

**Background** Cohort and cross-sectional studies have shown syphilis is associated with risk for HIV infection. However, population-based estimates of the actual risk for HIV following syphilis infections are lacking.

**Methods** In New York City, HIV and STD surveillance registries are separately maintained. Cases reported to these registries with diagnoses from 2000–June 2010 were matched using a deterministic algorithm. We measured HIV incidence among men following primary or secondary syphilis diagnoses. We calculated time at risk for HIV among men diagnosed with HIV  $\geq$  60 days after syphilis diagnosis; men without reported HIV were presumed uninfected and censored on 3/31/2011.

**Results** Of 2,805 men with syphilis who contributed 11,714 person-years of follow-up, 423 (15.1%) subsequently acquired HIV; annual incidence was 3.61% (95% CI: 3.27%, 3.97%). Median time to HIV diagnosis was 582 days (range 60–3150). HIV incidence was highest among men who have sex with men (MSM) (5.56%, 95% CI: 5.02%–6.13%), relatively uniform across race/ethnicity and year of syphilis diagnosis, and decreased with increasing age at syphilis diagnosis. HIV incidence was higher among males with secondary compared with primary syphilis (4.10% vs. 2.64%,  $p < 0.0001$ ). HIV incidence among males with syphilis who were diagnosed with another bacterial STD before HIV (14% of cases) was over double the incidence among those who were concurrently diagnosed (7.89% vs. 3.44%,  $p = 0.002$ ) or reported only with syphilis (7.89% vs. 2.89%,  $p < 0.0001$ ) during the analytic period.

**Conclusions** On a population level, one in 20 MSM with syphilis are diagnosed with HIV within a year; highly frequent HIV testing and HIV pre-exposure prophylaxis should be considered for HIV-negative syphilis cases. Secondary syphilis suggests untreated primary lesions; the higher HIV incidence among these cases underscores the importance of appropriate STD/HIV screening and early syphilis detection. Registry matching/integration permits identification of high-risk individuals, such as men repeatedly acquiring STD, for targeting prevention activities.

# 011.5 RISKS FOR SEXUALLY TRANSMITTED INFECTIONS (STIS), HIV, AND PREGNANCY AMONG WOMEN WORKING IN ENTERTAINMENT ESTABLISHMENTS IN CAMBODIA

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**Background** Since the 1990s, Cambodia successfully reduced HIV and STI prevalence among female sex workers. In 2008, brothels were outlawed, and non-brothel Entertainment Establishments (EEs) increased. Some women working in EEs exchange sex for gifts or money. We examined associations between behavioural risks and STIs, HIV and pregnancy among Cambodian Female Entertainment Workers (FEWs).

**Methods** In 2011, a stratified multi-stage cluster survey of 2,564 FEWs was conducted in karaoke establishments, beer halls, and former brothels. Participants consented to private interviews, blood collection, and self-administered vaginal swabs for gonorrhoea and chlamydia. Analyses were weighted and controlled for the complex design of the survey. Logistic regression models were used to examine potential risk factors of STIs, HIV and pregnancy.

**Results** Transactional sex in the last year was reported by 41.1% of FEWs. Chlamydia (18.9%), gonorrhoea (5.3%), and active syphilis (0.4%) were associated with younger age ( $p < 0.0001$ ). HIV (2.6%) and pregnancies ( $n = 1194$ ) were more likely among older women

( $p < 0.0001$ ). Heavy drinking was associated with gonorrhoea (odds ratio [OR] = 2.5, 95% CI 1.1–5.4), while drug use was associated with any STI ( $p = 0.0062$ ) and HIV ( $p = 0.0005$ ). Always using condoms varied by partner type (clients [74.0%], boyfriends [31.2%], and husbands [9.8%]) and was negatively associated with pregnancy only. Working in a former brothel (OR = 2.5, 95% CI 1.4–4.6) and having  $> 7$  vs.  $\leq 7$  clients per week (OR = 3.8, 95% CI 1.8–7.7) was associated with HIV. Among FEWs, 36.8% had clients plus a husband and/or boyfriend. Those with both a boyfriend and client had the highest odds of any STI (OR = 3.8, 95% CI 2.2–6.7).

