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# Mapping Service User Needs to inform a Supervised Injecting Room location in Cork, Ireland, EU

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### Summary

**Background:** Supervised injecting facilities (SIF) are intended to reduce the harm related to illicit intravenous drug use. **Aim:** The aim of the study was to map the location of current injecting practices of people who inject drugs (PWID) in Cork, Ireland, and to document the related high risk behaviours, ahead of a planned supervised injecting facility. **Methods:** A cross sectional survey, utilizing geo-mapping software (GMS) mapping, was offered to PWID, at sites within the homeless services, needle exchange, and addiction services. Data was analysed using GPS mapping, and descriptive and inferential statistics. **Results:** 51 PWID completed the survey (98% response), 66.67% were male. The age range was 20-55 years (mean age 30.78 years). 56.9% were in stable accommodation, with 43.1% currently homeless. 92.16% had been tested for HIV/Hepatitis C. 31.5% reported injecting into “high risk” areas (groin and neck), 72.55% injected alone. 58.82% reported injecting at least three times/day, 35.29% reported injecting at least four times/day. 54.9% reported sharing equipment/needles. 58.82% had previously overdosed. 89.3% of recalled overdoses involved an emergency services response. Correlation between history of accidental overdose, and injecting alone was statistically significant ( $p = 0.039$ ), as was previous history of overdose and injecting at least three times per day ( $p = 0.012$ ). 86.27% indicated they would use a SIF. A mapping exercise presented visual information around injecting sites, locations of overdoses, fatal overdoses, and preferred location of the SIF. **Conclusions:** The study provides an understanding of PWID profile and risk behaviours, alongside a geospatial analysis of injecting, overdose and potential location of a SIF in Cork, Ireland. The findings are intended to inform SIF location, and would allow dynamic comparison of both geographic and behavioural changes injecting drug use over time, post SIF provision.

*Key Words:* Safe injecting facility; injecting drug use; location

## 1. Introduction

Supervised Injecting Facilities (SIF) form a controversial part of harm reduction programming for drug users [5, 7, 12, 13, 18, 30, 35, 40, 51]. They aim to reach and engage with high-risk drug users, who are not ready or willing to quit drug use. The recent 2016 European Monitoring Centre for Drugs and Drug Addiction (EMCDDA) analysis of SIF describes three models of delivery; integrated, specialized and mobile [9]. Integrated facilities are incorporated into low-threshold facilities and attempt to address social care including showers, clothing, food, as well as care of the injecting health issues. Special-

ized facilities confine themselves only to the injecting health problems including hygienic injecting, medical observation and intervention when needed. Mobile facilities may be geographically more flexible, but this limits their effectiveness [41]. Over time there is evidence of improved public acceptance of SIF and no increase in drug-related crime [49]. The 2006 report commissioned by the Joseph Rowntree Foundation in the United Kingdom could not find any associated increase in drug use, or that the SIF attracted drug users from other geographical areas, both of which had been raised as community concerns in advance of SIF in an area [19].

As a public health intervention, SIF generally

aim to address the issues of dangerous injecting practices, including groin and neck injecting; unhygienic and dangerous environments, where persons may inject alone, and are open to the elements; reduce incidence of overdose, and help prevent spread of blood borne viruses (BBV) such as HIV and Hepatitis C (HCV) [37, 50]. A cost-benefit analysis conducted by Irwin et al in 2017 found that for every dollar spent on a SIF, \$2.33 would be saved [17]. This saving was from five public health outcomes: reducing incidence of HIV/HCV, reduced skin and soft tissue infection (SSTI), averted overdose deaths, and increased medication-assisted treatment uptake. SIF also attempt to address broader community public health issues such as reducing the dangers associated with discarded drug paraphernalia, and reduce the associated stigma attached to drug use, as “dirty” stigmatised habit [48]. An extension of SIF includes increased access to education and treatment entry, and reduced callout by the emergency medical services to both overdoses and poorly responsive drug induced intoxication [40]. Outcomes include improved interaction with chronic drug users and in doing so increasing uptake into addiction treatment [1, 8, 39, 43].

Currently, eight European countries, including Switzerland provide SIF [9]. The EMCDDA reports that within the seven European Member States (Denmark, France, Germany, the Netherlands, Luxembourg, Spain and Norway), there are 78 SIF in operation [9, 42]. As of 2017, the EMCDDA reported that there are; 31 in the Netherlands, 24 in Germany, 13 in Spain, 12 in Switzerland, five in Denmark, two in Norway, two in France and one in Luxemburg [9]. Many studies identify that people who inject drugs (PWID) would be happy to attend such facilities, [21, 46] but do not mention where they would prefer it to be located, nor objectively analyze where the issues it hoped to address were in fact centred. Few studies have mapped where PWID actually inject, inject alone, overdose, or would suggest to have a SIF [10, 24, 33, 35, 50]. There is a lack of evidence prior to opening such facilities, as to how decisions were informed in maximizing the advantage of its location [6].

Hence, we present findings which underpin decisions around SIF location in the southern city of Cork, Ireland, where services had noted increases in dangerous injecting practices among PWID including a rise in groin injecting, and unsafe environments in which PWID prepare their hit [3]. The study was undertaken against a backdrop of concern around the growing issue of visible drug littering, incidences of

needle stick injury among the non-drug using public, and Dublin HIV outbreak among PWID [11]. In 2017, the Misuse of Drugs (Supervised Injecting Facilities) Act was enacted in order to licence SIF in Ireland [16].

