Relapse to smoking following release from smoke-free correctional facilities in Queensland, Australia

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Highlights

- 94% of ex-smokers resumed smoking after release from smoke-free prisons.
- 72% of these prior smokers resumed smoking on the day of release from prison.
- Most were smoking less per day than before entering smoke-free prisons.
- Tailored smoking cessation interventions are needed for those leaving prison.
- Such interventions should include behavioral counselling and pharmacotherapy.

Abstract

Background: Smoke-free prison policies are increasingly common, but few studies have investigated relapse to smoking after release from prison. This study investigated return to tobacco smoking and correlates of smoking at reduced levels after release among adults recently released from smoke-free prisons in Queensland, Australia.

Methods: A cross-sectional survey of 114 people at parole offices within two months of release from prison was used. The survey measured health, social, and criminological factors related to tobacco smoking. We used logistic regression to identify factors associated with reduced post-release smoking levels compared to pre-incarceration levels.

Results: 94% of participants relapsed to smoking within two months of release; 72% relapsed on the day of release. 62% of participants smoked significantly less per day after compared with before incarceration. Living with a partner (Odds Ratio (OR) 2.77, 95%CI 1.02-7.52), expressing support for smoke-free prison policies (OR 2.44, 95%CI 1.12-5.32), intending to remain abstinent post-release (OR 4.29, 95%CI 1.88-9.82), and intending to quit in the future (OR 3.88, 95%CI 1.66-9.07) were associated with reduced smoking post-release. Use of illicit drugs post-release was negatively associated with reduced smoking post-release

(OR 0.27, 95%CI 0.09-0.79). In multivariate analyses, pre-release intention to remain smoke-free was associated with reduced smoking post-release (AOR 2.69, 95%CI 1.01-7.14).

Discussion: Relapse to smoking after release from smoke-free prisons is common, but many who relapse smoke less than before incarceration, suggesting that smoke-free prison policies may reduce post-release tobacco smoking. There is a need for tailored, evidence-based tobacco cessation interventions for people recently released from prison.

Keywords: Tobacco Use Cessation; Smoke-Free Policy; Prisoners; Vulnerable Populations

1. Introduction

Tobacco smoking is a major cause of illness and death globally (WHO, 2013). While tobacco use has been declining in most countries due to decades of tobacco control measures (GBD 2015 Tobacco Collaborators, 2017), some population groups continue to smoke at high levels, including people who experience incarceration. Prisoners smoke tobacco at a rate two to five times that of the general population (AIHW, 2014a; Baybutt et al., 2014); point prevalence is estimated at 56% for American prison entrants in 2014 (Binswanger et al., 2014) and 74% for Australian prison entrants in 2015 (AIHW, 2015). A major reason for this high rate of tobacco use among people entering prison is that population groups in which the prevalence of smoking is high in the community (e.g., people from disadvantaged socio-economic backgrounds (AIHW, 2015; Twyman et al., 2017), Indigenous people (AIHW, 2014b, 2013), people with mental illness (Fazel and Seewald, 2012; White and Whiteford, 2006), and people with substance use problems (AIHW, 2015; Butler et al., 2003; Richter et al., 2002) are over-represented among correctional populations (AIHW, 2015; Baker et al., 2006; Belcher et al., 2006). Tobacco smoking is also entrenched in prison culture, serving a variety of purposes such as stress relief, boredom alleviation, or as a common ground for

socialising (AIHW, 2013; Butler et al., 2007). A study of people released from prison in the United States (US) found that each additional five years of history of incarceration was associated with 1.3 times greater odds of smoking, suggesting that exposure to incarceration may be an important determinant of smoking (Howell et al., 2015).

