TOXIC BRAIN INJURY: A HIDDEN EPIDEMIC WITHIN THE DRUG TOXICITY CRISIS

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BA MD CCFP (AM), DISAM

October 14th, 2022

I respectfully acknowledge that I am a settler on the unceded traditional territories of the Hul'qumi'num speaking people who have cared for and lived in harmony with this land since time immemorial

OUTLINE

- Context of drug toxicity crisis
- Hypoxic/anoxic brain injury
- Fentanyl and excitotoxicity
- Toxic leukoencephalopathy
- Cumulative impact of nonfatal OD
- Next steps

MEET JOHN

- Person now early 30's
- 45 minutes of CPR
- Hypoxemia < 85%
- MoCA 20/30

Photo by Jon Tyson on Unsplash

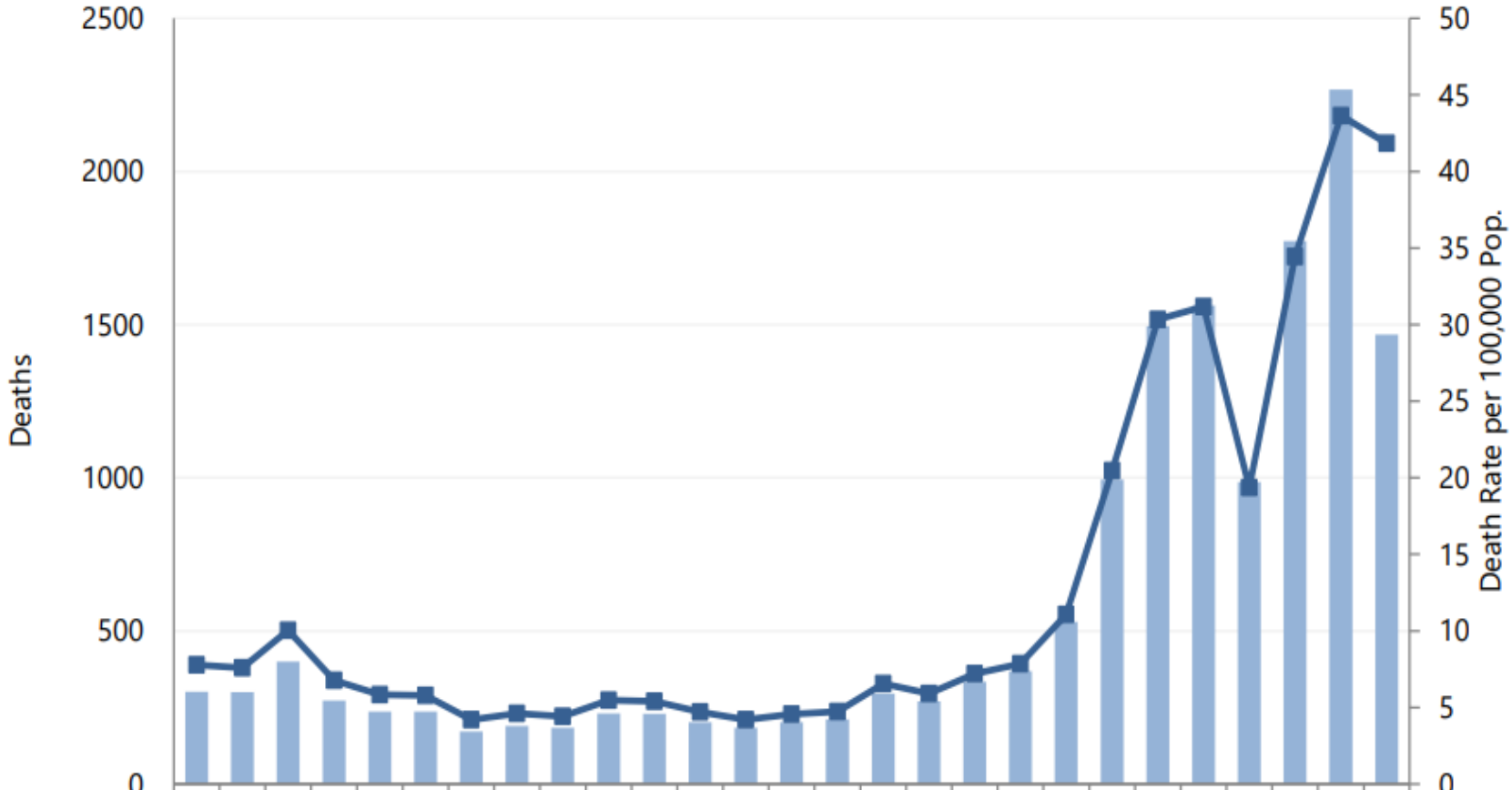
DRUG TOXICITY CRISIS OVERVIEW

- BC Public Health emergency declared 14/4/2016
- BC Coroner's Report 2021 (published Feb 28/22)
  - 1724 suspected drug OD deaths; ~5.5 deaths/day
  - 7x more illicit drug OD deaths than MVA deaths
  - Ages 30-59 = 69% deaths, Ages 19-59 = 87% deaths
  - per 100,000 individuals, NH highest rate of OD deaths (58.1) followed by VCH (44.1) IH (32.2)
  - Highest rates of deaths occur inside (88%), in males (81%), people using alone (>69%).

