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## Short communication

## Overdose and risk factors for coronavirus disease 2019

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## ABSTRACT

**Background:** There have been significant efforts to respond to the two public health emergencies of coronavirus disease 2019 (COVID-19) and overdose in British Columbia (BC), Canada. The purpose of this study was to quantify the prevalence of known risk factors associated with mortality due to COVID-19 for persons who have had a non-fatal overdose during 2015–2017 in comparison to persons who have not had an overdose.

**Methods:** Data were extracted from the BC Provincial Overdose Cohort which includes a 20 % random sample of BC residents and persons who have had a non-fatal overdose in BC from January 2015 to December 2017. Chi-square tests and logistic regression were used to compare risk factors by overdose history.

**Results:** Persons who had a non-fatal overdose were significantly more likely to have three (chronic pulmonary disease, diabetes, coronary heart disease) of the four known chronic conditions associated with the development of severe illness due to COVID-19 compared to persons who did not have a previous non-fatal overdose event.

**Conclusion:** Persons who had an overdose were more likely to have several chronic conditions associated with the development of severe illness due to COVID-19. The increased likelihood of having these risk factors is reflective of the social and health inequities experienced by persons who have a history of overdose.

## 1. Introduction

There have been significant efforts to respond to the dual public health emergencies of coronavirus disease 2019 (COVID-19) and overdose in British Columbia (BC), Canada including the provision of pharmaceutical alternatives to the toxic drug supply (BC Centre on Substance Use, 2020). The purpose of this analysis was to quantify the prevalence of known risk factors associated with mortality due to COVID-19 for persons who have had a non-fatal overdose during 2015–2017 in comparison to persons who have not had an overdose.

## 2. Materials and methods

Data were extracted from the Provincial Overdose Cohort (ODC), which includes a 20 % random sample of BC residents and persons who have had a non-fatal overdose in BC from January 1, 2015 to December 31, 2017. The ODC and definitions for identification of overdose cases are described elsewhere (MacDougall et al., 2018). Persons who died prior to December 31, 2017 were excluded. Risk factors for serious COVID-19-related illness were identified from the literature: 1) chronic pulmonary disease (including asthma and COPD), 2) diabetes, 3) hypertension, 4) coronary heart disease, 5) over 50 years of age, 6) male

sex, and 7) Elixhauser Comorbidity Index (ECI) of 2+ (Yang et al., 2020; Driggin et al., 2020). To be recorded as having risk factors 1–4, persons must have had two physician billing records or one hospitalization record in a one year period from 2015 to 2017 (British Columbia Ministry of Health, 2017a; British Columbia Ministry of Health, 2017b). Demographic information was extracted from the Client Roster for the year 2017 (British Columbia Ministry of Health, 2017c). The ECI was calculated using hospitalization data for all chronic diseases excluding respiratory illness, drug abuse, diabetes, hypertension, and coronary heart disease. Chi-square tests were used to compare risk factors by overdose history. Logistic regression was used to calculate odds ratio of having a risk factor for persons who had a previous overdose compared with persons who did not have an overdose after adjusting for age and sex. Statistical significance was defined as  $p < 0.05$ .

## 3. Results

This study included 1,041,536 persons, 19,005 persons had one or more non-fatal overdose events from 2015 to 2017. The average age was 39 years and 50.0 % were male. Among persons who had an overdose, 56.0 % had a record of receiving social assistance (N = 10,649) from 2015 to 2017. Of these persons, 53.7 % had a record of no

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**Table 1**  
Risk factors for coronavirus disease 2019 by overdose history.

Risk Factor	Persons without a Non-Fatal Overdose (N = 1,022,531)	Persons with a Non-Fatal Overdose (N = 19,005)	P Value	Adjusted OR (95 % CI) <sup>a,b</sup>
1. Chronic pulmonary disease	67,104 (6.6)	2102 (11.1)	< 0.001	2.01 (1.92–2.11)
2. Diabetes	66,278 (6.5)	1010 (5.3)	< 0.001	1.24 (1.16–1.32)
3. Hypertension	125,860 (12.3)	1341 (7.1)	< 0.001	0.98 (0.93–1.05)
4. Coronary heart disease	29,788 (2.9)	634 (3.3)	< 0.001	2.08 (1.92–2.27)
5. Age > 50	347,086 (33.9)	3219 (16.9)	< 0.001	<sup>c</sup>
6. Sex Male	506,549 (49.5)	12,502 (65.8)	< 0.001	<sup>c</sup>
7. Elixhauser Comorbidity index <sup>†</sup> > 2	16,971 (1.7)	2642 (13.9)	< 0.001	18.05 (17.19–18.96)

<sup>†</sup> Excluded chronic pulmonary disease, diabetes, hypertension, and drug abuse from the Elixhauser Comorbidity Index calculation.

