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An evaluation of the NSW Domestic Violence Electronic Monitoring program

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AIM

To examine the operation of the NSW Domestic Violence Electronic Monitoring (DVEM) program, and to estimate the association between DVEM program participation and recidivism.

METHOD

Entropy balancing was used to match 226 DVEM participants on parole with 768 parolees who met observed program eligibility conditions but did not participate in the program. Using multivariate probit regression, four recidivism outcomes were compared between offenders participating in DVEM and the matched offender sample, including the probability of any reoffending, domestic violence reoffending, Apprehended Domestic Violence Order breaches, and the probability that an offender on a community order was imprisoned for a new offence or breach of the conditions of their order.

RESULTS

Offenders participating in DVEM were around 7 percentage points (p.p.) less likely to return to custody within a year. DVEM participants were also significantly less likely to reoffend with any offence (7.1 p.p.), a domestic violence offence (10.5 p.p.), and an ADVO breach (8.7 p.p.). While the study assessed many factors related to both DVEM placement and reoffending, it is unable to exclude the possibility that unobserved variables and/or factors related to participation in DVEM may be influencing the results.

CONCLUSION

DVEM participation is associated with significant reductions in the probability that an offender reoffends and/or is imprisoned within a year of release.

KEYWORDS

Electronic monitoring | Domestic violence | Parole | Apprehended violence orders (AVO) | Recidivism | Evaluation reports

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INTRODUCTION

Domestic violence (DV) is a widespread and costly problem. In Australia, it is estimated that around one in six adults have experienced violence from an intimate partner since the age of 15 (Australian Bureau of Statistics [ABS], 2023), and that the economic cost of violence against women and their children may be as high as $21.7 billion annually (PricewaterhouseCoopers [PWC], 2015). Recognising this, and to curb further DV offending in New South Wales (NSW), DV was announced as one of the NSW Premier's Priorities in 2015. Alongside this announcement, a specific target was set to reduce the rate of DV offenders who reoffend by 25 per cent by 2023[1] (NSW Government, 2022).

While many tools, policies and programs have previously been implemented with the aim to reduce DV offending, few have been shown to be effective (Bell & Coates, 2022). One exception is victim protection orders. In NSW, these are known as Apprehended Domestic Violence Orders (ADVOs). ADVOs are civil orders granted by the Local Court which compel a defendant to comply with a set of conditions designed to protect a victim from further violence. Evidence suggests that the use of such orders reduces the likelihood of serious DV reoffending (Dowling et al., 2018; Trimboli & Bonney, 1997). However, the overall breach rate of ADVOs in NSW remains high, with approximately one in five orders breached (Poynton et al., 2016). It has been suggested that well targeted supplementary case management tools, such as GPS monitoring, duress alarms and proactive surveillance, may help to promote compliance with protection orders and further reduce DV reoffending (Dowling et al., 2018).

To support the Premier's Priority, the Domestic Violence Electronic Monitoring (DVEM) program was introduced in NSW to manage DV offenders serving a community-based sentence and to assist in monitoring offender compliance with ADVOs. Under the program, medium to high-risk offenders who meet a set of eligibility and suitability criteria are fitted with an electronic monitoring device, and have their location regularly monitored against a set of geographic exclusion zones stipulated in their ADVO. The program also makes an allowance for victims who meet suitability criteria to have a matched monitoring device, thereby promoting additional risk management and measurement of ADVO compliance while victims are away from home.

Evidence concerning the impacts of electronic monitoring

Several international studies have examined the impact of electronic monitoring on recidivism. Those with the most rigorous designs suggest that relative to imprisonment, electronic monitoring can reduce reoffending.[2] Of these studies, three use experimental or quasi experimental methods to estimate the impact of electronic monitoring as a form of early release supervision post imprisonment. The first evaluation by Meuer and Woessner (2020) used a randomised control trial to investigate the impact of electronic monitoring as a component of an early work release and home detention program for low to medium risk prisoners in Germany. They found no statistically significant impact of electronic monitoring on new convictions within three years. While the design of this research was strong, the authors make use of very small sample sizes and fail to account for attrition issues.[3] In the second paper, Marie (2015) utilised a regression discontinuity design leveraging eligibility criteria related to age and sentence length to estimate the recidivism impact of electronic monitoring for non-serious offenders[4] in England and Wales under the Home Detention Curfew scheme. The authors found that electronic monitoring reduced

1 Although this target had an initial deadline in 2021, it has since been extended to 2023.
2 Interested readers are directed to Belur et al. (2020) for a meta-analytic review of 18 studies assessing the impact of electronic monitoring on recidivism, and a thematic analysis of 31 studies concerning the mechanisms through with electronic monitoring produces an effect. While the authors provide a strong synthesis of evidence related to electronic monitoring, they include studies of relatively low quality in the review – likely introducing bias into meta-analytic results. Acknowledging this, care should be taken in interpreting pooled results from the meta-analytic approach in Belur et al. (2020).
3 Importantly, the randomised control trial lacks the statistical power to reasonably detect a statistically significant result at conventional thresholds due to small sample sizes. The study makes use of two analysis samples. The first, those subjected to home detention, consisted of 38 offenders (19 electronically monitored). The second, those on early work release consisted of 54 offenders (24 electronically monitored). In addition to this, a large proportion of both treatment and control samples dropped out of the study post randomisation (38% of the treatment group, 20% of the control group), with a large portion of this attrition being voluntary. As a result, it is likely that the randomisation approach applied in the study is insufficient for the credible identification of the effects of electronic monitoring.
4 Those sentenced to between three months and four years imprisonment.

re-arrest rates by between 18% and 37% within two years, when compared to those that served the remainder of their sentence in prison. The third study by Di Tella and Schargrodsky (2013) used an instrumental variables approach, leveraging the quasi-random assignment of offenders to judges in Argentina, to examine the impact of electronic monitoring relative to imprisonment. The authors find that electronic monitoring is associated with a 48% reduction in the rate of one-year re-arrests. Nevertheless, these findings may be biased by weak instruments and data linkage issues.[5]

Three additional studies examine the impact of electronic monitoring as an alternative to imprisonment. The first study by Henneguelle et al. (2016), exploits the incremental rollout of electronic monitoring in France using an instrumental variable design to estimate its effect on recidivism. The authors report that electronic monitoring reduces the probability of reconviction by between 9% and 11%. The second paper by Andersen and Telle (2022) used a similar approach to identify the impact of electronic monitoring in Norway, leveraging exogenous variation in electronic monitoring device eligibility by region during the rollout of the program. They found that relative to serving a prison sentence, electronic monitoring reduced the two-year recidivism rate by around 15%. Finally, Williams and Weatherburn (2022) examined the impact of electronic monitoring for non-violent offenders in NSW using a quasi-random judge assignment instrumental variable approach similar to that of Di Tella and Schargrodsky (2013). Relative to those who served a prison sentence, offenders placed on electronic monitoring had an 11 percentage point (p.p.) lower incidence of reoffending, and a 45% reduction in the cumulative number of offences 10 years after sentencing.

While these robust studies suggest that electronic monitoring can lead to large reductions in recidivism, the extent to which these findings are generalisable to other jurisdictions is unclear as the implementation of electronic monitoring programs differs widely between jurisdictions (Bartels & Martinovic, 2017). For example, of the 18 electronic monitoring evaluation studies identified by Belur et al. (2020), around half were delivered as a packaged intervention with other services or conditions rather than as a standalone intervention. This is true of the most recent NSW evaluation undertaken by Williams and Weatherburn (2022), where electronic monitoring was coupled with a home detention condition (which further restricts an offender's movement and opportunity to reoffend). Similarly, evaluations have been predominantly focused on the provision of electronic monitoring to offenders who might be considered to have a low to medium risk of reoffending. It is possible that a less restrictive electronic monitoring program, or one that is applied to offenders with a high likelihood of recidivism, may not result in similarly sizeable benefits.

Little evidence is available for whether electronic monitoring is effective in reducing DV offending. The primary reason for this knowledge gap is that programs targeting DV offenders tend to be smaller and less widely utilised (Nancarrow & Modini, 2018), which makes it difficult to undertake rigorous outcome evaluations. In a recent systematic review of the evidence base for DV-specific electronic monitoring programs, Gilbert and Coates (2021) found that there was insufficient evidence to conclude that such programs reduce repeat DV offending. To date, only two programs have been trialled and evaluated in Australia, both focusing on the use of electronic monitoring to manage DV offenders' compliance with conditions of bail and protection orders.

The first study, undertaken by Winter et al. (2021), evaluated the operation and impact of an electronic monitoring program operating in Tasmania. The study followed 39 DV offenders subjected to electronic monitoring and compared their offending behaviour in the 12 months before the device was issued with their offending during the monitoring period. The authors found large reductions in the number of family violence incidents recorded during the monitoring period. For example, offenders subjected to monitoring were found to be involved in 20% fewer family violence incidents and 81% fewer violent incidents compared with the year prior to electronic monitoring. However, this study suffers from several

5 Firstly, the paper suffers from a weak instrument problem as it is unable to demonstrate instrument relevance sufficiently in first stage regressions. The authors report a Joint F-Statistic of 4.4, where the acceptable threshold is 104.7 (See Lee et al., 2022). This is important, as weak instrument problems may artificially bias estimates and lead to hypothesis testing with large size distortions. Secondly, within subsets of observable characteristics authors randomly linked recidivism data for multiple offenders to those recorded in program data. As a result, it is unlikely that outcome measures are a reasonable reflection of recidivism for those undergoing electronic monitoring.

critical shortcomings, including the use of a very small sample of offenders, the lack of a comparison group[6], and unequal windows in which outcomes were measured for the treatment and comparison groups.[7] The study was also unable to appropriately account for any time that offenders may have spent in custody and likely suffers from Ashenfelter's Dip.[8]

Overcoming many of these limitations, the second study by Sced et al. (2020) evaluated the operation of the South Australian Department of Corrective Services Women's Safety Package Technology Trial. This study followed 197 electronically monitored male DV offenders who were on bail with an associated home detention condition between 1 January 2017 and 30 April 2018, and compared their outcomes with a similar group of DV offenders who were on bail but who were not electronically monitored. To improve comparability of offenders in each group, the study employed a propensity score matching approach[9] and estimated the associative impact of the program on several recidivism outcomes using Cox Proportional-Hazards Regression Survival Analysis.[10] The authors found that the electronic monitoring of bailees was associated with a significantly lower likelihood of recording any reoffence (IHR=0.45) or a domestic and family violence related reoffence (IHR=0.38).[11] However, electronic monitoring was also found to be associated with a significantly higher likelihood of a technical breach (IHR=2.14). Further analyses of the types of breaches committed indicated that much of this difference was directly attributable to increased surveillance of electronically monitored bailees. Of bailees who recorded a technical breach, those who were electronically monitored had a higher rate of breaches for the removal of electronics (14%, vs. 0%) and the failure to maintain technological devices (4%, vs. 0%), as well as attending an unapproved location (9%, vs. 0%), and breaching an exclusion zone (6%, vs. 2%). Although this study overcomes many of the limitations of the research by Winter et al. (2021), the methodology employed was unable to account for omitted variable or selection bias, and can therefore only reasonably be interpreted as an associative effect of program placement.