In an attempt to improve the health of smokers, and non-smokers exposed to second-hand smoke, tobacco smoking has been banned in many correctional facilities around the world, including in New Zealand (Bonita and Beaglehole, 2013), most states and territories of Australia (Butler and Yap, 2015), several European countries (Baybutt et al., 2014; Hartwig et al., 2008), Canada (Collier, 2013), and most states of the US (Kennedy et al., 2015). Smoke-free policies are also currently being introduced across prisons in England and Wales (Woodall and Tattersfield, 2017). There is evidence for the health benefits of correctional smoking bans (Clarke et al., 2015; Dickert et al., 2015), with one study reporting a 9% decrease in smoking-related deaths in US prisons that had implemented tobacco bans (Binswanger et al., 2014). However, studies conducted in the US (Clarke et al., 2013; Frank et al., 2016; Howell et al., 2015; Lincoln et al., 2009; Thibodeau et al., 2010; Valera et al., 2016) have found that the majority of people resume smoking upon release from smoke-free prisons; between 60% (Clarke et al., 2013; Lincoln et al., 2009) and 74% (Frank et al., 2016) resume smoking on the day of release, and 97% relapse within six months of release (Lincoln et al., 2009). A recent systematic review of this literature (de Andrade and Kinner, 2016) confirmed that correctional smoking bans result in short-term smoking cessation only and are insufficient to promote long-term smoking abstinence following release from prison. These high rates of tobacco relapse among people leaving prison are especially discouraging given evidence that correctional populations experience particularly poor physical (Binswanger et al., 2007; Morrow, 2009) and mental (Borschmann et al., 2016; Thomas et al., 2016) health outcomes following release from prison, including significantly higher rates of smoking-

related illness (Binswanger et al., 2007; Rosen et al., 2008) and mortality (Binswanger et al., 2016) compared to the general community. People leaving prison also experience numerous challenges to successful community re-entry, such as finding housing and employment (Baldry et al., 2003; Porter, 2014), re-establishing relationships (Massoglia et al., 2011), and dealing with substance use disorders (Farrell and Marsden, 2008; Winter et al., 2015), so tobacco smoking cessation may not be a high priority among this vulnerable population (Thibodeau et al., 2010).

Currently, the literature investigating rates of smoking relapse following release from smoke-free prisons is exclusively US-based, and these studies all report absolute post-release smoking status only; none have compared pre- and post-incarceration daily tobacco smoking rates to examine the effect of incarceration in smoke-free correctional facilities on levels of tobacco use after release from prison. Using a sample of adults recently released from smoke-free prisons in Queensland, Australia, this study aimed to (a) investigate time to tobacco smoking relapse following release from prison, (b) compare pre- and post-incarceration daily smoking rates, and (c) identify correlates of smoking at reduced daily levels following release from prison.

2. Methods

This study measured return to tobacco smoking among ex-smokers released from smoke-free prisons in Queensland, Australia in two phases: a cross-sectional survey and a two-month telephone follow-up.

2.1 Participant recruitment

Participants were recruited from 12 Probation and Parole offices across South-East Queensland. Participants were eligible to take part in the study if (1) they were daily smokers on entry to prison, (2) they had been released from prison within the past two months (as the majority of relapses occur within two months of a quit attempt (Hughes et al., 2004)), (3)

they were on parole and reporting in person to a Probation and Parole office, (4) they had been out of prison for at least one full day (24 hours), and (5) their most recent period of imprisonment was longer than one week (≥ 8 days), to provide sufficient exposure to the smoking ban. The Australian correctional system consists of prisons only, and the median expected time to serve for sentenced prisoners is 1.8 years (Australian Bureau of Statistics, 2017a). Twenty-one percent of people serving community-based corrections orders in Australia have been released from full-time prison custody to parole (Australian Bureau of Statistics, 2017b).

2.2 Data collection

In phase one of the study, parole officers identified potentially eligible participants and referred them to meet with the primary researcher in a private room within the parole office. Following screening for eligibility, the researcher explained the study and provided a written, plain language information sheet. Those who agreed to participate provided written consent. Surveys typically took 20 minutes to complete, and participants were provided with a $20 supermarket voucher as a reciprocity payment.

In phase two, participants who did not report having returned to smoking at the time of the survey were asked for their telephone number, and the researcher contacted them two months after their prison release date to assess their smoking status at that time. Ethical clearance for the study was granted by Griffith University's Human Research Ethics Committee.

2.3 Measures

Time to smoking relapse and daily smoking rates for those who reported relapse were measured using the timeline follow-back method (Brown et al., 1998; Sobell and Sobell, 1992), where a calendar was used to record the number of cigarettes smoked on each day since release from prison. The survey examined potential correlates of reduced tobacco use

following release across five domains: socio-demographic, mental and physical health, incarceration history, tobacco use, and other drug use. Exposed and unexposed categories for each variable and the data source are described in the Supplementary Table[1].

