



## LJMU Research Online

Horan, JA, Deasy, C, Hemy, K, O'Brien, D and Van Hout, MC

**Overdose risk perceptions and experience of overdose among heroin users in Cork, Ireland. Preliminary results from a pilot overdose prevention study**

<http://researchonline.ljmu.ac.uk/id/eprint/9681/>

### Article

**Citation** (please note it is advisable to refer to the publisher's version if you intend to cite from this work)

**Horan, JA, Deasy, C, Hemy, K, O'Brien, D and Van Hout, MC (2015) Overdose risk perceptions and experience of overdose among heroin users in Cork, Ireland. Preliminary results from a pilot overdose prevention study. Heroin Addiction And Related Clinical Problems. 17 (5). pp. 19-26. ISSN 1592-1638**

LJMU has developed **LJMU Research Online** for users to access the research output of the University more effectively. Copyright © and Moral Rights for the papers on this site are retained by the individual authors and/or other copyright owners. Users may download and/or print one copy of any article(s) in LJMU Research Online to facilitate their private study or for non-commercial research. You may not engage in further distribution of the material or use it for any profit-making activities or any commercial gain.

The version presented here may differ from the published version or from the version of the record. Please see the repository URL above for details on accessing the published version and note that access may require a subscription.

For more information please contact [researchonline@ljmu.ac.uk](mailto:researchonline@ljmu.ac.uk)

<http://researchonline.ljmu.ac.uk/>



Pacini Editore & AU CNS

Regular article

*Heroin Addict Relat Clin Probl* 2015; 17(5): 19-26

HEROIN ADDICTION &  
RELATED CLINICAL  
PROBLEMS

www.europad.org  
www.wftod.org

## Overdose risk perceptions and experience of overdose among heroin users in Cork, Ireland. Preliminary results from a pilot overdose prevention study

John Aidan Horan <sup>1</sup>, Conor Deasy <sup>2,3</sup>, Kieran Henry <sup>4</sup>, Declan O'Brien <sup>1</sup>, and Marie Claire Van Hout <sup>5</sup>

1. *Arbour House, HSE Addiction Services, Cork, Ireland, EU.*

2. *Emergency Medicine, Cork University Hospital, Ireland, EU*

3. *National Ambulance Service, Ireland, EU.*

4. *HSE Ambulance Service, Cork, Ireland, EU.*

5. *School of Health Sciences, Waterford Institute of Technology, Waterford, Ireland, EU.*

### Summary

**Background.** Opioid overdose is the primary cause of death among injecting drug users (IDU). Overdose is generally not sudden, occurs over one to three hours, and often in the presence of bystanders. This presents a unique window of opportunity to intervene. **Aim.** Successful overdose prevention training includes appropriate clinical and non-clinical responses. The study aimed to investigate Irish IDU experience of overdose, and need for education and resuscitation skills programming. We report on pilot findings. **Methods.** Phase One assessed service user experience of overdose, substances used, setting for overdose, and awareness of appropriate non-clinical responses (n=52). Phase two implemented an educational intervention at two Cork addiction service sites. This involved assessing service user awareness of appropriate non-clinical methods to manage overdose and their interest in receiving resuscitation training (n=26). Phase three piloted a resuscitation skills training intervention for staff, family and IDU consisting of instruction on how to recognise and prevent overdose, appropriate response techniques; rescue breathing, and calling emergency services (n=26). **Results.** The findings illustrated the majority had experienced overdose, described the main substances involved, the settings, the responses employed, and the perceptions of risk. The need for education equipping IDU with overdose prevention and management skills was identified. Awareness of appropriate responses (correct emergency numbers, recovery and resuscitation skills) improved following the educational and skills training interventions. **Conclusions.** Continued efforts in Ireland to integrate culturally specific overdose prevention into agonist opioid treatment services, prison discharge, homeless primary health and needle and syringe exchange are warranted.

