Social support and harm reduction activities in a peer led pilot study with respondent driven sampling and community based participatory action research

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Abstract

**Background:** People who smoke drugs (PWSD) are at high risk of both infectious disease and overdose. Harm reduction activities organised by their peers in the community can reduce risk by providing education; safer smoking supplies, and facilitate access to other services. Peers also provide a network of people who provide social support to PWSD which may reinforce harm reducing behaviours. We evaluated the numbers of supportive network members and the relationships between received support and participants’ harm reducing activities.

**Methods:** Initial participant-researchers with past or current lived drug use experience were employed from communities in Abbotsford and Vancouver to interview ten friends from their social networks who use illegal drugs mainly through smoking. Contacts completed a questionnaire about people in their own harm reduction networks, and their relationships with each other. We categorised social support into informational, emotional and tangible aspects, and harm reduction into being trained in the use of, or carrying naloxone; assisting peers with overdoses, using brass screens to smoke, obtaining pipes from service organisations and being trained in CPR.

**Results:** Fifteen initial participant-researchers interviewed 149 participants who provided information on up to 10 people who were friends or contacts and the relationships between them. People who smoked drugs in public were 1.46 (95% CI; 1.13-1.78) more likely to assist peers with possible overdoses if they received tangible support; women who received tangible support were 1.24(95% CI; 1.02-1.45) more likely to carry, and be trained in the use of naloxone. There was no relationship between number of supportive network members and harm reduction behaviours.

**Conclusions:** In this pilot study, PWSD who received tangible support were more likely to assist peers in possible overdoses and be trained in the use of and/or carry naloxone, than those who did not receive tangible support. Future work on the social relationships of PWSD may prove valuable in the search for credible and effective interventions.

**Highlights**

In a peer-developed study, people who smoke street drugs asked friends who also smoked drugs about relationships between 10 of their friends

Participants who received tangible items from network members were more likely to assist their peers during overdoses using naloxone.

Women who smoked street drugs and received tangible support were more likely to carry and be
trained in the use of naloxone than who did not receive tangible support.
The number of supportive network members was not associated with harm reduction behaviours.

Introduction

Sustained and chronic use of illicit drugs drug use in Canada is linked to various adverse health events that in turn contribute a substantial economic burden to the healthcare system and result in death and disability (Degenhardt & Hall, 2012; Rehm et al., 2006). Recent surveys cite illicit drug use at approximately 3% of the Canadian population who used cocaine or crack ecstasy, speed, methamphetamines, hallucinogens or heroin in the past year (Health Canada, 2018).

In response, harm reduction initiatives aimed at reducing harmful drug behaviours rather than drug use itself, have been adopted in various locations across Canada (Towards the Heart, 2019). The most common harm reduction programs are needle exchange programs (NEP), supervised consumption facilities (SCF), and opioid substitution therapies. Few harm reduction programs are specifically tailored to people who smoke illicit drug use (PWSD) have been adopted. The safer crack use kits (SCUK) distribution programs and supervised smoking facilities (SSF) have played crucial roles in mitigating infection rates among PWSD, as well as communicating crucial information on the health risks of drug use and the preventative measures and treatments available (Ivsins, Roth, Nakamura, Krajden, & Fischer, 2011; Prangnell et al., 2017), Spearheading many of these harm reduction initiatives in British Columbia is the Vancouver Area Network of Drug Users (VANDU), a peer-led organization comprising individuals with lived drug experiences. VANDU invites community members to design and implement activities to promote safe drug practices in the Downtown Eastside Community (DTES)(Jozaghi et al., 2018).

While these programs may be extremely beneficial to PWSD (Marshall, Dechman, Minichiello, Alcock, & Harris, 2015), benefits can only be attained through attendance. Recent initiatives have focused on peer networks as potential routes of harm reduction delivery (Harris, Shorter, Davidson, & Best, 2020; Marshall et al., 2015; Stengel et al., 2018; Thornton, Sedillo, Kalishman, Page, & Arora, 2018). Often likened to grassroots movements, peers can provide an organic and highly effective vehicle for harm reduction advocacy to PWSD less engaged in harm reduction. More specifically, through the provision of social support, harm reduction behaviours can be diffused from officially sanctioned harm reduction
programs by highly connected individuals (peers) to PWSD who may otherwise not be exposed or inclined to attend formal programs and services. Social support has been subdivided into three different kinds. Informational support is defined as the provision of information, guidance, advice, and suggestions to individuals in the hopes of assisting them in solving a problem. Tangible support is defined as direct and physical acts providing material goods, monetary assistance, or useful services. Emotional support is defined as actions intended to lift the self-esteem of the recipient and may include such as letting recipients know that they are valued, accepted, and loved (Cohen & Wills, 1985).

