


BMJ Open The Cedar Project: exploring the role of colonial harms and childhood maltreatment on HIV and hepatitis C infection in a cohort study involving young Indigenous people who use drugs in two Canadian cities

Margo E Pearce ¹, Kate Jongbloed,¹ Sherri Pooyak,^{2,3} Kukpi7 Wenecwtsin M Christian,⁴ Maaxswxw Gibuu (White Wolf) Mary Teegee,^{5,6} Nadine R Caron,^{7,8} Victoria Thomas,^{9,10} Earl Henderson,^{11,12} David Zamar,^{1,10} Eric M Yoshida,¹³ Martin T Schechter,¹ Patricia M Spittal^{1,14}

To cite: Pearce ME, Jongbloed K, Pooyak S, *et al*. The Cedar Project: exploring the role of colonial harms and childhood maltreatment on HIV and hepatitis C infection in a cohort study involving young Indigenous people who use drugs in two Canadian cities. *BMJ Open* 2021;**11**:e042545. doi:10.1136/bmjopen-2020-042545

► Prepublication history for this paper is available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2020-042545>).

Received 07 July 2020
Accepted 13 May 2021



© Author(s) (or their employer(s)) 2021. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

For numbered affiliations see end of article.

Correspondence to
Dr Margo E Pearce;
pmargo@mail.ubc.ca

ABSTRACT

Objectives This study examined associations between childhood maltreatment, colonial harms and sex/drug-related risks for HIV and hepatitis C virus (HCV) infection among young Indigenous people who use drugs.

Design The Cedar Project is a cohort involving young Indigenous people who use drugs in British Columbia (BC), Canada. Indigenous collaborators, collectively known as the Cedar Project Partnership, govern the entire research process.

Setting Vancouver is a large city on the traditional territory of the Coast Salish peoples. Prince George is a mid-sized city, on the traditional territory of Lheidli T'enneh First Nation.

Participants 420 participants completed the Childhood Trauma Questionnaire and returned for follow-up from 2003 to 2016.

Primary/secondary outcome measures Primary outcomes were HIV and HCV infection over the study period. Secondary outcomes included sex and substance use-related risks.

Results Prevalence of childhood maltreatment was 92.6% experienced any maltreatment; 73.4% experienced emotional abuse; 62.6% experienced physical abuse; 60.3% experienced sexual abuse; 69.5% experienced emotional neglect and 79.1% experienced physical neglect. We observed significant associations between childhood maltreatment and apprehensions into residential schools and foster care. All maltreatment types were associated with higher odds of sex/substance use-related risks; sexual abuse was associated with higher odds of HCV infection (adjusted OR: 1.67; 95% CI 1.05 to 2.66; $p=0.031$).

Conclusions Findings reflect high prevalence of childhood maltreatment and their associations with HIV/HCV risk and HCV infection. Public health prevention and treatment initiatives must be trauma informed and culturally safe to support healing, health, and well-being.

Strengths and limitations of this study

- Since 2003, the Cedar Project cohort has been governed by the Cedar Project Partnership, an independent body of Indigenous leaders, Elders and experts, representing an Indigenous-led, decolonising model of health research; to our knowledge, the Cedar Project is the only study of its kind globally.
- This study used 13 years of longitudinal Cedar Project cohort survey data and a validated instrument to measure childhood maltreatment.
- Study findings provide new information regarding the ongoing impacts of colonial harms on Indigenous young people and how stress coping with substances contributes to HIV and HCV risk.
- Cedar uses self-reported data from a nonprobabilistic sample; therefore, we cannot rule out selection bias and its impact.
- There was potential for recall bias, socially desirable reporting and misclassification of exposure and outcome variables (except for HIV/HCV serostatus).

INTRODUCTION

The vibrant health of Indigenous peoples has been sustained for thousands of years through relational interdependence of family, community and nation.¹ An intrinsic part of relational wellness is the sacredness of children and their vital role in cultural continuity.² These foundations of health and well-being have been essential to resilience of Indigenous peoples in the face of historical and contemporary colonial harms from legislation and policies that have deliberately targeted Indigenous social, political and familial systems. Colonialism continues to be

at the root of health and social disparities between Indigenous and non-Indigenous people in Canada with consequences for health across the life course. Indigenous leaders remain concerned that a key driver of disparities related to HIV/hepatitis C virus (HCV) infection is disproportionate numbers of Indigenous children who experience childhood maltreatment and family separation.²⁻⁴ This study seeks to contribute to a better understanding of childhood maltreatment as a driver of HIV and HCV infections among young Indigenous people who have used drugs in British Columbia (BC), Canada and aims to inform meaningful interventions that support healing, health and well-being.

Canada's Truth and Reconciliation Commission (TRC)⁵ made clear that the context of colonisation, especially state-based apprehensions of Indigenous children into the residential school and child welfare (foster care) systems, is critical to understanding Indigenous child and family health. The residential school system began as a church-state partnership designed to break Indigenous children's bonds with their families, lands and cultural identities and assimilate them into Christian society.⁵ In total, 139 residential schools operated across Canada between 1883 and 1996, and well over 150 000 children aged 4–16 years were attended.⁵ In contrast to Indigenous styles of parenting, students were subjected to physical punishment and an indoctrination of the inferiority of Indigenous languages, cultures and spirituality. Survivor testimonies to the TRC revealed the pervasiveness and severity of child abuse and neglect in residential schools.⁵ Meanwhile, the Canadian government legislated seizure of profitable lands, restricted Indigenous peoples to isolated/resource-poor reserves, criminalised Indigenous cultural, spiritual and land-based practices and diminished the autonomy of tribal leadership. Abuses experienced in residential schools and concurrent disruptions of traditional ways of life had severe and enduring repercussions.² Survivors and their descendants have suffered from post-traumatic stress, depression and some experienced problematic substance use while entire communities experienced extreme poverty and isolation.⁵ As a result of forced separation of families, abuses learnt in residential schools, cultural genocide, family violence and dysfunction began to affect a disproportionate number of Indigenous families.⁶ Furthermore, beginning in the 1950s, shifts in child welfare policies incentivised apprehension of Indigenous children from their families and placement in non-Indigenous foster homes, initiating new cycles of family separation that are ongoing. In 2016, Indigenous children accounted for 7.7% of children aged 0–4 years old in Canada, yet comprised 51.2% of all children in custody of child welfare agencies.⁷ In a landmark 2016 ruling, the Canadian Human Rights Tribunal found that the Government of Canada was racially discriminating against First Nations children through flawed policy implementation and inequitable funding schemes that fuel this over-representation.⁸

