HIV Monitoring

Annual report 2019

Annual report 2019, approved by the Stichting HIV Monitoring Governing Board on 20 May 2020

We would like to thank Inge Bartels, Daniela Bezemer, Sacha Boucherie, Anders Boyd, Catriona Ester, Annemieke Feyt, Robert Paul Geerling, Mireille Koenen, Amy Matser, Maria Prins, Ard van Sighem, Colette Smit, Yunka de Waart, Ferdinand Wit en Sima Zaheri.

Requests for copies: The annual report is only published online and can be downloaded from our website: www.hiv-monitoring.nl/en. For further information please contact the communications department by email: shm-communicatie@amc.uva.nl or by telephone: +31 20 5664172.

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Foreword

It goes without saying that Stichting HIV Monitoring (SHM) has continued to monitor HIV in the Netherlands in 2019 in accordance with the task it was assigned by the government. Our established collaboration with the 24 HIV treatment centres in the Netherlands enables us to collect and analyse data in relation to the HIV epidemic in the Netherlands and relevant health aspects of people living with HIV, including data on non-communicable comorbidities and viral hepatitis co-infections. With these analyses, we can paint a nationally representative picture of the outcomes of care for people with HIV and its impact on the epidemic in the Netherlands. This provides essential and extremely relevant information for both public health and the quality of the care provided. The 2019 Monitoring Report describes latest analyses and results in detail. It also summarizes main findings, for example the fact that the Netherlands has already exceeded the international 90-90-90 target set by UNAIDS. The latest figures for the Netherlands are 92-93-96.

Thanks to the efforts of the various teams within our organisation, our new data entry system, DataCapTree, reached full maturity in 2019. As we hoped and expected, our data collectors do experience this new system in practice as a more streamlined, decision-supporting and, according to their first impressions, more efficient system to collect information from electronic patient records. 2019 was also marked by further attention for and shaping of the practical implications of the General Data Protection Regulation (GDPR) for how we collect, process and manage medical data of people with HIV in care in the treatment centres.

Looking ahead

For SHM, achieving the 90-90-90 target means, among other things, that when collecting and analysing data, increasing attention will need to be given to gaining a more detailed insight into the characteristics of people who are part of the remaining "10-10-10". Insight into this can offer health care professionals and public health tools to make targeted improvements and innovations in the prevention and care chain. Our experience of the past year has taught us that, in addition to analyses of data at the national level, there is and will be an increasing need for data at the regional level, including at the ASG (Additional Sexual Healthcare) and/or GGD (Municipal Health Service) level and the metropolitan level, as the state of play regarding the extent to which the 90-90-90 targets have been achieved or exceeded may differ substantially between regions, cities or certain groups of people living with HIV.

Contributing to the practical knowledge about the effectiveness of pre-exposure prophylaxis (PreP), SHM also worked closely with care professionals in HIV treatment centres, making use of the knowledge and experience of GGD Amsterdam in the AMPreP study. The aim was to introduce a plan in 2019 to collect structured data on prior PreP use in people in care with a newly

Foreword

diagnosed HIV infection. This included data on potential resistance to antiretrovirals at the time of entering into HIV care.

One antiretroviral treatment option expected to be introduced in the near future is administering injectable antiretroviral medications once every 1-2 months as a replacement for the currently common oral treatment. SHM has, of course, made preparations to contribute to monitoring the effectiveness and safety of the use of this new treatment option in Dutch practice.

Acknowledgements
SHM's important task would not be possible without the dedication of many, working in different positions and disciplines. I want to thank everyone for that, in particular SHM staff, the HIV treatment teams, the members of SHM's management board, the advisory board, the working groups and everyone involved in the ATHENA cohort. Finally, I want to thank all people living with HIV and in care in the Netherlands for making their medical data and blood samples available. It is on this basis that SHM can continue to contribute to the further improvement of HIV care in the Netherlands.

In the meantime, all of us have also been confronted with the SARS-CoV-2 pandemic and the enormous effects it has on our daily lives. Thanks to everyone's efforts, we are very happy to see that all SHM employees, both in Amsterdam and the rest of the Netherlands, have quickly succeeded in continuing their work from home. We are grateful for that, too.

Prof. Peter Reiss, MD
Director
Amsterdam, 20 May 2020

Message from the governing board chair

This year's annual report once again offers an important insight into SHM's activities and the HIV epidemic in the Netherlands. It also reflects the very high quality of HIV care in the Netherlands. Internationally, we are among the frontrunners and have reached UNAIDS' 90-90-90 target. This would not have been possible without the excellent organisation of HIV care in the Netherlands, of which data collection via SHM forms an integral part. The challenges ahead are also carefully mapped out, and this year the analysis team has shifted its emphasis in many cases to make them even more visible.

It is worrying that even in 2019, an unacceptably high percentage of people with a new HIV infection will continue to receive care too late, whereby in addition to heterosexuals, a substantial number of men who have sex with men seem to be less well reached with current testing campaigns. The further increase in the age of people living with HIV in the Netherlands and, as a result, a sharp increase in chronic co-morbidities not related to HIV, also has a significant impact on care in HIV treatment centres.

In 2019, the foundation achieved an important improvement in efficiency with the implementation of DataCapTree, which allows for much more streamlined data collection. This placed high demands on the group of data collectors who had to significantly adjust their working methods.

As chairperson of the board, I am enormously impressed by how all parts of the organisation are continuously pursuing innovation.

Finally, a word of thanks is in order. SHM's valuable work would not be possible without the dedication of many people. That is why I want to thank the employees of SHM, the HIV treatment teams and, of course, the people who live with HIV and are in care, for their contribution. I would also like to thank all members of SHM's governing board for their invaluable input, time and effort.

Marc van der Valk, MD
Chair of the governing board
Amsterdam, 20 May 2020

In this year's report

Stichting HIV Monitoring in 2019

About

STICHTING HIV MONITORING

Stichting HIV Monitoring (SHM), the Dutch HIV monitoring foundation, was founded in 2001 and appointed by the Dutch minister of Health, Welfare and Sport as the executive organisation for the registration and monitoring of HIV-positive individuals in the Netherlands.

SHM contributes to the knowledge of HIV by studying the course of the infection and the effect of its treatment. In the Netherlands, SHM follows the treatment of every registered HIV-positive man, woman and child. In this way SHM is able to comprehensively map the HIV epidemic and HIV treatment outcomes in the Netherlands.

Since its founding, SHM has worked with HIV treatment centres in the Netherlands to develop a framework for systematically collecting HIV patient data for the long-term follow up of all registered individuals. The Netherlands is the only country in the world to have such a framework, which enables healthcare professionals to aspire to the highest standard of HIV care.

Continuous data collection is essential for the work of SHM and is carried out at the designated HIV treatment centres in the Netherlands by either treatment centre staff or by SHM data collectors in cooperation with the responsible HIV physician. Patient data are collected and entered into the registration database in a anonymized form for storage and analysis.

ABOUT STICHTING HIV MONITORING

OUR MISSION

Our mission is to further the knowledge and understanding of all relevant aspects of HIV infection, including comorbidities and co-infections, such as viral hepatitis, in HIV-positive persons in care in the Netherlands.

Objectives

- To monitor and report trends in all aspects of HIV infection by collecting high-quality, nationwide data from HIV-positive persons in care.
- To inform all relevant stakeholders, including healthcare providers, government, researchers, and the community of people living with HIV, about national trends in all aspects of HIV infection, including comorbidities and co-infections (such as viral hepatitis), in HIV-positive persons in care in the Netherlands.
- To develop models that accurately predict future trends in the overall HIV epidemic and in the clinical course of HIV-positive persons in care in the Netherlands.
- To monitor and report on the quality of HIV treatment and care in the Netherlands, thereby contributing to the national HIV quality of care standards and formal certification of HIV treatment centres in the Netherlands.
- To contribute to national and international collaborative scientific research.
- To act as a national knowledge centre for information on trends in all relevant aspects of HIV infection and in the clinical course of HIV-positive persons in care in the Netherlands.

ABOUT STICHTING HIV MONITORING

HIV TREATMENT CENTRES IN 2019

The monitoring of HIV-positive adults is a collaborative effort involving SHM and, in 2019, a total of 24 health institutes that are recognised by the Dutch minister of Health, Welfare and Sport as HIV treatment centres or subcentres. In addition, HIV-positive children and adolescents are monitored in four institutes that are recognised as paediatric HIV treatment centres.

SHM has contracts with each centre or subcentre for the collection of demographic, epidemiological, clinical, virological, immunological, and pharmacological data for HIV-positive individuals who are followed in one of these hospitals.

In addition to its work in the Netherlands, in collaboration with, and upon the request of, the Red Cross Blood Bank in Willemstad, Curaçao, SHM provides assistance in collecting data from HIV-positive persons seen by HIV-treating physicians at the St. Elisabeth Hospital in Curaçao (SEHOS).

24 HIV treatment centres in the Netherlands in 2019

4 paediatric HIV treatment centres

ABOUT STICHTING HIV MONITORING

HIV treatment centres and subcentres in 2019

1	Noordwest Ziekenhuisgroep	Alkmaar
2	Flevoziekenhuis	Almere
3	Amsterdam Universitair Medische Centra, AMC site	Amsterdam
4	Amsterdam Universitair Medische Centra, VUmc site	Amsterdam
5	DC Klinieken Lairesse - Hiv Focus Centrum	Amsterdam
6	OLVG	Amsterdam
7	Medisch Centrum Jan van Goyen (MC Jan van Goyen)	Amsterdam
8	Rijnstate	Arnhem
9	HagaZiekenhuis, locatie Leyweg	Den Haag
10	HMC (Haaglanden Medisch Centrum)	Den Haag
11	Catharina Ziekenhuis	Eindhoven
12	Medisch Spectrum Twente (MST)	Enschede
13	Admiraal De Ruyter Ziekenhuis	Goes
14	Universitair Medisch Centrum Groningen (UMCG)	Groningen
15	Spaarne Gasthuis	Haarlem
16	Medisch Centrum Leeuwarden (MCL)	Leeuwarden
17	Leids Universitair Medisch Centrum (LUMC)	Leiden
18	Maastricht UMC+ (MUMC+)	Maastricht
19	Radboudumc	Nijmegen
20	Erasmus MC	Rotterdam
21	Maasstad Ziekenhuis	Rotterdam
22	ETZ (Elisabeth-TweeSteden Ziekenhuis)	Tilburg
23	Universitair Medisch Centrum Utrecht (UMC Utrecht)	Utrecht
24	Isala	Zwolle

Centres for the treatment and monitoring of paediatric HIV:

A	Emma Kinderziekenhuis (EKZ), Amsterdam UMC	Amsterdam
B	Beatrix Kinderziekenhuis (BKZ), UMCG	Groningen
C	Erasmus MC-Sophia Kinderziekenhuis	Rotterdam
D	Wilhelmina Kinderziekenhuis (WKZ), UMC Utrecht	Utrecht

[Click on the hospital name to visit the hospital's website]

ABOUT STICHTING HIV MONITORING

OUR ORGANISATION

Governance and management

Governing board

Our governing board members represent academic and general hospitals, health insurers, the Duch HIV Association (Hiv Vereniging), the Dutch Association of HIV-Treating Physicians (*Nederlandse Vereniging van HIV Behandelaren*, NVHB), the national organization of Public Health Services (*GGD GHOR Nederland*), and the AMC site of Amsterdam UMC. The governing board convenes twice a year and its duties include broadly determine the policy of the foundation, approving SHM's budget and the content of the annual report. Board members receive no remuneration for this work.

Governing board members in 2019

Name	Position	Representing	Affiliation
Dr M. van der Valk	Chair	NVHB	Amsterdam UMC, AMC site, Amsterdam
Dr Y.T.H.P. van Duijnhoven	Secretary	GGD GHOR Nederland	GGD Amsterdam, Amsterdam
P.W.D. Venhoeven MSc	Treasurer		Alexander Monro Ziekenhuis, Bilthoven
P. Brokx	Member	Hiv Vereniging	Hiv Vereniging, Amsterdam
J. Crasborn MSc	Member	Zorgverzekeraars Nederland	Achmea, Zeist
P.E. van der Meer MSc (until October 2019)	Member	Nederlandse Vereniging van Ziekenhuizen (NVZ)	Albert Schweizer Ziekenhuis, Dordrecht
Prof. K.J. Jager	Member	Amsterdam UMC, AMC site	Amsterdam UMC, AMC site, Amsterdam
J.J. Schoo MSc (as of October 2019)	Member	NVZ	Rijnstate, Arnhem
Prof. M.M.E. Schneider	Member	Nederlandse Federatie Universitair Medische Centra (NFU)	UMC Utrecht, Utrecht

ABOUT STICHTING HIV MONITORING

Advisory board

A scientific advisory board has been established by the governing board to provide the governing board members and SHM's director with strategic advice regarding the registration and monitoring of data from HIV-positive individuals in care in the Netherlands and the use of these data in research. The advisory board comprises national and international experts from the field, as well as a representative of the *Hiv Vereniging*. The advisory board convenes once a year.

Advisory board members in 2019

Name	Affiliation
Prof. D. Kuritzkes (Chair)	Brigham and Women's Hospital, Boston, USA
Dr J. Arends	UMC Utrecht, Utrecht, the Netherlands
Prof. M. Egger (until 12 November 2019)	University of Bern, Bern, Switzerland
Prof. T.B.H. Geijtenbeek	Amsterdam UMC, AMC site, Amsterdam, the Netherlands
Prof. B. Ledergerber	University Hospital Zurich, Zurich, Switzerland
Prof. C. Sabin	University College, Londen, UK
P.J. Smit (until 24 April 2019)	Hiv Vereniging, Amsterdam, the Netherlands
R. Finkenflügel MSc (as of 24 April 2019)	Hiv Vereniging, Amsterdam, the Netherlands

ABOUT STICHTING HIV MONITORING

Working groups

SHM has two working groups that advise the director on executive matters regarding research proposals involving data stored in our national HIV database:

- The SHM working group reviews general scientific research proposals.
- The hepatitis working group works together with the NVHB and assesses scientific research proposals that relate specifically to HIV/hepatitis co-infection.

SHM working group members in 2019

Name	Affiliation
Dr E.H. Gisolf (Coordinator)	Rijnstate, Arnhem

SHM working group reviewers in 2019

Name	Affiliation
Dr J. Arends	UMC Utrecht, Utrecht
Dr W.F.W. Bierman	UMCG, Groningen
Prof. C.A.B. Boucher	Erasmus MC, Rotterdam
Prof. K. Brinkman	OLVG, Amsterdam
Prof. D.M. Burger	Radboudumc, Nijmegen
Prof. R. van Crevel	Radboudumc, Nijmegen
Dr S.P.M. Geelen	UMC Utrecht-WKZ, Utrecht
Dr G. Hermanides	Rode Kruis Ziekenhuis, Beverwijk
Prof. A.I.M. Hoepelman	UMC Utrecht, Utrecht
Dr S. Jurriaans	Amsterdam UMC, AMC locatie, Amsterdam
Dr F.C.M. van Leth	KNCV Tuberculosefonds, Den Haag; AIGHD Amsterdam
Dr C. van Nieuwkoop	HagaZiekenhuis, Den Haag
Prof. J.M. Prins	Amsterdam UMC, AMC locatie, Amsterdam
Dr B. Rijnders	Erasmus MC, Rotterdam
Dr C. Rokx	Erasmus MC, Rotterdam
Prof. A.M.C. van Rossum	Eramus MC-Sophie Kinderziekenhuis, Rotterdam
Dr R. Schuurman	UMC Utrecht, Utrecht
Dr K. Sigaloff	Amsterdam UMC, VUmc locatie, Amsterdam
Dr J. Schouten	Rijnstate, Arnhem
Dr M. van der Valk	Amsterdam UMC, AMC locatie, Amsterdam

Hepatitis working group in 2019

Name	Affiliation
Dr J. Arends (Chair)	UMC Utrecht, Utrecht
Prof. K. Brinkman	OLVG, Amsterdam
Prof. A.I.M. Hoepelman	UMC Utrecht, Utrecht
Dr J. van der Meer	Amsterdam UMC, AMC locatie, Amsterdam
Dr. B. Rijnders	Erasmus MC, Rotterdam
Dr J. Schinkel	Amsterdam UMC, AMC locatie, Amsterdam
Dr E.F. Schippers	HagaZiekenhuis, Den Haag
Dr C. Smit	SHM, Amsterdam
Dr M. van der Valk	Amsterdam UMC, AMC locatie, Amsterdam
Dr T.E.M.S. de Vries-Sluys	Erasmus MC, Rotterdam

ABOUT STICHTING HIV MONITORING

Management team

Our management team (MT) consists of the director (chair), the deputy director, the communications manager, and a senior researcher representing the data analysis, reporting & research unit. The MT implements SHM's strategic objectives by common agreement and is responsible for the day-to-day implementation of this strategy. The MT convenes once a week and is advised by the organisation's financial controller and human resources (HR) advisor.

Management team members

Name	Position
P. Reiss	Director
S. Zaheri	Deputy director
A.I. van Sighem	Senior researcher
C.J. Ester	Communications manager

Director

SHM's director is appointed by, and reports to, the governing board. He is responsible for day-to-day operations and is primarily responsible for representing the organization externally. He also manages the data analsyis, reporting & research unit.

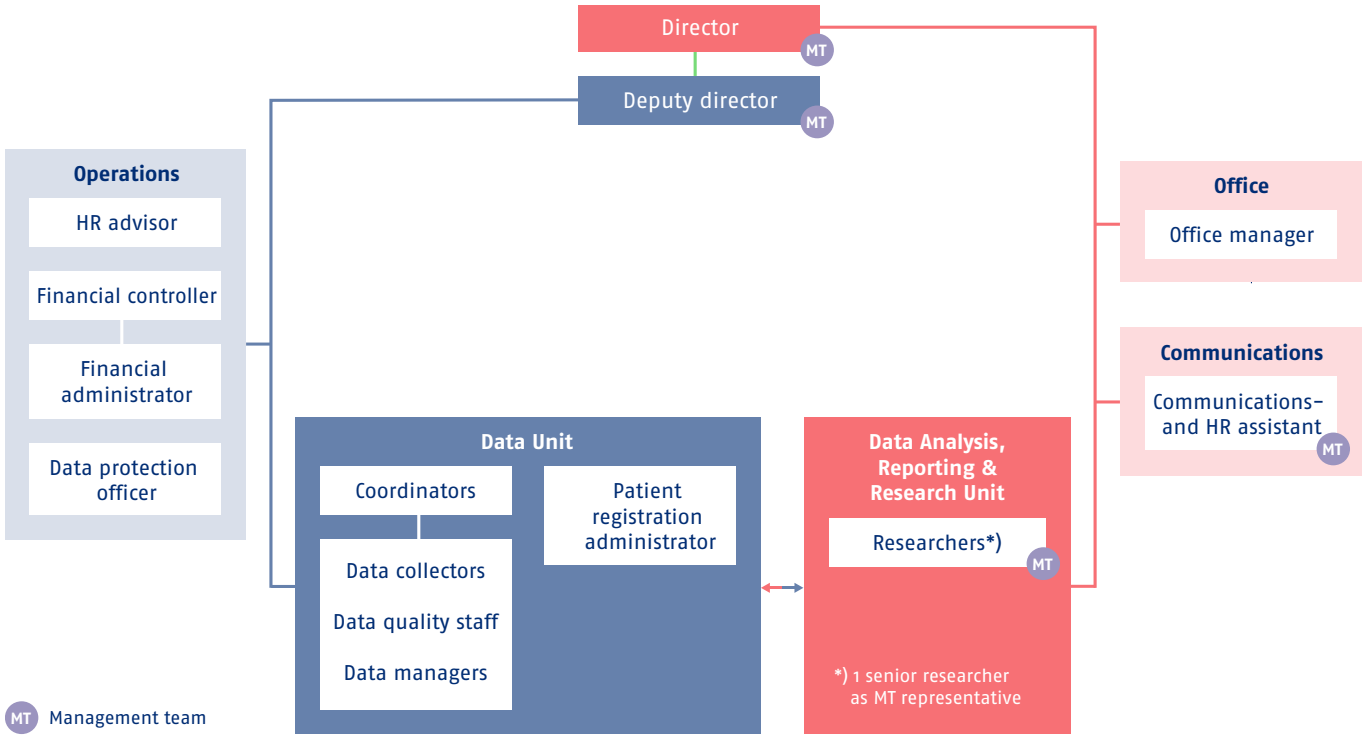
Deputy director

On behalf of the director, the deputy director oversees:

- Policy implementation within the data unit, HR and finance,
- Organizational and data security,
- Various essential processes, such as accommodation and office automation.

