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**The uptake of foil from needle and syringe provision services and its role in smoking or snorting heroin among people who inject drugs in Scotland.**

**Accepted manuscript**

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## **The uptake of foil from needle and syringe provision services and its role in smoking or snorting heroin among people who inject drugs in Scotland.**

Background: In the UK, legislation was implemented in 2014 allowing needle and syringe provision (NSP) services to offer foil to people who inject drugs (PWID) to encourage smoking rather than injecting. This paper aims to examine the association between foil uptake and smoking or snorting heroin among PWID. This is the first large scale national study to examine foil uptake and smoking or snorting heroin among PWID post legislative change.

Method: Data from 1453 PWID interviewed via Scotland's Needle Exchange Surveillance Initiative in 2017-2018 were analysed using multivariate logistic regression.

Results: Overall, 36% of PWID had obtained foil from NSP services in the past six months. The odds of smoking or snorting heroin were higher among those who had obtained foil (Adjusted Odds Ratio (AOR) 3.79 (95% CI 2.98-4.82)  $p < 0.001$ ) compared to those who had not. Smoking or snorting heroin was associated with lower odds of injecting four or more times daily (AOR 0.60 (95% CI 0.40-0.90)  $p = 0.012$ ) and injecting into the groin or neck (AOR 0.57 (95% CI 0.46-0.71)  $p < 0.001$ ) but increased odds of having had a SSTI (AOR 1.49 (95% CI 1.17-1.89)  $p = 0.001$ ) and having experienced an overdose both in the past year (AOR 1.58 (95% CI 1.18-2.10)  $p = 0.002$ ).

Conclusion: The promotion of smoking drugs via foil provision from NSP services may contribute to the package of harm reduction measures for PWID alongside the provision of injecting equipment. We found that those in receipt of foil were more likely to smoke or snort heroin, and that smoking or snorting heroin was associated with a lower likelihood of some risky injecting behaviours, namely frequent injecting and injecting into the groin or neck. But it remains uncertain if the provision of foil can lead to a reduction in health harms, such as SSTI and overdose. Future research is needed to understand PWID motivations for smoking drugs, obtaining foil from NSP services, and its uses particularly among polydrug users.

Keywords: people who inject drugs, people who smoke heroin, foil provision, harm reduction, health harms, polydrug use

## **INTRODUCTION**

Foil as a tool to smoke drugs is offered to people who inject drugs (PWID) as a form of harm reduction both internationally and within the UK. The drug is smoked by inhaling the vapours produced from heating it over a piece of foil (Gossop, Griffiths, & Strang, 1988). Of the 30 countries currently monitored by the EMCDDA, 12 were involved in the distribution of non-injecting drug paraphernalia, such as foil and pipes, to people who use drugs in 2017 (European Monitoring Centre for Drugs and Drug Addiction, 2019). During the 1990s there were national campaigns to promote foil use among PWID in Amsterdam including foil provision to PWID by outreach workers and in prisons (Kools, 2009). In 2013, the UK government legislated that foil could be legally distributed to PWID by drug treatment services, including needle and syringe provision (NSP) services upon the advice of the Advisory Council on the Misuse of Drugs (Advisory Council on the Misuse of Drugs, 2010; Home Office, 2013). Legislative change was formally implemented in September 2014, although some harm reduction services had provided foil prior to this change (Ryan-Mills & Stephenson, 2016).

Foil provision could potentially enable/encourage PWID to transition away from injecting drugs, such as heroin or crack-cocaine, to smoking (Advisory Council on the Misuse of Drugs, 2010). The ACMD's recommendation was based on judgements that foil provision would help with the engagement of drug users with services to deliver harm reduction messaging and to promote route transitioning away from injecting. The promotion of smoking drugs over injecting, in turn, could have the potential alongside injecting equipment provision to reduce injecting-related harms including: blood borne viruses; systemic infections; skin and soft tissue infections (SSTI); venal damage; and overdose (Advisory Council on the Misuse of Drugs, 2010).