**Aim:** The aim of the study was to map the location of current injecting practices of PWID in Cork, Ireland, and to document the related high risk behaviours, ahead of a planned SIF.

## 2. Methods

### 2.1. Design of the study

A cross-sectional descriptive study was conducted which aimed to profile and map service user needs in the PWID population in Cork, Ireland, and utilize geo -mapping software (GMS) to inform the location need of a SIF.

A survey, utilizing GMS, was offered to PWID, at sites within the homeless services, needle exchange, and addiction services. The survey was administered as a one to one interview by a single clinician. Questions included information about injecting practices, experiences of personal and peer overdose, risk behaviours, and preferred location for a SIF. Participants were asked to map injecting habits and needs, to try to capture the geographic spread of injecting locations, of associated overdose locations, and drug deaths. A series of questions were asked, including utilizing Google-maps to pinpoint locations within the city on a map, to help identify where risky behaviour in relation to injecting drugs was occurring. With the use of Geographic Information System (GIS) Software, this could be cross-referenced to known services, including emergency departments, needle exchange sites, addiction services, and emergency homeless accommodation and ultimately to the service user’s preferred location for a SIF. Core questions included; geographically, where were the issues occurring that a SIF would seek to address in terms of injecting, overdoses & related deaths; to what extent can the results be stratified according to the level of risky behaviour in terms of more frequent injecting, injecting in public/alone, frequency of previous overdose, associated deaths; and to what extent are these issues/risks currently geographically cross-referenced to known services, such as emergency departments, needle exchange sites, addiction services, emergency homeless accommodation, and by the service user’s preferred location for a SIF.

Ethical approval for the study was granted by

**Table 1.** How often do you inject?

Answer choices	Responses	
	N	%
Weekly	3	5.8
Every couple of days	2	3.9
Daily	7	13.7
Twice daily	9	17.6
Three times daily	12	25.5
Four times daily	9	17.6
Five times daily	9	17.6
Total	51	100.0

the Social Research Ethics Committee (S.R.E.C.), University College Cork, Ireland. A participant information sheet, consent and a copy of the topics to be covered at the researcher administered survey were discussed with each potential participant by the clinician (author one). Potential participants were asked to confirm their willingness to participate by indicating their consent and to answer the short questionnaire, and were given the option of withdrawal at any time during the course of the questionnaire.

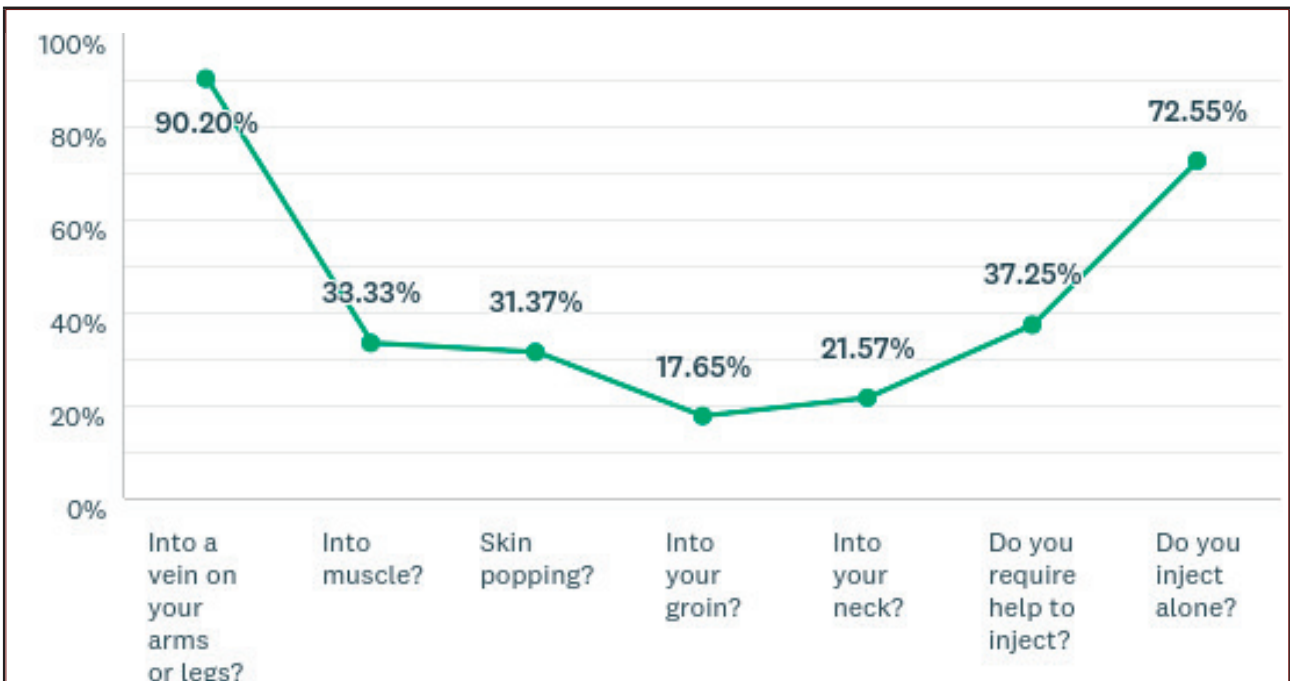
**2.2. Sample**

The study was confined to adult participants 18 years and older, and those who reported current injecting use of drugs within the past six months. Par-

ticipants were recruited based on convenience, from those attending medical clinics in the addiction services, homeless services, and needle exchange services in the city. Persons would be excluded if they were not felt capable of understanding, or consenting to the questions being asked. This was facilitated over three months from June 1st 2017.

