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Infection in the Netherlands

HIV Monitoring

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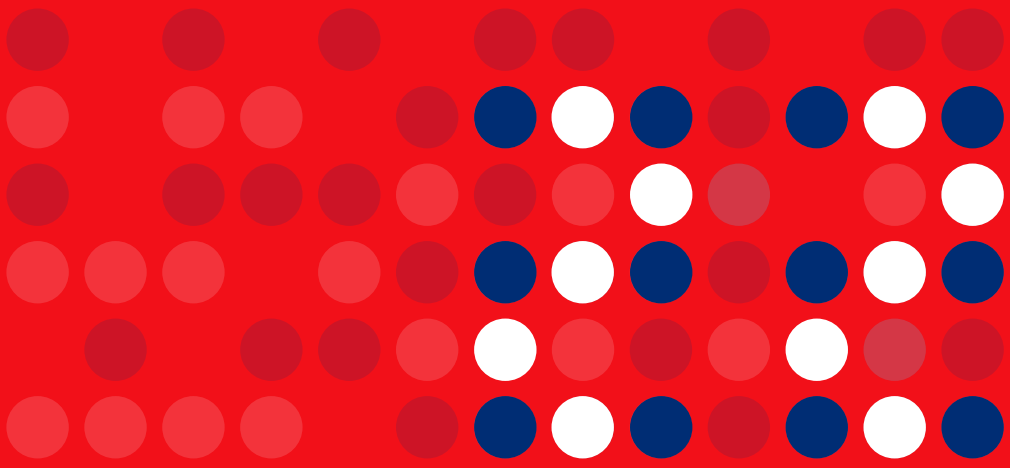
Chapter 8: The Amsterdam Cohort Studies (ACS) on HIV infection: annual report 2021



8. The Amsterdam Cohort Studies (ACS) on HIV Infection: annual report 2021

Amy Matser, Neeltje Kootstra, Lia van der Hoek, Maria Prins, Jeffrey Koole

Introduction

The Amsterdam Cohort Studies (ACS) on HIV infection and AIDS started shortly after the first cases of AIDS were diagnosed in the Netherlands. Since October 1984, men who have sex with men (MSM) have been enrolled in a prospective cohort study. A second cohort involving people who use/used injecting drugs (PWID) was initiated in 1985. In 2021, the cohorts reached 37 years of follow up. The initial aim of the ACS was to investigate the prevalence and incidence of HIV-1 infection and AIDS, the associated risk factors, the natural history and pathogenesis of HIV-1 infection, and the effects of interventions. During the past 37 years, these aims have remained primarily the same, although the emphasis of the studies has changed. Early on, the primary focus was to elucidate the epidemiology of HIV-1 infection, whereas, later, more in-depth studies were performed to investigate the pathogenesis of HIV-1 infection. In the past decade, research on the epidemiology of other blood-borne and sexually-transmitted infections (STIs), and their interaction with HIV, has also become an important component of the ACS research programme.

From the outset, research in the ACS has taken a multidisciplinary approach, integrating epidemiology, social science, virology, immunology, and clinical medicine in one study team. This unique collaboration has been highly productive, significantly contributing to the knowledge and understanding of many different aspects of HIV-1 infection, as well as other infections such as viral hepatitis B and C (HBV and HCV) and human papillomavirus (HPV). This expertise, in turn, has contributed directly to advances in prevention, diagnosis, and management of these infections.

Collaborating institutes and funding

Within the ACS, different institutes collaborate to bring together data and biological sample collections, and to conduct research. These include the:

- **Public Health Service of Amsterdam** (*Gemeentelijke Gezondheidsdienst Amsterdam,* GGD Amsterdam): Department of Infectious Diseases, Research and Prevention;
- **Amsterdam University Medical Centres** (Academic Medical Centre [AMC] site): Departments of Medical Microbiology, Experimental Immunology, and Internal Medicine (Division of Infectious Disease);
- **Emma Kinderziekenhuis** (paediatric HIV treatment centre);
- **Stichting HIV Monitoring** (SHM);
- **MC Jan van Goyen**: Department of Internal Medicine; and
- **HIV Focus Centrum** (DC Klinieken Lairesse).