There is limited research on the use of foil as a harm reduction intervention (Bridge, 2010) and on the impact of interventions to support route transitions to non-injecting (Des Jarlais et al., 2018). Stöver and Schäffer (2014) examined the promotion of 'SMOKE-IT' packs

(containing foil and information about smoking heroin) among PWID attendees at five drug consumption rooms in Germany. They found that 65% (66/101) of participants used the foil to smoke heroin instead of injecting (Stöver & Schäffer, 2014). In England, Pizzey & Hunt (2008) used routinely collected needle exchange transaction data from four NSP services to report that 54% (174/320) of attendees had collected foil and foil uptake was more common among women than men (Pizzey & Hunt, 2008). Post UK legislative change, Ryan-Mills and Stephenson (2016) examined the sales of foil from suppliers to service providers and undertook qualitative interviews with NSP staff. They found that foil supply to service providers increased after the change in legislation and NSP professionals believed that foil was particularly appealing to clients with injecting site issues - such as those who inject into the groin (Ryan-Mills & Stephenson, 2016). There have been no foil related studies conducted with PWID in the UK post legislative change.

The main aim of this paper was to examine the association between foil uptake from NSP services and smoking or snorting heroin among PWID. In addition, we aimed to explore the association between smoking or snorting heroin and injecting-related behaviours (namely, injecting frequency and body site of injection), and injecting-related health harms (namely, skin and soft tissue infections ((SSTI) and overdose). This is the first large scale national study to examine foil uptake and smoking or snorting heroin among PWID post UK legislative change.

## METHODS

### Data source

We used data collected via the Needle Exchange Surveillance Initiative (NESI) conducted in 2017-2018. NESI is a voluntary, cross-sectional, anonymous, bio-behavioural survey of PWID carried out across mainland Scotland since 2008. PWID were recruited by trained, independent research staff within 139 NSP services, typically community pharmacies, which represented over 50% of the national total. Eligible participants were those who had injected

drugs at least once in the past with 'current PWID' (i.e. those who have injected the past six months) accounting for 70% of the sample. With written consent, participants completed an interviewer-administered questionnaire. Participants were compensated for their time with a £5 shopping voucher. Ethical approval was granted by the West of Scotland NHS Research Ethics Committee (REC Ref: 08/S0709/46).

#### Outcome and exposure variables

Five self-reported outcome measures were included: i) smoked or snorted heroin ('In the last 6 months, have you smoked or snorted heroin (no, yes)?'); ii) SSTI in the past year ('In the last year, have you ever had an abscess (a swelling containing pus) at a site you have injected into or a sore/open wound at a site you have injected into? (no, yes)'); iii) overdose in the past year ('In the last year, have you overdosed to the point of losing consciousness? (no, yes)'); iv) injecting frequency ('In the months when you injected drugs how often on average did you inject'); v) main body site of injection ('In the last six months into which body part have you mainly injected? (arms, hands, groin, legs, feet, neck, other). Frequency of injection was re-categorised into two variables: 'whether injected four or more times a day' (no, yes) and 'whether injected daily or more' (no, yes). Main body site of injection was re-categorised into three separate variables: 'mainly injected arms or hands' (no, yes); 'mainly injected into groin or neck' (no, yes); 'mainly injected into legs or feet' (no, yes). The median years of time since onset of injecting was used to guide the re-categorisation of body sites (Darke, Ross, & Kaye, 2001). Time since onset of injecting for those mainly injecting into the arms and hands was 12.36 years (IQR 13.02) and 13.81 years (IQR 10.29) respectively; for legs and feet was 19.71 years (IQR 8.89) and 17.9 years (IQR 10.36) respectively; for groin and neck was 17.13 years (IQR 10.70) and 13.81 years (IQR 14.91) respectively. Groin and neck were grouped together as these two body sites are considered particularly risky injecting sites (Darke et al, 2001). The likelihood of damaging the groin and neck is high as it is difficult to observe the injection into these sites and as the veins in these sites are large

any damage caused to them may result in serious circulatory problems or life-threatening infections.