*Key Words:* Overdose prevention; cardio pulmonary resuscitation training; injecting drug user

### 1. Introduction

Opioid overdose is the primary cause of death among injecting drug users (IDU) [34; 42] with over half of IDU reporting at least one non-fatal overdose experience in their lifetime [36]. Drug related deaths otherwise known as overdoses or poisonings occur as therapeutic misadventures or adverse consequences from licit use of pain management or opioid maintenance medication, or from non-medical use of prescription opioids or illicit opiates such as heroin [33, 45]. In relation to illicit drug use, a number of risk factors for overdose are identified which include age and gender, administration by injection as opposed

to smoking or snorting of heroin, drug purity and availability, miscalculations in assessing strength of drugs prior to use, low tolerance in sporadic users, sharing of syringes and drug injecting paraphernalia, concurrent and sequential polydrug use and injecting use of other substances with opioids such as alcohol, cocaine, methamphetamines, benzodiazepines and barbiturates, experience of serious withdrawals in the past two months, HIV + status, participation in methadone maintenance treatment, recent incarceration, participation in sex work, presence of co-morbid disorder, lack of permanent housing and discharge from prison [1, 6, 8, 11, 16, 17, 20, 28, 32, 34, 41]. Substance users with a history of suicide intent or

previous attempts at self-harm are at increased risk of reporting intentional and unintentional overdose [3], sometimes catalysed by personal situation, real life problems, poor coping mechanisms and traumatic events [29, 30]. The presence of systemic disease resulting in pulmonary or hepatic dysfunction additionally increases vulnerability to fatal and non-fatal overdoses [44]. Protective factors relate to presence of social supports, structured drug treatment programmes, community and family [1, 41].

Experience of overdose is itself a risk factor, with potential for overdose increasing for each overdose reported [8, 31]. Studies have described IDU lack of perceived personal risk of overdose, despite recognition of peer risk [10, 27]. Optimism around potential future overdose is reported in heroin users with recent experience of overdose [27]. Of note however is that cumulative risk of overdose increases as frequency of injecting use of heroin increases [6]. Experience of overdose and the witnessing of someone else's overdose is common among injecting drug users [31]. Through fear of incarceration, witnesses may, when witnessing an overdose, run rather than call for help [23]. Overdosing is generally not a solitary experience [31] with the majority of nonfatal overdoses occurring in the company of others. Characteristics of drug users who witness overdoses include being male, with experience of homelessness, prior use of heroin, personal experience of overdose and attendance at Narcotics Anonymous [4]. These individuals were reportedly less likely to seek medical assistance and more likely report counterproductive or useless actions at the last overdose they witnessed, in comparison with drug users who only witness one or two overdoses. Bohnert et al., [4] underscore that these individuals and groups of IDU are key targets of overdose response training. Other studies point to the need to target large drug networks for overdose prevention interventions [23, 24].

As overdose is generally not sudden [36], occurs over the course of one to three hours, and often in the presence of another drug users, this presents a unique window of opportunity to intervene with life saving measures by bystander response. Successful overdose prevention training includes the training in how to reduce overdose risk, recognise overdose, stimulate the victim (i.e. sternum rub), administer naloxone by intramuscular injection or nasal spraying of the injection prior to the arrival of paramedics, rescue breathing and calling of emergency numbers [7, 38, 23, 45]. Naloxone (THN) is an antidote to opioid overdose [5, 16; 45]. Effectiveness of naloxone components in

overdose prevention programmes is well evidenced [25, 40]. Strang et al., [39] reported on how fellow drug users on average report three different actions on witnessing a peer overdose, and express interest in learning and expanding their skills in overdose interventions (particularly cardio-pulmonary resuscitation techniques and administration of naloxone). Studies have described barriers to calling emergency numbers, fear of police involvement [22], and how participation in overdose prevention training programmes assist dialogue among IDUs on the subject of overdose [38]. Barriers which prevent IDUs from acting in the recommended manner include prior success by administering folk remedies in reviving the victim, fear of police, and issues impacting on access to and use of naloxone [23].

In Ireland, in the period 2004-2012, 5,289 deaths by drug poisoning and deaths among drug users were recorded, of which 3,112 were due to poisoning, and 2,177 deaths among drug users (non-poisoning). Of concern is that deaths due to polydrug use increased by 60% in this reporting period [18]. An Irish study has previously illustrated that overdose prevention and management of overdose is a key issue for general practitioners caring for opiate dependent patients [9]. Naloxone is however currently not available to IDUs in Ireland. The study aimed to investigate Irish IDU experience of fatal/non-fatal/accidental/intentional overdose, and the need for appropriate education and resuscitation skills programming. We report here on preliminary pilot findings.