The impact of these colonial harms has been intergenerational and continues to challenge Indigenous families.¹⁵

The 2008 Canadian Incidence Study of Child Abuse and Neglect reported that substantiated childhood maltreatment investigations were five times higher for Indigenous families than non-Indigenous families.³ Furthermore, concurrent experiences of childhood maltreatment are common and contribute to a complex experience that may compound negative stress-coping later in life.⁹ In the absence of meaningful reconciliation and structural interventions as well as continued child apprehensions, some young Indigenous people turn to substance use to self-medicate emotional and psychological sequelae of colonial harms and family violence, which in turn can lead to risk of HIV and HCV infection.¹⁰ According to Canadian surveillance data from 2016, Indigenous people make up less than 5% of the population in Canada, yet 21.2% of HIV diagnoses were among Indigenous people.¹¹ Furthermore, between 2002 and 2008, estimated HCV incidence was 4.7-fold higher among Indigenous people than non-Indigenous people.¹² Injection drug use is the primary exposure category for both HIV/ HCV infection among Indigenous people, compared with sexual exposure among non-Indigenous people.¹¹

Kwagiulth (Kwakwaka'wakw) scholar Sarah Hunt has underscored the importance of witnessing, or mindful and responsible engagement, with Indigenous people's stories about their experiences of colonial violence.¹³ The following study addresses the paucity of longitudinal research addressing childhood maltreatment and HIV and HCV among young Indigenous people. It also seeks to bring forward young Indigenous people's accounts of childhood maltreatment to help understand and contextualise those experiences through the lens of colonialism. We present findings from the Cedar Project, a community-governed cohort study. We aimed to (a) describe associations between colonial harms through state-based child apprehension and childhood maltreatment among young Indigenous people who use drugs in two Canadian cities and (b) present longitudinal analyses of the effects of childhood maltreatment on sex and drug use-related HIV and HCV vulnerabilities over 13 years of study.

METHODS

The Cedar Project (Cedar) methods have previously been described in detail.¹⁴ In brief, Cedar is a prospective cohort involving 788 young Indigenous people who use drugs in Vancouver and Prince George, British Columbia. Vancouver is a large city in southern BC, on the traditional territory of the Coast Salish peoples. Prince George is a mid-sized city in the northern interior of BC, on the traditional territory of Lheidli T'enneh First Nation. Participants were eligible if they self-identified as having Indigenous ancestry, including First Nations, Aboriginal, Métis, Inuit, Status and non-Status Indians; were between 14–30 years old; had smoked or injected illicit drugs (other than marijuana) in the month before enrolment; and provided their written informed consent. Saliva screens (Oralscreen, Avitar Onsite Diagnostics)

were used to confirm drug use. Since 2003, participants have returned every 6 months to complete interviewer-administered questionnaires and provide venous blood samples which are tested for HIV and HCV status. This analysis included data collected from 2003 to 2016.¹⁵

Patient and public involvement

Since 2003, the Cedar Project Partnership, an independent body of Indigenous elders, leaders, health/social service experts and scholars, has governed the entire Cedar research process. The Partnership ensures respect for self-determining ethical principles and Indigenous knowledge. The partnership aims to meet every season to define research questions; review study protocols; address ethics concerns; interpret emergent results and review/approve manuscripts. Decisions are based on consensus and Indigenous voices are privileged.

Funding

This work was supported by Canadian Institutes of Health Research grant number (FDN-148376).

MEASURES

Childhood maltreatment

Beginning in 2011, participants were given the one-time option to complete the Childhood Trauma Questionnaire (CTQ).¹⁶ The CTQ is a widely used retrospective and self-reported 28-item inventory measuring five types of childhood maltreatment: emotional abuse, physical abuse, sexual abuse, emotional neglect and physical neglect. Answers were endorsed on a 5-point Likert-type scale according to the frequency of experiences (never true to very often true). For descriptive frequencies, we presented subscale scores within maltreatment severity quantiles: 'none or minimal' (sexual abuse subscale does not have a minimal category), 'low to moderate', 'moderate to severe' and 'severe to extreme'.¹⁶ As in other studies, for comparative analysis and multivariable models, we dichotomised subscales into two categories: none or minimal (0) and low to extreme (1).¹⁷ Therefore, maltreatment was considered present if a participant said 'yes' to any severity category from low to extreme. To create a variable that measured the number of distinct maltreatments reported by a participant, we summed the number of 'yes' answers across all five maltreatment types.⁹ The number of maltreatments experienced ranged from zero to five and was treated as a continuous variable in the analyses. The OR may be interpreted as the likelihood of an outcome occurring for each incremental increase in the number of maltreatments experienced. We previously validated the CTQ with Cedar participants.¹⁰

Colonial harms

We used two indicators of colonial harm that represent two eras of state-based apprehensions of Indigenous children, including having a parent who was taken into

residential school (no or unsure/yes) and having been taken into the child welfare system (foster care) (no/yes).

Sociodemographic covariates

Sociodemographic covariates included: biological sex (male/female); baseline location (Prince George/Vancouver); sexual identity (lesbian, gay, bisexual, transgender, queer, Two-Spirit./straight); education (<high school/ \geq high school); relationship status (single/in a relationship).