We conducted a pilot study to determine the feasibility of combining a Community Based Participatory Action Research (CBPAR) with respondent driven sampling (RDS), in which participant-researchers collected information on their social network members (Elkhalifa submitted). We then used these data from the pilot to explore whether the social support of friends and contacts (received social support) is associated with a) reported activities that reduce the risk of drug related harm in PWSD; and b) with greater personal network size of participants and better reported access to health services.

Method
Researchers used a Community Based Participatory Action Research (CBPAR) approach that involves the participation of the community in the development, implementation, and dissemination of research. By incorporating the inputs, needs, and concerns of the local organizations and the people living in these vulnerable situations, researchers are able to foster an environment of cooperation, co-learning, and collective action (Wallerstein & Duran, 2010). In this particular study. The British Columbia/Yukon Association of Drug War Survivors and Vancouver Area Network of Drug Users Board, Vancouver, British Columbia together with researchers from the University of British Columbia defined the research questions, decided on a community-based participatory action research (CBPAR) approach and selected the respondent driven sampling method in which people from hidden communities recruit each other. The board members played a large role in constructing the questionnaire, interviewing participants, entering data, reviewing findings and commenting on drafts.
of the manuscripts.

The methods for this study have been described in detail (Jozaghi et al., 2018). Briefly, after consultations with two community groups above, the research proposal was approved, along with the questionnaire, and oral consent. Advertisements for peer researchers disseminated by community advertisements in Abbotsford and posters distributed by community members in Vancouver, focussed on facilitating hiring of community members usually excluded from research. Eight and seven PWSD with lived drug experiences were recruited from Abbotsford and Vancouver, respectively and paid $20.00 per hour, similar to research assistants at the university. These initial participants were asked to recruit 10 “contacts or friends” from their established networks, who use illegal drugs mainly through smoking; were 19 years of age or older, and to whom they felt comfortable administering the questionnaire (Jozaghi et al., 2018). Besides providing information on themselves, each of the 10 friends then provided proxy information on ten of their “friends or contacts” and the relationships between them, for a total of about 1,500 people. Recruitment ended at the first wave of contacts or friends, as this was an initial pilot to demonstrate feasibility rather than to provide definitive, generalizable results. Each initial participant completed 10 hours of training in applied ethics. Ethics approval for this research, which included approval of the consent to participate was obtained from the University of British Columbia Certificate H16-01580 and from the University of Ottawa H-05-18-741.

Because friends and contacts of an initial participant may also be friends and contacts of others, and because they were encouraged to use aliases in lieu of legal names, egocentric network sizes were determined using a hierarchical cross-network matching algorithm. The number of friends a participant nominated was added to the additional friends of any one in their network who cross matched with other nominated friends. The social networks of initial participants were joined together using a hierarchical cross-network matching mechanism. Preliminary unique identifying data combined a mix of variables including the names/aliases, demographic attributes, and other variables. Then, the location and sex of suspected matches were compared. Successful matches were considered a match if they had ages within ten-year range; drug(s) of choice; current drug use status;
and within a 5 year range of previous drug use (Bouchard, Hashimi, Tsai, Lampkin, & Jozaghi, 2018). Subjects that matched in at least three of the abovementioned variables were judged to be the same individual. Physical and mental health status and drug route of administration were used to verify matches and to resolve outstanding discrepancies.

**Dependent Variables:**

Six harm reducing behaviours which we thought would be affected by a person’s social network included; using brass screens to smoke crack, being trained in CPR, having assisted other PWSD who have overdosed, being trained in naloxone use, and carrying naloxone. Because being trained in naloxone use and carrying naloxone were found to be highly correlated, they were combined into a single variable.

**Independent Variables:**

The primary independent variables evaluated were network size and the presence of three types of support; informational, tangible, and emotional, from at least one person in one’s network (Table1).

**Model Building:**

Confounders with a significance level below 0.05, or that yielded a 10% or greater change in the coefficient of interest were retained, while variables that were insignificant were removed in a manual stepwise process. Gender and age were identified as important factors in the health outcomes of social support (Cohen & Wills, 1985; Dean & Ensel, 1982; Schwarzer & Leppin, 1989), and were retained in the models, regardless of their significance. Collinearity was reduced by selecting the most significant of highly correlated variables (chi-square/fisher exact test p-value<0.05), and eliminating other correlated variables. Lastly, interactions between all the main predictors of interest and all other variables, including those found to be insignificant in the preliminary effects model, were tested.

