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# Sexual practices and condom use among a sample of Northern and Indigenous adolescents in Northern Canada: cross-sectional survey results

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Received 3 July 2018

Revised 26 November 2018

Accepted 10 December 2018

Published Online First

27 December 2018

## ABSTRACT

**Background** Sexually transmitted infections (STI) prevention in the Northwest Territories (NWT), Canada is an urgent concern as STI prevalence is seven-fold the national average. The study objective was to explore factors associated with sexual activity and condom use among adolescents in the NWT.

**Methods** We conducted a cross-sectional survey with youth aged 13–18-years-old in 17 NWT communities. We use Poisson regression models with a robust sandwich error variance to estimate adjusted relative risks estimates of the likelihood of experiencing the primary outcomes of sexual activity (vaginal/anal/oral sex) and consistent condom use (oral/anal sex) in the past 3 months by gender.

**Results** Participants (n=607; mean age: 14.2 years; SD: 1.5) included adolescent cisgender girls (n=302; 49.5%), cisgender boys (n=298; 48.9%) and transgender persons (n=7; 1.2%). Most identified as Indigenous (n=444; 73.1%) and 14.0% (n=85) as lesbian, gay, bisexual or queer sexuality (LGBQ+). Among sexually active individuals (n=115), less than half (n=54; 47.0%) reported past 3 month consistent condom use. In adjusted analyses among girls, sexual activity was associated with age, STI knowledge, and alcohol/drug use; LGBQ+ identity and alcohol/drug use were associated with reduced likelihood of condom use. Among boys, sexual activity was associated with age and alcohol/drug use; LGBQ+ identity was associated with increased likelihood of condom use.

**Conclusions** Findings demonstrate sexual activity among adolescents in the NWT varies by gender, age, and alcohol/drug use. Consistent condom utilisation was low, particularly for those using alcohol/drugs. Gender-tailored STI prevention

## Key messages

- ▶ Consistent condom use among adolescents is suboptimal in Northern Canada – this is particularly concerning as this region has sexually transmitted infection rates seven-fold the national average.
- ▶ Using alcohol and drugs was associated with a higher likelihood of being sexually active among both adolescent boys and girls, and a lower likelihood of consistent condom use among adolescent girls.
- ▶ Gender differences are important to consider: sexually diverse girls had a lower likelihood of consistent condom use while sexually diverse boys had a higher likelihood.

strategies with Northern adolescents should address alcohol/drug use and build protective factors.

## INTRODUCTION

Over 4 million persons live in the Arctic region, a vast area spanning eight countries.<sup>1</sup> There is a rich diversity of experiences, geographies and cultures across the Arctic, yet there are similarities regarding insufficient health resources, infrastructure and research, and a history of Indigenous Peoples' colonisation that render knowledge acquired in this context valuable for understanding other Arctic and global regions.<sup>2,3</sup> In Canada, youth living in the Northwest Territories (NWT) experience adverse sexual health outcomes, including a higher incidence



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**To cite:** Logie CH, Lys CL, Fujioka J, et al. *BMJ Sex Reprod Health* 2019;**45**:147–154.

of unintended pregnancies and sexually transmitted infections (STIs).<sup>3,4</sup> In 2010, the pregnancy rate among adolescent girls aged 15–19 years in the NWT was 40.4 per 1000 in comparison to the national average of 28.8 per 1000.<sup>5</sup> In 2015, the incidence of STIs in the NWT was seven times higher than the national incidence rate of 3.9 cases per 1000.<sup>6</sup> It was reported that 1 in 15 men and 1 in 8 women aged 15–24 years in the NWT had at least one STI during 2016.<sup>7</sup> In the same year, the prevalence of gonorrhoea and chlamydia in the NWT was 19 times<sup>7</sup> and six times<sup>8</sup> higher than the reported national prevalence, respectively.

