significant with coverage increase ≥ quartile (Q) 1: OR = 0.85 at Q1, 0.78 at Q2, 0.66 at Q3 and 0.51 at Q4.

Conclusions These findings suggest that increased programme coverage was associated with declining HIV prevalence among FSWs covered by the *Avahan* programme. The triangulation of our results with those from other approaches used in evaluating *Avahan* suggests a major impact of this intervention on the HIV epidemic in southern India.

017.2 HIV PREVENTION AT SCALE: HAS IT WORKED? EVALUATION OF THE IMPACT OF THE AVAHAN PROGRAMME IN SOUTH INDIA

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Background *Avahan*, the India AIDS initiative of the Bill & Melinda Gates Foundation, is the largest targeted HIV preventive intervention in the world. We examine evidence for its overall impact, and estimate HIV infections averted across *Avahan* districts.

Methods A mathematical model of HIV transmission among high-risk groups and the general population was developed. It was parameterised using data from serial cross-sectional surveys (IBBAs) within a Bayesian framework, to reproduce HIV prevalence trends amongst female sex workers (FSWs), their clients, and men who have sex with men (MSM) in 24 South Indian districts. We test whether these prevalence trends are more consistent with self-reported increases in consistent condom use (CCU) following *Avahan,* or a counterfactual assuming CCU increased at slower pre-*Avahan* rates. To assess this we used a Bayes factor, which also measures strength of evidence for the impact estimates. Using regression analysis, the prevention impact in the IBBA districts is extrapolated to all *Avahan* districts.

Results In 13/24 districts, modelling suggests medium to strong evidence for the large self-reported increase in CCU since *Avahan* implementation. Elsewhere evidence is weaker, with CCU generally already high pre-*Avahan*. Approximately 32,700 HIV infections (95% credibility interval 17,900–61,600) were averted over four years in IBBA districts with moderate/strong evidence. Adding districts with weaker evidence increases this to 62,800 (32,000–118,000), and extrapolation suggests that 202,000 (98,300–407,000) infections were averted across all 69 *Avahan* districts in South India, increasing to 606,000 (290,000–1,193,000) over ten years. Over four (ten) years, 42% (57%) of HIV infections were averted.

Conclusion This is the first evaluation of *Avahan* to account for the causal pathway of the intervention, changing risk behaviour in FSWs and MSM to avert HIV infections in these groups and the general population. The findings suggest considerable impact can be achieved from targeted behavioural HIV prevention initiatives.

017.3 DO WE NEED TO VACCINATE MALES AGAINST HPV?

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Background From mid-2007 Australia funded a universal HPV vaccination programme for young females, which achieved high coverage rates. In 2013, Australia has become the first country to extend the HPV vaccination programme to boys aged 12–13 years. A catch-up programme includes boys aged 14–15. The aim of this study was to look at the current and expected impact of the vaccination programme on genital warts in men.

Methods Eight Australian sexual health services provided data on all new patients. We compared trends in proportion of patients diagnosed with genital warts in the pre-vaccination (2004 to mid-2007) and vaccination (mid-2007 to 2011) periods. Furthermore, we used a mathematical model of HPV transmission to predict the impact of male vaccination on the incidence of genital warts.

Results In the pre-vaccination period, there was no change in proportion of men diagnosed with genital warts. In the vaccination period, there were significant declines in proportions of < 21 (81.8%, compared to 92.6% decline in women) and 21–30 year old (51.1%, compared to 72.6% in women) heterosexual men diagnosed with genital warts; from 12.1% in 2007 to 2.2% in 2011 and from 18.2% in 2007 to 8.9% in 2011 respectively. There was no significant decline in diagnosis in men > 30 years of age, or in homosexual or bisexual men. Results of the model are in-line with this decline in men. With the introduction of male vaccination programme, the model predicts a much lower incidence, approaching elimination, in coming decades.

Conclusion Although there has been a decline in the proportion of young heterosexual men diagnosed with genital warts suggesting herd immunity, the decline is slower than that of young females and no decline is observed in homosexual/bisexual men. The male vaccination programme will lead to near elimination of genital warts in both females and males in Australia.