ABOUT STICHTING HIV MONITORING

Stichting HIV Monitoring organisational chart.



ABOUT STICHTING HIV MONITORING

Business units and support

We have two main business units that carry out our primary activities:

- data unit,
- data analysis, reporting & research unit.

Data unit

The data unit is led by the deputy director and comprises the following three departments: patient registration & data collection; quality control, helpdesk & protocal management; and data management.

The data unit carries out the following five core activities:

- *Patient registration*: This involves the registration and de-registration of HIV-positive individuals. This administration system is used to assign a pseudonymised code to each registered individual.
- *Data collection and data entry*: This involves the collection of data from all HIV-positive individuals followed in one of the HIV treatment centres in the Netherlands.
- *Quality control*: This activity is carried out by data quality staff (data monitors) to safeguard th validity and reliability of the collected data entered into SHM's database.
- *Helpdesk and protocal management*: This involves keeping protocols up to date, and drafting regular helpdesk products such as mailings, protocol updates and FAQ sheets.
- *Data management*: This core activity is carried out by data managers and involves checking, cleaning, standardising, combining and documenting data.

Data analysis, reporting & research unit

The data analysis, reporting & research unit is led by our director and is staffed by researchers in the fields of epidemiology, (HIV) medicine, statistics, mathematical modelling of HIV and modelling of transmission networks. Together, these researchers implement the HIV monitoring programme, the results of which are presented in our annual Monitoring Report. The researchers also contribute to publications involving analyses of SHM's data in peer-reviewed national and international scientific journals.

In addition, the data analysis, reporting & research unit supports and collaborates with researchers in the national HIV treatment centres. The unit also collaborates with international research groups involved in comparable observational cohorts in the field of HIV epidemiology and treatment. Our researchers contribute to these collaborations by setting up and carrying out scientific research.

Support/ supporting departments

The primary activities of our management team are supported by the communications, HR, office and finance staff. The communications manager and office manager report to the director, while the finance and HR staff report to the deputy director.

Communications department

The communications department, led by the communications manager, actively disseminates data-supported information about the HIV epidemic in the Netherlands and provides updates about our activities through a variety of communication channels. The communications manager is also responsible for the annual reporting process, in close collaboration with our director and researches.

Human Resources

The HR advisor is responsible for the implementation of SHM's HR policy and is supported by the communications and HR employee. Attention is also given to the sustainable employability of the employees. The HR advisor and prevention officer inform employees formally and informally about topics such as healthy living, including encouraging lunch-break walks, ergonomics and psychosocial workload. Employees aged 45 and older are also given the opportunity to follow a 45+ Development Advice coaching programme during working hours.

ABOUT STICHTING HIV MONITORING

Personnel policy

We want to maintain our focus on sustainable employability in 2020 as well. We plan to do so by conducting an independent Well-being Survey and stimulating lifelong learning by continuing to invest in education, training and learning in the workplace, externally, internally and on the job. Work-related stress and work-life balance will have to remain/ must continue to be a structural topic of discussion between managers and employees. SHM also noticed shortages on the labour market in 2019. We will draw up a clear labour market profile in 2020 that will enable us to attract qualified employees more quickly.

The personnel organisation in 2019

SHM's staffed formation in 2019 averaged 35.15 FTE in total. On 31-12-2019 we had 46 employees, of which 9 men and 37 women, with an average employment of 30.4 hours per week. In the course of the year, six new employees joined in a variety of positions and five left SHM's employment. Three employees moved to another position at their request. In 2019, we deployed an intern for the 'Hybrid data collection' project. We opted for an interim solution during two months for the vacant position of Financial Controller.

New employees are recruited through our network or via specialised recruitment websites. An extensive onboarding programme is drawn up for them. We aim for as much diversity in our workforce as possible.

SHM's terms of employment are not subject to a collective labour agreement. The employment conditions regulations are included in the SHM Personnel Manual, which sets out the rights and obligations between SHM and its employees, including an extensive code of conduct. The regulations follow relevant legislative changes, and are, therefore, adjusted and communicated to employees at least once a year.

ABOUT STICHTING HIV MONITORING

Staffing in 2019

SHM's staffed formation in 2019 averaged 35.15 FTE in total. SHM finances 7.46 FTE to data collectors who are employed in HIV treatment centres and who are not employed by SHM.

SHM personnel in 2019*

Director
Prof. P. Reiss MD, PhD

Deputy director
S. Zaheri MSc

Data analysis, reporting & research unit

Researchers
D.O. Bezemer PhD
A.C. Boyd PhD
A.I. van Sighem PhD
C. Smit PhD
F.W.N.M. Wit MD PhD

Data unit

Data management
M.M.J. Hillebregt MSc (department coordinator)
A.S. de Jong MSc
T.J. Woudstra

Helpdesk staff
F. Paling MSc

Data quality staff
D. Bergsma MSc (department coordinator)
S. Grivell MSc
K.J. Lelivelt MSc
R. Meijering MSc
T. Rutkens
L. van de Sande MA
A. Scheijgrond MSc
S.T. van der Vliet

Data protection officer
M.M.B. Tuk-Stuster
J.P.A. Feijt

Patient registration & data collection
L.G.M. de Groot-Berndsen (department coordinator)
M.M.B. Tuk-Stuster (patient registration administrator & quality management coordinator)

Data collectors
M. van den Akker
Y.M. Bakker
M. Bezemer-Goedhart
N.M. Brétin
A. El Berkaoui
E.A. Djoechro MSc
J. Geerlings
M. Groters MSc
R. Regtop
E.I. Kruijne
C.R.E. Lodewijk
E.G.A. Lucas
R. van der Meer MA
L. Munjishvili MA
F. Paling MSc
B.M. Peeck MSc
C.M.J. Ree
Y.M.C. Ruijs-Tiggelman
P.P. Schnörr MSc
M.J.C. Schoorl MSc
E.M. Tuijn-de Bruin
D.P. Veenenberg-Benschop
K.M. Visser MSc
E.C.M. Witte

Communications

C.J. Ester PhD (communications manager)
Y. de Waart (communications and HR assistent)

Human resources, finance & office

I. Bartels (HR advisor)
A.J.P.M. van der Doelen (financial controller)
R.P. Geerling (Qualified Controller)
H.J.M. van Noort MSc (financial administrator)
M.M.T. Koenen (office manager)

**For the most recent overview of SHM personnel, please visit our website.*

Data & quality control in 2019

BACKGROUND

Our data unit carries out five main activities:

- patient registration,
- data collection and data entry,
- quality control,
- helpdesk and change requests,
- data management and reporting.

In addition to the above-mentioned core activities (discussed later in this chapter), the data unit is responsible for various projects designed to further improve both data quality and process efficiency. In 2019, priority was given to the following projects:

- **Continued development of the data entry system:** This project aimed to optimise and further develop SHM's new data entry system, DataCapTree. The aims were to:
- make manual data entry as efficient as possible;
- standardise and optimise data collection and data quality monitoring;
- expand data collection in the context of a pilot registration and monitoring of treatment of hepatitis C mono-infections with combinations of DAA, direct acting antivirals.
- **LabLink:** The The aim of this project is to expand hospital use of the automated link that allows laboratory data from hospital computer systems to be entered directly into the SHM database in a pseudonymised form.
- **DataLink:** This project aims to investigate the possibility of digitally sending clinical data to SHM that is currently collected manually from the HIV treatment centres.
- **Centralisation of data collection:** This project strives, where possible, to further centralise the collection of data by specially-trained staff employed by SHM.
- **Knowledge management:** This ongoing project aims to train and coach data collectors, data quality staff (data monitors) and data managers.

PROGRESS IN 2019

Further development DataCapTree

By 2018, the majority of data collection protocols had become available for data entry. In 2019, work on designing missing protocols and making them available for data entry continued. A total of 16 new protocols had become available in 2019, the last one as of 26 June. Several protocols have become available in the process, for data that had not previously been collected and which the stakeholders considered important.

DATA & QUALITY CONTROL IN 2019

In addition, much attention has been given to setting up a module for data verification in DataCapTree, used by SMH data teams when performing data quality checks. Data quality control records were previously stored in a separate database in Microsoft Access. In order to reduce the administrative burden, we decided to fully integrate the administration into DataCapTree. To this end, we adapted and redesigned all protocols in DataCapTree in 2019.

As part of the pilot registration and monitoring of hepatitis C mono-infections, in 2018, data was collected from 20 patients in the SHM protocols that were used for data collection in HIV and hepatitis C co-infections. This data was shared with the stakeholders of the pilot registration and discussed in terms of content, for evaluation purposes. Based on this evaluation, stakeholders have proposed changes regarding the data input protocols. The changes would reduce the input burden and improve data quality. In 2019, a total of 26 protocols were adapted on this basis and made suitable for entering data from patients with hepatitis C mono-infection.

In 2019, we also focused on making functionalities in DataCapTree generic to make desired adaptations and maintenance of protocols more efficient in the future.

We also worked on a new functionality in DataCapTree in 2019, which automatically checks for deviating values in the entered data and plans a verification task for the data collector. The data collector can then adjust the value or confirm that the deviating value is correct. This functionality is set up generically and can be added to all data collection protocols.

LabLink

The interface implemented at an HIV treatment centre that allows laboratory data to be collected electronically wherever possible and entered directly into our data warehouse is known as LabLink. LabLink forms part of our innovation programme to automate data collection as much as possible and, as such, minimise manual data collection.

Using LabLink, HIV-related laboratory data are selected from hospital information systems and sent to SHM in a pseudonymised form. These data are then transferred to SHM's data warehouse by the AMC's IT service (ADICT). In 2012, in collaboration with the AMC's Clinical Research Unit (CRU) and ADICT, a standard LabLink protocol was developed for sending laboratory results as HL7 messages (an international standard for electronic data exchange between healthcare information systems). All HIV treatment centres where LabLink is active send data to SHM according to this standard.

DATA & QUALITY CONTROL IN 2019

LabLink delivers lab results from **72%** of people followed by SHM

For the pseudonymisation of LabLink data, each hospital maintains a LabLink-specific overview of those individuals who are in care, have left care or have objected to their data being collected. Laboratory results are only collected for those individuals who are in care and who have not lodged an objection to data collection. For each laboratory result, the following data are required:

- pseudonym,
- date of sample collection,
- test carried out,
- result,
- unit,
- material code,
- assay code,
- normal values.

Expansion of LabLink in 2019

HIV treatment centres where LabLink was not yet available or where all desired laboratory results were not yet sent via LabLink, were actively approached to implement LabLink in 2019. This was not possible for all centres in 2019, but in the Isala hospital in Zwolle, all lab data will be sent via LabLink as of 1 March 2020. In addition, preparations in Leeuwarden Medical Center, Radboudumc in Nijmegen and Hagaziekenhuis, Leyweg location and Haaglanden Westeinde Medical Center, both in The Hague, have progressed to the extent that an implementation of LabLink will also be realised here in 2020. The other remaining HIV treatment centres are also investigating whether a LabLink connection is possible in 2020.

In total, 17 HIV treatment centres and sub-centres now use LabLink and, together, deliver electronic laboratory results from 72% of the individuals followed by SHM. Finally, in 2019, the AMC site of Amsterdam UMC continued to transfer results directly to SHM from its laboratory computer system using an internal LabLink connection made possible because SHM uses the AMC IT network.

Harmonisation of LabLink data

In 2012, the CRU developed a LabLink 'mapping tool' in Microsoft Access. This tool receives and standardises ('harmonises') laboratory results from different treatment centres with different terminology. In 2019 1,878 unique laboratory terms were translated to the SHM standard.

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LabLink status in HIV treatment centres.

- *Hospitals that transmit laboratory data through LabLink or other automated link.*
- *Hospitals that are in the process of implementing LabLink.*
- *Hospitals that are awaiting decision on whether to implement LabLink or that have postponed LabLink due to other ongoing projects.*

Numbers on map correspond to treatment centre list on page 11.

DataLink

Within this project, SHM will investigate in several HIV treatment centres whether, in addition to laboratory results, clinical data that is currently collected manually can be sent digitally. Manual collection of this data is a time-consuming and error-prone process. As described in the previous chapter, the LabLink project has obviated manual entry of laboratory data by data collectors in HIV treatment centres that have implemented Lablink. DataLink is a logical next step after LabLink, and will initially be pilot-tested in a limited number of HIV treatment centres. In this way, SHM aims to further increase data collection quality and make the process of data collection even more efficient. HIV treatment centres can use the same infrastructure for DataLink to send data to SHM as for LabLink. SHM is currently working on an extensive technical data specification of the data that will be sent via DataLink to limit the work on the side of the HIV treatment centre as much as possible. We are also investigating where the data is located in the HIV treatment centre, how to make the link with SHM's pseudonymous study number, and how to convert the data into the correct exchange format.

To this end, we took the following steps in 2019:

- An intern of the Department of Medical Information Science of Amsterdam UMC, AMC site, was appointed;

DATA & QUALITY CONTROL IN 2019

- A general project plan and data flow model was drawn up;
- Preparation of a set of clinical data to be requested from digital delivery treatment centres;
- A start was made with the technical specification for the pilot HIV treatment centres;
- A consultation with ADICT (ICT Automatisering and the AMC's general IT service) took place about the application for receiving this data on the SHM side;
- The pilot HIV treatment centres were informed about the project.

The follow-up steps will be further planned in 2020 and, where possible, this project will be completed in 2020.

Centralisation of data collection

The collection of data from all individuals who are in care at an HIV treatment centre in the Netherlands is carried out by data collectors, all of whom are trained and coached by SHM. Most data collectors are centrally employed by SHM, while a smaller number remain locally employed by the HIV treatment centre. Our experience has shown that centralisation of data collection, which involves the mobile deployment of specially trained staff employed by SHM (central data collectors), is more effective in terms of achieving efficient, timely, and high-quality data collection. In 2019, in two centres, ETZ (Elisabeth-TweeSteden Ziekenhuis) and Erasmus MC, part of the data collection was taken over by a SHM data collector, due to the departure of the local data collector. Our central data collectors did provide assistance to local data collectors in Spaarne Gasthuis and UMC Utrecht to ensure that data collection in these HIV treatment centres remained up to date and to resolve discrepancies in the data.

In addition, our central data collectors were involved in collecting additional data from a number of HIV treatment centres as part of a national collaboration entitled the NOVA study (part of the H-TEAM project), thereby creating more data analysis opportunities for the researchers involved.

Knowledge management

In 2019, two new data collectors and two new data monitors joined SHM and were given specific training on relevant medical information relating to HIV, data collection protocols, and the data entry system DataCapTree.

We also organised a central training day on 26 September for all data collectors, highlighting specific medical conditions and protocols. These components, i.e., malignancies, hepatitis C, pregnancies and baseline, will be further substantiated with data points in the new DataCapTree entry program and will therefore be collected more extensively. Our employees' knowledge was refreshed through a variety of presentations and workshops, in which the group practised using pre-selected cases.

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Since the further development of DataCapTree is managed by the SHM employees proper, in 2019 several employees were trained in SQL and Kanban, one of the Agile frameworks that can be used for effective team collaboration, whereby agility and high quality are paramount.

In order to be able to manage DataCapTree even more independently and continue to develop it according to the users' wishes, the SHM DataCapTree development team received training on certain functionalities within the Logicnets platform – the underlying software – in May 2019.

STRUCTURAL ACTIVITIES

Patient registration

Patient registration involves registering and de-registering patients in the registration system, and is carried out separately from the data collection activity. Patient registration takes place centrally because of the need to generate a unique number under which all subsequent data are stored and processed. This approach provides a clear separation between privacy-sensitive data stored in the registration database and the pseudonymised data stored in the national database.

In 2019, 1,815 individuals were registered and 597 individuals were de-registered. In addition to registrations of newly diagnosed people living with HIV and de-registration due to death of an individual, this also includes registration and de-registration due to an individual moving to another HIV treatment centre or abroad.

Data collection and data entry

Manual collection of data from individuals followed in the HIV treatment centres in the Netherlands is carried out by data collectors. They collect data straight from either paper or electronic medical records and, based on data collection protocols, standardise, code, and enter the data into SHM's data entry system.

Data collection progress

Table 1 presents the percentage of individuals in treatment centres with a possible backlog in data collection of more than 365 days. The difference between the date of the last visit registered in the database and the date of reporting (20 February 2020) represents the potential data collection backlog in number of days. Data are corrected for individuals who have been lost to follow up or who have died.

The average backlog in data collection in 2019 remained 0%, with just 6 HIV treatment centres with a backlog of 1% and 1 with 4%. This is yet another excellent result, which is partly due to the continuous training of data collectors in efficiently organising the logistics of the data collection, using patient reports and standard data queries to monitor the backlogs and set priorities.

DATA & QUALITY CONTROL IN 2019

Table 1: Percentage of individuals followed in each treatment centre with an average data collection backlog of more than 365 days.

HIV treatment centre	Location	2018	2019
Adult			
Noordwest Ziekenhuisgroep	Alkmaar	1%	0%
Flevoziekenhuis	Almere	1%	0%
Amsterdam UMC, AMC site	Amsterdam	0%	0%
Amsterdam UMC, VUmc site	Amsterdam	0%	0%
DC Klinieken Lairesse – Hiv Focus Centrum	Amsterdam	0%	0%
MC Jan van Goyen	Amsterdam	0%	0%
OLVG	Amsterdam	0%	0%
MC Slotervaart	Amsterdam	0%	0%
Rijnstate	Arnhem	0%	0%
HMC	Den Haag	0%	2%
HagaZiekenhuis, Leyweg site	Den Haag	1%	0%
Catharina Ziekenhuis	Eindhoven	0%	0%
Medisch Spectrum Twente	Enschede	0%	0%
Admiraal De Ruyter Ziekenhuis	Goes	1%	0%
Universitair Medisch Centrum Groningen (UMCG)	Groningen	0%	0%
Spaarne Gasthuis	Haarlem	0%	0%
Medisch Centrum Leeuwarden	Leeuwarden	0%	0%
Leids Universitair Medisch Centrum	Leiden	0%	0%
MC Zuiderzee	Lelystad	0%	2%
Maastricht UMC+	Maastricht	0%	0%
Radboudumc	Nijmegen	1%	0%
Erasmus MC	Rotterdam	0%	0%
Maasstad Ziekenhuis	Rotterdam	0%	0%
ETZ	Tilburg	0%	0%
Universitair Medisch Centrum Utrecht (UMC Utrecht)	Utrecht	1%	1%
Isala	Zwolle	0%	6%

HIV treatment centre	Location	2018	2019
Paediatric			
Emma Kinderziekenhuis AUMC, AMC site	Amsterdam	0%	0%
Beatrix Kinderziekenhuis, UMCG	Groningen	0%	0%
Erasmus MC-Sophia Kinderziekenhuis	Rotterdam	4%	0%
Wilhelmina Kinderziekenhuis, UMC Utrecht	Utrecht	0%	6%
Average	-	**0%**	**0%**

DATA & QUALITY CONTROL IN 2019

Quality control

Quality of the collected data is monitored and maintained in various ways. In particular, as the number of people studied over a prolonged period of time has grown, data quality requirements have become more demanding and complex. For example, data obtained electronically (i.e., through LabLink) require a different quality control approach to those collected manually, which are checked and improved by means of both manual and automated checks.

