Syndemic and synergistic effects of intimate partner violence, crystal methamphetamine, and depression on HIV sexual risk behavior among women who inject drugs in Indonesia

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Introduction

Women who inject drugs are disproportionately affected by co-occurring intimate partner violence (IPV), poor mental health, and substance use, a triad of afflictions that have been independently associated with elevated risk of HIV transmission among female drug-using women in high-income countries.[1] Little is known about the potentially synergistic effects of these factors on women's HIV risk behavior, and no known studies in Asia examine these relationships. Indonesia, the world's 4th most populous country with a population of nearly 260 million people, is one of three countries in South East Asia where HIV rates continue to rise rather than stabilize.[2] Approximately 29% of people who inject drugs in Indonesia live with HIV.[3] We conducted Indonesia's largest study of women who inject drugs to assess :

(1) whether depression, IPV, and crystal meth use are independently associated with elevated HIV sexual risk behavior;

(2) the potential additive effects of aggregate exposure to one or more of these conditions on women's HIV sexual risk behaviors; and

(3) the extent to which these conditions may interact on the multiplicative and/or additive scales to increase women's odds of participation in HIV sexual risk-taking behaviors beyond each condition's individual effects.

Methods & Analysis

***Perempuan Bersuara* (*Women Speak Out*)** is a community-based cross-sectional survey developed in collaboration with women who inject drugs, NGOs, and local experts from government and academia.

- **Participants**: 731 women 18+ years old who injected any illicit substances in the previous year
- **Procedures:** Data was collected between September 2014 and May 2015 at two urban sites with high burdens of injecting drug use and HIV. Sites included Jabodetabek (Jakarta, Bogor, Tangerang and Bekasi) and Bandung, West Java. Validated measures and scales with strong psychometric properties were used where available. All study instruments were back translated into Bahasa Indonesia and piloted with our community advisory group.
- **Sampling:** Participants were recruited via mobile respondent driven sampling, a modified form of peer-based, snowball sampling that uses a systematic referral procedure to reduce biases by providing all participants an equal chance to recruit peers into the study.[7] Data was collected by trained female peer fieldworkers using mobile devices and Open Data Kit, an open source data collection software.
- **Ethics:** Voluntary verbal and written informed consent was obtained from all women. Strict confidentiality and anonymity was maintained, except where participants were at significant harm or requested assistance. Each participant was offered referrals to harm reduction services and/or other support and care services, as needed. Ethics were approved by Oxford University's Central University Research Ethics Committee and the Ethics Board of Atma Jaya University.
- **Analysis:** All analyses were cross-sectional; thus findings should be interpreted as preliminary analyses indicating association rather than causality. Multivariate logistic regressions and marginal effects models tested associations and predicted probabilities of exposure to depression, IPV, and past-year non-injection crystal meth use on three major HIV sexual risk behaviour outcomes (i.e. sexually transmitted infection (STI) symptomatology, inconsistent condom use, and survival sex work). Multiplicative interaction was evaluated through cross-product terms, and additive interaction was assessed by calculating the relative excess risk due to interaction (RERI), attributable proportion due to interaction (AP), and synergy index (S).

Results

- **More than 1 in 4 women experienced concurrent exposure to IPV, depression, and non-injection crystal meth use** (Figure 1). All three syndemic factors were significantly positively associated with STI symptomatology, inconsistent condom use, and survival sex work (Figure 3).
- In adjusted marginal effects models, concurrent exposure to all three syndemic conditions was associated with a 4- to 7-fold elevation in women's reported prevalence of sexual risk behaviors : **STI symptomatology (from 12% to 60%), inconsistent condom use (from 3% to 22%), and survival sex work (from 6% to 25%)** (Figure 3).
- Most two-way effects of syndemic factors showed a greater than additive interaction (Figure 4):
  - **38%** of inconsistent condom use among women who experienced past-year IPV and used crystal meth was attributable to the intersection of these risk factors.
  - The presence of STI symptomology among women exposed to both IPV and depression was more than **3 times higher** than the prevalence of STI symptoms among women without either exposure.
  - The interaction between crystal meth use and depression accounted for **61%** of reported STI symptomatology and **53%** of survival sex work among women with both exposures.

Figure 1: Overlap in exposures to syndemic conditions (past-year intimate partner violence, depression, non-injection crystal meth) among women who inject drugs in Indonesia (N=731)

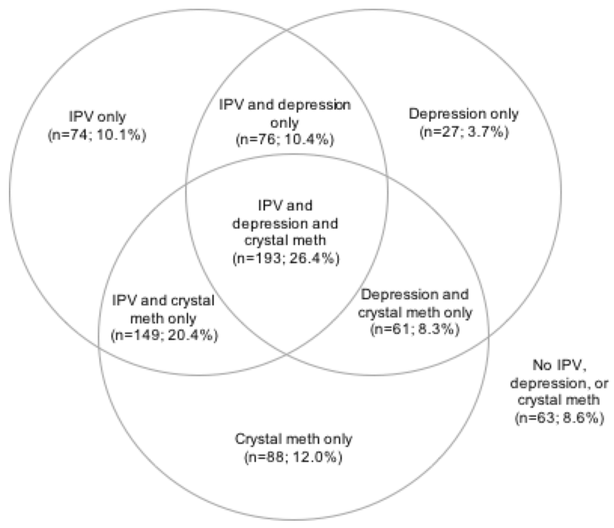

Figure 2: Associations between syndemic factors and HIV sexual risk outcomes among women who inject drugs in Indonesia (N=731)

