**Estimating a causal effect on recidivism for correctional multicomponent treatment for prisoners with an Alcohol Use Disorder in England.**

**Abstract**

There is an emerging literature on the impact of correctional substance abuse treatment (SAT) on reoffending for prisoners with substance misuse issues that is cognisant of treatment systems as opposed to individual interventions. The study aims to assess a causal multicomponent treatment effect for prisoners with an alcohol use disorder (AUD) to reduce reoffending. In England, treatment comprises Medication Assisted Treatments (MAT) and psychosocial interventions that also incorporates Risk Need Responsivity (RNR) designs. Multicomponent treatment effect estimators are provided for prisoners diagnosed with an AUD in England when matched to a balanced untreated control group for: (i) MAT only; (ii) RNR compliant treatment and (iii) ‘other’ psychosocial interventions in relation to reconvictions. Multiple quasi-experimental approaches are presented based on: (i) regression adjustment; (ii) treatment assignment and (iii) ‘doubly-robust’ modelling treatment assignment and outcomes simultaneously. The weighted outcomes for RNR compliant treatment only suggest a lower recidivism rate compared to the control group. MAT-only treatment yields significantly higher levels of reoffending than the other two treatments relative to the untreated group. Treatment in the English substance misuse correctional system is heavily weighted towards delivery of MAT. There is an opportunity to develop an integrated model of correctional SAT that combines MAT with RNR-compliant approaches.

**Keywords:**

Alcohol use disorder, correctional treatment, multicomponent treatment, reoffending

**Introduction**

Studies have highlighted the association between violence with alcohol and drugs with high estimates of treatment need in correctional settings for prisoners with an alcohol use disorder (AUD) (Fazel et al, 2016). US estimates of prisoners with an AUD show prevalence rates of around half of all prisoners with a moderate-severe AUD diagnosis (Proctor et al, 2016) which is comparable to prevalence rates of between one-third and one-half for prisoners with an alcohol dependency in England and Wales (Bebbington et al, 2017; Kissell et al, 2014; Jones & Hoffman, 2006).

The development of the ‘what works’ agenda and statistical meta-analyses in correctional rehabilitation coincided with publication of research detailing the role of community and correctional-based substance abuse treatment (SAT) as means to reduce criminal activity mainly for opiate misusers (Holloway & Bennett, 2016; Teeson et al, 2008; Gossop et al, 2005; Hubbard et al, 2003; Simpson et al, 1997). Community-based interventions for AUDs in the US and UK have highlighted treatment effectiveness for types of psychosocial interventions (PSI) including cognitive behavioral therapy (CBT); motivational interviewing, social behaviour and network therapy and Twelve-Step approaches (UKATT Research Team, 2005; Project MATCH Research Group, 1998)

However, correctional SAT is not homogenous and includes a variety of treatment styles, philosophies offered to differing offender segments. Interventions include medication-assisted treatment (MAT) that manage symptoms of withdrawal (acamprosate, disulfiram or naltrexone); structured (or ‘manualised’) group programmes that relate to alcohol consumption or focus on offending resulting from excessive use (e.g. violent behaviour or drink-driving) and therapeutic communities (TCs).

A large literature exists evaluating the impact of Therapeutic Communities (TCs) has suggested a modest treatment effect (Mitchell et al, 2012) in reducing relapse and reoffending although some studies are more sceptical (Welsh et al, 2014), with levels of recidivism dependent on the measure chosen (Jensen & Kane, 2012; Welsh & Zajac, 2013). Other systematic reviews (De Andrade et al, 2019; Doyle et al, 2019) also found TCs as a promising mechanism to affect change in reoffending but both analyses were largely focused on illicit drug use with alcohol enveloped within a wider substance misuse definition minimising the ability to draw drawing any firm conclusions of a treatment effect for prisoners with an AUD. Studies on TCs have noted selection effects by which prisoners are selected to engage with treatment based on motivation or treatment readiness (Davidson & Young, 2019; Zhang et al., 2011; Olson et al., 2009; Welsh and McGrain, 2008).

Structured group programmes utilising manualised approaches also aim to addressing AUDs either through an examination of cognitions surrounding alcohol consumption or offence-specific interventions. Evaluations of programmes that include prisoners with an AUD are often subsumed within a wider ‘substance use disorder’ definition and these have shown positive effects on reoffending (Blatch et al, 2016; Olson & Lurigio, 2014; Palmer et al, 2011; Friedmann et al, 2011; Turley et al, 2004; Zanis et al, 2003; Porporino et al, 2002). All these studies examine a wide range of interventions treating drug and alcohol misuse deploying a mix of methodologies and outcome metrics which can provide differing results (Welsh & Zajac, 2013).

Structured programmes for treating AUDs are comparatively limited in scope and design including use of alcohol-specific treatment orders for offenders released on community sentences and offence-specific interventions for violent behaviour or for drink-driving. Multi-site evaluations have presented no clear evidence of a treatment effect following treatment for an AUD. An English, national community-based prospective cohort study of individuals treated for an AUD found significant reductions in reconvictions with notable improvements by type of intervention including receiving MAT and for those with drink-driving offences (Willey et al, 2016). In comparison, two national studies deploying different methodologies found weak evidence in reducing reconvictions for prisoners with an AUD (Hillier & Mews, 2018; Ministry of Justice/Public Health England, 2017).