Manual quality control

Manual quality checks were carried out as usual in 2019 by our data quality team, albeit to a lesser extent than in previous years due to additional duties such as developing and testing protocols and functionalities for DataCapTree. As a result, quality checks in 2019 focussed on the data of deceased patients. For 180 individuals, the cause of death was classified and validated based on the CoDe (Coding Causes of Death in HIV) classification. In addition, checks were carried out on 50 endpoint-defined comorbidities, such as malignancies and cardiovascular diseases. The data on these comorbidities were also entered into research forms as part of an international collaboration, the RESPOND and EuroSIDA-study.

In addition, structural assistance was provided to the data collector in Curaçao. A tailored training was provided during a 5-day visit by one of our data quality staff to the data collection site in Curaçao.

LabLink quality control

Both automated and manual checks, developed in 2013 and updated annually, were carried out on the LabLink data in 2019. One-off checks for acceptance of new LabLink connections with a laboratory were carried out on data in an acceptance test environment. The LabLink data were specifically checked for the following points:

- anonymisation of HL7 messages from within the HIV treatment centre,
- completeness of the HIV treatment centre's patient population for which HL-7 messages are expected,
- completeness of the selected components and time-span of laboratory results, in line with expectations and agreements made with the HIV treatment centre,
- accuracy of message transmission frequency, based on agreements with HIV treatment centre,
- correct format of HL-7 messages,
- accuracy and completeness of transmitted laboratory results, based on a random selection and a comparison with laboratory results in the electronic medical records (carried out by the data collectors).

DATA & QUALITY CONTROL IN 2019

Helpdesk and change requests

The helpdesk is the point of contact for data collectors in case of questions on medical content, or if they run into data collection issues in the DataCapTree (DCT) input system. The helpdesk's purpose is threefold: guidance and training of data collectors, dealing with change requests that lead to an improvement in the user-friendliness and effectiveness of DCT, and identifying trends in the performance of HIV care in the Netherlands that are significant for the process of data collection.

In 2019, we decided to improve the workflow of the helpdesk, change requests, and other incoming questions. Following a brainstorming session with all stakeholders, we conducted online market research into a variety of helpdesk applications. As a result of the brainstorm and later sessions, program requirements for a new application were drawn up. Eventually, pilots took place with two applications, with TOPdesk Lite emerging as the most suitable application. TOPdesk Lite has the basic functionalities needed for good helpdesk workflow. In addition, a knowledge centre can be set up, which could offer space for answers to submitted questions, as well as more extensive background information and manuals on data collection. TOPdesk Lite is expected to be operational in the spring of 2020.

Data management and reporting

Data warehousing and data processing

The data warehouse is a relational database (located on an SQL server at the AMC site of Amsterdam UMC) and extracts data from all SHM source systems. The data warehouse is structured on the basis of the protocols integrated within DataCapTree.

To facilitate storage in the data warehouse, each answer option used in the protocols has been assigned a unique identification number. DataCapTree now includes a total of 3,162 protocol-specific options. These answer options are formulated clearly and in a user-friendly way to minimise data entry errors. Finally, the Anatomical Therapeutic Chemical (ATC) classification has also been included in the data warehouse so the correct ATC code can immediately be coupled to drugs.

The protocols in the DataCapTree database make it possible for records in the data warehouse tables to be created, changed or updated in real time. As soon as a data collector submits a protocol, the manually collected data are entered into the data warehouse. Data received via LabLink are updated on a daily basis within the data warehouse. To facilitate further development of the

DATA & QUALITY CONTROL IN 2019

3162
protocol-specific options in 2019

data warehouse and the data entry system, separate environments have been created, including the acceptance test environment and the production environment.

No further data from those people who object to collection of their data following inclusion can be collected in DataCapTree. Any existing data are immediately removed from reports and data sets intended for analysis. This is achieved through the use of a filter within the data warehouse to ensure people who have objected to data collection are excluded.

All the information in the data warehouse, except LabLink data, is real-time. A data freeze is carried out twice a year, after which the raw data tables from the data warehouse are processed to yield tables suitable for data analysis. This involves cleaning, clustering, and coding the information according to the standard protocols of various national and international collaborations and the ATC classification.

In 2019, these data processing steps resulted in data sets for use by our researchers, for centre-specific reports, and for five international collaborations, EuroSIDA, RESPOND, ART-CC, HIV-CAUSAL and BEEHIVE.

Patient-specific reports, graphs and queries

Each centre has access to Microsoft Report Builder, in which treatment teams can view and download reports, graphs and queries relating to raw data from their own patients. Following revision the data warehouse structure, restructuring of these reports started at the end of 2018.

In 2019, the following of these updated reports at the centre and individual patient level became available and were offered to the HIV treatment centres. The remaining reports will be built and made available in 2020.

Reporting at centre level

In these reports, the patient population of an HIV treatment centre can be compared with the data of the total nationally registered population managed by SHM in the form of graphs.

- Population in care: description of the population that has recently entered care, subdivided by region of origin and transmission group.
- Retention: percentage of participants who are still in care at least 18 months later.
- Undetectable: Percentage of participants who have used cART for at least 6 months and who have an HIV RNA value of <100 copies/ml.

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Reporting at individual patient level

At the individual patient level, an HIV/HBV medication chart became available in 2019. This report provides an overview of the administered HIV/HBV medication, the HIV viral load and the CD4 number of participants.

The report consists of four parts:

- Graph of HIV/HBV medication,
- Graph of HIV-1 RNA, or viral load,
- Graph of CD4 numbers,
- HIV/HBV medication table, displayed in regimens.

Access to the reports

In every HIV treatment centre, the chief HIV treating physician was asked who is allowed to access the centre's reports. Access to these reports has been arranged for 58 care workers and researchers in the country with the consent of the chief HIV treating physician.

Privacy

AT STICHTING HIV MONITORING

With respect to privacy, SHM focused on the further raising of employees' awareness of the importance of privacy, the careful handling of patient data and the security thereof in 2019. Patient information and further identification of risks and measures in accordance with the ISO9001 and ISO27001 standards were important points for attention as well.

Awareness of privacy is a continuous point for attention within SHM. It is important that employees continue to report incidents involving personal data, so that measures can be taken where necessary. In addition, the focus was on rules regarding the sharing of personal data, which data may/may not be shared with whom, and the sharing of recent relevant news regarding privacy with SHM employees.

Patient information received much attention in 2019 because GDPR privacy legislation prescribes several concrete obligations. It must be made clear in transparent language which information SHM collects from patients and why SHM collects this information. It should also be clear what rights patients have and how consent can be withdrawn. As a result, our website has undergone a significant transformation to make extensive information available online. We have also adapted our information brochure for patients, patient information letter and the accompanying animation video.

SHM attaches great importance to quality, security and privacy. In accordance with ISO9001 and ISO27001, we identify and monitor risks and potential risks every year. In 2019, SHM processes were, therefore, further elaborated, and all necessary processing agreements and data exchange agreements were concluded. Realisation of information security, such as authorisation policy and management, password policy and management and security of physical personal data, also received a lot of attention in 2019.

It goes without saying that quality, security and privacy will always continue to be of great importance. In 2020, the processes involving high risks with regard to privacy rights will be further mapped out and risk analyses, or DPIAs, will be carried out. Our resilience against digital threats will also be tested, and informing patients and optimising the information will be central.

Registration

OF HIV-POSITIVE INDIVIDUALS IN 2019

GENERAL

Up to and including 31 December 2019, a cumulative total of 28,593 HIV-positive people were registered by SHM (*Table 2*), of whom 251 are minors in care at a HIV treatment centre specialised in HIV care for children and adolescents. In addition, 1,011 people were registered before the official start of the ATHENA-project and whose clinical data are often missing. In 2019, 1,022 people were first registered by SHM (*Table 3*).

Further clinical data were collected for 27,883 (97.5%) of the registered individuals. The remaining 710 (2.5%) persons objected to the collection of their data. Of the 1,022 people who were newly registered in 2019, 50 (4.9%) were registered as objecting to data collection.

In 2019, data were collected from 20,879 (75%) individuals. Of the 7,004 (25%) individuals with no data collected in 2019, 3,169 had died before 2019, 1,849 had moved abroad and 1,986 had disappeared from care for an unknown reason. Of the individuals who had ever been registered as objecting to data collection, 77 were known to have died prior to 2019 and 5 had moved abroad.

Box 1: Definitions of infection, diagnosis, entry into care, and registration.

Infection	The moment an individual acquires an HIV infection. The time of infection is often unknown.
Diagnosis	The moment an individual is newly diagnosed with an HIV infection. The time of diagnosis can be weeks, months, or years after infection.
Entry into care	The moment an HIV-positive individual is first seen for care in an HIV treatment centre, which usually is within a few weeks of HIV diagnosis.
Registration	The moment an HIV-positive individual in care is notified to SHM by their treating HIV physician or nurse and registered in the SHM database. Registration is usually within a few months of entering care, but can take longer. Collection of demographic and clinical data from the time of HIV diagnosis can only be done after an HIV-positive individual is registered with SHM.

REGISTRATION OF HIV-POSITIVE INDIVIDUALS IN 2019

ADULTS

Of the 27,883 individuals registered up to and including 2019 and for whom further clinical data were collected, 27,402 were adults at the time of registration: 22,297 (81%) men and 5,105 (19%) women.

In 2019, there were 1,007 adults who were newly-registered and for whom clinical data were collected. These comprised 824 (82%) men and 183 (18%) women.

CHILDREN

Of the 27,883 persons registered up to and including 2019, 481 (2%) were children or adolescents at the time of registration. This group consisted of 225 (47%) boys and 256 (53%) girls. In 2019, 15 children and adolescents (13 children aged between 0 and 12 years and 2 adolescents aged 13-17 years) were newly registered, comprising 6 boys and 9 girls.

PREGNANT WOMEN

Between 1 January 1996 and 31 December 2019, 2,886 pregnancies had been registered in a total of 1,573 women living with HIV in the Netherlands at the time of pregnancy. In 65% of these women, the HIV diagnosis was known prior to conception of their first pregnancy since registration; in 35% of the pregnancies, the HIV diagnosis was established during the first pregnancy since registration.

During 2018 and 2019, 194 pregnancies were registered, 70 of which were first pregnancies since registration in SHM's database. In 36% of these first pregnancies since registration, HIV was diagnosed during the pregnancy.

15
children & adolescents with HIV newly registered in 2019

REGISTRATION OF HIV-POSITIVE INDIVIDUALS IN 2019

Table 2: Total number of HIV-positive individuals registered by SHM as of 31 December 2019, according to most recent HIV treatment centres.

		Total		Alive		Deceased		Objection[a]		Data in 2019[b]		No data in 2019			
												Deceased before 2019[c]		Other reasons[d]	
HIV treatment centre	**Location**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Adult															
Noordwest Ziekenhuisgroep	Alkmaar	446	1.6	402	90.1	44	9.9	7	1.6	348	78.0	41	9.2	50	11.2
Flevoziekenhuis	Almere	274	1.0	258	94.2	16	5.8	6	2.2	229	83.6	15	5.5	24	8.8
AUMC, AMC site	Amsterdam	2,959	10.4	2,502	84.6	457	15.4	11	0.4	2,038	68.9	447	15.1	463	15.6
AUMC, VUmc site	Amsterdam	747	2.6	644	86.2	103	13.8	18	2.4	500	66.9	101	13.5	128	17.1
Hiv Focus Centrum	Amsterdam	1,019	3.6	1,004	98.5	15	1.5	4	0.4	960	94.2	13	1.3	42	4.1
MC Jan van Goyen	Amsterdam	528	1.9	483	91.5	45	8.5	10	1.9	401	75.9	44	8.3	73	13.8
OLVG	Amsterdam	4,540	16.0	3,987	87.8	553	12.2	187	4.1	3,336	73.5	515	11.3	502	11.1
Slotervaartziekenhuis*	Amsterdam	387	1.4	208	53.7	179	46.3	6	1.6	0	0.0	176	45.5	205	53.0
Rijnstate	Arnhem	994	3.5	886	89.1	108	10.9	9	0.9	784	78.9	101	10.2	100	10.1
HMC	Den Haag	1,215	4.3	1,107	91.1	108	8.9	43	3.5	887	73.0	99	8.1	186	15.3
HagaZiekenhuis, Leyweg site	Den Haag	834	2.9	713	85.5	121	14.5	35	4.2	545	65.3	105	12.6	149	17.9
Catharina Ziekenhuis	Eindhoven	817	2.9	766	93.8	51	6.2	7	0.9	648	79.3	50	6.1	112	13.7
MST	Enschede	687	2.4	563	82.0	124	18.0	6	0.9	435	63.3	118	17.2	128	18.6
Admiraal De Ruyter Ziekenhuis	Goes	243	0.9	226	93.0	17	7.0	5	2.1	184	75.7	14	5.8	40	16.5
UMCG	Groningen	1,098	3.9	959	87.3	139	12.7	66	6.0	786	71.6	119	10.8	127	11.6
Spaarne Gasthuis	Haarlem	564	2.0	497	88.1	67	11.9	6	1.1	419	74.3	66	11.7	73	12.9
MCL	Leeuwarden	359	1.3	321	89.4	38	10.6	3	0.8	285	79.4	36	10.0	35	9.7
LUMC	Leiden	800	2.8	712	89.0	88	11.0	45	5.6	573	71.6	81	10.1	101	12.6
MC Zuiderzee*	Lelystad	82	0.3	81	98.8	1	1.2	1	1.2	44	53.7	1	1.2	36	43.9
Maastricht UMC+	Maastricht	1,080	3.8	905	83.8	175	16.2	5	0.5	741	68.6	165	15.3	169	15.6
Radboudumc	Nijmegen	902	3.2	785	87.0	117	13.0	40	4.4	694	76.9	98	10.9	70	7.8

[a] *Objection: consent not given for collection of clinical data.*
[b] *Data in 2019: registered by SHM in 2019, or deceased during 2019, or last contact with an HIV treatment centre during 2019.*
[c] *No data in 2019 – deceased before 2019: individuals who are not included in 'data in 2018' and who had died before 2019.*
[d] *No data in 2019 – other reasons: individuals who are not included in 'data in 2018' because they moved abroad before 2018 or because they had no contact with their HIV treatment centre in 2019 for an unknown reason.*
* *MC Slotervaart en MC Zuiderzee were declared bankrupt on 25 October 2018. Data collection continued in both hospitals until final closure early 2019.*

[Continued on page 36]

REGISTRATION OF HIV-POSITIVE INDIVIDUALS IN 2019

Table 2: Continued.

HIV treatment centre	Location	Total n	Total %	Alive n	Alive %	Deceased n	Deceased %	Objection[a] n	Objection[a] %	Data in 2019[b] n	Data in 2019[b] %	No data in 2019: Deceased before 2019[c] n	No data in 2019: Deceased before 2019[c] %	No data in 2019: Other reasons[d] n	No data in 2019: Other reasons[d] %
Adult (continued)															
Erasmus MC	Rotterdam	2,905	10.2	2,538	87.4	367	12.6	21	0.7	2,086	71.8	356	12.3	442	15.2
Maasstad Ziekenhuis	Rotterdam	953	3.4	887	93.1	66	6.9	15	1.6	792	83.1	63	6.6	83	8.7
ETZ	Tilburg	1,347	4.8	1,238	91.9	109	8.1	31	2.3	1,048	77.8	92	6.8	176	13.1
UMC Utrecht	Utrecht	1,904	6.7	1,692	88.9	212	11.1	72	3.8	1,422	74.7	206	10.8	204	10.7
Isala	Zwolle	658	2.3	603	91.6	55	8.4	47	7.1	490	74.5	44	6.7	77	11.7
Total		**28,342**	**100.0**	**24,967**	**88.1**	**3,375**	**11.9**	**706**	**2.5**	**20,675**	**72.9**	**3,166**	**11.2**	**3,795**	**13.4**
Paediatric															
Emma Kinderziekenhuis, AMC-UvA	Amsterdam	67	26.7	67	100.0	0	0.0	0	0.0	56	83.6	0	0.0	11	16.4
Beatrix Kinderziekenhuis, UMCG	Groningen	29	11.6	29	100.0	0	0.0	0	0.0	27	93.1	0	0.0	2	6.9
Erasmus MC-Sophia Kinderziekenhuis	Rotterdam	84	33.5	82	97.6	2	2.4	0	0.0	68	81.0	2	2.4	14	16.7
Wilhelmina Kinderziekenhuis, UMC Utrecht	Utrecht	71	28.3	70	98.6	1	1.4	4	5.6	53	74.6	1	1.4	13	18.3
Total		**251**	**100.0**	**248**	**98.8**	**3**	**1.2**	**4**	**1.6**	**204**	**81.3**	**3**	**1.2**	**40**	**15.9**
Curaçao															
SEHOS	Willemstad	1,142	98.7	963	84.3	179	15.7	0	0.0	692	60.6	174	15.2	276	24.2
SEHOS kinderkliniek	Willemstad	15	1.3	5	33.3	10	66.7	0	0.0	0	0.0	10	66.7	5	33.3
Total		**1,157**	**100.0**	**968**	**83.7**	**189**	**16.3**	**0**	**0.0**	**692**	**59.8**	**184**	**15.9**	**281**	**24.3**

Download Table 2

[a] *Objection: consent not given for collection of clinical data.*
[b] *Data in 2019: registered by SHM in 2019, or deceased during 2019, or last contact with an HIV treatment centre during 2019.*
[c] *No data in 2019 – deceased before 2019: individuals who are not included in 'data in 2018' and who had died before 2019.*
[d] *No data in 2019 – other reasons: individuals who are not included in 'data in 2018' because they moved abroad before 2018 or because they had no contact with their HIV treatment centre in 2019 for an unknown reason.*

REGISTRATION OF HIV-POSITIVE INDIVIDUALS IN 2019

Table 3: Total number of people who were first registered by SHM in 2019, according to most recent HIV treatment centre.