## 2. Methods

Overdose prevention programmes generally include information on how to avoid an opioid overdose and how bystanders should respond safely if an overdose is witnessed by safely stimulating the victim, calling of emergency medical services, rescue breathing and administration of naloxone (if licensed in that country) [43]. Whilst overdose prevention programmes are unique and for a unique target group, they share similarities with cardio-pulmonary resuscitation training (CPR) provided to bystanders who may witness a person in cardiac arrest.

The study setting was two addiction treatment services in Cork, the second largest city in the Republic of Ireland. Recent treatment data record in 2012 there were 49 cases who entered methadone treatment. In addition, on the 1st January 2012, 87 additional cases continued in methadone treatment from previous years. This gives a total of 136 cases

**Table 1** Age and gender of all cases in methadone treatment

Gender	N	Median	Mean	Std. Deviation	Range
Male	96	30.0	31.2	6.9	18 to 51
Female	40	27.0	28.2	6.7	18 to 49
Total	136	29.0	30.3	6.9	18 to 51

in methadone treatment in 2012. Some of these cases may have returned to treatment two or more times within the calendar year. See Table 1.

The study was operated as part of internal audit of service users and as per Health Service Executive protocols. It contained three components. Phase One aimed to explore service user personal experience of fatal/non-fatal/accidental/intentional overdose, awareness of appropriate responses to an overdose scenario and identify if there was a need for resuscitation skills education. A brief survey was compiled based on consultation with the literature and discussions between investigators (AH, CD, KH). The survey investigated the patient's lifetime and recent (past six month) personal experiences of non-fatal accidental and/or intentional overdoses, the substances involved, risk perceptions and concern for personal and peer overdose, frequency of witnessing of a peer fatal or non-fatal overdose, site where the witnessed fatal or non-fatal overdose took place, presence of other people, if an ambulance was called and using what number, awareness of appropriate non clinical methods to manage the overdose (recovery position, basic resuscitation) and interest in overdose prevention training (n=52).

Phase Two implemented an educational intervention at the two addiction service sites. This intervention consisted of a DVD "Overdose, Four short films about the prevention of overdose death" by Harm Reduction Works in the UK, which was designed to focus the viewer on the realities and dangers relating to overdose, and how to respond appropriately. The film was played in the waiting areas for 4 weeks. Phase Two re-audited with 26 service users who took part in Phase One, and surveyed awareness of appropriate non-clinical methods to manage overdose (recognition of correct emergency number and recovery positions). Clients were asked if they would avail of further training in cardio-pulmonary resuscitation skills.

Phase Three comprised of a resuscitation skills training pilot in 2013 which was conducted in collaboration with a consultant of emergency medicine (CD) and an advanced paramedic (KH). This Resus-

citation Skills Training Pilot was directed at both service users, and staff. This intervention consisted of instruction on how to recognise and prevent overdose, appropriate response techniques; rescue breathing, and for and appropriately facilitating an emergency service response. It involved recruitment of drug user participants from three sources; invitation of Phase Two participants (n=4), a Community Brief Intervention group consisting of staff (n=2) and more chaotic drug users (n=4), and an Addiction training course for staff and family members (n=10) and stabilised ex-users (n=6). Discussions also took place around participant perceptions of high risk behaviours. Service users were taken through real life scenarios, provided with instructions on how to reduce the risk of overdose and the actions that should occur following an overdose. These include what to expect when calling for an Ambulance, how to facilitate the Emergency Response, the importance of staying with the victim, reassurance that law enforcement would appreciate their help in saving a life etc. Training consisted of a didactic instructional component, hands-on using mannequins and engaging in role-play to practice the recovery positions, chest compressions and response techniques. Following the event a debrief focus group discussion was undertaken. A certificate of attendance was provided to add to the status and positive feelings that participants would have about the course. Participants also completed a brief evaluation questionnaire asking two questions relating to perceived benefit and recommendation to a friend, and open questions as to how the intervention could be improved, and if participants would like to be involved in the design and development of an Irish training DVD.

