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Research Paper

Correlates of seeking emergency medical help in the event of an overdose in British Columbia, Canada: Findings from the Take Home Naloxone program

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ABSTRACT

Background: British Columbia (BC), Canada, is experiencing an unprecedented number of opioid overdoses mainly due to the contamination of illicit drugs with fentanyl and its analogues. Reluctance to seek emergency medical help (i.e., by calling 9-1-1) has been identified as a barrier to optimal care for overdose victims. This study aimed to identify the correlates of seeking help during an overdose event when naloxone was administered via BC's Take Home Naloxone (THN) program.

Methods: In this cross-sectional study, we reviewed administrative records (from July 2015 to December 2017) about overdose events submitted by THN participants when they received their replacement naloxone kits (n = 2350). The primary outcome of the study was reported calling 9-1-1 and modified Poisson regression models were built to investigate the factors associated with help-seeking during an overdose event.

Results: Most overdose victims were men (69.0%) and > 30 years old (61.5%). Overall, participants reported calling 9-1-1 in 1310 (55.7%) overdose events. In the multivariable model, the likelihood of calling 9-1-1 was significantly and positively associated with the overdose victim being male and receiving rescue breathing. The likelihood of calling 9-1-1 was significantly and negatively associated with the overdoses occurring in private residences and health regions other than Vancouver Coastal which delivers services to mostly urban residents.

Conclusion: Overall, medical help was sought for 55.7% of overdoses where naloxone was administered. Overdoses occurring among male victims as well as those receiving higher doses of naloxone and mouth-to-mouth rescue breathing were associated with a higher likelihood of help-seeking by responders. Future interventions need to encourage people who witness an overdose to seek emergency medical help.

Introduction

North America is experiencing a public health emergency due to the unprecedented increase in the number of fatal and non-fatal opioid-related overdoses (Armenian, Vo, Barr-Walker, & Lynch, 2017; Karamouzian & Kerr, 2018; Rudd, Aleshire, Zibbell, & Matthew Gladden, 2016). In the United States, the Centers for Disease Control (CDC) reports that the overdose epidemic continues to worsen across cities and towns of all types (Center for Disease Control & Prevention, 2018). Similarly, in Canada, unintentional drug overdoses have become a public health crisis in the past few years (Tyndall, 2018). British Columbia (BC) has the highest overdose-related death rates in Canada (Public Health Agency of Canada, 2018). The overdose crisis in BC continues to worsen with 994 drug overdose deaths in 2016 (i.e., an 80% increase from 2015) and 1458 fatal overdoses in 2017. Illicit drug overdose deaths in BC often happen inside private residences (˜58% in 2018), are highest among men (˜80%), 30 to 59 year-old individuals (˜72%), and within the Vancouver Coastal Health Authority (38 deaths per 100,000 individuals) (BC Coroners Service, 2017, 2018b).

Drug overdoses have been found to occur primarily in the presence of bystanders who may be able to intervene (Martins, Sampson, Cerdá, & Galea, 2015). Therefore, promoting interventions aimed at improving overdose bystanders' responses — such as naloxone administration and seeking emergency medical help — are an integral part of efforts to reduce overdose fatalities (Ambrose, Amlani, & Buxton, 2016). Naloxone reverses the effects of opioid-related overdoses such as loss of consciousness and slowed breathing within 2–5 minutes (Ambrose et al., 2016; Watson, Steele, Muelleman, & Rush, 1998). One evidence-

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Fig. 1. Take Home Naloxone (THN) kit provided to people at risk of an opioid overdose or people likely to witness and respond to an overdose through the BCTHN program.
Note: Each kit contains three naloxone ampules, a rescue breathing face shield, a pair of disposable gloves, three retractable syringes, an infographic guideline on responding to an overdose, and a form to report details of an overdose event.

informed intervention proven to be successful and effective in preventing overdose deaths is the take home naloxone (THN) program (Bird, McAuley, Perry, & Hunter, 2016; Irvine et al., 2018; McDonald & Strang, 2016; Walley et al., 2013). The British Columbia take home naloxone (BCTHN) program was initially implemented in August 2012 in response to rising overdose mortality rates. Three years after the BCTHN program began operations, the increasing presence of fentanyl and other ultrapotent synthetic opioids in the illegal drug supply led to a dramatic increase in opioid overdose mortality rates, and ultimately the declaration of a public health emergency in April 2016 (Ambrose et al., 2016; BC Government News, 2016). BCTHN aims to connect with and educate the community of people who use drugs as well as those who are likely to witness an overdose and provide access to the life-saving naloxone in the form of personal THN kits (Ambrose et al., 2016; Tzemis, Al-Qutub, Amlani, Kesselring, & Buxton, 2014).