Outcome variables

Primary outcome variables included HIV serostatus and HCV antibody-positive serostatus. Secondary outcomes were time-varying variables related to the previous 6-month period and included sex work (no/yes), inconsistent condom use with regular or casual partner (no/yes), sexual assault (no/yes), sexually transmitted infection (STI) (no/yes), any injection drug use (no/yes), \geq daily cocaine injection (no/yes), \geq daily opiate injection (no/yes), binge injection (no/yes), rig sharing (no/yes) and needing help to inject (no/yes). Regular partners were defined as sexual relationships lasting \geq 3 months, and casual partners were those lasting <3 months. STIs were self-reported chlamydia, genital warts, gonorrhoea, herpes, syphilis or others.

Participants

In total, 788 participants were recruited between 2003 and 2016, and of those, 420 completed the CTQ. Among those participants, 383 (91.2%) returned for at least one follow-up interview and were included in regression analyses. Participants had a median number of 8.0 (IQR: 4.0–13.0) visits.

Statistical analysis

Each type of childhood maltreatment was compared by residential school and foster care using χ^2 tests. Multivariable generalised estimating equations (GEE) estimated effects of childhood maltreatment on adverse time-varying health-related outcomes. Analyses were carried out with R statistical software V.3.6.0¹⁸ using the 'geepack' package.¹⁹ Models were fit using a binomial GEE models with logit link, robust sandwich variance estimation and assuming an exchangeable working correlation structure. Associations between the CTQ subscales and study outcomes were tested in unadjusted and adjusted (multivariable) models controlling for potential confounders, including sex, location and age. We did not adjust for colonial harms because we do not consider those variables to be confounders but rather as part of the causal pathway. Temporally speaking, parental residential school attendance always occurs prior to participants' childhood maltreatment experiences. Foster care could have occurred before, after and in between participants' childhood maltreatment experiences. CTQ subscales had a range of missing data between 3.5% and 5.2%. Data missing from longitudinal outcomes ranged from 1.4% to 6.3% of observations. Available-case analysis

was undertaken and no imputation was conducted for missing data.

RESULTS

Baseline characteristics

Frequencies of demographic characteristics, colonial harms and childhood maltreatment experiences are reported in [table 1](#). Mean age at baseline was 24 years old; 55.2% participants were women; 52.4% were based in Prince George, 47.6% were based in Vancouver; 82.7% had not graduated high school and 77.8% were single ([table 1](#)). Overall, 48.4% reported that at least one parent had been taken into residential school, and 70.6% had been taken into foster care. In total, 34 (8.2%) and 119 (29.5%) were living with HIV and HCV, respectively.

Maltreatment experiences

Frequencies of maltreatment experiences are reported in [table 1](#). Emotional abuse was experienced by 73.4% of participants, among whom 37.9% had severe to extreme experiences. Physical abuse was experienced by 62.6% of participants, among whom 41% had severe to extreme experiences. Sexual abuse was experienced by 60.3% of participants, among whom severe to extreme experiences were reported by 42%. Emotional neglect was experienced by 69.5% of participants, among whom 20.7% reported severe to extreme experiences. Physical neglect was experienced by 79.1% of participants, among whom 43.2% had severe to extreme experiences. Overall, 92.4% of participants had experienced childhood maltreatment, and many (35%, n=135) had experienced all five different types of maltreatment.

Childhood maltreatment and colonial harms

[Table 2](#) displays comparisons of colonial harms by childhood maltreatment subscales among Cedar participants. A significantly higher proportion of participants who had at least one parent who attended residential school compared with participants whose parents did not attend, or who were unsure if their parents attended residential school, had been sexually abused (66.3% vs 55.1%, respectively; $p=0.022$). Significantly higher proportions of participants who had been taken into foster care compared with those who were never in foster care reported emotional abuse (77.1% vs 64.1%, respectively; $p=0.007$), sexual abuse (64.2% vs 51.3%, respectively; $p=0.016$) and physical neglect (82.3% vs 71.7%, respectively; $p=0.017$). A marginally higher proportion of participants who had been physically abused had been taken into foster care compared with those who were not taken into foster care (65.5% vs 55.7%, respectively; $p=0.063$).

Childhood maltreatment and HIV/HCV infection

Results from unadjusted and adjusted GEE models examining the associations between childhood maltreatment and HIV and HCV infection are displayed in [table 3](#). In the adjusted GEE models, participants who had experienced

Table 1 Baseline frequencies of demographic factors, colonial harms and childhood maltreatment subscales among Cedar Project participants (n=420)

Variable	N (%)*	Missing N (%)
Mean age (SD)	24.0 (4.0)	1 (0.2)
Biological sex		
Male	188 (44.8)	0 (0.0)
Female	232 (55.2)	
Baseline location		
Prince George	220 (52.4)	0 (0.0)
Vancouver	200 (47.6)	
Sexual identity		
LGBTQ2	53 (12.7)	2 (0.5)
Straight	365 (87.3)	
Baseline education		
Less than high school	340 (82.7)	9 (2.1)
High school education or higher	71 (17.3)	
Relationship status		
Single	311 (77.8)	20 (4.8)
In relationship	89 (22.2)	
Parents taken into residential school		
No/unsure	215 (51.6)	3 (0.7)
At least one parent attended	202 (48.4)	
Ever taken into foster care		
No	123 (29.4)	1 (0.2)
Yes	296 (70.6)	
Emotional abuse severity		
None or minimal	106 (26.6)	22 (5.2)
Low to moderate	81 (20.4)	
Moderate to severe	60 (15.1)	
Severe to extreme	151 (37.9)	
Physical abuse severity		
None or minimal	152 (37.4)	13 (3.1)
Low to moderate	39 (9.6)	
Moderate to severe	49 (12.0)	
Severe to extreme	167 (41.0)	
Sexual abuse severity		
None	159 (39.8)	20 (4.8)
Low to moderate	27 (6.8)	
Moderate to severe	46 (11.5)	
Severe to extreme	168 (42.0)	
Emotional neglect severity		
None or minimal	123 (30.4)	15 (3.6)
Low to moderate	133 (32.8)	