HIV treatment centre	Location	Total n	Total %	Alive n	Alive %	Deceased n	Deceased %	Objection[a] n	Objection[a] %
Adults									
Noordwest Ziekenhuisgroep	Alkmaar	35	3.5	35	100.0	0	0.0	0	0.0
Flevoziekenhuis	Almere	15	1.5	14	93.3	1	6.7	0	0.0
AUMC, AMC site	Amsterdam	72	7.1	72	100.0	0	0.0	0	0.0
AUMC, VUmc site	Amsterdam	23	2.3	23	100.0	0	0.0	0	0.0
Hiv Focus Centrum	Amsterdam	27	2.7	27	100.0	0	0.0	0	0.0
MC Jan van Goyen	Amsterdam	23	2.3	23	100.0	0	0.0	0	0.0
OLVG	Amsterdam	153	15.2	152	99.3	1	0.7	12	7.8
Rijnstate	Arnhem	45	4.5	45	100.0	0	0.0	4	8.9
HMC	Den Haag	46	4.6	46	100.0	0	0.0	0	0.0
HagaZiekenhuis, Leyweg site	Den Haag	25	2.5	25	100.0	0	0.0	1	4.0
Catharina Ziekenhuis	Eindhoven	23	2.3	23	100.0	0	0.0	0	0.0
MST	Enschede	31	3.1	31	100.0	0	0.0	1	3.2
Admiraal De Ruyter Ziekenhuis	Goes	9	0.9	9	100.0	0	0.0	0	0.0
UMCG	Groningen	45	4.5	45	100.0	0	0.0	7	15.6
Spaarne Gasthuis	Haarlem	18	1.8	18	100.0	0	0.0	0	0.0
MCL	Leeuwarden	15	1.5	15	100.0	0	0.0	0	0.0
LUMC	Leiden	25	2.5	25	100.0	0	0.0	1	4.0
Maastricht UMC+	Maastricht	42	4.2	42	100.0	0	0.0	0	0.0
Radboudumc	Nijmegen	40	4.0	40	100.0	0	0.0	5	12.5
Erasmus MC	Rotterdam	95	9.4	95	100.0	0	0.0	2	2.1
Maasstad Ziekenhuis	Rotterdam	54	5.4	54	100.0	0	0.0	3	5.6
ETZ	Tilburg	45	4.5	43	95.6	2	4.4	3	6.7
UMC Utrecht	Utrecht	54	5.4	54	100.0	0	0.0	2	3.7
Isala	Zwolle	48	4.8	46	95.8	2	4.2	7	14.6
Total		***1,008**	**100.0**	**1,002**	**99.4**	**6**	**0.6**	**48**	**4.8**

[a] *Objection: consent not given for collection of clinical data.*

* *Includes 2 of the 15 children/adolescents newly-registered in 2019.*

[Continued on page 38]

REGISTRATION OF HIV-POSITIVE INDIVIDUALS IN 2019

Table 3: Continued.

HIV treatment centre	Location	Total n	Total %	Alive n	Alive %	Deceased n	Deceased %	Objection[a] n	Objection[a] %
Paediatric									
Beatrix Kinderziekenhuis, UMCG	Groningen	2	14.3	2	100.0	0	0.0	0	0.0
Erasmus MC-Sophia Kinderziekenhuis	Rotterdam	5	35.7	5	100.0	0	0.0	0	0.0
Wilhelmina Kinderziekenhuis, UMC Utrecht	Utrecht	7	50.0	7	100.0	0	0.0	2	28.6
Total		**14**	**100.0**	**14**	**100.0**	**0**	**0.0**	**2**	**14.3**
Curaçao									
SEHOS	Willemstad	33	100.0	33	100.0	0	0.0	0	0.0

Download Table 3

[a] *Objection: consent not given for collection of clinical data.*

* *Includes 2 of the 15 children/adolescents newly-registered in 2019.*

REGISTRATION OF HIV-POSITIVE INDIVIDUALS IN 2019

Of the HIV-positive people monitored by SHM:

6% had a chronic HCV co-infection

2% had an acute HCV co-infection

6% had a chronic HBV co-infection

HIV SEQUENCE DATA

Up until 31 December 2019, 15,847 reverse transcriptase and/or protease sequences and 277 integrase gene sequences had been included in the SHM database. These sequences are used to examine resistance to treatment regimens and to investigate possible HIV transmission networks.

HEPATITIS B AND HEPATITIS C CO-INFECTION

Up to and including 31 December 2019, 1,335 (5%) of the monitored HIV-positive individuals were found to have a chronic hepatitis C virus (HCV) co-infection, while 715 (3%) were found to have a primary HCV co-infection. Of these 715 individuals, 33 were first diagnosed with HCV in 2019, 8 of whom were newly registered with SHM in 2019.

In 2019, chronic hepatitis B virus (HBV) co-infection was detected in 1,708 (6%) of the monitored HIV-positive individuals. HBV was first diagnosed in 2019 in 28 of these individuals, 21 of whom were newly registered with SHM in 2019.

In 2019, SHM registered 18 cases of liver fibrosis and 5 liver cirrhosis events and 1 hepatocellular carcinoma event.

SAMPLE COLLECTION AND STORAGE

Since the start of the AIDS Therapy Evaluation in the Netherlands (ATHENA) project in 1996, an estimated total of 577,195 plasma samples from people in follow up have been stored in microbiology laboratories at the HIV treatment centres or in laboratories associated with the centres. This biobank is exceptionally valuable for clinical epidemiology research into resistance development over time and for viral phylogenetic research into evolution of the epidemic and HIV transmission networks. The outcome of such research carries implications both for the quality of care of individual patients and for public health.

REGISTRATION OF HIV-POSITIVE INDIVIDUALS IN CURAÇAO

The registration and monitoring of HIV-positive persons being followed in the St. Elisabeth Hospital in Willemstad, Curaçao, continued in 2019. In total, 1,157 HIV-positive individuals were registered, of whom 33 were newly registered in 2019.

HIV in the Netherlands

KEY FINDINGS FROM OUR 2019 HIV MONITORING REPORT

This chapter provides a summary of the key findings from the latest HIV Monitoring Report that was published on 13 November 2019. The full report is available on our website. Note that our annual monitoring reports are always based on data collected in the previous year. In other words: the 2019 HIV Monitoring Report is based on 2018 data.

Download 2019 HIV Monitoring Report

THE HIV EPIDEMIC IN THE NETHERLANDS IN 2018

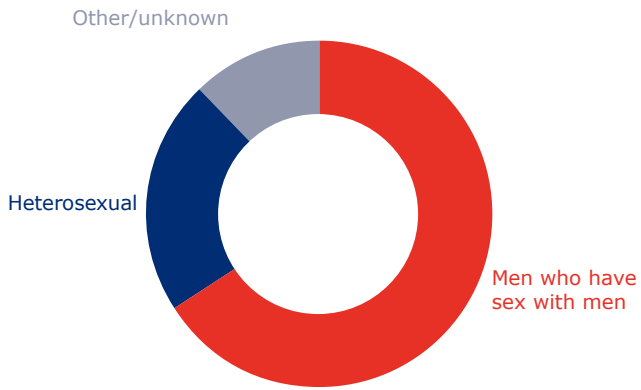
Trend of fewer new HIV diagnoses continues in 2018

Since 2008 there has been a decreasing trend in the annual number of newly-diagnosed HIV infections. This decreasing trend continued in 2018. The projected number of new diagnoses for 2018 is 664, compared with 749 in 2017.

Majority of new diagnoses continue to be in men who have sex with men

In 2018, the majority (66%) of newly-diagnosed infections were in men who have sex with men (MSM), while 22% were acquired through heterosexual contact and around 12% through other or unknown modes of transmission.

Figure 1: *Most likely route of HIV transmission in people in HIV care in the Netherlands in 2018.*



HIV IN THE NETHERLANDS KEY FINDINGS

People newly-diagnosed with HIV rapidly receive specialised care

Just over 95% of people newly-diagnosed with HIV entered specialised HIV care within 6 weeks after diagnosis. This rate was more or less the same regardless of where the diagnosis was made (i.e., hospital, general practice, sexual health centre, or other test location).

HIV testing is becoming more common

The rates of testing for HIV appear to be increasing in the Netherlands. This conclusion is based on a number of observations. Firstly, our data show that the proportion of individuals with a previously negative HIV test has increased (74% of MSM, 30% of other men and 41% of women diagnosed in 2018 had a reported previous negative test). In addition, the proportion of individuals who are diagnosed with HIV relatively early in their infection (including during primary HIV infection) continues to increase, particularly among MSM. This is reflected in the CD4 count at diagnosis gradually having risen over time to a median of 390 cells/mm^3 in 2018.

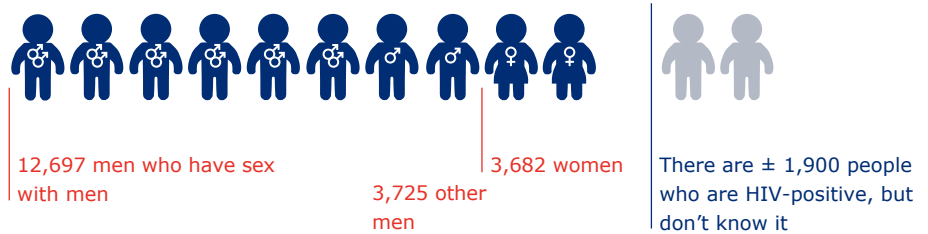
Late presentation for care remains a problem that needs attention

Despite the observed earlier diagnosis in certain groups, many people still present late for care, i.e., with an already markedly impaired immune system (CD4 count below 350 cells/mm^3) or even AIDS; in 2018, this was the case for 41% of MSM, 66% of other men and 45% of women.

How many people were in HIV care in 2018?

As of 31 December 2018, a total of 20,104 people living with HIV in the Netherlands (19,910 adults and 194 children and adolescents) were known to be in care in one of the 24 adult or 4 paediatric HIV treatment centres.

***Figure 2:** Number of people living with HIV and in care in the Netherlands in 2018.*



HIV IN THE NETHERLANDS KEY FINDINGS

CONTINUUM OF HIV CARE IN 2018: 92-93-96

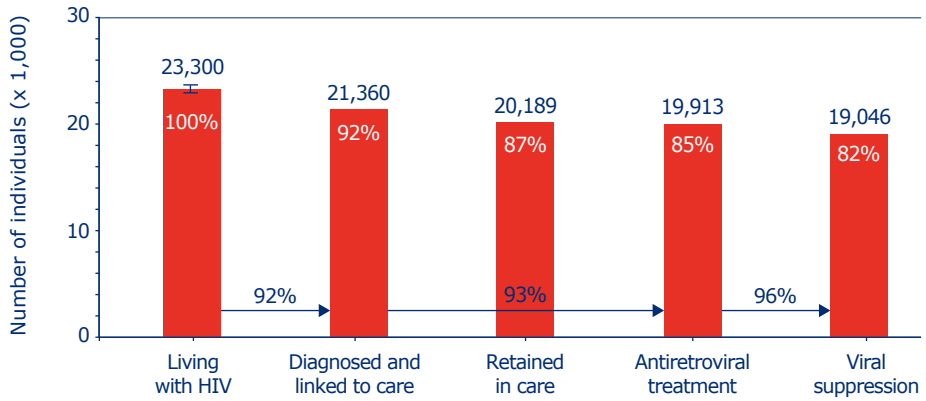
One of the goals of HIV treatment is to achieve viral suppression. The key steps that need to be achieved to reach viral suppression are illustrated in a continuum of HIV care. A continuum of care also gives a measure of progress towards achieving the UNAIDS 90-90-90 goals for HIV care by 2020.

The continuum of care for the Netherlands confirms that we have reached these goals (92-93-96 in 2018, see Figure 3):

- By the end of 2018, 23,300 individuals were estimated to be living with HIV, of whom an estimated 1,900 were still undiagnosed.
- In total, 21,360 individuals (**92%** of the total number estimated to be living with HIV) had been diagnosed, linked to care, and registered by SHM.
- Of the individuals who had been diagnosed, linked to care, and registered by SHM, the majority (19,913; **93%**), had started antiretroviral treatment, and 19,046 of those (**96%**) had achieved viral suppression.

This means that overall, 82% of the total estimated population living with HIV and 89% of those diagnosed and linked to care had a suppressed viral load by the end of 2018.

Figure 3: Continuum of HIV care for the total estimated HIV-positive population in the Netherlands by the end of 2018, based on UNAIDS 90-90-90 goals for 2020: 92-93-96.



HIV IN THE NETHERLANDS KEY FINDINGS

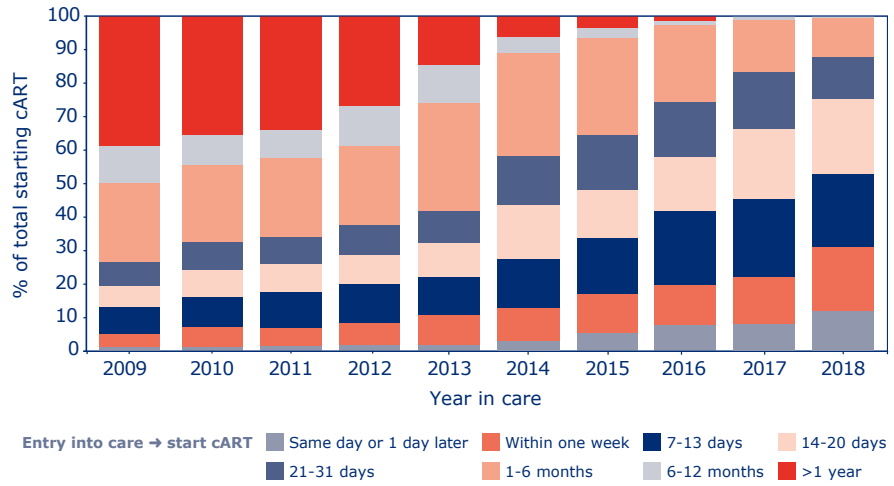
The figures for the Netherlands are impressive compared with other parts of the world. Nonetheless, in 2018 there were 664 new diagnoses and an estimated 1,900 people who remained undiagnosed. To achieve a significant decline in these numbers, novel transdisciplinary strategies are needed to simultaneously reduce the likelihood of HIV transmission in key populations at risk (including by provision of pre-exposure prophylaxis or PreP, identify individuals with HIV infection early, rapidly link all people living with HIV to care, and immediately offer them the possibility of starting combination antiretroviral therapy.

COMBINATION ANTIRETROVIRAL THERAPY IN ADULTS

In 2018, most people started HIV treatment within a month of entry into care

People are increasingly starting combination antiretroviral therapy (cART) soon after being diagnosed with HIV and entering care. In 2018, close to 90% of people started cART within one month of entry into care. Importantly, this was the case irrespective of the CD4 cell count at entry into care. In addition, in 2018, 3.5% started cART on the same day or the day after their HIV infection was diagnosed.

Figure 4: *Time between entry into care and starting combination antiretroviral therapy (cART) for those starting cART between 2008-2018.*



Legend: *cART=combination antiretroviral therapy.*

HIV IN THE NETHERLANDS KEY FINDINGS

Most common cART regimens in 2018

Initial regimen

Just over 75% people started on an integrase inhibitor-containing regimen in 2018, with abacavir/lamivudine/dolutegravir and tenofovir alafenamide/emtricitabine/cobicistat-boosted elvitegravir being the most frequently-prescribed initial regimens in 2018.

The likelihood of discontinuing or switching the initial regimens has been decreasing since 1996. As in previous years, toxicity continued to be a main reason for discontinuing or switching the initial regimen during the first year of treatment. Toxicity-related discontinuations were often due to neuropsychiatric, gastrointestinal, dermatological or renal problems. Other important reasons for discontinuation or regimen switch during the first year of treatment included regimen simplification or the availability of new drugs.

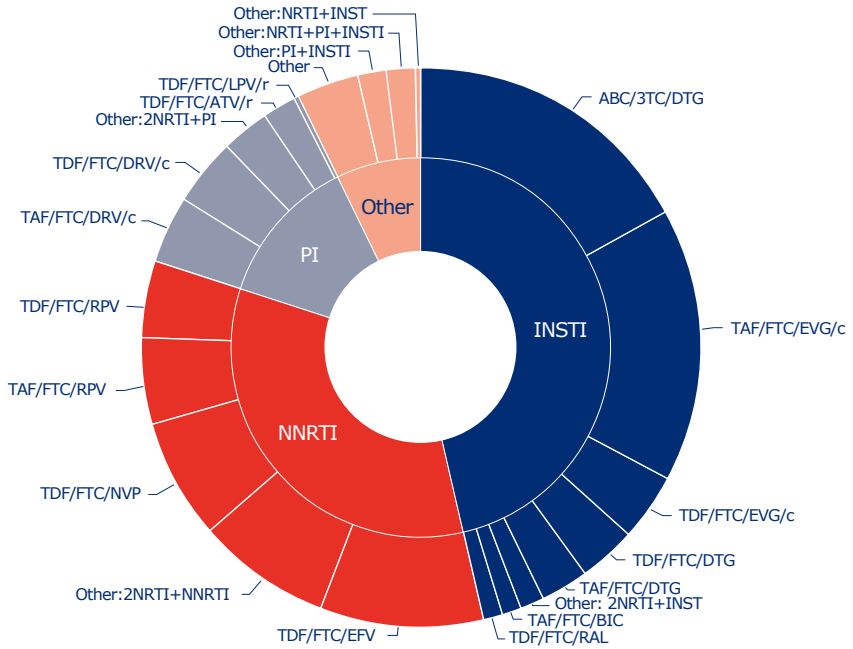
Integrase inhibitor–based cART used increasingly frequently

Integrase inhibitor-based cART continues to be further implemented on a large scale in the Netherlands: in 2018, 46% of all adults in care and on cART received an integrase inhibitor, compared with 39% in 2017. While 35% of the population on cART in 2018 received a backbone containing tenofovir disoproxil fumarate, new fixed-dose combinations have also led to an increase in the use of abacavir (35%) and tenofovir alafenamide (33%).

Among all HIV-positive individuals in care and on treatment in 2018, the majority (92.8%) received a cART regimen based on two nucleoside analogue reverse transcriptase inhibitors (NRTIs), combined with an integrase inhibitor (46.6%), a non-NRTI (NNRTI, 33.4%), or a protease inhibitor (14%) (*Figure 5*). The most commonly-prescribed regimens in 2018 were abacavir/lamivudine/dolutegravir (17.2%), tenofovir alafenamide/emtricitabine/cobicistat-boosted elvitegravir (15.6%), and tenofovir disoproxil /emtricitabine combined with efavirenz (9.4%) or nevirapine (7%).

HIV IN THE NETHERLANDS KEY FINDINGS

Figure 5: Combination antiretroviral therapy (cART) use in 2018 by all HIV-positive individuals in care.



Legend: *3TC=lamivudine; b=boosted (cobicistat or ritonavir); /r=ritonavir-boosted; /c=cobicistat-boosted; ABC=abacavir; ATV=atazanavir; DRV=darunavir; DTG=dolutegravir; EFV=efavirenz; EVG=elvitegravir; FTC=emtricitabine; INSTI=integrase inhibitor; LPV=lopinavir; NRTI=nucleoside analogue reverse transcriptase inhibitor; NNRTI=non-nucleoside reverse transcriptase inhibitor; NVP=nevirapine; PI=protease inhibitor; RAL=raltegravir; RPV=rilpivirine; TAF=tenofovir alafenamide; TDF=tenofovir disoproxil fumarate.*

Excellent virological response, including in long-term survivors

Both short-term and long-term viral suppression rates remain high and continue to improve. Of all adults receiving cART for at least 12 months and in care in 2018, 98% had an undetectable viral load (<200 copies/ml). Individuals who had been diagnosed with HIV before 1996 and who remained in care and on cART in 2018 (i.e., long-term survivors) had equally high levels of viral suppression.

Changing cART landscape

Following revised HIV treatment guidelines, prompt cART initiation has continued to become more common in 2018. In recent years, the introduction of new integrase inhibitor-based once-daily fixed-dose combinations has changed the landscape of cART use in the Netherlands. All currently-recommended regimens are durable.