BC Coroners Service

Illicit Drug Toxicity Deaths in BC
January 1, 2012 to August 31, 2022

Figure 1: Illicit Drug Toxicity Deaths and Death Rate per 100,000 Population [3,5]

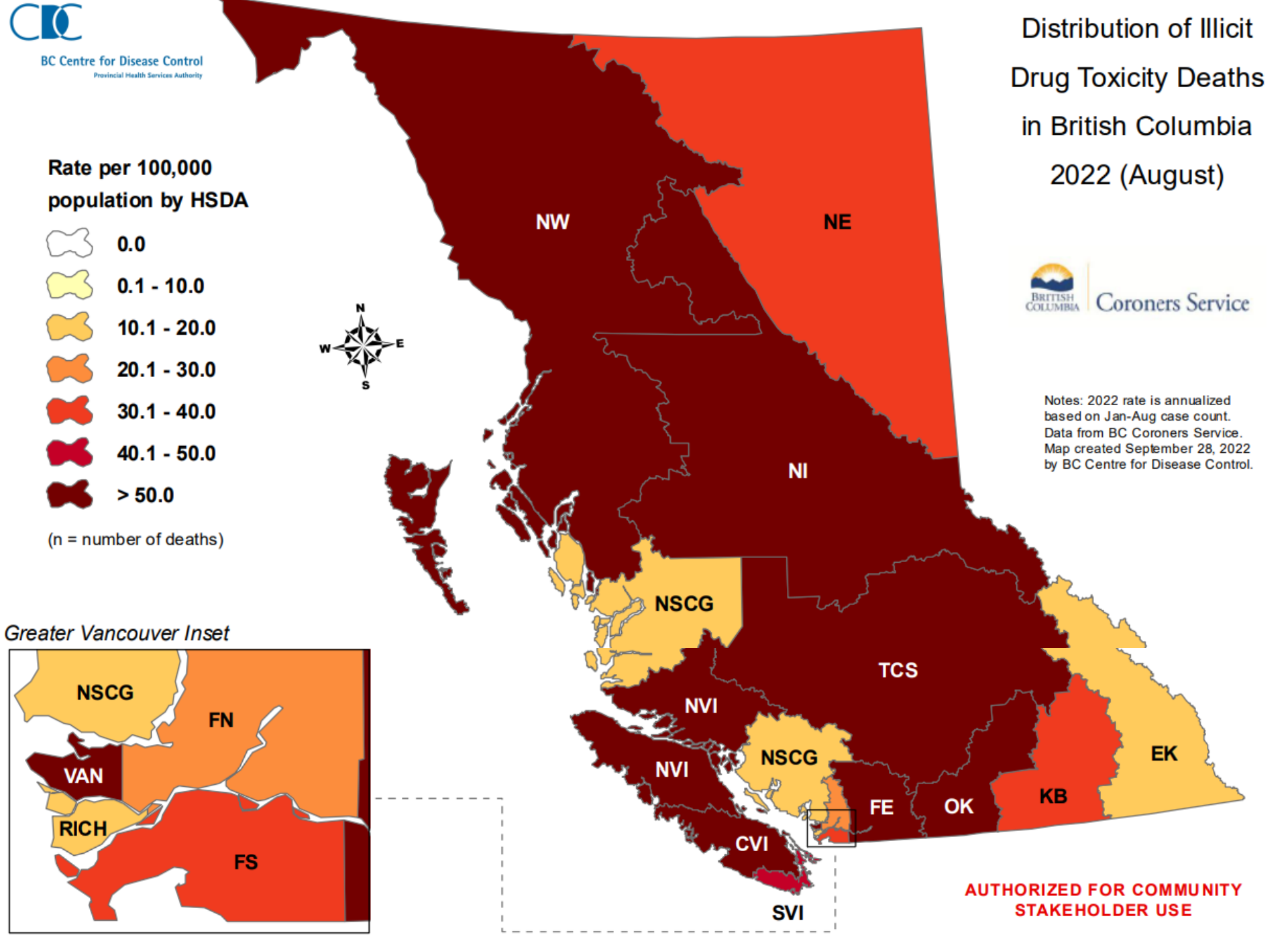


	'96	'97	'98	'99	'00	'01	'02	'03	'04	'05	'06	'07	'08	'09	'10	'11	'12	'13	'14	'15	'16	'17	'18	'19	'20	'21	'22
Deaths	301	300	400	272	236	236	172	190	183	230	229	202	183	201	211	295	270	334	369	529	994	1495	1562	986	1773	2267	1468
Rate	7.8	7.6	10.0	6.8	5.8	5.8	4.2	4.6	4.4	5.5	5.4	4.7	4.2	4.6	4.7	6.6	5.9	7.2	7.8	11.1	20.5	30.3	31.2	19.4	34.4	43.6	41.8

• BC Coroner's Service

BC Centre for Disease Control
Provincial Health Services Authority

Distribution of Illicit Drug Toxicity Deaths in British Columbia 2022 (August)