2.4 Data analysis

First, for participants who reported relapse to smoking, we calculated time to smoking relapse following release from prison. Next, we compared the number of cigarettes smoked per day before and after their most recent period of incarceration using a paired samples t-test. We performed univariate and multivariate logistic regression analyses with post-release tobacco use (reduced vs. same or more) as the outcome. Variables significant at $p<0.05$ in univariate analyses were included in a multivariate logistic regression model. An additional variable controlled for the amount of time between prison release and participation in the study. Statistical analyses were conducted using Stata version 13.1 (Stata, 2013).

3. Results

3.1 Sample

A total of 114 participants completed the survey. The sample characteristics were generally reflective of prisoners in Queensland (Australian Bureau of Statistics, 2017a). Ninety-eight participants (86%) were male, and the mean age was 33.8 years (range 18-63). Seventy percent of participants were Caucasian Australian, 23% identified as Indigenous Australian, and 7% were born outside of Australia. Participants had been incarcerated for a median of 14 weeks (interquartile range (IQR 9-24 weeks) and out of prison for a median of 30 days (IQR 19-48 days). Table 1 presents descriptive statistics according to change in smoking from before to after prison (less per day vs. same or more).

[1] Supplementary material can be found by accessing the online version of this paper at http://dx.doi.org and by entering doi:…

3.2 Relapse to tobacco smoking

In the two months following release from prison, 107 (94%) participants resumed tobacco smoking. Figure 1 shows the rapid decrease in tobacco abstinence in the time following release from prison. By the end of the day of release from prison, 32 (28%) participants were still abstinent from smoking. By the end of the first week following release, 13 (11%) were still abstinent, and at two months following release only 7 (6%) participants were still abstinent from smoking. All participants (n=7) who reported smoking abstinence at the time of the survey were reached by telephone at two months post-release and confirmed their continued abstinence; no participants were lost to follow-up.

Despite this high rate of smoking relapse following release, 71 (62%) participants were smoking less per day compared to pre-incarceration daily smoking levels (Figure 2). A paired samples t-test (two-tailed) showed that daily smoking frequency was significantly reduced from a mean of 21 cigarettes per day (SD=11.4) before incarceration to a mean of 11 cigarettes per day (SD=9.2) following release; $t(113) = 6.45$, $p<0.001$.

3.3 Correlates of reduced post-release daily tobacco use

Table 1 presents unadjusted (OR) and adjusted odds ratios (AOR) for the association between variables of interest and post-release tobacco use (reduced vs. same or more) following release from smoke-free prisons. In the unadjusted models, smoking at reduced daily rates following release from smoke-free prisons was positively associated with living with a partner (OR 2.77, 95%CI 1.02-7.52), expressing support for smoke-free correctional policies (OR 2.44, 95%CI 1.12-5.32), pre-release intention to remain abstinent following release (OR 4.29, 95%CI 1.88-9.82), and future intention to quit smoking (OR 3.88, 95%CI 1.66-9.07). Use of injectable drugs since release was negatively associated with reduced smoking post-release (OR 0.27, 95%CI 0.09-0.79). There was no association between days since release from prison and post-release smoking frequency (p=0.62). In the multivariate

model, the only variable independently associated with reduced smoking frequency after release from prison was pre-release intention to remain smoke-free following release (AOR 2.69, 95%CI 1.01-7.14).

4. Discussion

In this sample of prior smokers recently released from smoke-free prisons, 94% of participants returned to smoking following release, and 72% relapsed within 24 hours. Despite high rates of relapse, on average participants reported smoking significantly less per day than before they entered prison. While these findings are consistent with US-based literature showing that post-release smoking relapse rates are high (Clarke et al., 2013; Frank et al., 2016; Howell et al., 2015; Lincoln et al., 2009; Thibodeau et al., 2010; Valera et al., 2016), they also reveal for the first time reduced levels of daily tobacco use following release from smoke-free prisons.

There are a number of possible reasons for these reduced levels of tobacco consumption following release. First, participants may have purchased less tobacco due to the financial stress often experienced by people recently released from prison (Pogrebin et al., 2014; Siahpush et al., 2003). To the extent that this is the case, one might expect improved financial position to be associated with increased smoking levels over longer-follow-up periods. A second possibility is that participants may have found it difficult to immediately return to pre-incarceration levels of smoking due to the physiological effects of tobacco use following a period of abstinence. Studies of forced abstinence in other settings with smoke-free policies (e.g., inpatient psychiatric or drug rehabilitation facilities) have reported reductions in daily smoking levels post-discharge (Gariti et al., 2002; Stockings et al., 2014; Strong et al., 2012), but none of these studies provided explanation for these reductions and none followed participants further than six months post-discharge to investigate whether these reduced levels of tobacco use were maintained. Future research involving long-term

follow-up of people released from prison is needed to determine whether these reduced levels of tobacco use are maintained or whether people eventually return to pre-incarceration levels of tobacco use, as well as to explore the motivations behind reduced tobacco consumption post-release.

