number of days until re-booking. Intervals ending on 31 October 2006 without a re-booking event were defined as censored. The independent variable was whether or not the inmate was dosed with methadone in the jail during the index booking. Demographic characteristics, jail time served during the index booking and average annual booking rates prior to 22 November 2005 were compared between dosed and undosed inmates using Pearson's χ^2 (categorical measures) and Wilcoxon's test (continuous measures). Kaplan–Meier estimates of the recidivism rates were computed and compared using the log-rank statistic.

The use of from one to four inmate-intervals per inmate requires consideration of different baseline risks, or 'frailties', of recidivism among the inmates. This variability is modeled using random effects, or mixed models, so that inmates with more observed inmate-intervals do not influence inappropriately the estimated regression coefficients, and so that the standard errors of the regression coefficients are unbiased. The event that an inmate was given MMT in the jail is thus considered as a time-varying covariate. The hazard of re-booking was modeled

using the Weibull proportional hazards model, which has two important advantages over the Cox model. First, the Weibull model provides more precise estimates of the effect sizes. Secondly, the Weibull model can incorporate random effects, which accounts for the correlation among repeated re-bookings per inmate. As with the Cox model, the Weibull model provides regression coefficients interpreted as relative risks.

The hazard, $h_{ij}(t)$, of re-booking for the jth interval of the ith inmate after t days since release from the index booking was defined as:

$$h_{ij}(t) = \exp\left[X_{ij}^{T}\beta + \theta_i\right]\lambda\gamma t^{\gamma-1},$$

where λ is the Weibull scale parameter and γ is the Weibull shape parameter. X_{ij} is the covariate vector for the ith inmate during the jth interval, and β is a vector of log hazard ratios (HR). θ_i is the inmate-specific random effect, and is assumed to be distributed normally with mean 0 and SD σ. Covariates included age, gender, race/ethnicity, jail time served during the index booking and annual booking rate prior to the start of the DC MMT program. The number of months between 22 November 2005 and the start of the inmate-interval was also included in the model to control for process changes in the implementation of the MMT program that may affect recidivism risks. Age was standardized to a mean of zero and SD of 1 to improve estimation, and jail time was transformed to the log scale. We also re-fitted the model including the last dose received in the jail in mg/10. This evaluated the extent to which actual final dosage, rather than dosing as a binary indicator, affected recidivism rates. The random effects model allowed interpretation of the MMT effect as the expected change in recidivism risk for an inmate given continued MMT in the jail.

Non-proportional hazards can have marked effects on the interpretation of the regression coefficients in the Weibull model, as with the Cox model. The approach to evaluating non-proportional hazards in the adjusted Weibull model was to test for different shape parameters (γ) between treatment groups [18]. This was accomplished by modeling γ as a function of in-jail MMT treatment status into the Weibull likelihood. A log-linear model of the shape parameter (γ_{ij}) for the ith inmate during the jth interval was defined as:

$$\log(\gamma_{ij}) = \alpha + \tau D_{ij},$$

where α is the baseline shape for an undosed inmate-interval, D_{ij} is the treatment status for the ith inmate during the jth interval and τ is the change in the Weibull shape parameter for dosed inmate-intervals. A statistically significant treatment status (τ) effect indicates that the hazards are non-proportional between dosed and undosed inmate-intervals, and that regression effects cannot be interpreted as log relative risks.

Computation

All database management, graphics and tabulation were conducted using SAS software. The random effects Weibull model was fit in SAS PROC NLMIXED.

RESULT

One hundred and ninety-one of 727 inmate-intervals (26.3%) began with an index booking event during which the inmate was treated with MMT. Average final dose upon release from jail was 88 mg (range = 20–350 mg).

All inmates on methadone at the time of booking had high recidivism rates (Fig. 1). Median time to re-booking for the whole sample was 189 days [95% confidence interval (CI) = 151–225 days]. Median time to re-booking was about 1 month shorter for dosed (159 days; 95% CI = 131–267 days) than undosed inmate-intervals (197 days; 95% CI = 156–233 days), although these unadjusted recidivism curves were not significantly different from one another (log-rank test $P = 0.53$).

The random effects Weibull proportional hazards model showed a statistically significant age effect, indicating a 21% decrease in the re-booking risks per standard deviation in age (Table 1). There was also a statistically significant effect of previous booking history, measured by the annual booking rate before 22 November 2005. There was a 72% increase in the recidivism risk per unit increase in the annual booking rate. There was no statistically significant effect of gender, race, jail time or months since the program's inception on the re-booking hazard. The test of the proportional hazards assumption

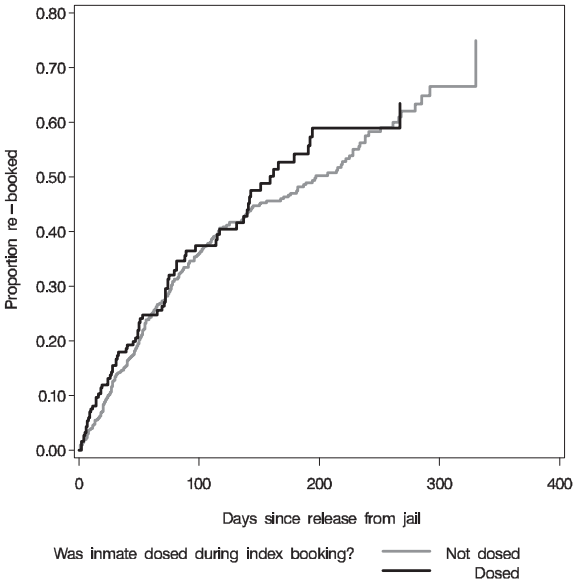

Figure 1 Kaplan–Meier estimates of the recidivism curves for 727 dosed and undosed inmate-intervals

Table 1 Random effects Weibull model results of inmate re-booking hazards.