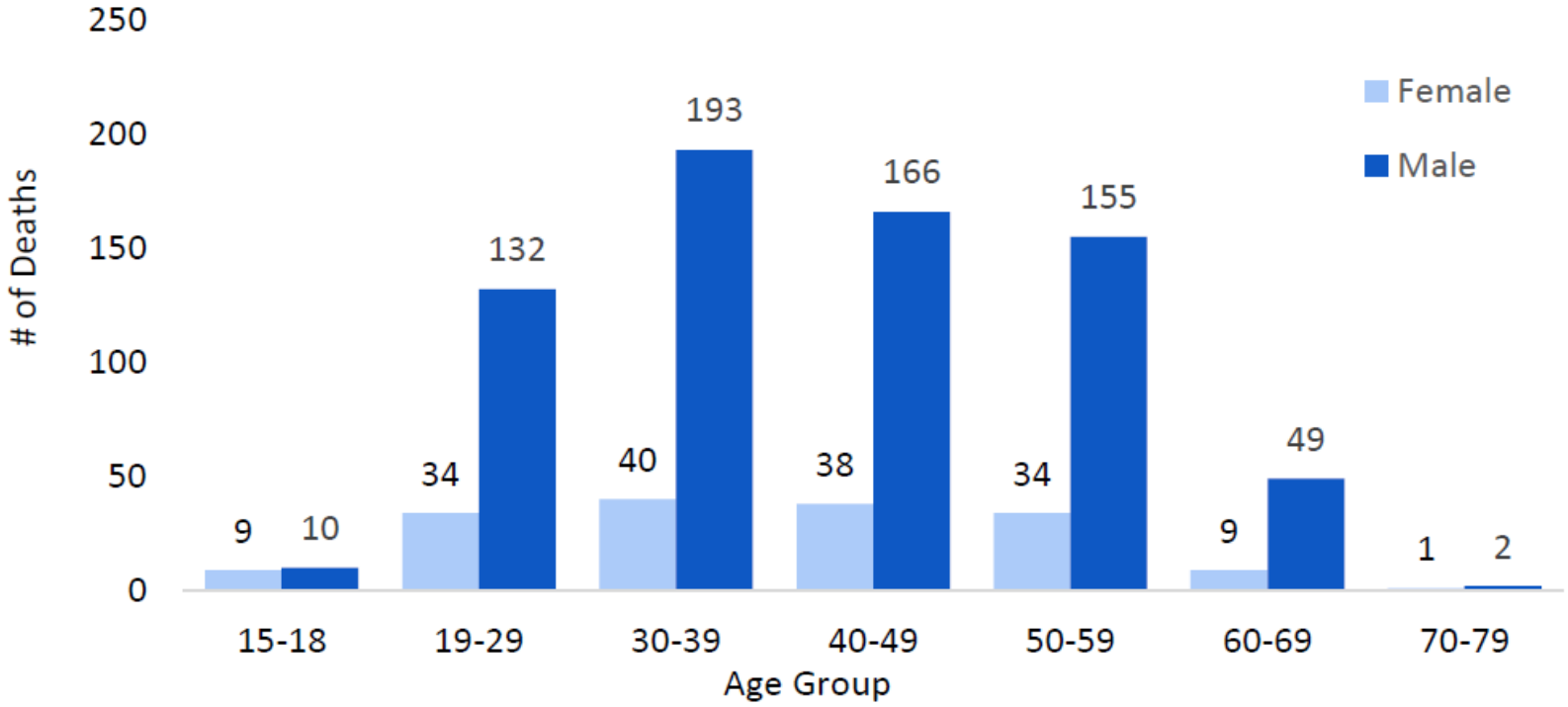


BRITISH COLUMBIA Coroners Service

Notes: 2022 rate is annualized based on Jan-Aug case count. Data from BC Coroners Service. Map created September 28, 2022 by BC Centre for Disease Control.

AUTHORIZED FOR COMMUNITY STAKEHOLDER USE

Fig. 1. Illicit drug overdose deaths by age group and sex



FIRST NATIONS IN BC AND THE TOXIC DRUG CRISIS

JANUARY - DECEMBER 2020

COVID-19 Pandemic Results in a Dramatic Increase in Toxic Drug Deaths

119%
INCREASE IN TOXIC DRUG DEATHS: 2020 vs 2019

2020: 254 First Nations people died
the highest number of toxic drug deaths since 2013

2019: 116 First Nations people died

First Nations people are
DISPROPORTIONATELY REPRESENTED IN TOXIC DRUG DEATHS

3.3%
of BC's Population

First Nations represent only **3.3%** of BC's population.

11.8%
IN 2019

14.7%
IN 2020

14.7% of all toxic drug deaths in 2020 were First Nations people. This number was **11.8%** in 2019.

THE GAP IS WIDENING DRAMATICALLY
between
First Nations and other BC residents.

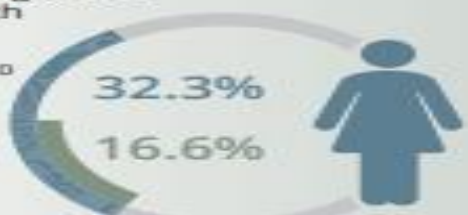
5.3x
First Nations people died at 5.3 times the rate of other BC residents in **2020**

3.9x
First Nations people died at 3.9 times the rate of other BC residents in **2019**

FIRST NATIONS WOMEN
experience very high rates of toxic drug death

32.3% of First Nations people who died in 2020 were women

16.6% of other BC residents who died were women



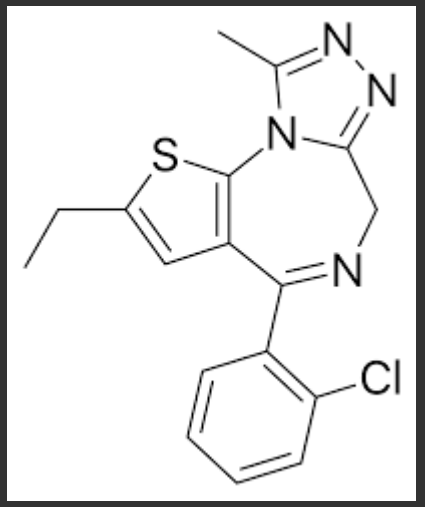
2020 RECORDED THE HIGHEST NUMBER OF DEATHS AMONG BOTH MEN AND WOMEN

9.9x First Nations **women** died at **9.9 times** the rate of other female BC residents

4.3x First Nations **men** died at **4.3 times** the rate of other male BC residents