The effects of naloxone begin to wear off in 30 min post-administration, and several doses are often required to revive an overdose victim exposed to long-acting or highly potent opioids (e.g., fentanyl and its derivatives) (Watson et al., 1998, Ambrose et al., 2016; Mueller, Walley, Calcaterra, Glanz, & Binswanger, 2015). Moreover, given the high potency of some opioids, post-overdose observations may be required to prevent overdose victims from falling back into an overdose despite being administered naloxone (Scheuermeyer et al., 2018) and concerning presentations such as fentanyl-induced muscle rigidity and dyskinesia (Buxton, Gauthier, Kinshella, & Godwin, 2018). Therefore, seeking medical help is recommended as the first action to be taken at an overdose event (BC Centre for Disease Control, 2017). However, overdose bystanders have been shown to delay or avoid calling 9-1-1 across numerous settings (Latimore & Bergstein, 2017; Sherman et al., 2008; Tobin, Davey, & Latkin, 2005). Reluctance in calling 9-1-1 is often driven by lay responders' concerns about police presence or harassment, child custody, illicit drug possession, eviction, lack of access to a phone, previous negative experience with first responders, or respect for the high or privacy of the overdose victim (Bennett, Bell, Tomedi, Hulsey, & Kral, 2011; Latimore & Bergstein, 2017; Sherman et al., 2008; Tobin et al., 2005; Tracy et al., 2005; Wagner et al., 2015). Interventions to reduce such barriers include introducing policies on reducing police presence at overdose scenes and implementation of the Good Samaritan drug overdose laws that provide legal protection for overdose bystanders who call 9-1-1; immunities vary from charges related to low-level drug possessions to parole violations (BC Centre for Disease Control, 2018a; Latimore & Bergstein, 2017).

Initial assessment of BCTHN over the period of 2012 to early 2015 found that emergency services were sought at approximately half of the overdose events (Ambrose et al., 2016). However, the conclusions of that evaluation were limited due to the small sample size of the study (n = 182) and the rapidly changing dynamics of the opioid crisis in BC (Ambrose et al., 2016). The increase in fentanyl-adulterated drugs in BC (BC Coroners Service, 2018a; Karamouzian et al., 2018), declaration of a public health emergency in 2016 (BC Government News, 2016), expansion of the THN project across the province (e.g., about 83,000 kits were distributed in 2016 and 2017 compared to < 5000 kits in 2013, 2014 and 2015 altogether (BC Centre for Disease Control, 2018b)), the establishment of overdose prevention sites in December 2016 (BC Centre for Disease Control, 2018a), introduction of police non-attendance policies at overdose events (i.e., as of June 2016 BCE Emergency Health Services only informs the Police for fatal overdoses, suicide cases, safety concerns, and when requested by paramedics), and the implementation of Good Samaritan Drug Overdose Act (GSDOA) (Cotter, 2017) may have changed the dynamics of calling 9-1-1 in overdose events. Therefore, this study aims to assess the prevalence and correlates of calling 9-1-1 by those who witness an overdose across different health authorities in BC from 2015 to the end of 2017 using BCTHN's administrative records.

Methods

Setting and data collection

The BCTHN program is operated and supervised by the harm reduction unit at the British Columbia Centre for Disease Control (BCCDC). About 1500 active distribution sites including emergency departments, community pharmacies, correctional facilities, and settings within Indigenous communities, participate in the program. The program provides educational and training resources to the registered sites and distributes naloxone kits to them. Kits are available at no cost to people who are at risk of an opioid overdose or those who are likely to witness and respond to an overdose (e.g., a family or friend of someone at risk of opioid overdose). A total of 3153, 21277, and 61912 kits were distributed across BC in 2015, 2016, and 2017, respectively; an estimate of 25% of which were used to reverse an overdose (BC Centre for Disease Control, 2018b). Each kit contains three naloxone ampules (as of March 2016), a rescue breathing face shield, a pair of disposable gloves, three retractable syringes, an infographic guideline on responding to an overdose, and a form to report details of an overdose event (Fig. 1). Clients could fill out the form independently and mail it, drop it at a site, or complete it with help from the staff when/if they attend a THN distribution site to request a replacement kit; however, filling out the form is not a mandatory step in acquiring a replacement kit (For more details about BCTHN, please see http://towardtheheart.com/naloxone). Data collection is anonymous and recorded data on the administrative forms are stored on a secure database (Please see Supplement 1 for sample overdose response form). For the purpose of this analysis, data regarding the overdose events reported between July 2015 and December 2017 were extracted. Records were excluded if they did not provide any responses to the main outcome of the study (i.e., calling 9-1-1).

