Geospatial Heterogeneity in Potential HIV Transmission Locations among MSM in Bhopal, India

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BACKGROUND

- HIV incidence is disproportionately high among men who have sex with men (MSM) globally and increasing among MSM in India.
- **Goal:** Describe the distribution of locations where MSM (all, with HIV, and with HIV viremia) met male sexual partners in Bhopal, India to inform spatially tailored interventions to interrupt HIV transmission.

METHODS

- **Setting:** Bhopal, India (population 2.6 million) between December 2023 and April 2024.
  - In 1984, a methyl isocyanate gas leak in northern Bhopal killed ~20,000 people and continues to impact health today.
- **Study Design:** Respondent-driven sampling (RDS).
- **Enrollment criteria:** Males aged 18+ who had sex with another man in the prior year.
- **Outcomes:** Determined through HIV rapid antibody and viral load testing.
- **Exposures:** Participant residence location and up to 4 locations where they met sexual partners in prior year. Behavioral survey administered.
- **Analysis:** Categorized meeting locations (e.g. commercial, transportation-related), kernel density estimation to identify areas where MSM with HIV viremia commonly met sexual partners. All analyses were weighted to account for RDS design.

MSM who met partners within 1 km of the 1984 Gas Tragedy Site had a 14% higher HIV prevalence on the absolute scale and twice as many sexual partners.

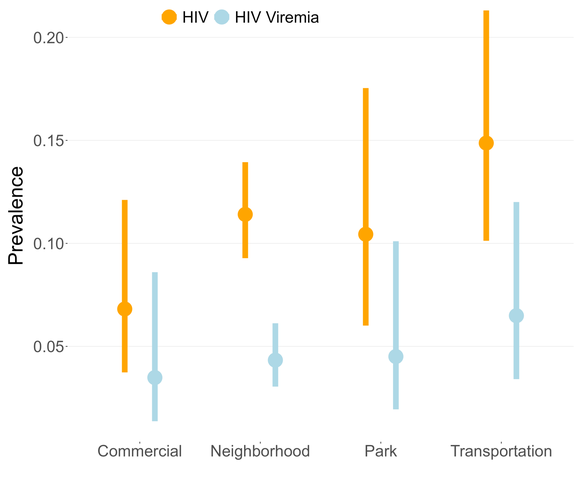


Figure 1: Prevalence of HIV and HIV Viremia by Category of Sex Partner Meeting Location

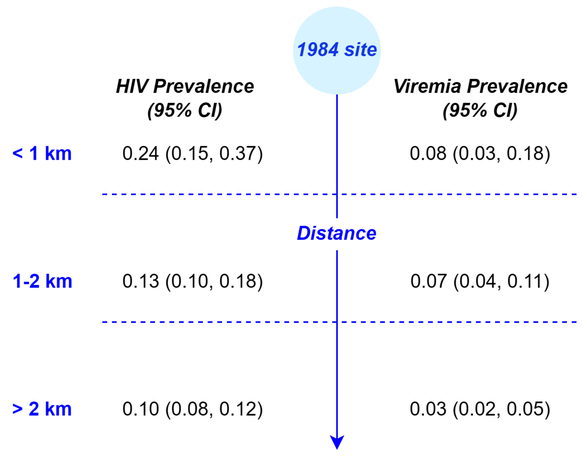


Figure 2: Prevalence of HIV and HIV Viremia by Closest Meeting Point Distance to the 1984 Gas Tragedy Site

RESULTS

- 752 MSM enrolled through RDS.
  - Highly employed (98.0%) and educated through secondary school (99.5%).
  - HIV, HIV viremia prevalence: 11.6%, 4.4%
- 328 named locations for meeting partners: 190 neighborhoods, 62 transportation-related, 30 commercial, 28 parks, and 18 other.
- MSM meeting at transportation-related locations had the highest prevalence of HIV (14.9%) and HIV viremia (6.5%) and those meeting at commercial locations had the lowest: 6.8% and 3.3% (Figure 1).
- Identified 3.88 km^2 area south of the 1984 Bhopal Gas Tragedy site, where 45.8% of all MSM with detectable viremia met partners.
- MSM who met within 1 km (versus those only meeting >2 km away) of the 1984 site had:
  - 14.1% (95% CI: 4.3%, 27.1%) higher HIV prevalence (Figure 2).
  - 4.3% (-0.6%,14.7%) higher HIV viremia prevalence (Figure 2).
  - More sexual partners (median [IQR]: 15 [5, 28] vs 7 [3, 22])
  - 5.3% (-4.8%, 9.2%) higher inconsistent condom use with casual partners

CONCLUSIONS

- Spatially tailored interventions may be efficient.
- Structural disparities may drive where MSM with HIV choose to meet partners for sex and limit access to treatment and prevention.

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