We identified a number of factors associated with smoking at reduced levels following release from prison. First, those living with a partner smoked less following release, providing possible corroboration for the positive role of social support in reducing tobacco use (Dimoff and Sayette, 2017; Hanson et al., 1990; Mermelstein et al., 1986; Murray et al., 1995). People who expressed support for the correctional smoke-free policy also smoked at reduced levels following release, providing justification for the implementation of prison-based awareness campaigns promoting these policies. Conversely, those who used injectable drugs following release from prison were less likely to reduce their smoking, which is consistent with previous research showing that people with a history of illicit substance use were less likely to plan to remain abstinent following release from smoke-free prisons (Indig and Haysom, 2012), less likely to remain abstinent (Howell et al., 2015), and less likely to attempt to quit smoking following relapsing (Frank et al., 2016). Among people in Australian prisons, illicit drug offenses are the second-most prevalent (15% of all offences (Australian Bureau of Statistics; 2017)). Efforts to provide successful post-release tobacco cessation programs for this population should be combined with co-ordinated treatment for other substance use— this approach has demonstrated effectiveness in the general community (Prochaska et al., 2004; Thurgood et al., 2016).

Finally, our results confirm the important influence of intention to quit on future smoking behaviours, with future intention to quit smoking related to decreased tobacco use post-release in unadjusted analyses, and pre-release intention to remain abstinent associated with reduced post-release levels of tobacco use in both the unadjusted and adjusted analyses.

These results are again consistent with the findings of other studies showing that pre-release intention to remain smoke-free predicts post-release smoking abstinence (Bock et al., 2013; Clarke et al., 2013; Thibodeau et al., 2010). They also provide justification for smoking cessation interventions with this population to include components aimed at increasing motivation to quit and self-efficacy, such as motivational interviewing (Lindson-Hawley et al., 2015), a technique shown to be effective in helping people released from smoke-free prisons to maintain post-release smoking abstinence (Clarke et al., 2013).

People released from smoke-free prisons have a head-start on smoking cessation, as most have been abstinent past the duration of nicotine withdrawal (Shiffman et al., 2006). However, the lack of investment in programs designed to support smoking abstinence after release from prison means that the benefits of correctional smoking bans are lost soon after return to the community. Despite previous research providing support for the effectiveness of prison-based smoking cessation interventions involving behavioural counselling (Clarke et al., 2013; Cropsey et al., 2008; Naik et al., 2014), smoking cessation pharmacotherapy (Awofeso et al., 2001), or a combination of the two (Jalali et al., 2015; Makris et al., 2012; Richmond et al., 2013, 2006), there are very few reports of correctional facilities currently providing any form of smoking cessation support to prisoners (Hefler et al., 2016; Jalali et al., 2015; Quit Victoria, 2017). We are unaware of *any* organised efforts, internationally, to reduce smoking relapse following release from prison. Some U.S. jails are selling customised e-cigarettes as a means of aiding smoking cessation (Curry et al., 2014), but there is debate about whether these represent an effective harm reduction strategy or renormalise smoking among a population with very high rates of tobacco-related illness (Young-Wolff et al., 2015).

Based on our results and other available literature, we recommend a comprehensive policy and practice shift designed to provide evidence-based smoking cessation support to

people released from smoke-free prisons. Available evidence (Clarke et al., 2013; Jalali et al., 2015; Makris et al., 2012; Richmond et al., 2013, 2006) shows that such interventions should (1) be delivered both prior to and following prison release; (2) incorporate behavioural counselling, specifically cognitive behavioural therapy and motivational interviewing aiming to increase intention to quit and reduce other illicit drug use; and (3) encourage use of smoking cessation pharmacotherapy. In the Australian context, smokers entering smoke-free prisons are prohibited from accessing government-subsidised tobacco cessation pharmacotherapies to assist with the symptoms of forced cessation, barring them from accessing a low-cost and highly effective (Cahill et al., 2013) means of smoking cessation support. This is in direct contravention of international human rights obligations to provide equivalent healthcare (Plueckhahn et al., 2015). However, use of such pharmacotherapy post-release should be encouraged— especially in light of recent evidence (Puljević et al., 2017) showing that fewer than one in ten prior smokers accesses smoking cessation pharmacotherapy following release from prison.

