HIV risk associated with injection drug use in Houston, Texas 2009: A Latent Class Analysis

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Presenter Disclosures

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Background

- Injection drug use (IDU) is the third most frequent risk factor for new HIV infections in US (Centers for Disease Control and Prevention, 2009a).

- A dual mode of exposure: unsafe drug using practice and risky sexual behavior, underlines injection drug users' risk for HIV infection (Santibanez et al., 2006).

Objective

To investigate HIV risk patterns among a sample of injection drug users using a Latent Class Analysis (LCA) approach

The Latent Variable

In this latent class analysis, the underlying latent variable is RISK that could lead to HIV infection

Sample

CDC National HIV Behavioral Surveillance Program (NHBS)

Second cycle (2009)

Harris County (Houston), Texas

Respondent Driven Sampling (RDS)

Methods

- Using maximum likelihood we calculated the posterior probability (Muthen & Muthen, 1998-2010) of being in an HIV risk class from nine drug and sexual behaviors

- A series of LCA models were estimated to identify the model with an "optimal" number of classes.

- Bayesian Information Criterion (BIC) (Nylund, Asparouhov, & Muthen, 2007),

- Lo-Mendel-Rubin likelihood ratio test (LMR-LR) (Lo, Mendell, & Rubin, 2001) and

- *entropy* (Ramaswamy, Desarbo, Reibstein, & Robinson, 1993) were used to identify HIV risk classes.

Methods (cont.)

- The posterior probabilities for the latent class membership for each participant were exported and used to identify socio-demographic covariates.

- To avoid distorted classification (e.g., incorrect class probabilities)(Muthen, 2004) a latent multinomial regression model was fit simultaneously to identify optimal number of HIV risk classes as well as predictors of class membership.

Methods (cont.)

50 sets of random starting values for the initial stage and 5 optimizations for the final stage of maximum likelihood optimization were specified

(Muthen, 2004).

Statistical Software

The Mplus (version 6.1)(Muthen & Muthen, 1998-2010) for LCA and for latent multinomial regression

Stata 11(StataCorp., 2010) for data management and descriptive statistics

Results

N=523

A majority of the sample were
    older,
    male, and
    non-Hispanic Black.

Fit Indices

Criteria	2-Class	3-Class	4-Class	5-Class	6-Class
BIC[1]	7128.89	7066.74	7032.05	7013.81	7057.11
p-value for LMR-LR[2] Test	<0.001	0.03	0.1205	0.1367	0.2398
Entropy	0.89	0.82	0.81	0.83	0.87

- [1]Bayesian Information Criteria
- [2]Lo-Mendell-Rubin-Likelihood Ratio

Class assignment probability by class (n=519)

	Class 1	Class 2	Class 3
Class 1 (n=128)	**0.89**	0.06	0.05
Class 2 (n=174)	0.06	**0.90**	0.04
Class 3 (n=217)	0.04	0.01	**0.95**
Entropy	0.82		

Latent class and conditional probability of drug using behaviors

Indicator	Sample		3-Class Model		
	Prevalence (%)	95% CI	Latent Class I (n=128)	Latent Class II (n=174)	Latent Class III (n=217)
Probability of each class			0.25	0.33	0.42
Years injecting, means	23.73 (11.98[1])		35.94 (0.86[2])	18.32 (1.67[2])	20.30 (1.22[2])
Using a sterile needle (Yes)	26.10	22.3-29.9	0.25	0.62	0.00
Sharing a needle (Yes)	49.62	45.3-53.9	0.40	0.00	0.93
Sharing equipment (Yes)	70.45	66.4-74.4	0.71	0.35	0.96

- [1]Standard Deviation
- [2]Standard Error

Latent class and conditional probability of sexual behaviors

Indicator	Sample		3-Class Model		
	Prevalence (%)	95% CI	Latent Class I (n=128)	Latent Class II (n=174)	Latent Class III (n=217)
Probability of each class			0.25	0.33	0.42
No. of sex partners in past 12 months (log transformed), means	0.25 (0.11[1])		0.17 (0.015[2])	0.24 (0.010[2])	0.31 (0.008[2])
Condom use[3] (Yes)	20.22	16.5-23.9	0.30	0.27	0.10
Partner type[3]					
Main partner	30.31	25.9-34.7	0.35	0.33	0.27
Casual partner	31.98	27.4-36.5	0.46	0.37	0.24
Exchange partner	37.71	33.0-42.3	0.19	0.30	0.49
Drug/Alcohol use[3] (Yes)	84.18	80.9-87.4	0.79	0.81	0.90
Anal sex[3] (Yes)	21.10	17.4-24.7	0.09	0.11	0.34

HIV Risk Classes

3-class model fit the data best: High HIV risk class (42%), Moderate HIV risk class (25%) and Low HIV risk class (33%).

3 HIV Risk Classes

- High HIV risk class—never used a sterile needle; condom use low (10%) but use of drug/alcohol during/before sex was high (90%) and 34% had anal sex at last sex.

- Moderate HIV risk class—higher drug risk behaviors but lower sexual risk behavior.

- Low HIV risk class—never shared a needle and more than two-thirds reported main partner or casual partner.

HIV Status by Risk Class

High risk class had the highest prevalence of HIV cases (19/217 or 9%) whereas the low risk class had the lowest prevalence (7/174 or 4%).

Multinomial Regression Model

Predictor	Moderate Vs High-risk group		Low Vs High-risk group	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Age (in years)	**1.49**	**1.29-1.72**	0.99	0.95-1.04
Education (>12 yr)	1.42	0.42-4.78	1.70	0.92-3.12
Income (>$5000 in past year)	2.07	0.47-9.07	1.22	0.73-2.04
Any STD in past year	0.42	0.02-7.81	0.54	0.19-1.49
No History of Incarceration in past year	0.33	0.09-1.12	**0.52**	**0.32-0.86**
Type of drug used				
Heroin	Ref		Ref	
Cocaine	0.61	0.15-2.46	0.64	0.37-1.09
Speedball	1.91	0.42-8.75	0.35	0.10-1.23
Other	1.62	0.22-11.51	0.52	0.18-1.46
Not Being Homeless in past year	**0.16**	**0.04-0.70**	**0.28**	**0.15-0.52**

Note: Bolded odds ratio indicates *p*-value less than 0.05

Discussion

- LCA is an effective approach to empirically categorize and identify risk patterns using multiple indicators.

- HIV risk varies among IDUs as their drug and sexual risk pattern.

- Age, homelessness and history of incarceration are contextual factors of the observed risk pattern.

Discussion (cont.)

- Particular concern is observed clustering pattern of drug and sexual risk behavior among IDUs.

- Considering the dual exposure, inter-group and intra-group HIV infection may occur at a higher rate and spread rapidly than previously anticipated.

Limitation

- Cross-sectional Study

- Self-report Bias