The following exposure measures included self-reported: i) foil uptake; ii) smoked or snorted heroin. Foil uptake was measured by 'In the last six months, did you obtain foil from an exchange (no, yes)?'. Smoked or snorted heroin was measured by 'In the last 6 months, have you smoked or snorted heroin (no, yes)?'.

### Statistical Analysis

Analysis was conducted on 1453 PWID who had injected in the past six months following de-duplication<sup>1</sup> and removal of those who exclusively injected performance and image enhancing drugs (n=16). Pearson's  $X^2$  test was applied to examine associations with participant demographics and foil uptake. A series of univariate and multivariate regression models were used to examine the associations between: i) foil uptake and whether smoked or snorted heroin; ii) whether smoked or snorted heroin and associated health harms (SSTI and overdose) stratified by whether had injected cocaine in the past six months; iii) whether smoked or snorted heroin and injecting frequency (stratified by whether had injected cocaine), and body site of injection. Stratification by cocaine injection was conducted posteriori. Although heroin remains the dominant drug injected, the numbers of PWID injecting cocaine in Scotland has risen from 9% to 29% between 2010 and 2017/2018 (Health Protection Scotland, Glasgow Caledonian University, & West of Scotland Specialist Virology Centre., 2019). Cocaine injecting is associated with increased injecting frequency and risk of associated health harms (Coffin et al., 2003; Van Beek, Dwyer, & Malcolm, 2001).

Confounders selected for inclusion in the multivariate logistic regression models included those drawn from the literature known to be associated with the outcome variables. For

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<sup>1</sup> Duplicate cases were identified using initials, gender and date of birth. Where a duplicate case was identified the earliest or first record was selected for inclusion unless a latter case had the first positive record of foil uptake (that is, the variable under study).

smoking or snorting heroin this included: methadone use, biological sex, injected cocaine in past six months, time since onset of injecting, injecting frequency (Gossop et al., 1988; Gossop, Stewart, Marsden, Kidd, & Strang, 2004; Ryan-Mills & Stephenson, 2016; Stöver & Schäffer, 2014; Strang, Griffiths, Powis, & Gossop, 1999). Whether foil was available in the health board at time of the interview and whether an individual was homeless in the past six months were also added given their association with foil uptake (Table 1). For SSTI, confounders included: methadone use, biological sex, time since onset of injecting, injecting frequency, needle/syringe uptake in the past six months and whether homeless in the past six months (Dunleavy et al., 2017; Larney, Peacock, Mathers, Hickman, & Degenhardt, 2017; Lloyd-Smith et al., 2008). For overdose, confounders included: methadone use, biological sex, time since onset of injecting, excessive weekly alcohol consumption, whether prescribed naloxone in the past year, whether homeless in past six months (Darke & Hall, 2003; Handanagic, Bozicevic, Sekerija, Rutherford, & Begovac, 2019; O'Halloran et al., 2017; Riley et al., 2016). For injecting frequency, confounders included methadone use, biological sex, time since onset of injecting, whether homeless in past six months (Colledge et al., 2020; Fortier et al., 2020; Van Beek et al., 2001). For main body site of injection, confounders included: methadone use, biological sex, injected cocaine in past six months, time since onset of injecting, injecting frequency, whether homeless in past six months (Darke et al., 2001; Karimi et al., 2014; Rhodes et al., 2006). Regression was statistically significant at  $p < 0.05$ . SPSS Version 24 was used for all the analysis.