The data was collected in an ethical and confidential manner, by virtue of informed consent prior to participation, the ability to withdraw from the study if requested, anonymity of participants by virtue of coding, and provision of overdose information should participants be at risk of harm. The data was analysed using SPSS to provide description and content related information.

**Table 2:** Substances involved in overdose

Substance	Intentional Overdose	Accidental Overdose	Total Overdose
Heroin	33.3%	66.6%	60.0%
Methadone	0.0%	20.8%	16.6%
Cocaine	0.0%	8.3%	6.6%
Alcohol	33.3%	33.3%	33.3%
Cannabis	16.6%	12.5%	13.3%
Benzodiazepines	83.3%	37.5%	46.6%
Novel Psychoactives	0.0%	8.3%	6.6%
Other Substances	50.0%	25.0%	30.0%

### 3. Results

#### 3.1. Phase One survey

52 service users completed Phase One survey with mean age 30 years, of which 12 were female and 40 were male. Due to the small sample size and lack of gender balance we did not engage in further cross tabulated gender analysis.

#### 3.2. Personal experience of overdose

59.6% had experienced overdose in their lives, and with 9.6% reporting an overdose in the previous 6 months. This amounted to 77 overdose incidents, or 2.65 incidents per individual. Of those, 80% were accidental, but 20% were intentional.

#### 3.3. Substances involved in overdose

Heroin was the substance most represented in terms of total experience of overdose (60.0%), and most implicated in accidental overdoses (66.67%). For those reporting experience of intentional overdose, benzodiazepines were most reported (83.33%). See Table 2.

Other substances (30%) were reported, and included MDMA and paracetamol in the intentional

category (50%), and codeine, amphetamine, DF118, MDMA, tramadol, paracetamol and distalgesics in the accidental overdose category (25%).

#### 3.4. Witnessed overdose

55.77% reported witnessing a non-fatal overdose, and 19.23% reported witnessing a fatal overdose. The total overdose incidents came to 121, of these 97 were non-fatal (3.3 average), and 24 fatal (2.4 average). Of those who reported personal experience of accidental overdose, 70.83% had witnessed a non-fatal overdose themselves, and 29.17% had witnessed a fatal overdose. For those who had never experienced an overdose, 47.62% reported witnessing a non-fatal overdose, and 9.52% reported witnessing a fatal overdose.

#### 3.5. Concern around overdose

53.84% reported never or rarely worrying about overdosing. 50.0% of those who reported accidental overdose never/rarely worried about personal overdose, compared with 62.90% of those who never experienced an overdose. See Table 3.

But when asked what percentage of substance users, participants thought would overdose in their lifetime, 75% indicated that half or more would over-

**Table 3** Concern around overdose

	Overall	Experienced Accidental OD	Never Experienced OD
Worry about Overdose			
Never	32.6%	20.8%	47.6%
Rarely	21.1%	29.1%	14.2%
Sometimes	32.6%	33.3%	33.3%
Fairly Often	11.5%	16.6%	4.7%
Most of the time	1.9%	0.0%	0.0%

**Table 4.** Perception of substance users lifetime overdose risk

What percentage of substance users they perceived would overdose in their lifetime:	Proportion of sample
10%	7.69%
25%	17.31%
50%	30.77%
75%	34.62%
90%	9.62%
100%	0.0%

dose. 83% of those with experience of accidental overdose reported that half or more of substance users would likely overdose in their lifetime compared with 62% of those with no experience of overdose. See Table 4.

### 3.6. Overdose setting

When asked where the overdoses occurred, in the non-fatal subgroup, 52% were reported to have occurred in a private home, and 22% on the street. But in the fatal subgroup, 87% were reported to have occurred in a private home. Of those that reported witnessing an overdose; 80% reported that other people were present, 80% reported calling an ambulance, and 55% reported placing the person in a recovery position on their side.