While quantitative evaluations have been largely limited to measuring changes in recidivism, a variety of qualitative studies have also considered the impact of electronic monitoring on the wellbeing of participants. Synthesising this work, Howard (2020) noted that studies repeatedly identify that offenders feel stigmatisation, shame, embarrassment, and emotional distress as a result of wearing a monitoring device. For example, Hwang et al. (2021a) interviewed 16 men who had recently experienced electronic monitoring under the NSW DVEM program. They report that 75% of offenders interviewed (n = 12 offenders) felt that electronic monitoring negatively impacted their ability to acquire and maintain stable employment, and 60% suggested that electronic monitoring had a medium or significant impact on the stability of their accommodation or housing (n = 10 offenders). However, despite these concerns, most DVEM participants surveyed in Hwang et al. (2021a) stated that they would rather be supervised under electronic monitoring than serve a longer episode in prison.

In contrast, the benefits reported by victims of offenders participating in the program were largely positive. Hwang et al. (2021b) interviewed six victims and 13 victim support staff about the operation of DVEM. They found that victims expressed a greater sense of psychological relief and feelings of safety, validation, and freedom to engage in daily activities while offenders were undergoing monitoring. This is generally consistent with other studies examining the sense of safety experienced by DV victims during

6 Interested readers are directed to Weatherburn (2009) for a digestible discussion of methodological approaches and limitations in quantitative criminological research.

7 While offending in the pre-period was measured over the year prior to placement on electronic monitoring, reoffending was not measured over the same time period. As a result, offenders did not have the same amount of time to offend while monitored as compared with the year prior, likely positively biasing the results.

8 Ashenfelter's Dip occurs when the likelihood of placement on a program is associated with prior offending behaviour. In the context of this study, since those placed on electronic monitoring are on bail for committing an offence, near all offenders would have offended in the year prior to placement on the program. Considering that it is unlikely that all offenders would have reoffended, the authors would have necessarily found a negative correlation between offending and electronic monitoring as an artefact of the methodological approach utilised. For a detailed discussion of these issues in relation to contemporary criminological evaluations, see NSW Bureau of Crime Statistics and Research (BOCSAR, 2021).

9 Specifically, the study employed a 1:1 nearest neighbour propensity score matching approach without replacement.

10 Importantly, Sced et al. (2020) use a reverse coded treatment variable (i.e., with those supervised under electronic monitoring as the reference category for those that were not). To compare these estimates with ours and other studies' estimates, we invert the hazard ratios (IHR) from Sced et al. (2020). These can be obtained using the formula IHR=1/(exp(B)).

11 These findings align with Cale et al. (2018) who find that electronic monitoring programs for general offenders (rather than specifically for DV offenders) in South Australia are similarly associated with reductions in reoffending.

electronic monitoring. It has been suggested that this disparity between offender and victim's experiences with DV electronic monitoring programs may be an artefact of agencies moving toward a more victim-centric approach to manage recidivism (see for example, Ibarra and Erez [2005]).

Mechanisms by which electronic monitoring may reduce offending

Numerous authors have proposed several causal mechanisms by which electronic monitoring may influence recidivism. Belur et al. (2020) examines plausible mechanisms from thirty-one studies of electronic monitoring. The mechanisms by which electronic monitoring works can be broadly divided into two categories: deterring recidivism, and augmenting existing case management practices to address criminogenic needs.

The deterrence rationale is by far the most popular mechanism among papers reviewed by Belur et al. (2020). Under this rationale, electronic monitoring may reduce reoffending if it increases the real or perceived risk of detection and effort required to offend. Several factors may mediate the extent to which offenders' perceived risk and effort of offending influences their reoffending behaviour while subject to electronic monitoring. For example, perceived risk may be dependent on program participants' education levels or understanding of their electronic monitoring conditions. Hwang et al (2021a) noted that most DVEM program participants had not completed secondary school and that many found it difficult to comprehend details of the program's operation. While many studies conclude that electronic monitoring reduces reoffending through deterrence, this mechanism is only applicable while the offender remains on electronic monitoring.

The second theorised mechanism is that electronic monitoring programs may improve adherence to case management plans, to reinforce pro-social behaviours and address an offender's criminogenic needs. Examples may include case management requiring therapeutic, employment or drug and alcohol components. Of the criminogenic needs identified by Andrews and Bonta (2010), alcohol use, work performance and association with criminally involved family members are factors most associated with recidivism (see Wooditch et al. [2014]). Unlike the deterrence mechanism, this case management mechanism may deliver benefits which extend beyond the monitoring period.

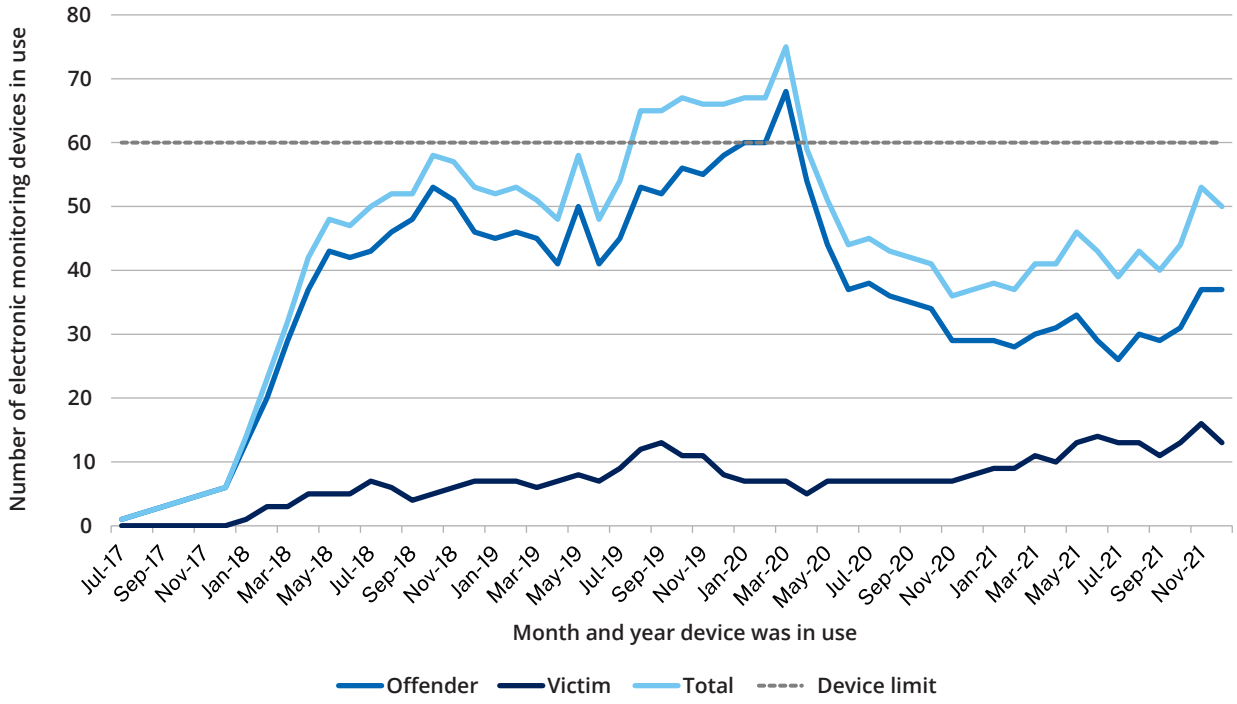
DVEM in NSW

DVEM is the first electronic monitoring program in NSW to specifically target DV offenders and manage their compliance with ADVOs. It has been in operation since June 2016.[12] Offenders placed on the program have one of 60 available GPS enabled electronic monitoring devices fitted to their ankles, and have their location tracked 24 hours a day. From this pool of 60 devices, victims found to be suitable for the program may also volunteer to carry a paired GPS enabled device to allow for bilateral location tracking between offenders and victims, and the creation of an additional exclusion zone surrounding victim devices.

Figure 1 shows the total number of active DVEM devices each month, and whether the device was issued to a victim or an offender. At the beginning of December 2021, NSW Corrective Services maintained 13 active victim devices and 37 active offender devices. While devices were more commonly issued to offenders, there has been a steady increase in the number of victim devices issued since program inception. Interestingly, the program has been running near capacity since expanding from trial phase in 2017 and between September 2019 and May 2020 additional devices were made available when program capacity had been reached.

12 While the program had been established in 2016, it initially operated as a small pilot site. It was not until 2017 that the program became more widely available in its current form. Legislative authority for directing an offender to comply with DVEM is provided in 214A (1) (d) of the Crimes (Administration of Sentences) Regulations 2014 (NSW), and in s7 of the Crimes (Sentencing Procedure) Act 1999 (NSW).

Figure 1. Number of DVEM devices in use on the first day of each month, by month and type of device



The movements of offenders are tracked in proximity to two types of geographic exclusion zones. The first, ADVO zones, are those resembling the geographic exclusion restrictions stipulated in any active ADVOs. For example, an ADVO may state that an offender is not to go within 100 metres of a Person In Need of Protection's (PINOP) address. The second form of zone, buffer zones, is implemented in the area surrounding ADVO zones. Extending the previous example, a buffer zone may be implemented in the one-kilometre area surrounding the PINOP's address. In practice, buffer zones must be as large as practicable without significantly imposing on an offender's daily movements. For a depiction of theoretical ADVO and buffer zones, see Appendix Figure A1.

Where an offender is found to be entering a buffer exclusion zone, electronic monitoring staff contact them by phone and warn them to exit the area. If this direction is complied with, the matter is considered to have ended. Otherwise, if the offender does not exit the buffer zone, or continues to move towards the ADVO exclusion zone, police are immediately contacted with evidence and details of the incident, and participating victims are alerted to the matter. Where a victim has been issued with a monitoring device, an offender may be subjected to a moving exclusion zone. As a result, it is possible that offenders with matched victim devices may be unaware that they are entering an exclusion zone until they are alerted to an imminent breach. Outside of this direct function to monitor offenders, DVEM acts to engage and support victims and offenders with additional support services.[13]

Acting as a case management tool, the primary purpose of the DVEM program is to monitor ADVO compliance amongst higher risk repeat DV offenders being managed in the community, and to promote desistance from DV offending. Offenders who meet a variety of eligibility and suitability conditions are referred to the program by Corrective Services NSW.

13 Interested readers are directed to Nancarrow and Modini (2018) for detailed depictions of program planning, service referrals, and protocols relating to breach responses.

Selection criteria for DVEM in NSW

To be eligible for DVEM, an offender must have:

1. a current Intensive Correction Order (ICO) or parole order for a DV offence;
2. a history of DV offending;
3. a medium to high risk of reoffending as measured by the Level of Service Inventory - Revised (LSI-R);[14] and
4. an active ADVO with:
    a. a no-contact restriction;[15]
    b. a metred geographical or suburb/Local Government Area restrictions; and
    c. a primary person in need of protection (PINOP) that is not a child.

In addition to this, for an offender to be suitable for the program:

1. electronic monitoring equipment must work at the offender's and victim's address;
2. there must be enough distance between an offender and a victim's address to make the use to electronic monitoring feasible; and
3. an offender should not have a serious cognitive impairment or other issue which would seriously affect their ability to comply with electronic monitoring.