## **RESULTS**

The majority of the sample were male (75%, 1083/1449), 69% (1004/1451) were aged 35 years or older, 28% (401/1451) had been homeless in the past six months and 76% (1102/1450) were currently receiving methadone. Approximately a third (31%, 446/1444) had been injecting for twenty or more years, 92% (1340/1448) and 31% (450/1448) had injected heroin and cocaine respectively in the past six months, and 51% (733/1440) had smoked or snorted heroin in the past six months.

Overall, 36% (511/1422) of participants reported they had obtained foil from NSP services in the previous six months. In bi-variate analysis, foil uptake was associated with homelessness in the previous six months, having injected heroin in the past six months and having been interviewed in a health board area that had introduced foil at the time of the interview (Table 1).

[Table 1 in here].

The association between smoking or snorting heroin and foil uptake is presented in Table 2. Multivariate analysis shows that those who had obtained foil had significantly higher odds of having smoked or snorted heroin in the past six months when compared to those who had not obtained foil (AOR 3.79, 95% CI 2.98-4.83). Notably, 40% (358/902) of those who did not obtain foil had smoked or snorted heroin in the past six months.

[Table 2 in here].

Table 3a presents the association between smoking or snorting heroin and injecting frequency. Table 3a shows that among those who smoked/snorted the likelihood of having injected four or more times a day was lower (AOR 0.60, 95% CI 0.40-0.89) but there was no difference in the odds of daily injecting (AOR 0.93, 95% CI 0.75-1.15). Supplementary Table 1 presents the above stratified by whether or not had injected cocaine in the past six months. This shows that there were no significant differences in injecting frequency when stratified by whether or not had injected cocaine.

[Table 3a in here].

The association between smoking or snorting heroin and body site of injection is presented in Table 3b. Multivariate regression shows that those who smoked or snorted heroin had significantly higher odds of having injected into arms or hands (AOR 1.72, 95% CI 1.37-

2.16), and significantly lower odds of having injected into the groin or neck (AOR 0.57, 95% CI 0.46-0.71) than those who had not smoked or snorted heroin.

[Table 3b in here].

Table 4 presents the association between associated health harms and smoking or snorting heroin. Multivariate analysis shows that those PWID who had smoked or snorted heroin had significantly higher odds of having had a SSTI in the past year compared to those who had not smoked or snorted heroin (AOR 1.49, 95% CI 1.17-1.89) and had significantly higher odds of having overdosed in the past year compared to those who had not smoked or snorted heroin (AOR 1.58, 95% CI 1.18-2.10).

[Table 4 in here].

Supplementary analysis, presented in Table S2, which stratified the above by whether or not had injected cocaine in the past six months, showed that among those who had injected cocaine, those who had smoked or snorted heroin were more likely to have had a SSTI in the past year (AOR 2.12, 95% CI 1.36-3.28); and that among those who had not injected cocaine, those who smoked or snorted heroin were more likely to have overdosed in the past year (AOR 1.79, 95% CI 1.22-2.62).

## **DISCUSSION**

Foil uptake from NSP services among PWID was low overall but was associated with increased likelihood of smoking or snorting heroin. Smoking or snorting heroin in the past six months was associated with a reduced likelihood of riskier injecting practices, namely injecting four or more times daily and into the groin or neck, but an increased likelihood of having had a SSTI or an overdose in the previous year. This is the first population-level assessment of foil uptake among PWID and the first study to examine foil uptake and smoking or snorting heroin since the 2014 UK legislation which permitted the supply foil as a

harm reduction strategy. The promotion of smoking drugs via foil provision from NSP services may contribute to the package of harm reduction measures for PWID alongside the provision of injecting equipment. It may have been used by some PWID to help avoid or provide a temporary break from some riskier injecting practices and it may help NSP services to engage with, or appeal to, those PWID who have recently experienced health harms such as SSTI and overdoses.