HIV IN THE NETHERLANDS KEY FINDINGS

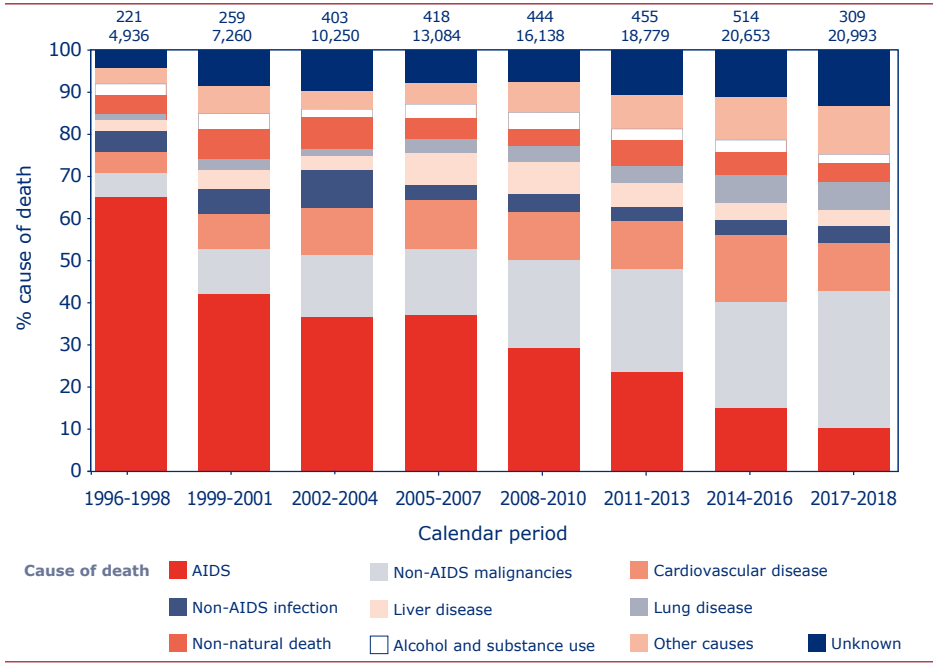
MORBIDITY AND MORTALITY

Sustained decline in AIDS-related death

Mortality remains low in HIV-positive individuals in care in the Netherlands. Since cART became available in the Netherlands in 1996, there has been a sustained decline in the risk of death from AIDS. Death is now increasingly likely to be caused by non-AIDS comorbidities, including non-AIDS-defining malignancies (NADM), cardiovascular disease (CVD) and chronic liver disease (*Figure 6*).

Those cases of AIDS-related death that do occur are largely driven by late entry into care, which once again stresses the importance of identifying and linking individuals to care earlier in the course of the infection.

Figure 6: Relative changes iin cause of death in different calendar periods since the introduction of combination antiretroviral therapy (cART) in the Netherlands. Numbers above each bar represent the number of people at risk during that calendar period.

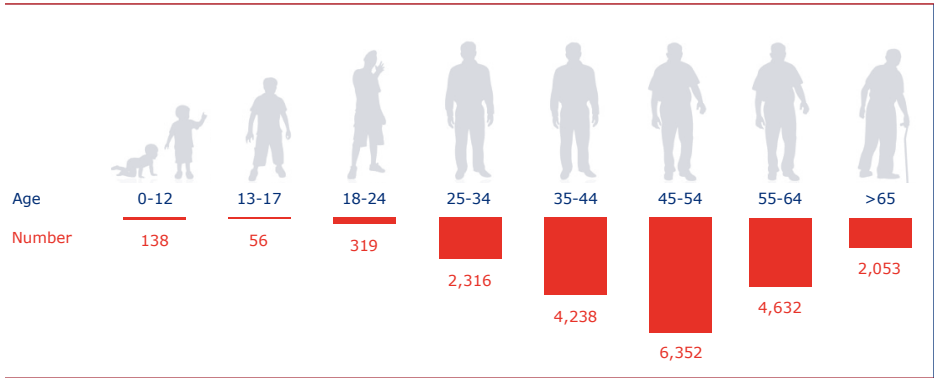


HIV IN THE NETHERLANDS KEY FINDINGS

Ageing and comorbidities

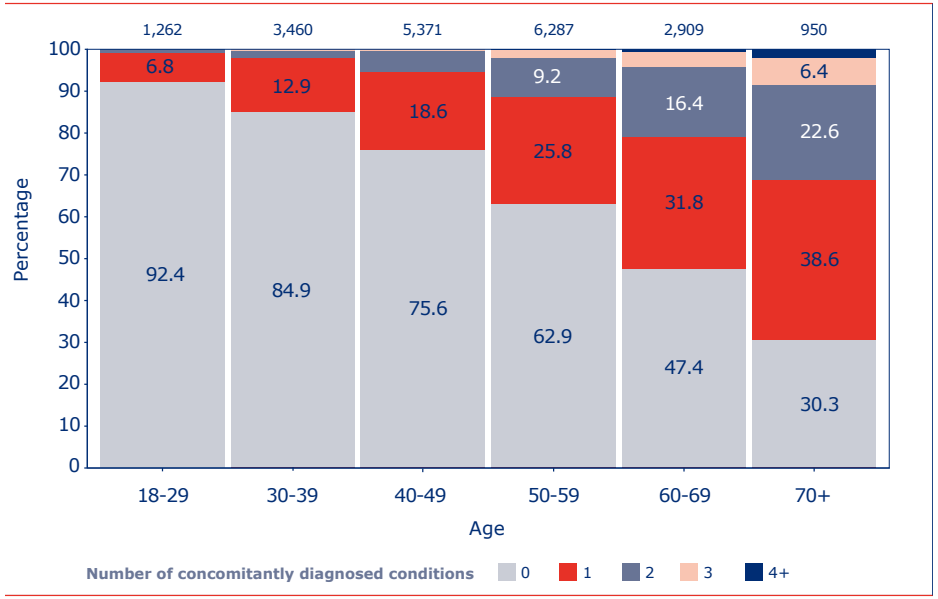
A substantial proportion of those people who were newly-diagnosed with HIV and entered HIV care in 2018 were older individuals; 24% were 50 years or older. At the same time, the overall population of people with HIV in care in the Netherlands also continues to age, with 50% currently older than 50 years (*Figure 7*).

***Figure 7:** : Age distribution of people living with HIV and in care in the Netherlands in 2018.*



As in the general population, older age was an important risk factor for comorbidities such as cardiovascular disease and non-AIDS malignancies. Of particular concern is the increasing proportion of individuals with multiple comorbidities, the risk of which appears to be increased in those with HIV (*Figure 8*).

***Figure 8:** Prevalence Prevalence of non-HIV/AIDS multimorbidity in adults in HIV care in 2018. Numbers on top of the bars represent the number of individuals contributing data to that age category.*



Cardiovascular risk

Despite the increasing age of the HIV-positive population, the proportion at high cardiovascular risk only increased slightly over the period 2000-2018. This suggests that cardiovascular risk management has improved over time. Nonetheless, there remains significant room for further improvement, given the suboptimal use of statin therapy, antihypertensive therapy and low-dose acetylsalicylic acid use as secondary prevention following a myocardial infarction or ischaemic stroke, as well as the low, albeit slowly improving, uptake of these medications in the prevention of primary cardiovascular disease.

Non-AIDS malignancies

The most common non-AIDS malignancies are lung, anal, and head and neck cancers, as well as Hodgkin's lymphoma. The incidence rate of non-AIDS malignancies in the Netherlands has remained stable over time. However, when the increasing age of the HIV-positive population is taken into account, we observe a decline in the age-adjusted risk of new non-AIDS malignancies in men, including anal cancer. This may be the result of a reduction in risk factors such as smoking, as well as expanded screening and treatment for early stages of anal cancer, together with a higher proportion of individuals living with higher CD4 cell counts in more recent years. Individuals who initiated ART within 12 months after their last HIV-negative test, had a lower risk of being diagnosed with a non-AIDS-defining malignancy, independent of their current CD4 cell count and other risk factors, suggesting an additional health benefit of early initiation of ART.

Improved awareness of risk factors may reduce comorbidity
Resilient ageing in people living with HIV and a lower comorbidity burden can be achieved by increasing awareness of the role of modifiable, lifestyle-related risk factors among both physicians and the people living with HIV themselves. This is particularly relevant for older individuals and those at increased risk of comorbidity.

HEPATITIS B AND C VIRUS CO-INFECTIONS

Hepatitis B and C virus screening is now universal

Hepatitis C (HCV) and hepatitis B (HBV) co-infections are far more prevalent in HIV-positive individuals than in the general population due to shared routes of transmission. Screening for HCV and HBV co-infection is part of the standard of HIV care in the Netherlands, and the presence or absence of these co-infections is now documented for almost all HIV-positive individuals.

HIV IN THE NETHERLANDS KEY FINDINGS

Hepatitis C virus co-infection

Approximately 12% of all individuals monitored by SHM had evidence of ever having been exposed to HCV, with 5% having documented evidence of chronic infection and 3% having evidence of acute HCV infection at the time of the first diagnosis. Most individuals with HCV infection were male and from the Netherlands or other European countries.

Hepatitis B virus co-infection

The prevalence of chronic HBV infection has decreased over time as a result of increased HBV vaccination rates, together with the HBV-prophylactic effect of tenofovir and tenofovir alafenamide for the treatment of HIV. Six percent of individuals ever in care were found to have, or have had, chronic HBV infection.

HBV vaccination remains a priority

An estimated 34% of HIV-positive individuals overall had not been exposed to HBV and had not been successfully vaccinated. These individuals remain at risk of acquiring HBV if they are not taking a cART regimen including tenofovir or tenofovir alafenamide. These findings illustrate the importance of continuing our efforts to increase successful HBV vaccination rates, particularly in those who are not receiving tenofovir-containing cART.

Risk of dying from HCV or HBV co-infection is decreasing

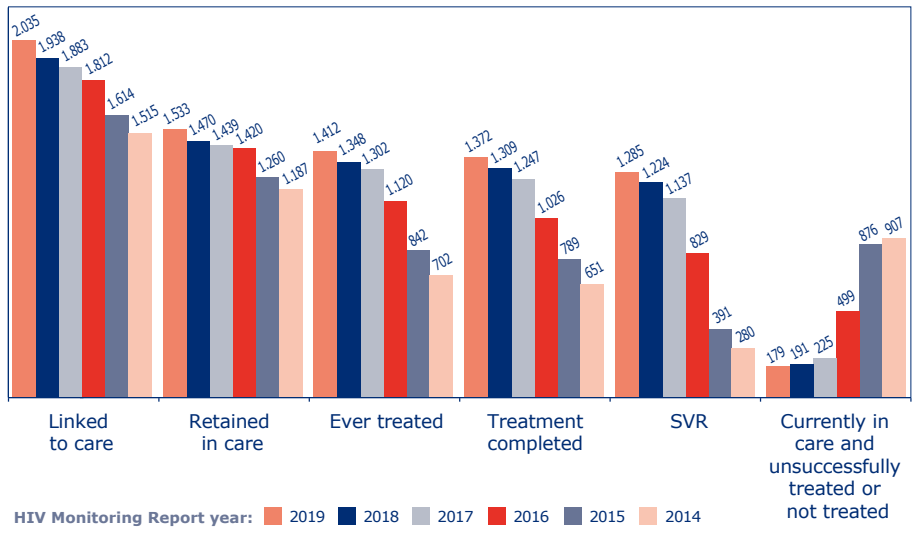
Overall, HIV-positive individuals with a chronic HCV or HBV co-infection remain at increased risk of liver-related morbidity and mortality. However, people diagnosed with chronic HCV or HBV have had a steadily decreasing risk of liver-related death since 2010. For those with chronic HBV infection, this is likely a result of increasingly effective HBV treatment through the use of tenofovir-containing cART that became more widespread in 2002.

Successful HCV treatment with direct-acting antivirals has progressed further

Our data clearly show that the large majority of HIV-positive individuals with HCV co-infection have now received effective treatment for HCV. By 31 December 2018, over 950 individuals had received or were receiving treatment with novel direct-acting antiviral agents (DAAs). Of all people treated with DAAs, 97% achieved a sustained virological response and no longer had evidence of an active HCV infection. These developments have resulted in fewer HCV co-infected individuals remaining in need of treatment than in previous years (*Figure 9*). However, not all individuals in need of treatment have yet received treatment with DAAs; this underlines the need for additional efforts to reach these people.

HIV IN THE NETHERLANDS KEY FINDINGS

Figure 9: Hepatitis C virus continuum of care.



Legend: *SVR=sustained virological response.*

Successful HCV treatment prevents HCV transmission

Successful treatment of HCV may also prevent onward HCV transmission, as suggested by the lower number of acute HCV infections observed in the past year, together with the rapid decline in prevalence of active HCV infections. In MSM the prevalence of active HCV infections decreased to less than 1% in 2018. Although there has been a drop in the HCV re-infection rate in most recent years, re-infection following successful treatment continues to be reported, indicating that HCV transmission has not ceased completely.

Regular HCV screening among sexually-active MSM recommended

Over time, the availability of DAA regimens for HCV, together with optimised screening for HCV co-infection, is expected to limit the impact of HCV co-infection on long-term liver-related morbidity and mortality; however, this effect should be monitored. To reduce new HCV infections among the key affected population of sexually-active MSM, regular screening for HCV among successfully-treated individuals is recommended for early detection of HCV re-infections, in combination with interventions to reduce HCV risk behaviours.

HIV IN THE NETHERLANDS KEY FINDINGS

PREGNANCIES IN WOMEN LIVING WITH HIV-1 IN THE NETHERLANDS

A total of 2,705 pregnancies were documented in 1,517 women in HIV care in the Netherlands. Of these women, 81% were born outside the Netherlands, mainly in sub-Saharan Africa (68%). Women who were born in the Netherlands were more likely to be aware of their HIV-positive status prior to conception than those born elsewhere (78% and 62%, respectively). In both groups, the most common mode of HIV acquisition was heterosexual contact (94%).

Fewer pregnancies

The number of pregnancies among women living with HIV-1 has been decreasing since 2009. This may be due to the increasing age of the women in HIV care, as well as a drop in national birth rates.

Higher detectable HIV RNA rates after delivery in 2018

Almost all women (99%) were treated with antiretroviral therapy during pregnancy. As a result, maternal HIV RNA levels were below 50 copies/ml (i.e., undetectable) in 85% of the deliveries, and between 50-500 copies/ml in a further 10% of deliveries. However, we did see an increase in the proportion of women with detectable HIV RNA levels in 2018. This was primarily in women who were newly-diagnosed with HIV during pregnancy and consequently only started treatment during pregnancy. Therefore, it is important that women who are newly-diagnosed with HIV during pregnancy are closely monitored.

Perinatal transmission of HIV now very rare in the Netherlands

Due to the high rates of successful treatment in women living with HIV, perinatal transmission of HIV is rare in the Netherlands, with only one reported case since 2015. The majority (69%) of children who acquired HIV perinatally were born outside the Netherlands. In the Netherlands, in women who receive treatment and have undetectable HIV RNA levels, the rate of vertical transmission is 0.18%.

Suboptimal viral suppression rates during the post-partum period

Following the new guideline recommendation in 2015 to prescribe cART to all individuals regardless of CD4 count, it is now also recommended that all pregnant women continue cART after pregnancy. Since 2015, of those women who continued using antiretroviral therapy after delivery, 12% had at least one detectable HIV RNA measurement in the year following delivery. This may reflect poorer treatment compliance during the post-partum period.

HIV IN THE NETHERLANDS KEY FINDINGS

To achieve viral suppression during delivery and maintain treatment compliance in the post-partum period, women living with HIV who start cART during pregnancy require additional support, not only during pregnancy but also post-partum.

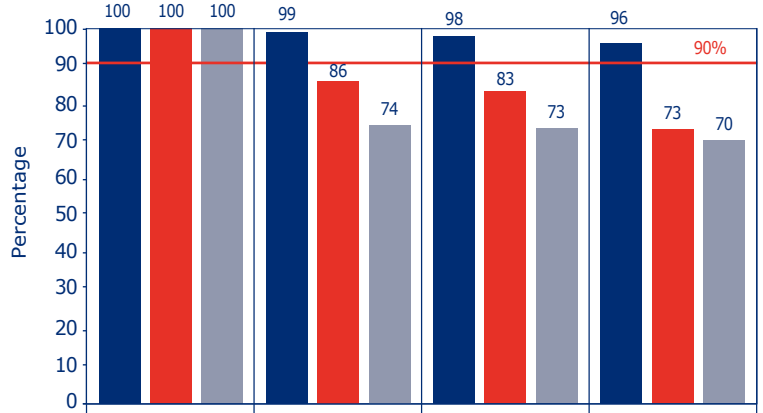
CHILDREN LIVING WITH HIV

Of 504 children ever registered by SHM and who entered HIV care in the Netherlands, the majority (81%) remain in care. Of the children who are currently in care, 136 (27%) were born outside the Netherlands and adopted by Dutch parents.

Favourable outcomes for HIV-positive children

There is a high retention-in-care rate among children currently under the age of 18. Outcomes for children who are receiving cART are generally favourable and have resulted in a low mortality rate and good long-term immunological responses (*Figure 10*).

Figure 10: *Cascade of care by age and mode of HIV acquisition, as of 31 December 2018. The numbers on top of the bars indicate the proportion of individuals.*



HIV IN THE NETHERLANDS KEY FINDINGS

Poorer viral suppression around transition to adult care

Of those individuals who were originally registered as a child, 81% were still in care in 2018, 52% of whom were older than 18 as of 31 December 2018. Of the children who had transitioned from paediatric to adult care, 20% did not have suppressed viraemia at the time of transition, suggesting challenges for these adolescents with respect to adherence to treatment around the time of transition to adult care.

Optimisation of long-term care for young people

The large proportion of adolescents who have inadequately-suppressed viraemia at the time of transitioning to adult care illustrates that long-term care for this particularly vulnerable and difficult-to-manage group of young individuals clearly needs to be further optimised.

QUALITY OF CARE

Comparing indicators to the national average

The quality of care provided in Dutch adult HIV treatment centres was explored using indicators based on the national guidelines issued by the Dutch Association of HIV-Treating Physicians. In this year's report, we also compared each centre's indicator to the national average, in a manner that takes into account the diverse mix of patients' geographical origin and routes of transmission that are found across centres.
In all centres the proportion of patients in care in 2018 who had initiated cART and had viral suppression were within the expected range of the national average.

High overall retention in care

Overall, retention in care was found to be high in most HIV treatment centres in the Netherlands, although in some centres it was lower for people not born in the Netherlands.

Earlier start of cART and high rates of viral suppression

In addition, across most centres, people are starting cART sooner after entering into care, confirming that most centres are following the guideline to offer cART to everyone with newly-diagnosed HIV regardless

of CD4 count. In fact, a median of 100% of all patients who entered care in 2016 and 2017 and who were retained in care in 2018 had initiated cART, while across all centres, more than 95% of patients in care in 2018 were on cART.

Viral suppression rates in the first 6 months on cART, as well as during longer term use of treatment, were high across all centres, regardless of the number of people receiving care at a particular centre.

HIV IN CURAÇAO

Over the years, an increasing proportion of individuals with HIV in care at the St Elisabeth Hospital in Willemstad in Curaçao have managed to achieve a suppressed viral load. However, although early start of treatment appears to be possible, data also suggest that long-term retention in care needs to be improved to optimise the sustained effect of treatment. In addition, the proportion of people entering care with late-stage HIV infection remains high, although the proportion with advanced HIV disease appears to be decreasing.