	Random effects Weibull model		
	Hazard ratio	*Lower confidence limit*	*Upper confidence limit*
Standardized age	0.79*	0.67	0.92
Previous annual bookings	1.72*	1.44	2.03
Months since program inception	1.03	0.98	1.08
Log jail time during index booking	0.87	0.74	1.02
Gender			
Female	0.89	0.64	1.24
Male	1	–	–
Race/ethnicity			
Native American	1.25	0.46	3.35
Hispanic	0.86	0.58	1.30
Non-Hispanic white	1	–	–
Treatment status			
Dosed in jail	1.16	0.81	1.68
Undosed in jail	1	–	–
Weibull parameters	*Estimate*	*Lower confidence limit*	*Upper confidence limit*
Shape	1.16	1.01	1.31
Scale	0.0008	0.0003	0.0022
Standard deviation of random effects distribution	0.99	0.72	1.38

*$P < 0.01$.

by modeling differences in the Weibull shape parameter due to treatment in the jail was not statistically significant (estimated $\tau = -0.09$, $P = 0.34$), indicating that the proportional hazards assumption is appropriate.

After adjusting for age, gender, race, jail time, previous booking rates, months since the program's inception and individual-level variability in re-booking risks with the random effects Weibull model there was no statistically significant effect of continued treatment with methadone in the jail on inmate recidivism (HR = 1.16; 95% CI = 0.81–1.68). The model was re-fitted to include final dosage on release in mg/10. Dosage received upon release had no statistically significant effect on recidivism rates (HR = 1.05 per additional 10 mg; 95% CI = 0.99–1.12; $P = 0.1$).

DISCUSSION

The results of this analysis indicate no statistically significant impact of MMT dosing in the jail on inmate recidivism. These results differ somewhat from those found by Bellin *et al.* [10], who investigated inmate recidivism in the Riker's Island program. Despite findings by Bellin *et al.* that inmates on a high dose (>60 mg) of methadone have lower recidivism rates than those on a low dose of methadone (<60 mg), both of these groups of treated inmates have significantly higher recidivism rates than inmates who were detoxified. Median time to re-booking was 253 days for high-dose MMT patients, 187 days for low-dose patients and 337 days for detoxified inmates. Bellin *et al.* suggest that these inmates, corresponding to the undosed inmate-intervals in our study, have a shorter history of criminal behavior, as measured by younger age, shorter time spent in jail and fewer previous incarcerations, which confounds the expected effect size. Our study adjusted for these factors, and our results indicate no statistically significant difference between dosed and undosed inmates.

The implications of this study are clear. There is no support for or against either argument that jail-based MMT will increase or reduce inmate recidivism. These results should encourage corrections administrators who are concerned that providing MMT in the jail will reduce the deterrent effects of jail time on MMT patients, if not actually motivating MMT patients to become incarcerated actively. Corrections administrators are further encouraged to promote jail-based MMT, as this may improve inmate linkage with outside MMT providers upon release from jail [14], although evidence is sparse due to the paucity of jail-based MMT programs. The concomitant reduction in demand for illicit opiates may, over time, reduce the long-term burden on the jail.

Our study indicates no decrease in recidivism rates among inmates treated with methadone in the jail. These results may, on the surface, discourage public health advocates hoping to use the public safety benefits of MMT to promote MMT in jails. However, given that MMT is the currently accepted treatment for heroin addiction, MMT can be promoted on clinical grounds only, with no expected harm to public safety. Aside from the personal

benefits that the MMT patient can expect from reducing the use of illicit opiates, effective MMT outreach presents an important public health benefit by reducing the burden of diseases spread by injecting drug use, such as human immunodeficiency virus (HIV) [19].

There are two important limitations to this study. First, we defined recidivism as re-booking into the DC, and not re-arrest. Our definition of recidivism thus underestimates re-arrest rates, as well as all rates of subsequent criminal behavior. Such a study could be conducted by accessing police records for each inmate, or by interview with a subsample of inmates after release from the jail. Secondly, our study did not investigate inmates' reconnection with MMT providers upon release from jail. This unmeasured effect of re-integration into MMT on release from jail may have an important impact on the estimates of recidivism risks. This is especially significant, as the implicit goal of the DC MMT program is to motivate continued treatment after release. In one study, active participation in prison post-release treatment was one of the most important predictors of recidivism risks, independent of background risks and treatment while in prison [20]. A reduction in recidivism risks as a result of post-release treatment is confirmed in one review [21], although the authors note several methodological concerns with previous research. Key among these is the problem of self-selection of comparatively low-risk inmates into continued treatment post-release. Clearly, evaluating the effects of re-entry into MMT post-release is an important consideration for future studies evaluating jail-based MMT.

This study is not a randomized controlled trial which, for ethical reasons, would not be possible to conduct in a corrections setting. Because this was a program evaluation, inmates were not randomized to receive MMT or a control condition. Therefore, treated inmates may be fundamentally different from untreated inmates in ways that may affect recidivism risks. Our analysis minimizes this potential bias to some extent by including important covariates such as age, gender, race, previous booking history, jail time and time since the program began into the analysis. This approach, however, can never truly replace the advantages of randomization in a controlled trial. Results must thus be considered with caution. Even so, our results indicate that current treatment practice in the DC does not affect recidivism risks among treated inmates.

Declarations of interest

None.

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