Sanquin Blood Supply Foundation has also been involved in the ACS from the very beginning; since 2007, it has provided financial support for the biobank of viable peripheral blood mononuclear cells (PBMC) at the AMC's Department of Experimental Immunology. In addition, there are numerous collaborations between the ACS and other research groups, both within and outside the Netherlands. The ACS is financially supported by the Centre for Infectious Disease Control Netherlands of the National Institute for Public Health and the Environment (*Centrum voor Infectieziektenbestrijding-Rijksinstituut voor Volksgezondheid en Milieu,* RIVM-CIb).

Ethics statement

The ACS has been conducted in accordance with the ethical principles set out in the Helsinki declaration. Participation in the ACS is voluntary and written informed consent is obtained from each participant. The most recent version was approved by the AMC medical ethics committee (METC) in 2007 for the MSM cohort, and in 2009 for the PWID cohort. In 2021, amendments – including the updated study protocol – were drafted for submission to the METC.

The ACS in 2021

The cohort of men who have sex with men (MSM)

As of 31 December 2021, 2,913 MSM were included in the ACS. Every three to six months, participants complete a standardised questionnaire designed to obtain data regarding: medical history, sexual behaviour and drug use, underlying psychosocial determinants, health care use, signs of depression and other psychological disorders, demographics.

Moreover, blood is collected for diagnostic tests and storage at the ACS biobank. Of the 2,913 MSM, 608 were HIV-positive at entry into the study and 264 seroconverted for HIV during follow up. In total, the GGD Amsterdam has been visited 64,664 times by MSM since 1984.

Between 1984 and 1985, men who had had sexual contact with a man in the preceding six months were enrolled, independent of their HIV status. From 1985 to 1988, HIV-negative men of all age groups were eligible to participate if they lived in, or around, Amsterdam and had had at least two male sexual partners in the preceding six months. Between 1988 and 1998, the cohort also included MSM with HIV. From 1995 to 2004, only men aged 30 years or younger, with at least one male sexual partner in the previous six months, could be included the study. Since 2005, HIV-negative men of all age groups have been eligible to participate in the ACS if they live in, or are closely connected to, the city of Amsterdam and have had at least one male sexual partner in the preceding six months. In line with the advice issued by the International Scientific Advisory Committee in 2013, the cohort continues to strive to recruit young HIV-negative MSM (aged 30 years or younger).

HIV-seroconverters within the ACS remained in the cohort until 1999, when follow up of a selection of MSM with HIV was transferred to the MC Jan van Goyen. In 2003, the HIV Research in Positive Individuals *(Hiv Onderzoek onder Positieven,* HOP) protocol was initiated. Individuals with a recent HIV infection when entering the study at the GGD Amsterdam, and those who seroconverted for HIV during follow up within the cohort, continue to return for study visits at the GGD Amsterdam, or at an HIV treatment centre. Blood samples from these participants are stored. All behavioural data are collected on a six-monthly basis by questionnaires, coordinated by the GGD Amsterdam, and clinical data are provided by SHM.

In the first half of 2021, data collection was affected by the COVID-19 pandemic, but overall a total of 699 HIV-negative and 52 MSM with HIV were active participants at the GGD Amsterdam in 2021. This is defined as visiting the cohort at least once in 2020 or 2021. All 52 MSM with HIV filled out behavioural questionnaires.

The group had the following characteristics:

- 12 new MSM with a median age at inclusion of 28.3 years (interquartile range [IQR]=26.5-31.0) were enrolled;
- The median age of the total group of MSM in active follow up was 45.1 years (IQR=34.9-52.6) at their last cohort visit;
- The majority were born in the Netherlands and were residents of Amsterdam (83.2% and 88.9%, respectively);
- 77.5% of the participants had a college degree or higher.