Continued

Table 1 Continued

Variable	N (%)*	Missing N (%)
Moderate to severe	65 (16.0)	
Severe to extreme	84 (20.7)	
Physical neglect severity		
None or minimal	84 (20.8)	17 (4.0)
Low to moderate	59 (14.6)	
Moderate to severe	86 (21.3)	
Severe to extreme	174 (43.2)	
Number of maltreatment types experienced		
0	29 (7.6%)	
1	36 (9.4%)	
2	49 (12.8%)	
3	76 (19.8%)	
4	58 (15.1%)	
5	135 (35.2%)	
HIV seropositive	34 (8.2)	7 (1.7)
HCV seropositive	119 (29.5)	17 (4.0)

*Proportions shown were obtained after excluding missing values. HCV, hepatitis C virus; LGBTQ2, lesbian, gay, bisexual, transgender, queer, Two-Spirit.

sexual abuse had significantly greater odds of HCV infection over the study period compared with participants who had not been sexually abused (adjusted OR (aOR)):

1.67; 95% CI 1.05 to 2.66; $p=0.031$) (table 3). There was a marginally significant association between the number of maltreatment types experienced by participants and HCV infection (aOR: 1.13; 95% CI 0.99 to 1.28; $p=0.073$).

Childhood maltreatment and sex-related risk factors

Results from unadjusted and adjusted GEE models examining associations between childhood maltreatment and recent sex-related experiences are displayed in table 3. In the adjusted GEE models, participants who had been sexually abused were more likely to be involved in sex work (aOR: 1.88; 95% CI 1.12 to 3.16; $p=0.017$). Physical abuse (aOR: 1.66; 95% CI 1.21 to 2.28; $p=0.002$) and the number of maltreatment types experienced (aOR: 1.16; 95% CI 1.06 to 1.27; $p=0.002$) were significantly associated with inconsistent condom use. Sexual abuse (aOR: 1.36; 95% CI 0.98 to 1.89; $p=0.070$), emotional neglect (aOR: 1.36, 95% CI 0.97 to 1.89; $p=0.074$) and physical neglect (aOR: 1.39, 95% CI 0.96 to 2.02, $p=0.085$) were marginally associated with inconsistent condom use. Participants who had been emotionally abused (aOR: 2.09; 95% CI 1.10 to 3.98; $p=0.024$) or sexually abused (aOR: 1.94; 95% CI 1.17 to 3.23; $p=0.010$) were significantly more likely to report having an STI. There was a marginally significant association between physical abuse and having an STI (aOR: 1.52; 95% CI 0.94 to 2.48; $p=0.090$). Participants who experienced emotional abuse were marginally more likely to have been sexually assaulted (aOR: 1.80, 95% CI 0.95 to 3.41, $p=0.071$), and those who were sexually abused were significantly more likely to have been sexually assaulted (aOR: 1.93; 95% CI 1.07 to 3.48; $p=0.028$).

Table 2 Descriptive comparisons of colonial harms by childhood maltreatment subscales among Cedar Project participants (n=420)

	Parents taken into residential school			P value	Ever taken into foster care			P value
	No/unsure	Yes	Total		No	Yes	Total	
	n (%)	n (%)	n (%)		n (%)	n (%)	n (%)	
Emotional abuse								
None or minimal	58 (27.9)	47 (25.0)	105 (26.5)	0.516	42 (35.9)	64 (22.9)	106 (26.7)	0.007
Low to extreme	150 (72.1)	141 (75.0)	291 (73.5)		75 (64.1)	216 (77.1)	291 (73.3)	
Physical abuse								
None or minimal	85 (41.1)	66 (33.5)	151 (37.4)	0.116	54 (44.3)	98 (34.5)	152 (37.4)	0.063
Low to extreme	122 (58.9)	131 (66.5)	253 (62.6)		68 (55.7)	186 (65.5)	254 (62.6)	
Sexual abuse								
None	93 (44.9)	64 (33.7)	157 (39.5)	0.022	57 (48.7)	101 (35.8)	158 (39.6)	0.016
Low to extreme	114 (55.1)	126 (66.3)	240 (60.5)		60 (51.3)	181 (64.2)	241 (60.4)	
Emotional neglect								
None or minimal	62 (29.5)	59 (30.7)	121 (30.1)	0.792	39 (32.8)	84 (29.5)	123 (30.4)	0.511
Low to extreme	148 (70.5)	133 (69.3)	281 (69.9)		80 (67.2)	201 (70.5)	281 (69.6)	
Physical neglect								
None or minimal	51 (24.6)	33 (17.0)	84 (20.9)	0.061	34 (28.3)	50 (17.7)	84 (20.9)	0.017
Low to extreme	156 (75.4)	161 (83.0)	317 (79.1)		86 (71.7)	232 (82.3)	318 (79.1)	