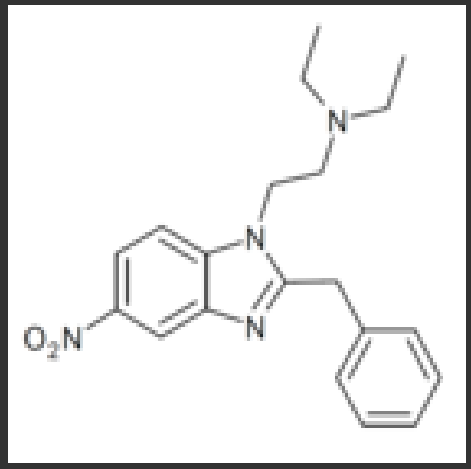
NOT JUST FENTANYL ANYMORE

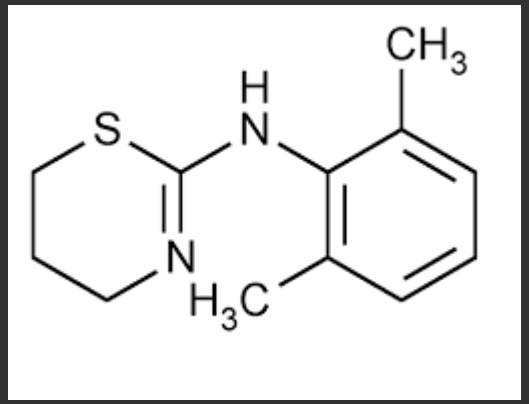
- New overdose presentations
- Naloxone restores respiration, not consciousness
- Constantly changing illicit supply



Etizolam

A nitazene





Xylazine

DRUG TOXICITY CRISIS OVERVIEW

- Canada: 19,355 opioid-related deaths Jan 2016-Sept 2020 with 82% related to fentanyl
- Following COVID-19 prevention measures, 3351 deaths – 74% increase from 6 months prior
- 90% of hospitalizations related to opioid/stimulant poisoning occurred in BC, AB and ON
- 4.2% (187) of hospitalizations for opioid toxicity had co-diagnosis of anoxic brain injury

https://www.canada.ca/en/health-canada/services/substance-use/problematic-prescription-drug-use/opioids/data-surveillance-research/harms-deaths.html

“The death numbers are what’s reported and people get the impression that if you have a drug overdose, you get naloxone and you survive. Or you do not get naloxone….and you die. But, there’s a lot of greyness in between.”

-Dr. Delbert Dorscheid, critical care physician SPH

NONFATAL OVERDOSE

- Estimates of 20-30 nonfatal overdoses to every death
- Revival via naloxone does not necessarily restore a person to baseline
- A nonfatal overdose is a risk for repeat or fatal overdose
- Any overdose which causes loss of consciousness is, by definition, a hypoxic event

TIME IS BRAIN

Neurons start to die 4-5 minutes without oxygen

Stroke interventions – time is brain

Harm reduction services are essential

Available online at www.sciencedirect.com

Resuscitation

journal homepage: www.elsevier.com/locate/resuscitation

Clinical paper

Differential outcomes following successful resuscitation in cardiac arrest due to drug overdose

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Abstract

Background: Data pertaining to clinical characteristics and outcomes of cardiac arrest (CA) due to drug overdose (ODCA) are limited. We hypothesized that patients with ODCA would have binary outcomes (brain death or functional recovery) compared to patients in whom CA was due to another etiology.

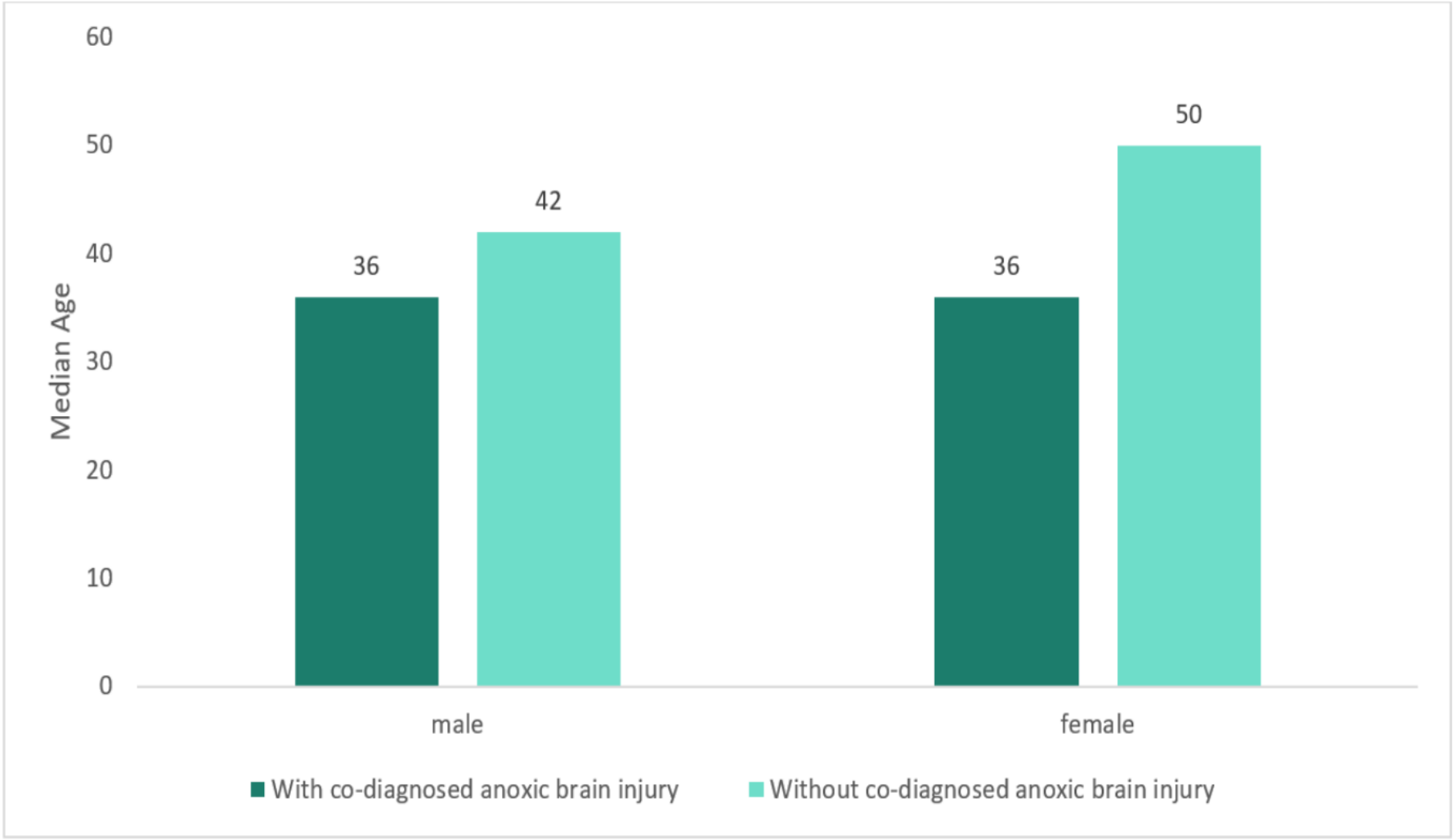
Methods: We performed a retrospective analysis of CA cases from a single academic institution from 2012 to 2017. ODCA cases were ascertained by admission notes strongly suggestive of OD or positive toxicology screens not explained by medication administration. Clinical characteristics and outcomes were extracted from medical records, and regression modeling was used to compare ODCA and non-ODCA patients.