While the presence of another STI elevates youth's vulnerability for HIV acquisition and transmission, documented HIV rates in the NWT are comparable with the rest of Canada.<sup>9</sup> However, these prevalence estimates may be under-reported as a result of socio-structural barriers that reduce uptake of HIV and STI testing in Northern and rural regions, including geographic isolation, stigma, and reduced access to sexual health services.<sup>4</sup>

STI incidence and unintended pregnancies may be substantially reduced through safer sex practices, and condom use is a key practice to prevent both outcomes among adolescents.<sup>10,11</sup> Studies have explored factors associated with sexual activity and condom use across diverse adolescent populations.<sup>10,12</sup> STI knowledge may be a protective factor associated with increased condom use.<sup>11</sup> In contrast, drug and alcohol use may increase adolescents' vulnerability to STIs through reducing sexual inhibitions and compromising sexual negotiation skills including contraceptive use.<sup>4,13,14</sup>

Youth substance use and its association with sexual health is particularly important to assess in the Arctic, where alcohol and substance use play a significant role in contributing to health disparities generally.<sup>2</sup> The NWT reported the highest rates of monthly heavy drinking in Canada in 2014.<sup>15</sup> Arctic Canadian regions such as the NWT have a high proportion of Indigenous Peoples (50.7%),<sup>16</sup> many of whom experience sexual and mental health disparities as a result of historical and ongoing colonisation, racism and discrimination, and the effects of intergenerational trauma from the forced removal of Indigenous children to attend residential schools.<sup>17,18</sup> A recent study with adolescent girls in the NWT revealed that substance use was associated with reporting multiple sex partners.<sup>19</sup> Limited research has examined substance use and its association with sexual activity and condom use among adolescents in the NWT.

Social-ecological factors are associated with gender and sexual orientation differences in sexual health.<sup>12,20</sup> Adolescent girls experience particular socio-ecological vulnerabilities to STI acquisition, including alcohol use norms in communities that can influence sexual decision-making,<sup>21</sup> gender norms that reduce their sexual relationship power, and biological vulnerabilities associated with the cervical opening and cervical

mucus development.<sup>22</sup> Lesbian, gay, bisexual queer and other sexually diverse (LGBQ+) youth in Canada experience increased sexual health disparities in part due to limited access to tailored sexual health information and resources.<sup>23</sup> This is evidenced in higher prevalence of STIs among bisexual vs heterosexual women<sup>24</sup> and disproportionate syphilis infections among gay and bisexual men vs heterosexual men in Canada.<sup>25</sup> Qualitative research in the NWT suggests that LGBQ+ youth experience safer sex barriers due to lack of knowledge and safer sex tool availability, in addition to stigma that produces shame and fear of accessing HIV/STI resources.<sup>20</sup> Gender and sexual orientation differences in sexual practices are understudied among Northern youth.

Identifying patterns of sexual activity and condom use can inform sexual health programming to promote uptake of safer sex practices.<sup>26</sup> However, knowledge gaps remain regarding sexual and condom use practices among NWT youth. The latest territorial/national data on sexual behaviour is from the 2009/2010 Canadian Community Health Survey, which reported that: 38.6% of individuals aged 15–24 years in the NWT had multiple sexual partners, in comparison to the national estimate of 32.5%<sup>27</sup>; 78.6% of NWT youth had used a condom during their last sexual encounter, higher than the national estimate of 67.9%<sup>27</sup>; and sexually active men reported higher condom use (73% vs 63%) than women.<sup>27</sup> The percentage reporting more than one sexual partner was higher among those aged 15–17 years than those aged 20–24 years (35% vs 30%). However, with the exception of gender and age, these data did not examine further variables associated with sexual practices. In addition, it did not examine consistent condom use.<sup>27</sup> Little is known of factors associated with engaging in sex, and using condoms, among Northern adolescents, particularly early adolescents aged 13–15 years in the NWT.

This study aimed to tackle knowledge gaps regarding sexual practices among NWT youth, specifically to examine (a) the prevalence of sexual activity and consistent condom use among NWT youth aged 13–18 years, and (b) socio-demographic, risk, and protective factors associated with sexual activity and consistent condom use among NWT youth.

## METHODS

We implemented a cross-sectional survey with Northern and Indigenous youth recruited using purposive, venue-based sampling at 23 schools in 17 NWT communities (Aklavik, Whati, Fort McPherson, N'Dilo, Lutselk'e, Fort Liard, Fort Simpson, Yellowknife, Ulukhaktok, Fort Resolution, Behchoko, Inuvik, Tuktoyaktuk, Hay River, Katlodeeche First Nation, Fort Smith, and Norman Wells) between October 2016 to June 2017. The 17 communities were purposively selected out of 25 communities with junior/secondary schools in the NWT, and only 1/24 schools

