Collaborating Centres
ANNUAL REPORT

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Name of the University, Hospital, Research Institute, Academy or Ministry

London School of Hygiene and Tropical Medicine, LSHTM

Name of the Division, Department, Unit, Section or Area

Department of Clinical Research

City	London	**Reference Number**	UNK-274
Title	WHO Collaborating Centre for Sexually Transmitted Infections, STI		
Report Year	05-2017 to 05-2018		

1. **Please briefly describe the progress made in the implementation of your agreed workplan as WHO collaborating centre during the past 12 months (or the reporting period listed above). Please report on how each workplan activity was implemented, if any outputs have been delivered, if any results have been achieved and if any difficulties have been encountered during this time. If an activity has previously been completed, has not started yet, or been placed on hold, please indicate this.**

The WHO Collaborating Centre for Sexually Transmitted Infections at the London School of Hygiene & Tropical medicine is based in the Clinical Research Department. Staff of the Department who work with WHO on STIs include Professors Rosanna Peeling, David Mabey, Philippe Mayaud and Deborah Watson-Jones; and Drs. Emma Harding-Esch, Kate Gallagher, Helen Kelly, Michael Marks and Joe Tucker. Colleagues in other departments at LSHTM who also work with WHO on STIs include Drs. Suzanna Francis and Fern Terris-Prestholt.

Activity 1

Support the STI POCTs initiative (advise on research/validation, support normative work (guidelines), training on STI POCTs in LMICs.

Description:

- **Update the performance of commercially available POC STI tests**
- **Finalize TPPs and core protocols for evaluation of STI POC tests**
- **Technical advice on the road map for the evaluation and implementation of new STI POC tests**
- **Evaluation network for STI POC tests**
- **Investment cases for POC STI tests**

The ongoing evaluation of STI POCTs is a common priority shared by WHO RHR and the London School. Professors Peeling and Mabey have developed protocols for laboratory and clinic-based evaluation of POCTs for a variety of STIs in the past. In collaboration with Dr Igor Toskin, Prof Peeling has adapted those protocols into 9 core protocols that can be used for the independent clinic-based and clinic-utility validation of STIs POCTs in different populations and in different use case scenarios. Prof Peeling worked with Dr Toskin and other colleagues to finalise the site-specific protocols for independent clinic-based evaluation of dual HIV/syphilis POCT and POCT to detect NG/CT and TV in 12 countries and for the clinic-utility evaluation of

dual HIV/syphilis tests in 5 countries, following feedback from the WHO ERC, and they have now been approved by the ERC.

Prof Peeling conducted a training workshop at the IUSTI meeting in Rio de Janeiro on Good Clinical Practice and Good Clinical Laboratory Practice for members of the POC STI evaluation network. Prof Peeling worked with Drs. Igor Toskin and James Kiari on the road map for the evaluation and implementation of STIs.

Profs Peeling and Mabey worked with Drs. Igor Toskin, Ian Askew and James Kiarie of WHO RHR to edit and publish a supplement of the journal Sexually Transmitted Infections entitled "Advancing point of care diagnostics for STIs", which was published in December 2017. The supplement included 12 papers reviewing the performance of POCTs for syphilis, gonorrhoea, chlamydial infection, *Trichomonas vaginalis*, *Mycoplasma genitalium* and human papillomavirus (HPV). Members of our Collaborating Centre co-authored 9 of these publications:

1. Toskin I, Peeling RW, Mabey D, Holmes K, Ballard R, Kiarie J, Askew I. Point-of-care tests for STIs: the way forward. Sex Transm Infect 2017;93:S1–S2.
2. Toskin I, Murtagh M, Peeling RW, Blondeel K, Cordero J, Kiarie J. Advancing prevention of sexually transmitted infections through point-of-care testing: target product profiles and landscape analysis. Sex Transm Infect 2017;93:S8–S19.
3. Zorzi A, Cordioli M, Gios L, Del Bravo P, Toskin I, Peeling RW, Blondeel K, Cornaglia G, KiarieJ, Ballard R, Mirandola M. Field evaluation of two point-of-care tests for syphilis among men who have sex with men, Verona, Italy. Sex Transm Infect 2017;93:S24-S31.
4. Gaydos CA, Klausner JD, Pai NP, Kelly H, Coltart C, Peeling RW. Rapid and point-of-care tests for the diagnosis of Trichomonas vaginalis in women and men. Sex Transm Infect 2017;93:S32–S36.
5. Guy RJ, Causer LM, Klausner JD, Unemo M, Toskin I, Azzini AM, Peeling RW. Performance and operational characteristics of point-of-care tests for the diagnosis of urogenital gonococcal infections. Sex Transm Infect 2017;93:S43-S48.
6. Toskin I, Blondeel K, Peeling RW, Deal C, Kiarie J. Advancing point of care diagnostics for the control and prevention of STIs: the way forward. Sex Transm Infect 2017;93:S49-S56.
7. Kelly H, Mayaud P, Segondy M, Pai NP, Peeling RW. A systematic review and meta-analysis of studies evaluating the performance of point-of-care tests for human papillomavirus screening. Sex Transm Infect 2017;93:S57–S66.
8. Gliddon HD, Peeling RW, Kamb ML, Toskin I, Wi TE, Taylor MM. A systematic review and meta-analysis of studies evaluating the performance and operational characteristics of dual point-of-care tests for HIV and syphilis. Sex Transm Infect 2017;93:S67–S79.
9. Kelly H, Coltart CEM, Pai NP, Klausner JD, Unemo M, Toskin I, Peeling RW. Systematic reviews of point-of-care tests for the diagnosis of urogenital Chlamydia trachomatis infections. Sex Transm Infect 2017;93:S80–S88.

Members of our centre have evaluated the performance of new POCTs for gonorrhoea and chlamydial infection as well as exploring the attitudes of patients and health care providers towards the use of POCTs and their implementation in health systems.

Although the prevalence of asymptomatic STIs is high, STI-related knowledge and awareness are limited. Together with stigma and ostracism this is a major barrier to strengthening health-seeking behaviours in all countries around the world. Innovations in technology (biotechnology, information technology, m-Health) as well as innovative approaches to delivering essential STI information and services (testing, treatment, communication and counselling aiming to reduce risk taking and to facilitate access to medical services in a timely manner) could help to overcome those barriers.

We have established a new collaboration with the Applied Diagnostic Research and Evaluation Unit (ADREU) led by Dr. Tariq Sadiq at St George's, University London through Dr. Emma Harding-Esch who was programme senior scientist in the group between 2012 to 2017, and who joined our department in 2017. The current work of the collaboration is a project assessing the impact of mass drug administration with azithromycin for trachoma elimination on antimicrobial resistance in STIs in the Solomon Islands (Harrison et al, manuscript submitted to IJE). Whilst at ADREU, together with Dr Sadiq, Dr Harding-Esch worked on many studies exploring novel strategies for STI diagnosis using novel diagnostic technologies and sampling strategies (including internet-based approaches and self-taken samples), some of which have been published in the past year (see below). The collaboration will strengthen the Centre's work for future global health diagnostic programmes, with potential to support diagnostic and impact evaluations.

Additional Publications on POC tests and testing linked to the Centre

In addition to the 9 publications in the *STI Journal* supplement mentioned above, members of our centre and our collaborators also published the following papers on POC tests and testing:

1. Aicken CRH, Sutcliffe LJ, Gibbs J, Tickle LJ, Hone K, Harding-Esch EM, Mercer CH, Sonnenberg P, Sadiq ST, Estcourt CS, Shahmanesh M. Using the eSexual Health Clinic to access chlamydia treatment and care via the internet: a qualitative interview study. Sex Transm Infect. 2018 Jun;94(4):241-247. doi: 10.1136/sextrans-2017-053227.

2. Dassah ET, Adu-Sarkodie Y, Mayaud P. Rollout of rapid point of care tests for antenatal syphilis screening in Ghana: healthcare provider perspectives and experiences. BMC Health Serv Res. 2018 Feb 20;18(1):130. doi: 10.1186/s12913-018-2935-y.

3. Estcourt CS, Gibbs J, Sutcliffe LJ, Gkatzidou V, Tickle L, Hone K, Aicken C, Lowndes CM, Harding-Esch EM, Eaton S, Oakeshott P, Szczepura A, Ashcroft RE, Copas A, Nettleship A, Sadiq ST, Sonnenberg P. The eSexual Health Clinic system for management, prevention, and control of sexually transmitted infections: exploratory studies in people testing for *Chlamydia trachomatis.* Lancet Public Health. 2017 Apr;2(4):e182-e190. doi: 10.1016/S2468-2667(17)30034-8. Epub 2017 Mar 18.