The cohort of people who use/used injecting drugs (PWID)

As of 31 December 2016, 1,680 PWID were included in the ACS and contributed 28,194 visits. In 2014, the cohort was closed to new participants. Regular follow up of PWID continued until February 2016. All PWID who had ever participated in the ACS were then invited for an end-of-study interview and follow up was successfully ended in July 2016. Of the 1,680 PWID, 323 were HIV-positive at entry, and 99 seroconverted during follow up. The last HIV seroconversion was seen in 2012. By 31 December 2016, 576 deaths had been confirmed among PWID. The median age of the PWID who visited the ACS in 2016 was 55 (IQR 49-59) years, 8.1% had attained a high level of education, and 63.4% were born in the Netherlands.

ACS biobank

The ACS visits, together with data collected from several subgroup studies and affiliated studies embedded in the ACS, have resulted in a large collection of stored samples. The ACS biobank includes plasma/serum and PBMC samples collected within the context of the ACS cohorts.

The biobank also contains samples collected during the Primo-SHM study: a national, randomised, study that started in 2003. It compares the effects of early, temporary antiviral therapy with that of no therapy among (1) patients who presented with primary HIV-1 infection at the AMC HIV outpatient clinic, and (2) ACS seroconverters. These samples are stored at the Amsterdam University Medical Centres' (AUMC) AMC location. Biological samples are still being collected prospectively for Primo-SHM participants visiting the AUMC's AMC clinic, up until one year after they have recommenced therapy.

The ACS biobank also contains plasma and PBMC samples collected from children with HIV and exposed to HIV, at the Emma Kinderziekenhuis in the AUMC's AMC clinic, before 2008. All stored samples are available for ACS research.

Subgroup studies and affiliated studies

AGE$_h$IV cohort study

The AGE$_h$IV cohort study is a collaboration between the Amsterdam UMC's AMC site Departments of Infectious Diseases and Global Health, the Amsterdam Institute of Global Health and Development, the GGD Amsterdam, and SHM. It was started in October 2010 and aims to assess the prevalence and incidence of a broad range of comorbidities, along with known risk factors for these comorbidities, in individuals with HIV aged 45 years and over. It also strives to determine the extent to which comorbidities, their risk factors and their relation to quality of life, differ between HIV-positive and HIV-negative groups. Participants undergo a comprehensive assessment for comorbidities and complete a questionnaire at intake plus follow-up research questionnaires every subsequent two years.

In total, 598 HIV-1-positive participants and 550 HIV-negative individuals completed a baseline visit between October 2010 and September 2012. People with HIV-1 (PWH) were included through the AUMC AMC site's HIV outpatient clinic, and HIV-negative participants from similar risk groups engaged via the Centre of Sexual Health Amsterdam (CSHA) (486) and the ACS (64). All participants were aged 45 years and over, and were as comparable as possible with respect to age, gender, ethnicity, and risk behaviour. In 2021, the sixth round was started; 59 HIV-negative participants came to the GGD for a sixth visit, which was lower than planned due to the COVID-19 pandemic. The sixth round of the AGE$_h$IV study will be completed in 2023.

In 2020, a two-year COVID-19 sub-study was started in this cohort, with five consecutive 6-monthly visits planned between September 2020 and October 2022. During each visit, participants completed a study questionnaire and provided a blood sample to measure SARS-CoV-2 immune responses. Additionally, in the four to 13 weeks after the last dose of the primary vaccination schedule, participants were invited for an additional blood draw to measure SARS-CoV-2 vaccine immune responses. In total, 567 participants (241 PWH and 326 HIV-negative people) were included in the COVID-19 sub-study, of whom 441 (195 PWH and 246 HIV-negative) participated in the additional post-vaccination blood draw[a].

a *The first manuscript on the cumulative SARS-CoV-2 incidence in this cohort was published in December 2021: https://academic.oup.com/jid/article/225/11/1937/6470931; (Verburgh et al., 2022)*

AMPrEP project in H-TEAM

The Amsterdam pre-exposure prophylaxis (AMPrEP) project was a prospective, longitudinal, open-label demonstration study conducted between 2015 and 2020. The aim was to assess the uptake and acceptability of daily, versus event-driven, pre-exposure prophylaxis (PrEP) among MSM and transgender people (TGP) at increased risk of HIV infection. It formed part of a comprehensive HIV-reduction package offered at a large centre for sexual health.