**2.3. Data analysis**

Data management was carried out in accordance with current General Data Protection Regulation (GDPR) and in accordance with ethical approval guidelines. Analysis of data was conducted using GPS mapping, and descriptive and inferential statistics. Descriptive statistics were used to summarize and analyse the data using the statistical software Stata version 13.1 (StataCorp, Texas, USA). Analyzed data are presented as either percentages or as numbers in frequency distribution tables. Age group, accommodation status [homeless/not], history of overdose or history of skin infection in the previous 3 months was tested for an association against the high risk injecting (groin/neck), injecting alone, or injecting at least three times daily, using the chi-square test. Associations between the venue type for injecting [private accommodation, public building or open/street space] was tested against age group, accommodation status, history of overdose, sharing of injecting parapherna-



**Graph 1.** How do you usually inject? [Multiple choices allowed]

**Table 2.** Association between Age & High Risk Injecting

High Risk Injecting		Aged 35 years or older		Total
		No	Yes	
No	Count	26	9	35
	% within Aged 35 years or older	65.0%	81.8%	68.6%
Yes, into groin/neck	Count	14	2	16
	% within Aged 35 years or older	35.0%	18.2%	31.4%
Total	Count	40	11	51
	% within Aged 35 years or older	100.0%	100.0%	100.0%

The  $\chi^2$  statistic is 1.133. The Fisher's exact is 0.466. The result is not significant at  $p > 0.287$

lia, or skin infection using the chi-square test also. Finally the history of sharing injecting paraphernalia was tested for an association with history of HCV/ HIV testing. A p-value of  $<0.05$  was considered statistically significant. GMS provided a useful tool to help visualize the data provided by PWID, and helps describe where in the city a SIF would be placed, while comparing this to the service user's preferred location for a SIF. GMS software, ArcGIS was used to try to capture the current geographic spread of injecting locations, previous overdose locations, and known deaths from overdose. This is cross-referenced to known services, including emergency departments, needle exchange facilities, addiction services, and existing needle bins.

### 3. Results

#### 3.1. Participant Profile

51 PWID completed the survey (98% response), of which 66.67% were male. The age range was 20-55 years (mean age 30.78 years). 56.9% were in stable accommodation, with 43.1% currently homeless.

#### 3.2. Injecting Practices

92.16% had been tested for HIV/Hepatitis C, with only 50.98% tested in the past six months. This is concerning given that 54.9% reported sharing equipment/needles. No association was found between sharing equipment/needles and being tested for HCV/ HIV. 31.5% reported injecting into "high risk" areas (groin and neck), and 72.55% injected alone, which places them at higher risk should they overdose, with no one available to call for help. These sites are close to significant arteries and nerves, and so leave the user at risk of catastrophic arterial sequelae, or neural damage, if the injection is misplaced. PWID usually resort to these sites when they no longer can find peripheral venous access. See Chart 1.

Table 1 gives an indication of how often PWID would need to access a SIF. 58.82% reported injecting at least three times/day, while 35.29% reported injecting at least four times/day. 54.9% reported sharing equipment/needles. 21.57% reported a SSTI, and 13.7% had attended the emergency services in the previous three months.

Although no association was recorded in between the older age group and injecting alone (72.7%

**Table 3.** Association between Overdose History and Injecting Alone

Injects Alone		Accidentally overdosed?		Total
		Yes	No	
0	Count	5	9	14
	% within Have you ever accidentally gone over/overdosed?	16.7%	42.9%	27.5%
Alone	Count	25	12	37
	% within Have you ever accidentally gone over/overdosed?	83.3%	57.1%	72.5%
Total	Count	30	21	51
	% within Have you ever accidentally gone over/overdosed?	100.0%	100.0%	100.0%

The  $\chi^2$  statistic is 4.255. The Fisher's exact is 0.057. The result is significant at  $p < 0.05$

**Table 4.** Association between Overdose History & Injecting Frequency

Injects at least three times daily		Accidentally overdosed?		Total
		Yes	No	
No	Count	8	13	21
	% within Have you ever accidentally gone over/overdosed?	26.7%	61.9%	41.2%
Yes	Count	22	8	30
	% within Have you ever accidentally gone over/overdosed?	73.3%	38.1%	58.8%
Total	Count	30	21	51
	% within Have you ever accidentally gone over/overdosed?	100.0%	100.0%	100.0%

The  $\chi^2$  statistic is 6.333. The Fisher's exact is 0.020. The result is significant at  $p < 0.05$

v 72.5%), the number reporting injecting at least three times per day was higher among those >35yrs, (72.7% v 55%) and high risk injecting was lower amongst >35yr olds (18.2% v 35.9%, Table 2). These findings were not statistically significant ( $p = 0.988$ ,  $p = 0.290$  and  $p = 0.287$ , respectively). Being homeless was tested for an association with the three injecting patterns; high risk injecting into the groin/neck, injecting alone, or injecting at least three/day. Homeless PWID reported less high risk injecting (27.3% v 34.5%), injected alone more (77.3% v 69.0%), and injecting at least three times per day close to those who were in stable accommodation (54.5% v 62.1%), but these findings were not statistically significant ( $p = 0.583$ ,  $p = 0.510$  and  $p = 0.589$ , respectively).