4. Harding-Esch EM, Fuller SS, Christine Chow SL, Nori AV, Harrison MA, Parker M, Piepenburg O, Forrest MS, Brooks DG, Patel R, Hay P, Fearnley N, Pond MJ, Kevin Dunbar J, Butcher PD, Planche T, Lowndes CM, Tariq Sadiq S. Diagnostic accuracy of a prototype rapid chlamydia and gonorrhoea recombinase polymerase amplification assay: a multi-centre cross-sectional pre-clinical evaluation. Clin Microbiol Infect. 2018 Jun 12. pii: S1198-743X(18)30462-2. doi: 10.1016/j.cmi.2018.06.003.

5. Harding-Esch EM, Cousins EC, Chow SC, Phillips LT, Hall CL, Cooper N, Fuller SS, Nori AV, Patel R, Thomas-William S, Whitlock G, Edwards SJE, Green M, Clarkson J, Arlett B, Dunbar JK, Lowndes CM, Sadiq ST. A 30-Min Nucleic Acid Amplification Point-of-Care Test for Genital *Chlamydia trachomatis* Infection in Women: A Prospective, Multi-center Study of Diagnostic Accuracy. EBioMedicine. 2018 Feb;28:120-127. doi: 10.1016/j.ebiom.2017.12.029.

6. Harding-Esch EM, Nori AV, Hegazi A, Pond MJ, Okolo O, Nardone A, Lowndes CM, Hay P, Sadiq ST. Impact of deploying multiple point-of-care tests with a 'sample first' approach on a sexual health clinical care pathway. A service evaluation. Sex Transm Infect. 2017 Sep;93(6):424-429. doi: 10.1136/sextrans-2016-052988.

7. Kerry-Barnard S, Fleming C, Reid F, Phillips R, Drennan VM, Adams EJ, Majewska W, Balendra A, Harding-Esch E, Cousins E, Tariq Sadiq S, Oakeshott P. 'Test n Treat (TnT)'- Rapid testing and same-day, on-site treatment to reduce rates of chlamydia in sexually active further education college students: study protocol for a cluster randomised feasibility trial. Trials. 2018 Jun 5;19(1):311. doi: 10.1186/s13063-018-2674-8.

8. Obiri-Yeboah D, Adu-Sarkodie Y, Djigma F, Hayfron-Benjamin A, Abdul L, Simpore J, Mayaud P. Self-collected vaginal sampling for the detection of genital human papillomavirus (HPV) using careHPV among Ghanaian women. BMC Women's Health. 2017;17(1):86. doi: 10.1186/s12905-017-0448-1.

Activity 2

Title: Assist WHO in activities that aim to improve STI control and prevention in key populations, mainly MSM, as well as to improve SRH services in adolescents.

Description:

- **Research into social entrepreneurship and crowdsourcing approaches to enhance the uptake of STI testing in MSM**
- **Conduct epidemiological studies of HPV and related disease in various population groups**

Social entrepreneurship and crowdsourcing

Prof Peeling and Dr. Joe Tucker have worked on organizational characteristics of HIV/syphilis testing services for men who have sex with men in South China since 2010 using social entrepreneurship and demonstrating that it is a sustainable service model. Dr. Tucker has gone onto crowdsourcing ideas and approaches to enhance the uptake of HIV and syphilis testing in MSM.

Recent Publications on Social entrepreneurship and STI:

1. Ong JJ, Fu H, Smith MK, Tucker JD. Expanding syphilis testing: a scoping review of syphilis testing interventions among key populations. Expert Rev Anti Infect Ther. 2018 May;16(5):423-432. doi: 10.1080/14787210.2018.1463846. Epub 2018 Apr 23

2. Ong JJ, Wu D, Huang W, Fu H, Desmond N, Ma W, Kang D, Liao M, Marley G, Wei C, Tang W, Liu C, Zhang Y, Pan SW, Yang B, Yang L, Huang S, Tucker JD. Pressured HIV testing "in the name of love": a mixed methods analysis of pressured HIV testing among men who have sex with men in China. J Int AIDS Soc. 2018 Mar;21(3):e25098. doi: 10.1002/jia2.25098