Table 1
Overdose characteristics associated with calling 9-1-1 in case of an overdose.

Overdose Characteristic	N	Called 9-1-1 n[d] (%)	Not Called 9-1-1 n[d] (%)	*p*-value[c]
Overall	2350	1310 (55.74)	1040 (44.26)	–
Age[a]				
≤30	824	452 (54.85)	364 (44.17)	
> 30	1321	723 (54.73)	584 (44.21)	0.973
Sex[a]				
Female	690	342 (49.57)	340 (49.28)	
Male	1541	876 (56.85)	645 (41.86)	0.001
Health authority				
Vancouver Coastal	489	358 (73.21)	122 (24.95)	
Fraser	1101	594 (53.95)	486 (44.14)	< 0.001
Interior	360	143 (39.72)	210 (58.33)	< 0.001
Northern	250	118 (47.20)	119 (47.60)	< 0.001
Island	201	93 (46.27)	101 (50.25)	< 0.001
Overdose setting				
Street/Alley/Park	763	500 (65.53)	255 (33.42)	
Private Residence	895	329 (36.76)	552 (61.68)	< 0.001
SRO/Supportive housing	180	134 (74.44)	44 (24.44)	0.021
Other[b]	398	275 (69.10)	115 (28.89)	0.142
No. of ampules administered				
1	625	317 (50.72)	299 (47.84)	
2	877	482 (54.96)	379 (43.22)	0.086
3	500	272 (54.40)	221 (44.20)	0.219
> 3	219	139 (63.47)	71 (32.42)	< 0.001
Withdrawal symptoms				
None	696	333 (47.84)	348 (50.00)	
Mild	207	100 (48.31)	104 (50.24)	0.976
Moderate	126	59 (46.83)	66 (52.38)	0.727
Severe	55	27 (49.09)	27 (49.09)	0.876
Mouth-mouth rescue breathing[a]				
No	923	439 (47.56)	476 (51.57)	
Yes	1145	716 (62.53)	410 (35.81)	< 0.001
Survived the overdose[a]				
No	27	16 (59.26)	11 (40.74)	
Yes	2086	1130 (54.17)	920 (44.10)	0.668
Date of overdose				
2015 (2nd half)	141	101 (71.63)	40 (28.37)	
2016 (1st half)	319	202 (63.32)	116 (36.36)	0.091
2016 (2nd half)	512	311 (60.74)	196 (38.28)	0.025
2017 (1st half)	853	388 (45.49)	447 (52.40)	< 0.001
2017 (2nd half)	389	220 (56.56)	156 (40.10)	0.007

[a] Refers to the overdose victim.
[b] Includes options such as vehicle, bar/night club/concert, community agency/drop-in, and, shelter/tent.
[c] Variables with a *p*-value < 0.2 were considered for the multivariable regression model.
[d] Although a total of 2416 forms were available to review in the period of our study, the final analytic sample included 2350 records which provided a valid response to our outcome variable (i.e., calling 9-1-1). Missing values account for percentages which do not add up to 100%.

Dependent variable

The current study examines the prevalence and correlates of seeking emergency medical help (i.e., calling 9-1-1) in the event of an overdose by people who witness the overdose and administered naloxone in British Columbia, Canada. Calling 9-1-1 was treated as a binary variable and responses to the question "Did anyone call 9-1-1 in the event of the overdose you witnessed?" were coded as yes or no.

Independent variables

Independent variables of interest included age group of the overdose victim (≤30 or > 30 years), sex of the overdose victim (male or female), BC regional health authority (Vancouver Coastal, Fraser, Interior, Northern, or Island [Please see www2.gov.bc.ca/gov/content/health/about-bc-s-health-care-system/partners/health-authorities/regional-health-authorities for further details on regional health authorities in BC]), overdose setting (street/alley/park, private residence, single room occupancies (SRO)/supportive housing, or other settings [e.g., vehicle, bar/nightclub/concert, community agency/drop-in, and, shelter/tent]), and number of naloxone ampules administered (1, 2, 3 or > 3). Other independent variables included in this analysis were reported withdrawal symptoms (none, mild, moderate, severe), mouth-to-mouth rescue breathing given (yes or no), surviving the overdose (yes or no), and date of overdose in six-month periods (2015 [2nd half], 2016 [1 st half], 2016 [2nd half], 2017 [1 st half], or 2017 [2nd half]).