Amsterdam Cohort Studies

The Amsterdam Cohort Studies (ACS) on HIV and AIDS started in 1984 among men who have sex with men (MSM) and were expanded in 1985 to include people who use drugs. The original aims were to investigate the epidemiology, psychosocial determinants, natural history, and pathogenesis of HIV-1 infection and AIDS, as well as to evaluate the effect of interventions in HIV-negative and HIV-positive MSM and in men and women who use drugs. In the past decade, the focus has broadened to include the epidemiology and natural history of blood-borne and sexually transmitted infections (STI) other than HIV. In recent years, this research has been further extended with prospective testing for STI and human papillomavirus infection.

From the outset, research within the ACS has taken a multidisciplinary approach. The collaborating institutes within the ACS framework are the Public Health Service of Amsterdam (Geneeskundige en Gezondheidsdienst Amsterdam; GGD Amsterdam), the Academic Medical Center (AMC) site of Amsterdam UMC, MC Jan van Goyen, Sanquin Blood Supply Foundation, DC Klinieken Lairesse - Hiv Focus Centrum, and SHM. The ACS infrastructure is financed primarily through a contribution from the National Institute for Public Health and the Environment (Rijksinstituut voor Volksgezondheid en Milieu, RIVM). The scientific studies are funded separately by external sources.

Following consultation with the ACS's scientific advisory group in 2015, follow up of people who use drugs ended from 2016 due to the absence of new HIV and hepatitis C infections in preceding years. During the 31 years of follow up, 1,680 people who use drugs took part in the study and made a combined total of 28,011 visits to the ACS. These data are still being used in scientific research.

In acccordance with the plan presented to the International Scientific Advisory Committee, which issued a positive evaluation of the ACS in 2013, expansion of the group of HIV-negative participants in the MSM cohort was initiated in 2015, with special efforts made to recruit younger MSM (below 30 years of age). In 2019, 18 new participants were included in the ACS, with a median age of 25 years. On 31 December 2019, there were 711 HIV-negative MSM in active follow up.

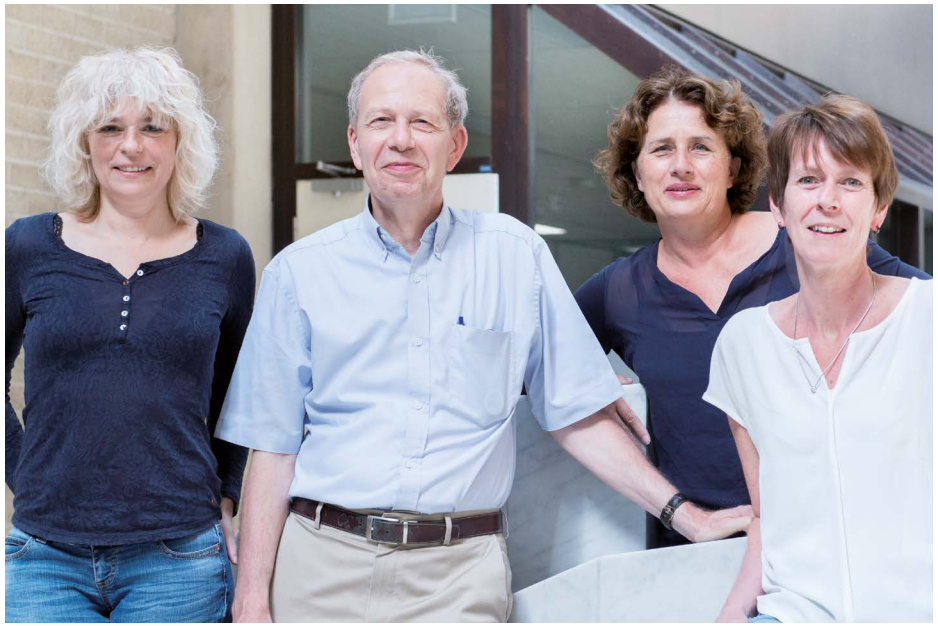
As well as following this large group of HIV-negative MSM, the ACS also follow a group of HIV-positive MSM. This follow up takes place primarily through the standard HIV medical care and through monitoring by SHM. In addition to the standard medical care, samples are collected and stored for specific immunological and virological studies. These samples are collected from HIV seroconverters who acquired HIV during the ACS follow up and from some of the individuals who were already HIV-positive

AMSTERDAM COHORT STUDIES

at inclusion in the ACS. In addition, body material from the HIV-negative men is also collected and stored as part of the ACS.

As of 31 December 2019, 2,906 MSM had participated in the ACS. Since the start of the ACS, these MSM have made 61,567 study visits. In 2019, 711 MSM, 47 of whom were HIV-positive, made a study visit to the GGD. HIV was diagnosed in 2 of the 663 HIV-negative participants in 2019. The preliminary HIV incidence within the ACS in 2019 was 0.22 per 100 person years.

As of September 2019, PrEP will also be offered to those eligible and interested, within the framework of the national PrEP programme in the cohort. As of 31 December 2019, 54 MSM received PrEP and PrEP care through the ACS.



The ACS steering committe (from left to right): Lia van der Hoek, Peter Reiss, Maria Prins, Neeltje Kootstra.*

**Photo by Roland van den Eijnden, Ministry of MEDIA.*

Communication activities

SHM actively disseminates information about its activities through a variety of communication channels. In doing so, we aim to provide relevant and regular updates to HIV treating physicians, other healthcare professionals, researchers, people living with HIV, policy makers, the media, and other interested parties. This chapter provides an overview of the main communication activities in 2019.

The HIV Monitoring Report 2019.

EXTERNAL COMMUNICATION ACTIVITIES

HIV Monitoring Report 2019: HIV Infection in the Netherlands

Each year, we publish our HIV Monitoring Report just before 1 December, World AIDS Day. The Monitoring Report is written by SHM researchers in close collaboration with a small group of reviewers consisting of HIV treating physicians and experts in public health, whose in-depth knowledge on relevant topics is highly valuable in shaping the content of the chapters.

The Monitoring Report presents major developments in the HIV epidemic in the Netherlands and describes among other things, the effect of the antiretroviral treatments as applied in clinical practice. In addition, the Monitoring Report describes trends in HIV-related and non-AIDS-related morbidity and mortality, and trends regarding hepatitis B and C coinfection. The report also includes a chapter to the quality of care in Dutch HIV treatment centres.

The main findings from the 2019 Monitoring Report are summarized in an earlier section of this annual report (*HIV in the Netherlands in 2019: Key findings from our latest HIV Monitoring Report*).

Distribution of 2019 HIV Monitoring Report

The full 2019 HIV Monitoring Report is available as an online PDF on our website. To facilitate access, each chapter and its accompanying figures can now be downloaded individually from the website. The report's Summary and Recommendations section was printed in both Dutch and English and distributed to stakeholders, together with a factsheet. In addition, the printed Summary and Recommendations and factsheet was included in the conference bags at the national conference on sexually transmitted diseases and HIV (*Nationaal Congres Soa*Hiv*Seks*) held on 29 November 2019.

COMMUNICATION ACTIVITIES

Scientific output

SHM also contributes to the understanding of HIV/AIDS through research projects and scientific publications. In 2019, SHM's ATHENA cohort data were included in **28** publications in peer-reviewed national and international scientific journals and **21** oral and poster presentations at international and national peer-reviewed conferences, workshops and meetings. A full overview of the scientific output is included in a later section of this report.

2018 annual report

Our 2018 annual report was published online on 4 June 2019. In addition to an overview of the SHM organisational structure, this provided a detailed overview of the data collection and quality control activities undertaken in 2018, as well as summary of the HIV population in care in the Netherlands as registered in SHM's database as of 31 December 2018. The annual report also comprised a list of SHM's national and international collaborations, progress reports on research involving SHM's data, and a comprehensive overview of the resulting scientific output. Finally, the annual report included the financial report on our activities in 2018.

eNewsletter

The eNewsletter was sent out twice in 2019: in April and October. All newsletters are archived on our new website and can be accessed via a direct link on the homepage.

New animation video

A short animation video for people living with HIV and in care at an HIV treatment centre was developed in 2019 to support the updated and GDPR-compliant patient information letter.

COMMUNICATION ACTIVITIES

Information brochure.

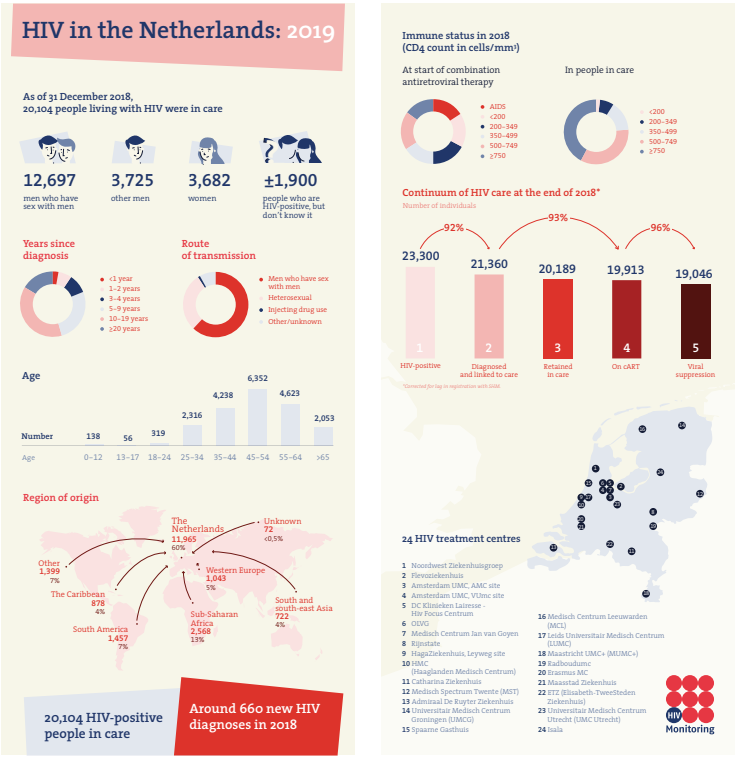
Information brochure about SHM and factsheet

Our information brochure provides a simple explanation of SHM's activities and data collection process. Produced in both Dutch and English, it illustrates how coded data provided by people living with HIV in the Netherlands can help to drive further improvements in HIV care through national and international research.

In 2019 the brochure was updated to ensure GDPR compliance and, together with the factsheet insert, redesigned in the style of the new animated explainer. The redesigned brochure and factsheet will be made available to HIV treatment centres at the beginning of 2020, for distribution to new patients. The information brochure and insert are also available for download on our website.

SHM website

IDuring the course of the year our website has been updated on an ongoing basis, for example with news about SHM and information on recent research and publications.



Updated factsheet: 'HIV in the Netherlands: 2019'.

COMMUNICATION ACTIVITIES

Events

In 2019, our researchers and collaborators presented their work with SHM data at various international and national conferences and meetings. While further information on these presentations can be found later in this report, two Netherlands-based events that took place in 2019 are described in more detail below.

Netherlands Conference on HIV Pathogenesis, Epidemiology, Prevention and Treatment (NCHIV)

In 2019, SHM organised the 12th annual Netherlands Conference on HIV Pathogenesis, Epidemiology, Prevention and Treatment (NCHIV), in collaboration with the Centre for Infectious Disease Control of the National Institute for Public Health and the Environment (RIVM-CIb), the Aidsfonds, the Amsterdam Institute for Global Health and Development (AIGHD)/ Department of Global Health of Amsterdam UMC, AMC site, and the Dutch Association of HIV-Treating Physicians (NVHB).

NCHIV 2019 was well-attended, with just under 300 participants. During the course of the day, there were 21 presentations, including a keynote lecture by Dr Anthony Fauci of the US National Institute of Allergy and Infectious Diseases, and three plenary talks by pre-eminent guest speakers on topics such as the changing landscape of ART (Prof. Chloe Orkin), challenges facing women around conception and pregnancy (Dr Karoline Aebi-Popp), and the global HIV response (Prof. Wafaa El Sadr).

Photo by Monique Kooijmans

COMMUNICATION ACTIVITIES

*NCHIV congress bag.**

In addition, SHM researchers presented highlights from the 2019 HIV Monitoring Report in the context of a moderated panel discussion with experts from intramural and public health care and people with HIV. The remaining talks comprised oral abstract presentations on results of new research. During the lunchtime poster session, 29 posters, grouped according to broader themes, were presented for viewing. The lunch break also included five guided poster tours where the concerned researchers were given the opportunity to briefly present their findings to a group of conference delegates, followed by a discussion led by a moderator.

World AIDS Day

In the run-up to World AIDS Day (1 December 2019), Stichting HIV Monitoring was present at the *Soa*Hiv*Seks* conference on 29 November 2019, with a stand providing information about SHM's activities.

**photo by Monique Kooijmans*

INTERNAL COMMUNICATION ACTIVITIES

Intranet

This externally-accessible, password-protected platform provides a central point of information for all our employees, with up-to-date contact details, HR documents, standard templates, and internal news and meetings. During 2019, the intranet continued to provide updates on upcoming events and news.

Internal newsletter

In 2019, the internal Dutch-language newsletter, entitled *SHM Positive: a collection of all the internal news*, was published five times. It continues to provide a channel through which all employees, including those working outside the SHM offices in Amsterdam, can get to know new colleagues and stay up to date with internal developments, relevant issues such as privacy legislation, and upcoming events.

Internal meetings

A so-called internal meeting for all SHM employees is held at our office in Amsteram on a bi-monthly basis. During this meeting, any internal developments are discussed and staff are brought up to date with recent scientific developments relevant to SHM's work, either by an invited speaker or one of our researchers.

Scientific topics covered in 2019 included hepatitis B infection in people living with HIV in the Netherlands, challenges facing young people transitioning from paediatric to adult care, women with HIV in the Netherlands, and SHM's role in the certification of Dutch HIV treatment centres. During 2019, the internal meetings also included information on SHM's privacy and GDPR policy and HR-related issues.

Our collaborations

IN 2019

SHM participates in both national and international scientific research collaborations. An overview of these collaborations is provided below.

NATIONAL COLLABORATIONS

Amsterdam University Medical Centers, AMC site

SHM collaborates with the Academic Medical Center (AMC) site of Amsterdam University Medical Centers (Amsterdam UMC) on various projects. Led by Prof. Peter Reiss (department of Global Health and division of Infectious Diseases at Amsterdam UMC, AMC site, and director of SHM), the *Comorbidity and Ageing with HIV* (AGE_hIV) cohort study aims to assess the incidence and prevalence of a broad range of comorbidities and known risk factors for these comorbidities in HIV-positive individuals compared with HIV-negative individuals.

Another collaboration closely associated with the AGE_hIV cohort study, is the COBRA (*Comorbidity in relation to AIDS*) programme, which aims to further investigate these issues in collaboration with a number of European partners, for example by identifying reliable biomarkers of comorbidity and ageing in the context of HIV (refer to http://fp7-cobra.eu for further information). As a COBRA partner, SHM collaborated with Amsterdam UMC and provided the data collection infrastructure for the project.

COBRA's EU funding formally ended March 1, 2017, but scientific productivity based on collected data and biomaterial continues.

SHM also makes a contribution in terms of expertise in methodology and data management to the *HIV Transmission Elimination Amsterdam* (H-TEAM) project, led by the Amsterdam Institute for Global Health and Development/ department of Global Health at the Amsterdam UMC, AMC site. The project is a multidisciplinary and interdisciplinary collaboration that aims to reduce the number of new HIV infections in Amsterdam and involves various stakeholders in HIV prevention, treatment and care, including the community of people with, or at risk of, HIV (see the H-TEAM website for full list of participating organisations).

RIVM-CIb

The Centre for Infectious Disease Control of the National Institute for Public Health and the Environment (*Centrum Infectieziektebestrijding, Rijksinstituut voor Volksgezondheid en Milieu*; RIVM-CIb) coordinates the surveillance and control of infectious diseases within the Netherlands, including the registration of new HIV infections within the framework of the national HIV registration and surveillance programme. SHM's registration activities are closely associated with the CIb with regard to HIV and other sexually transmitted co-infections such as infection with hepatitis B virus

OUR COLLABORATIONS IN 2019

(HBV) and hepatitis C virus (HCV), as well as infectious diseases such as tuberculosis. For the purpose of national HIV surveillance work carried out by the RIVM-CIb and to fulfil RIVM-CIb's reporting requirements to the European Centre for Disease Prevention and Control (ECDC), the RIVM-CIb and SHM regularly exchange data collected through SHM's framework.

GGD Amsterdam

SHM has contributed to the *MSM Observational Study of Acute Infection with Hepatitis C* (MOSAIC) coordinated by the GGD Amsterdam. The MOSAIC study involved a cohort of men who have sex with men (MSM) with chronic HIV infection who have contracted an acute hepatitis C (HCV) infection. The study aimed to look at how this group contributes to the transmission of HIV, to explore the driving factors of the HCV epidemic and HIV's role in this epidemic, and to examine the impact of acute HCV infection, reinfection and treatment on disease progression. Although MOSAIC has formally ended, scientific productivity based on collected data and biomaterial continues.

SHM and GGD Amsterdam also work together on the *Amsterdam Cohort Studies* (ACS, reviewed earlier in this report) in collaboration with Amsterdam UMC, AMC site. The ACS are primarily funded through the RIVM-CIb. Since 2015, ACS funding has been included in the structural institute grant awarded to SHM by the ministry of Health, Welfare and Sport through the RIVM-CIb.

Finally, the GGD participated in the aMASE study, which was part of EuroCoord. This study aimed to identify barriers that migrant communities face when accessing healthcare, so that HIV prevention, diagnosis and prognosis may be improved in migrants in Europe. SHM provided clinical data required for the Netherlands' part of the study.

aMASE was part of EuroCoord, the collaboration that encompassed all EU-funded cohort studies in the field of HIV and that ended in 2015. For the time being, scientific productivity within aMASE is continuing based on the last available joint dataset.

Pilot registration and monitoring of hepatitis C mono-infection

The National Hepatitis Plan adopted in 2016 sets out five key approaches by which to prevent further dissemination of viral hepatitis in the Netherlands and reduce related disease burden and mortality. One of the approaches is to improve surveillance and monitoring of HBV and HCV in order to gain insight into the cascade of care. The Dutch Society for Internal Medicine (Nederlandse Internisten Vereniging, NIV) and the Dutch Association of Gastroenterologists and Hepatologists (Nederlandse Vereniging van Maag-Darm-Leverartsen, NVMDL) established a steering committee that elected to work together with SHM to implement such a monitoring system. A working group was subsequently established, comprising representatives from

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NIV, NVMDL, the Dutch Association of HIV-Treating Physicians (NVHB) and SHM. As a first step, the working group has agreed to set up a pilot registration of individuals who are in care with a hepatitis C mono-infection and who have received direct-acting antiviral treatment. During 2017, the working group established the scope and implementation process of this pilot registration, deciding it would take place at a select number of clinical centres. Data collection started in one of the pilot centres, namely Erasmus MC, at the end of 2018, and is soon to be expanded in the remaining centres.

INTERNATIONAL COLLABORATIONS

EuroCoord

The *European Coordinating Committee for the Integration of Ongoing Coordination Actions Related to Clinical and Epidemiological HIV Research* (EuroCoord) was established by several of the largest HIV cohorts and collaborations within Europe - CASCADE, COHERE, EuroSIDA, and the *Paediatric European Network for the Treatment of AIDS* (PENTA). The overall aim of EuroCoord was to use the scientific strengths of each collaboration to ensure that the best, most competitive research was performed. EuroCoord formed a large, integrated network with a common virtual database, which currently contains data from more than 250,000 HIV-positive individuals from many different settings within and outside Europe.

EuroCoord's multidisciplinary approach has allowed HIV research into a number of key areas aimed at improving the management and quality of life of HIV-positive individuals, while also exploring differences within subgroups.