### 3.7. Awareness of appropriate non-clinical methods of managing an overdose

When asked what number to use to call an ambulance, 92.31% were correct, 7.69% indicated an incorrect response. 61.54% reported that they knew of the recovery position, 48.08% reported that they knew basic resuscitation. When questioned around further training needs, 65.38% reported interested in learning basic resuscitation skills. Those with personal experience of accidental overdose reported a higher interest in learning resuscitation skills (70.83%), compared with 61.90% of those with no experience of overdose.

### 3.8. Phase Two: educational intervention survey

26 service users from the original sample of 52 who completed Phase One survey completed the survey, with mean age 32 years and 5 females/21 males. Following this 4 week educational interventions, 100% reported the correct ambulance number,

73% knew what the recovery position was, and when questioned around interest in undertaking resuscitation skills training, 77% indicated interest.

### 3.9. Phase Three: pilot resuscitation training

26 participants took part in Phase Three; invitation of Phase Two participants (n=4), a Community Brief Intervention group consisting of staff (n=2) and more chaotic drug users (n=4), and an Addiction training course for staff and family members (n=10) and stabilised ex-users (n=6).

A brief evaluation questionnaire asked two questions relating to perceived benefit and recommendation to a friend, and open questions as to how the intervention could be improved, and if participants would like to be involved in the design and development of an Irish training DVD. 16 participants completed the open ended evaluation survey and 20 were involved in the focus group as part of the Addiction Training course. Key themes are presented in Table 5.

## 4. Discussion

Understanding IDU perceptions of risk associated with overdose, their attitudes and responses to overdose and their overdose prevention, risk management and coping strategies is pivotal to developing effective responses to prevent overdose and overdose fatalities. There is a growing awareness among IDU of their personal capacity to reduce harm [19]. Drug user involvement as ‘public health ally’ or collaborator in contrast to victim or patient is increasingly the new public image amid heightened service user involvement movements in drug treatment care [43]. As overdose is preventable, audit studies such as this Irish pilot in conjunction with development of protocols and interventions have a key role to play in understanding the dynamics of overdose situations, and the regional medical and health professional development of overdose prevention and risk management interventions [2, 14, 30, 32, 45]. The results in this pilot study in Ireland underscore the interest in and need for overdose prevention programmes, alongside increases in awareness and potential for positive social and drug taking behaviour change of IDU and through the process of assuming new responsible social roles as overdose responders (see Wagner et al., [43]). Participant views around risk perceptions are similar to studies elsewhere [10]. Findings further highlight the need for Irish policy makers to consider expansion to provide intranasal naloxone to sub-

**Table 5.** Key evaluation themes

Overdose Risk Behaviours	Release from Prison Withdrawal from drug treatment Induction into drug treatment Mixing and polyuse of drugs (alcohol and opiates, benzodiazepines and opiates) Injecting of drugs Being a long term user
Overdose Discussion	Likely to remind participants of overdose episodes they had witnessed, experienced and friends/peers lost.
Overdose Prevention and Training	Equipping substance users with education, resources and skills to help prevent mortality if important. Dissemination of overdose prevention information to injecting drug users and drug users not engaging in services is vital. Propagation of information to front line is more effective.
Training development	As part of brief intervention models for alcohol users. At point of contact setting, Emergency departments, Community Counselling, Social Work, Public Health and General Practice Ireland specific training and DVD.

stance users who present to needle exchanges, and consideration of the provision of supervised injecting facilities. Safe injecting facilities are equally important in mediating the socio-contextual risks relating to overdose, particularly those relating to rushed injecting, fear of police involvement and injecting alone or in the presence of strangers [11, 21].

This pilot study is limited by small sample size, convenience nature of sampling, lack of representative sampling, reliance on self-report and whilst basic education improved, the inability to differentiate between the effects of training and the actual behavioural responses. Lankenau et al., [23] recommended regular booster sessions to optimise on the implementation of a broad range of recommended techniques when trained. Whilst positive in terms of education, and indicative of need for overdose prevention programmes in the area, further investigation around the drug consumption, morbidity and mortality outcomes of such interventions is warranted. Positive and negative effects of 'overdose responders' for trained IDU centre on the creation of a new social role within drug networks, and feelings of enhancement empowerment, recognition of expertise and autonomy, control, pride and heroism, and with negative effects grounded in stress, regret, over burdening, fear, anger oftentimes leading to social isolation and the cutting of social ties [26, 36, 43]. Equally the recognition of emotional outcomes of participation in such pilots cannot be underestimated for individuals with experience of fatal overdose. Social and professional support mechanisms alongside diffusion within drug