To account for the correlation between participants selected by the same initial participant, a fixed effect generalized linear model procedure was used; missing data was accounted for using multiple imputations (Yuan, 2011).

Results
Eight of 10 and seven of eight initial participants in Abbotsford and Vancouver successfully completed applied ethics training and recruited 79 and 70 friends or contacts (known as alters), who reported on 739 and 498 friends from whom they may receive support, respectively (Figs. 1 and 2). The demographic and behavioural attributes of the 149 friends and contacts of initial participant researchers are listed in Table 1. One contact or friend in Abbotsford did not complete their questionnaire and two identified as transgender, too small to be analysed, so their genders were recorded missing and imputed.

PWSD who had received informational support were 1.14 (p=0.04) more likely to assist people who had overdosed. Those who received tangible support or informational support were 1.10, (p<0.01) and 1.13 (p<0.03) times more likely to be trained in the use of, and/or carry naloxone.

After including covariates into the model, only the association between tangible support and assisting friends and being trained in and/or carrying naloxone persisted (Tables 4 and 5). There was an interaction between tangible support and public drug use, such that those who used drugs in public and received tangible support were more likely to assist others during an overdose, than those who did not use drugs in public. Likewise, those who received tangible support and were women were 24% more likely to be trained in the use of and/or carry naloxone. The model of correlates for assisting overdosed friends or contacts was adjusted for sex, age, public drug use, and number of years residing in Downtown Eastside. Being trained in, or carrying naloxone was adjusted for sex, age, trained in CPR, and number of days since visiting a doctor/nurse. An increase of one person providing tangible support in the networks of PWSD, corresponded to an increase of 58% in the odds that they would assist their friends or contacts in an overdose. Similarly, for an increase of one person providing tangible support in the network of female PWSD, there was an increase of 25% in the odds of being trained in and/or carrying naloxone.

We examined whether network size was associated with the number of contacts who provided any of the social support roles (Table 6). Bivariate analysis revealed a weak correlation between social support and network size that disappeared following adjustment for sex; age, lending, borrowing, or sharing drugs, carrying naloxone, and the number of people known.
Discussion
To our knowledge, this is one of the first studies examining the effect of social network support on naloxone carriage, training or use among people who smoke drugs. We set out to examine the relationship between social networks and the harm reducing behaviour of PWSD. The odds of assisting contacts or friends during an overdose increased with each addition of a contact who provided tangible support in drug smokers’ network, but only for those who reported smoking in public areas in the past month. This is probably because PWSD in public are more likely to be exposed to overdosed friends or contacts, and therefore, more familiar with the procedure required to resuscitate them. Kerr et al. identified public drug use as a positive correlate of non-fatal overdose among poly-substance people who inject drugs (PWID) (Kerr et al., 2007). Another contributing factor is the fact that people who smoke in public rather than in private may be satisfying intense cravings for the drug elicited by withdrawal, and to avoid law enforcement and other individuals, PWID will rush their drug use when in public, consuming large amounts of drugs in a short period of time. This urgency is more likely to lead to mistakes in dose and safer practices, less access to clean and sterile supplies, public areas being unhygienic, and the urgency sensed by them (Broadhead et al., 1998; DeBeck et al., 2009). In Germany, a survey showed that large percentage of PWID will regularly consume drugs in locations near their area of purchase to end withdrawal symptoms (Zurhold, Degwitz, Verthein, & Haasen, 2003).

Therefore, while PWSD in public areas are at a greater risk of overdose and less likely to smoke safely, they are more likely to be assisted by friends or contacts. A strong association between public drug use and homelessness was identified in our study (p<0.01 data not shown), and others (Kerr et al., 2007), as homeless people do not have a private space in which to use drugs. Homelessness is also a risk factor for overdose and premature death because of the multiple social and physical barriers encountered in everyday life (Fischer et al., 2004; Galea & Vlahov, 2002; Martens, 2001). The effect of tangible support on the likelihood of being trained in and/or carrying naloxone varied according to sex. Women who smoke drugs and who had tangible network support were more likely to carry and be trained in the use of naloxone, whereas it did not seem to affect men. In a population
similar to ours of women who inject street drugs, those who reported three or more sources of social support were less likely to have a non-fatal overdose than those who reported fewer sources of support (Pabayo, Alcantara, Kawachi, Wood, & Kerr, 2013). Earlier studies have demonstrated considerable variability in the provision and reception of social support between men and women (Belle, 1987; Ptacek, Smith, & Zanas, 1992). Women are more likely to seek social support from network members than their male counterparts (Thoits, 1995), which may indicate that women are more open and receptive to the positive benefits associated with social support than men. Moreover, women have been reported to perceive events as more stressful than men, even after adjusting for the stressful event in question (Day & Livingstone, 2003). Therefore, variability in the biopsychosocial mechanisms that mediate the beneficial effects of social may be a function of differences in perceptions of, and response to stressful events between women and men.