that were offered the opportunity to participate in the research declined. Each school selected classrooms in grades 7–12 to participate. The paper-based survey questionnaires were self-administered among a cohort of secondary school youth aged 13–18 years, who agreed to participate in a sexual health workshop held by a Northern and Indigenous youth sexual health programme (Fostering Open eXpression Among Youth [FOXY]). The survey results included in this analysis are the pre-test results (conducted before the workshops). Self-administration of surveys helped to reduce social desirability bias. Trained research assistants provided details of the informed consent process, were present to answer any questions, and collected the completed surveys that were entered into a database for analyses. The study protocol was approved by the research ethics boards of the University of Toronto and the Aurora Research Institute. All participants provided informed voluntary written consent prior to engaging in the study.

Self-reported information on gender and gender identity, sexual orientation (lesbian, bisexual, gay, queer or other sexual diversity [LGBQ+] vs. heterosexual/straight), ethnicity (Indigenous or non-Indigenous), rural vs. urban residence (living in Yellowknife [urban] vs. outside of Yellowknife [rural]), past 3 month drug/alcohol use ('In the past 3 months have you drank alcohol or used drugs?' Yes/No) was collected. We assessed STI knowledge using a scale based on the Sexually Transmitted Disease Knowledge Questionnaire,<sup>28</sup> which was previously validated in the NWT with adolescent girls<sup>19</sup> (Cronbach's alpha in current study=0.81). The primary outcomes of interest were (a) engagement in any sexual activity, defined as ever engaging in oral, vaginal or anal sex ('Have you done any of these in your life? (Yes/No): vaginal sex, anal sex, oral sex') and (b) for those that were sexually active in the past 3 months, consistent condom use within the past 3 months, defined as individuals indicating that they 'always' used condoms during vaginal/anal sex ('If you have had vaginal or anal sex in the past 3 months, how often do you use a condom?' Always/Sometimes/Never).

Summary statistics were used to compare socio-demographic differences across the primary outcomes by gender. Due to the small sample size, individuals identifying as transgender or other non-cisgender genders (n=7) were excluded from bivariate and multivariate analysis, however frequencies are reported. Statistical comparisons were made using Student's t-test for continuous variables, and  $\chi^2$  test for homogeneity for categorical variables. For categorical comparisons with any cell size less than five, Fisher's exact tests were used to determine statistical significance. Statistical significance was evaluated using two-sided p values at a 0.05 level of significance. We use crude and adjusted Poisson regression models with a robust sandwich error variance to produce adjusted relative risks estimates of

the likelihood of experiencing the primary outcomes.<sup>29</sup> As a sensitivity analysis, we conducted a log binomial regression model with GEE adjustment for community to examine if findings clustered by community.

#### Patient and public involvement

This research is a collaborative partnership with an Indigenous agency, including manuscript authors (CLL, NM, KM) that guided the study foci, research question development, and provided feedback into the outcome measures. The questions were pilot-tested with Northern and Indigenous adolescent peer leaders, many based in the communities the study was conducted in and supporting the sexual health workshops. Results will be shared in factsheets and briefs developed with a NWT Indigenous knowledge translation agency.

## RESULTS

In total 610 individuals completed the survey, 302 (49.5%) self-reported gender as cisgender girls, 298 (48.9%) as cisgender boys, 7 (1.2%) identified as transgender or gender diverse (TG/GD), and 3 (0.5%) had missing information on gender. Individuals with missing information on gender were excluded from further analysis, and transgender and gender diverse participant responses were described in the frequency table, but excluded from further analysis due to the small number.

The mean age was 14.2 years (SD: 1.5) with a age range of 13–18 years. We observed a mean STI knowledge score of 3.46 (SD: 3.21); min/max of 0 and 13 correct answers, respectively. Most participants identified as Indigenous (n=444; 73.1%) and 14.0% (n=85) identified as lesbian, gay, bisexual, queer or other sexually diversity (LGBQ+). Most individuals resided outside of Yellowknife in rural communities (n=430; 70.8%). One-third reported ever using alcohol or drugs (n=211; 34.8%). Among sexually active individuals (n=115; 18.9%) less than half (n=54; 47.0%) reported past 3 month consistent condom use.