There is also a mixed picture for offenders on a community order, with a positive treatment effect noticed in some studies (Needham et al, 2015; Ashby et al, 2011) but not in others (McSweeney, 2015). More promising are targeted interventions aimed at addressing alcohol-related violence (Bowes et al, 2014; McCulloch & McMurran, 2008) and cognitive therapies for alcohol-dependent males with a history of interpersonal violence to reduce alcohol consumption and aggression (Easton et al, 2007). Similar promising evidence can be shown for interventions aimed at addressing drink-driving offences (e.g. Miller et al, 2015) with cognitive therapies also a potentially promising approach for hard-to-treat, pre-contemplative offenders (Quinn & Quinn, 2015). The need for an intervention for this group has been shown in drink-driving offender groups where nearly all offenders have been noted to have an AUD (Mullen et al, 2015). Overall, the evidence suggests a mixed picture on the effectiveness of treatment to realise changes in reoffending. These are due to heterogeneity in research designs, sample sizes, definition of AUD (which may be sub-divided into dependent or non-dependent); selection effects of prisoners into treatment and the treatment model deployed. Moreover, few studies aim to measure a treatment effect where there are competing interventions, thereby limiting any causal explanation underpinning the efficacy of a single treatment (Thanner & Taxman, 2003).

*Risk-Need-Responsivity (RNR) in SAT*

Whilst community-based treatment for AUDs may incorporate MAT and PSI components, in correctional settings prisoners may be offered structured programs that address attitudes and behaviours associated with a prisoner’s risk factors for reoffending. Andrews and Bonta (2010) have highlighted three principles that underpin effective treatment programs aimed at offender rehabilitation identified from meta-analyses of criminogenic factors that predicted the likelihood of reoffending. The first principle focuses on an offender’s likelihood of ‘risk’ such that higher-risk offenders are required to receive more intensive (higher ‘dose’) interventions. Lowenkamp et al’s (2005) meta-analysis of drug court programs found that high-risk offenders were likely to reduce levels of recidivism by twice as much compared to low-risk groups. The second facet is to address the criminogenic and non-criminogenic ‘needs’ of an offender. These are subdivided into static (age, gender, ethnicity, offending history) and dynamic factors (motivation, attitude to authority etc.). The final component is ‘responsivity’ including ‘general’ responsivity that posits cognitive-behavioural interventions are more efficacious than nonbehavioral approaches (Andrews et al, 1990). For example, ‘specific’ responsivity includes a range of tailored interventions deployed to treat or manage alcohol consumption.

Reliable and validated tools are implicit in the measurement of criminogenic risk. In the UK, the Offender Group Reconviction Scale 3 (OGRS) is an actuarial tool established to predict general reoffending and is administered to all adult prisoners across England and Wales (Howard et al, 2009). It incorporates three static risk factors (age, gender and offending history) to derive the likelihood of reoffending 1-2 years from prison discharge and has been shown to achieve a high level of predictive accuracy (Howard et al, 2009). OGRS scores are broken down into low-medium-high/very-high risk categories. Use of OGRS scores have been incorporated within a wider Offender Assessment System (OASys) that integrates actuarial risk with dynamic and static risk factors including details of the offence, housing, employment/education/training, financial, relationship, lifestyle/associates, drug and alcohol, emotional well-being, thinking and behaviour, attitudes and general health needs. These components have been used in quasi-experimental studies creating matched control samples (Bloomfield & Dixon, 2015; Sadlier, 2010)

Meta-analyses of structured programmes have supported the notion that these interventions either in custody or among community-based offender populations can reduce reoffending (Bahr et al, 2012: Andrews et al, 1990). Lipsey’s meta-analyses found treatment for juvenile offenders resulted in a 10% reduction in reoffending. When methodological differences (such as sample size) and treatment components were adjusted for, the reduction in reoffending was 30% compared to 6% for ‘other’ forms of treatment. These studies pinpointed a “dosage” effect with intensive interventions (e.g. longer and more often) more likely to be effective regardless of criminal offence (Lipsey, 1995; 1992). Underpinning this model is the ‘integrity’ of delivery to ensure fidelity to evidence-based practices with a failure to do so resulting in an ‘implementation gap’ (Goggin & Gendreau, 2006; Lowenkamp et al, 2006; Landenburger & Lipsey, 2005).

Alongside the evidence for general offending, there is evidence that compliance with the three RNR components also produces a positive effect on recidivism for high-risk offenders in SAT (Thanner and Taxman, 2003). A meta-analysis of RNR compliance in substance misuse programmes has suggested that reductions in offending and ongoing substance use are not mutually reinforcing and that reductions in consumption may not automatically translate to reduced reoffending (Farabee, 2018; Prendergast et al, 2013). Moreover, there have been issues with operationalising RNR with correctional SAT. The focus of SAT on measuring historic levels of usage and dependency may not be relevant to their immediate clinical or reoffending needs thereby diluting the responsiveness of treatment provided (Marlowe, 2011; Taxman et al, 2006).