The size of participant’s social network was not associated with the quantity of social support received among people who smoke illicit drugs, after adjusting for confounders. Similarly, previous studies have reported a weak correlation between the number of social ties and the availability of social support received (Schaefer, Coyne, & Lazarus, 1981; Seeman & Berkman, 1988). The lack of correlation may also be due to the fact that initial participants reported on the numbers of contacts and their perceived social ties with friends and contacts, which may not reflect actual social ties. Our findings are in opposition to the social exchange theory that individuals retain relationships on the basis of a cost-reward analysis, such that relationships which provide rewards at lower costs are selected and retained. In contrast, relationships whose maintenance incurs negative costs to the individual are discarded. In this way, ‘rules’ on reciprocity govern the evolution of relationships (Cropanzano & Mitchell, 2005). However, it’s possible that the surrounding environment may force negative social ties that may not be voluntary by limiting the choices of potential contacts; social ties may function as a source of stress and anxiety (Fiore, Becker, & Coppel, 1983). Therefore, the presence of close contacts in one’s social network is not equivalent to the social support received. Rather, specific components of the social network function to mediate health promotion.

We have shown the how the presence of social support may affect both harm reduction and risk
interactions. The risk environment including social networks in which PWSD find themselves is a

crucial, yet often overlooked factor for understanding and predicting the harm production and

reduction of drugs. In the context of harm reduction, the enabling environment is comprised of a wide

array of micro and macro-level factors, all of which distill down to the interpersonal connections of

individuals and their interactions with the environment (De, Cox, Boivin, Platt, & Jolly, 2007; Logan,

Jolly, & Blanford, 2016). As a consequence of this framework, drug-related risks can be perceived as a

complex construct that is reflective of not only individual level factors, but the interplay of those

factors with the social environment (Rhodes, 2009).

Limitations

In a true respondent driven sample (RDS) with a number of recruitment generations, equilibrium can

be realized when chain-referrals are continued for a minimum of six waves (Heckathorn, 1997),

allowing population means and percentages to stabilize. We had only a single wave to test the

feasibility of asking participants detailed questions about a number of friends. Therefore, the study

population cannot be assumed to represent the community of DTE and Abbotsford PWSD. Second,

responses were self-reported and may be subject to the social desirability bias, though this was likely

less than being interviewed by a health professional. Finally, because participants were allowed to

use aliases and nicknames for both themselves and their contacts or fri, we cannot be completely

certain on whether all contacts who have been named multiple times have been identified correctly.

However, this was systematic across all participants and contacts, so the relative network sizes are

likely valid.

Multiple studies have demonstrated considerable variation between the perception of social support

and the actual supportive behaviour (Haber, Cohen, Lucas, & Baltes, 2007; Lakey et al., 2002; Sandler

& Barrera, 1984). Other studies have reported that the perception of social support has stronger

influence on the health behaviour of recipient than received support (Dunkel-Schetter & Bennett,

1990; Wethington & Kessler, 1986). We may have underestimated the effect of social support on

harm reduction behaviour, so that in fact it may be more important than reflected in the study.

Nevertheless, this is one of the few studies on social support in PWUID and the only one in PWSD.
Conclusion

We aimed to understand how network size and the social support provided by friends and contacts in these networks can promote harm reducing behaviour among PWSD who may otherwise not be exposed to harm reduction initiatives. We demonstrated that the number of contacts in the social network of PWSD who were reported to provide tangible support increased the likelihood of the participant assisting friends or contacts and being trained in and/or carrying naloxone. Results of this study lend further credibility to the importance of accounting for the social context surrounding PWSD in the search for credible and effective interventions.

Declarations

Declarations of interest; None

Ethical approvals; included under Methods; end of paragraph 2

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Availability of data; The data may be available under request to Dr. Ehsan Jozaghi.

Competing interests; None of the authors have any competing interests.