### 3.3. Overdose

PWID are at significant risk of accidental overdose, and place a large burden on the emergency services to respond to these events. This is one of the main pillars on which SIFs were constructed. 58.82%

had previously overdosed, including 6.12% in the last six months. 89.3% of recalled overdoses involved an emergency services response. While those that reported a history of overdose also reported high risk injecting more (33.3% v 28.6%), this was not statistically significant,  $p = 0.718$ . Correlation between history of accidental overdose, and injecting alone was statistically significant ( $p = 0.039$ ) (Table 3), as was previous history of overdose and injecting at least three times per day ( $p = 0.012$ ) (Table 4).

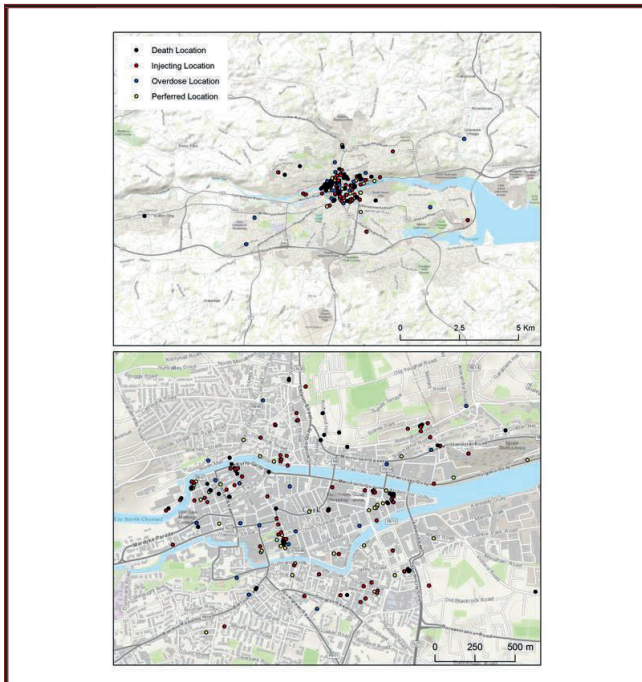
### 3.4. Injecting and overdose locations

86.27% indicated they would use a SIF. Participants were asked where they currently injected, had experienced an overdose, or knew of an overdose death occurring in the past. Within each of these questions they were asked to describe if the location was within a private accommodation, in a public building, or out in the open/street space. They were given the opportunity to give three answers to each type of question, as they may inject or have overdosed in more than one

**Table 5:** Location type

			OD	Death
Is this in private accommodation	Count	35	20	36
	%	26.1%	42.5%	62.06%
Is it in a public building	Count	53	15	11
	%	39.5%	31.9%	18.97%
Is it in an open/street space	Count	46	12	11
	%	34.3%	25.5%	18.97%
Emergency Services	Count [%]		42 [89.3%]	
Total	Count	134	47	58
	%	100.0%	100.0%	100.0%

Inject -Where do you usually inject?  
 OD-Where did you [accidentally] overdose?  
 Death-Where did the drug related death occur



**Figure 1.** Fatal overdose, injecting, overdose and preferred SIF location.

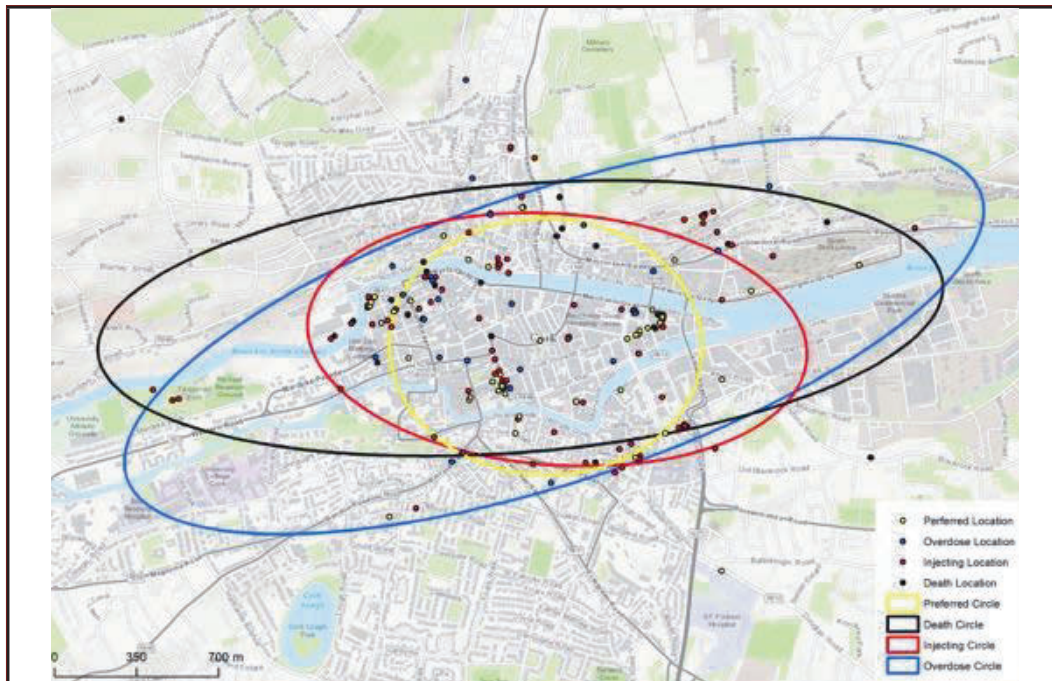
location, and similarly may have known of an overdose in more than one location. Participants had no issue identifying multiple injecting locations, but less likely to identify overdose locations, and death locations (Table 5). 90.2% of respondents knew of someone who had died from an overdose. Users identified that overdose occurred relatively more commonly in

private, as did known deaths. Emergency services were asked to attend in 89.3% of overdoses.