Statistically significant gender differences were observed in STI knowledge, sexual activity, LGBQ+ identity, and alcohol or drug use for cisgender girls verses boys, respectively (table 1). Statistically significant differences were observed across all categories when stratifying by sexual activity, with higher age, rural community of residence vs. Yellowknife, higher STI knowledge, Indigenous vs. non-Indigenous identity, alcohol/drug use, and LGBQ+ vs heterosexual identity for sexually active verses non-sexually active individuals, respectively. Stratifying by consistent condom use yielded no statistically significant differences (table 2).

Table 3 and table 4 report socio-demographic factors associated with sexual activity and consistent condom use among cisgender girls and boys. In adjusted

**Table 1** Socio-demographic characteristics among a sample of Northern adolescents in the Northwest Territories (NWT), Canada (n=607)†

Characteristic	Adolescent cisgender girl (n=302)	Adolescent cisgender boy (n=298)	Transgender youth (n=7)	P value*
<b>Socio-demographic factors</b>				
Age in years (mean (SD))	14.2 (1.5)	14.2 (1.4)	14.0 (1.4)	0.735
STI knowledge (mean (SD))	3.9 (3.6)	3.0 (2.6)	4.6 (4.0)	<0.001
Indigenous identity				
No	74 (24.5% (19.8% to 29.8%))	88 (29.5% (24.4% to 35.1%))	1 (14.3% (0.4% to 57.9%))	0.166
Yes	228 (75.5% (70.2% to 80.2%))	210 (70.5% (64.9% to 75.6%))	6 (85.7% (42.1% to 99.6%))	
LGBQ+ identity				
Missing	6 (2.0% (0.7% to 4.3%))	2 (0.7% (0.1% to 2.4%))	–	<0.001
No	234 (77.5% (72.3% to 82.1%))	279 (93.6% (90.2% to 96.1%))	1 (14.3% (0.4% to 57.9%))	
Yes	62 (20.5% (16.1% to 25.5%))	17 (5.7% (3.4% to 9.0%))	6 (85.7% (42.1% to 99.6%))	
Rural residence				
No	82 (27.2% (22.2% to 32.5%))	92 (30.9% (25.7% to 36.5%))	3 (42.9% (9.9% to 81.6%))	0.315
Yes	220 (72.9% (67.5% to 77.8%))	206 (69.1% (63.5% to 74.3%))	4 (57.1% (18.4% to 90.1%))	
Alcohol or drug use in past 3 months				
No	180 (59.6% (53.8% to 65.2%))	212 (71.1% (65.6% to 76.2%))	4 (57.1% (18.4% to 90.1%))	0.003
Yes	122 (40.4% (34.8% to 46.2%))	86 (28.9% (23.8% to 34.4%))	3 (42.9% (9.9% to 81.6%))	
Sexually active				
No	233 (77.2% (72.0% to 81.8%))	252 (84.6% (80.0% to 88.5%))	7 (100% (59% to 100%))	0.021
Yes	69 (22.9% (2.0% to 28.0%))	46 (15.4% (11.5% to 20.0%))	–	
<b>Sexual practices, risk and protective factors among sexually active youth</b>				
Age in years (mean (SD))	15.3 (2.0)	15.6 (1.4)	–	0.366
STI knowledge (mean (SD))	5.8 (4.0)	3.8 (3.0)	–	0.006
Number of sexual partners (mean (SD))	2.3 (1.5)	2.6 (1.7)	–	0.280
Types of sexual act‡				
Not stated	1 (1.5% (0.0% to 7.8%))	2 (4.3% (0.5% to 14.8%))	–	–
Oral	35 (50.7% (38.4% to 63.0%))	21 (45.7% (30.9% to 61.0%))	–	0.546
Vaginal	64 (92.8% (83.9% to 97.6%))	42 (91.3% (79.2% to 97.6%))	–	0.779
Anal	10 (14.5% (7.2% to 25.0%))	5 (10.9% (3.6% to 23.6%))	–	0.576
Consistent condom use				
No	39 (56.5% (44.0% to 68.4%))	22 (47.8% (32.9% to 63.1%))	–	0.360
Yes	30 (43.5% (31.6% to 56.0%))	24 (52.3% (36.9% to 67.1%))	–	
Alcohol or drug use in past 3 months				
No	14 (20.3% (11.6% to 31.7%))	14 (30.4% (17.7%–45.8%))	–	0.214
Yes	55 (79.7% (68.3% to 88.4%))	32 (69.6% (54.2% to 82.3%))	–	
Indigenous identity				
No	9 (13.0% (6.1% to 23.3%))	8 (17.4% (7.8% to 31.4%))	–	0.520
Yes	60 (87.0% (76.7% to 93.9%))	38 (82.6% (68.6% to 92.2%))	–	
Rural residence				
No	3 (4.4% (0.9% to 12.2%))	10 (21.7% (10.9% to 36.4%))	–	0.004
Yes	66 (95.6% (87.7% to 99.1%))	36 (78.3% (63.6% to 89.1%))	–	