Table 3 Continued

	Emotional Neglect				Physical Neglect				Number of Maltreatments Experienced									
	OR	95% CI	P value	AOR	95% CI	P value	AOR	95% CI	OR	95% CI	P value	AOR	95% CI	P value				
STI	0.88	0.54 to 1.42	0.600	0.84	0.53 to 1.32	0.450	1.44	0.76 to 2.74	0.268	1.36	0.71 to 2.62	0.349	1.14	0.99 to 1.30	0.062	1.11	0.97 to 1.27	0.139
Injection drug use related vulnerabilities	1.20	0.82 to 1.77	0.352	1.20	0.80 to 1.79	0.384	1.33	0.85 to 2.06	0.207	1.28	0.80 to 2.06	0.298	1.13	1.02 to 1.26	0.021	1.11	1.00 to 1.24	0.058
Any injection drug use	1.66	0.85 to 3.26	0.140	1.59	0.83 to 3.08	0.165	1.50	0.60 to 3.77	0.387	1.48	0.61 to 3.56	0.382	1.15	0.95 to 1.40	0.152	1.13	0.94 to 1.35	0.188
Daily or more injection cocaine	1.01	0.66 to 1.56	0.957	0.97	0.62 to 1.52	0.894	1.13	0.70 to 1.83	0.617	1.05	0.63 to 1.74	0.865	1.06	0.94 to 1.19	0.365	1.01	0.89 to 1.14	0.860
Daily or more injection opiates	1.29	0.79 to 2.11	0.306	1.35	0.83 to 2.21	0.231	1.84	1.00 to 3.38	0.051	1.89	1.01 to 3.52	0.047	1.23	1.07 to 1.43	0.005	1.24	1.08 to 1.44	0.003
Binge injection	0.58	0.32 to 1.03	0.064	0.53	0.30 to 0.93	0.027	1.93	0.81 to 4.59	0.135	1.83	0.77 to 4.39	0.174	1.08	0.92 to 1.26	0.371	1.05	0.89 to 1.23	0.561
Sharing rigs	0.96	0.61 to 1.50	0.844	0.92	0.59 to 1.45	0.720	1.11	0.66 to 1.85	0.699	1.06	0.64 to 1.76	0.828	1.05	0.92 to 1.19	0.489	1.02	0.89 to 1.17	0.757
Need help to inject																		

*Includes the last study visit for participants that remained HIV seronegative over the study period or the first study visit where participants tested HIV seropositive.
 †Includes the last study visit for participants that remained HCV seronegative over the study period or the first study visit where participants tested HCV seropositive.
 AOR, adjusted OR; HCV, hepatitis C virus; STI, sexually transmitted infection.

Childhood maltreatment and substance use

Unadjusted and adjusted GEE models for the associations between childhood maltreatment and recent substance use-related risks are displayed in table 3. In the adjusted GEE models, there was a marginally significant association between the number of maltreatment types experienced and injecting any drug (aOR: 1.11; 95% CI 1.00 to 1.24; $p=0.058$). Participants who were sexually abused were 2.48 times more likely to inject cocaine daily or more (aOR: 2.48; 95% CI 1.26 to 4.86; $p=0.008$). Participants who had been physically abused (aOR: 1.84; 95% CI 1.15 to 2.95; $p=0.011$), sexually abused (aOR: 1.91; 95% CI 1.19 to 3.06; $p=0.007$) or physically neglected (aOR: 1.89; 95% CI 1.01 to 3.52; $p=0.047$) had significantly higher odds of binge injection drug use. With each additional maltreatment experience, participants' odds of binge injection drug use increased by 1.24 (95% CI 1.08 to 1.44; $p=0.003$). There was a marginally significant association between emotional abuse and binge injection drug use (aOR: 1.64; 95% CI 0.98 to 2.74, $p=0.058$). Emotional neglect was associated with decreased odds of sharing rigs (aOR: 0.53; 95% CI 0.30 to 0.93; $p=0.027$).

DISCUSSION

This study reaffirms that experiences of childhood maltreatment are deeply harmful events in the life course, contributing to a cascade of consequences including problematic substance use, sex and drug-related risks, revictimisation and HIV and HCV infection. It also suggests complex intersections of 140 years of state-based apprehensions of Indigenous children and childhood maltreatment continue to harm Indigenous children and families. These results emphasise the importance of implementing Canada's TRC's 94 Calls to Action, especially those that demand resources to support Indigenous families healing from ongoing effects of the residential school system and to reform harmful child welfare policies.⁵ They may also shed light on why public health efforts persistently fail to meet the needs of Indigenous people who use drugs and the critical need for HIV and HCV prevention and treatment to be both culturally safe and trauma informed. This section begins by discussion of associations between childhood maltreatment and colonial harms, turning next to associations with primary outcomes. Subsequent paragraphs unpack sex and substance use-related risks that form the hypothesised linkages between colonial harms, childhood maltreatment and HIV/HCV infection. Finally, we compare our findings with other studies on child maltreatment and make concluding remarks.

Colonial harms and childhood maltreatment

Child abuse and neglect are inconsistent with Indigenous cultures and traditions. Indigenous peoples in North America have always regarded children as sacred.²⁰ Historical and ongoing cycles of child apprehension have often prevented Elders and leaders from passing down teachings about parenting and ceremonial ways of

coping to younger generations.⁵ Higher proportions of Cedar participants who were second-generation residential school survivors had experienced sexual abuse, and higher proportions of those who had been taken into foster care reported emotional and sexual abuse and physical neglect. Indigenous leaders and Elders have pointed to the failure of the Canadian justice system to respond to the *intergenerational* impacts of colonial violence.² Indigenous legal scholars have been clear that reconciliation efforts must involve reviving ancestral systems of governance that build community capacity to support Indigenous families.²¹ On a global scale, policymakers must acknowledge that child apprehension systems in Canada, Australia and the USA have failed Indigenous families and are associated with long-term health-related harms including death and HIV and HCV infection.⁴ These systems are based on imposed colonial values/laws, removing children from their families without any meaningful support for prevention or healing. As advocated by Indigenous leaders and scholars, priorities should include legislation that supports Indigenous governments' autonomy to assert jurisdictional authority over the welfare of their own children including child welfare laws, policies and practice.⁸

Childhood maltreatment and HCV infection

This study suggests that sexual abuse is a risk factor for HCV infection among Cedar participants with a marginal association between the number of maltreatments experienced with HCV infection. To our knowledge, this is the first time a study has reported this association and this finding may have implications for delivery of HCV care. While legal and harm reduction strategies aiming to curb the HIV and HCV epidemics among people who use drugs in British Columbia have made encouraging progress, they often fall short as a result of their focus on changing individual risk behaviours rather than addressing systemic/structural barriers and facilitators to health and healing. For example, though newly developed highly effective and tolerated HCV treatments are publicly funded in Canada, Indigenous people are less likely to engage in HCV care²² and more likely to die without ever accessing HCV care.²³ Barriers such as experiences of stigma, discrimination and lack of cultural safety in healthcare settings dissuade many Indigenous people who use drugs from engaging into primary healthcare and lifesaving treatment programmes.²⁴ For clinicians supporting Indigenous patients living with HCV, our finding suggests the possible history of sexual abuse and complex trauma should be explored and addressed through provision of publicly funded trauma-informed care.