Results: Of the 300 CA cases in this analysis, 28 (9%) were attributed to drug overdose, with opioids accounting for 54%. ODCA patients were younger, had fewer comorbidities, were less likely to have witnessed arrests or bystander cardiopulmonary resuscitation, and had longer downtimes. Inpatient mortality did not differ between cohorts (79% ODCA, 73% non-ODCA, $p = 0.66$), but ODCA was associated with higher rates of brain death (43%, 6%, $p < 0.001$). Of patients who survived to discharge, there was no difference in the likelihood of favorable neurological recovery, defined as Cerebral Performance Category score of 1–2 (7%, 7%, $p = 1.00$) or modified Rankin Scale score of 0–3 (7%, 9%, $p = 1.00$).

Conclusions: Despite similar neurological recovery and survival rates to hospital discharge, ODCA patients were more likely than non-ODCA patients to progress to brain death. Larger prospective studies analyzing ODCA are needed to better understand potential treatment options and prognostic tools in this cohort.

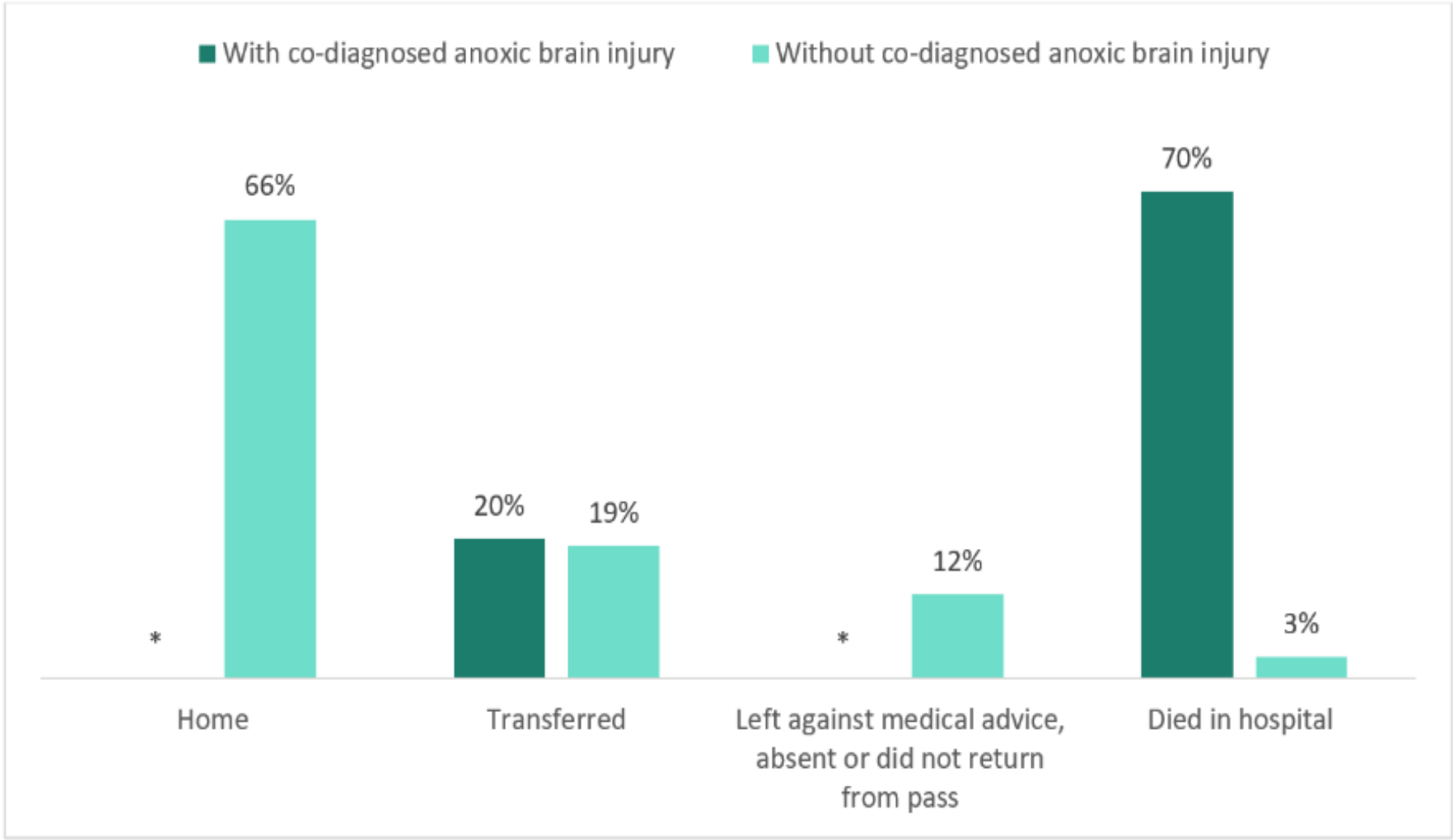
Keywords: Drug overdose, Overdose, Opioids, Brain death