Furthermore, with only four published studies (all based in the US) that have investigated the impact of smoke-free policies on prisoners' health, (Binswanger et al., 2014; Clarke et al., 2015; Dickert et al., 2015; Heng et al., 2007) and only one randomised controlled trial that has rigorously evaluated an intervention designed to reduce post-release smoking relapse (Clarke et al., 2013), there is a pressing need for investment in further high-quality research aimed at investigating best-practice methods for promoting continued tobacco abstinence among people leaving smoke-free prisons. Additionally, as all other literature in this area focuses on absolute post-release smoking status only (Clarke et al., 2013; Frank et al., 2016; Howell et al., 2015; Lincoln et al., 2009; Thibodeau et al., 2010; Valera et al., 2016) and shows a near 100% post-release smoking relapse rate (Clarke et al., 2013; Frank et al., 2016; Lincoln et al., 2009), research comparing pre- and post-incarceration

smoking levels may provide a more useful measure of the effect of correctional smoke-free policies on post-release return to tobacco smoking.

Those under correctional supervision are an easily targeted population who could benefit from targeted, evidence-based health promotion messages and interventions (Cropsey et al., 2012; Frank et al., 2016). The lack of evidence-based smoking cessation support programs for this vulnerable population, and the lack of high-quality research to support these programs, is a missed public health opportunity in terms of both improving the health of a population with especially poor health outcomes and in reducing the cost of treating smoking-related illness in this marginalised and underserved population (Cohen et al., 2008; Kauffman et al., 2008; Rumberger et al., 2010).

4.1 Limitations

This study is, to the best of our knowledge, the first to investigate smoking behaviour after release from smoke-free prisons outside of the US and the first to consider changes in frequency of smoking among those who relapsed. As such, our findings lay the groundwork for future studies. This study had four notable limitations. First, due to the small sample size, the study was underpowered for multivariate analyses, and replication in other settings is required to confirm generalisability. Second, although there was no significant association between time since release from prison and number of cigarettes smoked, the two-month follow-up time frame limited the investigation of subsequent quit attempts or increases in tobacco consumption. Third, the cross-sectional design precluded making causal inferences. A final limitation concerns our use of self-reported data, which can be subject to recall bias or underreporting of illicit behaviours. Smoking behaviours were also measured using self-report instead of through biological verification (e.g., presence of cotinine in urine). However, there is increasing evidence that incarcerated populations often provide reliable self-reported health information (Carroll et al., 2016) and that self-report can be a valid

measure of smoking abstinence (Clarke et al., 2013; Richmond et al., 2013; Short et al., 2009).

4.2 Conclusion

Although this study is consistent with the findings of US-based studies showing a high rate of tobacco smoking relapse following release from smoke-free prisons, people released from smoke-free prisons in Queensland, Australia typically smoked significantly less than before incarceration. Improving motivation to quit, support for smoke-free policies, and providing co-ordinated treatment for other illicit drug use may improve smoking cessation outcomes among former prisoners. These findings provide justification for the introduction of tailored smoking cessation interventions aimed at those leaving smoke-free prisons, with a focus on combined behavioural and pharmacotherapy smoking cessation support, to improve the health of a profoundly vulnerable and often ignored population.

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Contributors

Conception and design of study: CP, SK, DdA, RC; Data analysis: DdA, CP; Drafting the manuscript: CP; Editing the manuscript: SK, DdA, RC, CP; Approval of the manuscript to be published: CP, SK, DdA, RC. All authors contributed to and approved of the final version of the manuscript.

Conflict of interest

No conflict declared.

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Figure Legends

Figure 1. Percentage of participants remaining abstinent from tobacco smoking following release from smoke-free correctional facilities over time.

Figure 2. Change in daily cigarette consumption from before to after incarceration.

Figure 1.