3. Tucker JD, Pan SW, Mathews A, Stein G, Bayus B, Rennie S. Ethical Concerns of and Risk Mitigation Strategies for Crowdsourcing Contests and Innovation Challenges: Scoping Review. J Med Internet Res. 2018 Mar 9;20(3):e75. doi: 10.2196/jmir.8226

4. Watson J, Tang W, Pan S, Wu D, Zhao P, Cao B, Liu C, Bien C, Huang W, Luo Z, Tucker JD. Out of the Closet, Into the Clinic: Opportunities for Expanding MSM-Competent Services in China. Sex Transm Dis. 2018 Feb 13. doi: 10.1097/OLQ.0000000000000808. [Epub ahead of print]

5. Cao B, Liu C, Stein G, Tang W, Best J, Zhang Y, Yang B, Huang S, Wei C, Tucker JD.

Faster and Riskier? Online Context of Sex Seeking Among Men Who Have Sex With Men in China. Sex Transm Dis. 2017 Apr;44(4):239-244. doi: 10.1097/OLQ.0000000000000575

6. Pan SW, Stein G, Bayus B, Tang W, Mathews A, Wang C, Wei C, Tucker JD. Systematic review of innovation design contests for health: spurring innovation and mass engagement.
   BMJ Innov. 2017;3:227-237. doi: 10.1136/bmjinnov-2017-000203. Epub 2017 Oct 27.
7. Zhong F, Tang W, Cheng W, Lin P, Wu Q, Cai Y, Tang S, Fan L, Zhao Y, Chen X, Mao J, Meng G, Tucker JD, Xu H. Acceptability and feasibility of a social entrepreneurship testing model to promote HIV self-testing and linkage to care among men who have sex with men.
   HIV Med. 2017 May;18(5):376-382. doi: 10.1111/hiv.12437. Epub 2016 Sep 7.
8. Tang W, Han L, Best J, Zhang Y, Mollan K, Kim J, Liu F, Hudgens M, Bayus B, Terris-Prestholt F, Galler S, Yang L, Peeling R, Volberding P, Ma B, Xu H, Yang B, Huang S, Fenton K, Wei C, Tucker JD. Crowdsourcing HIV Test Promotion Videos: A Noninferiority Randomized Controlled Trial in China. Clin Infect Dis. 2016 Jun 1;62(11):1436-1442. doi: 10.1093/cid/ciw171. Epub 2016 Apr 29.

Epidemiological studies on HPV and related diseases

Profs. Mayaud and Watson-Jones and Drs Kelly and Gallagher have completed studies on the epidemiology and prevention of HPV infection in Tanzania, Ghana, Burkina Faso and South Africa and published their results. The studied populations have included general populations of young women, HIV-negative and HIV-positive women and men.

Publications on HPV in LMICs:

1. Chikandiwa A, Kelly H, Sawadogo B, Ngou J, Pisa PT, Gibson L, Didelot MN, Meda N, Weiss HA, Segondy M, Mayaud P, Delany-Moretlwe S; HARP Study Group. Prevalence, incidence and correlates of low risk HPV infection and anogenital warts in a cohort of women living with HIV in Burkina Faso and South Africa. PLoS One. 2018 May 1;13(5):e0196018. doi: 0.1371/journal.pone.0196018

2. Chikandiwa A, Pisa PT, Chersich MF, Muller EE, Mayaud P, Delany-Moretlwe S. Oropharyngeal HPV infection: prevalence and sampling methods among HIV-infected men in South Africa. Int J STD AIDS. 2018 Jul;29(8):776-780. doi: 10.1177/0956462418755882.

3. Chikandiwa A, Chimoyi L, Pisa PT, Chersich MF, Muller EE, Michelow P, Mayaud P, Delany-Moretlwe S. Prevalence of anogenital HPV infection, related disease and risk factors among HIV-infected men in inner-city Johannesburg, South Africa: baseline findings from a cohort study. BMC Public Health. 2017 Jul 4;17(Suppl 3):425. doi: 10.1186/s12889-017-4354-0.

4. Doutre S, Omar T, Goumbri-Lompo O, Kelly H, Clavero O, Zan S, Chikandiwa A, Sawadogo B, Delany-Moretlwe S, Costes V, Mayaud P, Segondy M; HARP Study Group. Cervical intraepithelial neoplasia (CIN) in African women living with HIV: role and effect of rigorous histopathological review by a panel of pathologists in the HARP study endpoint determination. J Clin Pathol. 2018 Jan;71(1):40-45. doi: 10.1136/jclinpath-2017-204512. Epub 2017

5. Gallagher KE, Erio T, Baisley K, Lees S, Watson-Jones D. The impact of a human papillomavirus (HPV) vaccination campaign on routine primary health service provision and health workers in Tanzania: a controlled before and after study. BMC Health Serv Res. 2018 Mar 12;18(1):173. doi: 10.1186/s12913-018-2976-2.