Those in the homeless category identified injecting in public buildings more (46.6% v 34.2%), but this was tempered by the fact that many of those in this category injected in their homeless emergency room, and this was classed as private ( $p = 0.345$ ). Although no difference was seen between the two age categories injecting on the street (37.9% v 40.0%), those aged 35 years or older injected more in private accommodation (41.4% v 21.9%), and less on the street (20.7% v 38.1%). This did not reach statistical significance ( $p = 0.070$ ). Tests for an association between injecting location type and history of overdose, sharing injecting paraphernalia, or a history of SSTI in the previous three months, did not reveal large differences ( $p = 0.947$ ,  $p = 0.448$  and  $p = 0.210$ , respectively).

### 3.5. Geo-mapping of SIF, existing services, injecting and overdose Locations

A mapping exercise presented visual information around injecting sites, locations of overdoses, fatal overdoses, and preferred location of the SIF. Participants identified where they injected, and this was sub typed as described above, into public buildings, private accommodation, or open/street space. Similarly participants identified where they had had



**Figure 2.** 1SD weighted ellipses of all locations, by behaviour type.

a history of accidental overdose, knew of an overdose death, and where they would subjectively like to place the SIF themselves. Using these GPS coordinates, the GIS software was able to generate maps of the data. The data was first mapped together, to visualize obvious outliers, and then expanded to just visualize the main focus of activity (Figure 1).

In Figure 2 we overlaid the weighted ellipses of each of the main mapping questions. While the overdose and death distributions are larger, which may indicate the more widespread dispersion of fewer data points, the injecting ellipse is focused on the city centre, as is the user preferences for a SIF location.

#### 4. Discussion

We present here findings from an exercise undertaken in a city in south Ireland to profile and map service user needs in the PWID population, and utilize geo-mapping software to inform the location need of a SIF. GIS allows both static and dynamic illustration of public health issues, and can use statistical parameters to confine the data, and help make objective decisions [4, 14, 26, 36, 28, 52]. This is especially important in the case of SIF as it permits service provision, and social contexts to be visualized within the data, and inform policy makers of the potential public health impact on PWID, related mortality and morbidity, and relevant clinical issues. Potential trends evidenced in this study include high risk injecting practices into the groin and neck, and injecting alone, and future impact studies can compare whether an improvement can be seen in such practices with provision of a SIF in a targeted location. As this study found an association between injecting alone ( $p = 0.039$ ), or injecting at least three times per day ( $p = 0.012$ ) and overdose, GIS could be used to map where such activities are concentrated, and again whether this is focused in public toilets or homeless accommodation.

The provision of SIF are often in response to community outcry around public injecting, and its associated problems, and only secondarily to the public health issue of injecting drug users themselves [44]. The study emphasises the importance of consultation with the PWID community in order to best understand where injecting and overdose sites are located, in order to accurately establish where best to situate a SIF, and in order to full engage with the local communities. This may help reduce the objections of “Not In My Backyard”, and instead bring pragmatism to this public health debate [5, 39]. It will also better

understand the existing PWID in terms of injecting risk behaviours and locations, and in defining the associated risk behaviour which establishment of a new SIF might address. 86.27% of participants in this study agreed they would use a SIF if available, and which compares to 71% in Sydney, while Vancouver reported between 37% and 92% willingness to attend a SIF [21, 27-29, 37, 38, 46, 48]. A high proportion of PWID in this study injected frequently during the day, and thus highlighting the need for sufficient service provision in terms of opening times. An overview in 2014 of 62 SIF found that there was a wide variation in the available opening hours of such facilities with just over half providing a daily service; open on average eight hours per day [51].

The study provides a cross-sectional view of Cork city’s drug injecting practices, including risk-taking injecting behaviours such as sharing drug taking apparel, and high risk behaviour including injecting alone, and injecting into the groin and neck. Of the PWID in this study, 58.8% had previously overdosed, including 6.12% in the last 6 months, and 89.3% of recalled overdoses involved an emergency services response. This compares to a previous Irish study in 2015, which found that 60% had an overdose history, with 10% in the previous 6 months, and illustrates the on-going need for an intervention [15]. SIF have been shown in many studies to prevent PWID from overdosing both within SIF, and to reduce overdose mortality [8, 31, 32]. Studies of Insite, the SIF in Vancouver, have estimated that 5% of the neighbourhood’s overdoses occur within the facility, but that between 7% and 43% of the neighbourhoods overdoses may be further prevented outside, as a result of education from the SIF [34].

The study suggests that 25.5% of accidental overdoses in Cork occur on the street, with 18.9% of the fatal overdose recalled by PWID as having occurred on the street. This compares to the estimated risk of overdose 10 times higher for street overdoses than in SIF [1]. 42.5% of overdoses in this Irish study occurred in private accommodation and 32.9% in public locations. In Norway, ambulance call out times were more likely to be longer to overdose callouts to private locations than to public locations [29]. This is important for the emergency services to understand, with many of these private accommodations representing homeless emergency rooms, reflected in the fact that 43.1% of participants in this study were categorized as currently homeless and 56.9% in stable accommodation. 21.57% reported an SSTI, and 13.7% had attended the emergency services in the