*Treatment for AUDs in English Prisons*

In England the Government’s Drug Strategy (HM Government, 2017) emphasised offenders’ access to SATs at all stages of the criminal justice system with treatment for AUDs enshrined alongside illicit drug misuse with an explicit aim to reduce reoffending (NHS England, 2018). Implicit within these guidance documents is the need to create equivalence between correctional and prison-based treatment. Access to prison-based SATs in England include multiple entry points. On arrival a clinical assessment of current need for an AUD intervention that determines severity of alcohol use using validated clinical screening and diagnostic tests. If acute alcohol needs require MAT, alcohol withdrawal may be managed by prescribing acamprosate, disulfiram or oral naltrexone allied with PSIs that focus on alcohol misuse and its role in offending behaviour. Prisoners may also be offered pain relief to address symptoms of associated with problematic alcohol consumption (Department of Health, 2017).

Prisoners may also access treatment resulting from historic misuse of alcohol that is associated with criminal behaviour through the offender manager who will ensure engagement with SAT as part of sentence planning. Prisoners with no immediate clinical need will access a range of PSIs including structured group work. UK guidance on psychosocial interventions have emphasized Moos (2007) need to develop a therapeutic alliance between practitioner and client, use of evidence-based practices whilst ensuring staff are adequately trained and supervised (Department of Health, 2017). This approach argues for interventions based on an individual’s needs at different points of the treatment process (differentiating between assessment, engagement, behaviour change and early recovery). Hamilton et al’s (2015) review of European correctional treatment suggested that PSIs were sufficiently tailored to RNR principles although fidelity was relatively under-developed.

Individuals with an AUD are encouraged to receive a range of evidence-based PSIs aimed at addressing remission including cognitive behavioural and other behavioural therapies or social network therapies that focus on alcohol-related cognitions, behaviour, problems including criminal activities and social networks including access to self-help groups such as Alcoholic Anonymous. Moreover, therapeutic interventions are geared towards ensuring intensive support based on need over a minimum period of 12 weeks (National Institute for Clinical Evidence, 2011).

Understanding the efficacy of treatment for AUDs is an under-researched area, partly due to subsuming alcohol within a ‘substance misuse’ rubric and the prioritisation of treating illicit drug misuse. Few studies examine multiple treatment arms within the same treatment unit. The aim of the study is to examine the causal effect of multicomponent treatment for an AUD in reducing recidivism in a national correctional setting. The components will test for a treatment effect for three interventions including MAT, PSI and RNR-compliant approaches. The paper will contribute to the wider effectiveness literature by utilising regression-based methods to estimate treatment effects across multimodal correctional interventions.

**Methods**

*Participants*

Data for this study were derived from an administrative dataset of 59,150 adult prison leavers (aged 18 or more years) in England released back into the community during 2013-14. The information held on these leavers included socio-demographic details, release dates, spell length and the most recent (at the point of release) offender assessment utilising the Offender Assessment System (OASys). Using information contained within OASys, adult prisoners with an AUD were determined based on whether the prisoner had been assessed as consuming alcohol which was linked to offending behaviour or the severity of alcohol use prior to incarceration (dichotomised into yes [1] or no [0]). Out of 59,150 prison leavers, 26,654 prisoners (45%) were identified as having an AUD. A separate dataset (the National Drug Treatment Monitoring System [NDTMS]) on English prisoners accessing prison-based SAT was merged with the 59,150 prison leavers using a unique identifier (‘NOMSID’) that was common across the two systems. Where multiple records of a treatment episode existed, the one nearest to the date of release from prison was chosen. A total of 2,647 prisoners (10%) reported to have received treatment for an AUD were flagged onto the prison leavers dataset with the remainder not known to treatment services and therefore considered untreated (n=24,007). The possibility of whether any prisoners in the untreated group had received AUD treatment was examined through combining the unique ID match with ‘fuzzy logic’ linkages based on personal identifiers held across both datasets (initials, date of birth and gender). An initial run generated around 8,000 possible matches but adjusting the logic to ‘likely’ characteristics (e.g. gender, ethnicity, home location) matched to the same establishment and time period generated 166 possible matches (1%) where a person may have received AUD treatment. Sensitivity tests using the single and enhanced matches generated very similar outcomes and therefore the unique identifier match was used as the final analytical method.

Prisoners receiving treatment were coded into treatment modalities based upon the interventions they received. 733 prisoners (28%) received MAT-only with no PSI input. 241 (9%) prisoners were coded as receiving RNR compliant treatment in that they were categorised as high-risk offenders within OGRS receiving the highest dose (coded into low-medium-high levels) whilst also receiving an evidence-based PSI. 1,673 (63%) prisoners received non-RNR compliant PSI treatment such that they were not high-risk offenders with lower dosage levels.