We found that approximately a third of PWID who had injected in the past six months had obtained foil from NSP services in the previous six months. Of the 36% who had obtained foil, the majority (70%) smoked or snorted heroin in the previous six months. Our foil uptake from NSP services was 18% lower than that reported by Pizzey and Hunt (2008) prior to legislative change but the extent of its use to smoke or snort heroin was comparable to Stöver and Schäffer's (2014) study where 65% of PWID who obtained foil from drug consumption rooms had used it to smoke heroin instead of injecting. Notably, we found that 40% of PWID who did not obtain foil had smoked or snorted heroin, this suggests that this group missed the potential for a harm reduction dialogue that can be facilitated via foil provision. More research is needed to inform the services why this group did not access foil provision. Although, since our study foil provision in Scotland has been actively promoted within some health boards and has increased by 125% from 1.1 million distributed sheets in 2017/2018 to 2.4 million in 2019/2020 (Public Health Scotland, 2020). Our study found that foil uptake was higher within those health boards from which foil was available at the time of the survey, suggesting the importance of its availability. Although, a health board may provide foil there is no guarantee that availability is ubiquitous across all services or outlets within that health board. In 2019/2020, about three quarters of NSP services in Scotland distributed foil (Public Health Scotland, 2020). Our findings also show that around a third (30%) of those who obtained foil from NSP services did not smoke or snort heroin. This may

suggest they smoked or snorted other drugs (we were unable to test this as we had no data on what other drugs were smoked or snorted), obtained the foil just in case, felt obliged to take it from services with no intention of using it or were involved in secondary distribution. Secondary distribution of foil among the drug using network occurs (Pizzey & Hunt, 2008). Further research into the motivations behind foil uptake among PWID, how it is used, and the drugs smoked off foil is merited.

We also found that amongst all PWID, smoking or snorting heroin was associated with a reduced odds of riskier injecting behaviours; namely, injecting four or more times daily and into the groin or neck in the past six months. This may suggest the avoidance or taking breaks from these practices by smoking or snorting heroin. For some PWID smoking drugs using foil can be a temporary or intermittent avoidance of injecting rather than an intermediate stage of route transitioning towards injecting abstinence (Gossop et al., 2004). It may appeal to some PWID for wound management, during periods of poor venous access or when veins need a rest (Dunleavy, Hope, Roy, & Taylor, 2019; Pizzey & Hunt, 2008; Stöver & Schäffer, 2014), to avoid injecting into the groin (Ryan-Mills & Stephenson, 2016) or to avoid re-using unsterile needle and syringes. NSP services have actively promoted foil to clients for such reasons and are recommended to do so by public health guidance (Public Health England, 2014; Ryan-Mills & Stephenson, 2016). Indeed, veins needing a rest may be a sign that they were struggling to inject, which may reflect the higher prevalence of SSTI among those PWID who smoked or snorted heroin. Smoking drugs among PWID can also be used for gauging drug purity and adulteration prior to injecting (Harris, Forseth, & Rhodes, 2015; Mars, Ondocsin, & Ciccarone, 2018). More research is needed to understand the impact of foil provision from the services on preventing and reducing use of the riskier injection sites, such as the groin (Hope et al., 2015). Groin injecting which is prevalent among PWID and is on the increase in the UK is considered to be partly due to the aging

cohort of PWID (Public Health England, 2018). In Scotland, 45% of PWID used the groin as their main injecting site in the past six months; the most common injecting site reported (Health Protection Scotland et al., 2019). Groin injecting is considered an extremely risky practice due to the potential for damage to the femoral vein, femoral artery and nerves (Public Health England, 2018) and has been associated with serious harms such as, deep vein thrombosis and septicaemia (Hope et al., 2015). Nevertheless, for some PWID, groin injecting can be viewed as an acceptable risk because it can be more convenient, discrete, quicker and less painful (Maliphant & Scott, 2005; Rhodes, Briggs, Kimber, Jones, & Holloway, 2007). Further research is needed to understand PWIDs' perception of smoking or snorting and foil provision for harm reduction to reduce the riskier injecting practices.