**Conclusion** Cambodian FEWs are a heterogeneous group with varying risk behaviours. STIs and HIV appear to be concentrated in distinct subpopulations, but sexual partner relationships contribute to the complex transmission dynamics. Defining those most at risk will help focus national prevention and case-finding programmes.

# 011.6 MIGRATION AND HIV RISK IN RAKAI YOUTH, 2000–2010

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**Background** Migration is common among youth in Africa and is connected to life transitions. Migration has also long been associated with increased risk of being HIV-infected. Although this association has been observed in multiple studies, the temporal order between infection and migration is often unclear. This investigation uses unique cohort data from Rakai, Uganda to test whether recent in-migration places youth at a higher risk of HIV acquisition.

**Methods** We used data from the Rakai Community Cohort Study, 1999–2011. Respondents included were aged 15–24, sexually experienced and initially HIV negative ( $n = 9365$ ). Migration and HIV status were assessed at each annual survey round. Poisson regression with robust standard errors was used to estimate age-adjusted incidence rate ratios (aIRR) of HIV acquisition among in-migrants versus non-migrants, by geographic origin and reason for migration. Additional adjustment for characteristics assessed at follow-up was explored.

**Results** In young men, HIV incidence in recent in-migrants (14.3 per 1000 person-years (py)) was 2 times greater than non-migrants (6.6 per 1000 py) (aIRR = 2.04; 95% confidence interval (CI): 1.07–3.92). In young women, incidence among in-migrants (12.6 per 1000 py) was similar to non-migrants (11.5 per 1000 py) (aIRR = 1.07; CI: 0.74–1.55). Associations were not affected by geographic origin. Men who had migrated for marriage were at particularly high risk (141 per 1000 py) compared to non-migrants (aIRR = 17.16; CI: 3.15–93.35). However, this was uncommon ( $< 1\%$  of py) and only in men aged  $> 19$ . Women who had migrated for work were at increased risk (30.3 per 1000 py) compared to non-migrants (aIRR = 2.59; CI: 1.41–4.76). IRRs were relatively unchanged with adjustment for marital status, number of partners in last 12 months or sexual concurrency.

**Conclusion** Recent in-migration is associated with increased HIV risk in young Ugandan men. Among young women, the increase in HIV risk may be specific to migration for work.

# 0.12 - Social determinants and structural interventions

## 012.1 USING SOCIAL DETERMINANTS TO PREDICT NEISSERIA GONORRHOEAE INFECTION RISK AT THE CENSUS TRACT-LEVEL: FINDINGS FROM THE STD SURVEILLANCE NETWORK (SSUN), UNITED STATES

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**Background** Associations between social factors and health outcomes have been established for many diseases, including gonorrhoea. Inequalities in gonorrhoea are particularly pronounced; the incidence for non-Hispanic Blacks is 17 times the incidence for non-Hispanic Whites. A gap exists in the literature on how social determinants for this population can be used to target STD interventions.

**Methods** Health departments from 10 diverse states geocoded female gonorrhoea case reports from 2009–2011 to the census tract. We calculated three-year gonorrhoea incidence rates among females for 11,832 tracts in the study area. Tract-level social determinants were obtained from the American Community Survey. Female rates were used to preclude confounding by the unknown proportion of men-who-have-sex-with-men among male cases. Tracts were stratified as above or below the county-level mean proportion of non-Hispanic Black residents to minimise interactions between race and other factors, and subsequent analyses were limited to the stratum with a higher proportion of blacks (N = 4,345). Using hierarchical models and logistic regression, associations between female gonorrhoea incidence, household income, education and housing characteristics were examined. Factors found to be associated with gonorrhoea incidence were used to construct tract-level gonorrhoea risk indices.

**Results** The mean tract-level female incidence rate was 194/100,000 (range, 0–2,836) in this stratum. Gonorrhea incidence was correlated with: proportion of households with annual income below \$20,000 ( $\beta = 0.7089$ ,  $P < 0.0001$ ), housing vacancy rate ( $\beta = 0.5519$ ,  $p < 0.0001$ ) and proportion of population with less than high school education ( $\beta = 0.3206$ ,  $p < 0.0001$ ). Risk indices based on these factors correctly predicted 77.3% of tracts with incidence in the highest quartile in this stratum while excluding 58.9% of tracts with lowest incidence.