Childhood maltreatment and sex-related risks

Cedar participants who experienced sexual abuse were more likely to report sex work involvement. Participants who experienced physical abuse, sexual abuse or emotional or physical neglect were more

likely to report inconsistent condom use, and, with each additional type of maltreatment experienced the odds of inconsistent condom use increased. Participants who experienced emotional abuse were more likely to report an STI. Emotional abuse and sexual abuse were associated with sexual assault. Few studies have addressed multiple types of maltreatment and sexual vulnerability, however research has highlighted sexual abuse survivors' feelings of powerlessness and low self-esteem, contributing to decreased self-efficacy to negotiate protected sex.²⁵ As evidenced by previous research, HIV prevention interventions and treatment programming must be cognizant of the mediating effect that childhood maltreatment has on young people's self-efficacy to refuse unwanted sexual activity, seek balanced power dynamics in sexual relationships and negotiate condom use.²⁶ Moreover, control over Indigenous people's bodies has been a focus of the Canadian state, including medical, social, religious and judicial systems.²⁷ This continues to affect Indigenous people's sexual health and safety by exacerbating existing traumas and contributing to revictimisation.²⁸ Indigenous women in Canada, USA and Australia face excessive predation and violence, yet are provided little protection or justice.^{28 29} Our study suggests that young Indigenous people who have experienced childhood maltreatment and who use drugs require tailored interventions that address the impacts of complex trauma on sexual well-being. Community, relationships, identity and traditional teachings are foundational to young Indigenous people's sexual well-being.³⁰ Building on this strength-based perspective, Indigenous people experiencing sexual vulnerabilities must be meaningfully supported to prevent and heal from family violence for the protection of future generations.

Childhood maltreatment and substance use-related risks

Cedar participants who were sexually abused were more likely to report high-frequency cocaine injection. Those who had been emotionally abused, physically abused, sexually abused or physically neglected were more likely to report bingeing with injection drug use. With each additional type of maltreatment experience, the odds of binge injection increased. Cedar participants who reported emotional neglect were less likely to report needle sharing, possibly related to the effect of emotional neglect on social isolation in adulthood.³¹ Associations between high-risk and high-intensity substance use with HIV and HCV infection are well established, especially high-frequency cocaine and binge injection drug use.³² It is deeply concerning that though relationships between childhood maltreatment and substance use leading to HIV/HCV risk have been well established, and despite tremendous innovation in harm reduction over the past 15 years, we have been unable to interrupt these harmful pathways to support well-being

through conventional means. Taken together, with associations identified in this study between colonial harms and childhood maltreatment, it seems clear that ongoing imposition of colonial laws, systems and institutions undermine Indigenous families, contributing to self-medication and creating risk of infectious disease. Where Cedar participants' experiences differ from established understandings of substance use is the role of ongoing colonial harms and impeding access to prevention and healing programming. In this context, substance use represents a way to cope with the effects of colonial harms. Indigenous leaders have called for responses to substance use that address the roots of wholistic well-being, including strengthening foundations of family, identity and culture, in addition to harm reduction programmes that help people remain safe while using.² In particular, trauma and addiction interventions that blend Indigenous ways of knowing and healing with western approaches to positive stress-coping have had encouraging results.¹ This study's findings support the need for such interventions to specifically address the role of childhood trauma in high-intensity injection drug use among young Indigenous people.

Comparisons to other studies

Few studies addressing childhood maltreatment among people who use drugs have involved Indigenous participants. Proportions of Cedar participants who reported severe childhood maltreatment are similar or higher than a cross-sectional study including 676 ethnically diverse men and women who used drugs in San Antonio, USA³³ and in a cross-sectional study involving 85 adults (15% Indigenous) who used opiates in Vancouver, British Columbia.³⁴ Severity of emotional, physical and sexual abuse among Cedar participants was higher than in a cross-sectional study involving 234 American Indian women accessing primary care in the USA¹⁷ and higher than another cross-sectional study involving 91 Aboriginal/Torres Strait Islander youths in the juvenile justice system in New South Wales, Australia.³⁵

LIMITATIONS

Cedar uses self-reported data from a nonprobabilistic sample. While we cannot rule out selection bias and its impact, we are confident that our recruitment methods and rigorous eligibility criteria ensured that the sample was approximately representative of Indigenous young people who use drugs in Vancouver and Prince George. There was potential for recall bias, socially desirable reporting and misclassification of exposure and outcome variables (except for HIV and HCV serostatus). Nevertheless, Cedar's long-term relationships with participants and Indigenous governance have fostered trust in the research process. The measures of colonial harms (parents being taken into

residential school and being taken into foster care) do not capture the full extent of colonial harms experienced by Cedar participants. We could not determine the temporality of childhood maltreatment and being taken into foster care; considerable evidence from Cedar and elsewhere indicates that multiple apprehensions and all forms of maltreatment are common within the child welfare system.¹⁰ The maltreatment types and outcomes were specified a priori and were likely to correlate with one another, as such, correcting for multiple testing would have imposed too great of a reduction in power for these explorations.³⁶ Nevertheless, our results should be interpreted with caution and viewed as forming a basis for future investigations. Despite these limitations, we believe that this study provides new and important epidemiological evidence regarding health outcomes associated with childhood maltreatment.