Kelly H, Faust H, Chikandiwa A, Ngou J, Weiss HA, Segondy M, Dillner J, Delany-Moretlwe S, Mayaud P. Human Papillomavirus Serology Among Women Living With HIV: Type-Specific Seroprevalence, Seroconversion, and Risk of Cervical Reinfection. J Infect Dis. 2018 May 30. doi: 10.1093/infdis/jiy252.

6. Kelly HA, Ngou J, Chikandiwa A, Sawadogo B, Gilham C, Omar T, Lompo O, Doutre S, Meda N, Weiss HA, Delany-Moretlwe S, Segondy M, Mayaud P; HARP Study Group. Associations of Human Papillomavirus (HPV) genotypes with high-grade cervical neoplasia (CIN2+) in a cohort of women living with HIV in Burkina Faso and South Africa. PLoS One. 2017;12(3):e0174117. doi: 10.1371/journal.pone.0174117.

7. Obiri-Yeboah D, Akakpo PK, Mutocheluh M, Adjei-Danso E, Allornuvor G, Amoako-Sakyi D, Adu-Sarkodie Y, Mayaud P. Epidemiology of cervical human papillomavirus (HPV) infection and squamous intraepithelial lesions (SIL) among a cohort of HIV-infected and uninfected Ghanaian women. BMC Cancer. 2017;17(1):688. doi: 10.1186/s12885-017-3682.

8. Obiri-Yeboah D, Adu-Sarkodie Y, Djigma F, Akakpo K, Aniakwa-Bonsu E, Amoako-Sakyi D, Jacques S, Mayaud P. Options in human papillomavirus (HPV) detection for cervical cancer screening: comparison between full genotyping and a rapid qualitative HPV-DNA assay in Ghana. Gynecol Oncol Res Pract. 2017 Mar 3;4:5. doi: 10.1186/s40661-017-0041-1.

9. Segondy M, Ngou J, Kelly H, Omar T, Goumbri-Lompo O, Doutre S, Mayaud P, Didelot MN. Diagnostic value of human papillomavirus (HPV) 16 and HPV18 viral loads for the detection of high-grade cervical intraepithelial neoplasia (CIN2+) in a cohort of African women living with HIV. J Clin Virol. 2018;99-100:79-83. doi: 10.1016/j.jcv.2018.01.006.

Activity 3

Title: Assist WHO in activities that aim to improve women's and children's health particularly in the area of dual elimination of mother to child transmission of HIV and Syphilis (eMTCT) and prevention of cervical cancer.

Description:

- **Update dashboard for eMTCT of HIV and Syphilis**
- **Update toolkit development for eMTCT of HIV and Syphilis**
- **(Point of care activities for eMTCT described in TOR 1 could also be included under this heading)**
- **Evaluate the efficacy of HPV vaccination for the prevention of cervical cancer**
- **Produce systematic reviews, clinical validation studies and health economic evaluations for HPV**
- **Conduct and support evaluation (clinical and health economics) of cervical cancer screening strategies**

Prof Peeling is a member of the WHO/UNAIDS Global Validation Advisory Committee (GVAC) for the dual elimination of the Mother to Child Transmission of HIV and Syphilis. She participated in the review of dossiers submitted to GVAC from countries claiming to have achieved elimination of HIV and Syphilis. She also contributed to the revision of the dual elimination handbook. In particular, she developed diagnostic quality standards that countries need to meet when they submit data to prove that they have achieved elimination. The International Diagnostics centre has created a dashboard to help countries track their progress with dual elimination. Prof Peeling worked with WHO RHR on a systematic review of the accuracy of dual rapid HIV-syphilis syphilis test.

