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Background Paper **35**



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# Foreword

The extent to which criminal offenders reoffend upon release is of particular interest for criminal justice policymakers and practitioners. Measures of reoffending (recidivism) have been included in the National Information Development Plan for crime and justice. Using data drawn from the University of Western Australia Crime Research Centre's offender database, this study undertakes to assess the impact of two factors—'available street time' (time available to commit crimes, that is, when offenders are not incarcerated) and mortality—on the estimation of adult offender recidivism (measured by re-arrest). It explores recidivism across different offender populations (by sex, Indigenous status and offence type) and over different follow-up periods. In contrast to previous studies, it was found that adjusting for time spent in custody and mortality made little difference to the two year recidivism rates of large offender populations. However, it should be recognised that for certain offender groups (eg Indigenous males) and over shorter follow-up periods (eg 6 months), the underestimation of recidivism is more marked. The study concludes that current methods of estimating population-level recidivism rates are adequate and do not require wholesale recalibration to account for available street time or mortality.

**Adam Tomison**  
**Director**



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# Acronyms

**CRCOD** Crime Research Centre's offender database

**KME** Kaplan-Meier Estimator

**NST** non-street time





# Introduction

The task of measuring recidivism and identifying recidivist offenders has been of increasing interest to criminal justice policymakers and practitioners. This is evidenced by an accumulation of Australian literature in the area (Payne 2007) and recent national developments, such as the Australian Institute of Criminology's (AIC) *Recidivism Roundtable* 2005 and the inclusion of measures of recidivism in the *National Information Development Plan* for crime and justice (ABS 2005). Most recidivism research activity has focused on either the exploration of recidivism or program evaluation. However, more recently, recidivism research has found application in the area of risk assessment and prediction modelling (eg see Maller 2002).

## Problems with defining and measuring recidivism

Definitional and methodological problems associated with recidivism research have been acknowledged since the earliest days of criminal career research (Blumstein et al. 1986; Maltz 1984). Problems have tended to fall into three areas of concern: data availability and data quality, choice of follow-up times and determining appropriateness of measures and models (Maltz 1984). Debates on choice or

appropriateness of various follow-up times (eg whether to measure recidivism after 6 months, 12 months or 2 years), have invariably included discussion about 'exposure time' or 'available street time'; that is, the time that an offender is assumed to be free to commit crimes. Estimates of reoffending that do not take exposure or 'available street time' into account assume that a person is completely free during the follow-up period to commit crime. However, this may not be the case, especially when offenders are known to spend portions of time in custody. Estimates that fail to exclude any time spent in custody (otherwise referred to as 'non-street time' (NST)) will lead to underestimates of reoffending rates by virtue of having overestimated exposure time.

## Controlling for exposure time or 'non-street time'

Although it is acknowledged that the construction of unbiased estimates of recidivism ideally requires an accurate account of 'exposure time', not all studies have implemented controls to do this. Few researchers in Australia have considered and adjusted for exposure time in analyses of reoffending (eg Harding & Maller 1997; Payne 2005). Payne

(2005) took account of NST in an evaluation of outcomes of the North Queensland Drug Court pilot program. Estimates of the individual rate of offending increased by 50 percent when an offender's time in custody was taken into account (Payne 2005). Conversely, Harding and Maller (1997) found little effect on age-arrest profiles after adjusting for NST. Even after controlling for various offender types, such as violent offenders or those receiving relatively long prison sentences, it was found that adjustments for NST produced an insignificant effect on arrest profiles. It was concluded that this was either because the number of such offenders in these groups was too small to observe an effect, or because their prison and/or lock-up time accounted for too small a proportion of the total time involved in their calculations.

## Accounting for death

The need for recidivism studies to take into account mortality has been accentuated by a growing body of research demonstrating significantly higher rates of mortality and morbidity among offender populations (Biles, Harding & Walker 1999; Graham 2003; Harding-Pink & Fryc 1988; Hobbs et al 2006; Lattimore, Linster & MacDonald 1997; Laub & Vaillant 2000; Paanila, Hakola & Tiihonen 1999; Putkonen 2001). Failure to take into account the death of offenders has confounding effects on recidivism analyses. First, researchers will incorrectly classify individuals who have died as being offenders who have desisted from crime (known as 'false desistors'). Second, their exposure time will incorrectly include the period between date of death and the end of the follow-up period. In all cases, this is likely to lead to an underestimation of recidivism and a corresponding overestimation of the rate of desistance.