Taken together, these findings have implications for all fields of health that aim to support the wellness of Indigenous people who use drugs, including primary health-care, harm reduction, drug/alcohol treatment, mental health services and HIV and HCV prevention and treatment. Indigenous experts have long argued for adoption of Indigenous-led healthcare models that take into account the whole person, including mental, emotional, physical and spiritual well-being.²⁰ Such strength-based and culturally safe case management may be effective in facilitating access to HIV and HCV care while supporting engagement with healing resources.¹ Our findings suggest that it is important to consider reports of childhood maltreatment among young Indigenous people who use drugs within the lens of past and ongoing colonial harms, as they continue to be a negative determinant of health for Indigenous families. Health professionals in Canada must understand their unique and pivotal role and responsibilities in reconciliation with Indigenous peoples. Education and practical training in culturally safe and trauma-informed care should be required for both new and established healthcare providers.

Author affiliations

¹Faculty of Medicine, School of Population and Public Health, The University of British Columbia, Vancouver, British Columbia, Canada

²Cree, Saskatoon, Saskatchewan, Canada

³Aboriginal HIV/AIDS Community Based Collaborative Centre, Saskatoon, Saskatchewan, Canada

⁴Splatsin Secwepemc Nation, Enderby, British Columbia, Canada

⁵Gitk'san and Carrier, Luxgaboo Wolf Clan, Takla Lake First Nation, Prince George, British Columbia, Canada

⁶Carrier Sekani Family Services, Prince George, British Columbia, Canada

⁷Sagamok Anishnawbek First Nation (Ojibwa), Massey, Ontario, Canada

⁸Centre for Excellence in Indigenous Health, The University of British Columbia, Vancouver, British Columbia, Canada

⁹Wuikinuxv Nation, Prince George, British Columbia, Canada

¹⁰The Cedar Project, BC Children's Hospital, Vancouver, British Columbia, Canada

¹¹Cree, Métis, Prince George, British Columbia, Canada

¹²Department of Anthropology, University of Northern British Columbia, Prince George, British Columbia, Canada

¹³Faculty of Medicine, Division of Gastroenterology, The University of British Columbia, Vancouver, British Columbia, Canada

¹⁴British Columbia Children's Hospital Research Institute, Vancouver, British Columbia, Canada

Acknowledgements The authors are indebted to the Cedar Project participants for continuing to share their stories. They extend special thanks to members of the Cedar Project Partnership for their conviction and for holding the research team accountable to the voices of young Indigenous people. The authors also thank the Elders who supported this study for continued wisdom and guidance. The authors are grateful to past and present study staff who bring tremendous care and energy to this work.

Contributors Partnership contributed to study conception and design; interpretation of results; Indigenous research methods and cultural safety in study protocols and procedures; critical revision of the manuscript for intellectual content and accuracy especially related to: child welfare policies and legislation; Indigenous family health and wellness; and culture and healing. VT contributed to study conception and design; data collection; interpretation of results; critical revision of the manuscript for intellectual content and accuracy, ensuring study recommendations are relevant to young Indigenous people who use drugs. DZ contributed to study data analysis; interpretation of results; critical revision of the manuscript for intellectual content and accuracy related to statistical methods and interpretations. EMY contributed to study conception and design; interpretation of results; critical revision of the manuscript for intellectual content and accuracy related to infectious and chronic diseases, health equity, and transformative change in healthcare. MS and PMS contributed to funding acquisition; study conception and design; supervision and oversight; interpretation of results; manuscript development and review for intellectual content and accuracy related to HIV/HCV epidemiology and health policy. All authors gave approval for the final version of the manuscript and agreed to be accountable for all aspects of the work.

Funding The Cedar Project is supported by Canadian Institutes of Health Research grant number [FDN – 148 376].

Competing interests None declared.

Patient and public involvement Patients and/or the public were involved in the design, or conduct, or reporting, or dissemination plans of this research. Refer to the Methods section for further details.

Patient consent for publication Not required.

Ethics approval The University of British Columbia/Providence Health Care Research Ethics Board approved the study. Reporting of this study conforms to the STROBE statement.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement No data are available. The Cedar Project (Cedar) cohort study data is protected and governed by the Cedar Project Partnership, an independent body of Indigenous Elders, leaders, and public health and social services experts. The Partnership considers the data to be not just numbers, but the voices and lived experiences of their young people, their relations. The Partnership ensures that Cedar researchers meet ethical standards set out by the University of British Columbia REB as well as the Tri-Council Policy Statement for Ethical Research Involving Humans, with a special focus on Section 9 pertaining to Indigenous peoples in Canada. Under our Research Agreement with the Partnership, we are not permitted to share or distribute Cedar data publicly and only Cedar researchers who have signed confidentiality agreements and been assigned a research mentor are permitted to work with Cedar data. All research questions, analyses, and outputs are strictly vetted via the Partnership. For these reasons, open access to Cedar data is not possible. Nevertheless, we welcome academic queries and conversations about Cedar research via the corresponding author.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Margo E Pearce <http://orcid.org/0000-0002-1563-8029>