017.4 EVALUATING THE COST EFFECTIVENESS OF TARGETED VACCINATION STRATEGIES TO REDUCE INCIDENCE OF HPV-RELATED CANCER AND OTHER CLINICAL OUTCOMES IN MEN WHO HAVE SEX WITH MEN (MSM) IN BRITISH COLUMBIA, CANADA

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Background Of late, there has been discussion around the potential for vaccinating males in addition to the routine female human papillomavirus (HPV) vaccination programme against cervical cancer. While men who have sex with women (MSW) will likely receive some protection from female vaccination, men who have sex with men (MSM) remain vulnerable. Incidence rates of vaccine preventable cancers are disproportionately represented among MSM.

Methods Based on the natural history of infection progression for HPV subtypes 6, 11, 16 and 18, mathematical transmission dynamics and cost-effectiveness analysis models were developed to assess the prevalence and incidence of these subtypes among the MSM population in the Greater Vancouver Area, British Columbia, Canada. Model parameters, demographic, and epidemiological data were informed from provincial data and the literature.

We simulated three additional vaccination strategies, in combination with the current programme (Grade 6 schoolgirls (with 70% vaccine coverage)): first, vaccination of Grade 6 boys (with 70% vaccine coverage); second, vaccinating 18-year old self-identified MSM (with 25, 50 or 75% vaccine coverage); and finally, vaccinating any MSM within the vaccine-approved age range (with 25, 50 or 75% vaccine coverage).

Results There is significant variability of cost estimates associated with clinical outcomes related to the HPV vaccine-preventable strains in the literature. Our sensitivity analysis indicates that the implementation of any scenario tested is incrementally cost effective, assuming a baseline of the current girls-only immunisation programme. On average, overall incidence of anal, penile, and oropharyngeal cancer cases attributable to vaccine-preventable strains will be reduced by approximately 90%, within 50 years, and given effective prophylaxis and lifelong immunity.

Conclusion All targeted MSM immunisation scenarios tested were cost-effective by averting high costs related to each cancer case avoided and given the relatively low number of vaccine doses required within this population, compared to the male population at large.

017.5 IMPACT OF COMPREHENSIVE HIV/AIDS - YOUTH PEER EDUCATION PROGRAM WITH INTEGRATED 'LIFE SKILLS' AND 'COMMUNITY LINKS' COMPONENTS ON KNOWLEDGE, ATTITUDE AND BEHAVIOUR OF YOUTHS IN 65 SCHOOLS IN 2 DISTRICTS OF KARNATAKA STATE, INDIA

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Background Rapid physical and psychosocial development, wrong information, tendency to experiment and sociocultural sensitivity to discuss issues around sexuality make young people vulnerable to HIV. In 2009, young people aged 15–24 accounted for 41% of new HIV infections in people aged > 15. The objective of this evaluation was to analyse the impact of comprehensive HIV/AIDS Youth Peer Education Program (April 2008-March 2011) on knowledge, attitude and behaviour of targeted youths comparing with those without any such intervention.
Methods As part of evaluation in February–March 2011, a sample of 26 programme schools was chosen (confidence level of 95% and confidence interval of +/- 15%). One non-programme school was selected for every two sample programme schools. The multistage stratified systematic random sampling method was deployed for selection of students and self-administered structured questionnaires were given. Descriptive statistics, graphical representations and cross tabulation of relevant factors were used for data analysis. Also, z and chi - square tests were applied at relevant places.
Results Overall knowledge about HIV/AIDS was found significantly better in schools having peer education mechanism. Awareness on HIV testing centres was more among programme students (92%) in-comparison to non-programme student (62%). Most students from programme schools (99%) indicated positive attitude towards people living with HIV than non-programme students (39%). Adaptations of 'prevention methods' was high in programme students (91%) than in non-programme students (53%). Most of the programme students reported getting influenced to adopt safe sex practises (z-6.062, p-0.0001). Statistically significant no. of parents of programme students reported noticing improvement in inter-personal behaviour of their children (z-8.411, p-0.0001).
Conclusion Comprehensive youth peer education with integrated 'life skills' and 'community links' components can be the strategy for India and many other countries who are struggling for a comprehensive, culturally appropriate, sustainable and cost-effective strategy for adolescent/youth education on HIV/AIDS.