\*Significance determined at  $\alpha=0.05$ , and p values produced via Student's t-test,  $\chi^2$  test for homogeneity, or Fisher's exact test.

†Types of sexual acts are overlapping categories causing the sum total to exceed the number of sexually active youth.

‡Unless otherwise stated, the number of individuals and column percentages along with their 95% binomial confidence intervals are reported in each cell. Those with missing information on variables or who's self-reported gender was other than cisgender girl/boy were reported but not used in for statistical comparisons due to small numbers.

SD, standard deviation; STI, sexually transmitted infection.

analyses including socio-demographic variables, age was associated with increased odds of sexual activity among both boys and girls, and rural vs Yellowknife residence was associated with lower odds of sexual activity among boys. Odds of consistent condom use were lower for rural vs Yellowknife residence among

boys and girls, and lower for LGBQ+ girls vs heterosexual girls. Among boys, Indigenous identity and LGBQ+ identity were associated with increased odds of consistent condom use.

In multivariable models that included socio-demographic variables and modifiable factors such as past

**Table 2** Sexual practices among a sample of Northern adolescents in the Northwest Territories (NWT), Canada (n=607)

	Sexually active			Consistent condom use		
	No (n=495)	Yes (n=115)	P value*	No (n=61)	Yes (n=54)	P value*
Age in years (mean (SD))	13.9 (1.2)	15.4 (1.8)	<0.001	15.4 (2.1)	15.4 (1.4)	0.789
Types of sexual act†						
Not stated	–	1 (1.5%(0.0% to 4.7%))	–	–	1 (1.9%(0.0% to 9.9%))	–
Oral	–	56 (48.7%(39.3% to 58.2%))	–	37 (60.7%(47.3% to 72.9%))	19 (35.2%(22.7% to 49.4%))	0.008
Vaginal	–	106 (92.2%(85.7% to 96.4%))	–	55 (90.1%(79.8% to 96.3%))	51 (94.4%(84.6% to 98.8%))	0.398
Anal	–	15 (13.0%(7.5% to 20.6%))	–	7 (11.5%(4.7% to 22.2%))	8 (14.8%(6.6% to 27.1%))	0.599
Number of sexual partners (mean (SD))	–	2.4 (1.6)	–	2.1 (1.6)	2.6 (1.5)	0.171
STI knowledge score (mean (SD))	3.1 (3.0)	5.0 (3.7)	<0.001	5.4 (3.8)	4.7 (3.6)	0.343
Gender						
Adolescent cisgender girls	233 (77.2%(72.0% to 81.8%))	69 (22.9%(18.2% to 28.0%))	0.021	39 (56.5%(44.0% to 68.4%))	30 (43.5%(31.6% to 56.0%))	0.360
Adolescent cisgender boys	252 (84.6%(80.0% to 88.5%))	46 (15.4%(11.5% to 20.0%))	–	22 (47.8%(32.9% to 63.1%))	24 (52.2%(36.9% to 67.1%))	–
Transgender youth	7 (100.0%(59.0% to 100%))	0 (0.0%(0.0% to 41.0%))	–	–	–	–
Indigenous identity						
No	146 (89.6%(83.8% to 93.8%))	17 (10.4%(6.2% to 16.2%))	0.001	9 (52.9%(27.8% to 77.0%))	8 (47.1%(23.0% to 72.2%))	0.993
Yes	349 (78.1%(73.9% to 81.8%))	98 (21.9%(18.2% to 26.1%))	–	52 (53.1%(42.7% to 63.2%))	46 (46.9%(36.8% to 57.3%))	–
LGBQ+ identity						
Missing	8 (88.9%(51.8% to 99.7%))	1 (11.1%(0.3% to 48.2%))	–	0 (0.0%(0.0% to 97.5%))	1 (100.0%(2.5% to 100%))	–
No	424 (82.2%(78.6% to 85.4%))	92 (17.8%(14.6% to 21.4%))	0.038	46 (50.0%(39.4% to 60.6%))	46 (50.0%(39.4% to 60.6%))	0.125
Yes	63 (74.1%(63.5% to 83.0%))	22 (25.9%(17.0% to 36.5%))	–	15 (68.2%(45.1% to 86.1%))	7 (31.8%(13.9% to 54.9%))	–
Rural residence (n (row %))						
No	164 (92.7%(87.8% to 96.0%))	13 (7.3%(4.0% to 12.2%))	<0.001	4 (30.8%(9.1% to 61.4%))	9 (69.2%(38.6% to 90.9%))	0.087
Yes	331 (76.4%(72.2% to 80.4%))	102 (23.6%(19.6% to 27.8%))	–	57 (55.9%(45.7% to 65.7%))	45 (44.1%(34.3% to 54.3%))	–
Alcohol or drug use in past 3 months						
No	371 (93.0%(90.0% to 95.3%))	28 (7.0%(4.7% to 10.0%))	<0.001	11 (39.3%(21.5% to 59.4%))	17 (60.7%(40.6% to 78.5%))	0.094
Yes	124 (58.8%(51.8% to 65.5%))	87 (41.2%(34.5% to 48.2%))	–	50 (57.5%(46.4% to 68.0%))	37 (42.5%(32.0% to 53.6%))	–