In total, 374 MSM and two TGP were enrolled between August 2015 and May 2016 at GGD Amsterdam's sexual health centre, including 35 ACS participants who chose to participate in the AMPrEP project. Participants were asked to attend a follow-up visit one month after their PrEP initiation visit, and return every three months thereafter. At every visit, participants filled out questionnaires on risk behaviour, adherence, and general wellbeing, and were screened for STIs and HIV.

AMPrEP follow-up was completed on 1 December 2020. By then, all participants still in care and willing to continue PrEP were included in the national PrEP pilot scheme at a centre for sexual health of their choice.

The AMPrEP project was part of the HIV Transmission Elimination Amsterdam (H-TEAM) initiative, a multidisciplinary and integrative approach to reduce the spread of HIV[b].

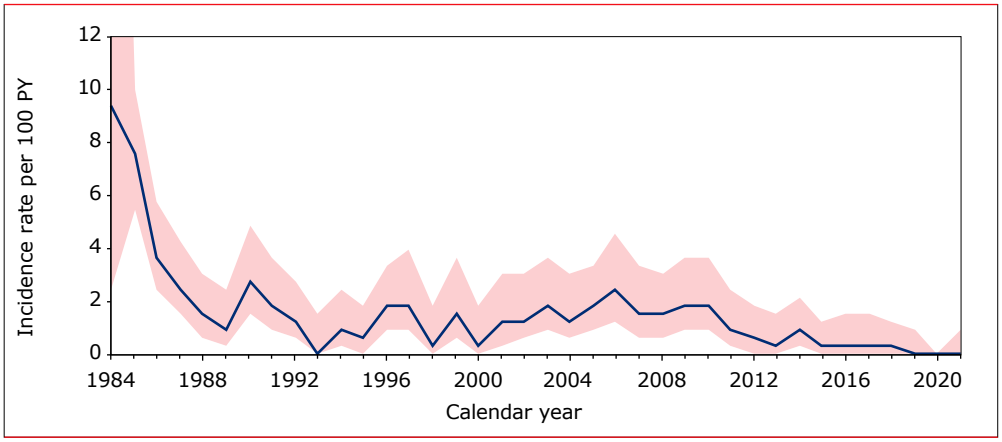
The HIV population

HIV incidence

The observed HIV incidence rate among MSM participating in the ACS has changed over time. Between 1985 and 1993 it declined significantly, then stabilised between 1993 and 1996, before rising in the period 1996 to 2009. Since 2009, the HIV incidence has decreased significantly. In 2021, two MSM participating in the ACS seroconverted for HIV. *Figure 8.1* shows the annually-observed HIV incidence rate for MSM from the start of the ACS through 2021.

b *www.hteam.nl*

Figure 8.1: HIV incidence per calendar year in the Amsterdam Cohort Studies (ACS) among men who have sex with men (MSM), 1984–2021.