While victims are consulted during the assessment process, victim consent is not required for an offender to be placed on the program. However, matched monitoring devices are available to victims of offenders placed on DVEM subject to additional suitability requirements being met. Specifically, the victim must:

1. have a history of being stalked away from the home;
2. agree to ensure the device is fully charged prior to leaving home and is always with them when away from home, and understand the limits of the technology; and
3. not already have a monitoring device or duress alarm from another program.

The current study

To date, there is a dearth of evidence to support the use of electronic monitoring as a strategy to increase compliance with ADVOs and reduce DV offending. The current study addresses this gap by undertaking the first outcome evaluation of the NSW Domestic Violence Electronic Monitoring (DVEM) program. In this bulletin we provide descriptive statistics regarding the operation of the DVEM program. We then estimate the association between DVEM program participation and recidivism. Specifically, we evaluate whether DVEM participation is associated with improved compliance with ADVOs and a reduction in the probability of reoffending with any offence or a DV offence. Given that the program operates as a case management tool to promote the effective management of offenders in the community, we also examine the impact of DVEM on the probability that an offender is returned to custody.

14 The LSI-R is a validated risk assessment tool designed to measure both reoffending risk associated with general offending, and an individual's correctional treatment needs to reduce this risk. For a more comprehensive discussion of risk assessment using the LSI-R, see Andrews and Bonta (1995).

15 In some circumstances, particularly those where children are involved in the relationship, condition 6 was used in place of condition 2 as a no contact condition. As of July 2020, eligibility criteria for access to DVEM were altered to specifically exclude conditions 6b, 6c, 6d, and 6e. Those already on DVEM at the time of this change remain included in the program until the first of: the expiry of the order, other removal from the program, or confirmation of a written agreement allowing contact between offender and victim. In alignment with the operation of DVEM during the majority of the study period, a no contact condition is assumed to include offenders with these conditions. For detailed information concerning ADVO order conditions and interpretation, see https://www.lawaccess.nsw.gov.au/Pages/representing/lawassist_avo/lawassist_defendingavo_home/lawassist_responding_avo/lawassist_mandatory_additional_def.aspx#%E2%80%8BMandator%E2%80%8Byorders/Ordersaboutbehaviour.

METHOD

Data

The data used in this study were obtained from six distinct sources:

1. **DVEM program participation:** An extract prepared by Corrective Services NSW Community Corrections, which contained details of DVEM program participation between June 2017 and December 2021. Specifically, the extract provided information on participant monitoring dates, order types, reasons for exiting the program, and whether a matched victim device was issued.
2. **Electronic monitoring participation (non-DVEM):** An extract prepared by the Corrective Services NSW Electronic and External Monitoring Group, which provided dates of monitoring for all offenders subject to electronic monitoring unrelated to DVEM (general electronic monitoring) in the study period.
3. **Community corrections data:** An extract prepared by the Corrections Research Evaluation and Statistics team in Corrective Services NSW, which contained information for all individuals with an LSI-R reoffending risk assessment score of medium of higher, a history of DV offending, and who served a Parole order or ICO in NSW during the study period. This extract provided information on order start and expiry dates, the type of order being served, the outcomes of criminogenic risk assessment tools recorded at the beginning of the order, and whether an offender has been identified as a person with intellectual disability by Corrective Services NSW.
4. **ADVO data:** An extract from the BOCSAR ADVO database, detailing the order conditions, amendments, persons of interest, and PINOPs for all ADVOs created or amended in NSW after December 2016.
5. **Police data:** An extract of statistical linkage keys drawn from the NSW Police Computerised Operational Policing System (COPS) database, used in this study to support and validate linkage between datasets.
6. **Offending and custodial data:** An extract from the BOCSAR Reoffending Database (ROD). The ROD extract contained a record of all police cautions, youth justice conferences, and court appearances finalised in NSW from January 1994 until May 2022, including the sociodemographic characteristics of defendants, offence characteristics, court outcomes, and episodes in both remanded and sentenced custody.

The Community Corrections DVEM program data extract provided information relating to 402 unique offenders who were electronically monitored between June 2017 and December 2021.[16] Of these offenders, 100% were successfully linked with ROD based on individual identifiers. The sample was then restricted to the 262 DVEM participants with at least one year of follow-up time after placement on DVEM (to allow for measurement of recidivism outcomes), with a valid parole order or ICO, and with a valid ADVO. Finally, a small number of DVEM offenders were placed on the program after initial release from custody (n=36). For these offenders, it is probable that placement on the program was in response to offending behaviours or escalation that, while visible to Community Corrections staff, is not captured in our datasets. These offenders have therefore been excluded from the sample to avoid biasing the results through comparison with non-comparable offenders. After applying these conditions, all remaining DVEM participants were found to have been serving a parole order, rather than an ICO. Combining remaining datasets, a further 768 records were identified for offenders who were released on parole and met the observable eligibility conditions for placement on DVEM but who were not placed on the program.

The final dataset contained information on 994 records of offenders who met all four eligibility criteria (226 DVEM participants and 768 who did not participate). Specifically, all offenders were: serving a parole order for a DV offence; had a history of DV offending; and, had a concurrent ADVO with a no-contact

16 Where there were multiple episodes of DVEM experienced by the same offender, the earliest episode was selected.

restriction, a metred geographical or suburb/Local Government Area restrictions, and a PINOP over the age of 18 at the start of the parole order. Each record was associated with an index parole episode (the parole episode at which offenders met eligibility criteria), and an index offence (the court case or offending contact linked to the index parole episode).[17,18]

Variables

Outcome variables

In line with the aims of DVEM, four key outcome variables were considered in this analysis:

1. **Reoffending with any offence:** A variable equal to one if the offender recorded at least one proven offence[19] committed within 12 free months[20] from release to their index parole episode, and zero otherwise.
2. **Reoffending with a DV offence:** A variable equal to one if the offender recorded at least one proven DV-flagged offence (excluding ADVO breach offences as defined below) committed within 12 free months from release to their index parole episode, and zero otherwise.
3. **Reoffending with an ADVO breach offence:** A variable equal to one if the offender recorded at least one proven ADVO breach offence committed within 12 free months following release to their index parole episode, and zero otherwise. This includes DV-flagged offences with an Australian and New Zealand Offence Classification (ANZSOC) group[21] of 1531 relating to a breach of violence order, and offences with lawpart codes[22] relating to ADVO breaches, including 1207, 1208, 62079, 65020, or 69120.
4. **Return to custody:** A variable equal to one if the offender recorded a custodial episode within 12 months calendar time following release to their index parole episode, and zero otherwise. Both sentenced and remand custodial episodes were included here.

Explanatory variables

Multiple variables relating to an offender's sociodemographic background, characteristics of their index offence and parole episode, and their offending history were considered for inclusion in the regression models.

1. **Sociodemographic characteristics**
   The sociodemographic variables included were:
   - Gender: whether the offender was male or female.
   - Aboriginality: whether the offender has ever been identified as an Aboriginal and/or Torres Strait Islander person at any appearance in ROD.
   - Remoteness of residence: The ABS remoteness area associated with the postcode of an offender's residence.[23]
   - Socioeconomic disadvantage: The ABS Socio-Economic Indices for Areas (SEIFA) Index of Relative Disadvantage associated with the postcode of an offender's residence.[24]

17 The index offence was identified as the offence for which the end of an imprisonment penalty began an index parole episode.
18 In an extension, we re-estimate models using larger counterfactual samples derived by relaxing ADVO condition eligibility requirements for the program. First, we relax eligibility requirement 4b, requiring a metred geographical or suburb/Local Government Area restriction, identifying a comparator group of n=1,354 offenders. Second, we relax eligibility requirement 4a that requires an ADVO to have a no contact condition, identifying a comparator group of n=1,681 offenders.
19 Excluded from this measure are offences committed in custody and breach of justice procedure offences, which are likely influenced by differences in policing activity and surveillance.
20 Free months in this context refers to time outside of custody.
21 For further details on ANZSOC offence categorisations, see ABS (2011).
22 Lawpart codes are unique offence identifiers applied to categorise all NSW offences and Commonwealth offences dealt with in NSW. For further details see https://lawcodes.judcom.nsw.gov.au/.
23 Based on the Accessibility and Remoteness Index of Australia (ARIA+), remoteness measures are organised into three categories (Greater cities, Inner regional, and Outer regional or Remote) based on relative access to services in each area (see ABS [2016a] for more information).
24 For ease of interpretation, SEIFA scores are segmented into quartiles reflecting relative socioeconomic disadvantage in the population (for more information, see ABS [2016b]).

- Intellectual disability: An indicator variable equal to one if Corrective Services NSW Special Disability Services ever identified an offender as having an intellectual disability while in custody, and zero otherwise.
- Age at release: An offender's age in years at the date they started their index parole episode.
- Age at first offence: The offender's age in years at their first proven offence in ROD.

2. **Characteristics of the index offence and parole episode**

- Offence type: Principal offence type, categorised by ANZSOC division as serious violence offending (divisions 01, 02, 03, and 06), property offending (divisions 07, 08, and 09), breach offending (division 15), and other offending (divisions 04, 05, 10, 11, 12, 13, 14, and 16).[25]
- Offence seriousness: The Median Sentence Ranking (MSR) of the principal offence, segmented into quartiles reflecting relative offence seriousness.[26]
- Concurrent offences: The number of proven concurrent offences at index offence.
- LSI-R risk categorisation: The category of general reoffending risk associated with the index parole episode. Categorised as a medium, medium-high, or a high risk of general reoffending.[27]
- Community Impact Assessment (CIA) tier: The CIA tier associated with the index parole episode.[28]
- Month and year of release: Indicator variables representing the month and year that an offender began their index parole episode.
- Reduced offending opportunity days in follow-up period: A count variable measuring the number of days in an offender's follow-up period that occurred after the beginning of March 2020.[29]

3. **Prior criminal offending**

- Prior court appearances: The number of court appearances with a proven offence in the 5 years prior to the index offence.
- Prior DV offences: The number of court appearances with a proven DV-flagged offence in the 5 years prior to the index offence.
- Prior prison episodes: The number of finalised court appearances in which an offender was given a full-time prison sentence or control order in the 5 years prior to the index offence.

Empirical approach

We utilise a matching technique to address possible selection bias when comparing samples of DVEM participants and parolees who did not participate in the program. We then use regression analysis using a matched sample of DVEM and non-DVEM offenders to identify the degree to which DVEM is associated with changes in our outcome variables, while controlling for relevant demographic and offending characteristics.

25 Where an offender has multiple charges in a case, the principal offence represents the proven offence associated with the most serious penalty. In cases where an offenders have a proven serious violence offence and a proven ADVO breach, it is possible that the breach offence would be recorded as the principal offence.
26 The MSR is a ranking measure of offence seriousness based on penalty the median offender receives for an offence type. The measure ranges from 1 to 135, with higher values corresponding to less serious offences (see Mackinell et al. [2010] for further details).
27 Relevant LSI-R scores were available for each parole episode in the community corrections data provided by Corrective Services NSW.
28 The CIA is a set of questions which measure the consequence of an offender reoffending. It is designed to complement scores produced by other reoffending risk tools such as the LSI-R, and is categorised into three tiers of increasing consequence, tier 1, tier 2, and tier 3. Interested readers are directed to Corrective Services NSW (2021) for further details regarding CIA assessment. Relevant CIA scores were available for each parole episode in the community corrections data provided by Corrective Services NSW.
29 In response to the COVID-19 pandemic declared on 11 Mach 2020, multiple social distancing rules and restrictions were enacted in NSW, and large associated reductions in community mobility were observed in the following months. In line with these changes, NSW experienced large reductions across multiple crime categories (see for example Kim and Leung [2020]). In an attempt to examine and control for this difference in the opportunity to offend in our study period, we introduce a time-based measure of affectedness into our models.