## Combined effects of non-street time and mortality

Few studies have explicitly assessed the *joint* effects of both NST and mortality on exposure time and therefore on estimates of recidivism. Only one study that investigated how these two factors influenced offending patterns could be identified (Eggleston, Laub & Sampson 2004). The study found that both mortality and exposure time altered offending trajectories, particularly those of high-frequency offenders.

## Purpose of this study

The aims of the present study are to:

- derive accurate estimates of recidivism which take into account both available street time and the mortality of offenders;
- compare the *adjusted* estimates derived in the first aim with *unadjusted* estimates that do not control for street time and/or mortality;
- assess the size and nature of differences for various sub-groups of the offender population; and
- consider the wider implication of these findings to Australian criminal justice policy, evaluation and research.



# Method

## Data source

The study draws on the Crime Research Centre's offender database (CRCOD) which contains anonymised records from the administrative systems of the Western Australian criminal justice system (ie police apprehensions, juvenile cautions, police lock-ups, court records, prison and community correction records, and other juvenile justice records). Data from the various systems are linked through the Integrated Numerical Offender Identification System which allocates a unique identification number to each offender, allowing both cross-sectional (interagency) and longitudinal tracking (Ferrante 1993). The database contains complete and linked records of police apprehensions or arrests from 1984 onwards, prison terms from 1975 onwards, community corrections records from 1984 onwards and stays in police lock-ups from 1979 to 2005.

## Study population(s)

Only adult records from CRCOD were included in the study as there was incomplete data in relation to time spent in juvenile detention facilities. The adult offender population was further categorised into

three groups so as to assess how the effects of NST and mortality might vary across differing populations. The three groups comprised:

- *ever arrested*—the complete population of adults arrested in Western Australia for the first time since 1 April 1984 (n=258,077 persons). For each individual, the full arrest history from first arrest to latest known arrest (as at study cut off on 31 December 2005) were assembled and used (n=674,039 events).
- *ever ordered*—all offenders who had ever served an adult non-custodial order in Western Australia from 1984 to 2005 (n=34,518 persons; n=231,328 events).
- *ever imprisoned*—all offenders who had ever been imprisoned as adults in Western Australia from 1984 to 2005 (n=17,337 persons; n=167,583 events).

## Recidivism measurement and analysis

Consistent with other studies of recidivism (eg Broadhurst & Loh 1995), this study used re-arrest as the base measure of recidivism. Estimates of recidivism were derived using survival analysis

techniques and the Kaplan-Meier Estimator (KME). Recidivism estimates were calculated at varying follow-up times and for various subgroups of the offender population as previously described.

## Calculation of available street time

Given the linked nature of data in the CRCOD, it was possible to determine for each offender any periods of time between arrests that were spent in custody (prison time, as well as time spent in police lock-ups). These time periods were factored into recidivism calculations to produced adjusted estimates.

## Adjusting for death of offenders

With the cooperation of the Department of Corrective Services, a large cross-sectional cohort of offender data was extracted and linked to Registrar-General death records. Ethical approval to undertake the linkage was obtained from both the University of Western Australia and the Western Australian Department of Health. The linkage was effected by the Data Linkage Unit, Department of Health, using a best practice protocol designed to ensure protection of privacy (Kelman, Bass & Holman 2002). The linkage follows the precedent set by earlier linkage-based research studies (eg Jablensky et al. 2004).



# Results

## Accounting for non-street time

Table 1 describes the prevalence and magnitude of NST among each group. As the Table shows, the prevalence of NST varies considerably between groups. Approximately 11 percent of all offenders in the *ever arrested* population experienced NST; that is, spent some time during their criminal careers either in prison or in police custody (lock-up). Episodes of incarceration affected 8.4 percent of all arrests belonging to this offender population. Therefore, fewer than one in 10 persons *ever arrested* by police spent any time in custody and when they did, it was not very often—about one in every 12 arrests.