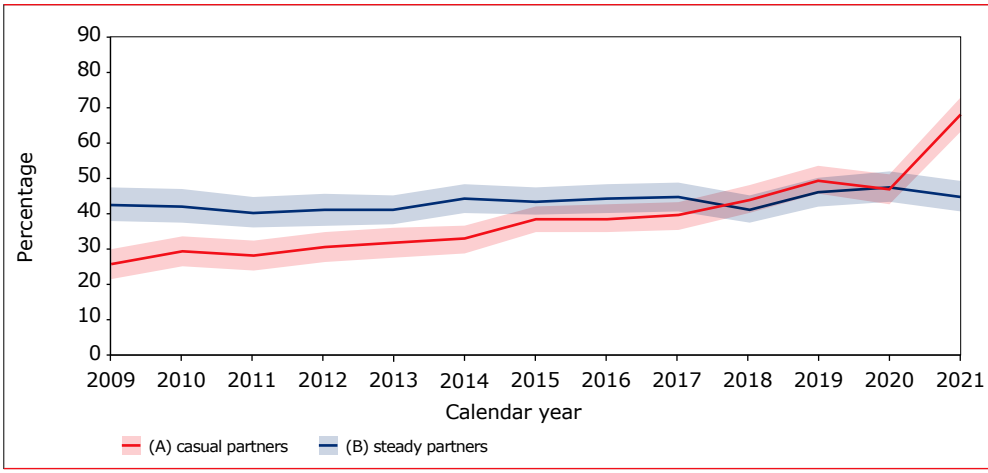
Transmission of therapy-resistant HIV strains

In 2021, there was no surveillance conducted of transmitted, drug-resistant HIV-1 strains.

Risk behaviour of MSM in ACS

Condomless anal sex (CAS) with a steady and casual partner was reported by 179 out of 440 (40.7%) and 183 out of 440 (41.5%) HIV-negative MSM, respectively, during their cohort visit in 2021. Trends in CAS among HIV-negative MSM participating in the ACS continued to show a gradual increase from 2009 onwards (*Figure 8.2*). Use of PrEP has also increased since 2015. In 2021, 322 of the 652 (49.4%) HIV-negative MSM actively participating in the ACS reported PrEP use in the preceding six months. CAS with a steady or casual partner was reported by 134 (41.6%) and 210 (65.2%) PrEP-using MSM, respectively. Among non-PrEP-using MSM, those figures were 119 (36.1%) and 75 (22.7%) respectively.

Figure 8.2: Trend in the proportion of condomless anal sex (CAS) with: (A) casual partners, and (B) steady partners, among HIV-negative men who have sex with men (MSM) in the Amsterdam Cohort Studies (ACS), 2009-21.



STI screening among MSM in ACS

Since October 2008 all MSM participating in the ACS have been routinely screened for bacterial STIs during their cohort visits. This conforms with the standard care offered by the Centre of Sexual Health Amsterdam (CSHA). Chlamydia and gonorrhoea were detected by polymerase chain reaction (PCR) techniques using urine samples and pharyngeal and rectal swabs. Syphilis was detected by Treponema pallidum haemagglutination assay (TPHA).

In 2021, 61 out of 577 (10.1%) MSM in the ACS tested positive for one of the bacterial STIs at least once during a cohort visit. For HIV-negative and HIV-positive MSM, these figures were 51 out of 541 (9.4%), and 10 out of 37 (27.0%), respectively. As the STI testing frequency differs between PrEP-using (quarter-annually) and non-PrEP-using participants (semi-annually), STI incidence rates of these groups cannot be compared and, therefore, are not reported. In general, the incidence rate of a bacterial STI significantly increased in the period 2009 to 2021.

Impact of COVID-19 on ACS

In the beginning of 2021 the COVID-19 pandemic was still ongoing and the ACS study visits continued only for participants who i) had been warned by a partner that they may have contracted an STI, ii) had run out of PrEP pills, or iii) had STD symptoms. In the first quarter, most governmental restrictions to prevent SARS-CoV-2 transmission were lifted. As per 1 April 2021, ACS study visits were scheduled according to the study protocol for all participants.

ACS 2021 research highlights

HIV-1 Nef sequences obtained from PWH show variations and mutations

Nef is a multifunctional viral protein that has the ability to downregulate cell surface molecules, including CD4 and major histocompatibility complex class I (MHC-I) and, as recently shown, also members of the serine incorporator family (SERINC). Natural occurring mutations in HIV-1 Nef may affect its function and as a consequence the clinical course of infection.

HIV-1 Nef sequences were obtained from 123 participants of the ACS and showed multiple amino acid variations and mutations. Most of the primary Nef proteins showed increased activity to counteract SERINC3 and SERINC5, as compared to NL4-3 Nef. Several mutations in Nef were associated with either an increased or decreased infectivity of the virus produced in the presence of SERINC3 or SERINC5. The 8R, 157N and R178G Nef mutations were shown to have an effect on disease progression[c].