*Outcome Measure*

A binary definition of reoffending (yes/no) for prisoners released during 2013-14 was calculated from the Police National Computer and defined as a count of court convictions, cautions, reprimands or warnings, but excluded Penalty Notices for Disorder, in a one-year period after release from prison and appended to the dataset (Ministry of Justice, 2011).

*Statistical Analyses*

Two explicit assumptions are required to establish a causal effect. The first is to adjust for all confounders associated with treatment assignment and with the outcome. A second is for there to be complete ‘overlap’ in the distribution of prognostics across treatment modalities. When these conditions have been fulfilled then there is ‘strong ignorability’ of how an individual came to be ‘treated’ or in the comparison group relative to the outcome (Rosenbaum & Rubin, 1983). Rosenbaum and Rubin (1983) established a propensity score structure for binary treatment which has been deployed to minimise selection bias and has been extended for multi-component interventions (Imbens, 2000; Lechner, 2001). Methodologies encompassing regression and inverse probability weighting have been enhanced for the evaluation of multiple treatment components in medicine (Linden et al, 2015). Causal treatment effects will be determined by testing recidivism outcomes using four alternative methods: regression adjustment (RA), inverse probability of treatment weighting (IPTW), augmented inverse probability of treatment weighting (AIPTW) and inverse probability of treatment weighted regression adjustment (IPTWRA).

RA will regress the reconviction outcome measure on the list of prognostics separately for each treatment modality, so that predicted outcomes for each prisoner and modality are calculated from individuals receiving the treatment. The average treatment effect (ATE) is calculated by comparing the predicted probabilities of reoffending also known as the potential outcome means (POM) between the list of treatment modalities. Using RA it is possible to assess reoffending levels for each prisoner independent of treatment exposure. IPTW models the treatment assignment process and does not specify a model for our reoffending binary outcome. Static (demographics, offending history) and dynamic variables (motivation, health status etc) will determine whether a prisoner is assigned to AUD treatment. IPTW adjusts for these differences by creating weights for each prognostic.

IPTWRA model both the reoffending outcome and the treatment to account for the non-random assignment to treatment. IPTWRA uses the IPW weighting approach described above to estimate corrected regression coefficients that are used to perform the regression adjustment. This approach is described as ‘doubly-robust’ as the effect will be consistent even when the treatment model or the outcome model (but not both) are inaccurate. IPTWRA models both the reoffending outcome and treatment prognostics to adjust for non-random treatment assignment. A similarly doubly-robust approach is achieved through AIPTW. The model estimates the general propensity score and the IPT weights. Regression models for the outcome are calculated for each treatment modality and predicted outcomes for each individual, creating unconditional POMs for each treatment modality. Recent evaluations of these approaches suggest prioritising “doubly-robust” (AIPTW or IPTWRA) approaches (Linden et al, 2016) for measurements of multi-component treatments.

*Prognostic Variables*

Characteristics of the baseline population were determined through a number of static and dynamic prognostic variables derived from the merged dataset. These included socio-demographics (age, gender), offending history, length of prison spell and dynamic variables derived from the OASys actuarial risk assessment including emotional well-being, temper and control, problem solving skills, awareness of criminal consequences, general health status, whether unemployed, access to prosocial activities, illicit drug use, alcohol consumption linked to offending and levels of binge drinking.

**Results**

Table 1 presents the crude reconviction outcomes for the treated and untreated populations using the derived treatment modalities. RNR compliant treatment recorded have the lowest rates of reoffending of all treatment modalities (36.5%) marginally lower than the untreated group (37.5%).

# Table 1 about here #

Table 2 examines the POM for each treatment modality by method. As expected, the larger the sample size, the more the estimated POMs did not vary, which was noticeable for the untreated group. Each method yielded similar estimates for each treatment modality. The exception was the IPTWRA method, which for RNR compliant treatment yielded a POM of 0.756 compared to a range of 0.342 to 0.417 by the other three methods). A diagnostic look at the regression coefficients from the logistic regression for the binary re-offending outcome within the RNR compliant treatment by the IPTWRA method revealed a convergence failure. Therefore, the unexpectedly high predicted POM of 0.756 for the RNR compliant group is an unreliable result. Instead, across the other three methods (AIPTW, IPTW and RA) exposure to RNR-compliant treatment consistently yielded a lower estimated re-offending rate compared to that of the untreated group.

# Table 2 about here #

Table 3 examines the ATE for reoffending rate estimates across all treatment modalities, by each estimation method. The ATE are the differences between POMs which relate to pairwise comparisons between the estimated proportions of reoffending (the risk difference); 99 per cent confidence is needed to yield a set of simultaneous intervals. A single-step Bonferroni adjustment for multiplicity is applied to p-values from z-tests. All of the adjusted methods presented significantly higher levels of reoffending among prisoners receiving MAT-only compared to the comparison group of untreated prisoners. IPTW found significantly higher levels of reoffending for MAT-only prisoners compared to both RNR compliant and PSI non-compliant treatment. Except for the anomalous finding in IPTWRA, the other three approaches yielded similar results, in that MAT-only has least effect on reoffending, followed by PSI non-compliant treatment, and with RNR compliant treatment the approach most likely to see positive changes in reoffending rate. In the pairwise comparison with PSI non-RNR compliant treatment, RNR compliant approaches appeared to be the most effective treatment type in reducing reoffending, though the ATE was not statistically significantly different from zero. The latter result was not unexpected, as the small sample size of the RNR-compliant treatment is a strongly limiting factor for the precision of its estimates.