previous 3 months. This can be compared to a study in Vancouver, where a cohort study estimated that 22% of PWID reported an SSTI in the previous 6 months [28]. Post establishment studies of SIFs suggests that SSTI are reduced in degree and number [27, 40]. 92.16% had been tested for HIV/HCV, only 50.98% recalled being tested in the last 6 months, but 54.9% reported sharing equipment/needles. Current Irish data of PWID places the estimated number infected with HCV at 12, 423 (95%CI: 10 799-13 161) [2]. SIF reduce HIV/HCV transmission by reducing needle sharing and through education [1, 22, 23]. Vancouver's SIF has been shown to reduce needle-sharing by as much as 70% [20]. Many HCV infections remain undiagnosed with as many as two in five PWID living with HCV, but half undiagnosed. One in four PWID have not been vaccinated for Hepatitis B, and one in three PWID reported having had bacterial infections at injection sites [37]. There is recent evidence that opening a SIF can further change drug use behaviour and syringe disposal. In a large Danish study, drug users reported being less stressed or rushed, injected less outdoors, and no longer shared needles even when the facility was closed at night [25]. Between 2004 and 2012, Barcelona reported a fourfold decrease in syringe litter [47].

### Limitations

The sample size is small, and so limits the applicability to other cities. There is acknowledged duplication in the recounting of known overdose deaths, as the PWID population is small and closely connected, which means that any death within this community is communicated throughout the population. The pool of respondents, while representing current injecting practices, may not capture the most chaotic users, who do not attend any of the survey sites, and equally may not capture the early intravenous drug users, as they may as yet not attend services for assistance. A SIF would hope to capture both of these populations.

## 5. Conclusions

The study provides an understanding of PWID profile and risk behaviours, alongside a geospatial analysis of injecting, overdose and potential location of a SIF in Cork, Ireland. The findings are intended to inform SIF location, and would allow dynamic comparison of both geographic and behavioural changes injecting drug use over time, post SIF provision. Ultimately, the benefits of this mapping study are to in-

form the new national drug strategy, and to identify possible deficiencies and solutions to improving the current and future locations and availability of treatment in the City of Cork, Ireland. This could improve treatment for persons who inject drugs and reduce waiting times for those wishing to access treatment. It may also inform treatment and harm reduction services in the design and implementation of an information leaflet for PWID and their service providers to signpost where services are currently located in relation to need.

## References

1. Bravo, M. J., Royuela, L., De la Fuente, L., Brugal, M. T., Barrigo, G., Domingo-Salvany, A., Itínere Project Group. (2009): Use of supervised injection facilities and injection risk behaviours among young drug injectors. *Addiction*. 104(4): 614-619.
2. Carew, A. M., Murphy, N., Long, J., Hunter, K., Lyons, S., Walsh, C., Thornton, L. (2017): Incidence of hepatitis C among people who inject drugs in Ireland. *Hepatol Med Policy*. 2: 7.
3. Cork Local Drug & Alcohol Task Force. (2015): *Medically Supervised Injection Centres*. Available at <http://www.corkdrugandalcohol.ie/resources/medically-supervised-injection-centres/#>
4. Cromley, E. K., McLafferty, S. L. (2002): *GIS and public health*. The Guilford Press, New York.
5. Csete, J., Kamarulzaman, A., Kazatchkine, M., Altice, F., Balicki, M., Buxton, J., Cepeda, J., Comfort, M., Goosby, E., Goulão, J., Hart, C., Kerr, T., Madrazo Lajous., Lewis, S., Martin, N., Mejía, D., Camacho, A., Mathieson, D., Obot, I., Ogunrombi, A., Sherman, S., Stone, J., Vallath, N., Vickerman, P., Zábanský, T., Beyrer, C. (2016): Public Health and international drug policy. *Lancet*. 387(10026): 1427-1480.
6. Davies, G. (2010): A Critical Evaluation of the Effects of Safe Injection Facilities. *J Glob Drug Policy Pract*. Available at <https://pdfs.semanticscholar.org/5788/5de17b210927023c7c1a338ef6e7e24c4327.pdf>
7. De Jong, W., Weber, U. (1999): The professional acceptance of drug use: A closer look at drug consumption rooms in the Netherlands, Germany and Switzerland. *Int J Drug Pol*. 10(2): 99-108.
8. DeBeck, K., Kerr, T., Bird, L., Zhang, R., Marsh, D., Tyndall, M., Montaner, J., Wood E. (2011): Injection drug use cessation and use of North America's first medically supervised safer injecting facility. *Drug Alcohol Depend*. 113(2-3): 172-176.
9. EMCDDA. (2016): *Drug consumption rooms: an overview of provision and evidence*. European Monitoring Agency for Drugs & Drug Addiction, Lisbon. Available at <http://www.emcdda.europa.eu/topics/pods/>