networks can only boost the salience of outcomes [43]. Studies have observed how intervention participants can diffuse and share information on overdose prevention and use of naloxone with peers and family [36]. Overdose prevention and response training programmes can additionally stimulate unforeseen impacts in relation to reduced personal drug use [42] and reduced frequency of heroin injection [35]. However concerns are evident with regard to the dissemination of overdose training from trained to untrained individuals, and the potential false sense of security garnered and potentially resulting in increased opioid use [13]. Limited research is conducted to date on the factors inhibiting or stimulating IDUs to undertake the recommended response techniques in the event of an overdose when trained [23].

## 5. Conclusion

Equipping IDU with skills and education around overdose prevention and management can benefit individual, IDU networks and communities. Continued efforts in Ireland to integration of culturally and learner specific overdose prevention into agonist opioid treatment services, prison discharge, homeless services, primary health and needle and syringe exchange are warranted.

## References

1. Binswanger, IA., Nowels, C., Cors, KF., Glanz, J., Long, J., Booth, R., Steiner, JF (2012). Return to drug use and

- overdose after release from prison: a qualitative study of risk and protective factors. *Addict Sci Clin Pract.* 7:3.
2. Biong, S., Svensson, T (2009). Bridging the gaps: Experiencing and preventing life-threatening heroin overdoses in men in Oslo. *Int J Qual Stud Health Well-being.* 4: 94-105.
  3. Bohnert, A., Roeder, K., Ilgen, MA (2010). Unintentional overdose and suicide among substance users: A review of overlap and risk factors. *Drug Alcohol Depend.* 110, 183–192.
  4. Bohnert, A., Tracey, M., Galea, S (2012). Characteristics of drug users who witness many overdoses: Implications for overdose prevention. *Drug Alcohol Depend.* 120, 168– 173.
  5. Boyer E. (2012) Management of opioid analgesic overdose. *N Engl J Med.* 367: 146–155.
  6. Brugal MT, Barrio G, De LF, Regidor E, Royuela L, Suelves JM.(2002). Factors associated with non-fatal heroin overdose: assessing the effect of frequency and route of heroin administration. *Addiction.* 97(3):319-27.
  7. Clark AK, Wilder CM, Winstanley EL. A systematic review of community opioid overdose prevention and naloxone distribution programs. *J Addict Med.* 8(3):153-63.
  8. Coffin PO, Tracy M, Bucciarelli A, Ompad D, Vlahov D, Galea S (2007). Identifying injection drug users at risk of nonfatal overdose. *Acad Emerg Med.* 14(7):616-23.
  9. Cullen, W., Bury, G., Langton, D (2000). . Experience of heroin overdose among drug users attending general practice. *Br J Gen Pract.* 50, 546-549.
  10. Darke S, Ross J (1997). Overdose Risk Perceptions and Behaviours among Heroin Users in Sydney, Australia. *Eur Addict Res.* 3:87-92.
  11. Dietze P, Jolley D, Fry C, Bammer G (2005). Transient changes in behaviour lead to heroin overdose: results from a case-crossover study of non-fatal overdose. *Addiction.* 100(5):636-42.
  12. Dietze, P., Kenkinson, R., Aitken, C., Stoové, M., Jolley, D., Hickman, M., Kerr, T (2013). The relationship between alcohol use and injecting drug use: Impacts on health, crime and wellbeing. *Drug Alcohol Depend.* 128, 111– 115.