Sample selection

We begin with a sample of 226 DVEM participants and another sample of 768 offenders who were serving a parole order and met all four DVEM eligibility criteria but who were not placed on the program. We refer to the latter group as the "comparison group".

A simple comparison of outcomes for DVEM participants with outcomes for the comparison group does *not* allow us to estimate the causal impact of DVEM if selection bias causes the two groups to be different on unobserved factors which influence these outcomes (and are not accounted for). For instance, DVEM prioritises higher risk offenders for access to the program, therefore we would expect the DVEM group to contain more high-risk offenders than the non-DVEM group. If higher risk offenders are also more likely to reoffend, our estimate of the effect of DVEM on reoffending would be biased *upwards*.

To address any potential selection bias, we use entropy balancing to identify a more comparable set of offenders to DVEM participants. The simplest form of matching would be to pair each DVEM participant to a non-DVEM participant with the closest characteristics. However, when using many explanatory variables, the idea of "closeness" of pairs is not well defined. We use entropy balancing (Hainmueller, 2012) to calibrate a doubly-robust set of matching weights that by design forces reweighted groups to match as closely as possible on the explanatory variables described above.[30] Importantly, entropy balancing provides methodological improvements over propensity score matching, a more commonly used matching method. Firstly, this method results in a balance of observables that is as good as or better than the balance achieved using propensity score matching (Hainmueller, 2012). Second, it removes the need for researchers to manually iterate between different propensity score models until all covariates have been adequately balanced, reducing modelling bias. However, entropy balancing may not be appropriate if there are only a few non-DVEM offenders who have similar observable characteristics to DVEM participants. In this case, this small group of non-DVEM offenders will receive large matching weights and would therefore unduly influence our results. To check this, diagnostic tests were performed after the matching procedure was completed to ensure that DVEM participants and entropy balanced non-DVEM participants were comparable. This involved checking whether the standardised bias, which quantifies the remaining differences in observable characteristics between groups, was reasonably small after matching,[31] as well as examining the entropy balancing weights for the presence of large outlier values. While no standard rule exists to determine a threshold value for extreme weights, it has been recommended that weights between 20-30 may be acceptably low (see for example, Parish et al. [2017] and McMullin and Schonberger [2022]).

Statistical Model

To identify how DVEM is associated with changes in our outcome variables, we estimate the following probit regression model, using the treatment group of DVEM participants and the control group of non-DVEM offenders matched via entropy balancing:

$$Y_i = \Phi(\beta_0 + \beta_1 D_i + \beta_2 X_i + \epsilon_i) \qquad (1)$$

where Y_i is the binary reoffending outcome of interest, Φ is the standard normal cumulative distribution function and D_i is a variable equal to one if an offender was a DVEM participant and zero otherwise. X_i is a vector of covariates which includes sociodemographic characteristics, index offence and parole episode characteristics, and variables relating to prior criminal offending and ϵ_i is the error term.

30 When used separately, linear regression and logistic propensity score models are only unbiased if the statistical models are correctly specified. Zhao & Percival (2017) show that entropy balancing is doubly robust with respect to both methods - only one of these two models need to be correctly specified to obtain an unbiased estimator. While similar double robustness may be achieved using inverse probability weighting, Monte Carlo simulations have shown that relative to inverse probability weighting methods, entropy balancing results in higher estimate accuracy, but higher standard errors (Harvey et al., 2017).

31 Rosenbaum and Rubin's (1985) standardised bias is calculated as the difference in means between the DVEM and the matched non-DVEM group, divided by the standard deviation of the DVEM group. While there is currently no clear consensus regarding standard rules of thumb to denote importance in remaining covariate balance after propensity score matching, commonly selected thresholds include 25%, 20% and 10%. It has been suggested that one reason for this disagreement is that the relative importance of covariate imbalance in research evaluation studies is related to the prognostic importance of a covariate to model outcomes, with balance being less important for weak predictors of the outcome. Considering that imbalance in this study exists in covariates known to directly influence the likelihood of reoffending, we adopt a conservative threshold of 10% as a marker of covariate balance. See Austin (2009) for a detailed discussion of propensity score matching methods and covariate balance diagnostics.

The main advantage of probit regression relative to linear regression is that it restricts the predicted probability of our outcome variables to lie between zero and one. We are interested in the marginal effect of DVEM on the probability of a given outcome variable. Since probit regression models the outcome variable as a non-linear function of the explanatory variables, the estimated marginal effect of being on DVEM on offending outcomes can be different for each offender. Consequently, we report the average marginal effect[32] of being on DVEM, which involves computing the marginal effect separately for each offender then averaging these estimates across all offenders in our sample. This can be interpreted as the average change in the probability of a given outcome variable associated with DVEM participation.

In the context of our study, there are two main threats to internal validity. The first arises from the fact that a large proportion of offenders included in the study were serving supervision orders after March 2020. During this period various public health orders were introduced in NSW in order to limit the spread of COVID-19 and these may have affected opportunities to reoffend.[33] This is only a problem for our estimates of the effect of DVEM if there is a large difference in the distribution of index parole start dates for the DVEM and non-DVEM groups. For example, if most DVEM participants were placed on the program during COVID-19 lockdowns, but the majority of non-DVEM offenders began their supervision order before the lockdowns, then the effect of DVEM on reoffending would be biased. We compare the distribution of index parole start dates between the DVEM and non-DVEM groups to determine whether these differences are large enough to threaten the validity of our study. We also include time-based variables in regressions in an attempt to control for remaining COVID-19 related impacts.[34]

The second potential threat is omitted variable bias. We are not able to match on variables we do not observe, so cannot guarantee that matched groups are comparable across *all* variables that affect our outcomes. Importantly, we do not observe several eligibility criteria for DVEM, such as the requirements that electronic monitoring works at both the offender and victim's addresses, that there is enough distance between the offender and victim's address to make electronic monitoring feasible. As a robustness test, we repeat our analysis using alterative control groups which relax the restriction that non-DVEM participants meet all observed DVEM eligibility criteria. Specifically, we relax our sample restriction requiring that non-DVEM offenders have ADVO conditions stipulating geographical restrictions, or conditions which prevent contact between the PINOP and offender. This allows us to test the degree to which eligibility criteria influence to the estimated effect of the program (Rosenbaum, 1987). Nevertheless, caution should be taken when interpreting the associative (non-causal) estimates reported in this bulletin given that we are unable to fully account for the likely impact of omitted variable bias.

RESULTS

DVEM program operation

Table 1 shows the program characteristics for all 226 DVEM participants in our analysis sample. While DVEM was available to those serving either a parole order or an ICO, all offenders included in this sample were serving a parole order (100.0%). The majority of DVEM episodes involved the provision of a monitoring device only to the offender (88.1%). Slightly less than one fifth of all DVEM participants were monitored for between 0-60 days (18.6%). Around one quarter of DVEM participants were monitored between 61-120 days (26.6%), 121-180 days (25.7%), or 181 days or longer (29.2%).

32 See Wooldridge (2015) for more details on how average marginal effects are calculated with probit models.
33 See Freeman and Leung (2021) and Kim and Leung (2020) for a discussion of the impact of COVID-19 reforms on the NSW offending environment.
34 We include month by year fixed effects in the set of variables we match on. We also control for these fixed effects along with a variable which counts the days an offender was exposed to COVID-19 lockdowns in our regressions.

Table 1. DVEM Program characteristics, by offender

		DVEM participants	
		n	%
Type of order served by participants	Parole order	226	100.0
Type of device issued	Offender device only	199	88.1
	Offender and victim provided with device	27	11.9
Duration of DVEM participation (days)	0-60	42	18.6
	61-120	60	26.6
	121-180	58	25.7
	181+	66	29.2
Total		226	100.0

Note. n – observation frequency counts. Frequencies relate to an offender's first placement on the DVEM program.

Offenders can be removed from the DVEM program for a variety of reasons. Table 2 shows the number of offenders placed on DVEM by the reason for exiting the program. More than half of all participants successfully completed the program (54.4%), either through a de-escalation in their risk of offending or through an expiry of their parole order or ADVO. Meanwhile, approximately one in three DVEM offenders were imprisoned for new offences or had their order revoked, and nearly one in twenty exited the program after forcibly removing their own electronic monitoring tag. All offenders who were identified as removing their electronic monitoring tag had their order revoked and/or were reimprisoned.

Table 2. Number of DVEM participants, by method of exit from the program as of December 2021

	DVEM participants	
	n	%
Change in offender program eligibility^	16	7.1
Order revoked or reimprisoned	76	33.6
Offender removed monitoring device	11	4.9
Completed program	123	54.4
Total	226	100.0

Note. n – observation frequency counts. Frequencies relate to an offender's first placement on the DVEM program. Offenders who removed their monitoring devices subsequently had their order revoked or were reimprisoned. ^ - examples of changes in eligibility include alterations to ADVO conditions and reassessment at a lower LSI-R risk level.

Descriptive statistics

Table 3 compares demographic characteristics of those who participated in the DVEM program with the restricted sample of offenders who met all observable eligibility criteria for DVEM but were not placed on the program. On average, offenders in our sample were in their mid-30s at their index court contact, first offended at 19 years of age, were male, were not identified as having an intellectual disability, and had 4 concurrent offences. The majority of offenders lived in socioeconomically disadvantaged areas, and had a serious violent index offence. Roughly 80% of our sample started their parole order in 2018 or 2019 and around 75% of all offenders had 3 or more prior proven offences in the last 5 years.

Comparing DVEM participants with offenders in the comparator group, we find that DVEM participants were slightly older when issued their parole order, were more likely to self-identify as Aboriginal, and were more likely to live in inner regional areas rather than major cities or outer regional/remote areas. On average, DVEM participants were 8 p.p. less likely to have a serious violent index offence but 6 p.p. more likely to have a breach as their index offence. They also had slightly more concurrent offences, were more likely to have a higher reoffending risk, and had CIA scores indicating that the consequences of their reoffending may be more serious when compared to the counterfactual group. DVEM participants were also 9 p.p. less likely to be released to parole in 2017 than in later years, 5 p.p. less likely to have two prior proven offences at index court contact, more likely to have a prior sentenced custodial episode, and had slightly more prior DV offences on average.