1. Gliddon HD, Peeling RW, Kamb ML, Toskin I, Wi TE, Taylor MM. A systematic review and meta-analysis of studies evaluating the performance and operational characteristics of dual point-of-care tests for HIV and syphilis. Sex Transm Infect. 2017 Jul 26. pii: sextrans-2016-053069. doi: 10.1136/sextrans-2016-053069. [Epub ahead of print] PMID:28747410
2. Taylor MM, Peeling RW, Toskin I, Ghinidelli. Role of dual HIV/syphilis test kits in expanding syphilis screening. Sex Transm Infect. 2017 Aug 4. pii: sextrans-2017-053301. doi: 10.1136/sextrans-2017-053301. PMID: 28778981
3. Peeling RW, Mabey D, Kamb ML, Chen XS, Radolf JD, Benzaken AS. Syphilis. Nat Rev Dis Primers. 2017 Oct 12;3:17073. doi: 10.1038/nrdp.2017.73. PMID: 29022569

Studies on HPV vaccination and the prevention of cervical cancer

Profs Mayaud and Watson-Jones and colleagues published a number of papers on systematic reviews of HPV and HIV, of screening strategies for cervical cancer among women living with HIV, and on strategies for improving the uptake of HPV vaccination in LMICs.

Publications on HPV vaccination

1. Gallagher KE, Howard N, Kabakama S, Mounier-Jack S, Griffiths UK, Feletto M, Burchett HED, LaMontagne DS, Watson-Jones D. Lessons learnt from human papillomavirus (HPV) vaccination in 45 low- and middle-income countries. PLoS One. 2017 Jun 2;12(6):e0177773. doi: 10.1371/journal.pone.0177773.

2. Gallagher KE, LaMontagne DS, Watson-Jones D. Status of HPV vaccine introduction and barriers to country uptake. Vaccine. 2018 Mar 23. pii: S0264-410X(18)30167-1. doi: 10.1016/j.vaccine.2018.02.003. [Epub ahead of print]

3. Gallagher KE, Howard N, Kabakama S, Mounier-Jack S, Burchett HED, LaMontagne DS, Watson-Jones D. Human papillomavirus (HPV) vaccine coverage achievements in low and middle-income countries 2007-2016. Papillomavirus Res. 2017 Dec;4:72-78. doi: 10.1016/j.pvr.2017.09.001. Epub 2017 Oct 3.

4. Howard N, Gallagher KE, Mounier-Jack S, Burchett HED, Kabakama S, LaMontagne DS, Watson-Jones D. What works for human papillomavirus vaccine introduction in low and middle-income countries? Papillomavirus Res. 2017 Dec;4:22-25. doi: 10.1016/j.pvr.2017.06.003.

5. Kelly H, Weiss HA, Benavente Y, de Sanjose S, Mayaud P; ART and HPV Review Group. Association of antiretroviral therapy with high-risk human papillomavirus, cervical intraepithelial

neoplasia, and invasive cervical cancer in women living with HIV: a systematic review and meta-analysis. Lancet HIV. 2018;5(1):e45-e58. doi: 10.1016/S2352-3018(17)30149-2.

6. Looker KJ, Rönn MM, Brock PM, Brisson M, Drolet M, Mayaud P, Boily MC. Evidence of synergistic relationships between HIV and Human Papillomavirus (HPV): systematic reviews and meta-analyses of longitudinal studies of HPV acquisition and clearance by HIV status, and of HIV acquisition by HPV status. J Int AIDS Soc. 2018 Jun;21(6):e25110. doi: 10.1002/jia2.25110.

Profs Watson-Jones and Mayaud have collaborated with WHO and others to produce the following reports:

Publications on STI Epidemiology in LMIC and adolescent SRH

1. Doyle AM, Plummer ML, Weiss HA, Changalucha J, Watson-Jones D, Hayes RJ, Ross DA. Concurrency and other sexual partnership patterns reported in a survey of young people in rural Northern Tanzania. PLoS One. 2017 Aug 24;12(8):e0182567. doi: 10.1371/journal.pone.0182567.

2. Korenromp EL, Mahiané G, Rowley J, Nagelkerke N, Abu-Raddad L, Ndowa F, El-Kettani A, El-Rhilani H, Mayaud P, Chico RM, Pretorius C, Hecht K, Wi T. Estimating prevalence trends in adult gonorrhoea and syphilis in low- and middle-income countries with the Spectrum-STI model: results for Zimbabwe and Morocco from 1995 to 2016. Sex Transm Infect. 2017 Dec;93(8):599-606. doi: 10.1136/sextrans-2016-052953.