Figure 2: Median age of opioid-related poisoning hospitalizations with and without co-diagnosed anoxic brain injury by sex, Canada (excluding Quebec), April 2019 to March 2020



Opioid-related poisoning and anoxic brain injury in Canada: a descriptive analysis of hospitalization data. Ottawa: Public Health Agency of Canada; March 2021

Figure 3: Percentage of opioid-related poisoning hospitalizations with and without co-diagnosed anoxic brain injury by discharge disposition, Canada (excluding Quebec), April 2019 to March 2020

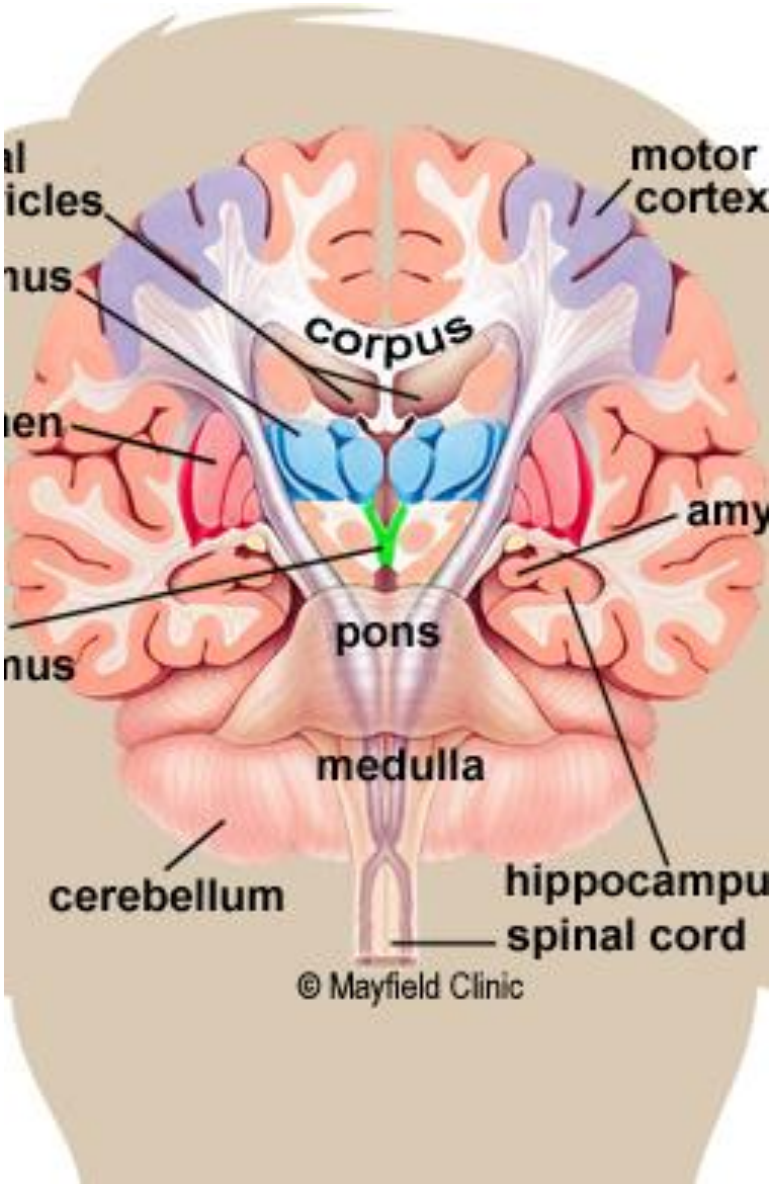


PROVINCIAL OVERDOSE COHORT

The Provincial Overdose Cohort **(ODC)** is a collection of information on people who had an overdose between January 1st, 2015 and December 31st, 2019 in BC. It was created to ensure people responding to the overdose crisis have up-to-date information on people at risk of experiencing an overdose.

What is the Provincial Overdose Cohort?