- drug-consumption-rooms
10. Fry, C., Fox, S., Rumbold, G. (1999): Establishing safe injecting rooms in Australia: attitudes of injecting drug users. *Aust N Z J Public Health*. 23(5): 501-504.
  11. Giese, C., Igoe, D., Gibbons, Z., Hurley, C., Stokes, S., McNamara, S., Ennis, O., O'Donnell, K., Keenan, E., De Gascun, C., Lyons, F., Ward, M., Danis, K., Glynn, R., Waters, A., Fitzgerald, M., outbreak control team. (2015): Injection of new psychoactive substance snow blow associated with recently acquired HIV infections among homeless people who inject drugs in Dublin, Ireland. *Euro Surveill*. 20(40), 40.
  12. Harm Reduction Coalition. (2016): *Harm Reduction Intervention at Civil Society Hearing for UN High Level Meeting on HIV/AIDS*, 6th April 2016. Benjamin Phillips Harm Reduction Coalition, New York.
  13. Hedrich, D., Hartnoll, R. (2015): Harm reduction interventions. In: El-Guebaly, N., Carrà, G., Galanter, M. (Eds.) *Textbook of addiction treatment: International perspectives*, Section IV: Main elements of a systems approach to addiction treatment, Springer, Milan. pp. 1291–1313.
  14. Heubl, B. (2014): *Can Public Health Data Mapping and Visualization Transform Healthcare Globally?* Digital Health UK Correspondent, 07/31/2014. Available at <http://hitconsultant.net/2014/07/31/can-public-health-data-mapping-transform-healthcare-globally/>
  15. Horan, J.A., Deasy, C., Henry, K., O'Brien, D., Van Hout, M. C. (2015): Overdose risk perceptions and experience of overdose among heroin users in Cork, Ireland. Preliminary results from a pilot overdose prevention study. *Heroin Addict Relat Clin Probl*. 17(5): 19-26.
  16. Irish Statute Book. (2015): *Misuse Of Drugs (Amendment) Act 2015*. Government of Ireland, Irish Statute Book. Available at <http://www.irishstatutebook.ie/eli/2015/act/6/enacted/en/html>
  17. Irwin, A., Jozaghi, E., Blunthenthal, R. N., Kral, A. H. (2017): A Cost-Benefit Analysis of a Potential Supervised Injection Facility in San Francisco, California, USA. *J Drug Issues*. 47(2): 164-184.
  18. Jauffret-Roustide, M., Pedrono, G., Beltzer, N. (2013): Supervised consumption rooms: The French paradox. *Int J Drug Policy*. 24(6): 628–630.
  19. Joseph Rowntree Foundation. (2006): *The Report of the Independent Working Group on Drug Consumption*. Joseph Rowntree Foundation, York.
  20. Kerr, T., Tyndall, M., Li, K., Montaner, J., Wood, E. (2005): Safer injection facility use and syringe sharing in injection drug users. *Lancet*. 366(9482): 316-318.
  21. Kerr, T., Wood, E., Small, D., Palepu, A., Tyndall, M. W. (2003): Potential use of safer injecting facilities among injecting drug users in Vancouver's Downtown Eastside. *CMAJ*, 169(8): 759-763.
  22. Kerr, T., Kimber, J., DeBeck, K., Wood, E. (2007): The role of safer injection facilities in the response to HIV/AIDS among injection drug users. *Cur HIV/AIDS Rep*. 4(4): 158-164.
  23. Kimber, J., Dolan, K. (2007) Shooting gallery operation in the context of establishing a Medically Supervised Injecting Center: Sydney, Australia. *J Urban Health*. 84(2): 255-266.
  24. Kimber, J., MacDonald, M., van Beek, I., Kaldor, J., Weatherburn, D., Lapsley, H., Mattick, R. P. (2003): Sydney Medically Supervised Injecting Centre: Client characteristics and predictors of frequent attendance in the first 12-months of operation. *J Drug Issues*. 33(3): 639-649.
  25. Klinnard, E. N., Howe, C. J., Kerr, T., Skjødt, H. V., Marshall, B. D. (2014): Self-reported changes in drug use behaviors and syringe disposal methods following the opening of a supervised injecting facility in Copenhagen, Denmark. *Harm Reduct J*. 11(1): 29.
  26. Lefer, T. B., Anderson, M. R., Fornari, A., Lambert, A., Fletcher, J., Baquero, M. (2008): Using Google Earth as an Innovative Tool for Community Mapping. *Public Health Rep*. 123(4): 474–480.
  27. Lloyd-Smith, E., Wood, E., Zhang, R., Tyndall, M. W., Sheps, S., Montaner, J. S., Kerr, T. (2010): Determinants of hospitalizations for a cutaneous injection -related infection among injection drug users: A cohort study. *BMC Public Health*, 10: 327.
  28. Lloyd-Smith, E., Kerr, T., Hogg, R. S., Li, K., Montaner, J. S. G., Wood, E. (2005): Prevalence and correlates of abscesses among a cohort of injection drug users. *Harm Reduct J*. 2: 24.
  29. Madah-Amiri, D., Clausen, T., Myrmel, L., Brattebø, G., Lobmaier, P. (2016): Circumstances surrounding non-fatal opioid overdoses attended by ambulance services. *Drug Alcohol Rev*. 36(3): 288-294.
  30. Maher, L. Salmon, A. (2007): Supervised injecting facilities: how much evidence is enough? *Drug Alcohol Rev*. 26(4): 351-353.
  31. Marshall, B. D., Milloy, M. J., Wood, E., Montaner, J. S. G., Kerr, T. (2011): Reduction in overdose mortality after the opening of North America's first medically supervised safer injecting facility: a retrospective population-based study. *Lancet*. 377(9775): 1429-1437.
  32. Marshall, B. D., Milloy, M. J., Wood, E., Montaner, J. S. G., Kerr, T. (2012). Overdose deaths and Vancouver's supervised injection facility -Authors' reply. *Lancet*. 379(9811): 118-119.
  33. Medically Supervised Injecting Centre [MSIC] Evaluation Committee. (2003): *Final report of the evaluation of the Sydney Medically Supervised injecting Centre*. MSIC Evaluation Committee, Sydney. Available at [http://www.drugsandalcohol.ie/5706/1/MSIC\\_final\\_evaluation\\_report.pdf](http://www.drugsandalcohol.ie/5706/1/MSIC_final_evaluation_report.pdf)
  34. Milloy, M. S., Kerr, T., Tyndall, M., Montaner, J., Wood, E. (2008): Estimated drug overdose deaths averted by North America's first medically-supervised safer injection facility. *PLoS ONE*, 3(10): e3351.
  35. Potier, C., Laprévote, V., Dubois-Arber, F., Cottencin,