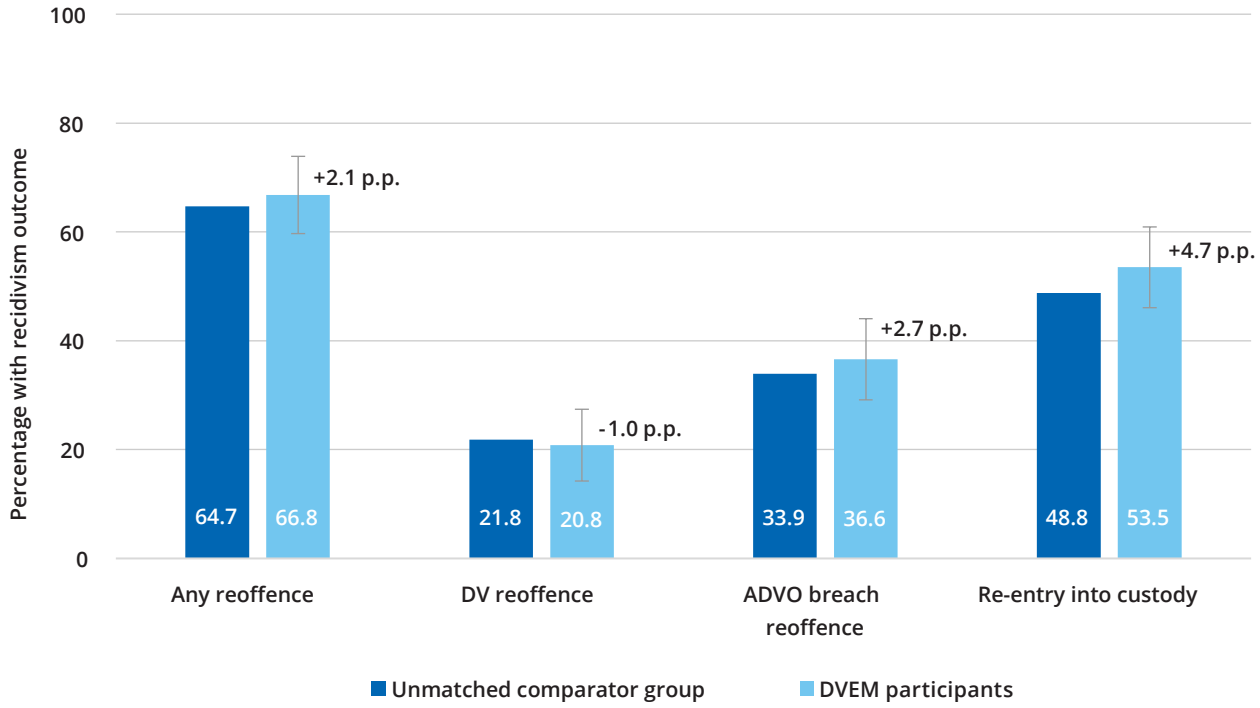
Table 3. Differences in the characteristics of DVEM participants and unmatched comparator group

Variable		Unmatched comparator group (N=768)	DVEM participants (N=226)	Difference (N=994)
Panel A. Demographic characteristics				
Age at start of order (mean)		34.47	36.10	1.62**
Age at first offence (mean)		19.07	19.13	0.06
Male		0.96	0.98	0.02
Aboriginal		0.47	0.54	0.06*
Intellectual disability		0.01	0.01	0.01
Socioeconomic disadvantage	Q1 (most disadvantaged)	0.25	0.27	0.02
	Q2	0.26	0.24	-0.02
	Q3	0.20	0.15	-0.05
	Q4 (least disadvantaged)	0.05	0.05	-0.00
Missing location		0.24	0.28	0.04
Remoteness	Major cities	0.46	0.39	-0.08**
	Inner regional	0.20	0.27	0.07**
	Outer regional or remote	0.10	0.06	-0.04*
Panel B. Index offence and parole episode				
Index offence type	Serious violence	0.64	0.56	-0.08**
	Property	0.03	0.03	-0.00
	Breach	0.24	0.30	0.06*
	Other	0.09	0.11	0.02
Offence seriousness (mean)		54.20	54.92	0.72
Concurrent offences (mean)		3.85	4.05	0.20*
Reoffending risk (LSI-R)	Medium	0.42	0.08	-0.34***
	Medium high	0.42	0.59	0.17***
	High	0.16	0.33	0.17***
CIA	Tier 2	0.51	0.18	-0.33***
	Tier 3	0.49	0.82	0.33***
Year of order start	2017	0.13	0.04	-0.09***
	2018	0.37	0.40	0.03
	2019	0.43	0.46	0.03
	2020	0.08	0.10	0.02
Panel C. Offending within prior five years				
Prior proven offences	0	0.03	0.04	0.00
	1	0.10	0.10	-0.00
	2	0.14	0.08	-0.05**
	3+	0.73	0.78	0.05
Prior sentenced custodial episodes	0	0.39	0.27	-0.12***
	1	0.23	0.27	0.03
	2	0.17	0.20	0.03
	3+	0.21	0.27	0.05*
Prior DV offences (mean)		1.63	1.91	0.28**

Note. Values are reported in proportions unless otherwise stated. Stars indicate statistical significance at a variety of conventional thresholds of statistical significance: * – 10%, ** – 5%, *** – 1%.

Figure 2 shows differences in unadjusted reoffending outcomes between DVEM participants and the unmatched sample of non-DVEM offenders. Across all outcomes, there were small but not statistically significant differences in reoffending between groups. Relative to the unmatched comparator group, the DVEM group was 2 p.p. more likely to reoffend with any offence, 1 p.p. less likely to reoffend with a DV offence, 3 p.p. more likely to reoffend with an ADVO breach, and 5 p.p. more likely to re-enter custody. It is important to note that since this comparison does not control for differences in characteristics of DVEM offenders and non-DVEM offenders, it is not possible to draw any inferences regarding the effectiveness of DVEM on reoffending.

Figure 2. Unadjusted differences in the recidivism outcomes of DVEM participants and unmatched comparator group



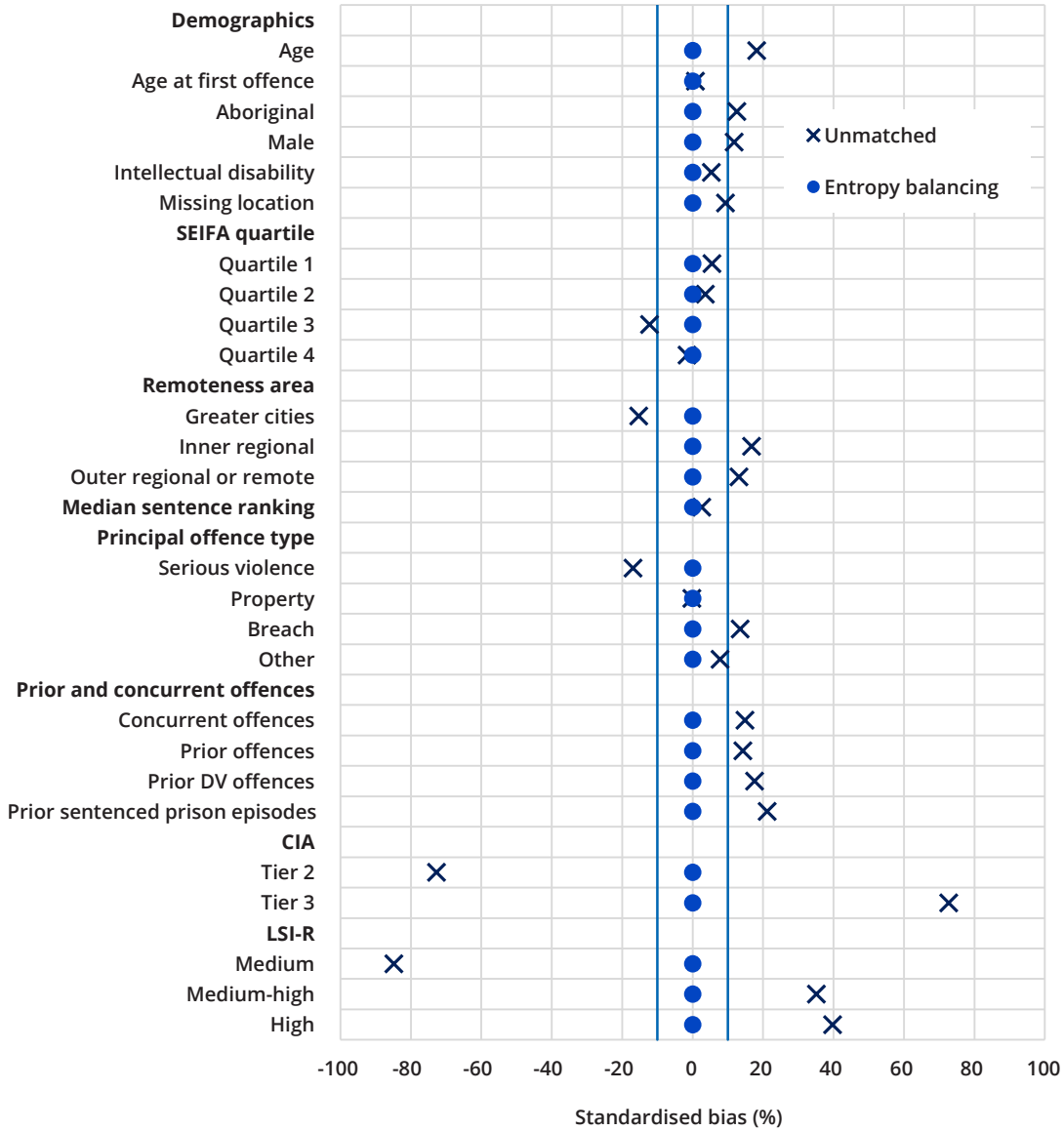
Note. Error bars refer to the 95% confidence interval associated with the unadjusted difference. Stars indicate statistical significance at a variety of conventional thresholds of statistical significance: * – 10%, ** – 5%, *** – 1%.

Matching analysis

Diagnostic testing

To account for possible selection bias, we use matching analysis to identify a more comparable group of offenders to DVEM participants. Figure 3 shows the standardised bias before and after matching for the full set of covariates available for the analysis. The standardised bias is a measure of the difference between DVEM participants and the non-DVEM group on each covariate.[35] The two dashed dark blue lines represent the 10% standardised bias threshold, which is often used as a cut-off to indicate 'adequate balance' for a covariate. Prior to matching, most covariates are only slightly outside of the 10% threshold and can therefore be considered relatively well balanced across the two groups. However, several explanatory variables lie far outside the 10% threshold. For instance, relative to the comparator sample, DVEM participants were more likely to have higher CIA tiers and LSI-R scores. This indicates that DVEM participants had a higher estimated risk of reoffending than their counterfactuals; a likely consequence of the prioritising of high-risk offenders for the DVEM program. As seen in Figure 3, after applying entropy balancing, all covariates lie inside the 10% standardised bias threshold. We report the results from additional diagnostic tests in Appendix B.[36]

Figure 3. Standardised bias between DVEM participants and control group before and after matching

