mid-2000s, but since then, increases have been more modest. These trends coincided with changes in sexual health policy and practise in Britain, resulting in greater STI testing and the use of more sensitive diagnostic tests, making STI surveillance data less indicative of risk behaviour. This paper reviews a range of evidence to examine whether, and if so how, sexual behaviour has changed in Britain since the start of the millennium.

Methods Analyses of routine data (including STI surveillance data, census data), general population surveys (including Natsal, Health Survey for England 2010 (HSE-2010), British Social Attitudes surveys), and community surveys of men-who-have-sex-with-men (MSM, including London's Gay Men's Sexual Health Surveys).

Results Demographic trends support the limited sexual behaviour data collected experimentally by HSE-2010 suggesting that increases in heterosexual risk behaviour observed between 1990 and 2000 have not been sustained since 2000. At the same time, there has been increasing tolerance in Britain of more diverse sexual lifestyles, with public attitudes towards homosexuality increasingly liberal. While the population prevalence of recent same-sex behaviour in 2010 remains around 2–3%, among MSM, the proportion reporting high-risk sexual practises continues to rise, especially among HIV-positive MSM, as evident from increasing HIV incidence and STI outbreaks among this core-group.

Conclusions Increases in sexual risk behaviour among MSM in Britain have clearly been observed since 2000, however, definitive conclusions regarding changes in heterosexual behaviour are limited until methodologically-comparable data are available from Natsal-3. These new data will enable us to better examine hypotheses regarding changes in the British population's sexual behaviour across time and across the life-course.

S11.2 SEX IN THE UNITED STATES IN THE NEW MILLENNIUM: TEMPORAL TRENDS AMONG MEN AND WOMEN AGED 15–44 YEARS

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Background Examining national trends in sexual behaviour can aid in the understanding of STD trends. We examined trends in sexual behaviour, focusing on sub-populations most impacted by STDs in the US.

Methods We used data from the 2002 and 2006–10 National Survey of Family Growth (NSFG), a multi-stage survey nationally representative of men and women aged 15–44 years living in the United States (US). The sample sizes and response rates for the surveys were 12, 571 (79%) in 2002 and 22,682 (77%) in 2006–10. Sexual behaviours included in this analysis were predominantly from audio computer assisted self-interview and were compared by several demographics, separately by sex. Data were weighted to represent the US population and data analyses accounted for the multi-staged sampling procedures used by NSFG.

Results Sexual behaviours with opposite- and same-sex partners were frequently similar in 2002 and 2006–10. Of women who ever had vaginal sex, there was no change in the average number of partners in the past 12 months (1.21 in 2002, 1.11 in 2006–10); however there was a slight decrease over time for Hispanic and black women and a slight increase among women in the non-Hispanic other category. Findings for men were similar except for a slight increase in partners among white men. Overall, HIV-related risk with opposite-sex partners decreased from 2002 to 2006–10. Specifically, exchanging sex for money or drugs significantly decreased among women (2.0% to 0.7%, $p < 0.05$) and men (2.6% to 1.3%, $p < 0.05$). Finally, the average number of male partners decreased among sexually active men who have sex with men (MSM) from 2.9 in 2002 to 2.3 in 2006–10 ($p < 0.05$). Specific HIV risk also declined among MSM.

Conclusion Preliminary findings suggest that behaviours have not changed much during this time; however, we did identify shifts in behaviours among sub-populations.

S11.3 SWITZERLAND: NATIONAL TRENDS IN SEXUAL BEHAVIOUR IN THE CONTEXT OF HIV/STI BEHAVIOURAL SURVEILLANCE 1987–2012

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Background National trends in sexual behaviour have been assessed mainly in the context of the HIV related behavioural surveillance system set up in Switzerland between 1987 and 1992.

Methods Several populations are included in the system. Repeated surveys have been regularly conducted among the general population and youth, men having sex with other men (MSM), injecting drug users (IDU). Data on sexual behaviour are regularly recorded among people living with HIV/Aids (PLWHA) included in the Swiss HIV Cohort.

Results The main trends observed are :

In young adults (aged 18–20):

- a steady increase in the proportion of sexually active at age 17
- a stable median number of partners with a recent increase in the proportion of multipartners;
- a high and stable level of condom use among multipartners.

Among MSM:

- an increase in the number of partners and a steady increase in unprotected anal intercourse since 1997, after a period of decreasing trends.

Among IDU:

- a low and stable use of condoms with stable partners;
- a high and stable use of condoms with occasional and paying partners (only among women) with a possible recent decreasing trend.

Among PLWHA: a high use of condoms with all types of partners with a recent decrease.

Conclusions The behavioural surveillance system in place allowed to assess various trends in sexual behaviour in several populations such as: long term trends regarding sexual debut, stable trends and recent changes regarding different indicators of sexual activity in the general population, IDU and PLWHA, inversion of trends in sexual activity and condom use among MSM.

S.12 - STD vaccines and correlates of immunity

S12.1 HUMAN PAPILLOMAVIRUS VACCINES - CORRELATES OF PROTECTION ARE NOT DEFINED

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Specific types of human papillomavirus (HPV) are causally associated with cervical cancer, with at least 99% of cervical cancers having detectable HPV DNA. Other cancers that also have an association with HPV include anogenital and oropharyngeal malignancies affecting both males and females. Over two thirds of these cancers are associated with HPV types 16 and 18, which are the high-risk types targeted by the HPV vaccines Gardasil and Cervarix. Gardasil also protects from infection with HPV-6 and HPV-11, which cause genital warts and recurrent respiratory papillomatosis. The vaccines are

based on the major capsid protein, L1, which self assembles into virus-like particles. Although HPV L1 is a relatively conserved gene with different HPV types having L1 sequence homology of up to 90%, the vaccine induced protection is HPV type-specific. Both vaccines induce excellent protection against the specific types targeted; however, there is also limited protection from infection with closely related HPV types. The vaccines do not cause regression of established genital lesions: regression is due to cell-mediated immunity. The serological correlates of protection of the vaccines are not defined but it is likely that protection is largely due to neutralising antibodies: animal studies have shown that protection can be transferred by passive immunisation with immune sera. In natural infections, titres of HPV antibodies are much lower than for vaccine induced antibodies, and in fact not all infected people develop detectable antibodies. It is likely that serological correlates of protection will become better defined only if vaccine induced protection starts to wane as the antibody titres potentially drop over time; it may then be possible to define levels of antibody needed for protection. Such information could inform the need for further booster vaccinations.