Contributions of authors; Ehsan Jozaghi, Jane Buxton, Ann Jolly conceived the study with assistance from Samona Marsh, Erica Thomson, and Delilah Gregg; data collection was co-ordinated by Samona Marsh, Erica Thomson, and Delilah Gregg; Sulaf Elkhalifa, Ann Jolly completed the data analysis and interpretation with assistance in further interpretation from all authors. Sulaf Elkhalifa and Ann Jolly drafted the paper, all authors provided comments and Ann Jolly edited the final version.

References

Belle, D. (1987). Gender differences in the social moderators of stress. In R. . Barnett, L. Biener, & G. K. Baruch (Eds.), Gender and Stress (pp. 257–275). New York: The Free Press.

Bouchard, M., Hashimi, S., Tsai, K., Lampkin, H., & Jozaghi, E. (2018). Back to the core: a network approach to bolster harm reduction among persons who inject drugs. International Journal of Drug Policy, 51, 95–104.
Broadhead, R. S., Heckathorn, D. D., Weakliem, D. L., Anthony, D. L., Madray, H., Mills, R. J., & Hughes, J. (1998). Harnessing peer networks as an instrument for AIDS prevention: results from a peer-driven intervention. *Public Health Reports, 113*(5/10/2010), 42–57. Retrieved from http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emed4&AN=1999247757

Cohen, S., & Wills, T. A. (1985). Stress, Social Support, and the Buffering Hypothesis. *Psychological Bulletin, 98*(2), 310–357. https://doi.org/10.1037/0033-2909.98.2.310

Cropanzano, R., & Mitchell, M. S. (2005). Social exchange theory: An Interdisciplinary review. *Journal of Management, 31*(6), 874–900. https://doi.org/10.1177/0149206305279602

Day, A. L., & Livingstone, H. A. (2003). Gender differences in perceptions of stressors and utilization of social support among university students. *Canadian Journal of Behavioural Science, 35*(2), 73–83. https://doi.org/10.1037/h0087190

De, P., Cox, J., Boivin, J. J.-F.-F. F., Platt, R. W. R. W. W., & Jolly, A. M. M. A. M. (2007). The importance of social networks in their association to drug equipment sharing among injection drug users: A review. *Addiction, 102*(11), 1730–1739. https://doi.org/http://dx.doi.org/10.1111/j.1360-0443.2007.01936.x

Dean, A., & Ensel, W. M. (1982). Modelling social support, life events, competence, and depression in the context of age and sex. *Journal of Community Psychology, 10*(4), 392–408. https://doi.org/10.1002/1520-6629(198210)10:4<392::AID-JCOP2290100409>3.0.CO;2-2

DeBeck, K., Small, W., Wood, E., Li, K., Montaner, J., & Kerr, T. (2009). Public injecting among a cohort of injecting drug users in Vancouver, Canada. *Journal of Epidemiology and Community Health, 63*(1), 81–86. https://doi.org/10.1136/jech.2007.069013

Degenhardt, L., & Hall, W. (2012). Extent of illicit drug use and dependence, and their contribution to the global burden of disease. *The Lancet, 379*(9810), 55–70. https://doi.org/10.1016/S0140-6736(11)61138-0

Dunkel-Schetter, C., & Bennett, T. (1990). The availability of social support and its activation in times of stress. In B. Sarason, I. Sarason, & G. Pierce (Eds.), *Social Support: An Interational View* (1st ed.).
New York: John Wiley & Sons.

Fiore, J., Becker, J., & Coppel, D. B. (1983). Social network interactions: A buffer or a stress. *American Journal of Community Psychology, 11*(4), 423-439. https://doi.org/10.1007/BF00894057

Fischer, B., Brissette, S., Brochu, S., Bruneau, J., El-Guebaly, N., Noël, L., ... Baliunas, D. (2004). Determinants of overdose incidents among illicit opioid users in 5 Canadian cities. *Cmaj, 171*(3), 235-239. https://doi.org/10.1503/cmaj.1031416

Galea, S., & Vlahov, D. (2002). Social determinants and the health of drug users: Socioeconomic status, homelessness, and incarceration. *Public Health Reports, 117*(SUPPL. 1).

Haber, M. G., Cohen, J. L., Lucas, T., & Baltes, B. B. (2007). The relationship between self-reported received and perceived social support: A meta-analytic review. *American Journal of Community Psychology, 39*(1-2), 133-144. https://doi.org/10.1007/s10464-007-9100-9

Harris, J., Shorter, G. W., Davidson, G., & Best, P. (2020). Risk perception, changing social context, and norms prevent transition to regular injection among people who smoke heroin. *Drug and Alcohol Dependence, 208*(January), 107878. https://doi.org/10.1016/j.drugalcdep.2020.107878

Health Canada. (2018). Canadian Tobacco, Alcohol and Drugs Survey (CTADS): 2017 summary.

