Parents belonging to the Muslim religion (0.54; CI: 0.37, 0.80) had lower odds of vaccine of HPV vaccine acceptance.

Conclusion The majority of parents of school-going adolescent girls in Mysore found HPV immunisation acceptable. Further research is needed to understand the issues associated with HPV vaccination in different religious groups in India.

019.5 **ASSESSING THE EFFECTIVENESS OF THE HUMAN PAPILLOMAVIRUS (HPV) VACCINATION PROGRAMME IN VICTORIA, AUSTRALIA**

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Background Quadrivalent HPV vaccination has been available in Australia through the National HPV Vaccination Program since 2007. The VACCINE study aims to evaluate the effectiveness of the programme by assessing the prevalence of vaccine targeted HPV genotypes (HPV 6, 11, 16 and 18). We aim to detect any decrease in prevalence of vaccine-targeted HPV genotypes amongst young women in vaccine eligible cohorts and to independently measure vaccine coverage in young Victorian women.

Methods Young Victorian women aged 18–25 are recruited using the social networking site Facebook. Participants complete an online questionnaire and those sexually active are asked to provide a self-collected vaginal swab. Swabs are genotyped using a Linear Array HPV genotyping test (Roche Diagnostics).

Results To date, 623 (of 1570) females have been recruited into the study and 477 participants have completed the study. 71% (440) were sexually active and of these women 373/440 (85%) provided a self-collected swab, of which 75% were negative for HPV. Of the 95 cases positive for HPV, only 6 cases of HPV 16 have been recorded, and no cases of HPV 6, 11 or 18 have been identified. The prevalence of HPV16 (1.6%) is significantly lower than that detected from pre-vaccine age matched Victorian women cervical specimens (9.4%) ($\chi^2_{(1)} = 18.3, p < 0.001$). Based on self-reported vaccination status, 85% of women aged 18–21 years old in our sample have received at least one dose of the HPV vaccine, compared with 83% for women aged 22–25. Cross protection against HPV 31 is also being seen (0.5% versus 5.6%, $\chi^2_{(1)} = 14.2, p < 0.001$).

Conclusions Preliminary data from the VACCINE study suggest a significant decline in the prevalence of vaccine-targeted HPV genotypes. These results support the hypothesis that the HPV vaccine programme is effective in reducing HPV genotypes 6, 11, 16 and 18 amongst populations offered the vaccine.

019.6 **USE OF SURFACTANT VESICLES AS A POTENTIAL GONOCOCCAL VACCINE DELIVERY SYSTEM TO GENERATE ANTIBODY AGAINST NEISSERIAL LIPOOLIGOSACCHARIDE**

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Background To date, no one has been able to exploit the immunological potential of neisserial lipooligosaccharide (LOS) as a vaccine candidate.

Methods We have developed a glycoconjugate vaccine (TRIAD) that contains native LOS derived from *Neisseria gonorrhoeae* F62)

ΔlgtD (a strain that produces lacto-N-neotetraose LOS and a peptide (PADRE) that possesses the ability to bind to a large number of HLA class II molecules, inserted into a surfactant vesicle. TRIAD is a catanionic surfactant vesicle formulation and the resulting vesicle is stable at room temperature for years, unlike a typical liposome. TRIAD is so robust that it can be autoclaved without any appreciable loss of structural integrity.

Results Using TRIAD that contained LOS and PADRE at a ratio of 10:1, and immunising with 2 μg of LOS equivalent, we were able to demonstrate that our vaccine induces a high titer anti-LOS antibody response, with the majority of the elicited antibody being IgG. Intraperitoneal immunisation of mice with our vaccine construct produced no observable adverse effects in mice, while intraperitoneal immunisation with equivalent amounts of purified LOS induced significant adverse effects.

Conclusions Our surfactant vesicle platform possesses all of the advantages seen with traditional liposome formulations, without any of the inherent problems associated with liposome-mediated vaccines. This vaccine platform readily lends itself to further modifications in that it is possible to include additional neisserial proteins into the vaccine via a novel whole cell extraction protocol. We believe that this will allow us to generate a universal vaccine able to protect against all serotypes of *N. meningitidis*.