# Table 3 about here #

***Covariate Balance***

The extent to which a weighting method achieves covariate balance was assessed visually using the approach recommended by Austin & Stuart (2015). Their suggestion is to illustrate absolute mean standardised differences between covariates in each separate treatment group relative to the untreated comparison group, both before (“raw”) and after (“weighted”) the weighting process. Ideally, all symbols of the weighted absolute mean standardised differences would be aligned above the value of zero on the horizontal axis. The next best scenario is shown in Figure 1 for the MAT treatment group, where all symbols for the weighted differences are on the left of those for the raw differences, suggesting that covariates are more balanced after weighting than before it. There are three prognostics (age, OGRS score and employment related to offending) to the right of the circles and they are closely situated. For RNR compliant treatment (Figure 2), four covariates (offence type, previous convictions, previous prison events and temper control) are less balanced after weighting than before it, due to the small samples size of this treatment group. Figure 3 shows only the prognostics ‘Lifestyle’ is less balanced after weighting than before it for the PSI non-RNR compliant groups.

# Figures 1 to 3 about here#

**Discussion**

The study aims to describe an effect on recidivism as measured by post-treatment reconviction rates for multi-component SAT within a prison-setting. SAT was divided into three groups relating to MAT-only (28%), RNR-compliant treatment (9%) and non-RNR compliant PSI (63%). The weighted reoffending rates for prisoners treated for an AUD-only was estimated to be between 34-42% which is lower than the 48% overall offending rates for adults released from custody (Ministry of Justice, 2019). For the purpose of this study,

SAT was divided into three groups relating to MAT-only (28%), RNR-compliant treatment (9%) and non-RNR compliant PSI (63%). It is notable that despite governmental guidance, over one-quarter of all SAT interventions were MAT-only with no PSI input. The reasons for this are unclear but are likely to reflect the nature of SAT provision within a custodial setting in England. This may include prisoners receiving a short sentence or housed for a short spell, the availability of PSIs and an emphasis on treating the health-related consequences of alcohol consumption. It is also likely that receipt of MAT-only reflected the severity of alcohol-related needs that required a clinical response prior to any cognitive behavioural work. Research in the UK has found healthcare systems are relatively well-developed relative to psychosocial support especially for AUDs (Lloyd et al, 2019).

However, it is likely that the principle of treatment equivalence has resulted in a reframing of English correctional SAT towards health-based approaches commensurate with community-based treatment. Structured programs and interventions designed to be RNR-compliant such as the Counselling, Assessment, Referral, Advice and Throughcare (CARAT) have been subsumed within more health-focused approaches which will have diluted a focus on recidivism. Psychosocial interventions are therefore more likely to focus on managing relapse or minimising the harm from excessive alcohol consumption which diluted the impact on reoffending (Farabee, 2018; Prendergast et al, 2013).

Treatment in a prison environment is an opportunity for breaking the cycle of substance misuse and offending if treatment is effectively planned and delivered. Community-based treatment for AUDs have shown the effectiveness of MAT alongside PSIs in reducing criminal behaviour (Willey et al, 2016). The extant literature on RNR has emphasised the role of cognitive behavioural therapy (CBT) as the treatment modality to affect behavioural changes that will facilitate reductions in general reoffending (Landenburger et al, 2005; Wilson et al, 2005; Pearson et al, 2002) whilst there is cognisance that SAT may require specialist, tailored components (Lipsey et al, 2007). CBT for prisoners aims to affect change by addressing criminal and substance-misusing thinking patterns by providing coping strategies to manage high-risk situations. Despite its attraction, other reviews have been more equivocal in its role in reducing recidivism (de Andrade et al, 2018; Perry et al, 2016) with commentators arguing that prison-based CBT interventions can be vague, generic and lack tailoring to the target population (Taxman & Cundy, 2005).

The utilisation of RNR principles within SAT has also been shown to be problematic where differing treatments coexist, and these separate components are rarely examined for their role in reducing reoffending. Moreover, some commentators argue that many of the programmes evaluated do not reflect routine practice and benefit from abnormal levels of funding and support (Lab & Whitehead, 1990) that in turn lead to higher rates of “therapeutic integrity” (Smith et al, 2009: 161). Operationalising severity of substance misuse to encompass dependence and how consumption changes over time has been shown to be problematic (Taxman et al, 2006). Marlowe (2011) argues that treating both non-dependent and low-risk substance misusers may dilute a treatment effect on recidivism. The delivery of treatment within custodial settings has also been viewed as problematic as few prisoners may access the treatment they need, using non-evidence based interventions such as group-based drug education (Pearson & Lipton, 1999) and what interventions are available may be delivered poorly (Marlowe, 2011). Evidence from English criminal justice settings suggest that the majority of PSIs are limited in scope with little therapeutic contact, with a focus on administrative duties (Best et al, 2010; 2009).