**Conclusions** Area-based social factors provide more specific criteria than race alone and may be useful for better targeting disease prevention activities to areas at highest risk for gonorrhoea incidence, especially where street-level address information on reported cases is unavailable.

## 012.2 CHURCH ATTENDANCE IN MEN WHO HAVE SEX WITH MEN DIAGNOSED WITH HIV IS ASSOCIATED WITH LATER PRESENTATION

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**Background** Tensions between religion/religious beliefs and personal behaviours may impact HIV-related health seeking for persons at risk for HIV. We evaluated the relationship between self-reported church attendance and sexual partner characteristics on CD4+ T lymphocyte count (CD4 count) and history of HIV screening among persons presenting for the first time to establish HIV care.

**Methods** This was a secondary analysis of prospectively collected data at a University HIV Clinic in the U.S between April 2008 and June 2012. Socio-demographic and behavioural information, including church attendance, is collected and linked to laboratory data. Using logistic regression, we assessed for a 2-way interaction between church attendance and sexual behaviour on CD4 count at entry into care and on history of prior HIV testing in univariate and multivariable models.

**Results** Of 508 participants, current church attendance was reported by 56%. There was a significant interaction between church attendance and sexual behaviour ( $p = 0.02$ ) with CD4 count at the

time of entry into care. MSM who reported church attendance were significantly more likely to present with a CD4 count  $< 200$  cells/mm<sup>3</sup> ( $p = 0.013$ ) than MSM who did not. No difference in CD4 count was observed for MSW or WSM when evaluated by report of church attendance. There was a significant interaction between church attendance and sexual behaviour ( $p = 0.012$ ) on history of previous HIV testing. WSM who attended church were more likely to report previous HIV testing ( $p = 0.01$ ). MSM who attended church were less likely to report previous HIV testing (unadj  $p = 0.041$ ) but this difference did not maintain significance in adjusted models.

**Discussion** These findings frame a potentially important interaction between church attendance and sexual behaviour on timing of HIV diagnosis and presentation into care with important implications for individual health outcomes and secondary HIV prevention.

## 012.3 EVALUATION OF A COMMUNITY-BASED HIV PREVENTIVE INTERVENTION FOR FEMALE SEX WORKERS IN RURAL AREAS OF KARNATAKA STATE, SOUTH INDIA

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**Background** To examine changes in behavioural outcomes among rural female sex workers (FSWs) involved in a community-based HIV preventive intervention in south India.

**Methods** 14,284 rural FSWs from 1,253 villages that were selected through a process of rapid rural mapping were reached by community workers (called link workers) and FSW peer educators over a period of three years between 2009 and 2012. A community-based model for delivering outreach, medical and referral services was developed and employed. Socio-demographic profiles of the FSWs and programme outputs were captured using an individualised computerised management information system (CMIS). Changes in behaviour were assessed in an anonymised fashion using two rounds of polling booth surveys (PBS) conducted in 2009 and 2012.

**Results** 91% of FSWs were above the age of 25, and 85% had been involved in sex work for two or more years. During the three-year period, 95% of the mapped FSWs were reached at least once, 80.3% received condoms as per need, and 71% received health services for sexually transmitted infections. In 2012, 45% reported having been tested for HIV infection, at least once in the previous six months. The two rounds of PBS showed significant differences in behavioural outcomes. Condom use increased from 60% to 72%, and condom breakage reduced from 30.2% to 8.4%. Utilization of HIV counseling and testing services increased from 64% to 92.4%, and the proportion of FSWs testing HIV positive declined from 2.3% to 0.17%.

**Conclusions** This community-based model for delivering HIV prevention programmes and services among widely dispersed female sex workers in rural areas was effective. Community-based health workers provided the vital link between marginalised communities in need of services and the formal health system. This model for rural outreach and HIV care could also be applied to many other health problems.

## 012.4 DESIGN AND FEASIBILITY OF YO PUEDO, A COMBINED CONDITIONAL CASH TRANSFER AND LIFE SKILLS SEXUAL HEALTH INTERVENTION FOR ADOLESCENTS IN SAN FRANCISCO, CALIFORNIA: RESULTS OF A RANDOMISED STUDY

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