0.20 - Sexual partnerships and networks

020.1 **TWO-MODE ANALYSIS OF HIV, HCV AND RISK BEHAVIOURS: A PLACE-BASED ANALYSIS OF MOST AT-RISK POPULATIONS IN WINNIPEG, CANADA**

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Background The HIV epidemic has shown a considerable amount of heterogeneity, complicating the design and placement of prevention, intervention and treatment programmes. Place-based analyses providing specific information on pathogen prevalence, risk behaviours and other micro-level behaviours can help to target public health responses.

Methods Data were from a cross-sectional survey of most-at-risk populations (MARPs) from Winnipeg, Canada. Respondents were recruited through respondent-driven sampling, and biological, behavioural and egocentric network data were collected. Respondents named locations where they frequented and where they engaged in risk behaviours, including the use of crack cocaine, injectable and non-injectable drug use, and solvents; and either seeking sex work clients or sex workers. Locations were geo-coded up to Statistics Canada dissemination areas. Two-mode network visualisation and centrality, degree, and betweenness measures were generated using Ucinet (V.6).

Results From a sample size of 600, nine locations were named by 10 or more respondents. The following results pertain only to these nine locations (N: 231). Locations corresponded to three “hot spots” in Winnipeg’s inner and outer core areas. Across the sample, HIV and HCV prevalence was 9.8% and 51.5%, respectively. Prevalence varied considerably by location, ranging from 0% to 15% for HIV and 20% to 70% for HCV. Degree ranged from 0.054 to 0.330, closeness from 0.178 to 0.411 and betweenness from 0.054 to 0.521. No association between prevalence of HIV and HCV and network metrics was found. Substantial heterogeneity in pathogen prevalence and risk behaviour was observed by location, while pathogen, risk and mixing characteristics of populations bridging the nine locations were made apparent by two-mode visualisation.

Conclusion Two-mode analysis of egocentric network data revealed geographic clustering of risk behaviours, while at the same

time demonstrating substantial mixing between high-risk bridge populations. Targeted prevention and intervention efforts can be aided by use of micro-level analyses.

020.2 SOCIAL NETWORKS OF STI PATIENTS HAVE HIGHER STI PREVALENCE THAN SOCIAL NETWORKS OF COMMUNITY CONTROLS

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Background Persons with sexually transmitted infections (STIs), including HIV, are more likely to have sexual partners with STIs. It is not known whether persons with STIs are more likely to have social contacts with STIs. We compared the prevalence of HIV and STIs in the social networks of STI patients to the social networks of community controls.

Methods The study was based at Kamuzu Central Hospital STI Unit from 2010–2012. Three groups of 45 “seeds” were enrolled: HIV-infected STI patients, HIV-uninfected STI patients, and community controls frequency matched on age, gender, and area. Seeds were asked to recruit < 5 “contacts.” HIV prevalence and STI prevalence among contacts were compared between arms using generalised estimating equations accounting for correlation by seed.

Results Mean number of contacts recruited was 1.3 for HIV-infected clinic seeds, 1.8 for HIV-uninfected clinic seeds, and 2.3 for community seeds (N = 243). The majority of contacts (89%) had never been in a sexual relationship with the recruiting seed. HIV prevalence was higher in HIV-infected clinic seeds’ contacts (31%) compared to community seeds’ contacts (11%) (p = 0.009), but not in HIV-uninfected clinic seeds’ contacts (10%) compared to community seeds’ contacts (11%) (p > 0.9). STI syndrome prevalence was higher in both HIV-infected clinic seeds’ contacts (18%) and HIV-uninfected clinic seeds’ contacts (26%) compared to community seeds’ contacts (8%) (p = 0.04). Differences between arms remained significant for both HIV and STI prevalence when analysis was restricted to non-sexual contacts.