There is also a suggestion that some substance misuse practitioners are resistant to treating high-risk prisoners as they are more likely to be disruptive and lack motivation to change (Thanner and Taxman, 2003). Moreover, critics also argue that prison-based treatment will include prisoners with tangential needs (e.g. involvement in activities relating to the production or supply of substances or with high rates of co-occurring disorders including suicidal thoughts, anxiety and depression, and generally in poor physical health); clinical screening tools may overstate the need for treatment by focusing on a prisoner’s immediate severity of use, and the role of self-selection through self-referrals or court-mandated treatment (Jolley and Kerbs, 2010). Psychosocial interventions in prisons therefore tend to be characterised by an “overreliance on low-intensity and non-clinical interventions” (ibid: 291).

Despite these concerns, there is evidence from this study that correctional SAT can result in reductions in recidivism compared to a control group. Adherence to RNR principles has been shown to be the most effective treatment to reduce recidivism compared to other modalities including MAT and other forms of PSI. This provides an opportunity for correctional SAT to integrate MAT with RNR-compliant approaches. Such approaches may consider stepped care approaches that ensure linkages to aftercare services that provide interventions that may not have been delivered within a prison setting.

**Strengths and Limitations**

This study examines the effectiveness of multi-component treatment systems in reducing recidivism and focuses on AUDs rather than placing alcohol within a ‘substance abuse’ framework. The value of this study is that it simultaneously compares treatments to each other and to an untreated group using four regression-based approaches. The study also has a national geographic focus and includes relatively large sample sizes. However, some limitations should be noted. Firstly, there is limited information available on the detail within each treatment component, what the intervention comprised of, when it was delivered and how relevant it was to their needs. It is likely that broad categorisations do not capture the nuance of the treatment experience in each prison (Davidson & Young, 2019). Second, despite the large sizes of the aggregated treatment groups, the RNR sample size was relatively small and there were issues in achieving balance relative to the untreated control group. This may have resulted in the unexpected result using the IPWRA method where the logistic regression model underpinning the method failed to converge. Further work is required to test the validity of these findings with larger sample sizes. The pairwise comparisons whilst highlighting some differences show few statistically significant results (after Bonferroni adjustments) suggesting that the sample sizes of the treated groups were too small for a confirmatory study.

**Conclusion**

The analysis of multicomponent SAT suggests that treatment incorporating RNR components are the most effective form in comparison with other forms of intervention including MAT-only and non-RNR compliant PSI. In fact, RNR-compliant treatment was the only intervention arm that demonstrated a higher rate of reducing reoffending when compared with the untreated group acknowledging the anomalous result using IPTWRA that failed to converge. Furthermore, MAT-only interventions were shown to produce significantly negative results on reoffending compared to the untreated group. Quasi-experimental techniques using ‘doubly-robust’ estimators should be considered an alternative method to assess multicomponent SAT that are a likely reflection of “real-world” treatment systems (Day and Mitcheson, 2017). Further work is required to develop RNR-compliant treatment in an English prison context that integrates criminogenic risk with wider health-related clinical needs.

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Table 1: Crude reconviction rates of prisoners receiving multi-component treatment and comparison (untreated) prisoners

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatment Modality | Did not reoffend | | Reoffended | |
| Untreated | 62.5% | n=35,320 | 37.5% | n=21,183 |
| MAT-Only | 46.2% | n=339 | 53.8% | n=394 |
| RNR Compliant | 63.5% | n=153 | 36.5% | n=88 |
| PSI Non RNR Compliant | 59.8% | n=1,000 | 40.2% | n=673 |
| (Total Treated Population) | 62.2% | n=1,492 | 37.8% | n=22,338 |

Table 2: Potential Outcome Means receiving multi-component treatment and comparison (untreated) prisoners by causal estimator

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Estimated Potential Outcome Means | | | |
| Treatment | IPWRA | AIPW | IPW | RA |
| Untreated Control Group | 0.435 | 0.435 | 0.436 | 0.436 |
| MAT | 0.514 | 0.527 | 0.531 | 0.505 |
| RNR Compliant | 0.756 | 0.417 | 0.342 | 0.412 |
| PSI non RNR Compliant | 0.450 | 0.450 | 0.424 | 0.441 |

Table 3: Pairwise Average Treatment Effects (Bonferroni adjusted) across multi-component treatment and comparison (untreated) prisoners by causal estimator