Heckathorn, D. D. (1997). Respondent-Driven Sampling: A New Approach to the Study of Hidden Populations. *Social Problems, 44*(2), 174-199. Retrieved from http://dx.doi.org/10.1525/sp.1997.44.2.03x0221m

Ivsins, A., Roth, E., Nakamura, N., Krajden, M., & Fischer, B. (2011). Uptake, benefits of and barriers to safer crack use kit (SCUK) distribution programmes in Victoria, Canada-A qualitative exploration. *International Journal of Drug Policy, 22*(4), 292-300. https://doi.org/10.1016/j.drugpo.2011.05.005

Jozaghi, E., Buxton, J. A., Thomson, E., Marsh, S., Gregg, D., & Bouchard, M. (2018). Building new approaches to risk reduction with social networks and people who smoke illegal drugs from participatory community-based research. *International Journal of Qualitative Methods, 17*(1), 1609406918771247.

Kerr, T., Fairbairn, N., Tyndall, M., Marsh, D., Li, K., Montaner, J., & Wood, E. (2007). Predictors of non-fatal overdose among a cohort of polysubstance-using injection drug users. *Drug and Alcohol...
Dependence, 87(1), 39–45. https://doi.org/10.1016/j.drugalcdep.2006.07.009

Lakey, B., Adams, K., Neely, L., Rhodes, G., Lutz, C. J., & Sielky, K. (2002). Perceived support and low emotional distress: The role of enacted support, dyad similarity, and provider personality. *Personality and Social Psychology Bulletin, 28*(11), 1546–1555. https://doi.org/10.1177/014616702237582

Logan, J. J. J., Jolly, A. M. A. M., & Blanford, J. I. J. I. (2016). The sociospatial network: Risk and the role of place in the transmission of infectious diseases. *PLoS ONE, 11*(2), 1–14. https://doi.org/10.1371/journal.pone.0146915

Marshall, Z., Dechman, M. K., Minichiello, A., Alcock, L., & Harris, G. E. (2015). Peering into the literature: A systematic review of the roles of people who inject drugs in harm reduction initiatives. *Drug and Alcohol Dependence, 151*, 1–14. https://doi.org/10.1016/j.drugalcdep.2015.03.002

Martens, W. H. (2001). A review of physical and mental health in homeless persons. *Public Health Reviews, 29*(1), 13–33.

Pabayo, R., Alcantara, C., Kawachi, I., Wood, E., & Kerr, T. (2013). The role of depression and social support in non-fatal drug overdose among a cohort of injection drug users in a Canadian setting. *Drug and Alcohol Dependence, 132*(3), 603–609. https://doi.org/10.1016/j.drugalcdep.2013.04.007

Prangnell, A., Dong, H., Daly, P., Milloy, M. J., Kerr, T., & Hayashi, K. (2017). Declining rates of health problems associated with crack smoking during the expansion of crack pipe distribution in Vancouver, Canada. *BMC Public Health, 17*(1), 1–7. https://doi.org/10.1186/s12889-017-4099-9

Ptacek, J. T., Smith, R. E., & Zanas, J. (1992). Gender, Appraisal, and Coping: A Longitudinal Analysis. *Journal of Personality, 60*(4), 747–770. https://doi.org/10.1111/j.1467-6494.1992.tb00272.x

Rehm, J., Baliunas, D., Brochu, S., Fischer, B., Gnam, W., Patra, J., ... Recel, M. (2006). *The cost of substance abuse in Canada*. Ottawa.

Rhodes, T. (2009). Risk environments and drug harms: A social science for harm reduction approach. *International Journal of Drug Policy, 20*(3), 193–201. https://doi.org/10.1016/j.drugpo.2008.10.003

Sandler, I. N., & Barrera, M. (1984). Toward a multimethod approach to assessing the effects of social support. *American Journal of Community Psychology, 12*(1), 37–52. https://doi.org/10.1007/BF00896927
Schaefer, C., Coyne, J. C., & Lazarus, R. S. (1981). The health-related functions of social support. *Journal of Behavioral Medicine, 4*(4), 381–406. https://doi.org/10.1007/BF00846149

Schwarzer, R., & Leppin, A. (1989). Social support and health: A meta-analysis. *Psychology and Health, 3*, 1-15.