As Table 1 shows, the prevalence of NST is higher for the *ever ordered* and *ever imprisoned* populations. More than one-third (36.5%) of *ever ordered* offenders experienced some time in custody. Of the 231,328 arrest events, 13.7 percent contained an NST component. As would be expected, all of the *ever imprisoned* population experienced some time in custody. Of the arrest events belonging to this group, almost one-quarter (24%) contained an NST component. Therefore,

incarceration for this group occurred on average about once in every four arrests.

The magnitude of the impact of NST for each of the study subpopulations is also demonstrated in Table 1. It can be seen that progressive movement from the *ever arrested* to the *ever imprisoned* population increases the size of the NST effect. The table also illustrates how NST varies within each population. For example, within the *ever arrested* population, NST is longer for Indigenous male offenders (mean NST=15.7 days) than for the total population (mean NST=9.3 days).

## Accounting for mortality

Table 1 also shows that only a small proportion of offender records are linked to death records, despite the population-level nature of the linkage process. Only 4.3 percent of individuals in the *ever ordered* cohort and 5.1 percent of individuals in the *ever imprisoned* cohort were identified as having died during the study period. A greater proportion of Indigenous offenders than non-Indigenous offenders were found to link to death records (eg compare 5.8% of Indigenous males to 5% of non-Indigenous males in *ever imprisoned* population).

**Table 1** Prevalence and magnitude of NST and prevalence of mortality across various offender sub-populations

Offender population	Prevalence of NST <sup>a</sup>		Magnitude of NST		Mortality
	% of persons	% of arrests	Mean days (n)	NST as % of time between arrest events	% of persons
<b>Ever arrested: Adults persons ever arrested by police</b>					
MI	43.1	17.3	15.7	3.4	n/k
MN	10.4	7.0	9.9	0.6	n/k
FI	27.7	13.3	3.8	0.6	n/k
FN	5.5	4.7	3.3	0.1	n/k
Total	11.3	8.4	9.3	0.6	n/k
<b>Ever ordered: Offenders with adult community corrections history</b>					
MI	68.1	20.1	19.8	7.1	5.9
MN	35.1	12.1	13.8	2.1	4.3
FI	54.5	16.3	6.0	1.7	4.8
FN	20.5	9.1	4.9	0.5	3.5
Total	36.5	13.7	13.2	2.2	4.3
<b>Ever imprisoned: Offenders who have spent time in adult prison</b>					
MI	100.0	25.5	29.5	10.8	5.8
MN	100.0	23.5	45.7	7.7	5.0
FI	100.0	24.5	11.3	3.7	7.9
FN	100.0	22.2	27.4	4.7	3.7
Total	100.0	24.0	37.1	7.7	5.1

a: NST comprises time spent in adult prisons and in police lock-ups

n/k=not known, as not all records of arrested persons were linked by the study

MI=male Indigenous; MN=male non-Indigenous; FI=female Indigenous; FN=female non-Indigenous

## Recidivism analysis —effects of mortality and non-street time

Recidivism estimates were computed at various follow-up times using the KME. Table 2 presents estimates computed at two years (KME2), as this is typical of the length of follow-up time used in criminal justice research. The estimates represent the probability or likelihood that an individual will be re-arrested within two years of an earlier arrest. Estimates were computed for each of the study populations and for subgroups within them (eg male Indigenous offenders). For each group, an adjusted KME2—which took into account NST and mortality—and an unadjusted KME2 were calculated and

compared. Estimates for the *ever arrested* and *ever ordered* groups were computed but are not presented because for these groups, the difference between estimates was not found to be statistically significant.

Table 2 shows that the adjusted KME2 for Indigenous males in the *ever imprisoned* population is 0.92. This estimate represents the probability that an Indigenous male who has ever been imprisoned will be rearrested within two years of an arrest having adjusted for mortality and time spent in custody. Without adjustment, the KME2 is 0.90. Therefore, the difference between estimates, which represents the effect of adjusting for both factors, is 0.02 or two percent. For non-Indigenous males, the difference between adjusted and unadjusted KME2 is also 0.02 (0.80–0.78). For non-Indigenous females, the

**Table 2** KME2 estimates, adjusted and unadjusted for both NST and mortality, for the *ever imprisoned population*, by gender-race and other characteristics