<sup>a</sup> Adjusted for age and sex.

<sup>b</sup> Persons who did not have a previous non-fatal overdose were the reference group.

<sup>c</sup> Entered as covariates in the adjusted model.

fixed address from 2015 to 2017 (N = 5716). After adjusting for age and sex, persons who had a previous overdose were more likely to have chronic pulmonary disease, diabetes, coronary heart disease, and an ECI of over two compared with persons who did not have a previous overdose (Table 1).

#### 4. Discussion

Persons who had an overdose were more likely to have three of the four known chronic conditions associated with the development of severe illness due to COVID-19. The increased likelihood of having these risk factors is reflective of the social and health inequities experienced by persons who have a history of overdose. Despite being a younger population, persons who have a history of overdose were more likely to have co-morbid conditions. Overdose events and chronic health conditions are likely underreported due to misclassification bias. Increasing use of take home naloxone in community settings has reduced reliance on health care providers to reverse overdose which is believed to have lowered health care utilization for overdose events. The high proportion of persons who had a previous overdose who received income assistance and experienced homelessness may suggest limited access to material resources to support physical isolation.

#### Author contributions

Dr. Wen Qi Gan and Dr. Amanda Slaunwhite had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. All authors approved of the final article for publication.

Concept and Design: Slaunwhite, Gan, Buxton, Xavier

Acquisition, analysis or interpretation of data: All authors

Drafting of the manuscript: Slaunwhite, Gan

Critical revision of the manuscript for important intellectual content: All authors

Statistical analysis: Gan

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#### Declaration of Competing Interest

The authors have no conflicts of interest to declare.

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#### References

- BC Centre on Substance Use, 2020. Risk Mitigation in the Context of the Dual Public Health Emergencies. Vancouver BC. <https://www.bccsu.ca/wp-content/uploads/2020/03/Risk-Mitigation-in-the-Context-of-Dual-Public-Health-Emergencies-v1.2.pdf>. Accessed on April 2, 2020.
- [dataset] British Columbia Ministry of Health, Discharge Abstract Database (Hospital Separations), British Columbia Ministry of Health, Data Extract, 2017, MOH.
- [dataset] British Columbia Ministry of Health, Medical Services Plan (MSP) Payment Information File, British Columbia Ministry of Health, Data Extract, 2017, MOH.
- [dataset] British Columbia Ministry of Health, Consolidation File (MSP Registration & Premium Billing), British Columbia Ministry of Health, Data Extract, 2017, MOH.
- Driggin, E., Madhavan, M.V., Bikdeli, B., Chuich, T., Laracy, J., Bondi-Zoccai, G., Brown, T.S., Der Nigoghossian, C., Zidar, D.A., Haythe, J., Brodie, D., Beckman, J.A., Kirtane, A.J., Stone, G.W., Krumholz, H.M., Parikh, S.A., 2020. Cardiovascular considerations for patients, health care workers, and health systems during the coronavirus disease 2019 (COVID-19) pandemic. *J. Am. Coll. Cardiol.* <https://doi.org/10.1016/j.jacc.2020.03.031>.
- MacDougall, L., Smolina, K., Otterstatter, M., Zhao, B., Chong, M., Godfrey, D., Mussavi-Rizi, A., Sutherland, J., Kuo, M., Kendall, P., 2018. Development and characteristics of the provincial overdose cohort in British Columbia. *Canada. Int. J. Popul. Data Sci.* <https://doi.org/10.23889/ijpds.v3i4.1033>.
- Yang, X., Yu, Y., Xu, J., Shu, H., Xia, J., Liu, H., Wu, Y., Zhang, L., Yu, Z., Fang, M., Yu, T., Wang, Y., Pan, S., Zou, X., Yuan, S., Shang, Y., 2020. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *Lancet Respir. Med.* [https://doi.org/10.1016/S2213-2600\(20\)30079-5](https://doi.org/10.1016/S2213-2600(20)30079-5).