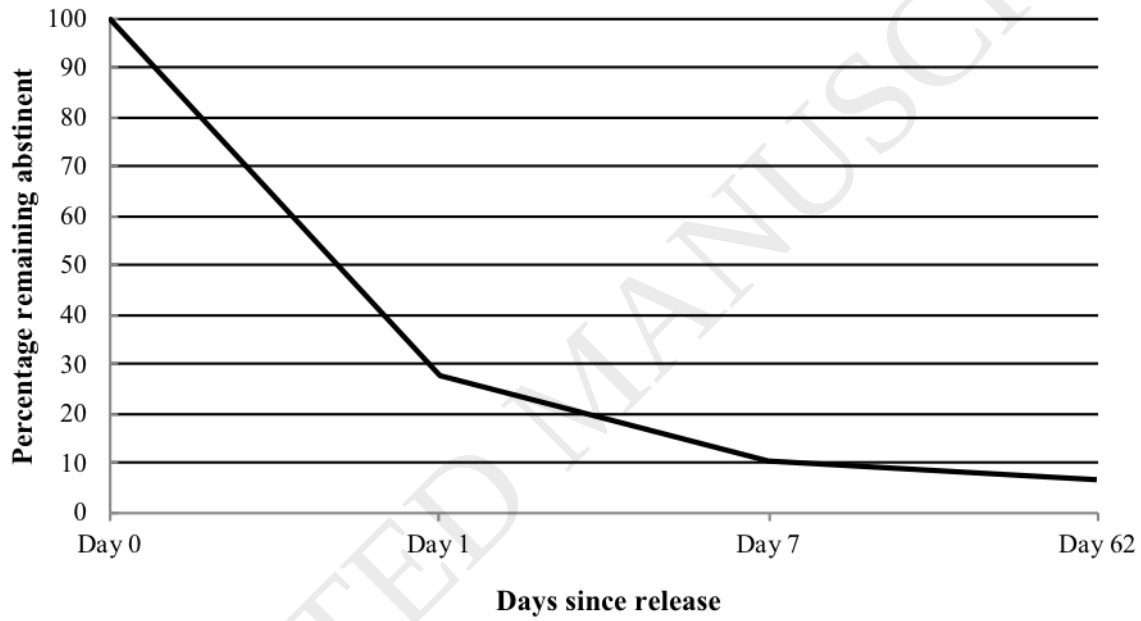

Figure 2.