	Male Indigenous		Male non-Indigenous		Female Indigenous		Female non-Indigenous	
	Adj p	Unadj p	Adj p	Unadj p	Adj p	Unadj p	Adj p	Unadj p
<b>Ever imprisoned population</b>								
Total population	0.92	0.90	0.80	0.78	0.88	0.88	0.80	0.79
<b>Arrest progression</b>								
@ arrest 1–4	0.82	0.81	0.69	0.68	0.74	0.74	0.67	0.66
@ arrest 5–10	0.88	0.87	0.79	0.78	0.84	0.84	0.80	0.80
@ arrest 11–20	0.92	0.90	0.85	0.83	0.91	0.90	0.88	0.87
@ arrest 21+	0.96	0.94	0.91	0.89	0.95	0.94	0.92	0.91
<b>Offence (at prior arrest)</b>								
Violence	0.90	0.87	0.71	0.66	0.89	0.88	0.75	0.73
Burglary/theft	0.93	0.91	0.85	0.83	0.89	0.89	0.82	0.81
Good order	0.93	0.92	0.83	0.82	0.89	0.88	0.85	0.84
Traffic	0.89	0.88	0.77	0.76	0.83	0.83	0.74	0.73
Other	0.92	0.91	0.77	0.75	0.89	0.89	0.74	0.73
<b>Age groups in years</b>								
18–19	0.95	0.94	0.90	0.89	0.92	0.91	0.85	0.85
20–24	0.92	0.91	0.83	0.81	0.90	0.89	0.83	0.82
25–30	0.90	0.88	0.77	0.75	0.87	0.87	0.81	0.80
30–34	0.87	0.85	0.72	0.70	0.85	0.85	0.78	0.78
35+	0.82	0.81	0.60	0.58	0.80	0.79	0.68	0.68

Adj p=adjusted population; unadj p=unadjusted population; Arrest progression = classification of offenders on the basis of the length of their criminal record. @arrest 1–4 describes offenders with fewer than 4 previous arrests. @arrest21+ describes offenders with more than 20 prior arrests.

difference is 0.01 (0.80–0.79), while for Indigenous females, there is no difference in estimates (both at 0.88). The results clearly show that for the *ever imprisoned* group, the effect of adjusting for NST and mortality for gender-race groups is quite small and, in some cases, nil.

Some slightly larger differences emerge when other characteristics of the *ever imprisoned* group are considered. For example, when offence type is taken into account, the adjusted KME2 for male non-Indigenous offenders arrested for violent offences is 0.71, but 0.66 if left unadjusted. The difference of 0.05 is the largest variation identified in Table 2 and represents an ‘error rate’ in recidivism estimate of seven percent. Therefore, for this group, the unadjusted estimate of recidivism underestimates the true rate for this group by seven percent.

The ‘error rates’ for other subgroups of the *ever imprisoned* population are depicted in Figure 1. As the figure shows, error rates in recidivism estimation never rise beyond two to three percent, except for male non-Indigenous offenders who have been arrested for a violent offence. Therefore, except for this group, adjusting for NST and mortality appears to have little effect on the recidivism rates of the *ever imprisoned* population.

## Probability of re-arrest within different timeframes

Kaplan-Meier estimates were calculated at shorter follow-up times (from 3 months to a maximum of

2 years). Differences between adjusted and unadjusted Kaplan-Meier estimates were found to vary with length of follow up. Error rates (or, more meaningfully, the extent of underestimation of recidivism) tended to peak at six months follow-up.