Statistical analysis

Descriptive statistics were computed for all variables stratified by the main outcome (i.e., having called 9-1-1). Descriptive statistics were also reported for the trend of police presence at the overdose scene, number of naloxone ampules administered, and reasons for not calling 9-1-1 among participants who reported not seeking emergency medical help (collected using a free-text entry in the form) across different health authorities over time. Bivariable and multivariable modified Poisson regression using a generalized linear model (GLM) with Poisson as family and log link function (Zou, 2004) were used to examine the correlates of calling 9-1-1 in an overdose event. Variables with a P-value < 0.2 in the bivariable regression were entered into the multivariable regression model (Maldonado & Greenland, 1993). The final model was selected using a backward selection approach based on Akaike's Information Criterion (AIC). Crude and adjusted prevalence ratios (APRs) along with their 95% confidence intervals (CI) were reported. All statistical analyses were performed using Stata v.14 (Stata Corp., College Station, Texas) and *p*-values less than 0.05 were considered statistically significant.

Handling missing data

A total of 2416 forms were available to review in the period of our study. The final analytic sample included 2350 records which provided a valid response to our outcome variable (i.e., calling 9-1-1). The percentage of missing values included in the final multivariable regression analysis was 0.25% [health authority], 7.2% [number of ampules administered], 6.2% [sex], 6.2% [overdose setting], and 7.3% [date of overdose] and 13% [mouth-to-mouth rescue breathing]. To assess the potential impact of missing data on our findings, the final multivariable regression model was re-analyzed based on ten imputed datasets using the multiple imputations by chained equation (MICE) algorithm (Royston & White, 2011). Missing data were assumed to be at random.

Ethical considerations

The study analyzed anonymous administrative data. Approval from Behavioural Ethics Board at the University of British Columbia was received (Ethics reference number: H12-02557).

Results

Out of the 2350 records included in the analysis, 1310 (55.7%) reported calling 9-1-1 in the event of an overdose. Our findings indicated that the prevalence of bystanders calling 9-1-1 fluctuated over time from 56.5% in 2016 to 46.0% in 2017. Characteristics of the overdose events stratified by calling 9-1-1 are presented in Table 1. Most overdose victims were > 30 years old (n = 1321; 61.5%) and male (n = 1541; 69.0%). Across all health authorities, Fraser Health had the highest number of administration forms (n = 1101; 45.8%) followed by the Vancouver Coastal Health (n = 489, 20.3%). Naloxone administrations events occurred primarily in private residences (n = 895; 40.0%) and in the streets/alleys/parks (n = 763; 34.1%); however, SRO/supportive housing was the setting with the highest

Table 2
Correlates of calling 9-1-1 in the case of an overdose with unadjusted and adjusted prevalence ratios and *p*-values.

Overdose Characteristic	Unadjusted PR (95% CI)	*p*-value	Adjusted PR (95% CI)	*p*-value
Sex[a]				
Male vs. Female	1.14 (1.05–1.25)	0.002	1.11 (1.02–1.22)	0.013
Health authority				
Fraser vs. Vancouver Coastal	0.73 (0.68–0.79)	< 0.001	0.80 (0.73–0.87)	< 0.001
Interior vs. Vancouver Coastal	0.54 (0.47–0.62)	< 0.001	0.68 (0.58–0.79)	< 0.001
Northern vs. Vancouver Coastal	0.66 (0.58–0.76)	< 0.001	0.85 (0.73–0.98)	0.045
Island vs. Vancouver Coastal	0.64 (0.55–0.75)	< 0.001	0.80 (0.67–0.97)	0.025
Overdose setting				
Private Residence vs. Street/Alley/Park	0.56 (0.51–0.62)	< 0.001	0.59 (0.53–0.66)	< 0.001
SRO/Supportive housing vs. Street/Alley/Park	1.13 (1.03–1.25)	0.011	1.00 (0.89–1.12)	0.952
Other[b] vs. Street/Alley/Park	1.06 (0.98–1.55)	0.134	1.10 (0.97–1.20)	0.116
No. of ampules administered				
2 vs. 1	1.08 (0.98–1.19)	0.089	1.04 (0.94–1.15)	0.401
3 vs. 1	1.07 (0.95–1.19)	0.217	1.09 (0.97–1.22)	0.118
> 3 vs. 1	1.28 (1.13–1.45)	< 0.001	1.17 (1.03–1.33)	0.011
Mouth-mouth rescue breathing[a]				
Yes vs. No	1.32 (1.22k1.43)	< 0.001	1.32 (1.22–1.44)	< 0.001
Date of overdose				
2016 (1st half) vs. 2015 (2nd half)	0.88 (0.77–1.01)	0.077	0.97 (0.85–1.11)	0.708
2016 (2nd half) vs. 2015 (2nd half)	0.85 (0.75–0.97)	0.015	0.88 (0.77–1.01)	0.086
2017 (1st half) vs. 2015 (2nd half)	0.64 (0.57–0.73)	< 0.001	0.70 (0.61–0.80)	< 0.001
2017 (2nd half) vs. 2015 (2nd half)	0.81 (0.71–0.93)	0.003	0.83 (0.71–0.97)	0.019