Virological and immunological biomarkers among PWH

Incomplete restoration of CD4+ T-cell counts on antiretroviral therapy (ART) is a major predictor of HIV-related morbidity and mortality. To understand the possible mechanisms behind this poor immunological response despite viral suppression, virological and immunological biomarkers were measured among ACS participants with HIV.

Cell-associated HIV-1 unspliced-to-multiply-spliced (US/MS) RNA ratio at 12 weeks of ART positively correlated with markers of CD4+ T-cell activation and apoptosis, and negatively predicted both the absolute and relative CD4+ T-cell counts at 48 and 96 weeks. The fact that a virological biomarker performed better than any immunological biomarker in predicting an immunological outcome highlights the importance of considering the residual HIV activity on ART as a correlate and a possible cause of the residual immune dysfunction that frequently occurs despite virologically suppressive ART[d].

c *Kruize et. al. Viruses. 2021 Mar 6;13(3):423. (Kruize et al., 2021)*

d *Scherpenisse et.al. mBio. 2021 Mar 9;12(2):e00099-21. (Scherpenisse, Kootstra, Bakker, Berkhout & Pasternak, 2021)*

Afucosylated IgG characterises enveloped viral responses and correlates with COVID-19 severity

Immunoglobulin G (IgG) antibodies are crucial for protection against invading pathogens. A highly conserved N-linked glycan within the IgG-Fc tail, which is essential for IgG function, shows variable composition in humans. Afucosylated IgG (approximately 6% of total IgG in humans) are specifically formed against enveloped viruses including HIV-1 and SARS-CoV-2, but generally not against other antigens. Antibody glycosylation plays a critical role in immune responses to enveloped viruses via FcγRIIIa-expressing natural killer (NK) cells, monocytes, and macrophages as well as FcγRIIIb-expressing granulocytes. This may be desirable in some responses, such as against HIV, and can be achieved with available attenuated enveloped viral vaccine shuttles against targets for which vaccine-based approaches have failed. However, this phenomenon can also lead to an undesirable exaggerated response, as is the case for SARS-CoV-2[e].

Harm-reduction programmes for HIV, HCV and HBV among PWID

Major declines in HIV and HCV/HBV incidence among PWID have been attributed to early implementation of harm-reduction programmes (HRP) in the Netherlands. Using ACS data (1985-2014), we included 983 PWID who ever used opioids, had a recent history of injecting drug use (IDU) and tested negative for HIV, HCV or HBV. Intervention arms were: complete HRP participation [≥ 60 mg/day methadone and 100% needle and syringe programme (NSP) coverage, or any methadone dose if no recent injection drug use] versus no HRP and partial HRP participation combined (< 60 methadone mg/day and/or < 100% NSP coverage).

Compared with no/partial HRP participation, complete HRP participation led to lower risk of HIV [HR = 0.54, 95% confidence interval (CI) = 0.27-1.08], HCV (HR = 0.16, 0.06-0.40) and HBV (HR = 0.28, 0.13-0.61) acquisition[f].

Increase in sexualised drug use among HIV-negative MSM

There is a high prevalence of recreational drug use (RDU) among MSM. This study encompassed 976 ACS participants (HIV-negative MSM aged 18 and over) between 2008 and 2018, and evaluated changes in self-reported RDU (during sex: [SDU]) over time. It included the proportion of individuals and number of drugs, adjusted for current age, country of birth and education level.

