Latent Class Analysis of Substance Use and HIV VL Trajectory Patterns Among PWH in DC Cohort

Morgan Byrne[1], Anne K. Monroe[1], Lindsey Powers Happ[1], Rupali K. Doshi[1], Michael A. Horberg[2], Amanda D. Castel[1], on behalf of the DC Cohort Executive Committee
[1]George Washington University, Washington, DC, USA; [2]Kaiser Permanente Mid-Atlantic Permanente Research Institute, Rockville, MD, USA

891

Background

- People with HIV (PWH) with substance use disorders (SUD) have worse HIV RNA suppression than PWH without SUD.
- Identifying distinct profiles of polysubstance use can assist in assessing additional health care needs.

Objective to characterize substance use (SU) patterns and their conditional relationship with Viral Load (VL) trajectories among PWH.

Methods

Study Population

DC Cohort is a longitudinal study of PWH in care at 15 clinics in Washington, DC. Data were abstracted from participants' EMRs at 14 of 15 sites.

- Included PWH aged ≥18 years
- Enrolled Jan 2011-Mar 2018
- ≥ 3 VL measures with at least 18 months of follow-up

Substance Use Variables & Other Covariates

SU was defined as documented at DC Cohort enrollment, SU-related ICD9/10, and reported drug abuse treatments throughout follow-up for defined categories including: **Alcohol, Cannabis, Stimulant, Inhalant, Hallucinogen, Opioid, Sedative-hypnotic drugs (including anxiolytic use), and Other unspecified drug use.**

Other covariates included demographic characteristics collected at baseline, smoking history and mental health diagnoses that presented through follow-up.

Analysis Methods

- **Latent class analysis (LCA)** was used to identify patterns of substance use using fit indexes in Mplus software version 5.2**. (Table 1)**
- Associations in demographic and clinical characteristics between the SU classes were evaluated using χ^2 test **(Table 2).**
- **HIV VL Trajectories were** chosen by optimizing fit statistics and clinical interpretation. **(Figure 1)**
- Conditional membership in HIV RNA trajectories was evaluated among LCA SU groups **(Figure 2).**
- Multinomial Logistic regression was used to model variables associated with SU class membership **(Table 3).**
- Analyses performed using SAS Version 9.4 and Significance tests evaluated with alpha set at 0.05.

Results

Latent Substance Use Classes

6,301 participants were assigned to one of 3 SU classes based on estimated posterior probabilities:

- **(1) No illicit SU (2) limited SU & (3) polysubstance use**.

Table 1. Results of LCA and Patterns of Estimated Class Membership

	N	Alcohol	Cannabis	Opioid	Stimulant	Hallucinogen	Inhalant	Sedative, Hypnotic, or Anxiolytic	Other
Class 1: No Illicit Use	**5223**	13%	7%	1%	0%	0%	0%	0%	1%
Class 2: Limited Use	**978**	43%	24%	11%	42%	1%	1%	1%	22%
Class 3: Polysubstance Use	**100**	94%	44%	58%	89%	12%	0%	0%	100%

Figure 1. Log Viral Load Trajectories at 6-month intervals following DC Cohort Enrollment Over 18 months of Follow-up

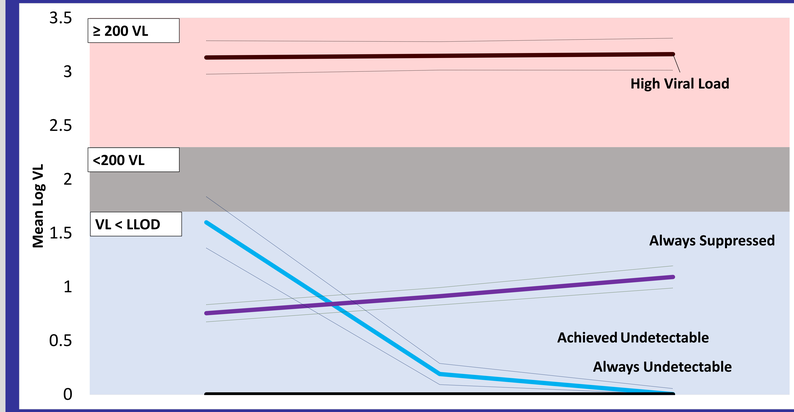


Figure 2. Conditional Probability of HIV RNA Trajectory, given Substance Use Class among PWH