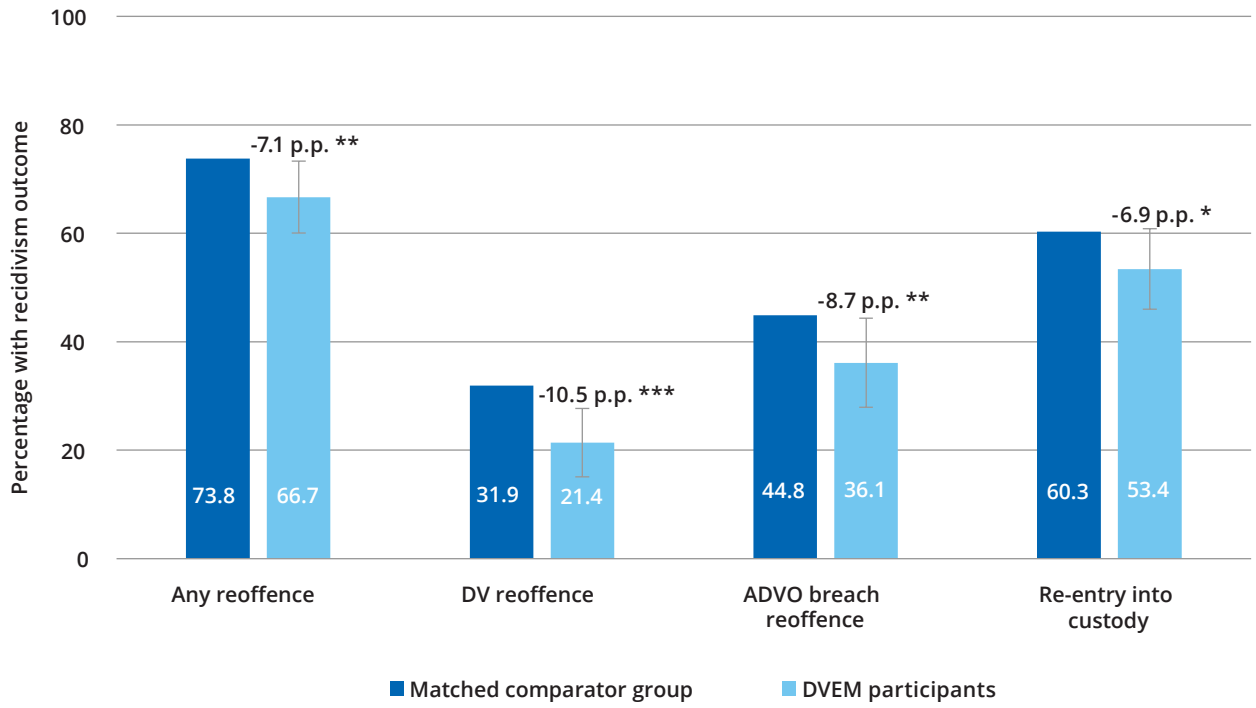


35 The output used to construct Figure 3 is available in Appendix tables B1, containing standardised bias tables for the entropy balancing model.
36 As seen in Appendix B, for the entropy balancing sample, large entropy balancing weights were not placed on a disproportionately small subsample of non-DVEM offenders (Figure B1), with the largest weight being 3.1. For the same sample, DVEM participants and controls were largely similar in their distribution of supervision start dates, but those placed on DVEM were slightly less likely to be impacted by COVID-19 related reforms (Figure B2).

Regression Results

Figure 4 shows the differences in reoffending outcomes between DVEM offenders and the entropy balanced comparator group of offenders after controlling for all relevant covariates using probit regression. More detailed regression results can be found in Appendix C. We estimate that at the 5% significance level, DVEM participants were 7.1 p.p. less likely to reoffend with any offence, 10.5 p.p. less likely to reoffend with a proven DV-flagged offence and 8.7 p.p. less likely to reoffend with an ADVO breach offence within 12 free months following release to their index parole episode. When considering baseline reoffending levels, this reflects marginal decreases of 9.6% in any reoffending, 32.9% in DV reoffending and 19.4% in ADVO breach reoffending for DVEM participants relative to the matched control group. At the 5% significance level, DVEM has no statistically significant effect on whether offenders will return to custody, but at the less conservative 10% significance level, DVEM is associated with a 6.9 p.p. decrease (or a 11.4% marginal decrease) in the probability of returning to custody.

Figure 4. Conditional association between placement on DVEM and recidivism outcomes, entropy balanced sample



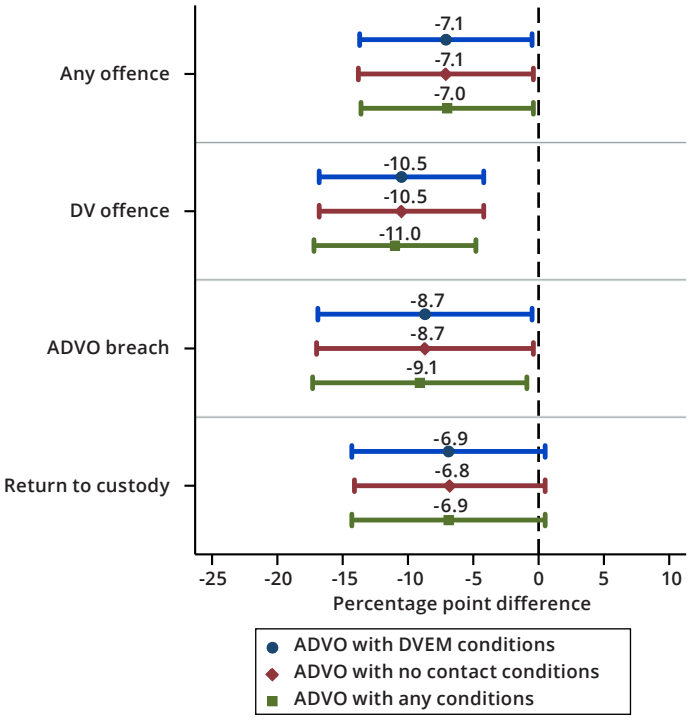
Note. Error bars refer to the 95% confidence interval associated with the adjusted difference. Stars indicate statistical significance at a variety of conventional thresholds of statistical significance: * – 10%, ** – 5%, *** – 1%.

Robustness checks

In this section we present results of robustness tests where we reestimate the association between DVEM participation and recidivism outcomes using alternative counterfactual samples, derived by relaxing the requirement that offenders in our non-DVEM control group meet all observed eligibility crtieria for DVEM. Figure 5 shows point estimates and confidence intervals for the estimated average marginal effects from our probit regression for all outcome variables across alternative non-DVEM control groups, after matching. More detailed results from these models are available in Appendix D.[37]

The ADVO with DVEM conditions group is the same entropy balanced control group used in our main analysis and presented in Figure 4, which requires non-DVEM offenders to meet all of the observed eligibility criteria for DVEM. The other two control groups are analagous to the control group used in our main analysis but allow non-DVEM offenders to meet only some of the observed eligibility criteria for DVEM. Specifically, the ADVO with no contact restriction group relaxes the requirement that non-DVEM offenders are on ADVOs with a condition stipulating a metred geographical or suburb/Local Government Area restriction. The ADVO with any conditions group relaxes the previous condition, as well as the requirement for an ADVO to have a condition restricting contact between the offender and the PINOP noted on the order.[38] Regression coefficients and confidence intervals are very similar across control groups. In particular, at the 5% significance level, DVEM reduces any offending, DV offending, and ADVO breaches by around 7 p.p., 11 p.p., and 9 p.p. respectively, regardless of which control group DVEM offenders were compared to. Similarly, across all comparisons DVEM participants were around 7 p.p. less likely to return to custody than non-DVEM offenders. The consistency of results presented in Figure 4 provides evidence that our estimated effect of DVEM is robust to sample restrictions and the use of multiple control groups. Since the relaxed eligibility criteria have little observable influence on the estimated effect of DVEM on recidivism, it is possible that other eligibility criteria that we do not observe have a similarly small impact on our estimates.

Figure 5. Percentage point association between placement on DVEM and recidivism outcomes, entropy balanced samples comparing DVEM offenders to groups of offenders who have ADVOs with differing sets of conditions



37 As seen in Appendix D, our findings are also robust to alternative model specifications which exclude the measure of follow-up days after the start of COVID-19 reports in NSW, and utilised alternative matching methods.

38 The eligibility criteria for DVEM are detailed in the "DVEM in NSW" section of our introduction. Of those eligibility criteria, we relax ADVO conditions 4a and 4b which correspond to no-contact restrictions and metred geographical or suburb/Local Government Area restrictions respectively.

DISCUSSION

In this study we examined the association between DVEM program participation and the likelihood of recidivism and reincarceration. We found that compared to similar parolees who were not subjected to electronic monitoring, DVEM participants were less likely to reoffend with any offence (7.1 p.p.), a DV-related offence (10.5 p.p.), and a breach ADVO offence (8.7 p.p.) within a year of release. Additionally, parolees participating in DVEM were more often successfully managed in the community, with our results showing that they were less likely to return to custody within a year of release (6.9 p.p.).

Our results are consistent with the more robust evaluations of electronic monitoring programs undertaken in Australia and overseas (Belur et al., 2020; Andersen & Telle, 2022). The most comparable is the work by Williams and Weatherburn (2022), who estimate that offenders sentenced to home detention with electronic monitoring in NSW have ten-year reoffending rates that are 11 p.p. lower than offenders sentenced to prison. While our findings are broadly consistent with this research, Williams and Weatherburn (2022) find slightly larger and more persistent reductions in recidivism. There are several possible reasons for these differences. Most notably, the electronic monitoring program evaluated by Williams and Weatherburn (2022) was restricted to non-violent offenders, who are known to reoffend at a higher rate and frequency than violent offenders (Pisani, 2022). Another important difference is that in our study, electronic monitoring was not a condition of a home detention order. This more restrictive sanction may have additional benefits in terms of reducing opportunities to reoffend. Williams and Weatherburn (2022) also use a more rigorous quasi-experimental method to overcome omitted variable bias, which may have resulted in more precise estimates of treatment effects.

Our research findings also mirror those reported by Sced et al. (2020) in their evaluation of the South Australian electronic monitoring program. They found that compared to other similar offenders on bail for a DV offence, those placed on electronic monitoring had a 55% lower likelihood of any reoffending and a 62% lower likelihood of domestic and family violence reoffending. In our study, we found that compared to a matched comparator group of parolees, electronic monitoring is associated with a 9.6% marginal reduction in any reoffending and a 32.9% marginal reduction in DV reoffending. However, unlike Sced et al. (2020) we find no evidence of higher breach rates for DVEM participants.[39] Again, this may be due to the fact that the EM program evaluated by Sced et al. (2020) included a home detention requirement. Being more restrictive, a home detention condition would increase the opportunity for monitored offenders to commit a breach. The additional requirement for home detention also likely reduces the complexity of accurately monitoring offender movements, and as a result, could increase the likelihood of a breach being detected.[40] It is also possible that the higher breach rate observed by Sced et al. (2020) is due to differences in how breaches were measured. The SA evaluation includes only unproven reoffending outcomes, and both proven and unproven breaches, whereas we measure change in proven ADVO breaches and returns to custody (the latter including both imprisonment for new offences and revocations for breaches). Proven breach reoffending is arguably a better measure given that EM devices have been found to erroneously detect breaches (QPS, 2019; Nancarrow & Modini, 2018). However, if a DVEM participant committed a technical breach of their parole order that did not result in a parole revocation, this would not be captured in our study. We therefore cannot exclude the possibility that DVEM is associated with less consequential forms of non-escalated technical breaching of parole orders, such as those identified by Sced et al. (2020).[41]

39 As reflected by the associative reductions in the probability that an offender on electronic monitoring reoffends with an ADVO breach or is returned to custody.

40 Examining this issue in the Australian context, the Queensland Police Service (QPS, 2019) conducted a feasibility study to test the ability of GPS monitoring devices to detect breaches of set conditions under 35 simulated scenarios. For scenarios testing a breach of pre-set and static exclusion zones, such as those associated with home detention, monitoring devices failed to detect the breach in 40 per cent of scenarios tests. In the more complicated scenarios testing exclusion zones related to victim proximity, such as those present in DVEM, devices failed to detect around two thirds of all breaches.