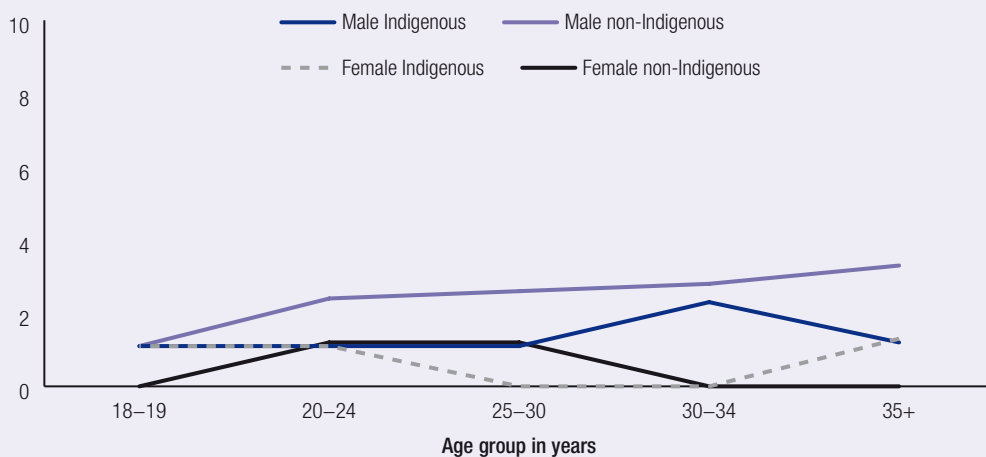
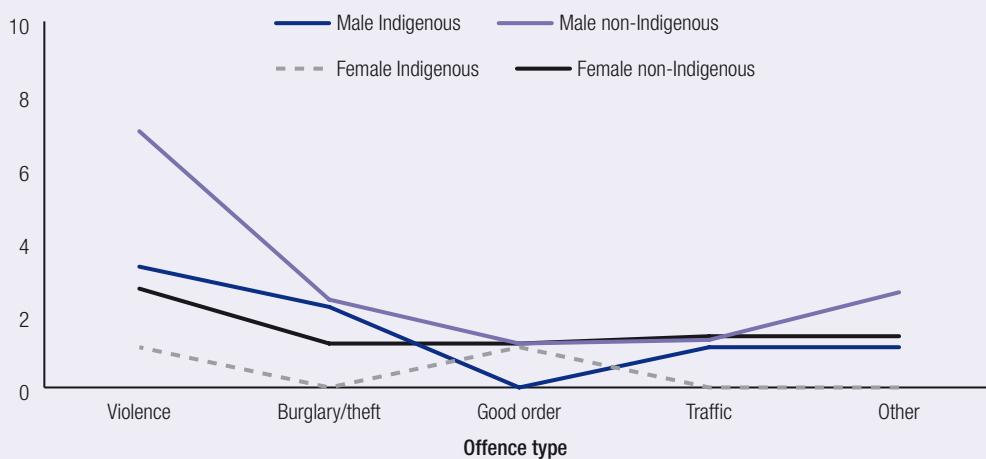
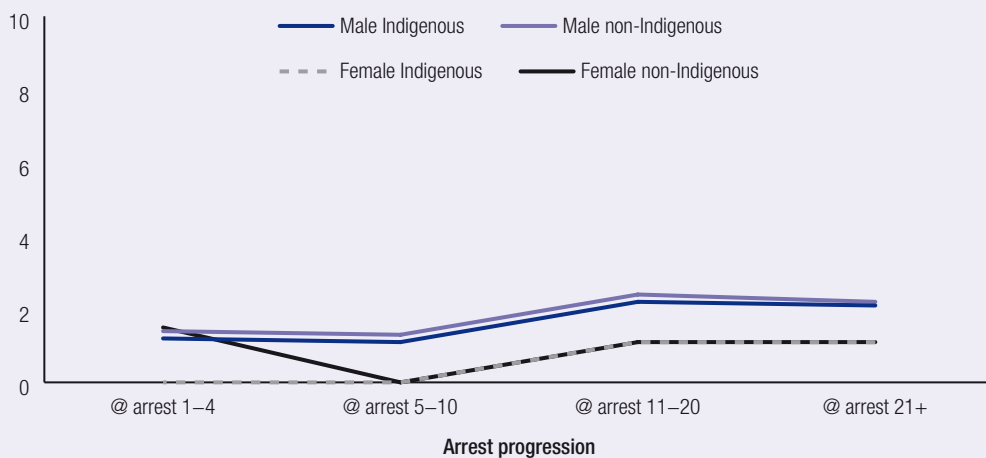
At this level of follow-up, the underestimation of recidivism was 7.6 percent for Indigenous males, 3.7 percent for non-Indigenous males, 3.2 percent for Indigenous females and 3.5 percent for non-Indigenous females. As previously discussed, underestimation was found to be greatest for offenders who have accumulated a significant arrest record (21+ arrests) and for offenders arrested for violent offences (see Figure 2). For the population

of male Indigenous offenders arrested for violent offences, the error rate in recidivism estimation was 12.5 percent. For male offenders with a significant arrest record (21+ arrests), the error rate in recidivism estimation was nine percent. Overall, it was found that as the length of follow up increases, so the difference between adjusted and unadjusted rates diminishes.