S12.2 TALES OF WOE: HSV VACCINE AND NULL STUDY RESULTS

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Herpes simplex virus type 2 (HSV-2) infects 530 million people, is the predominant cause of genital ulcer disease, and a key driver of HIV epidemic in subSaharan Africa. In human populations with susceptibility to HSV appears universal. In animal models, several candidate preventative and therapeutic vaccines have been successful only to fail in clinical trials, including recent null results from the prophylactic glycoprotein D2 subunit vaccine trial. However, detailed analyses of the immune suggest assays that antibody response may correlate with protective immune response, providing the first evidence of immune correlate of protection from infection. In addition, recent characterization of CD8 tissue memory cells in genital mucosa suggests that we may also identify immune correlate of HSV-2 control in the infected host. In this Symposium, I will discuss HSV-2 vaccine efforts in the context of our understanding of pathogenesis and epidemiology, as well as the current pipeline of candidate vaccines.

S12.3 UNDERSTANDING HOW BROADLY CROSS-NEUTRALISING ANTIBODIES DEVELOP IN HIV INFECTION - CLUES FOR HIV VACCINE DEVELOPMENT?

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Neutralizing antibodies are likely to play a crucial role in a preventative HIV-1 vaccine. Although efforts to elicit broadly cross-neutralising (BCN) antibodies by vaccination have been unsuccessful, a minority of individuals naturally develops these antibodies after many years. Thus understanding how these antibodies evolve could provide a template for HIV vaccine design. To date we have studied ~80 HIV-infected individuals in the long-term CAPRISA cohort and found that approximately a quarter develop cross-neutralising antibodies by 3 years of infection. Analysis of longitudinal samples showed that breadth developed gradually starting from year 2, with the number of viruses neutralised as well as the antibody titer increasing over time, peaking at 4 years post-infection with little activity thereafter. The extent of cross-neutralising activity correlated with CD4 T cell decline and viral load at 6 months post infection, suggesting that early events set the stage for the development of breadth. Mapping of the epitopes targeted by cross-neutralising antibodies revealed that in most cases they recognised one of the 4 well-defined sites of vulnerability on the HIV envelope. This included the two glycan-dependent epitopes in the V2 and C3 regions of gp120, the CD4 binding site as well as the membrane-proximal external region (MPER). Isolation of monoclonal antibodies from some of these individuals has confirmed the plasma specificities and revealed interesting insights into antibody ontogeny. Furthermore, we have shown how viral escape from earlier strain-specific antibodies contributes to the formation of neutralising antibody epitopes highlighting the dynamic interplay between viral and antibody evolution. Our ongoing work aims to more precisely define the changes in the antibody and viral repertoires that accompany the development of broadly cross-neutralising antibodies with the aim of mimicking these events in a vaccine scenario.

S12.4 CHLAMYDIA TRACHOMATIS

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In vaccine enterprises there are two goals that must be achieved to be successful. Priority is usually given to the vaccine components, which antigen(s) and adjuvants. However an equally important goal is to understand the parameters of protective immunity, or the immunologic goal of vaccination. *Chlamydia trachomatis* infections pose a unique challenge for host immunity. In the majority of infected individuals the invading bacteria replicate only in the epithelial monolayer lining the reproductive tract. The business end (mechanism) of an effective vaccine is likely to be T cells functioning at the epithelial interface. During natural infections individuals' immune responses range from asymptomatic clearance, to asymptomatic infertility, to hospitalisation for PID. Early *Chlamydia* vaccine attempts were associated with enhanced immunopathology. It is possible that *Chlamydia* vaccine candidates will cause enhanced immunopathology, with or without enhanced protection from bacterial replication in the reproductive tract. Evaluation of *Chlamydia* vaccines will need to include their ability to limit bacterial replication and immunopathology. There are some after-the-fact correlates for bad outcomes in women infected with *C. trachomatis* including circulating peripheral mononuclear cells that make too little IFN-γ, too much IL-10 or TNFα when activated by *C. trachomatis* antigens. The *Chlamydia muridarum* mouse model provides an opportunity to define the parameters of protective immunity in the genital tract, and then evaluate/validate them in humans. The mouse model has shown the CD4 T cells are critical to protection and CD8 T cells likely responsible for immunopathology. More recently it was demonstrated that there are redundant mechanisms for clearing *C. muridarum* from the genital tract. This presentation will cover the newest mouse model data, correlating it with what is known in humans. The practicable human correlates of protective immunity and immunopathology are likely to be novel CD4 and CD8 T cell subsets, with antibody possibly falling into disfavour.

S.13 - Challenges to a comprehensive approach to the prevention of HIV and STI among men who have sex with men in Europe (organised by ECDC)

S13.1 CURRENT AND FUTURE CHALLENGES IN GAY MEN'S HEALTH

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Epidemics of HIV in men who have sex with men (MSM) were first recognised in the early 1980s. Since the introduction of antiretroviral treatment (ART) in the mid-1990s incidence of HIV has not, despite