3. Mayaud P, McCartney D & Mabey D. Sexually Transmitted Infections. Chapter 7 in: Alan Magill, Edward T. Ryan, David R. Hill, Tom Solomon (eds). *Hunter's Tropical Medicine & Emerging Infectious Diseases*. Ninth edition. Elsevier Saunders. Tenth Edition, 2018.

4. Torrone EA, Morrison CS, Chen PL, Kwok C, Francis SC, Hayes RJ, Looker KJ, McCormack S, McGrath N, van de Wijgert JHHM, Watson-Jones D, Low N, Gottlieb SL; STIMA Working Group. Prevalence of sexually transmitted infections and bacterial vaginosis among women in sub-Saharan Africa: An individual participant data meta-analysis of 18 HIV prevention studies. PLoS Med. 2018 Feb 27;15(2):e1002511. doi: 10.1371/journal.pmed.1002511.

Prof Mayaud also published with colleagues at CDC the chapter on STI in the very influential 3rd Edition of *Disease Control Priorities in Developing Countries (DCP3*). Profs Peeling and Mabey published a chapter in the same edition on syphilis in pregnancy

Publications on health economics of STI control

1. Chesson HW, Mayaud P, Aral SO. Sexually Transmitted Infections: Impact and Cost-Effectiveness of Prevention. Chapter in Holmes KK et al. 3rd Edition of *Disease Control Priorities in Developing Countries (DCP3*), USA 2017.

2. John-Stewart G, Peeling RW, Garcia PJ, Mabey D, Kinuthia J. Effectiveness and Cost-Effectiveness of EMTCT for HIV and Syphilis. Disease Control Priorities (DCP3) Volume 6, Chapter 6.

2. Please briefly describe your collaboration with WHO with regards to the activities of the WHO collaborating centre during the past 12 months (e.g. means of communication, frequency of contact, visits to or from WHO). Please feel free to mention any difficulties encountered (if any) and to provide suggestions for increased or improved communication (if applicable).

Profs Peeling and Mayaud have made frequent visits to WHO in the past year to discuss our collaboration in the field of STI/SRH. Prof Mabey was a member of the committee which agreed the new WHO guidelines for the management of Sexually Transmitted Infections, and of the Scientific and Technical Advisory Group for Reproductive Health and Research until 2017. Prof Peeling is a member of the WHO/UNAIDS Global Validation Advisory Committee (GVAC) for the dual elimination of the Mother to Child. Prof Mayaud is a member of the committee reviewing the burden of STI, of the committee reviewing the management of STIs and Syndromic management guidelines. Prof Mayaud has been asked by Dr James Kiarie (WHO/RRH) to be nominated as STI experts to the International Health Regulations (IHR) Roster of Experts. Dr Harding-Esch is a member of the Public Health Applications of *Chlamydia trachomatis* Serology (PHACTS) group, with WHO leadership from Igor Toskin, which aims to develop Target Product Profiles for new diagnostics. In collaboration with colleagues at LSHTM and Public Health England, she is working on an ECDC-funded systematic literature review of novel testing technologies, strategies and approaches for testing high-risk populations for STIs in the EU/EEA.

3. Please briefly describe any interactions or collaborations with other WHO collaborating centres in the context of the implementation of the above activities (if any). If you are part of a network of WHO collaborating centres, please also mention the name of the network, and describe any involvement in the network during the last 12 months.

Prof Peeling has interacted with WHO regional offices in Europe, Africa, Western Pacific, South East Asia and South America to discuss the evaluation and implementation of improved diagnostic tests for syphilis and other STIs, including Zika virus.

Publications resulting from these collaborations:

1. Mirandola M, Gios L, Sherriff N, Pachankis J, Toskin I, Ferrer L, Dias S, Velicko I, Staneková D, Caplinskas S, Naseva E, Niedźwiedzka-Stadnik M; Sialon II Network. Socio-demographic Characteristics, Sexual and Test-Seeking Behaviours Amongst Men Who have Sex with Both Men and Women: Results from a Bio-behavioural Survey in 13 European Cities. AIDS Behav. 2017 Jun 22. doi: 10.1007/s10461-017-1831-5. [Epub ahead of print] PMID: 28643241

2. Benzaken AS, Sabidó M, Brito I, Bermúdez XPD, Benzaken NS, Galbán E, Peeling RW, Mabey D. HIV and syphilis in the context of community vulnerability among indigenous people in the Brazilian Amazon. Int J Equity Health. 2017 Jun 5;16(1):92. doi: 10.1186/s12939-017-0589-8. PMID: 28583173