- O., Rolland, B. (2014): Supervised injection services: What has been demonstrated? A systematic literature review. *Drug Alcohol Depend.* 145: 48–68.
36. Primary Health Care Research & Information. (2018) *Data mapping in Primary Health Care*. Primary Health Care Research and Information Service. Available at [http://www.phcris.org.au/guides/mapping\\_data.php](http://www.phcris.org.au/guides/mapping_data.php)
  37. Public Health England. (2015): *Shooting Up: Infections among people who inject drugs in the United Kingdom*. Public Health England, London. Available at [http://www.drugsandalcohol.ie/26470/1/Shooting\\_Up\\_2016\\_Update.pdf](http://www.drugsandalcohol.ie/26470/1/Shooting_Up_2016_Update.pdf)
  38. Richards, T. B., Croner, C. M., Rushton G., Brown, C. K., Fowler, L. (1999): Geographic information systems and public health: mapping the future. *Public Health Rep.* 114(4): 359–373.
  39. Rolles, S., Murkin, G., Powell, M., Kushlick, D., Saunter, N., Slater, J. (2016): *The Alternative World Drug Report (2016). Counting the Costs of the War on Drugs*. 2<sup>nd</sup> Edition. Transform Drug Policy Foundation, Bristol. Available at <http://www.countthecosts.org/sites/default/files/AWDR-2nd-edition.pdf>
  40. Salmon, A. M., Van Beek, I., Amin, J., Kaldor, J., Maher, L. (2010): The impact of a supervised injecting facility on ambulance call-outs in Sydney, Australia. *Addiction.* 105(4): 676–683.
  41. Salmon, A. M., Dwyer, R., Jauncey, M., van Beek, I., Topp, L., Maher, L. (2009): Injecting-related injury and disease among clients of a supervised injecting facility. *Drug Alcohol Depend.* 101(1-2): 132-136.
  42. Schäffer, D., Stöver, H. and Weichert, L. (2014): *Drug consumption rooms in Europe: Models, best practice and challenges*, European Harm Reduction Network, Amsterdam.
  43. Strathdee, S. A., Pollini, R. A. (2007): A 21<sup>st</sup>-century Lazarus: The role of safer injection sites in harm reduction and recovery. *Addiction.* 102(6): 848-849.
  44. Thein, H., Klimber, J., Maher, L., MacDonald, M., Kaldor, J. M. (2005): Public opinion towards supervised injecting centres and the Sydney Medically Supervised Injecting Centre. *Int J Drug Pol.* 16(4): 275–280.
  45. Tyndall, M. W., Kerr, T., Zhang, R., King, E., Montaner, J. G., Wood, E. (2006): Attendance, drug use patterns, and referrals made from North America's first supervised injection facility. *Drug Alcohol Depend.* 83(3): 193-198.
  46. Van Beek, I., Gilmour, S. (2000): Preference to have used a medically supervised injecting centre among injecting drug users in King's Cross, Sydney. *Aust N Z J Public Health.* 24(5): 540-542.
  47. Vecino, C., Villalbí, J. R., Guitart, A., Espelt, A., Bartroli, M., Castellano, Y., Brugal, M. T. (2013): Safe injection rooms and police crackdowns in areas with heavy drug dealing: Evaluation by counting discarded syringes collected from the public space (in Spanish). *Addiciones.* 25(4): 333–338.
  48. Wood, E., Kerr, T., Spittal, P.M., Li, K., Small, W., Tyndall, M. W., Hogg, R. S., O'Shaughnessy, M. V., Schechter, M. T. (2003): The potential public health and community impacts of safer injecting facilities: Evidence from a cohort of injection drug users. *J Acquir Immune Defic Syndr.* 32(1): 2-8.
  49. Wood, E., Tyndall, M. W., Lai, C., Montaner, J. S., Kerr, T. (2006): Impact of a medically supervised safer injecting facility on drug dealing and other drug-related crime. *Subst Abuse Treat Prev Policy.* 1: 13.
  50. Wood, E., Tyndall, M. W., Spittal, P. M. (2001): Unsafe injection practices in a cohort of injection drug users: Could safer injecting rooms help? *CMAJ.* 165(4): 405-410.
  51. Woods, S. (2014): *Organisational overview of drug consumption rooms in Europe*, European Harm Reduction Network – Regenboog Groep, Amsterdam. Available at <http://www.eurohrn.eu/index.php/drug-consumption-rooms>
  52. World Health Organization. (2007): *Public health mapping and GIS map library*. World Health Organization, Geneva.

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#### Contributors

J.A.H., designed the study and wrote the protocol. J.A.H., managed the literature searches and analyses. J.A.H., M.C.V.H., undertook the statistical analysis, and the authors discussed the results. M.C.V.H., wrote the first draft of the manuscript. The authors revised the last draft. All the authors contributed to, and have approved, the final manuscript.

#### Conflict of interest

The authors have no conflict of interest.

#### Ethics

Authors confirm that the submitted study was conducted according to the WMA Declaration of Helsinki -Ethical Principles for Medical Research Involving Human Subjects. The study has IRB review/approval.

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