EuroCoord was funded for a period of 5 years from 2011 onwards as part of the European Commission's 7th Framework Programme. Funding for EuroCoord and associated collaborations (see below) therefore ceased on 31 December 2015. Some of its associated collaborations (in particular, EPPICC and EuroSIDA) have succeeded in continuing parts of their research agendas through alternative funding mechanisms. Scientific productivity continues based on the last available joint dataset and collected biomaterial.

COHERE

The *Collaboration of Observational HIV Epidemiological Research in Europe* (COHERE), was part of EuroCoord, the collaboration that encompassed all EU-funded cohort studies in the field of HIV and that ended in 2015. It was comprised of a collaboration of 33 cohorts in Europe that aims to conduct epidemiological research on the prognosis and outcome of HIV-positive populations from across Europe, including children, pregnant mothers, and other adults. Scientific productivity continues based on the last available joint dataset.

Papers published by COHERE in 2019.

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CASCADE

Concerted Action on SeroConversion to AIDS and Death in Europe (CASCADE) was established in 1997 as a collaboration between 25 cohorts of documented HIV seroconverters from 15 European countries, Australia, Canada and Africa. CASCADE's main aim was to monitor the course of HIV infection from the time of infection onwards. The Amsterdam Cohort Studies (ACS) participated in this study through their HIV seroconverted participants.

CASCADE later also became part of EuroCoord, the collaboration that encompassed all EU-funded cohort studies in the field of HIV and that ended in 2015. For the time being, scientific productivity within CASCADE is continuing based on the last available joint dataset.

EuroSIDA

The EuroSIDA study, initiated in 1994, is a prospective, observational cohort study of more than 16,500 individuals followed in 103 hospitals in 32 European countries, plus Israel and Argentina. The main objective of the study is to assess the outcomes of HIV-positive individuals across Europe, with an important focus on assessing regional differences across Europe. The Netherlands is represented through the participation of Amsterdam UMC, AMC site, in Amsterdam. At the request of the principal investigator of EuroSIDA in the AMC site, Prof. Peter Reiss, SHM collects data from the AMC for EuroSIDA.

EuroSIDA was part of EuroCoord, the collaboration that encompassed all EU-funded cohort studies in the field of HIV (http://www.eurocoord.net) and that ended in 2015. EuroSIDA has since undergone reorganisation and secured alternative funding to continue this longstanding, highly successful collaboration.

Papers published by EuroSIDA in 2019.

RESPOND

In addition to its activities described above, EuroSIDA is also a founding partner of the newly-formed *International Cohort Consortium of Infectious Disease* (RESPOND). RESPOND is a non-interventional, non-randomised, open-label, multi-cohort observational study. The aim of RESPOND is to build a flexible and dynamic cohort consortium for the study of infectious diseases, including HIV, as a generic structure for facilitating multi-stakeholder involvement. This consortium builds on the collaborative work in HIV cohort studies that has taken place in Europe and beyond over the last 20 years and that has provided crucial information contributing to the

OUR COLLABORATIONS IN 2019

improvement of the lives of HIV-positive individuals. RESPOND will continue with a rigorous approach to answering questions with robust and reliable scientific methodologies, as well as having the flexibility and willingness to answer the most important questions of interest to the infectious diseases research community.

SHM, together with other cohorts including EuroSIDA, contributes pseudonymised data from a number of ATHENA participants for designated RESPOND projects, alongside those ATHENA cohort participants already included in EuroSIDA.

EPPICC

The *European Pregnancy and Paediatric HIV Cohort Collaboration* (EPPICC) conducts epidemiological research on the prognosis and outcome of HIV infections in pregnant women and children, as well as in children exposed to HIV *in utero*, across Europe. EPPICC currently consists of 13 studies, including the *European Collaborative Study* (ECS). As the number of children living with HIV in Europe is relatively small, a single network running paediatric trials and cohorts is essential to efficiently answer research questions in this population.

EPPICC was part of EuroCoord, the collaboration that encompassed all EU-funded cohort studies in the field of HIV (http://www.eurocoord.net). Within EuroCoord, EPPICC was part of the HIV in children collaboration, *Paediatric European Network for Treatment of AIDS* (PENTA). With EuroCoord having ended in 2015, EPPICC has successfully secured alternative funding to continue its research, and to which SHM continues to contribute.

Papers published by EPPICC in 2019.

ART-CC

The *Antiretroviral Therapy Cohort Collaboration* (ART-CC) coordinated by Prof. Jonathan Sterne, University of Bristol, is a long-standing international collaboration that includes 19 cohort studies in Europe and North America. ART-CC was initiated to carry out prognostic studies to assess the effect of cART in therapy-naive individuals. In 2019, Prof. Peter Reiss and Dr Ard van Sighem represented SHM in the ART-CC steering group.

Papers published by ART-CC in 2019.

OUR COLLABORATIONS IN 2019

D:A:D

The *Data Collection on Adverse Events of Anti-HIV Drugs* (D:A:D) was a prospective multi-cohort study that focused on the potential association between antiretroviral drugs and cardiovascular disease, liver and renal disease, and non-AIDS-defining malignancies.

Funding for the D:A:D study ceased as of 1 February 2016. Scientific productivity has continued based on the last available joint dataset.

Papers published by D:A:D in 2019.

ECDC

The *European Centre for Disease Prevention and Control* (ECDC) is an EU agency that aims to strengthen Europe's response to infectious diseases. ECDC works in partnership with national health protection bodies across Europe to improve and develop continent-wide disease surveillance and early warning systems. By working with experts throughout Europe, ECDC pools Europe's health knowledge to develop authoritative scientific opinions about the risks posed by current and emerging infectious diseases.

Together with the National Institute of Public Health in Warsaw and the National and Kapodistrian University of Athens, SHM is a partner in a consortium that supports ECDC in the further development and integration of the ECDC HIV Modelling Tool and the HIV Estimates Accuracy Tool. In addition, SHM is partner in a collaborative multi-year project led by Prof. Kholoud Porter from University College London to improve the monitoring of the HIV continuum of care in Europe.

Papers published by ECDC in 2019.

HIV-CAUSAL & HEP-CAUSAL

The HIV-CAUSAL Collaboration, led by Prof. Miguel Hernan at Harvard University's T.H. Chan School of Public Healthh, is a multinational collaboration of prospective studies of HIV-positive individuals from six European countries, Brazil, Canada and the United States. Originally HIV-CAUSAL was an acronym for *HIV Cohorts Analyzed Using Structural Approaches to Longitudinal data*. The collaboration, applying causal inference methodology, aims to contribute to answering questions such as: when to start antiretroviral therapy, what antiretroviral regimen to use initially, and when to switch to another regimen. These questions are unlikely to be answered by a single study and therefore require a collaborative approach.

The HIV-CAUSAL collaboration pools data collected for clinical purposes within healthcare systems with few barriers to access. The data are

OUR COLLABORATIONS IN 2019

analysed using methods specifically designed for causal inference from complex longitudinal data.

The HIV-CAUSAL collaboration is designed to inform evidence-based guidelines and the planning of clinical trials. In addition, the collaboration facilitates understanding and training in causal modelling across leading HIV observational research groups in the United States and Europe.

Based on very similar principles, and using innovative causal inference methods, the HEP-CAUSAL collaboration was established in 2019 in order to study the extent to which direct acting antivirals (DAA) against hepatitis C impact hepatic and extra-hepatic morbidity and HCV reinfection in the long-term.

Papers published by HIV-CAUSAL & HEP-CAUSAL in 2019.

Imperial College London and Oxford University

SHM has had a longstanding collaboration since 2002 with the Department of Infectious Disease Epidemiology (DIDE), part of the Faculty of Medicine, Imperial College London. The collaboration focuses on using mathematical modelling and viral phylogenetics to improve our understanding of the HIV epidemic and the potential impact of different interventions, including 'treatment as prevention' and pre-exposure prophylaxis (PrEP). Prof. Christophe Fraser currently coordinates the collaboration with SHM from his position at the Big Data Institute of Oxford University's Li Ka Shing Centre for Health Information and Discovery.

In the B*ridging the Epidemiology and Evolution of HIV in Europe* (BEEHIVE) project (ERC grant to Prof. Fraser), Oxford University, Imperial College's DIDE, and SHM collaborate with the Amsterdam UMC, AMC site, and the Sanger Institute, UK, on a viral whole genome association study. The primary aim of this study is to identify viral virulence factors, which could ultimately shed new light on the pathogenesis of HIV.

Dr. Oliver Ratmann, Imperial College London, continues as an important collaborator in this area of work, particularly in the context of H-TEAM.

OUR COLLABORATIONS IN 2019

RDI

The *HIV Resistance Database Initiative* (RDI) is made up of a small research team based in the United Kingdom, an international scientific advisory group, and a network of collaborators and supporters. The main activities of the RDI are exploring the relationship between changes in the genetic code of HIV (genotype), as well as other clinical and laboratory factors and response to HIV drug therapy, on the basis of which computational models are developed to help physicians and their patients select the best individualised combination of drugs in situations where resistance measurements are not available. The developed models power the RDI's HIV Treatment Response Prediction System (HIV-TRePS), a free online tool enabling informed, individualised treatment decision-making.

Papers published by RDI in 2019.

Scientific output in 2019

Scientific output

IN 2019

In 2019, SHM received 5 new requests to make use of SHM's cohort data, of which 3 have been approved. During the year, 40 articles were published in international peer-reviewed journals. In addition, 27 abstracts were accepted for presentation at 18 meetings and conferences (9 posters and 18 oral presentations). An overview of research projects, publications and presentations can be found on our website.

40
peer-reviewed articles

27
abstracts at 18 meetings

Completed research projects

I10021 Characteristics of HIV-1 transmission among men having sex with men in the Netherlands
Ratmann O, van Sighem A, Bezemer D, Reiss P, de Wolf F, Fraser C, Pettersson A, Schutten M, Bierman W.

I14067 Predictive value of cardiovascular risk equations in the HIV-infected population receiving care in the Dutch HIV treatment centers
Wit F, van Zoest R, Vaartjes I, Gras L, Arends J, Reiss P.

I14145 Evaluation of an evidence-based, Internet-supported self-help program for people living with HIV suffering from mild to moderate depressive symptoms
Garnefski N, Kraaij V, Spinhoven P, van Luenen S.

I15021 Global resistance following virologic failure with tenofovir+NNRTI containing antiretroviral regimens: a retrospective multi-centre multi-cohort study and meta-analysis
Rokx C, Gupta R, Rijnders B, Shafer B, Gregson J, Tang M, Hamers R, Raizes E, Crawford K, Marconi V, Hill A, Hosseinipour M, Clumeck N, Kanki P, Lockman S, Rinke de Wit T, Hoffman S, de Oliveira T, Wallis C, Morris L, Hunt G, Dunn D, Blanco JL, Gunthard H, Kumarasamy D, Kaleebu P, Pillay D, Charpentier C, Descamps D, van Damme A, Theys K, Camacho R, Calvez V, Gras L.

I16011 Type of cART regimen and the risk for immune reconstitution and inflammatory syndrome in HIV-1 infected patients. Is integrase inhibitor use an independent risk factor?
Wijting IEA, Wit FWNM, Rokx C, Leyten EMS, Lowe SH, Brinkman K, Bierman WFW, van Kasteren MEE, Postma AM, Bloemen VCM, Bouchtoubi G, Hoepelman AIM, van der Ende ME, Reiss P, Rijnders BJA.

I16091 Longitudinal virological outcomes and factors associated with virological failure in HIV infected young adults in the Netherlands 1996-2016
Weijsenfeld AM, Wit FWNM, Pajkrt D.

I17093 The impact of mutations on the effectiveness of abacavir/lamivudine/dolutegravir regimens prescribed in treatment-experienced patients (The M184V/I – DTG study)
Olearo F, Kouyos R, Bonnet F, Yerly S, Wandeler G, Stoeckle M, Baettig V, Cavassini M, Gayet-Ageron A, Scherrer A, Schmid P, Bucher HC, Günthard H, Böni J, D'Armino A, Zazzi M, Bellecave P, Cazanave C, Daffau P, Rijnders B, Reiss P, Wit F, Calmy A.

Ongoing research projects

I05513 HIV Resistance Response Database Initiative (RDI)

Revell A.

Date of approval: 1 October 2005

The main activities of the RDI during 2019 using ATHENA data were as follows:

The prediction of absolute plasma HIV-1 RNA levels over time after initiation of cART without viral genotypes: with and without time on therapy and baseline CD4 count

Objectives

To develop random forest (RF) models to predict absolute viral load values over time following a switch of antiretroviral therapy due to virological failure:

1. Without the use of a genotype - ANG
2. Without the use of a genotype, time on therapy and baseline CD4 count - ANG(-TOT-CD4)

Methods

1. Data were extracted from the RDI database that conform to all our standard criteria, as published elsewhere, including the date that antiretroviral therapy was first commenced.
2. The data were partitioned at random into a training set (n=56,717 TCEs) and test set (2,856 TCEs).
3. Two committees of 5 random forest (RF) models were developed to predict the absolute follow-up viral load value after a change to antiretroviral therapy.
4. The ANG committee was trained using the current standard variable set including time on treatment time (ToT), the number of days since first antiretroviral therapy was initiated. The ANG(-TOT-CD4)committee had two variables removed: ToT and the baseline CD4 count. A five-way cross validation scheme was employed.
5. The accuracy of each of the committees and models was assessed by performing a correlation between the predicted and actual viral load values at follow-up during cross validation in order to select the most accurate models for the final committee. The same analysis was then employed for the final committee of five models with an independent test set.

Summary of the results from independent testing

During testing with the independent set, the averaged predictions of the ANG committee of 5 models achieved a correlation of 0.68 ($p<0.00001$), $r2 = 0.46$. The mean absolute error was 0.73 log. The ANG(-TOT-CD4) models achieved a slightly reduced correlation of 0.66 ($p<0.00001$), $r2 = 0.44$. The mean absolute error was only slightly increased to 0.75 log.

Conclusions

These new models that do not require a genotype to predict absolute virological response performed well. In independent testing they produced estimates of the viral load following a change to ART that correlated highly significantly with the

ONGOING RESEARCH PROJECTS

observed viral loads. It is encouraging that the ANG models, which included the additional variable of time on therapy, performed with exactly the same accuracy as the existing AG models, which use a genotype. Removal of the time on therapy and baseline CD4 count reduced the accuracy (r) by only 0.02 and increased the mean absolute error by the same amount, from 0.73 to 0.75 (plasma viral load as log10 HIV RNA/ml.

The prediction of virological response after initiation of cART, using viral genotypes, with and without time on therapy: CG, CG(-ToT), AG, AG(-ToT)

Objectives

To develop categorical (C) and absolute (A) random forest (RF) models to predict the probability of virological response following a switch of anti-retroviral therapy due to virological failure:

1. With the use of a genotype CG, AG
2. Without the use time on therapy CG(-ToT), AG(-ToT)

Methods in brief

Data were extracted from the RDI database that conform to all our standard criteria, as published elsewhere, including a baseline genotype and the date that antiretroviral therapy was first commenced.

For each of the four sets of models CG, AG, CG(-ToT), AG(-ToT):

6. Available data were partitioned at random by patient into training (95%) and test (5%) data sets.
7. A committee of 5 RF models was developed to estimate the probability of virological response following a treatment change in the context of virological failure.
8. The models were trained using a 5 x cross validation scheme with the best performing model from each of the 5 partitions being used for the final committee
9. The models were then evaluated by using the baseline data from the test cases to obtain a prediction of response and these predictions compared to the responses observed in the clinic.

Main results of independent testing

CG and CG(-ToT) models

When tested with the independent test cases using the OOP developed in cross validation, the CG models, achieved an AUC of 0.89.
The overall accuracy was 81%, sensitivity 75% and specificity 85%. The CG(-ToT) models achieved an AUC value during testing of 0.90, overall accuracy of 82%, sensitivity of 80% and specificity of 83%.

Genotypic sensitivity scores were generated for the test TCEs using three rules-based genotype interpretation systems in common use: ANRS, REGA and Stanford's HIVdb. These scores were then used as predictors of response or failure and the performance compared to that of the models. The genotype systems achieved AUROC values of 0.64-0.67, compared with 0.89-0.90 using the models. All three genotype inter-pretation systems were significantly poorer at predicting responses than the models ($p<0.00001$).

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AG and AG(-ToT) models
The averaged predictions of the AG models achieved a correlation of 0.74 (p<0.00001), r2 = 0.55. The mean absolute error was 0.69 log10 HIV RNA. The AG(-ToT) models achieved a slightly reduced correlation of 0.72 (p<0.00001), r2 = 0.52. The mean absolute error was 0.70 log10 HIV RNA.

Conclusions
The new classifier models that use the viral genotype amongst the variables in their predictions response achieved the highest performance seen to date. The area under the receiver-operator curve from independent testing of the CG models was 89% and for the CG(-ToT) models was 90% - a milestone in model performance. Sensitivity and specificity were similarly impressive at 75%-80% and 83-85% respectively.

It is interesting that the CG models, which used time on therapy in their predictions produced marginally (not statistically significantly) less accurate predictions than the models that did not use this variable. This is likely to be due to the larger training set available when this variable is not required.

Both sets of models comprehensively outperformed the use of genotypic sensitivity scores as predictors of response.

Turning to the new models developed to predict absolute viral load at follow-up, again the performance was encouraging. Correlations (r) between predicted and actual viral loads were 0.75 and 0.74 for AG and AG(-ToT) during cross validation and 0.74 and 0.72 during independent testing. This is superior to the performance of the recent models trained to predict absolute viral load changes without genotypes, as would be expected.

I08115 Proposal for collaboration and data exchange between HMF and RIVM for national HIV/AIDS surveillance and data transfer to ECDC in the context of EU obligations for reporting on HIV/AIDS
Op de Coul E, de Wolf F, Vlugt J, van Sighem A, van der Sande M.

Date of approval: 2008

Ongoing.

I12045 A HIV-1 genome wide association study to identify viral determinants of HIV-1 plasma concentration (BEEHIVE)
Cornelissen M, Gall A, Vink M, Zorgdrager F, Binters S, Edwards S, Jurriaans S, Ong SH, Bakker M, Gras L, de Wolf F, Reiss P, Kellam P, Berkhout B, Fraser C, van der Kuyl AC.

Date of approval: 12 September 2012

Ongoing.

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I13120 SPREAD Program 3.0 – Surveillance of transmission of HIV-1 drug resistance

Wensing AMJ, Boucher CAB, Brinkman K, Richter C, Bierman WFW, Ende van der ME, M Kasteren van MEE, Hoepelman AIM, Hofstra M.

Ongoing.

I14065 Incidence of hepatocellular carcinoma in HIV/HBV co-infected patients: Implications for screening strategies

Wandeler G, Rauch A, Reiss P, Smit C, van der Valk M, Arends J.

Date of approval: 4 May 2014

Background: Robust data on hepatocellular carcinoma (HCC) incidence among HIV/hepatitis B virus (HBV)-coinfected individuals on antiretroviral therapy (ART) are needed to inform HCC screening strategies. We aimed to evaluate the incidence and risk factors of HCC among HIV/HBV-coinfected individuals on tenofovir disoproxil fumarate (TDF)-containing ART in a large multi-cohort study.

Methods: We included all all HIV-infected adults with a positive hepatitis B surface antigen test followed in 4 prospective European cohorts. The primary outcome was the occurrence of HCC. Demographic and clinical information was retrieved from routinely collected data, and liver cirrhosis was defined according to results from liver biopsy or non-invasive measurements. Multivariable Poisson regression was used to assess HCC risk factors.