  13. Doe-Simkins M, Quinn E, Xuan Z, Sorensen-Alawad A, Hackman H, Ozonoff A, Walley AY.(2014). Overdose rescues by trained and untrained participants and change in opioid use among substance-using participants in overdose education and naloxone distribution programs: a retrospective cohort study. *BMC Public Health.* 14:297.
  14. Frischer, M., Baldacchino, A., Crome, I, Bloor, R (2012). Preventing opioid overdoses in Europe: A critical assessment of known risk factors and preventative measures. Prevalence, Consequences and Data Management Unit. Lisbon: EMCDDA.
  15. Green TC, McGowan SK, Yokell MA, Pouget ER, Rich JD. (2012). HIV infection and risk of overdose: a systematic review and meta-analysis. *AIDS.* 26(4):403-17.
  16. Hasegawa K., Brown D., Tsugawa Y, Camargo C. (2014) Epidemiology of emergency department visits for opioid overdose: A population-based study. *Mayo Clin Proc.* 89: 461–471
  17. Havens JR, Oser CB, Knudsen HK, Lofwall M, Stoops WW, Walsh SL, Leukefeld CG, Kral AH (2011). Individual and network factors associated with non-fatal overdose among rural Appalachian drug users. *Drug Alcohol Depend.* 115(1-2):107-12.
  18. Health Research Board. (2014) Drug-related deaths and deaths among drug users in Ireland: 2012 figures from the National Drug-Related Deaths Index. Health Research Board, Dublin. Accessed 31-03-2015 from <http://www.drugsandalcohol.ie/23003/>
  19. Henman AR, Paone D, Des Jarlais DC, Kochems LM, Friedman SR.(1998) Injection drug users as social actors: A stigmatized community’s participation in the syringe exchange programmes of New York City. *AIDS Care.* 10(4):397–408.
  20. Jenkins LM, Banta-Green CJ, Maynard C, Kingston S, Hanrahan M, Merrill JO, Coffin PO. (2011). Risk factors for nonfatal overdose at Seattle-area syringe exchanges. *J Urban Health.* 88(1):118-28.
  21. Kerr, T., Small, W., Moore, D., Wood, E (2007). A micro-environmental intervention to reduce the harms associated with drug-related overdose: Evidence from the evaluation of Vancouver’s safer injection facility. *Int J Drug Policy.* 18(1):37-45
  22. Lankenau S, Wagner K, Silva K, Kecojevic A, Iverson E, McNeely M, Kral A (2012). Injection Drug Users Trained by Overdose Prevention Programs: Responses to Witnessed Overdoses. *J Commun Health.* 1–9.
  23. Lankenau, S., Wagner, K., Silva, K., Kecojevic, Iverson, E., McNeely, M., Kral, A (2013). Injection drug users trained by overdose prevention programs: Responses to witnessed overdoses *J Commun Health.* 38(1): 133–141.
  24. Latkin CA, Hua W, Tobin KE. (2004). Social Network Correlates of Self-reported Non-fatal Overdose. *Drug Alcohol Depend.* 73(1):61–67.
  25. Leece PN, Hopkins S, Marshall C, Orkin A, Gassanov MA, Shahin RM. (2013). Development and implementation of an opioid overdose prevention and response program in Toronto, Ontario. *Can J Public Health.* 104(3):e200-4.
  26. Maxwell S, Bigg D, Stanczykiewicz K, Carlberg-Racich S (2006). Prescribing Naloxone to Actively Injecting Heroin Users: A Program to Reduce Heroin Overdose Deaths. *J Addict Dis.* 25(3):89–96.
  27. McGregor, C., Darke, S., Ali, R., Christie, P (1998). Experience of non-fatal overdose among heroin users in Adelaide, Australia: circumstances and risk perceptions. *Addiction.*;93(5):701-11.
  28. Moore, D (2004). Governing street-based injecting drug users: a critique of heroin overdose prevention in *Australia Social Science & Medicine* 59, 1547–1557.
  29. Neale J (2000). Suicidal intent in non-fatal illicit drug overdose. *Addiction.* 95(1):85-93.