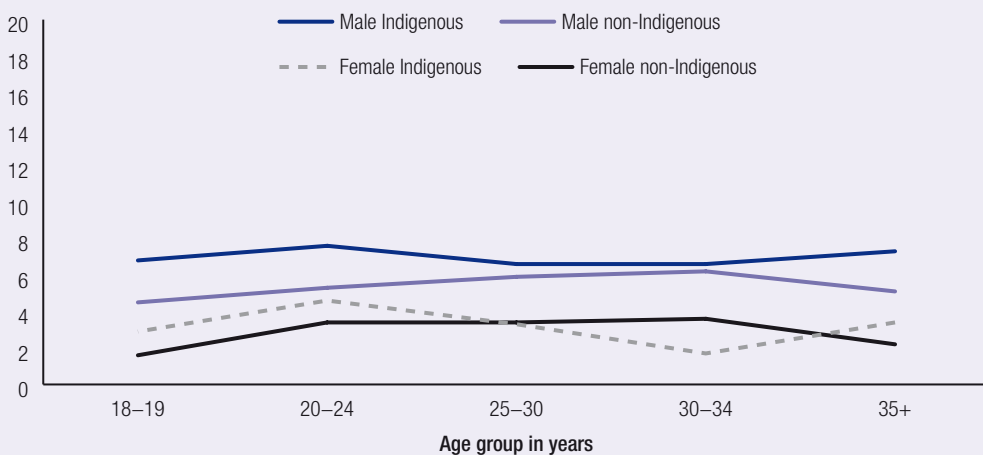
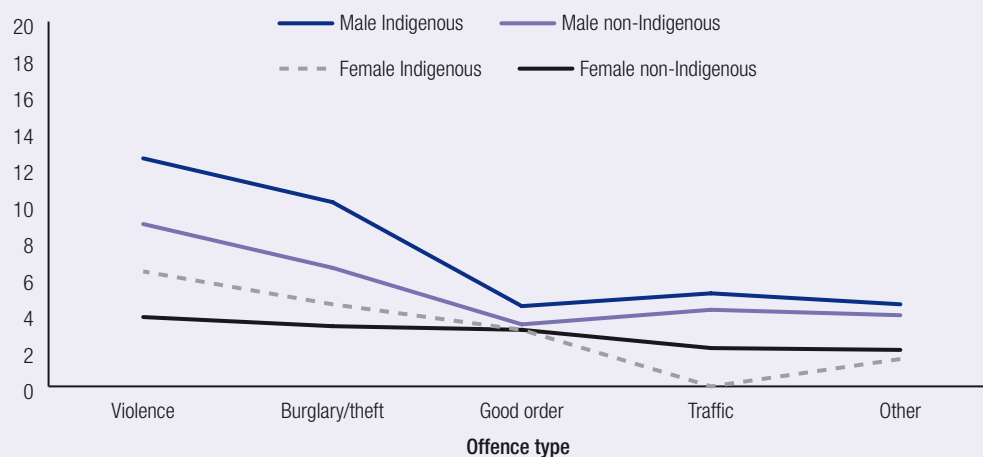
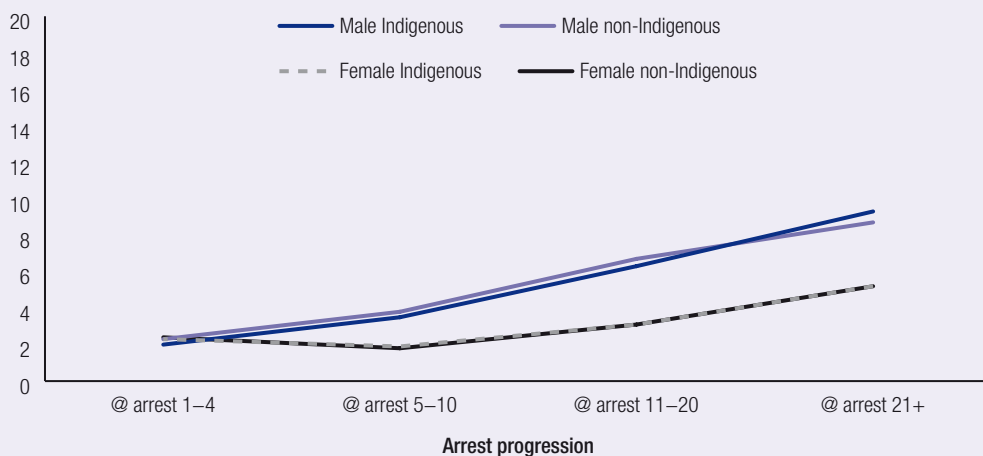
No significant difference between adjusted and unadjusted estimates could be found for any offender group when recidivism estimates were estimated at longer follow-up periods (beyond two years).