41 While we are able to examine breach reoffending proven in court, we are unable to detect or examine the rate of technical breaches of an offender's parole order. In the NSW context, it is possible that minor or technical breaches related to the electronic monitoring of offenders under DVEM are dealt with by the State Parole Authority rather than progressed to court.

Our study contributes to a nascent research base which suggests that electronic monitoring is associated with relatively large reductions in recidivism amongst Australian DV parolees. However, further research is required to understand how the DVEM program works to reduce reoffending. From their thematic analysis of 34 studies, Belur et al. (2020) suggest that there are two potential mechanisms through which electronic monitoring affects criminal behaviour. The first (and most commonly cited) mechanism is that electronic monitoring deters offending by increasing the actual or perceived risk of detection.[42] If DVEM primarily operates through deterrence, the reductions in recidivism elicited by electronic monitoring would be expected to dissipate when offenders are no longer being actively monitored. The fact that we were able to detect differences in reoffending within a year, despite 71% of DVEM participants in our study being monitored for less than 6 months, would suggest that deterrence is not the only driver of change. The second mechanism identified by Belur et al. is that electronic monitoring augments existing case management practices.[43] This seems plausible, as DVEM operates as a case management tool packaged within the NSW parole framework[44] and works to support compliance with ADVO conditions. If DVEM primarily works by improving adherence to post-release case management plans, crime reduction benefits may persist well beyond the period that an offender is actively monitored.[45] DVEM should continue to be monitored to assess whether the reductions in DV observed during the initial surveillance period are maintained over the longer term.

Given the effectiveness of DVEM, it is natural to consider if and how it could be expanded. Offering DVEM to more high-risk parolees would appear to be one feasible option given that we identified a large group of offenders who met most of the eligibility criteria for DVEM participation but were not placed on the program (n=768, 70.6% of observably eligible sample). Avenues to increase participation through the relaxation of eligibility conditions are less obvious. For example, without the requirement for offenders to have an ADVO condition stipulating a metered geographic restriction, the rationale behind setting up and monitoring exclusion zones is unclear. Instead, advocating for increased usage of the metred geographic restriction in ADVOs issued to high-risk parolees may be a more suitable means to increase the eligible population of offenders. In our study, we identified a further 586 parolees (59.0% of observably eligible sample) who met observable eligibility criteria but did not have a metred geographical or suburb/Local Government Area restriction as a condition of their ADVO.

It is possible that the improvements in reoffending outcomes identified in this study are specific to the current operating environment of the DVEM program. Electronic monitoring provided in isolation from NSW Community Corrections parole supervision may not elicit a comparable reduction in recidivism. It is also possible that offenders who pose a lower recidivism risk may respond differently to the increased scrutiny, supervision and surveillance associated with electronic monitoring. It has previously been suggested that increased community supervision of low-risk offenders may have a criminogenic effect and can lead to unintended or undesired "net widening" (Doleac, 2018; Lowenkamp & Latessa, 2004). Making electronic monitoring available to DV offenders at other points in the criminal justice process (for example as a condition of bail) would therefore benefit from careful piloting and early monitoring to identify and contend with potential "net widening". Additionally, future evaluations of DV electronic monitoring would benefit from an evaluation-conscious approach to program expansion, such as the introduction of a random assignment mechanism or a strategically structured rollout approach mirroring that of Henneguelle et al. (2016) and Andersen and Telle (2022).

There are several strengths of our study. We apply strict sample restrictions based on a large number of observable program eligibility criteria, employ a matching approach, and make use of rich sources of data concerning the criminal risk and criminal history of offenders. This ensured that those in the DVEM program and the comparator groups were observably similar across multiple domains relevant to both

42 It should be noted that our study examines general and DV recidivism broadly, rather than against the specific victim to whom ADVOs relate. As such, we are unable to differentiate between deterrence from offending against victims listed on ADVOs, or a more general deterrent effect.

43 Specifically, case management focused on providing stability and structure in offenders' lives, encouraging employment, and promoting a therapeutic component is thought to elicit reductions in recidivism (Belur et al., 2020).

44 Parole supervision in NSW has itself been found to have a positive influence on recidivism, with a suggested causal mechanism being a particularly high quality of supervision in the state (Wan et al., 2014).

45 See Doleac (2018), for a review of evidence regarding strategies to productively reincorporate formerly incarcerated offenders back into communities.

program participation and offending behaviour. Nevertheless, the methods we used were unable to eliminate omitted variable bias. The primary concern is that several program suitability criteria, which may introduce selection bias into a models, could not be observed in the data.[46] The implementation of several state-wide reforms influencing community supervision, such as the COVID-19 pandemic response, during the period in which reoffending was measured, limited our ability to examine DVEM using alternative quasi-experimental statistical methods.[47] However, several features of the program implementation indicate that any selection effects may be relatively small. Importantly, program data suggests that victims were often unable to be contacted by Community Corrections staff to confirm their address. This suggests that a victim's location was not consistently used as a criterion to exclude offenders from participating in DVEM. It is also unclear whether these unobserved suitability criteria, namely that electronic monitoring works at both the offender and victim's addresses and sufficient distance between the offender and victim's address to make electronic monitoring feasible, would influence reoffending in any meaningful way. Furthermore, we show that our results are robust to the use of alternative control groups. Since our results are similar when relaxing observed eligibility criteria, it is plausible that eligibility criteria (including those that are unobserved) may have little impact on our estimates. Future research should however consider adopting a more robust experimental approach to verify our results.

A further limitation is that the small number of offenders participating in DVEM precluded any subgroup analyses. As a result, several interesting questions regarding program effectiveness are left unanswered, and would benefit from further investigation. For example, it is unclear whether the provision of a matched victim device is associated with additional benefits, or whether the length of monitoring that an offender experiences is associated with later recidivism. It is also unclear whether DVEM works particularly well (or doesn't work at all) for different subgroups of the population. This is an important consideration for groups such as Aboriginal offenders and offenders with disability, who experience disproportionately high reimprisonment rates. Finally, while our study observed a reduction in proven DV offences and re-entry into custody, DV-related behaviours that were not reported to police (such as harassing phone calls and online stalking) were harder to measure and therefore were not included in our study. Future research should consider whether electronic monitoring also works to reduce these unreported behaviours. Ideally this would be achieved through interviews with victims before and after the offender has been issued with the device.

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46 Including whether electronic monitoring equipment would work at both offenders and victims addresses, and whether there would be enough distance between an offender and a victims address to make the use to electronic monitoring feasible.

47 Similarly, amendments to the Crimes (Domestic and Personal Violence) Act 2007 (NSW) introduced the use of plain English ADVOs in December 2016, shortly before the period examined in our study.

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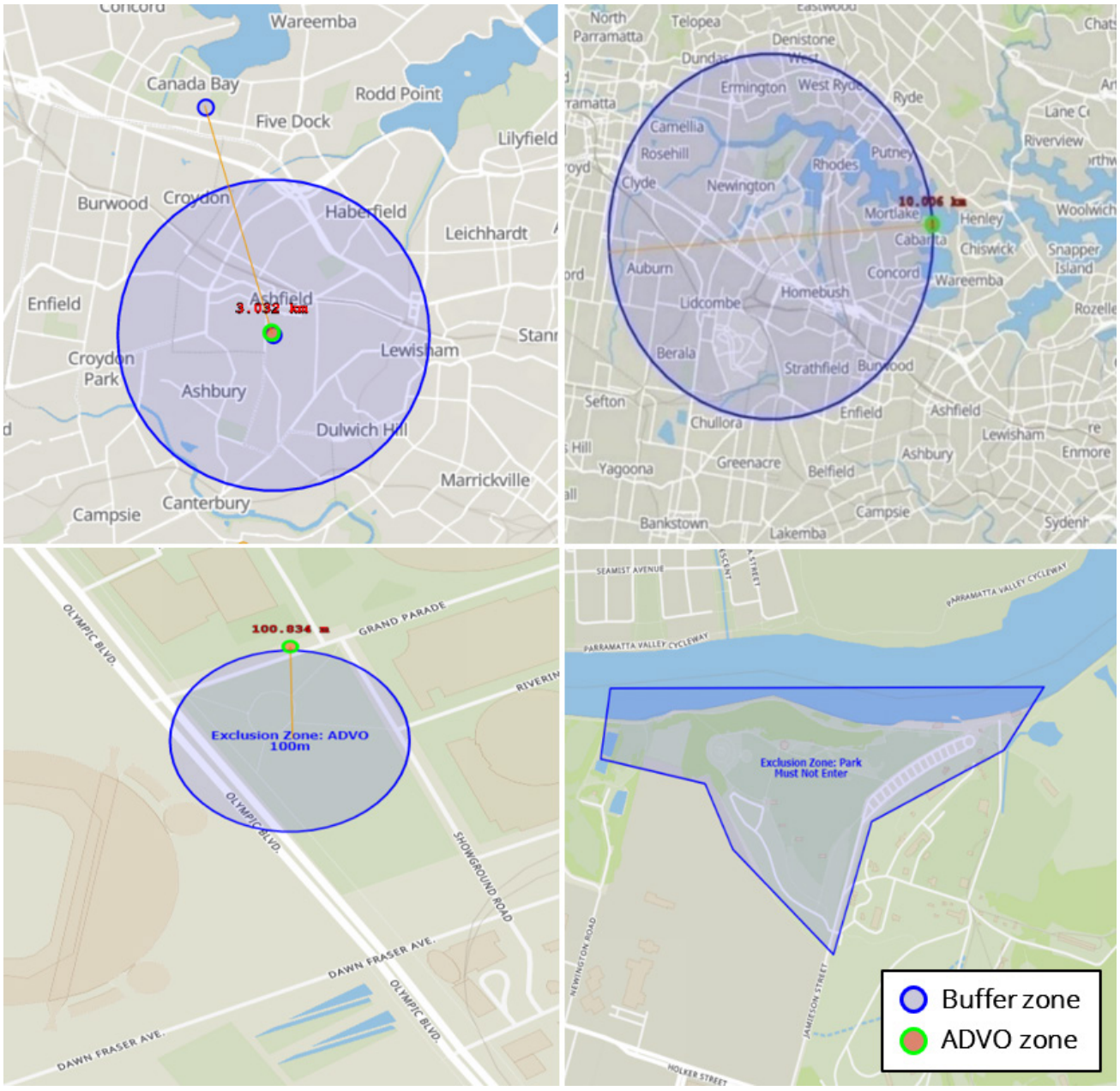
APPENDIX

Appendix A – DVEM geographic exclusion zoning

Figure A1. Examples of DVEM geographic exclusion zoning



Note. Figures sourced from Community Corrections NSW.