The proportion of any RDU increased from 67.2% in 2008 to 69.5% in 2018 (aOR = 1.25; 95% CI = 1.03–1.51). Any SDU increased from 53.8% in 2008 to 59.8% in 2013 (aOR = 1.23; 1.07–1.42) and remained stable afterwards. The average number of

e *Larsen et.al. Science. 2021 Feb 26;371(6532):eabc8378. (Larsen et al., 2021)*

f *Van Santen-Addiction-2021 (van Santen et al., 2021)*

drugs used increased for those reporting any RDU and SDU (all P < 0.05). Among those engaging in sex, any SDU was associated with CAS (aOR = 1.36; 1.19–1.55), HIV (aOR = 5.86; 2.39–14.4) and STI (aOR = 2.31; 1.95–2.73).

Among HIV-negative MSM participating in the ACS, recreational drug use, including sexualized drug use, increased between 2008 and 2018. Sexualized drug use was strongly associated with condomless anal sex, HIV and sexually transmitted infections[g].

High carriage of ESBL-producing Enterobacteriaceae associated with sexual activity among men who have sex with men

Extended-spectrum β-lactamase Enterobacteriaceae (ESBL-E) may be sexually transmitted. MSM engage in different sexual behaviour than the general population, and thus may be at risk of ESBL-E carriage. For this study 583 HIV-positive and HIV-negative MSM from the Amsterdam Cohort Study were screened for rectal ESBL-E carriage between April and December 2018. Self-reported (sexual) behaviour and risk factors for antimicrobial resistance were also collected. The proportion of the study population with ESBL-E carriage was compared by number of sexual partners using logistic regression, and across clusters of sexual behaviours with steady and casual partners, separately, using latent class analyses. All results were adjusted for recent use of antibiotics, travel and hospitalisation.

Overall, 16.3% (95% CI 13.4-19.5) of the study population tested positive for ESBL-E. The odds of ESBL-E carriage increased as the number of sexual partners increased [aOR per ln(partner+1), 1.57, 95% CI 1.26-1.94; P<0.001]. There was no association between ESBL-E carriage and sexual behaviour with steady partner(s). Compared with participants in the 'no sex with casual partner(s)' cluster, adjusted odds of being ESBL-E positive were 2.95-fold higher (1.52-5.80) for participants in the 'rimming and frottage' cluster (P=0.001) and 2.28-fold higher (0.98-5.31) for participants in the 'toy use and fisting' cluster (P=0.056).

The prevalence of ESBL-E in MSM is higher compared with the overall Dutch population, which is likely due to sexual transmission with casual partners. This implies that sexually active MSM should be considered a risk group for ESBL-E carriage[h].

g *Coyer-Addiction-2021 (Coyer et al., 2022)*

h *van Bilsen-Int. J. Antimicrob. Agents-2021 (van Bilsen et al., 2021)*

Current and upcoming ACS research projects

Data collected within the ACS are used for multiple research projects at present. HCV-infection incidence and spontaneous-clearance rates, along with associated factors, are in the process of being estimated and identified. Additionally, blood samples of ACS participants, among others, are being analysed for SARS-CoV-2 antibodies to investigate the seroprevalence of SARS-CoV-2 antibodies and their determinants.

With PrEP widely available for eligible individuals since 2019, ACS data is also being used to optimise current PrEP eligibility criteria, uptake, and retention. Previously, trials on prophylactic use of antibiotics (before or after sex) to prevent bacterial STIs have been conducted outside the ACS cohort. At present the option to take antibiotics in this way is not offered in the Netherlands due to insufficient evidence regarding efficacy and safety. Hence this study aims to determine current informal use, intentions, and beliefs regarding prophylactic antibiotics among ACS participants. In particular, trials have found that long-acting oral and injectable PrEP are as safe and effective as the (short-acting oral) PrEP currently available in the Netherlands. Therefore attitudes towards, and intentions to switch to, long-acting PrEP among ACS participants are to be determined. Finally, qualitative research methods in the form of in-depth interviews on PrEP(-use) experience are used to identify missed opportunities, barriers and circumstances of PrEP use and care. These are held with MSM and TGP with HIV, who have a recent HIV-diagnosis from 2019 onwards.