[a] Refers to the overdose victim.
[b] Includes options such as bar, night club, concert, community agency, drop-in, and shelter. Final model was run on 1739 observations.

prevalence of help-seeking (n = 134; 74.4%). Most overdose events were handled with less than four naloxone ampules (n = 2002; 90.1%) and the majority reported no or mild withdrawal symptoms (n = 903; 83.3%). Mouth-to-mouth rescue breathing was given in 1145 (55.3%) events and most overdose victims survived the overdose (n = 2086; 98.7%).

In the multivariable regression model (Table 2), the likelihood of calling 9-1-1 was significantly and positively associated with the overdose victim being male (APR = 1.11; 95% CI: 1.02–1.22), administering > 3 ampules (APR = 1.17; 95% CI: 1.03–1.33), and giving mouth-to-mouth rescue breathing (APR = 1.32; 95% CI: 1.22–1.44). The likelihood of calling 9-1-1 was also significantly and negatively associated with overdoses occurring in private residences (APR = 0.59; 95% CI: 0.53–0.66) and health authorities other than Vancouver Coastal, which delivers services to BC residents living in Vancouver, Vancouver's North Shore, Richmond and surrounding areas (APR_{Fraser} = 0.80; 95% CI: 0.73–0.87; $APR_{Interior}$ = 0.68; 95% CI: 0.58–0.79 $APR_{Northern}$ = 0.85; 95% CI: 0.73–0.98; APR_{Island} = 0.80; 95% CI: 0.67–0.97). Furthermore, the 1st and 2nd halves of 2017 were associated with a reduced prevalence ratio of calling 911 in comparison with the 2nd half of 2015 ($APR_{2017\ (1st\ half)}$ = 0.70; 95% CI: 0.61–0.80; $APR_{2017\ (2nd\ half)}$ = 0.83; 95% CI: 0.71–0.97). The multivariable regression analysis was fitted using 1739 observations (i.e., 74% of the analytic sample). The directions and strength of the associations remained fairly unchanged after imputing the missing data (Please see Supplement 2).

Details of police presence at the overdose events and reasons for not calling 9-1-1 across different health authorities are presented in Table 3. Of the 1040 participants who did not call 9-1-1, 543 provided reasons for their behaviour. Overall, the most common reasons for not calling 9-1-1 were reported as perceiving they had the situation under control (n = 286; 52.7%) and concerns about police presence at the overdose scene (n = 171; 31.5%). Over the course of the study, confidence in handling the overdose event was increasingly cited as a reason for not calling 9-1-1 at an overdose event (Fig. 2). Across all health authorities, the police were largely not the first agency to attend the overdose scene (n = 1836; 94.7%); however, they did attend 421 (38.9%) of the events. The trend analysis of police attendance across different health authorities over the course of the study shows an overall decrease in police presence at overdose events (Fig. 3). Lastly, the number of naloxone ampules administered has increased over time (Fig. 4).

Discussion

In this province-wide retrospective analysis from 2015 to 2017, we found that 9-1-1 was called in only 55.7% of the overdose events. Our findings were compatible with provincial overdose statistics suggesting most overdoses happening among men, inside private residences, and within certain health authorities (BC Coroners Service, 2018b). Prevalence of calling 9-1-1 at overdose events in our study is also comparable with estimates across various settings ranging from 21% in Baltimore (Tobin et al., 2005) to 68% in New York (Tracy et al., 2005). BCTHN administration forms suggest that frequencies of bystanders calling 9-1-1 seem to have decreased over time; a finding that could be due to bystanders' increased confidence in handling overdoses or fear of police presence. The former explanation seems more plausible as most bystanders cited feeling confident in handling the overdose events using their naloxone kits as the main reason for not calling 9-1-1. While feeling empowered in the community about handling overdoses and saving lives is promising, overdose awareness and naloxone training campaigns should further stress calling 9-1-1 and the importance of linking non-fatal overdose victims to care (Olfson et al., 2018).