Appendix B – Entropy balancing diagnostics

Figure B1. Distribution of entropy balancing weights for DVEM and control parolees

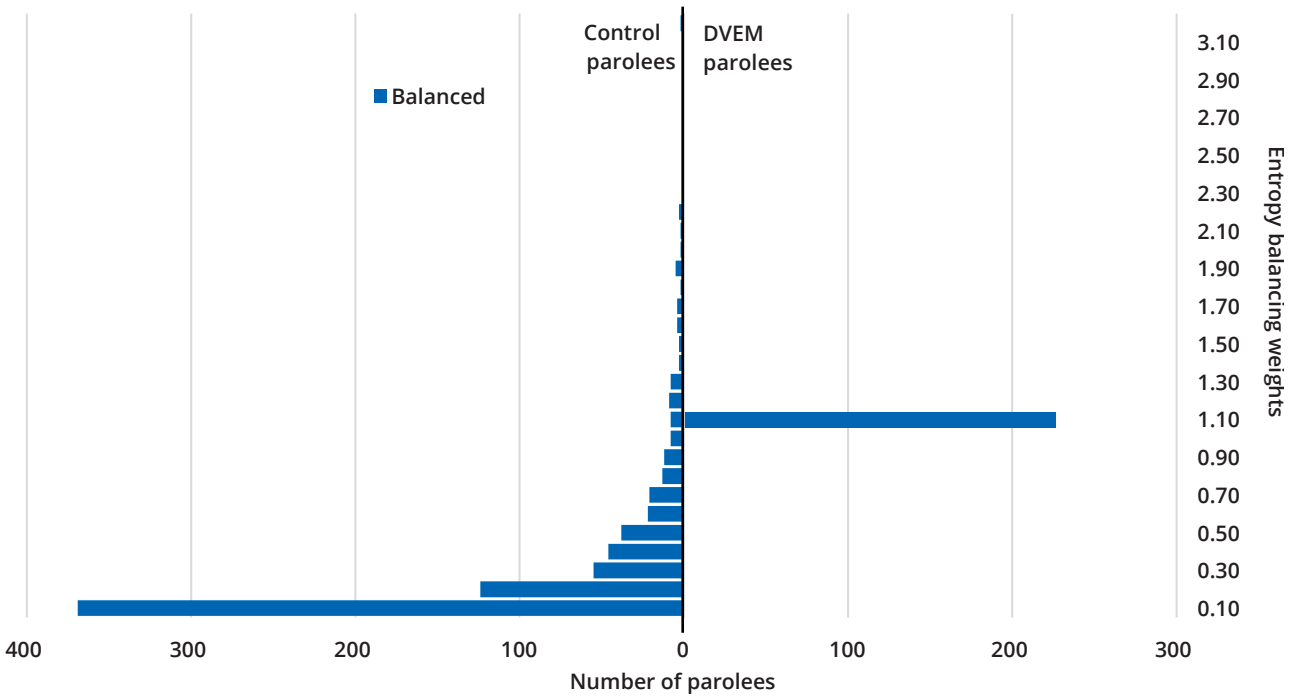


Figure B2. Proportion of DVEM participant and balanced control samples beginning parole orders, by month and year of parole start date

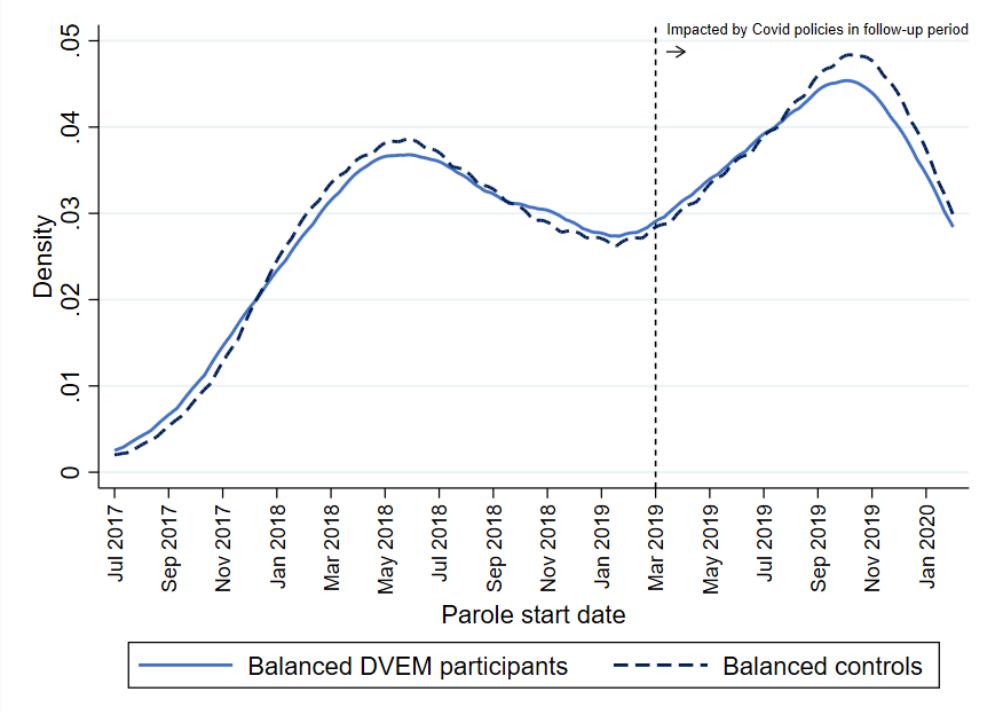


Table B1. Standardised bias tables for entropy balanced model

		Mean		Standardised bias (%)	Test of equality (*p*-value)
		Treated	Control		
Panel A. Demographic characteristics					
Age at start of order (mean)		36.10	36.10	0.00	1.000
Age at first offence (mean)		19.13	19.13	0.00	1.000
Male		0.98	0.98	0.00	1.000
Aboriginal		0.54	0.54	0.00	1.000
Intellectual disability		0.01	0.01	0.00	1.000
Socioeconomic disadvantage	Q1 (most disadvantaged)	0.27	0.27	0.00	1.000
	Q2	0.24	0.24	0.00	1.000
	Q3	0.15	0.15	0.00	1.000
	Q4 (least disadvantaged)	0.05	0.05	0.00	1.000
Missing location		0.28	0.28	0.00	1.000
Remoteness	Major cities	0.39	0.39	0.00	1.000
	Inner regional	0.27	0.27	0.00	1.000
	Outer regional or remote	0.06	0.06	0.00	1.000
Panel B. Index offence and supervision					
Index offence type	Serious violence	0.56	0.56	0.00	1.000
	Property	0.03	0.03	0.00	1.000
	Breach	0.30	0.30	0.00	1.000
	Other	0.11	0.11	0.00	1.000
Offence seriousness (mean)		1.06	1.06	0.00	1.000
Concurrent offences (mean)		4.05	4.05	0.00	1.000
Reoffending risk (LSI-R)	Medium	0.08	0.08	0.00	.998
	Medium high	0.59	0.59	0.00	.999
	High	0.33	0.33	0.00	1.000
CIA	Tier 2	0.18	0.18	0.00	1.000
	Tier 3	0.82	0.82	0.00	1.000
Panel C. Offending within prior five years					
Prior proven offences (mean)		3.76	3.76	0.00	1.000
Prior sentenced custodial episodes (mean)		1.91	1.91	0.00	1.000
Prior DV offences (mean)		1.64	1.64	0.00	1.000

Note. Stars indicate statistical significance at a variety of conventional thresholds of statistical significance: * – 10%, ** – 5%, *** – 1%..

Appendix C – Detailed regression results

Table C1. Regression results and diagnostics

	Effect estimate	95% CI	Standard error	p-value	AUC	Pseudo R^2
Panel A. Probability of reoffending with any offence						
Unmatched sample	-0.051	[-0.123, 0.021]	(0.037)	.167	0.76	0.16
Entropy balanced sample	-0.071**	[-0.138, -0.005]	(0.034)	.037	0.83	0.25
Panel B. Probability of reoffending with a DV offence						
Unmatched sample	-0.055**	[-0.109, -0.001]	(0.028)	.050	0.86	0.30
Entropy balanced sample	-0.105***	[-0.168, -0.042]	(0.032)	.001	0.89	0.38
Panel C. Probability of reoffending with an ADVO breach offence						
Unmatched sample	-0.047	[-0.123, 0.028]	(0.038)	.217	0.72	0.12
Entropy balanced sample	-0.087**	[-0.170, -0.005]	(0.042)	.039	0.77	0.18
Panel D. Probability of returning to custody						
Unmatched sample	-0.058	[-0.129, 0.014]	(0.037)	.115	0.79	0.20
Entropy balanced sample	-0.069*	[-0.143, 0.005]	(0.038)	.068	0.82	0.25

Note. This table reports average marginal effects derived from a Probit regression. AUC = Area Under the receiver operating characteristic Curve. Standard errors obtained using the Delta method are reported in parentheses. 95% CI – The 95 % confidence interval associated with the estimates. Stars indicate statistical significance at a variety of conventional thresholds of statistical significance: * – 10%, ** – 5%, *** – 1%.

Appendix D – Robustness checks

Table D1. Robustness checks: regression results and diagnostics for alternative modelling approaches and counterfactual groups

	(1) All ADVO conditions, with COVID-19 days indicator Propensity score matching	(2) All ADVO conditions, no COVID-19 days indicator Entropy balancing	(3) No contact ADVO, with COVID-19 days indicator Entropy balancing	(4) Any ADVO, with COVID-19 days indicator Entropy balancing
Panel A. Probability of reoffending with any offence				
Estimate	-0.072*	-0.071**	-0.071**	-0.070**
Standard error	(0.039)	(0.035)	(0.034)	(0.034)
AUC	0.85	0.81	0.82	0.83
Pseudo R2	0.30	0.23	0.25	0.26
Panel B. Probability of reoffending with a DV offence				
Estimate	-0.103***	-0.140***	-0.105***	-0.110***
Standard error	(0.039)	(0.037)	(0.032)	(0.032)
AUC	0.90	0.82	0.89	0.89
Pseudo R2	0.42	0.23	0.38	0.38
Panel C. Probability of reoffending with an ADVO breach offence				
Estimate	-0.079	-0.088**	-0.087**	-0.091**
Standard error	(0.050)	(0.043)	(0.042)	(0.042)
AUC	0.79	0.77	0.77	0.77
Pseudo R2	0.21	0.18	0.18	0.18
Panel D. Probability of returning to custody				
Estimate	-0.071	-0.072*	-0.068*	-0.069*
Standard error	(0.044)	(0.039)	(0.037)	(0.038)
AUC	0.84	0.79	0.83	0.82
Pseudo R2	0.29	0.21	0.26	0.26

Note. This table reports average marginal effects derived from a Probit regression. Among offenders who meet all eligibility criteria (the main analysis sample used in the paper), Column 1 reports the results from propensity score matching analysis using a 1:1 nearest neighbour matching approach (n = 364; calliper =0.02). Column 2 presents results from an entropy balancing approach analogous to that of the main results, but excluding the measure of follow-up days after the start of COVID-19 response in NSW. Alternatively, Column 3 details the results from an entropy balancing analysis relaxing one of the eligibility criteria for participation in DVEM, the need for an ADVO with a condition stipulating a metred geographical or suburb/Local Government Area restriction. Similarly, Column 4 presents results from an entropy balancing analysis further relaxing program eligibility criteria, additionally removing the requirement for an ADVO to have a condition restricting contact between the offender and the PINOP noted on the order. AUC = Area Under the receiver operating characteristic Curve. Standard errors obtained using the Delta method are reported in parentheses. 95% CI – The 95 % confidence interval associated with the estimates. Stars indicate statistical significance at a variety of conventional thresholds of statistical significance: * – 10%, ** – 5%, *** – 1%.

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