30. Neale J, Robertson M.(2005). Recent life problems and non-fatal overdose among heroin users entering treatment. *Addiction*. 100(2):168-75.
31. Powis, B., Strang, J., Griffiths, P., Taylor, C., Williamson, S., Fountain, J., Gossop, M (1999). Self-reported overdose among injecting drug users in London: extent and nature of the problem. *Addiction*. 94(4): 471-478.
32. Rhodes, T., Barnard, M., Fountain, J., Hariga, F., Avilés, N., Vicente, J., Weber, U (2001). Injecting drug use, risk behaviour and qualitative research in the time of AIDS. Lisbon: EMCDDA. 32
33. Rosen L., Khan D., Warner M. (2013) Trends and geographic patterns in drug-poisoning death rates in the US, 1999–2009. *Am J Prev Med*. 45: e19–e25 33
34. Seal KH, Kral AH, Gee L, Moore LD, Bluthenthal RN, Lorvick J, Edlin BR (2001). Predictors and prevention of nonfatal overdose among street-recruited injection heroin users in the San Francisco Bay Area, 1998–1999. *Am J Public Health*. 91(11):1842–1846. 34
35. Seal KH, Thawley R, Gee L, Bamberger J, Kral AH, Ciccarone D, Edlin BR (2005). Naloxone Distribution and Cardiopulmonary Resuscitation Training for Injection Drug Users to Prevent Heroin Overdose Death: A Pilot Intervention Study. *J Urban Health*. 82(2):303–311. 35
36. Sherman, S., Gann, D., Scott, G., Carlberg, S., Bigg, D., Heiner, R (2008). A qualitative study of overdose responses among Chicago IDUs. *Harm Reduct J*. 5:2 doi:10.1186/1477-7517-5-2 36
37. Sherman, S., Gann, D., Tobin, K., Latkin, C., Welsh, C., Bielensohn, P (2009). “The life they save may be mine”: Diffusion of overdose prevention information from a city sponsored programme. *Int J Drug Policy*. 20, 137–142 37
38. Sherman, S., Markham, K., Thambinayagam, A., Rudenstine, S., Vasquez, Hoover, S., Stancliff, S., Galea, S (2006). Qualitative exploration of injection drug users' (IDUs) experiences with overdose and naloxone in New York City. *Public Health Hum Rights*. 38
39. Strang, J., Best, D., Man, L., Noble, A., Gossop, M (2000). Peer-initiated overdose resuscitation: fellow drug users could be mobilised to implement resuscitation. *Int J Drug Policy*. 11: 437–445. 39
40. Tobin KE, Sherman SG, Beilenson P, Welsh C, Latkin CA.(2009). Evaluation of the Staying Alive programme: training injection drug users to properly administer naloxone and save lives. *Int J Drug Policy*. 20(2):131-6. 40
41. Tobin, K., Hua, W., Costenbader, E., Latkin, CA (2007). The association between change in social network characteristics and non-fatal overdose: Results from the SHIELD study in Baltimore, MD, USA *Drug Alcohol Depend*. 87: 63–68. 41
42. Wagner KD, Valente TW, Casanova M, Partovi SM, Mendenhall BM, Hundley JH, Unger JB (2010). Evaluation of a Comprehensive Overdose Prevention and Response Training Programme for Injection Drug Users in the Skid Row Area of Los Angeles, CA. *Int J Drug Policy*. 21:186–193. 42
43. Wagner, K., Davidson, P., Iverson, E., Washburn, R., Burke, E., Kral, A., McNeeley, M., Jackson Bloom, J., Lankenau, S (2014). “I Felt Like a Superhero”: The Experience of Responding to Drug Overdose Among Individuals Trained in Overdose Prevention. *Int J Drug Policy*, 25(1):157-65.43
44. Warner-Smith M, Darke S, Lynskey M, Hall W(2001). Heroin overdose: causes and consequences. *Addiction*. 96(8):1113-25 44
45. Wermeling, DP (2015). Review of naloxone safety for opioid overdose: practical considerations for new technology and expanded public access. *Ther Adv Drug Saf*. 6(1): 20–31. 45

#### *Role of the funding source*

Authors state that this study was financed with internal funds. No sponsor played a role in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

#### *Contributors*

All authors were involved in the study design, had full access to the survey data and analyses, and interpreted the data, critically reviewed the manuscript and had full control, including final responsibility for the decision to submit the paper for publication.

#### *Conflict of interest*

Authors declare 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 does not have IRB review/approval; this study does not require ethics committee approval because the pilot was undertaken as internal audit of service users and operated under Health Service Executive protocols.