We found that smoking or snorting heroin was associated with a higher likelihood of injecting related health harms, namely SSTI or overdose. We do not know the direction or nature of this association. The experience of such injecting related health harms may drive the uptake of foil to smoke or snort heroin, or those with a history of such harms may have been prioritised by NSP services for the promotion of smoking heroin using foil (Ryan-Mills & Stephenson, 2016). Equally, we know that foil has been promoted during outbreaks of serious infection. In Scotland, smoking heroin instead of injecting was promoted during the botulism outbreak among PWID in 2014-2015 and the on-going HIV outbreak among PWID in Glasgow which was first detected in 2015 (Scottish Drugs Forum, 2019; Scottish Drugs Forum & NHS Greater Glasgow and Clyde, 2015). Also, we found that those PWID who had been homeless in the past six months were more likely to have obtained foil, this may suggest that this group were targeted for the promotion of smoking drugs. Homelessness is associated with public injecting (Whittaker et al., 2015) which is a risk factor for SSTI and overdose (Trayner et al., 2020) and public injecting as well as cocaine injecting were implicated in the HIV outbreak (McAuley et al., 2019).

Our findings, when stratified by cocaine injecting, showed that among those who injected cocaine, those who smoked or snorted heroin had a higher likelihood of having had a SSTI than those cocaine injectors who did not smoke or snort. Van Beek et al. (2001) described cocaine injecting, among a group of poly-drug users, as bingeing which was typically characterised by more frequent and frenetic injecting. The experience of SSTI among cocaine injectors may have driven this group to using foil to smoke or snort. Equally, co-use of heroin and cocaine is associated with multi-methods of drug consumption (Roy, Richer, Arruda, Vandermeerschen, & Bruneau, 2013). Further research may be needed to examine the use of foil to smoke drugs by PWID, and foil provision, in the context of polydrug use, multi-routes of drug administration and associated risk environments.

Our study has a number of limitations which we must acknowledge. Our measures of smoking or snorting heroin, and foil uptake relied on self-report responses which may be subject to response bias although self-reported drug use behaviours have previously been found to be reliable (Darke, 1998). Also, our measure of foil uptake from services may be an under-estimate of the overall uptake as our results were based on current PWID only. We were unable to include former PWID in our analysis as the question on foil uptake was asked only of current PWID. Similarly, people who use drugs who have never injected were excluded as NESI is designed to survey former and current PWID. Although, it is not known to what extent our NSP services attract non-injecting people who use drugs PWUD, it has been noted that foil provision can attract this group into NSP services (Ryan-Mills & Stephenson, 2016). We did not have data on sources of foil other than NSP services, such as, secondary distribution. We were therefore unable to measure the potential harm reduction provided to these groups from smoking drugs and foil provision. There was also a mismatch in the time periods for some of our measures – for example, smoking or snorting heroin was measured over six months but the health harms were measured over one year.

This makes it harder to be certain if the behaviours occurred within the same time frame or were relative to each other.

## CONCLUSION

The promotion of smoking drugs via foil provision from NSP services may contribute to the package of harm reduction measures for PWID alongside the provision of injecting equipment. We found that those in receipt of foil were more likely to smoke or snort heroin, and that smoking or snorting heroin was associated with a lower likelihood of some risky injecting behaviours, namely high injecting frequency and injecting into the groin or neck. But it remains uncertain if the provision of foil can lead to a reduction in health harms, such as SSTI and overdose. Future research is needed to understand PWID motivations for smoking drugs, obtaining foil from NSP services, and its uses particularly among polydrug users.

### Conflict of interests

SH has received honoraria from Gilead, unrelated to the submitted work.