**Figure 1** 'Error rates' in KME2 for the *ever imprisoned* population, by various offender characteristics (%)



**Figure 2** ‘Error rates’ in six-month recidivism estimates, for the *ever imprisoned* population, by various offender characteristics (%)





# Discussion

Using population-level, linked datasets, the study has systematically examined the effects of NST and mortality on estimates of recidivism. In contrast to many previous studies, the study has found that adjusting for time spent in custody and mortality makes little difference to the two year recidivism rates of large offender groups. For the general offender population, this result was largely expected as the group contains few offenders who ever spend time in custody. Conversely, it was surprising to find that recidivism rates of other offender populations and in particular, the *ever imprisoned* population, are only moderately impervious to the influences of NST and mortality. The study anticipated that for a group with heavy involvement in the criminal justice system, with known custodial time and with elevated rates of injury and death, the effect of adjusting for NST and mortality might be significant. However, for this group, the 'error rate' in the estimation of recidivism was just two to three percent. The 'error rate' was marginally higher for certain sections of the *ever imprisoned* population such as for non-Indigenous male offenders arrested for violent offence, where the unadjusted KME2 underestimated the true recidivism rate by seven percent.

The study found that underestimation of recidivism tended to increase over shorter follow-up periods. For Indigenous male offenders arrested for violent

offences, the recidivism rate at six months was found to be underestimated by more than 12 percent if NST and mortality were not taken into account.

For researchers, practitioners and evaluators who work with certain segments of the offender population, the study's findings have relevance in that they provide evidence that without controlling for time spent in custody, recidivism estimates could be underestimated by as much as 12 percent for some groups. While this may not seem a large figure per se, when applied in a practical setting or in an evaluation of the effectiveness of a program or intervention, it may mean the difference between action and inaction or between program success and failure. It would be prudent, therefore, for researchers and practitioners to consider making appropriate adjustments, where relevant, when estimating recidivism in future evaluations.

Overall, however, the small-sized effects of NST and mortality should provide reassurance that current methods of estimating population-level recidivism rates are adequate and do not require wholesale recalibration in order to improve their accuracy. Essentially, NST and mortality have been shown to be important, but not critical, factors in the development of accurate and robust population-level models of reoffending.

## Broader policy relevance

The study's finding that only modest adjustments to recidivism rates result from controlling for NST provokes thinking about penal policy and the incapacitation effects of imprisonment. Given that adjustments for time spent in custody appear to have little or no effect on Kaplan-Meier estimates, it is tempting to conclude that incapacitation is ineffective in reducing reoffending. However, such a conclusion would be premature. In reality, the modest effects observed have more to do with factors such as the low prevalence and small magnitude of NST than any limitations of penal policy. On this point, the results seem to suggest that a potentially massive-scale increase in the prevalence of imprisonment would be required if incapacitation were to be effective at a population level. While it was beyond the scope of the current

project to follow this particular line of enquiry, there is clear potential to further examine and test the incapacitation effects of incarceration.

In academic circles, much has been made of NST and its implications with respect to the estimation of recidivism and other criminal career dimensions. On the evidence presented here, it would appear as though those effects may be overstated. At a population level, the underestimation of rates does not appear to be large enough to warrant wholesale reconstruction of recidivism databases or an investment in linkages to better account for NST and mortality. This does not mean though that NST and mortality should be dismissed as important factors in the design and construction of models of reoffending, rather that they are important only some of the time and under certain circumstances. This study has been important in defining just those times and circumstances.



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