3. Unemo M, Bradshaw CS, Hocking JS, de Vries HJC, Francis SC, Mabey D, Marrazzo JM, Sonder GJB, Schwebke JR, Hoornenborg E**,** Peeling RW, Philip SS, Low N, Fairley CK. Sexually transmitted infections: challenges ahead. Lancet Infect Dis. 2017 Aug;17(8):e235-e279. doi: 10.1016/S1473-3099(17)30310-9. Epub 2017 Jul 9. PMID: 28701272 M

Dr Natalie Broutet (WHO RHR) convened two meeting of experts in Geneva to discuss the sexual transmission of zika virus, and to develop research protocols that would lead to a better understanding of this

phenomenon; Prof Mayaud was invited to present at those meetings his work with colleagues from EU funded Horizon 2020 ZIKAlliance.

Publications on sexual transmission of Zika virus

1. Kim CR, Counotte M, Bernstein K, Deal C, Mayaud P, Low N, Broutet N; Investigating the sexual transmission of Zika virus. Transmission of Zika virus Expert Meeting participants. Lancet Glob Health. 2018 Jan;6(1):e24-e25. doi: 10.1016/S2214-109X(17)30419-9.

2. WHO. Sexual transmission of Zika Virus: Current status, challenges and research priorities. WHO: Geneva, Dec 2017. WHO/RHR/17.23.

4. Please briefly describe any type of technical, programmatic, advisory or other support received from WHO during the past 12 months for the implementation of the agreed activities listed above (if any).

Prof Mayaud has received two grants from WHO's recent RFPs, as part of Consortia looking at estimating the burden of non-sexual HSV1-related disease (Project 1 led by University of Bristol – PI: K Looker) and modelling the interactions between HSV-2 and HIV to estimate the burden of HSV2 associated HIV infections to predict the impact of HSV2 vaccines (Project 2 led by Imperial College London - PI: MC Boily). The WHO is seeking to reinvigorate efforts in the research of HSV1 and hsV2 vaccines for global use.

Together with WHO's Dr Sami Gottlieb and others, Prof Mayaud has been involved in a successful bid to BactiVac Consortium for Catalyst projects. This project aims to convene an expert meeting to review the progress towards a gonococcal vaccine.

Prof Mayaud was part of the WHO Expert committee reviewing the guidelines for management of rape in young children and adolescents. A WHO report has been published and academic papers are in preparation for submission.

Prof Peeling worked with the WHO HIV Department on innovations on diagnostic testing and approaches for Hepatitis and HIV with the following publications:

1. Amini A, Varsaneux O, Kelly H, Tang W, Chen W, Boeras DI, Falconer J, Tucker JD, Chou R, Ishizaki A, Easterbrook P, **Peeling RW**. Diagnostic accuracy of tests to detect hepatitis B surface antigen: a systematic review of the literature and meta-analysis. BMC Infect Dis. 2017 Nov 1;17(Suppl 1):698. doi: 10.1186/s12879-017-2772-3. PMID:29143619

2. Tang W, Chen W, Amini A, Boeras D, Falconer J, Kelly H, Peeling R, Varsaneux O, Tucker JD, Easterbrook P. Diagnostic accuracy of tests to detect Hepatitis C antibody: a meta-analysis and review of the literature. BMC Infect Dis. 2017 Nov 1;17(Suppl 1):695. doi: 10.1186/s12879-017-2773-2.

3. **Peeling RW**, Boeras DI, Marinucci F, Easterbrook P. The future of viral hepatitis testing: innovations in testing technologies and approaches. BMC Infect Dis. 2017 Nov 1;17(Suppl 1):699. doi: 10.1186/s12879-017-2775-0. PMID 29143676

4. Easterbrook PJ, Roberts T, Sands A, **Peeling R.** Diagnosis of viral hepatitis. Curr Opin HIV AIDS. 2017 Mar 16. doi: 10.1097/COH.0000000000000370. [Epub ahead of print] PMID: 28306597

5. **Peeling RW**, Ford N. Reprising the role of CD4 cell count in HIV programmes. Lancet HIV. 2017 May 31. pii: S2352-3018(17)30096-6. doi: 10.1016/S2352-3018(17)30096-6. [Epub ahead of print] PMID: 28579226