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Table 1. Demographics of PWID<sup>1</sup> who had obtained foil from a NSP in the previous six months

Demographic	N	Foil uptake n %	P-value <sup>2</sup>
Sex			0.488
Male	1064	378 (36)	
Female	354	133 (38)	
Missing	35		
Age (years)			0.279
<= 25	44	19 (43)	
26-30	94	41 (44)	
31-35	295	105 (36)	
>35	987	345 (35)	
Missing	33		
Time since onset injecting (yrs.)			0.091
< 10	366	150 (41)	
10-14	256	87 (34)	
15-19	352	128 (36)	
20+	440	144 (33)	
Missing	39		
Homeless in past 6 months			0.005
No	1026	346 (34)	
Yes	394	164 (42)	
Missing	33		
In prison past year			0.561
No	1067	387 (36)	
Yes	336	116 (34)	
Missing	50		
Excessive alcohol <sup>3</sup>			0.434
No	1101	389 (35)	
Yes	310	117 (38)	
Missing	42		
Injected cocaine past 6 months <sup>4</sup>			0.231
No	977	340 (35)	
Yes	441	168 (38)	
Missing	35		
Injected heroin past 6 months			<0.001
No	105	19 (18)	
Yes	1313	489 (37)	
Missing	35		
Methadone use			0.374
Current	1081	390 (36)	
In last 6 months	40	12 (30)	
Past but not last 6 months	190	63 (33)	
Never	109	46 (42)	
Missing	33		

Table 1 (contd). Demographics of PWID<sup>1</sup> who had obtained foil from a NSP in the previous six months

Demographic	N	Foil uptake n %	P-value <sup>2</sup>
Foil available in Health Board <sup>5</sup>			
No	77	14 (18)	0.001
Yes	134531	497 (37)	
Missing			

1. Defined as those who injected in past 6 months and excludes those who solely injected bodybuilding drugs
2. Pearson chi square test
3. Defined as > 14units/week
4. Defined as either cocaine or speedball (speedball = heroin and cocaine/crack together)
5. At the time when participant was interviewed in the Health Board

Table 2. Univariate and multivariate logistic regression examining the association between foil uptake and smoking or snorting heroin in the past 6 months among PWID (2017-2018).

EXPOSURE (in past 6 months)	Smoked/ snorted heroin % (n/N)	OR for 'smoking or snorting heroin' (in past 6 months) OR (95% CIs), p-value	AOR <sup>1</sup> (95% CIs), p-value (n=1390)
Foil uptake			
No	40 (358/902)	1	1
Yes	70 (359/509)	3.64 (2.88 4.59) <0.001	3.79 (2.98 4.83) <0.001
Missing	42		

1. Multivariate model adjusted for: Methadone use (currently on methadone, in the last 6 months, in past but not last 6 months, never), sex (female, male), whether injected cocaine or speedball in past 6 months (no, yes), time since onset of injecting in years (less than 10, 10-14, 15-19, 20 plus), injecting frequency (less than daily, daily or more), whether foil available in health board at time of interview (no, yes), whether homeless in the past 6 months (no, yes).

Table 3a. Univariate and multivariate logistic regression examining the association between smoking or snorting heroin and injection frequency among PWID (2017-2018).

EXPOSURE (past 6 months)	Injected ≥ 4 times a day % (n/N)	OR for 'injected ≥ 4 times daily' (in past 6 months)	
		OR (95% CIs), p-value	AOR <sup>1</sup> (95% CIs), p-value
Smoked/snorted No Yes Missing = 16	9% (65/705) 7% (52/732)	1 0.75 (0.51 1.10) 0.144	1 0.60 (0.40 0.89) 0.012 (n=1421)
EXPOSURE (past 6 months)	Injected ≥ daily % (n/N)	OR for 'injected daily or more' (in past 6 months)	
		OR (95% CIs), p-value	AOR <sup>1</sup> (95% CIs), p-value
Smoked/snorted No Yes Missing = 16	45% (321/705) 45% (327/732)	1 0.97 (0.79 1.19) 0.743	1 0.93 (0.75 1.15) 0.48 (n=1421)

1. Multivariate model adjusted for: Methadone use (currently on methadone, in the last 6 months, in past but not last 6 months, never), sex (female, male), time since onset of injecting in years (less than 10, 10-14, 15-19, 20 plus), whether homeless in the past 6 months (no, yes).