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Estimator | ATE | SE | Z | P > [z] | 99% Confidence Interval | |
| **Regression adjustment** |  |  |  |  |  |  |
| Untreated vs MAT Only | -0.149 | 0.060 | -2.5 | 0.075 | -0.302 | 0.005 |
| Untreated vs RNR compliant | 0.055 | 0.374 | 0.15 | 1.000 | -0.909 | 1.019 |
| Untreated vs PSI non-RNR compliant | -0.013 | 0.040 | -0.33 | 1.000 | -0.115 | 0.089 |
| MAT Only vs RNR compliant | 0.204 | 0.379 | 0.54 | 1.000 | -0.772 | 1.180 |
| MAT Only vs PSI non-RNR compliant | 0.136 | 0.071 | 1.91 | 0.337 | -0.047 | 0.318 |
| RNR compliant vs PSI non-RNR compliant | -0.068 | 0.376 | -0.18 | 1.000 | -1.038 | 0.901 |
| **IPW** |  |  |  |  |  |  |
| Untreated vs MAT Only | -0.197 | 0.070 | -2.83 | 0.028 | -0.376 | -0.018 |
| Untreated vs RNR compliant | 0.243 | 0.133 | 1.83 | 0.403 | -0.099 | 0.584 |
| Untreated vs PSI non-RNR compliant | 0.029 | 0.043 | 0.67 | 1.000 | -0.081 | 0.138 |
| MAT Only vs RNR compliant | 0.439 | 0.149 | 2.94 | 0.020 | 0.055 | 0.824 |
| MAT Only vs PSI non-RNR compliant | 0.226 | 0.081 | 2.78 | 0.033 | 0.017 | 0.435 |
| RNR compliant vs PSI non-RNR compliant | -0.214 | 0.139 | -1.54 | 0.741 | -0.572 | 0.144 |
| **AIPW** |  |  |  |  |  |  |
| Untreated vs MAT Only | -0.192 | 0.062 | -3.10 | 0.012 | -0.351 | -0.032 |
| Untreated vs RNR compliant | 0.042 | 0.368 | 0.11 | 1.000 | -0.905 | 0.988 |
| Untreated vs PSI non-RNR compliant | -0.035 | 0.040 | -0.86 | 1.000 | -0.138 | 0.069 |
| MAT Only vs RNR compliant | 0.233 | 0.373 | 0.63 | 1.000 | -0.727 | 1.193 |
| MAT Only vs PSI non-RNR compliant | 0.157 | 0.073 | 2.15 | 0.189 | -0.031 | 0.345 |
| RNR compliant vs PSI non-RNR compliant | -0.076 | 0.370 | -0.21 | 1.000 | -1.03 | 0.878 |
| **IPWRA** |  |  |  |  |  |  |
| Untreated vs MAT Only | -0.187 | 0.056 | -2.97 | 0.018 | -0.323 | -0.022 |
| Untreated vs RNR compliant | -0.553 | 0.133 | -4.15 | <0.0001 | -0.896 | -0.209 |
| Untreated vs PSI non-RNR compliant | 0.035 | 0.040 | -0.86 | 1.000 | -0.138 | 0.069 |
| MAT Only vs RNR compliant | -0.385 | 0.144 | -2.67 | 0.038 | -0.7567 | -0.014 |
| MAT Only vs PSI non-RNR compliant | 0.133 | 0.069 | 1.94 | 0.262 | -0.044 | 0.309 |
| RNR compliant vs PSI non-RNR compliant | 0.518 | 0.138 | 3.73 | 0.001 | 0.161 | 0.875 |

Table 4: Relative risk ratios

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Estimator | Relative Risk | Lower Limit | Upper Limit | Bonferroni  p-value |
| **Regression adjustment** |  |  |  |  |
| Untreated vs MAT Only | 0.812 | 0.676 | 0.975 | 0.020 |
| Untreated vs RNR compliant | 1.136 | 0.415 | 3.109 | 1.000 |
| Untreated vs PSI non-RNR compliant | 0.962 | 0.816 | 1.136 | 1.000 |
| MAT Only vs RNR compliant | 1.398 | 0.503 | 3.891 | 1.000 |
| MAT Only vs PSI non-RNR compliant | 1.185 | 0.927 | 1.516 | 0.450 |
| RNR compliant vs PSI non-RNR compliant | 0.848 | 0.306 | 2.351 | 1.000 |
| **IPW** |  |  |  |  |
| Untreated vs MAT Only | 0.735 | 0.604 | 0.893 | <0.001 |
| Untreated vs RNR compliant | 1.280 | 0.766 | 2.139 | 1.000 |
| Untreated vs PSI non-RNR compliant | 0.988 | 0.804 | 1.214 | 1.000 |
| MAT Only vs RNR compliant | 1.742 | 1.005 | 3.017 | 0.056 |
| MAT Only vs PSI non-RNR compliant | 1.345 | 1.013 | 1.785 | 0.043 |
| RNR compliant vs PSI non-RNR compliant | 0.772 | 0.444 | 1.342 | 1.000 |
| **AIPW** |  |  |  |  |
| Untreated vs MAT Only | 0.764 | 0.631 | 0.925 | 0.002 |
| Untreated vs RNR compliant | 1.110 | 0.414 | 2.976 | 1.000 |
| Untreated vs PSI non-RNR compliant | 0.991 | 0.827 | 1.188 | 1.000 |
| MAT Only vs RNR compliant | 1.453 | 0.532 | 3.968 | 1.000 |
| MAT Only vs PSI non-RNR compliant | 1.298 | 0.997 | 1.688 | 0.065 |
| RNR compliant vs PSI non-RNR compliant | 0.893 | 0.328 | 2.436 | 1.000 |
| **IPWRA** |  |  |  |  |
| Untreated vs MAT Only | 0.815 | 0.684 | 0.972 | 0.018 |
| Untreated vs RNR compliant | 0.732 | 0.288 | 1.857 | 1.000 |
| Untreated vs PSI non-RNR compliant | 1.016 | 0.842 | 1.226 | 1.000 |
| MAT Only vs RNR compliant | 0.898 | 0.348 | 2.315 | 1.000 |
| MAT Only vs PSI non-RNR compliant | 1.246 | 0.964 | 1.612 | 0.162 |
| RNR compliant vs PSI non-RNR compliant | 1.389 | 0.537 | 3.589 | 1.000 |

