

# Impacts and Responses for Substance Use Among Canadian Women Living with HIV: A Latent Class Analysis

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## Background

Substance use can have multiple health consequences for women living with HIV (WLWH) including lowering adherence to combination antiretroviral therapy (cART).

Studies often conceptualize substance use broadly (e.g., injection drug use (IDU) vs. non-IDU), despite research showing women who are heavy substance users rarely use a single substance and not all substances are equally harmful.

**Study objective:** To analyze current substance use patterns among Canadian WLWH to determine the effects of substance use on cART adherence and identify social determinants of health covariates.

## Methods

The **Canadian HIV Women's Sexual and Reproductive Health Cohort Study (CHIWOS)** is a longitudinal community-based research study of 1,425 WLWH in BC, ON, and QC. Peer Research Associates (WLWH) administer questionnaires at baseline and 18-months, collecting socio-demographic, behavioral, clinical, and health information including data on substance use and cART adherence.

**In this analysis:** Baseline questionnaire data were analyzed for participants enrolled between Aug 27, 2013 and May 1, 2015, with valid responses to all substance use indicators (n=1,363). Patterns of substance use were modeled using **latent class analysis (LCA)** with 7 indicators (current use vs. no use vs. abstainer) included in model. **Multinomial logistic regression** with class membership as the dependent variable identified independent covariates.

## Results

### Model selection (Table 1)

Solutions with 2 to 6 classes were examined. To select the best model, we considered interpretability of the classes and relied on information criteria. We selected the 6-class model because of scores associated with three fit statistics, i.e. log-likelihood, G-squared and AIC and because it contained classes recognizable as socially distinctive substance user groups.

**Table 1. Comparison of fit statistics for baseline models (N=1,363)**

Number of latent classes	2	3	4	5	6
% Seeds asso. w/ best model	100/100	60/100	70/100	31/100	28/100
Log-likelihood	-3958.04	-3647	-3533.65	-3508.37	-3489.03
G-squared	1007.12	385.03	158.33	107.77	69.1
AIC	1065.12	473.03	276.33	255.77	247.1
BIC	1216.42	702.6	584.16	641.87	711.45
CAIC	1245.42	746.6	643.16	715.87	800.45
Adjusted BIC	1124.3	562.83	396.74	406.8	428.74

### The latent classes (Table 2)

LCA results indicate a continuum of women's substance use, from none at all, through legal and socially acceptable substances, to illicit and socially unacceptable substances exemplified by crack cocaine, morphine, and heroin, as well as increased polysubstance use. Latent classes included:

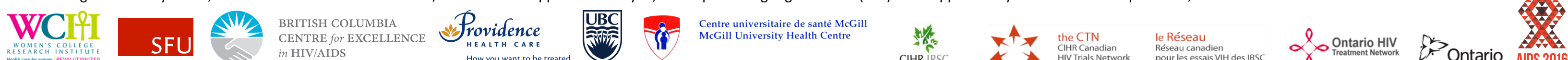
- 1) Abstainers (26.3%)** – characterized by almost 100% of members reporting no current use of any of the 7 substances;
- 2) Tobacco Users (8.8%)** – the numerically smallest class, with almost 100% reporting smoking tobacco, but with few members using other substances;
- 3) Alcohol Users (31.9%)** – the largest class, with almost everyone reporting alcohol use combined with very low use of other substances;
- 4) Socially Acceptable Polysubstance Users (13.9%)** – group members reported high levels of tobacco, alcohol and cannabis use;
- 5) Illicit Polysubstance Users (9.8%)** – in addition to tobacco, alcohol and cannabis use, this group recorded much higher use rates for recreational drugs (39%) and stimulants (59%);
- 6) Heavy Illicit Polysubstance Users (9.3%)** – unlike the previous class, these members also recorded high rates of use of prescription drug (39%) and opiates (78%).