Seeman, T. E., & Berkman, L. F. (1988). Structural characteristics of social networks and their relationship with social support in the elderly: Who provides support. *Social Science and Medicine, 26*(7), 737-749. https://doi.org/10.1016/0277-9536(88)90065-2

Stengel, C. M., Mane, F., Guise, A., Pouye, M., Sigrist, M., & Rhodes, T. (2018). “They accept me, because I was one of them”: Formative qualitative research supporting the feasibility of peer-led outreach for people who use drugs in Dakar, Senegal. *Harm Reduction Journal, 15*(1), 1-12. https://doi.org/10.1186/s12954-018-0214-1

Thoits, P. A. (1995). Stress, coping, and social support processes: where are we? What next? *Journal of Health and Social Behavior, Spec No*(1995), 53–79. https://doi.org/10.2307/2626957

Thornton, K., Sedillo, M. L., Kalishman, S., Page, K., & Arora, S. (2018). The new Mexico peer education project: Filling a critical gap in HCV prison education. *Journal of Health Care for the Poor and Underserved, 29*(4), 1544–1557. https://doi.org/10.1353/hpu.2018.0111

Towards the Heart. (2019). Towards the heart. Retrieved November 12, 2019, from British Columbia Provincial Harm Reduction Program website: https://towardtheheart.com/naloxone-training

Wallerstein, N., & Duran, B. (2010). Community-based participatory research contributions to intervention research: The intersection of science and practice to improve health equity. *American Journal of Public Health, 100*(SUPPL. 1), 40–46. https://doi.org/10.2105/AJPH.2009.184036

Wethington, E., & Kessler, R. C. (1986). *Perceived Support, Received Support, and Adjustment to Stressful Life Events Author ( s ): Elaine Wethington and Ronald C. Kessler Source : Journal of Health and Social Behavior, Vol . 27 , No . 1 ( Mar ., 1986 ), pp . 78-89 Published by : American So. 27(1), 78-89.

Yuan, Y. (2011). Multiple imputation using SAS software. *Journal of Statistical Software, 45*(6), 1-25. https://doi.org/10.18637/jss.v045.i06
Zurhold, H., Degwitz, P., Verthein, U., & Haasen, C. (2003). Drug consumption rooms in Hamburg, Germany; evaluation of the effects of harm reduction and the reduction of public nuisance. *Journal of Drug Issues, 33*(3), 663–688. https://doi.org/10.1146/annurev.pharmtox.41.1.625

### Tables

**Table 1:** Categorization of support roles into emotional, tangible, and informational support.

| Role Number | Support Role |
|-------------|--------------|
| **Emotional Support** |
| Role15 | talked to me and asked how I was doing |
| Role17 | came with me to hospital |
| Role16 | know me by first name |
| **Tangible Support** |
| Role4 | provided pipes, alcohol swaps, filters... |
| Role9 | provided food, coffee, juice or water |
| Role19 | lent me some money or dope when I was dope sick |
| Role10 | performed CPR when I/or someone overdosed |
| Role11 | administered naloxone when I/or someone overdosed |
| Role12 | called ambulance for help when I/someone overdosed |
| Role14 | broke up fight |
| Role19 | lent me some money or dope when I was dope sick |
| Role21 | lent me some money for food when I was hungry |
| **Informational** |
| Role1 | told me about detox |
| Role2 | taught me how to fix my pipe or my dope |
| Role3 | told me about Insite/VANDU/or other harm reduction places |
| Role5 | referred me to a nurse or a doctor |
| Role6 | referred me to a homeless shelter |
| Role7 | referred me to a place where I could get food |
| Role8 | referred me to a pharmacy where I could get methadone |
| Role13 | provided harm reduction education |
| Role18 | referred me to a welfare office |
| Role20 | referred me to a good dealer |
| Role22 | told me where to get naloxone |
| Role23 | Showed me how to use naloxone |

**Table 2:** Distribution of participants’ characteristics in Abbotsford and Downtown Eastside (DTES).

N=149. Data presented as either count (percent frequency) or mean (standard Deviation).
### Demographic Variables of Participants

| Variable                              | n or mean (% or SD) |
|---------------------------------------|---------------------|
| Age                                   | 44(11)              |
| Male                                  | 71(48)              |
| Homeless                              | 51(34)              |
| House/Apartment                       | 38(26)              |
| Living with friends or family         | 15(10)              |
| Supported Living                      | 45(30)              |
| First Nations                         | 62(42)              |
| Relationship Status (Single)          | 36(24)              |