Figure 1: Covariate Balance for MAT compared to untreated control group

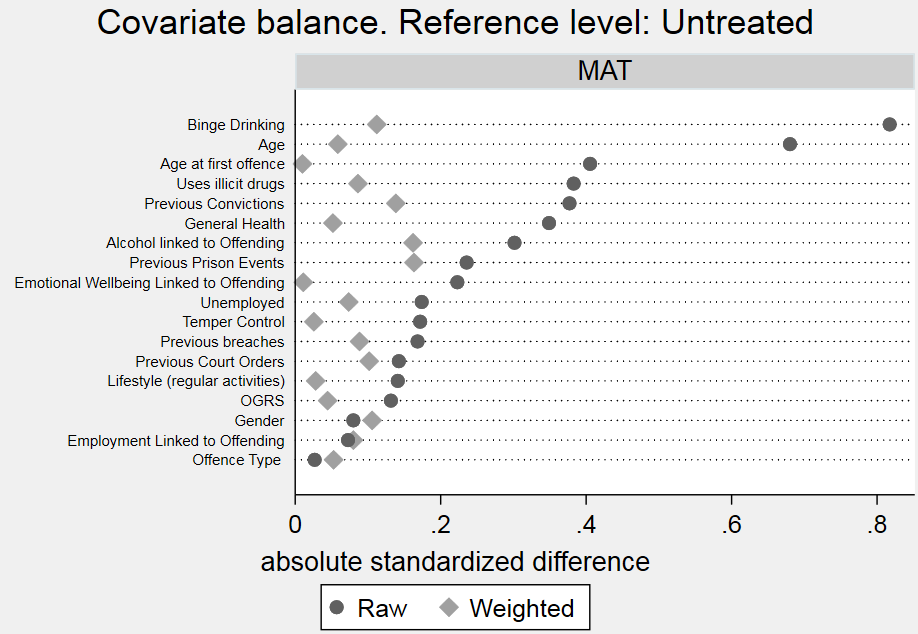


Figure 2: Covariate Balance for RNR Compliant Treatment

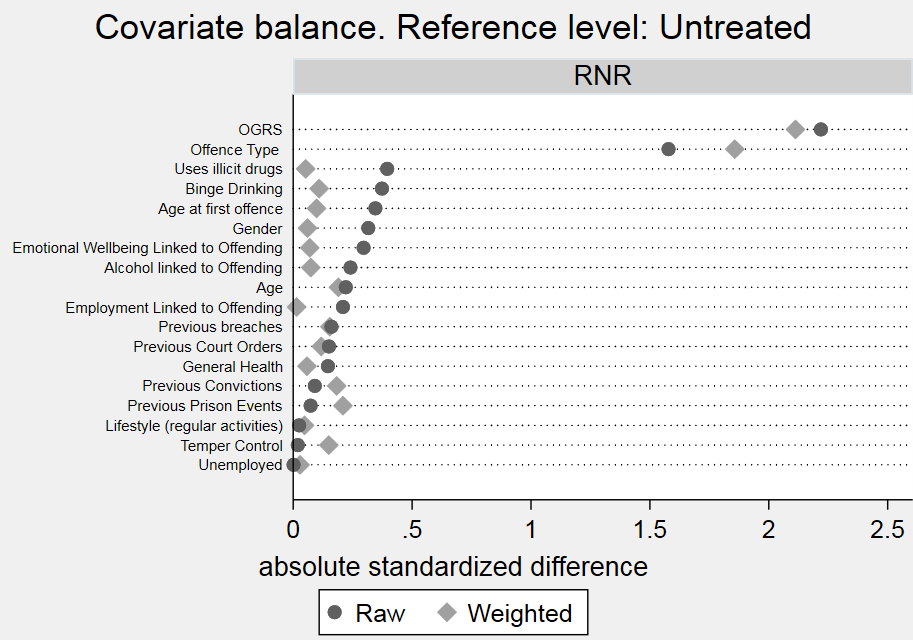


Figure 3: Covariate Balance for PSI Non-Compliant Treatment