On the other hand, the BC Emergency Health Services' revised policy about informing police of overdose events in June 2016, the decreasing trend of police presence at overdose events across all health authorities in BC, and bystanders' decreasing concerns about police presence over time are all promising. Indeed, decoupling police-medical response at the institutional level could be accomplished with inexpensive modifications to standard operating procedures and enhanced overdose-related training for law enforcement (Latimore & Bergstein, 2017). However, concerns about police presence continue to exist and create barriers to bystanders' help-seeking behaviour. For example, consistent with findings from elsewhere, overdoses occurring in private residences remained negatively associated with calling 9-1-1 (Klimas, O'Reilly, Egan, Tobin, & Bury, 2014; Lankenau et al., 2013; Tobin et al., 2005; Tracy et al., 2005). Not calling 9-1-1 in private residences is often underpinned by a history of unpleasant interaction with the law enforcement, having drugs at home, losing the custody of children, homicide charges, or eviction (Bennett et al., 2011; Latimore

Table 3
Reasons for not calling 9-1-1 and police presence at the overdose scene across different health regions in British Columbia.

	Police 1st on overdose scene N = 1938 n (%)			Police attended the overdose scene N = 1082 n (%)			Reason for not calling 9-1-1 N = 543 n (%)			
Health Authority	Yes	No	*p*-value	Yes	No	*p*-value	Concerns for police presence	Situation under control	Other[a]	*p*-value
Vancouver Coastal	21 (5.5)	363 (94.5)	0.009	64 (27.9)	165 (72.1)	0.001	29 (32.6)	47 (52.8)	13 (14.6)	0.059
Fraser	57 (6.1)	872 (93.9)		239 (43.9)	305 (56.1)		75 (29.1)	141 (54.6)	42 (16.3)	
Interior	2 (0.7)	269 (99.3)		39 (36.8)	67 (63.2)		25 (25.5)	53 (54.1)	20 (20.4)	
Northern	13 (6.8)	178 (93.2)		49 (37.1)	83 (62.9)		19 (33.9)	31 (55.4)	6 (10.7)	
Island	9 (5.5)	154 (94.5)		30 (42.2)	41 (57.7)		23 (54.8)	14 (33.3)	5 (11.9)	
Total	102 (5.3)	1836 (94.7)		421 (38.9)	661 (61.1)		171 (31.5)	286 (52.7)	86 (15.8)	

[a] Other category includes options such as not having a phone available or no phone service or unspecified other options.

& Bergstein, 2017; Sherman et al., 2008; Tobin et al., 2005; Tracy et al., 2005; Wagner et al., 2015). Moreover, despite the existing policies, police non-attendance practices seem to vary across different health authorities in BC. For example, participants in the Vancouver Coastal region were more likely to call 9-1-1 compared with all other regions; a finding that could be attributed to the fact that the Vancouver Police Department has a long-standing overdose non-attendance policy in place (Vancouver Police Department, 2006).

While the impact of policy changes during the course of our study was not assessed in our analysis, bystanders' concern about calling 9-1-1 could be partly addressed by the introduction of the GSDOA in Canada in mid-2017 (Health Canada, 2017). Nonetheless, there are a number of issues that need to be addressed before GSDOA reaches its full potential in Canada. Previous studies elsewhere suggest that most people who are at risk of overdose or witness an overdose event are unaware of the Good Samaritan laws and the policy penetration among bystanders and first responders is poor (Banta-Green, Beletsky, Schoeppe, Coffin, & Kuszler, 2013; Davis & Carr, 2015; Latimore & Bergstein, 2017; McLean, 2018). While informational posters and wallet/ THN case cards were developed to explain the GSDOA in BC, it is essential that there be sufficient funding for public communication and educational campaigns about GSDOA tailored to the community of people of who use drugs, law enforcement, and emergency medical personnel across BC. Moreover, the current GSDOA in Canada is limited to providing immunity against simple possession of an illegal substance as well as charges for breach of probation, pre-trial release, conditional sentences or parole relating to simple drug possession; it fails to provide protection against outstanding warrants, drug production and trafficking, and all other crimes not included in the act (Health Canada, 2017). Given the grey zone between drug possession and drug dealing, future studies in BC need to examine how the community of people who use drugs and law enforcement interpret and understand GSDOA.