Steering committee

In 2021 the steering committee gathered on five occasions. Seven proposals for use of data and/or samples (serum/PBMC) were submitted to the committee: three from Experimental Immunology (AUMC), three from Medical Microbiology and Infection Prevention (AUMC), and one from the GGD Amsterdam. One of the proposals was a collaboration with a group outside the ACS; RIVM in collaboration with the GGD Amsterdam. The ACS requested major revisions to three of the proposals, after which all requests were approved.

Publications in 2021 that included ACS data

1. Scherpenisse M, Kootstra NA, Bakker M, Berkhout B, Pasternak AO. Cell-Associated HIV-1 Unspliced-to-Multiply-Spliced RNA Ratio at 12 Weeks of ART Predicts Immune Reconstitution on Therapy. mBio. 2021 Mar 9;12(2):e00099-21. doi: 10.1128/mBio.00099-21. PMID: 33688002; PMCID: PMC8092199.
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3. Larsen MD, de Graaf EL, Sonneveld ME, Plomp HR, Nouta J, Hoepel W, Chen HJ, Linty F, Visser R, Brinkhaus M, Šuštić T, de Taeye SW, Bentlage AEH, Toivonen S, Koeleman CAM, Sainio S, Kootstra NA, Brouwer PJM, Geyer CE, Derksen NIL, Wolbink G, de Winther M, Sanders RW, van Gils MJ, de Bruin S, Vlaar APJ; Amsterdam UMC COVID-19; biobank study group, Rispens T, den Dunnen J, Zaaijer HL, Wuhrer M, Ellen van der Schoot C, Vidarsson G. Afucosylated IgG characterizes enveloped viral responses and correlates with COVID-19 severity. Science. 2021 Feb 26;371(6532):eabc8378. doi: 10.1126/science.abc8378. Epub 2020 Dec 23. PMID: 33361116; PMCID: PMC7919849.
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6. Basten M, den Daas C, Heijne JCM, Boyd A, Davidovich U, Rozhnova G, Kretzschmar M, Matser A. The Rhythm of Risk: Sexual Behaviour, PrEP Use and HIV Risk Perception Between 1999 and 2018 Among Men Who Have Sex with Men in Amsterdam, The Netherlands.AIDS Behav. 2021; 2021 Jun;25(6):1800-1809.
7. Caby F, Guiguet M, Weiss L, Winston A, Miro JM, Konopnicki D, Le Moing V, Bonnet F, Reiss P, Mussini C, Poizot-Martin I, Taylor N, Skoutelis A, Meyer L, Goujard C, Bartmeyer B, Boesecke C, Antinori A, Quiros-Roldan E, Wittkop L, Frederiksen C, Castagna A, Thurnheer MC, Svedhem V, Jose S, Costagliola D,

Mary-Krause M, Grabar S; (CD4/CD8 ratio and cancer risk) project Working Group for the Collaboration of Observational HIV Epidemiological Research Europe (COHERE) in EuroCoord. CD4/CD8 Ratio and the Risk of Kaposi Sarcoma or Non-Hodgkin Lymphoma in the Context of Efficiently Treated Human Immunodeficiency Virus (HIV) Infection: A Collaborative Analysis of 20 European Cohort Studies. Clin Infect Dis. 2021 Jul 1;73(1):50-59.

8. Coyer L, Boyd A, Davidovich U, van Bilsen WPH, Prins M, Matser A. Increase in recreational drug use between 2008 and 2018: results from a prospective cohort study among HIV-negative men who have sex with men. Addiction. 2021 Aug 17.
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Maartje Dijkstra – Early diagnosis and immediate treatment of HIV infection. Promotors: prof. dr. M. Prins & prof. dr. J.M. Prins. Co-promotors: dr. G.J. de Bree & prof. dr. M.F. Schim van der Loeff.

Vita Jongen – Studies on HPV and PrEP How People Vaccinate and Practices of responsible and Efficient Prevention. Promotors: prof. dr. M. Prins and prof. dr. M.F. Schim van der Loeff. Co-promotor: dr. E. Hoornenborg

Zita Kruize – HIV-1 infection: A complex interplay between virus and host
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