**Table 2. Class membership and item-response probabilities for the six-class solution (N=1,363)**

	Abstainers	Tobacco Users	Alcohol Users	Poly-Substance Users: Socially Acceptable	Poly-Substance Users: Illicit	Poly-Substance Users: Heavy Illicit
<b>Class membership probabilities</b>	26.34%	8.81%	31.92%	13.85%	9.81%	9.27%
<b>Item response probabilities</b>						
<b>Alcohol</b>						
No	0.01%	90.59%	0.01%	18.43%	12.67%	31.13%
Yes	0.03%	9.38%	99.98%	81.55%	87.30%	68.84%
Abstainer	99.97%	0.04%	0.01%	0.02%	0.03%	0.03%
<b>Tobacco</b>						
No	0.01%	0.08%	76.92%	34.57%	9.08%	3.07%
Yes	0.02%	99.88%	23.07%	65.41%	90.89%	96.89%
Abstainer	99.97%	0.04%	0.01%	0.02%	0.03%	0.03%
<b>Cannabis</b>						
No	0.02%	88.83%	99.50%	0.68%	39.22%	51.17%
Yes	0.01%	11.13%	0.49%	99.30%	60.74%	48.80%
Abstainer	99.97%	0.04%	0.01%	0.02%	0.03%	0.03%
<b>Recreational (Cocaine/Ecstasy/MDMA/Acid/Mushrooms)</b>						
No	0.03%	98.88%	99.88%	95.41%	61.19%	70.93%
Yes	0.00%	1.09%	0.11%	4.57%	38.78%	29.04%
Abstainer	99.97%	0.04%	0.01%	0.02%	0.03%	0.03%
<b>Stimulants (Methamphetamine/Crack/Speed)</b>						
No	0.03%	95.25%	98.42%	99.91%	43.44%	23.42%
Yes	0.01%	4.72%	1.57%	0.07%	56.53%	76.55%
Abstainer	99.97%	0.04%	0.01%	0.02%	0.03%	0.03%
<b>Misused prescription (Benzodiazepines/Dilaudid/Oxycotin/Ocycodone/Talwin &amp; Ritalin/T3s &amp; T4s)</b>						
No	0.03%	99.96%	99.99%	98.28%	99.93%	61.43%
Yes	0.00%	0.01%	0.00%	1.69%	0.04%	38.54%
Abstainer	99.97%	0.04%	0.01%	0.02%	0.03%	0.03%
<b>Opiates (Heroin/Speedballs/Morphine/Methadone)</b>						
No	0.03%	97.24%	99.74%	99.95%	99.88%	22.08%
Yes	0.00%	2.72%	0.25%	0.03%	0.09%	77.89%
Abstainer	99.97%	0.04%	0.01%	0.02%	0.03%	0.03%

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## Results (continued)

### Bivariable results (Table 3)

In terms of cART adherence, **Tobacco Users (81%)** and **Abstainers (79%)** had the highest prevalence, followed by **Alcohol Users (76%)** and **Polysubstance Users**, ranging from a high of 68% for those using socially acceptable drugs to a low of 58% for the heaviest illicit substance users. Socio-economic marginalization and violence was increasingly prevalent across classes.

**Table 3. Baseline characteristics and bivariable associations with latent classes**

Variables	Total n (%)	Abstainers	Tobacco Users	Alcohol Users	Poly-Substance Users: Socially Acceptable	Poly-Substance Users: Illicit	Poly-Substance Users: Heavy Illicit
<b>Age at interview (years)</b>							
< median (43)	676 (50)	194 (54)	50 (42)	200 (46)	91 (48)	65 (49)	76 (60)
>= median (43)	687 (50)	165 (46)	70 (58)	235 (54)	98 (52)	69 (51)	51 (40)
<b>Time since diagnosis (years)</b>							
< median (10.8)	691 (51)	196 (55)	54 (45)	226 (52)	77 (41)	67 (50)	70 (56)
>= median (10.8)	672 (49)	163 (45)	66 (55)	209 (48)	111 (59)	66 (50)	56 (44)
<b>Sexual orientation (DK/PNTA: N=3)</b>							
Heterosexual	1191 (87)	327 (91)	107 (89)	410 (94)	155 (83)	103 (77)	89 (70)
LGBTQ	169 (13)	31 (9)	13 (11)	25 (6)	32 (17)	30 (23)	38 (30)
<b>Ethnicity</b>							
White	565 (41)	93 (26)	63 (52)	168 (39)	113 (60)	70 (52)	59 (46)
Indigenous	297 (22)	42 (12)	41 (34)	55 (13)	53 (28)	49 (37)	56 (45)
African/Caribbean/Black	403 (30)	201 (56)	6 (5)	178 (41)	10 (5)	5 (4)	3 (3)
Other	98 (7)	23 (6)	11 (9)	34 (8)	13 (7)	10 (7)	8 (6)
<b>Household annual income (CAD) (DK/PNTA: N=40)</b>							
<\$20,000	860 (65)	221 (64)	92 (77)	221 (52)	120 (65)	103 (77)	103 (86)
>=\$20,000	463 (35)	125 (36)	26 (22)	201 (48)	64 (35)	30 (23)	17 (14)
<b>Any violence as an adult (DK/PNTA: N=94)</b>							
Yes	1017 (80)	208 (62)	104 (87)	311 (78)	163 (91)	119 (94)	111 (99)
No	252 (20)	126 (38)	11 (9)	90 (22)	17 (9)	7 (6)	<5
<b>Current sex worker (DK/PNTA: N=99)</b>							
Yes	77 (6)	<5	6 (5)	7 (2)	8 (5)	17 (14)	39 (35)
No	1187 (94)	329 (99)	109 (91)	399 (98)	169 (95)	107 (66)	74 (65)
<b>Adherence (Never/Not Currently on cART: N=236)</b>							
>= 95%	827 (73)	229 (79)	89 (74)	276 (76)	111 (68)	67 (63)	55 (58)
<95%	300 (27)	62 (21)	21 (17)	85 (24)	52 (32)	40 (37)	40 (42)
<b>Resiliency scale (DK/PNTA: N=5)</b>							
>= median (64)	711 (52)	215 (61)	59 (49)	257 (59)	89 (47)	56 (42)	46 (44)
< median (64)	647 (48)	140 (39)	61 (51)	177 (41)	100 (53)	78 (58)	91 (66)

Abbreviations: LGBTQ: Lesbian, gay, bisexual, two-spirited, queer; Don't know: DK; Prefer Not the Answer: PNTA.