We also observed that bystanders were more likely to call 9-1-1 in events where mouth-to-mouth rescue breathing was carried out, higher doses (i.e., > 3) of naloxone ampules were administered, or the overdose victim was male. While about 60% of the overdose events in 2017 were handled using one or two doses of naloxone, observing that seeking help in severe cases was practiced more frequently warrants further investigations on the source of additional naloxone doses. Although such an increase could be mainly attributed to the policy shift in March 2016 when the number of naloxone ampules in each kit was increased to three (BC Centre for Disease Control, 2018a), it might also reflect the increasing presence of fentanyl and its analogues in the illicit drug market which requires higher doses of naloxone to reverse an overdose or prevent overdose victims from falling back into an overdose after naloxone wears off (BC Coroners Service, 2018a). The role of the overdose victim's sex in calling 9-1-1 is another important finding that calls for further assessments to shed more light on the gendered dynamics of calling 9-1-1 in the context of the ongoing overdose epidemic in BC.

While our study has several strengths and important implications for scaling up THN programs across BC and beyond, we acknowledge

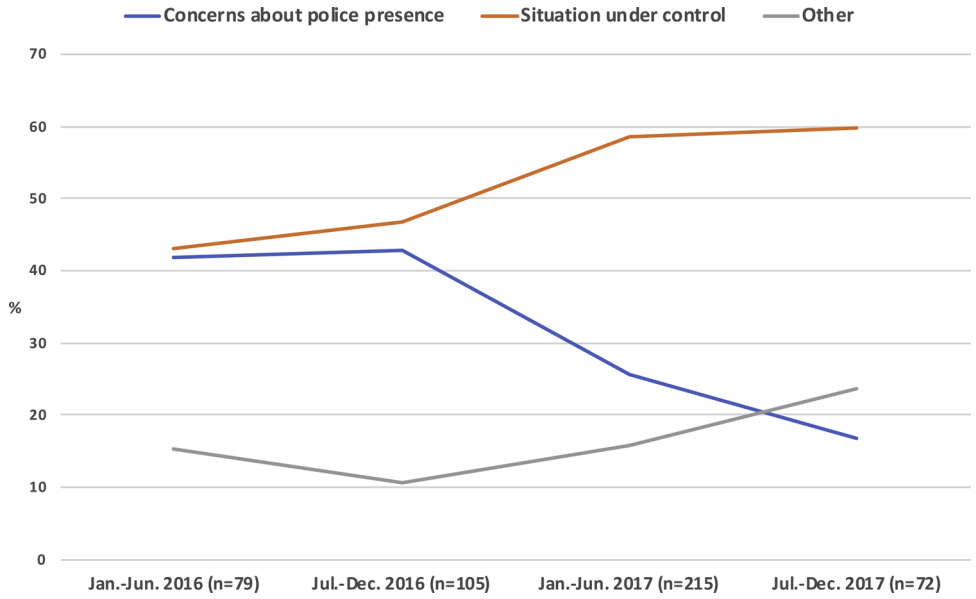

Fig. 2. Frequencies (%) of reasons for not calling 9-1-1 at an overdose event across British Columbia, Canada (January 2016-December 2017).
Note: Other category includes options such as not having a phone available or no phone service.

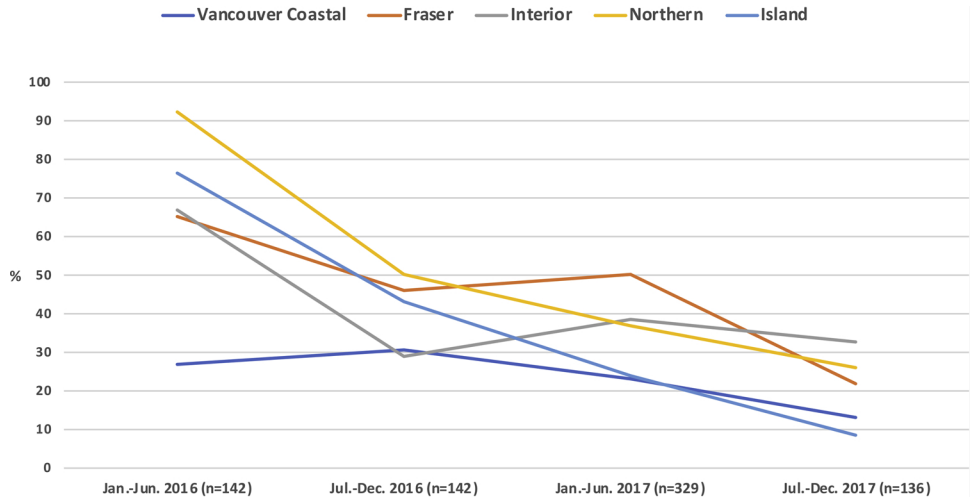

Fig. 3. Frequencies (%) of police attendance at the overdose scene across different health authorities in British Columbia, Canada (January 2016-December 2017).