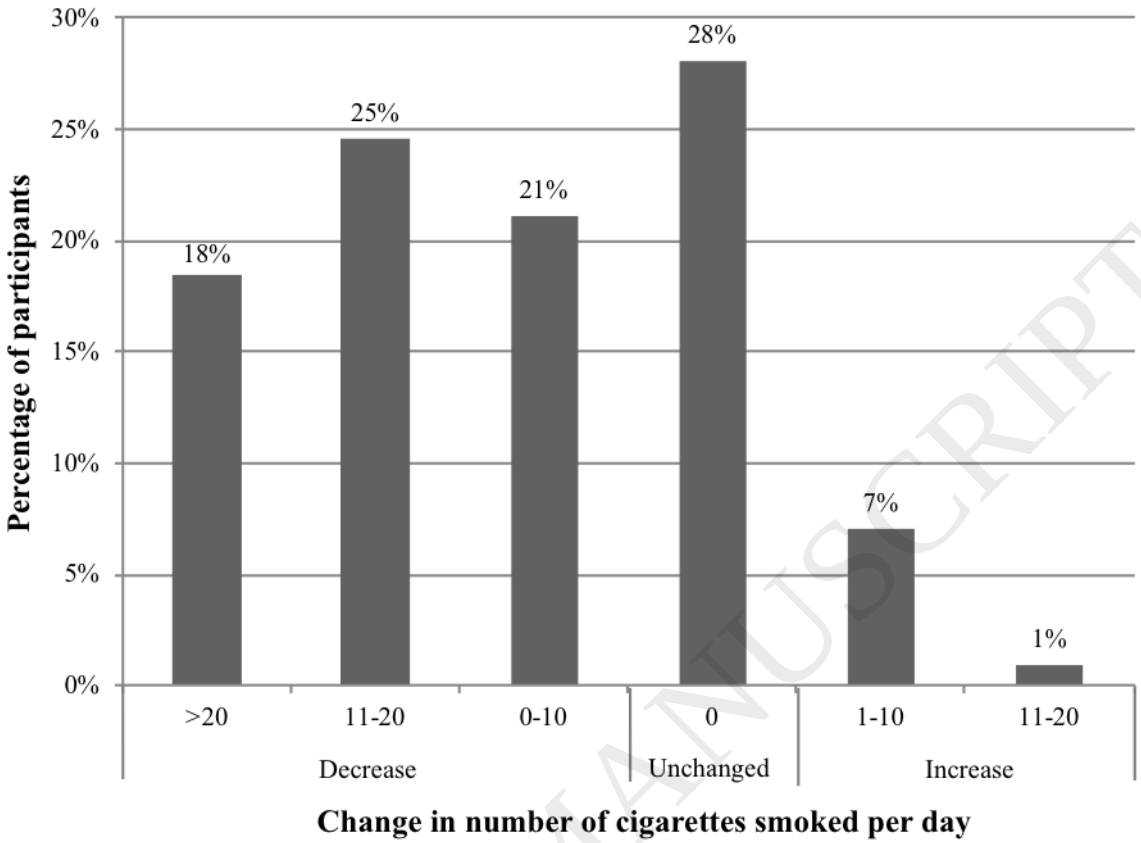

Table 1: Descriptive statistics and unadjusted and adjusted odds of smoking at reduced levels following release from smoke-free prisons according to baseline characteristics (N=114)

Characteristic (exposed)	Number (%) with characteristic (N=114)	Number (%) smoking less (n=71)		OR (95%CI)	AOR (95%CI)
		With characteristic	Without characteristic		
Socio-demographic					
Age ≥ 25 years	95 (83)	61 (64)	10 (53)	1.61 (0.60-4.36)	
Male	98 (86)	60 (61)	11 (69)	1.39 (0.45-4.32)	
Indigenous Australian	26 (22)	17 (65)	54 (61)	1.19 (.048-2.97)	
Lives in disadvantaged area (SEIFA)[a]	80 (70)	50 (62)	21 (62)	1.03 (0.45-2.36)	
Lives with partner	28 (24)	22 (78)	49 (57)	2.77 (1.02-7.52)*	2.55 (0.84-7.65)
Mental and physical health					
High depression score[b]	32 (23)	18 (56)	53 (65)	0.70 (0.30-1.62)	
Poor physical health[c]	23 (20)	11 (48)	60 (66)	0.47 (0.19-1.20)	
Incarceration history					
≥5 times in adult prison	36 (31)	25 (69)	46 (59)	1.58 (0.68-3.66)	
Most recent period of incarceration >20 weeks	47 (41)	30 (64)	41 (61)	1.12 (0.52-2.42)	
Tobacco use					
Smoked tobacco in prison	21 (18)	16 (76)	55 (59)	2.21 (0.75-6.55)	
Supported the prison smoke-free policy	58 (50)	42 (72)	29 (52)	2.44 (1.12-5.32)*	1.34 (0.53-3.38)
Pre-release intention to remain abstinent following release	76 (66)	56 (74)	15 (39)	4.29 (1.88-9.82)**	2.69 (1.01-7.14)*
Future plans to stop smoking (MTSS)[d]	81 (71)	58 (72)	13 (39)	3.88 (1.66-9.07)**	1.97 (0.71-5.48)
High proportion of social network smoke[e]	16 (14)	9 (56)	62 (63)	0.75 (0.26-2.16)	
Other drug use					
High risk alcohol use since release (AUDIT-C)[f]	46 (40)	32 (70)	39 (57)	1.70 (0.77-3.75)	
Cannabis use since release	13 (11)	6 (46)	65 (64)	0.47 (0.15-1.52)	
Injectable drug use since release	17 (14)	6 (35)	65 (67)	0.27 (0.09-0.79)*	0.37 (0.19-1.12)
Mean number of days between release and survey (SD)	32.2 (17)	31.5(17)		0.99 (0.97-1.02)	

*p=<0.05; **p=<0.01; [a] Socio-economic Indexes for Areas (SEIFA) score of 3 or below (Queensland Government Statistician's Office, 2011); [b] A score of 3 on a three-level depression index (Cooper et al., 2016; Whooley et al., 1997); [c] self-reported assessment of physical health as poor (vs. good); [d] MTSS: Motivation to Stop Scale score ≥2 (Kotz et al., 2013); [e] self-reported that "most or all" family members and friends smoke (vs. more than half, about half, less than half, or none); [f] AUDIT-C: Alcohol Use Disorders Identification Test Consumption score ≥4 (Bradley et al., 2007).