\*Significance determined at  $\alpha=0.05$ , and p values produced via Student's t-test,  $\chi^2$  test for homogeneity, or Fisher's exact test. Those with missing information on variables or whose self-reported gender was other than girl/boy were not used in the statistical comparisons.

†Types of sexual acts are overlapping categories causing the sum total to exceed the number of sexually active youth. Column percentages represent the marginal proportions. SD, standard deviation; STI, sexually transmitted infection.

3 month alcohol and drug use and STI knowledge, an increased likelihood of being sexual active was associated with higher age, alcohol or drug use, and STI knowledge among girls; and higher age, and alcohol or drug use among boys. Decreased likelihood of consistent condom use was associated with LGBQ+ identity and alcohol or drug use among girls, and increased likelihood of consistent condom use was associated with LGBQ+ identity among boys. No significant collinearity was observed between the adjusted included variables; all variance inflation factor values were <1.25. A cross-product interaction term was included for both adjusted models (data not shown)

yielding P values <0.001, justifying the choice of stratifying the analysis by gender. The sensitivity analysis for clustering by community did not change the results substantially, suggesting the results are similar across communities in the study.

## DISCUSSION

A minority of participants – 22.9% of cisgender girls and 15.4% of cisgender boys – reported being sexually active. Of these sexually active participants, less than half reported past 3 month consistent condom use. Notably, past 3 month alcohol and drug use were significantly associated with being sexually active irrespective



**Table 3** Socio-demographic factors associated with the odds of sexual activity and consistent condom use among adolescent cisgender girl (aged 13–18 years) participants in the Northwest Territories (NWT), Canada

Socio-demographic factor	uRR	P value	aRR*	P value	aRR†	P value
Sexual activity (n=115)						
Age	1.23 (1.12, 1.34)	<0.001	1.17 (1.11, 1.24)	<0.001	1.16 (1.08, 1.25)	<0.001
Indigenous identity	2.17 (1.13, 4.16)	0.020	1.18 (0.89, 1.56)	0.243	1.12 (0.65, 1.95)	0.678
LGBQ+ identity	1.48 (0.94, 2.33)	0.088	1.3 (0.88, 1.93)	0.183	1.35 (0.91, 1.99)	0.134
Rural residence	8.11 (2.62, 25.09)	<0.001	0.73 (0.31, 1.74)	0.482	2.58 (0.82, 8.14)	0.105
Past 3 month alcohol/drug use	6.55 (3.67, 11.70)	<0.001			4.32 (2.17, 8.61)	<0.001
STI knowledge	1.13 (1.08, 1.19)	<0.001			1.07 (1.02, 1.13)	0.006
Consistent condom use (n=54)						
Age	1.02 (0.90, 1.16)	0.734	0.99 (0.9, 1.1)	0.913	1.02 (0.90, 1.15)	0.762
Indigenous identity	0.74 (0.39, 1.44)	0.382	0.83 (0.68, 1.03)	0.092	0.85 (0.41, 1.73)	0.646
LGBQ+ identity	0.40 (0.16, 1.01)	0.052	0.5 (0.26, 0.94)	0.032	0.43 (0.19, 0.96)	0.040
Rural residence	0.41 (0.30, 0.55)	<0.001	0.57 (0.47, 0.67)	<0.001	0.65 (0.34, 1.27)	0.213
Past 3 month alcohol/drug use	0.41 (0.27, 0.65)	<0.001			0.40 (0.27, 0.58)	<0.001
STI knowledge	0.98 (0.91, 1.05)	0.527			0.98 (0.92, 1.04)	0.500