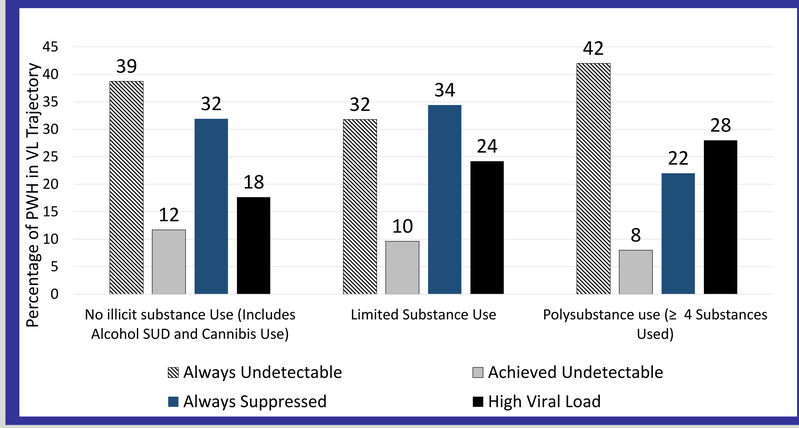


Table 2. Demographic Characteristics of DC Cohort Participants Associated with Three Latent Substance Use Classes

	Overall	Class 1 (No illicit substance use)	Class 2 (Limited Substance Use)	Class 3 (Polysubstance Use)	P-value
	6301	5223	978	100	
Characteristics					
Age					<.0001
18-24	294 (4.7)	401 (7.5)	30 (3.1)	1 (1.0)	
25-39	1490 (23.7)	1234 (23.6)	239 (24.4)	17 (17.0)	
40-49	1848 (29.33)	1541 (29.5)	288 (29.5)	19 (19.0)	
50+	2669 (42.4)	2185 (41.8)	421 (43.1)	63 (63.0)	
Race					<.0001
NH White	833 (13.2)	731 (14.0)	98 (10.0)	4 (4.0)	
NH Black	4879 (77.4)	3961 (75.8)	825 (84.4)	93 (93.0)	
Hispanic	346 (5.5)	307 (5.9)	38 (3.9)	1 (1.0)	
Other	243 (3.9)	224 (4.3)	17 (1.7)	2 (2.0)	
Housing, most recent					<.0001
Permanent/Stable	5340 (84.8)	4513 (86.4)	754 (77.1)	73 (73.0)	
Homeless	556 (8.8)	370 (7.1)	166 (17.0)	20 (20.0)	
Other	405 (6.4)	340 (6.5)	58 (5.9)	7 (7.0)	
Primary Insurance, most recent					<.0001
Private	1578 (25.0)	1503 (28.8)	74 (7.6)	1 (1.0)	
Public	4451 (70.6)	3502 (67.1)	853 (87.2)	96 (96.0)	
Other	173 (2.8)	138 (2.6)	33 (2.4)	2 (2.0)	
Unknown	99 (1.6)	80 (1.5)	18 (1.8)	1 (1.0)	
HIV Risk Category					<.0001
MSM	2396 (38.0)	2057 (39.4)	326 (33.3)	13 (13.0)	
HRH	2074 (32.0)	1726 (33.1)	317 (32.4)	31 (31.0)	
IDU	456 (7.2)	292 (5.6)	123 (12.6)	41 (41.0)	
MSM/IDU	62 (1.0)	38 (0.7)	22 (2.3)	2 (2.0)	
Other/Unknown	1313 (20.8)	1110 (21.3)	190 (19.4)	13 (10.0)	
Smoking, at Enrollment					<.0001
Yes	2288 (36.3)	1602 (30.7)	610 (62.4)	76 (76.0)	
Mental Health					<.0001
Yes	2943 (46.7)	2143 (41.0)	710 (72.6)	90 (90.0)	