Dependent syndemic variables	STI symptomatology *AOR[a] (95% CI)*	Inconsistent condom use *AOR[b] (95% CI)*	Survival sex work *AOR[c] (95% CI)*
Past-year intimate partner violence	**2.62*** ** (1.80, 3.80)	**3.61*** ** (2.03, 6.42)	**1.85** ** (1.20,2.85)
Depressive symptoms (CESD-R ≥16)	**2.38*** ** (1.67, 3.39)	**1.66*** (1.0, 2.73)	**1.83** ** (1.18,2.84)
Past-year use of non-injection crystal methamphetamine	**1.66** ** (1.16, 2.38)	**1.84** ** (1.12, 3.02)	**1.76** ** (1.14,2.70)

Figure 3: Predicted probabilities of syndemic exposures on HIV sexual risk behaviours among women who inject drugs in Indonesia (N=731)

			STI symptomatology		Inconsistent condom use		Survival sex work	
Syndemic exposures			Predicted Probability (%)[a]	95% CIs	Predicted Probability (%)[b]	95% CIs	Predicted Probability (%)[c]	95% CIs
IPV	**Crystal meth**	**Depression**						
–	–	–	11.9	6.9, 16.9	3.0	1.0, 5.1	6.1	2.9, 9.2
+	–	–	25.2	17.5, 32.9	9.3	4.8, 13.8	10.3	5.6, 14.9
–	+	–	20.0	13.6, 26.4	5.2	2.3, 8.1	9.9	5.8, 13.9
–	–	+	24.7	17.4, 32.0	4.8	1.9, 7.6	10.2	6.1, 14.3
+	+	–	38.2	30.7, 45.8	15.0	9.6, 20.5	16.0	11.0, 21.0
–	+	+	37.6	29.8, 45.3	8.1	4.4, 11.8	15.9	11.0, 20.8
+	–	+	44.7	37.2, 52.3	13.9	9.0, 18.7	16.5	11.5, 21.5
+	+	+	59.7	54.1, 65.3	21.6	17.4, 25.9	24.6	20.3, 28.9

Figure 4: Additive interactions between two-way syndemic exposures on HIV sexual risk behaviours among women who inject drugs in Indonesia (N=731)

		STI symptomatology			Inconsistent condom use			Survival sex work		
IPV	**Crystal meth**	*RERI*	*AP*	*S*	*RERI*	*AP*	*S*	*RERI*	*AP*	*S*
+	+	1.19 (-0.82, 3.20)	0.19 (-0.12, 0.51)	1.30 (0.79, 2.14)	2.01 (-0.33, 4.35)	**0.38 (-0.00, 0.76)***	1.88 (0.72, 4.90)	0.20 (-1.57, 1.98)	0.05 (-0.42, 0.52)	1.08 (0.54, 2.16)
Crystal meth	**Depression**									
+	+	**2.04 (0.94, 3.13)*** **	**0.61 (0.36, 0.85)*** **	7.17 (0.26, 198.94)	0.45 (-1.07, 1.97)	0.15 (-0.39, 0.70)	1.29 (0.42, 3.97)	**1.20 (0.32, 2.08)** **	**0.53 (0.11, 0.94)** **	15.96 (0.00, 4.18)
IPV	**Depression**									
+	+	**3.01 (1.11, 4.92)** **	**0.52 (0.30, 0.74)*** **	**2.70 (1.26, 5.80)** **	1.61 (-1.25, 4.47)	0.25 (-0.17, 0.67)	1.42 (0.69, 2.92)	**1.21 (-0.01, 2.42)***	**0.40 (0.01, 0.79)***	2.44 (0.49, 12.24)

*p<0.05, **p<0.01, ***p<0.001. Abbreviations: AOR = Adjusted Odds Ratio; CI = Confidence Intervals; RERI = Relative Excess Risk due to Interaction; AP= Attributable Proportion due to Interaction; S = Synergy index.
[a] Adjusted for self-reported HIV status, relationship status, housing status, survey city, and education level.
[b] Adjusted for self-reported HIV status, relationship status, housing status, education level, individual monthly income, and having children and/or other dependents.
[c] Adjusted for self-reported HIV status, relationship status, housing status, individual monthly income, and having children and/or other dependents.

Conclusions

- The results should be interpreted with caution given the cross sectional nature of the data.
- Women who inject drugs in Indonesia are exposed to high rates of IPV, depression, and non-injection crystal meth use. The interaction of these syndemic exposures may have a significant impact on women's HIV risk-taking behavior.
- While previous studies have documented the concentration of health and psychosocial problems among drug-involved female populations,[4] this study extends the field by demonstrating that a substantial proportion of variation in drug-using women's HIV risk behaviors may be explained by interactions among syndemic IPV, substance use and mental health problems.
- By establishing an empirical basis for the syndemic interactions between mental health, IPV, and substance use among women who inject drugs, this study highlights the urgent need to optimise existing health systems to better address the needs of key populations.
- There is an urgent need for multicomponent interventions aimed at improving women's health and psychosocial wellbeing which target the full scope of syndemic vulnerabilities, rather than addressing these in isolation. Implementing such interventions requires not only programmatic improvements, but attention to the broader social and policy contexts that can reduce adverse health outcomes.

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