Table 3b. Univariate and multivariate logistic regression examining the association between smoking or snorting heroin and the main body site of injection among PWID (2017-2018).

EXPOSURE (past 6 months)	Arms or hands % (n/N)	OR for 'main injecting site: arms or hands' (in past 6 months)	
		OR (95% CIs), p-value	AOR <sup>1</sup> (95% CIs), p-value
Smoked/snorted No Yes Missing cases = 15	32% (227/705) 48% (353/733)	1 1.96 (1.58 2.42) <0.001	1 1.72 (1.37 2.16) <0.001 (n=1418)
EXPOSURE (past 6 months)	Groin or neck % (n/N)	OR for 'main injecting site: groin or neck' (in past 6 months)	
		OR (95% CIs), p-value	AOR <sup>1</sup> (95% CIs), p-value
Smoked/snorted No Yes Missing cases = 15	55% (385/705) 39% (285/733)	1 0.53 (0.43 0.65) <0.001	1 0.57 (0.46 0.71) <0.001 (n=1418)
EXPOSURE (past 6 months)	Leg or feet % (n/N)	OR for 'main injecting site: leg or feet' (in past 6 months)	
		OR (95% CIs), p-value	AOR <sup>1</sup> (95% CIs), p-value
Smoked/snorted No Yes Missing cases = 15	13% (89/705) 12% (87/733)	1 0.93 (0.68 1.28) p=0.662	1 1.11 (0.80 1.54) 0.550 (n=1418)

1. Multivariate model adjusted for: Methadone use (currently on methadone, in the last 6 months, in past but not last 6 months, never), sex (female, male), time since onset of injecting in years (less than 10, 10-14, 15-19, 20 plus), whether injected cocaine or speedball in past 6 months (no, yes), injecting frequency (less than daily, daily or more), whether homeless in the past 6 months (no, yes).

Table 4. Univariate and multivariate logistic regression examining the association between smoking or snorting heroin and SSTI and overdose stratified by cocaine injection among PWID (2017-2018).

EXPOSURE (past 6 months)	SSTI % (n/N)	OR for SSTI (in past year)	
		OR (95% CIs), p-value	AOR <sup>1</sup> (95% CIs), p-value
Smoked/snorted			
No	24 (171/701)	1	1
Yes	31 (229/728)	1.42 (1.13 1.76) 0.003	1.49 (1.17 1.89) 0.001
Missing = 24			(n=1403)
EXPOSURE (past 6 months)	Overdose % (n/N)	OR for Overdose (in past year)	
		OR (95% CIs), p-value	AOR <sup>2</sup> (95% CIs), p-value
Smoked/snorted			
No	14 (99/691)	1	1
Yes	23 (163/720)	1.75 (1.33 2.30) <0.001	1.58 (1.18 2.10) 0.002
Missing = 42			(n=1383)

1. Multivariate model adjusted for: Methadone use (currently on methadone, in the last 6 months, in past but not last 6 months, never), sex (female, male), time since onset of injecting in years (less than 10, 10-14, 15-19, 20 plus), needle/syringe uptake (<200% - less than twice as many needle/syringes as injections, 200% plus – at least twice as many needle/syringes as injections), whether homeless in the past 6 months (no, yes).
2. Multivariate model adjusted for: Methadone use (currently on methadone, in the last 6 months, in past but not last 6 months, never), sex (female, male), time since onset of injecting in years (less than 10, 10-14, 15-19, 20 plus), exceeded recommended weekly alcohol intake of 14 units (no, yes), whether prescribed naloxone (no, yes), whether homeless in the past 6 months (no, yes).