017.6 EXPANDED HIV TESTING PROGRAM IN STD CLINICS FAILS TO IMPACT DIAGNOSIS OF NEW HIV-POSITIVE CASES

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Background The Centers for Disease Control recommends routine HIV testing in clinical settings. The evidence for an increase in HIV diagnoses as a result of these testing programmes is inconclusive. We examined the North Carolina (NC) expanded HIV testing programme's impact on HIV testing and the diagnosis of new HIV-positive cases in sexually-transmitted disease (STD) clinics.
Methods The NC expanded HIV testing programme implemented routine, opt-out HIV testing in STD clinics in November 2007. All persons aged 18–65 who were tested for HIV in NC STD clinics July 2005-June 2011 were analysed. The monthly change in the number of HIV tests performed, number of new HIV-positive cases identified, and HIV positivity proportion per 1000 tests before and after the intervention were evaluated. Interrupted time series analysis with autoregressive components was used to account for underlying temporal trends and autocorrelation.
Results From July 2005-June 2011, 414,612 HIV tests were performed, yielding 1293 new HIV cases (0.3%). Prior to the intervention, the number of HIV tests performed increased by 60 tests per month (rate difference [RD] = 60.4, 95% confidence interval [CI]: 50.6, 70.2). However, after the intervention, the monthly increase in testing slowed to 42 tests per month (RD = 41.7, 95% CI: 36.8, 46.6). After the introduction of the intervention, neither the number of new HIV-positive cases identified nor the HIV positivity per month differed from expected case detection trends without the intervention (number of new HIV-positive cases: RD = –0.11, 95% CI: –0.33, 0.11; HIV positivity per 1000 tests: RD = 0.04, 95% CI:-0.001, 0.073).
Conclusion Despite the introduction of an expanded HIV testing programme in NC STD clinics, no change in HIV testing or HIV case detection was observed. A lack of evidence for programme yield in a clinical setting with high baseline levels of HIV testing questions the intervention's appropriateness.

O.18 - Diagnosis of sexually transmitted infections

018.1 MOLECULAR TECHNIQUES FOR DIFFERENTIATION OF THE *T. PALLIDUM* SUBSPECIES AND SPECIMEN COLLECTION WITH FTA ELUTE CARDS

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Introduction The causative agents of venereal syphilis (*Treponema* subsp. *pallidum*), yaws (subsp. *pertenue*), and bejel (subsp. *endemicum*) are indistinguishable on the basis of morphology, syphilis serology and existing diagnostic PCR. Our objective was to develop a real-time (rt) multiplex PCR assay that can simultaneously detect all three organisms in a single tube. In addition, we evaluated the potential use of FTA Elute cards for collection of skin lesion specimens for molecular testing.
Methods Serial dilutions of purified genomic DNA from *T. pallidum* were spotted onto FTA cards and air dried. Cards were stored at ambient temperature (~23°C) for up to 1 month. DNA was eluted from a 6-mm disc and tested by a *polA* PCR, a rt PCR for macrolide point mutations in the 23S rRNA gene, and the CDC typing method (PCR/RFLP analysis of *tpr* and *arp*). The rt triplex PCR targets the *tp858* and *tp0620* genes and the assay was evaluated using DNA from 25 strains of *T. pallidum*, 14 strains of *T. pertenue,* and 2 strains of *T. endemicum*.
Results The rt triplex PCR distinguished all three subspecies and had an analytical sensitivity of 1–10 genomic copies using purified DNA from *T. pallidum* strain Nichols. The detection limit of *polA* rt PCR was approximately 10–100 genomic copies/6-mm disc. The molecular subtype and azithromycin susceptibility genotype was easily determined using the spiked FTA cards.
Conclusions The rt triplex PCR is a specific and sensitive assay for differentiation of the *T. pallidum* subspecies and should be useful in areas where both syphilis and yaws or bejel are endemic and, in determining the extent of yaws worldwide. The FTA Elute card provides a simple way to collect, store and transport specimens at ambient temperature in the absence of a cold chain and involves minimal sample processing prior to molecular testing.