\*Multivariable models adjusted for age, Indigenous ancestry, LGBQ+ identity, and rural place of residence.

†Multivariable models adjusted for age, Indigenous ancestry, LGBQ+ identity, rural place of residence, alcohol use in the past 3 months, and STI knowledge.

aRR, adjusted relative risk; LGBQ+, lesbian, gay, bisexual, queer and other sexually diverse; STI, sexually transmitted infection; uRR, unadjusted relative risk.

of gender, and with reduced likelihood of condom use among adolescent girls in the NWT. This study revealed important gender differences, with girls reporting higher STI knowledge, increased sexual activity, and higher alcohol and drug use than boys.

Similar to prior studies, we found that alcohol and drug use were associated with adolescent sexual risk practices, including being sexually active<sup>13</sup> and a lower likelihood of condom use.<sup>14</sup> Alcohol and drug use among youth is a public health concern that extends beyond sexual health, as it can contribute to long-term health and substance use issues.<sup>30</sup> To our knowledge

this is among the first quantitative studies to explore factors associated with sexual activity and condom use among adolescents aged 13 years and older in circumpolar regions. Future sexual health programmes with NWT adolescents can work from a syndemics approach that conceptualises the interconnectedness of social and health disparities, including the complex linkages between substance use and sexual risk practices.<sup>31</sup>

Girls were more likely than boys to identify as sexually diverse, and sexually diverse girls reported lower condom use than sexually diverse boys, in comparison with their heterosexual counterparts. Our findings that

**Table 4** Socio-demographic factors associated with the odds of sexual activity and consistent condom use among adolescent cisgender boy (aged 13–18 years) participants in the Northwest Territories (NWT), Canada

Socio-demographic factor	uRR	P value	aRR*	P value	aRR†	P value
Sexual activity (n=115)						
Age	1.62 (1.42, 1.84)	<0.001	1.50 (1.30, 1.74)	<0.001	1.51 (1.27, 1.79)	<0.001
Indigenous identity	2.02 (0.98, 4.14)	0.056	1.08 (0.83, 1.41)	0.565	1.07 (0.54, 2.13)	0.851
LGBQ+ identity	1.13 (0.39, 3.27)	0.824	1.2 (0.69, 2.11)	0.520	1.48 (0.52, 4.21)	0.463
Rural residence	1.60 (0.83, 3.09)	0.158	0.34 (0.26, 0.46)	<0.001	0.63 (0.34, 1.15)	0.131
Past 3 month alcohol/drug use	5.76 (3.24, 10.22)	<0.001	–	–	3.90 (2.12, 7.19)	<0.001
STI knowledge	1.12 (1.02, 1.22)	0.012	–	–	1.07 (0.99, 1.15)	0.097
Consistent condom use (n=54)						
Age	0.92 (0.75, 1.12)	0.389	0.99 (0.90, 1.10)	0.884	0.95 (0.77, 1.18)	0.660
Indigenous identity	1.47 (0.58, 3.77)	0.418	1.73 (1.16, 2.56)	0.007	1.93 (0.92, 4.02)	0.080
LGBQ+ identity	2.05 (1.51, 2.78)	<0.001	2.39 (1.93, 2.95)	<0.001	2.37 (1.44, 3.91)	<0.001
Rural residence	0.83 (0.46, 1.52)	0.553	0.70 (0.56, 0.86)	0.001	0.70 (0.38, 1.30)	0.257
Past 3 month alcohol/drug use	1.31 (0.67, 2.58)	0.432	–	–	1.35 (0.73, 2.50)	0.338
STI knowledge	1.00 (0.91, 1.10)	0.979	–	–	1.01 (0.92, 1.10)	0.846

\*Multivariable models adjusted for age, Indigenous ancestry, LGBQ+ identity, and rural place of residence.