Data in the ODC



DEEP BRAIN STRUCTURES

Regions affected by anoxic/hypoxic injury:

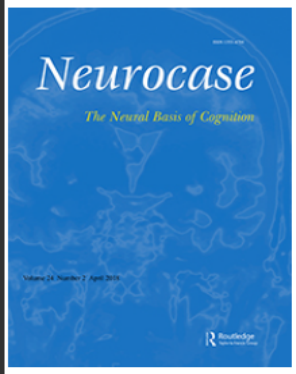
- Hippocampus
- Thalamus
- Basal ganglia nuclei
- Substantia nigra
- cerebellum

Hypoxic Brain Injury Following Heroin Overdose

Patricia O'Brien[1] and Jenny Todd[2,3]

[1] *Royal Talbot Rehabilitation Centre, Melbourne, Australia*
[2] *Barwon Health, Geelong, Australia*
[3] *ABI Behaviour Consultancy, Melbourne, Australia*

Hypoxic brain injury is an under-recognised consequence of heroin overdose. This article documents the disability experienced by 10 people with hypoxic brain injuries following heroin overdose who presented in the 2-year period July 1997 to June 1999 at the Royal Talbot Rehabilitation Centre, a brain injury rehabilitation facility in Melbourne, Australia. Medical histories of these clients were reviewed and follow-up interviews were conducted between 2 and 4 years post-injury. Measures included the Functional Independence Measure (FIM) and the Community Integration Questionnaire (CIQ). The results showed that there were significant and enduring consequences for most of the 10 participants. At follow-up two participants had died from subsequent overdose, three required support to live in the community and one lived in an aged care facility. Only one participant was able to return to work. Cognitive problems were present in most of the group and problem solving and social interaction difficulties were the most commonly recorded problems. Three cases are described in detail to highlight some of the significant issues identified in this sample. Implications for the rehabilitation of people with brain injury following heroin overdose are discussed.



Routledge
Taylor & Francis Group

Neurocase

The Neural Basis of Cognition

ISSN: 1355-4794 (Print) 1465-3656 (Online) Journal homepage: https://www.tandfonline.com/loi/nncs20

Connecting the dots: an association between opioids and acute hippocampal injury

Jed A. Barash & W. Andrew Kofke

ABSTRACT

Acute hippocampal injury represents a relatively rare cause of amnesia. Interestingly however, between 2012 and 2017, 18 patients were reported at hospitals in Massachusetts with sudden-onset amnesia in the setting of complete diffusion-weighted hyperintensity of both hippocampi on magnetic resonance imaging. Notably, 17 of the 18 patients tested positive for opioids or had a recorded history of opioid use. This observation suggests an association between opioids and acute hippocampal injury. With particular attention to the Massachusetts cluster and data on fentanyl and its congeners, the epidemiological and pathophysiological evidence that supports this hypothesis is presented, as are potential underlying mechanisms.

TOXIC LEUKOENCEPHALOPATHY

- Rare syndrome affecting white matter
- Acute and delayed presentations
- Prognosis more favourable than anoxic/hypoxic but variable
- "Chasing the dragon"

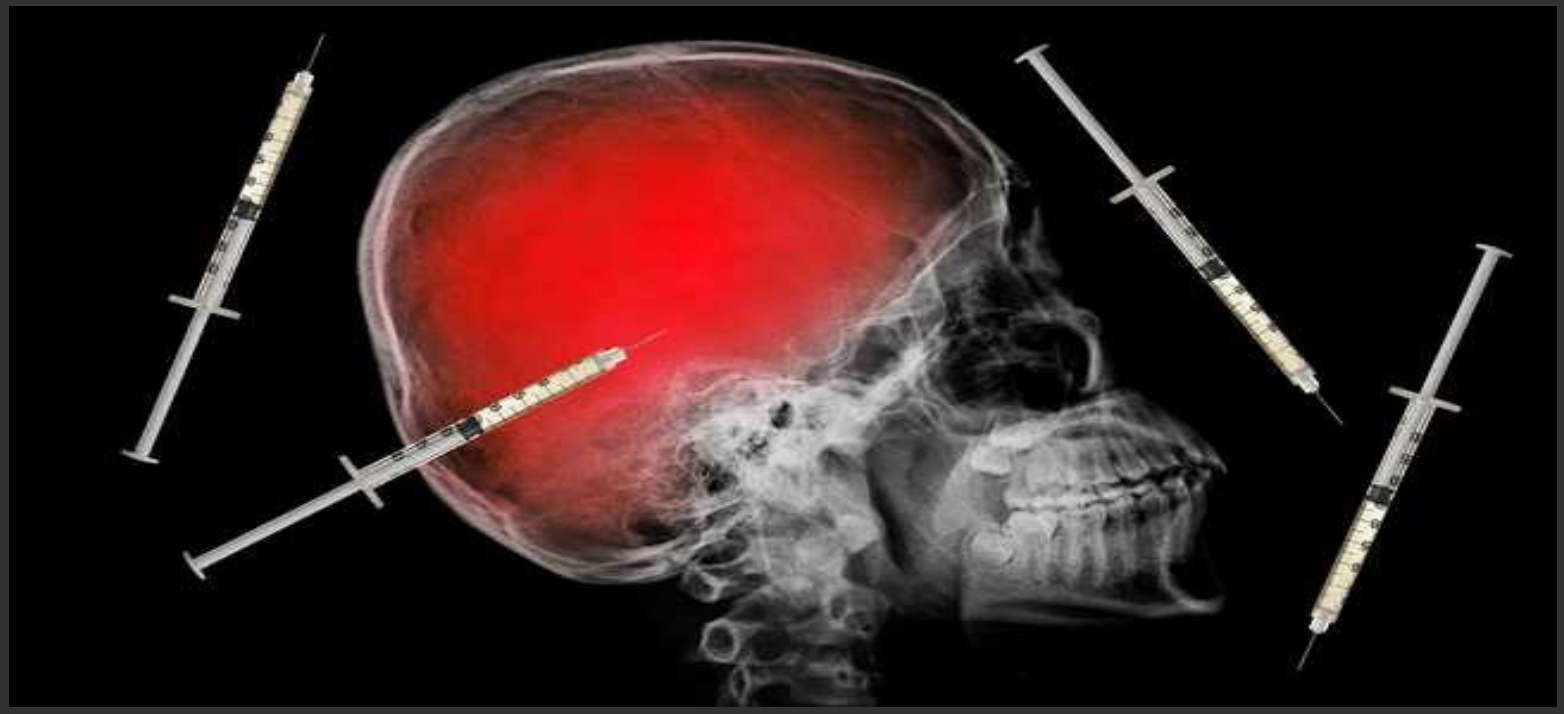
WHAT ABOUT MULTIPLE OVERDOSES?