### Multinomial logistic regression results (Table 4)

- African, Caribbean, and Black women exhibit significantly lower AORs for all five latent classes relative to White women, while no independent associations are seen for women with Indigenous ancestry.
- LGBTQ women have lower AORs for membership in some latent classes, namely the **Tobacco** and **Alcohol User** classes, relative to heterosexual women, but higher AORs in the **Heavy Illicit Polysubstance User** class.
- Women with incomes less than \$20,000 are significantly more likely to be **Tobacco** and **Heavy Illicit Polysubstance Users**, but significantly less likely to be **Alcohol Users**.
- Women with below median resiliency scale scores are significantly more likely to be members of the **Heavy Illicit Polysubstance User** class.
- Violence is independently associated with membership in every latent class, with **Illicit** (AOR: 6.22 (95% CI: 3.22, 12.02)) and **Heavy Illicit** (AOR: 6.32 (95% CI: 3.15, 12.68)) **Polysubstance Users** having double the odds of experiencing violence, along with a wider range of possible effects, compared with **Alcohol**, **Tobacco**, and **Socially Acceptable Polysubstance Users**.
- After adjusting for sexual orientation, ethnicity, income, violence, and resiliency, the adjusted odds of non-adherence gradually increase across increasing classes of substance users, ranging from 1.27 (95% CI: 0.66, 2.45) for **Tobacco Users** to 2.78 (95% CI: 1.45, 5.34) for **Heavy Illicit Polysubstance Users**, relative to **Abstainers**.

**Table 4. Multinomial logistic regression showing AOR (95% CI), with 'abstainers' as the reference class (n=1005)**

Variables	Tobacco Users	Alcohol Users	Poly-Substance Users: Socially Acceptable	Poly-Substance Users: Illicit	Poly-Substance Users: Heavy Illicit
<b>Sexual orientation (Reference: Heterosexual)</b>					
LGBTQ	0.78 (0.34, 1.77)	<b>0.42 (0.20, 0.87)</b>	1.22 (0.61, 2.45)	1.4 (0.66, 2.97)	2.08 (0.97, 4.44)
<b>Ethnicity (Reference: White)</b>					
Indigenous	1.18 (0.61, 2.31)	0.79 (0.42, 1.48)	0.93 (0.49, 1.75)	1.16 (0.59, 2.30)	1.38 (0.67, 2.82)
African/Carib./ Black	<b>0.03 (0.01, 0.08)</b>	<b>0.42 (0.28, 0.63)</b>	<b>0.03 (0.01, 0.06)</b>	<b>0.02 (0.01, 0.06)</b>	<b>0.02 (0.00, 0.08)</b>
Other ethnicities	0.66 (0.26, 1.67)	0.92 (0.45, 1.90)	0.45 (0.19, 1.09)	0.49 (0.18, 1.33)	0.59 (0.20, 1.73)
<b>Household annual income (CAD) (Reference: &gt;=\$20,000)</b>					
<\$20,000	<b>2.28 (1.27, 4.09)</b>	0.62 (0.44, 0.88)	1.08 (0.67, 1.74)	1.78 (0.99, 3.20)	<b>3.60 (1.70, 7.63)</b>
<b>Any violence as an adult (Reference: No)</b>					
Yes	<b>3.40 (1.72, 6.70)</b>	<b>2.25 (1.34, 3.78)</b>	<b>3.60 (1.93, 6.71)</b>	<b>6.22 (3.22, 12.02)</b>	<b>6.32 (3.15, 12.68)</b>
<b>Adherence (Reference: &gt;= 95%)</b>					
<95%	1.27 (0.66, 2.45)	1.41 (0.92, 2.18)	<b>2.23 (1.29, 3.86)</b>	<b>2.50 (1.35, 4.62)</b>	<b>2.78 (1.45, 5.34)</b>
<b>Resiliency scale (Reference: &gt;= 64)</b>					
< median (64)	1.16 (0.69, 1.94)	0.84 (0.59, 1.20)	1.26 (0.79, 2.01)	1.22 (0.71, 2.08)	<b>2.08 (1.13, 3.83)</b>

## Conclusions

Findings indicate heterogeneity in substance use patterns among WLWH. One-third (31.9%) were Alcohol Users, and the second most prevalent class was Abstainers (26.3%). Four other classes were identified, defined by socially acceptable and illicit drugs.

Across the latent classes, there was a trend of poorer cART adherence and increased societal marginalization. Heavy illicit poly-substance users were the least likely to realize cART adherence and the most vulnerable, struggling with competing difficulties including violence and poverty.

In conclusion, this study shows that substance use, violence, poverty, and cART adherence are connected, with variation depending on the specific drugs used. Findings highlight a need for gender-sensitive service coordination for WLWH to address co-occurring health and social needs.

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