### Reported Medical Condition

| Condition                        | n or mean (% or SD) |
|----------------------------------|---------------------|
| HCV                              | 59(40)              |
| No Medical Condition             | 61(41)              |
| Anxiety                          | 79(53)              |
| Depression                       | 84(56)              |
| No Mental Condition              | 25(17)              |
| Other Mental Conditions          | 72(48)              |

### Drug Use

| Type                          | n or mean (% or SD) |
|-------------------------------|---------------------|
| Meth preferred                | 99(66)              |
| Crack preferred               | 71(48)              |

### Outreach Organizations

| Source                        | n or mean (% or SD) |
|-------------------------------|---------------------|
| Outreach Organizations        | 122(82)             |
| Store                         | 30(20)              |
| Peers                         | 21(14)              |
| Lend, borrow or share pipes   | 84(56)              |
| Overdosed in the past month   | 15(10)              |
| Trained on how to use naloxone| 100(67)             |
| Trained on CPR                | 102(68)             |
| Carry naloxone                | 70(47)              |
| Have assisted peers who have  | 66(45)              |
| Overdosed                     |                     |
| Arrested for smoking or       | 24(16)              |
| Using illicit drugs in public |                     |
| Received tickets for          | 12(8)               |
| Smoking or using illicit      |                     |
| Drugs in the past             |                     |
| Have experienced violence or  |                     |
| Exploitation when using drugs |                     |
| in public by:                 |                     |
| PWSD                           | 83(56)              |
| Dealers                       | 57(39)              |
| Police                        | 48(32)              |
| Have experienced psychosis or  | 91(61)              |
| Paranoia as a result of       |                     |
| Smoking illicit drugs in the  |                     |
| Past                           | 39(26)              |
| Have had blisters, cuts,      |                     |
| Damaged, or infections to     |                     |
| Your mouth, oral area or lips |                     |
| Public Drug Use               | 152(436)            |
| Pipe Screen Material          | 106(71)             |
| Brillo                        | 59(40)              |
| Brass                         | 54(36)              |
| Meth Equipment                | 48(32)              |

### Network Characteristics

| Characteristic | n or mean (% or SD) |
|----------------|---------------------|
| Network Size   | 21(14)              |

1Pairwise deletion for missing values used

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### Table 3: Univariate generalized linear model of harm reducing behaviour among people who smoke illicit drugs.
**Table 4:** Adjusted generalized linear model of assisting peers stratified by public drug smoking.

| Harm Reduction | Predictor                  | Public Drug Smoking in the Past Month | OR (±95% CI)  | SE   |
|---------------|----------------------------|--------------------------------------|----------------|------|
| Assist Peers during overdose | Tangible Support                        | Yes                                  | 1.08(0.99-1.17) | 0.01 |
|               |                                                           | No                                    | 1.46(1.13-1.78) | 0.1  |

1 adjusted for age, sex, and number of years residing in Downtown Eastside.

*Statistical difference p<0.05.

**Table 5:** Adjusted generalized linear model of being trained in and/or carrying naloxone stratified by sex.

| Harm Reduction | Predictor                  | Sex     | OR (±95% CI)  | SE   |
|---------------|----------------------------|---------|----------------|------|
| Trained in and/or carry Narcan | Tangible Support                        | Male    | 0.87(0.73-1.00) | 0.01 |
|               |                            | Female  | 1.24(1.02-1.45) | 0.1  |

1 adjusted for age, sex, CPR training, and number of days since last visiting a doctor or nurse.

*Statistical difference p<0.05.

**Table 6:** Adjusted and unadjusted generalized linear model of the association between social support and network size.

| Harm Reducing Behaviour | Predictor                  | OR (±95% CI)  | SE   |
|-------------------------|----------------------------|----------------|------|
| Unadjusted Network Size | Social Support             | 0.09(1.01-1.88) | 0.05 |
| Adjusted Network Size   | Social Support1            | 1.08(0.99-1.17) | 0.04 |
Adjusted for age, sex, lending borrowing or sharing drugs, carrying naloxone, and number of people known

Figures

Figure 1

Social network of eight Abbotsford participants, 79 recruits, and their 739 friends. Dots represent individuals, and lines between them relationships, including recruitment referrals into the study.
Figure 2

Social network of seven DTES participants, 70 recruits, and their 498 friends. Dots represent individuals and lines between them relationships, including recruitment referrals into the study.