†Multivariable models adjusted for age, Indigenous ancestry, LGBQ+ identity, rural place of residence, alcohol use in the past 3 months, and STI knowledge.

aRR, adjusted relative risk; LGBQ+, lesbian, gay, bisexual, queer and other sexually diverse; STI, sexually transmitted infection; uRR, unadjusted relative risk.

sexually diverse girls were 60% less likely to consistently use condoms than heterosexual girls corroborates prior research in the NWT that revealed a lack of LGBTQ+ safersex education in secondary schools<sup>21</sup> and a general lack of knowledge of safer sex for sexually diverse women. These findings also align with research that situates the low uptake of safer sex practices, and corresponding STI risks, among sexually diverse women in larger social contexts that construct their STI risks as negligible.<sup>25</sup> It is also plausible that sexually diverse girls use condoms less as they may have less male sex partners. This is an area for future research. Interestingly, LGBTQ+ boys were 130% more likely to consistently use condoms as compared with heterosexual boys. Due to the high HIV and syphilis prevalence among gay and bisexual men in Canada<sup>10</sup> there has been a focus on HIV prevention strategies, including condom use, targeting this group. Qualitative narratives from sexually diverse boys in the NWT reinforced the construction of HIV and STI as an issue impacting gay/bisexual men,<sup>22</sup> so it is plausible that sexually diverse boys perceive themselves at higher risk for HIV/STI than heterosexual boys and therefore use condoms more frequently and consistently to manage this risk. Findings have implications for tailoring messages for condom use for both sexually diverse and heterosexual boys and girls to improve HIV and STI literacy and address barriers to consistent condom use. Future research can also consider tailoring interventions for adolescent girls and boys living in more rural locations who reported lower consistent condom use than those in Yellowknife.

The study has several limitations. There is a likelihood of underreporting sexual activity due to social desirability bias and fear of judgement. Future studies could use tablet-based vs. paper-based surveys to minimise confidentiality concerns. We did not collect data on other mental health variables, such as depression, noted to be associated with both substance use and sexual risks among NWT youth.<sup>21</sup> The few variables associated with consistent condom use in adjusted analyses suggests the need for qualitative research to further explore factors shaping condom use decision-making among adolescents in the NWT. Low numbers, particularly among consistent condom use, may mean that we are underpowered to detect statistically significant associations. However, the magnitude/direction of these associations and overall interpretations are unlikely to change with the achieved statistical power. While schools from 68% of regions with junior/secondary schools participated in the study, the representativeness of the sample is limited by the non-probability sampling of regions, and of classrooms within each participating school. Future research can expand to all NWT communities with junior/secondary schools and systematically select participating classrooms within schools to gather more representative data across NWT youth. Despite these limitations, our study provides unique insight into the ways in which sexual activity varies among this

sample of NWT adolescents by gender, age, rurality, and alcohol and drug use.

While STI knowledge was higher among sexually active vs non-sexually active girls, it was not associated with condom use among sexually active girls or boys. This suggests the need to go beyond providing STI information to promoting sexual health literacy and condom negotiation skills, and integrating a syndemics framework<sup>31</sup> to explore the role that alcohol and drug use play in adolescents' lives and sexual practices. These can inform culturally, gender and contextually tailored strategies to promote sexual health and well-being among adolescents in the NWT.

**Contributors** CHL conceptualised the paper and led the writing. CLL conceptualised the FOXY/SMASH programme with MacNeill, led research implementation and contributed to manuscript writing and interpretation. CHL and CLL are co-principal investigators of this study and NM a co-investigator. JF contributed substantially to manuscript writing. NM and KM led data collection and contributed to interpretation. AY led data analysis and contributed to manuscript writing.

**Funding** The study was supported by funding from the Canadian Institutes of Health Research (CIHR) and the Social Sciences & Humanities Research Council of Canada (SSHRC). Funders played no role in study design or interpretation of findings. CHL was also supported by funding from the Ontario Ministry of Research & Innovation Early Researcher Award, Canada Research Chairs Program and the Canada Foundation for Innovation.

**Competing interests** None declared.

**Patient consent** Not required.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data sharing statement** The data are not available to be shared without obtaining ethical approval for changes in the data sharing process.

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