REFERENCES

- Million D. *Therapeutic nations: healing in an age of Indigenous human rights*. USA: University of Arizona Press, 2013.
- Christian W. Voice of a Leader: If you Truly Believe Children are our Future - the Future is Now! *First Peoples Child Fam Rev* 2010;5:10–14.
- Sinha V, Trocmé N, Fallon B. *Kiskisik Awasisak: remember the children. Understanding the overrepresentation of first nations children in the child welfare system*. Ontario: Assembly of First Nations, 2011.
- Clarkson AF, Christian WM, et al. Cedar Project Partnership. The cedar project: negative health outcomes associated with involvement in the child welfare system among young Indigenous people who use injection and non-injection drugs in two Canadian cities. *Can J Public Health* 2015;106:e265–70.
- Truth and Reconciliation Commission Canada. Canada's Residential Schools: The Legacy: The Final Report of the Truth and Reconciliation Commission of Canada; 2015.
- Christian WM, Spittal PM. The cedar project: acknowledging the pain of our children. *Lancet* 2008;372:1132–3.
- Statistics Canada. Diverse family characteristics of Aboriginal children aged 0 to 4: census of population, 2016. Ottawa, Ontario; 2017.
- Blackstock C. Reconciliation means no saying sorry twice: Lessons from child welfare in Canada. In: Brant Castellano M, Archibald L, DeGagne M, eds. *From truth to reconciliation, transforming the legacy of residential schools*. Ottawa, ON: Aboriginal Healing Foundation, 2008: 165–78.
- Rodgers CS, Lang AJ, Laffaye C, et al. The impact of individual forms of childhood maltreatment on health behavior. *Child Abuse Negl* 2004;28:575–86.
- Pearce ME, Blair AH, Teegee M. *The cedar project: understanding the association between childhood maltreatment and psychological distress, resilience, and HIV and HCV vulnerability among young Indigenous people who use drugs in three Canadian cities*. Vancouver: Healthcare and Epidemiology, University of British Columbia, 2015: 21. 313–29.
- Bourgeois AC, Edmunds M, Awan A, et al. HIV in Canada-Surveillance report, 2016. *Can Commun Dis Rep* 2017;43:248–56.
- Public Health Agency of Canada. Epi-Update: Hepatitis C virus (HCV) among Aboriginal people surveyed by three national enhanced surveillance systems in Canada. Ottawa Centre for Communicable Disease and Infection Control; 2010.
- Hunt S. *Researching within relations of violence: witnessing as methodology*. Toronto: Canadian Scholars, 2018.
- Spittal PM, Craib KJP, Teegee M, et al. The cedar project: prevalence and correlates of HIV infection among young Aboriginal people who use drugs in two Canadian cities. *Int J Circumpolar Health* 2007;66:227–40.
- von Elm E, Altman DG, Egger M, et al. The strengthening of reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. *J Clin Epidemiol* 2008;61:344–9.
- Bernstein D, Fink L. *Childhood trauma questionnaire: a retrospective self-report manual*. San Antonio, TX: The Psychological Corporation, 1998.
- Duran B, Malcoe LH, Sanders M, et al. Child maltreatment prevalence and mental disorders outcomes among American Indian women in primary care. *Child Abuse Negl* 2004;28:131–45.
- R. A Language and Environment for Statistical Computing [computer program]. Vienna, Austria R Foundation for Statistical Computing; 2016.
- Hojsgaard S, Halekoh U, Yan J. The R package geepack for generalized estimating equations. *Journal of Statistical Software* 2006;15:1–11.
- First Nations Health Authority. A Path Forward: BC First Nations and Aboriginal People's Mental Wellness and Substance Use - 10 Year Plan. Vancouver, BC; 2013.
- McCaslin WD. *Justice as healing: writings on community Peacemaking and restorative justice from the native law centre*. St. Paul, Minnesota: Living Justice Press, 2005.
- Saeed S, Strumpf EC, Moodie EE, et al. Disparities in direct acting antivirals uptake in HIV-hepatitis C co-infected populations in Canada. *J Int AIDS Soc* 2017;20:e25013.
- Jongbloed K, Pearce ME, Pooyak S, et al. The cedar project: mortality among young Indigenous people who use drugs in British Columbia. *CMAJ* 2017;189:E1352–9.
- Pearce ME, Jongbloed K, Demerais L, et al. "Another thing to live for": Supporting HCV treatment and cure among Indigenous people impacted by substance use in Canadian cities. *Int J Drug Policy* 2019;74:52–61.
- Parillo KM, Freeman RC, Collier K, et al. Association between early sexual abuse and adult HIV-risky sexual behaviors among community-recruited women. *Child Abuse Negl* 2001;25:335–46.

- 26 Stoltz J-AM, Shannon K, Kerr T, *et al.* Associations between childhood maltreatment and sex work in a cohort of drug-using youth. *Soc Sci Med* 2007;65:1214–21.
- 27 Kelm ME. *Colonizing bodies: Aboriginal health and healing in British Columbia, 1900–50*. Vancouver, BC: UBC Press, 1998.
- 28 Martin CM, Walia H. *Red Women Rising: Indigenous Women Survivors of Vancouver's Downtown Eastside*. Vancouver, BC, 2019.
- 29 Evans-Campbell T, Lindhorst T, Huang B, *et al.* Interpersonal violence in the lives of urban American Indian and Alaska Native women: implications for health, mental health, and help-seeking. *Am J Public Health* 2006;96:1416–22.
- 30 First Nations Health Authority. *Fact sheet: sexual wellbeing learning model*. in. Coast Salish Territory, West Vancouver, BC: FNHA, 2018.
- 31 Reyome ND, Dodge Reyome N. Childhood emotional maltreatment and later intimate relationships: themes from the empirical literature. *J Aggress Maltreat Trauma* 2010;19:224–42.
- 32 Miller CL, Kerr T, Frankish JC, *et al.* Binge drug use independently predicts HIV seroconversion among injection drug users: implications for public health strategies. *Subst Use Misuse* 2006;41:199–210.
- 33 Medrano MA, Hatch JP, Zule WA, *et al.* Psychological distress in childhood trauma survivors who abuse drugs. *Am J Drug Alcohol Abuse* 2002;28:1–13.
- 34 Krausz MR, Saddichha S, Strehlau V, *et al.* Is exposure to childhood maltreatment associated with adult psychological distress among adult intravenous drug user? *Mental Health and Substance Use* 2014;7:207–16.
- 35 Kenny DT, Lennings CJ. Cultural group differences in social disadvantage, offence characteristics, and experience of childhood trauma and psychopathology in incarcerated juvenile offenders in NSW, Australia: implications for service delivery. *Psychiatry, Psychology and Law* 2007;14:294–305.
- 36 Feise RJ. Do multiple outcome measures require p-value adjustment? *BMC Med Res Methodol* 2002;2:8.