Table 3. Multinomial Logistic Regression Comparing Demographic Characteristics by Latent Substance Use Classes

	Limited SU vs. No illicit SU			Polysubstance Use vs. No illicit SU		
	aOR	95% CI		aOR	95% CI	
Age at Enrollment	1.0	1.0	1.0	**1.0**	**1.0**	**1.1**
Mental Health Diagnosis (Yes v. No)	**3.0**	**2.6**	**3.5**	**9.6**	**5.0**	**18.6**
Current Smoker (Yes v. No)	**2.9**	**2.5**	**3.4**	**5.2**	**3.2**	**8.3**
Housing Status						
Homeless vs Permanent/stable	**1.7**	**1.4**	**2.1**	**1.9**	**1.15**	**3.3**
Other vs Permanent/stable	0.8	0.6	1.1	0.9	0.416	2.1
Insurance						
Other vs Private	**3.2**	**2.0**	**5.1**	10.9	1.0	123.7
Public vs Private	**3.1**	**2.4**	**4.1**	**17.4**	**2.4**	**126.0**
Unknown vs Private	**2.9**	**1.6**	**5.2**	**9.8**	**0.6**	**162.4**

Participants in both the polysubstance or limited SU, when compared to the no illicit SU class (**Table 3**) after adjusting for demographic factors were :

- **Less** likely to have private insurance (P<0.05)
- **More** likely to be current smokers (P<0.001)
- **More** likely to be unstably housed/ homeless (P<0.01)

Polysubstance use participants were most likely to be categorized in the trajectory that did not achieve VS, followed by participants in the limited SU class (28% and 24% respectively; p-value <0.001).

Study Limitations

This is a clinical EMR-based study, that does not collect additional substance use information following enrollment other than diagnoses codes and treatment information

Conclusions

- Results provide insight into patterns of SU among DC Cohort enrollees.
- Limited and polysubstance users have higher proportions of high VL trajectories.
- Despite high proportions of substance use, most participants were either able to achieve or maintain viral suppression
- SU treatment especially for newly diagnosed PWH is encourage to improve ability to achieve and sustain VS.

Author Correspondence:
Morgan Byrne, MPH

Email:
byrne410@gwu.edu

Acknowledgements: DC Cohort: Data in this poster were collected by the DC Cohort Study Group with investigators and research staff located at: Children's National Medical Center Adolescent (Lawrence D'Angelo) and Pediatric (Natella Rakhmanina) clinics; The Senior Deputy Director of the DC Department of Health HAHSTA (Michael Kharfen); Family and Medical Counseling Service (Michael Serlin); Georgetown University (Princy Kumar); The George Washington University Medical Faculty Associates (David Parenti); The George Washington University Department of Epidemiology and Biostatistics (Amanda Castel, Alan Greenberg, Anne Monroe, Lindsey Powers Happ, Maria Jaurretche, Brittany Wilbourn, James Peterson, Matthew Levy, Morgan Byrne, Yan Ma); Howard University Adult Infectious Disease Clinic (Ronald Wilcox), and Pediatric Clinic (Sohail Rana); Kaiser Permanente Mid-Atlantic (Michael Horberg); La Clinica Del Pueblo, (Ricardo Fernandez); MetroHealth (Annick Hebou); National Institutes of Health (Carl Dieffenbach, Henry Masur); Providence Hospital (Jose Bordon); Unity Health Care (Gebeyehu Teferi); Veterans Affairs Medical Center (Debra Benator); Washington Hospital Center (Maria Elena Ruiz); and Whitman-Walker Health (Deborah Goldstein). The DC Cohort is funded by the National Institute of Allergy and Infectious Diseases, 5UM1AI069503