Conclusion Seeds with HIV were more likely to have networks with higher HIV prevalence and seeds with STIs were more likely to have networks with higher STI prevalence, even among non-sexual contacts. Research is needed to understand the social and epidemiologic mechanisms underlying these findings. Social contact recruitment at an STI clinic is one promising way of identifying persons in need of HIV and STI services.

020.3 SEX IN SEATTLE: MECHANISTIC MODELING OF SEXUAL PARTNERSHIP DYNAMICS

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Background To devise sexually-transmitted disease (STD) surveillance and intervention strategies based on the importance of individuals or relationships in pathogen diffusion, mechanistic models of sexual partnerships are needed. We modelled heterosexual partnerships, chose functions and estimated parameters by re-analysing information from a 2003–04 random-digit dialling survey among Seattle residents.

Methods We created artificial populations having the joint distributions of age and gender from a recent U.S. census. We used partnership formation rates calculated from the complete histories of male and female survey participants with and without partners to determine stochastically at each time-step who in the population

was eligible to form new partnerships; these were matched according to age preferences from the National Health and Social Life Survey using the algorithm for which Shapley received the 2012 Nobel Prize in Economics. Similarly, we used durations from survival analyses of partnerships formed by survey participants to schedule the dissolution of new and reschedule the dissolution of existing partnerships when concurrent partners would replace existing ones.

Results Most modelled partnerships are short-lived, as are the gaps and overlaps between them. This finding matches those from several published studies. Heterosexual adolescents and young adults form and dissolve concurrent partnerships at approximately 0.1 and 10 times, respectively, the rates at which they form and dissolve exclusive ones. Consequently, concurrent partnerships are ephemeral relative to exclusive ones. We estimate that, by age 45 years, approximately 20% of men and women have had concurrent partners, but at any particular time, most have 0 or 1 partners.

Conclusions Few individuals have multiple partners at any time, but lifetime partner numbers increase with age at gender-specific rates. The risk of infection increases with the number of partners; thus, public health messages that refer to concurrent partners may not adequately address the STD risk associated with lifetime partner numbers.

020.4 DAILY VARIATION IN FEELINGS OF INTIMACY PREDICT INCIDENT STI WITHIN A PROSPECTIVE COHORT OF URBAN ADOLESCENT FEMALES

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Background Previous work has illustrated daily variation in feelings of intimacy, perceptions of partner concurrency (PPC) and STD risk perception (PRSTD), indicating these are dynamic attributes within adolescent romantic relationships. Our objective was to examine whether daily variations in these STI-associated feelings and perceptions predicted incident chlamydia and/or gonorrhoea infection.

Methods A clinic and community venue recruited cohort of females (N = 122), 16–19yrs at baseline, completed daily diaries on feelings and perceptions about each current sex partner on a Smartphone continuously for 18 months. Urine was tested for chlamydia and gonorrhoea quarterly. As means for feelings of trust, closeness and commitment were high in these relationships, data were coded to indicate any decrease in feelings from the previous day. PRSTD and PCC were reverse coded to indicate any increase. GEE was used to account for the correlation among repeated measures within relationships.

Results For each day there was a decrease in trust there was a 52% increase in the odds of being infected with an STI at follow-up [OR: 1.52, 95% CI: 1.20–1.91, p < 0.001]. For each day there was a decrease in closeness the odds of being infected with an STI at follow-up increased by 44% [OR: 1.44, 95% CI: 0.97–2.12, p = 0.067]. Neither an increase in PRSTD or PPC nor decrease in commitment was associated with an STI. An index was created to examine the cumulative effect of variation in feelings and perceptions and found evidence of co-variation. A change in an additional feeling or perception that day increased odds of an STI by 16% [OR: 1.16, 95% CI: 1.02–1.33, p = 0.027].

Conclusions A decrease in feelings of intimacy toward a partner may be a more sensitive indicator of STI risk than PRSTD, PPC or commitment. The next generation of interventions for youth will need strategies to address feelings of intimacy within adolescent romantic relationships.