- Common amongst those with OUD
- Correlated with impaired social cognition
- Difficulty with understanding humour, sarcasm
- Suggests need for SUD treatment which is straightforward, sincere

Ornstein et al. (2000); MacDonald et al. (2012)

The Mysterious Consequences of Repeatedly Overdosing on Opioids

High Wire Maia Szalavitz June 5, 2019



“There is a frightening dearth of knowledge about the long-term outcomes for people who have recurrent overdoses. Researchers have become concerned that, much the same way repeated concussions appear to cause later cognitive and emotional problems in football players, recurrent overdose in the age of fentanyl saturation could lead to delayed neurological consequences in people with opioid addiction.”

TREATMENT AND OUTCOMES

- Lack of appropriate treatment (SUD tx for BI, BI tx for SUD)
- Lack of appropriate care facilities for those needing long term care
- Increased risk of SUD, further overdose injury, death
- Social isolation, marginalization
- Criminalization of a medical issue

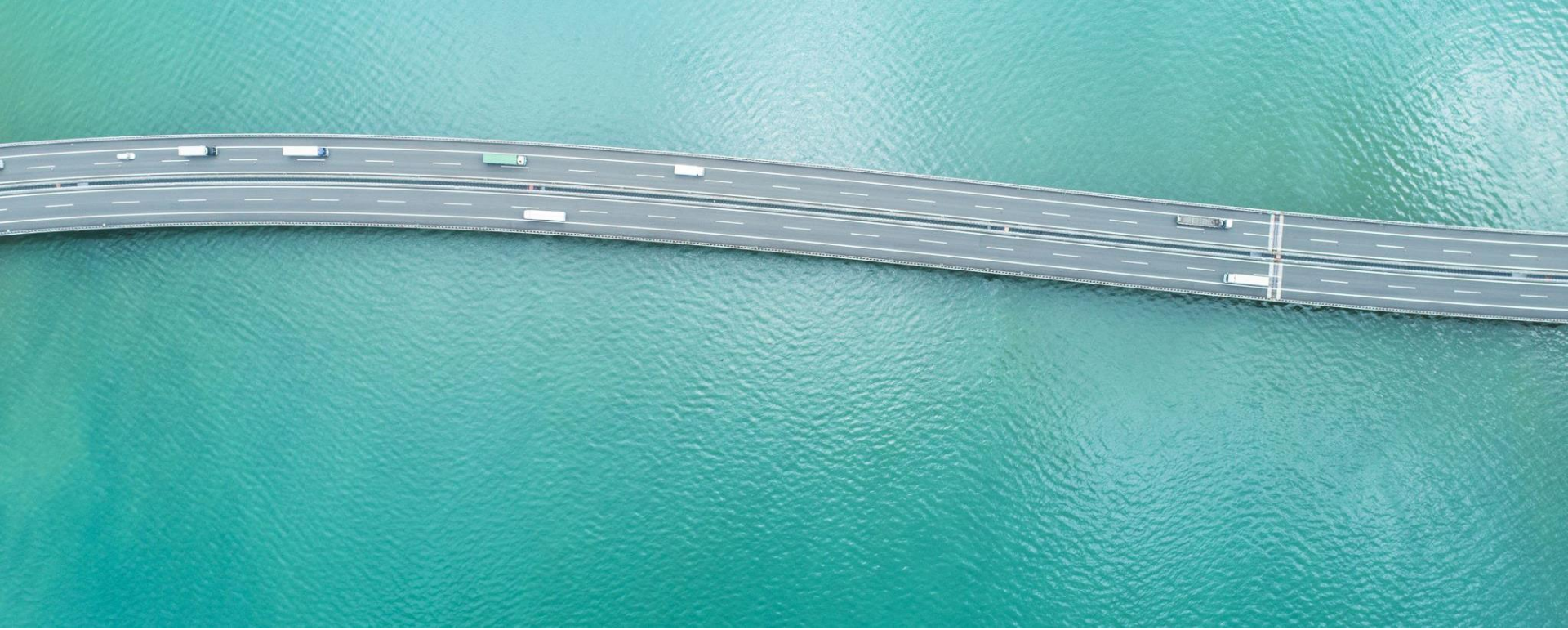
BRAIN INJURY ASSOCIATION OF AMERICA

Non-lethal **Opioid Overdose** and **Acquired Brain Injury**

A POSITION STATEMENT OF THE BRAIN INJURY ASSOCIATION OF AMERICA

CONCLUSIONS

- The drug toxicity crisis has profound morbidity we are beginning to recognize
- Minimal epidemiology to quantify scope of toxic brain injury
- Need for integrated BI and SUD treatment
- Assisted living, low-barrier facilities for young, otherwise healthy individuals



THANK YOU!

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