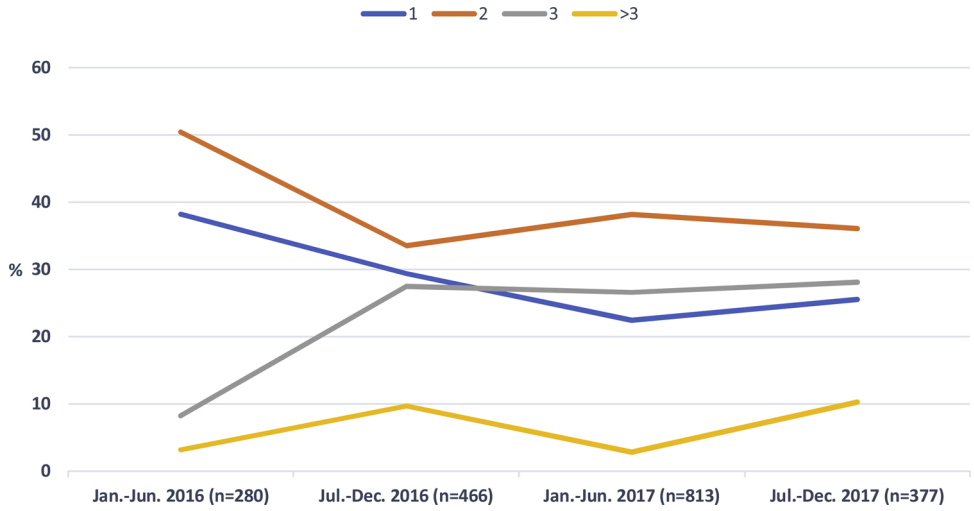

Fig. 4. Frequencies (%) of number of naloxone ampules administered through the Take Home Naloxone program across British Columbia, Canada (January 2016-December 2017).
Note: From March 2016, THN kits contained three doses of naloxone.

the limitations of our findings. First, the self-reported and voluntary nature of responses to the THN administrative forms should be considered when interpreting our findings (i.e., recall and reporting biases could not be ruled out). Second, in order to keep the participation burden low, we were unable to collect more detailed information about the overdose event (e.g., certain characteristics of the bystanders or overdose victims such as previous overdose experiences or type of substance led to overdose). Third, as the people who receive the kits are not required to register upon receiving the kits, we cannot provide detailed statistics on how they compare with those who fill out the administration forms. Forth, given the anonymous nature of data collection, we were unable to examine whether overdose response reports were from the same or unique individuals. Moreover, participants with multiple administrations of naloxone may have not necessarily reported all their overdose cases. Fifth, although our sample characteristics are fairly comparable with the provincial statistics, the convenience nature of our participants and the fact that only a small proportion of the forms were returned, limits the generalizability of our findings to all overdoses in BC and might be biased towards those that are more likely to call 9-1-1 (i.e., levels of help-seeking may actually be lower in the general population, especially among those who do not access BCTHN). Lastly, the introduction of new policies during the course of data collection (e.g., overdose prevention sites, facility overdose response box (FORB) program, GSDOA, public health emergency declaration) might have also affected the rates of overdose reports which need to be further investigated in future evaluations of BCTHN.

Conclusion

Our findings showed that medical help was sought in about 56% of overdoses where naloxone was administered. Seeking help was more likely to take place among male victims as well as those receiving higher doses of naloxone and mouth-to-mouth rescue breathing. Despite the decreasing rates of police presence at overdose events, people who use drugs or witness an overdose continue to have concerns about police presence at overdose events. Further interventions are required to address these concerns and increase awareness and penetration of policies such as police non-attendance or GSDOA among both law enforcement and the community of people who use drugs to help encourage people to call 9-1-1. Lastly, overdose awareness and educational campaigns should further stress the importance of calling 9-1-1 and not using alone.

Declarations of interest

None.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.drugpo.2019.01.006.

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