Results: A total of 3,625 HIV/HBV-coinfected patients were included, of whom 72% had started TDF-containing ART. Over 32,673 patient-years (py), 60 individuals (1.7%) developed an HCC. The incidence of HCC remained stable over time among individuals on TDF, whereas it increased steadily among those not on TDF. Among individuals on TDF, the incidence of HCC was 5.9 per 1,000 py (95% CI 3.60–9.10) in cirrhotics and 1.17 per 1,000 py (0.56–2.14) among non-cirrhotics. Age at initiation of TDF (adjusted incidence rate ratio per 10-year increase: 2.2, 95% CI 1.6–3.0) and the presence of liver cirrhosis (4.5, 2.3–8.9) were predictors of HCC. Among non-cirrhotic individuals, the incidence of HCC was only above the commonly used screening threshold of 2 cases per 1,000 py in patients aged >45 years old at TDF initiation.

Conclusions: Whereas the incidence of HCC was high in cirrhotic HIV/HBV-coinfected individuals, it remained below the HCC screening threshold in patients without cirrhosis who started TDF aged <46 years old.

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I15004 The impact of combinations of strategies for HIV prevention among men who have sex with men

Reitsema M, van Hoek AJ, Mangen MJ,
van Benthem B, Wallinga J, van Sighem A,
Schim van der Loeff M, Xiridou M.

Date of approval: 28 January 2015

Background: In the Netherlands, men who have sex with men (MSM) account for most new HIV diagnoses. Despite the availability of successful treatment, there is still ongoing transmission. To control HIV, several preventive measures are being considered or employed, such as increased HIV testing and pre-exposure prophylaxis (PrEP). We assessed the impact of these measures on HIV transmission and their cost-effectiveness. To investigate the impact of HIV prevention measures on the transmission of other sexually transmitted infections (STIs), we examined also the transmission of *N. gonorrhoeae* (NG) in the model.

Methods: We developed an individual based model that describes the formation of sexual relationships between MSM and the transmission of HIV and NG. Parameters relating to sexual behaviour were estimated from data from the Amsterdam Cohort Study and the Network Study among MSM in Amsterdam. Parameters relating to HIV progression were estimated from data from Stichting HIV Monitoring (SHM). Frequency of HIV/STI testing was estimated from data of the national database of STI clinics in the Netherlands. The model was calibrated to data on HIV diagnoses from SHM and gonorrhoea positivity rates from STI clinics. In the model, we assumed that from 2015 onwards, all HIV treatment centers in the Netherlands follow the new guidelines for immediate initiation of cART after diagnosis. Data on medication consumption for those choosing event-driven PrEP were obtained from the Amsterdam PrEP Project (AMPrEP).

Subsequently, we developed an economic model. Direct healthcare costs were calculated using an activity-based costing approach and included costs of medical consultations, costs for laboratory tests, and cART medication. For the PrEP programmes, we included costs of PrEP medication and costs of PrEP monitoring every three months. Effects of the interventions were expressed in quality-adjusted life-years (QALY) gained. The incremental cost-effectiveness ratio (ICER) was calculated, showing the additional costs per QALY gained with the intervention, compared to the current situation. Costs were expressed in 2016 Euros. According to Dutch guidelines, costs were discounted by 4% and effects by 1.5%. The analyses were carried out from a healthcare payer perspective, considering only healthcare costs relating to HIV testing and HIV care.

Results: Criteria for PrEP eligibility in the model follow the recent Dutch guidelines on PrEP use. We examined several scenarios of how a nationwide PrEP program could be implemented. We examined PrEP programs with or without risk

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compensation, in the form of reduced condom use. With PrEP, the HIV incidence rate was reduced from 0.192 infections per 100 PY in 2017 to 0.092 per 100 PY in 2027, assuming no risk compensation, or to 0.083 per 100 PY with risk compensation. The prevalence of gonorrhoea was also reduced due to PrEP; with risk compensation, gonorrhoea prevalence was higher than that without risk compensation. A PrEP program without risk compensation resulted in 1,482 QALYs gained and €12.3 million less costs than the current situation without PrEP, making the PrEP program cost-saving. PrEP with risk compensation resulted in 1,380 QALYs gained and €1.0 million less costs, and an average ICER of €1,925 per QALY gained. Furthermore, from AMPrEP data, it was estimated that 27% of PrEP users prefer event-driven PrEP and they use half of the amount of PrEP pills used by users of daily PrEP. With a PrEP programme offering only daily PrEP, the costs of PrEP medication over the period 2018-2027 were calculated at €22 million. With a programme offering a choice of daily or event-driven PrEP, the costs of PrEP medication over 2018-2027 were calculated at €19 million. The mean ICER of daily and event-driven PrEP was €217 per QALY gained, compared to daily PrEP.

Conclusions: Our analyses indicate that PrEP for high-risk MSM can be cost-effective even with moderate levels of risk compensation. Moreover, offering a choice of daily and event-driven PrEP can be cost-effective compared to offering only daily PrEP.

I15040 Monitoring recent HIV infections in the Netherlands: implementation of Recent Infection Testing Algorithm (RITA) into routine HIV surveillance

Slurink I, van de Baan F, van Sighem A, van Dam A, van de Laar T, de Bree G, van Benthem B, Op de Coul E for the Amsterdam RITA study group.

Date of approval: September 2015

Background: Surveillance of recently acquired HIV infections (RHI) based on a biomarker-assay has been implemented at Dutch sexual health centres since 2014, but insight in the attribution of other HIV test locations in identifying RHI is lacking in the Netherlands. For a pilot region, we studied the added value of this assay for RHI on specimens collected via HIV treatment centres for surveillance and prevention purposes.

Methods: In 2016-2017, leftover specimens from newly diagnosed HIV patients in care (2013-2015) in the Amsterdam region were tested with an avidity assay. Avidity Index (AI) values were AI≤0.80 for recent infection (acquired ≤6 months prior to diagnosis), and AI>0.80 (acquired >6 months) for established infection. The ECDC algorithm for RHI was applied to correct for false recency. Multivariable logistic regression analysis was used to identify factors associated with having a RHI among men who have sex with men (MSM).

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Results: In total, 447 specimens were tested with the avidity assay; 72% from MSM. Proportions of RHI were 20% among MSM and 10% among heterosexuals. Sexual health centres identified highest percentages of RHI (27%), followed by GPs (15%), hospitals (5%) and other/unknown locations (11%)(p<.001). In a multivariable model for MSM, test location was the only factor significantly associated with RHI. Recency based on avidity testing varied considerably from recency based on epidemiological data only.

Conclusions: Sexual health centres identify most RHI infections compared to other test locations, as they serve high risk populations and offer frequent HIV testing among MSM. The use of the avidity assay for surveillance purposes may help targeting prevention programs, but it lacks robustness and its added value may decline with improved, repeat HIV testing and data collection on testing history.

I15066 Cost-effectiveness of HIV treatment and care in the Netherlands

Popping S, Verbon A, Nichols BE, Versteegh L, Boucher C, Vijver van de D, Geerlings S, Reiss P, Sighem van A, Kroon FP, Brinkman K.

Date of approval: 24 June 2015

Background: People living with HIV (PLWH) have a similar live expectancy than HIV uninfected people, due to good antiretroviral therapy. Subsequently, health- related quality of life (HrQoL) becomes more important. Therefore, HrQoL is an acknowledged treatment objective in HIV-care.

Additionally, cost-effectiveness analyses can be used to provide the most health benefits at the lowest costs. Quality adjusted life years (QALYs), are key in assessing health benefits in a cost-effectiveness analysis. Unfortunately, QALYs for HIV-infected individuals available in literature are outdated and obtained at a time when antiretroviral drugs were more toxic and CD4 treatment thresholds were low.

The first part of this study aims to measure HrQoL using the validated EuroQol-5-dimension questionnaire (EQ-5D-5L) among HIV-positive individuals. The EQ-5D-5L can directly be converted into a utility score which can be used to calculate QALYs. We will assess the HrQoL among different groups of people living with HIV (PLWH).
In the second part of the study the calculated QALY scores will be combined with cost and clinical data to assess the cost effectiveness of HIV care.

The third part of the study aims to assess the additional cost of late presenters in HIV care. In Europe, as many as 50% of HIV-positive individuals present late to care. Late presentation is associated with high morbidity from AIDS-defining malignancies and opportunistic infections which may substantially increase the cost of care.

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Methods: To measure the HrQoL, a longitudinal observational study was initiated at the Erasmus Medical Centre outpatient clinic. All HIV-positive adults were eligible to fill out the EQ-5D-5L questionnaire during their doctors' appointment. Patients were approached in the time period from June 2016 until December 2018. In addition, since December 2018, patients, who consented to the electronically study, have received an email with a personal link to the online EQ-5D-5L. The gemstracker software, facilitated by the Erasmus MC, is used to send out and collect the EQ-5D-5L questionnaires.

All collected HrQoL scores are combined with clinical data, using the SHM cohort. We combined the data from the Netherlands with data from the UK in order to look at country specific differences and predictors of a lower HrQoL. We assessed the HrQoL difference between different patient groups and compared PLWH with the general population.

For the second part of our study we calculated QALYs using the Dutch value set for the EQ-5D-5L. Calculated QALY scores will be combined with costs.

For the third part of the study, we used SHM data from individuals who first initiated ART between 1 July 2013 and 1 July 2014 to investigate the short- and long-term cost of late presenters. Costs of ART, hospitalization, outpatient visits, co-medication and HIV-laboratory tests were calculated. Factors independently associated with high non-ART costs, were determined by multivariable logistic regression, including parameters with P<0.1 from the univariable analysis.

Results: Preliminary; In total, 5,338 people with HIV are included, 916 from NL and 4,422 from the UK. The NL single centre sample is representative of the Dutch HIV population. In NL, the mean QoL is 0.86 and comparable to the Dutch general population (0.87), while in the UK a significantly lower 0.83 QoL (ß:-0.03,95%CI: -0.04 to -0.02) is reported among people with HIV, not comparable to the UK general population (0.86). Both HIV populations consist predominantly of males (77% NL; 72% UK), reflecting MSM as main transmission route (60% NL; 54% UK). Additionally, in both countries half of the participants are migrants and participants are on average 49.5 and 48.1 years in NL and the UK, respectively. drivers of lower QoL are anxiety/depression (50% UK; 34% NL) and pain/discomfort (46% UK; 36% NL). Additional analysis are ongoing.

We are currently compiling a combined dataset with clinical data, QALYs and cost. Further analyses will be following in a timely manner.

For the third part of the study: 1344 PLWH remained for further analysis, which were divided in 844 (65%) timely presenters, 273 (21%) late presenters, and 179 (14%) with an advanced HIV disease. Most PLWH in the Netherlands are males, which did not differ between the time of presentation (p=0.07) (Table 2). Patients mostly entered care in the age

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group of 40-60. Interestingly, elderly PLWH (>60) presented more often with an advanced HIV-disease, whereas younger (<40) people tended to present in early stage of the disease (p<0.001).

The main route of transmission in the Netherlands is MSM, however strikingly, PLWH that acquired the infection via heterosexual contact, presented more often with advanced HIV-disease (p<0.001).

The total cost for HIV-care in the Netherlands in the first year of ART is €17.2 million, divided in €12.2 million for ART (71%) and €5.1 million for non-ART costs (29%). *Additional analysis are ongoing.*

Conclusions: Along with life expectancy, HrQoL of people with HIV is good and approaching that of the general population in two European countries. Elderly PLWH presented more often with an advanced HIV-disease. Over 70% of the total cost for HIV-care in the first year on ART is due to ART use

I16060 Evaluation of dolutegravir use in the treatment of HIV in the Netherlands: focus on switchers and adverse events
Bollen P, Hakkers CS, Boender TS, van Crevel R, Brouwer AE, Hoepelman AIM, Reiss P, Wit FNMW, Arends JE, Burger D.

Date of approval: 30 August 2016

Ongoing.

I17095 Evaluation of diagnosis, referral and treatment of acute HIV-1 infection at the Amsterdam STI clinic: trends over time
Dijkstra M, van Rooijen MS, Hillebregt MM, van Sighem AI, Smit C, Hogewoning A, Davidovich U, Heijman E, Hoornenborg E, Reiss P, van der Valk M, Prins M, Prins JM, Schim van der Loeff M, de Bree GJ on behalf of the HIV Transmission Elimination Amsterdam (H-TEAM) initiative.

Date of approval: 24 November 2017

Background: Men who have sex with men (MSM) with acute HIV infection (AHI) are a key source of new infections. To curb transmission we implemented at the Amsterdam sexually transmitted infection (STI) clinic in August 2015 a trajectory for increased AHI awareness, rapid diagnosis of AHI with point-of-care HIV-RNA testing in MSM, and referral for immediate cART initiation. We assessed the AHI trajectory's effectiveness in diagnosing AHI and decreasing the time to viral suppression.

Methods: We included 63,278 HIV testing visits in 2008-2017, during which 1,013 MSM were 9 diagnosed with HIV at the Amsterdam STI clinic. Proportions of AHI diagnoses were assessed 10 before and after implementation of the AHI trajectory. Time from diagnosis to viral suppression 11 was compared for three periods during which guidelines for cART initiation had changed: (1) January 2008-December 2011: standard of care (SOC) to initiate cART if CD4<500 cells/mm^3 12 ; (2) January 2012-July 2015:

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SOC to initiate cART if CD4<500 cells/mm^3 or irrespective of CD4 count in case of AHI or early HIV infection; (3a) August 2015-June 2017: SOC to initiate cART universally; and (3b) August 2015-June 2017: the AHI trajectory.

Findings: Before implementation of the AHI trajectory, the proportion of AHI of all HIV diagnoses was 0·6% (5/876); after implementation this was 11·0% (15/137). Median time from diagnosis to viral suppression during period 1, 2, 3a, and 3b was 584 (IQR, 267-1065), 230 (IQR, 19 132-480), 95 (IQR, 63-136), and 55 (IQR, 31-72) days, respectively (p<0.001).

Interpretation: Implementing the AHI trajectory was successful in improving recognition of AHI and significantly decreasing the time between HIV diagnosis and viral suppression, when compared to standard of care. This may have contributed to the current decline in HIV incidence among MSM in Amsterdam.

I18098 Geospatial analyse and mapping of new HIV diagnoses, late presentations and testing practices in Amsterdam – "het GIS project" within the H-TEAM initiative
De Bree G, Prins M, Boehnke L., Bozzacchi C, Reiss P, Heidenrijk M, van Bergen J, van Sighem A, van Rooijen M, Kroone M, Groot-Bruinderink M, Ratmann O, op de Coul E.

Date of approval: 11 September 2018

Ongoing.

I19100 HIV treatment outcomes of transgender people versus the general HIV-positive population in the Netherlands
Daans C, Hoornenborg E, den Heijer M, Prins M.

Date of approval: 14 oktober 2019

Ongoing.

I19101 Hepatitis C Virus incidence among men who have sex with men in Amsterdam before and after introduction of direct acting antivirals
Koops J, Schinkel J, van der Valk M, Prins M, Smit C, Boyd A.

Date of approval: 9 april 2019

Ongoing.

Publications

IN 2019

ATHENA

Compliance with laboratory monitoring guidelines in outpatient HIV care: a qualitative study in the Netherlands
Toxopeus DCM, Pell CL, Westrhenen NB, Smit C, Wit FWNM, Ondoa P, Reiss P, Boender TS.
AIDS Care. 2019 Jan 2:1-8. doi: 10.1080/09540121.2018.1563280. [Epub ahead of print]

Incidence of a first thrombotic event in people with HIV in the Netherlands: a retrospective cohort study
Borjas Howard JF, Rokx C, Smit C, Wit FWNM, Pieterman ED, Meijer K, Rijnders B, Bierman WFW, Vladimir Tichelaar YIG, on behalf of ATHENA observational HIV cohort investigators.
The Lancet HIV, published online February 15 2019; OI:https://doi.org/10.1016/S2352-3018(18)30333-3

Evaluating progress towards triple elimination of mother-to-child transmission of HIV, syphilis and hepatitis B in the Netherlands
Visser M, van der Ploeg CPB, Smit C, Hukkelhoven CWPM, Abbink F, van Benthem BHB, Op de Coul ELM.
BMC Public Health. 2019 Mar 29;19(1):353. doi: 10.1186/s12889-019-6668-6.

Incidence of hepatocellular carcinoma in HIV/HBV-coinfected patients on tenofovir therapy: Relevance for screening strategies
Wandeler G, Mauron E, Atkinson A, Dufour JF, Kraus D, Reiss P, Peters L, Dabis F, Fehr J, Bernasconi E, van der Valk M, Smit C, Gjærde LK, Rockstroh J, Neau D, Bonnet F, Rauch A; Swiss HIV Cohort Study, Athena Observational Cohort Study, EuroSIDA, ANRS CO3 Aquitaine Cohort.
J Hepatol. 2019 Apr 6. pii: S0168-8278(19)30226-0. doi: 10.1016/j.jhep.2019.03.032. [Epub ahead of print]

Progression of liver fibrosis following acute hepatitis C virus infection in HIV-positive MSM
Newsum AM, Kooij KW, Boyd A, Smit C, Wit FWNM, van der Meer JTM, Prins M, Reiss P, van der Valk M; MOSAIC study group, ATHENA observational HIV cohort and NVHB-SHM hepatitis working group.
AIDS. 2019 Apr 1;33(5):833-844

Neurocognitive development in perinatally HIV-infected adolescents on long-term treatment compared to healthy matched controls: a longitudinal study
Van den Hof M, Ter Haar AM, Scherpbier HJ, van der Lee JH, Reiss P, Wit FWNM, Oostrom KJ, Pajkrt D.
Clin Infect Dis. 2019 May 18. pii: ciz386. doi: 10.1093/cid/ciz386. [Epub ahead of print]

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Longitudinal virological outcomes and factors associated with virological failure in behaviourally HIV-infected young adults on combination antiretroviral treatment in the Netherlands, 2000-2015
Weijsenfeld AM, Blokhuis C, Stuiver MM, Wit FWNM, Pajkrt D; ATHENA observational HIV cohort.
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Incidence and risk factors for invasive pneumococcal disease and community-acquired pneumonia in human immunodeficiency virus-infected individuals in a high-income setting
Garcia Garrido HM, Mak AMR, Wit FWNM, Wong GWM, Knol MJ, Vollaard A, Tanck MWT, Van Der Ende A, Grobusch MP, Goorhuis A.
Clin Infect Dis. 2019 Oct 21. pii: ciz728. doi: 10.1093/cid/ciz728.

Moderators of the effect of guided online self-help for people with HIV and depressive symptoms
Van Luenen S, Kraaij V, Spinhoven P, Dusseldor, E, Garnefski N.
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Lower IQ and poorer cognitive profiles in treated perinatally HIV-infected children is irrespective of having a background of international adoption
Van den Hof M, Ter Haar AM, Scherpbier HJ, Reiss P, Wit FWNM, Oostrom KJ, Pajkrt D
PLoS One. 2019 Dec 5;14(12):e0224930. doi: 10.1371/journal.pone.0224930. eCollection 2019.

Immune reconstitution inflammatory syndrome in HIV late presenters starting integrase inhibitor containing antiretroviral therapy
Wijting IEA, Wit FWNM, Rokx C, Leyten EMS, Lowe SH, Brinkman K, Bierman WFW, van Kasteren MEE, Postma AM, Bloemen VCM, Bouchtoubi G, Hoepelman AIM, van der Ende ME, Reiss P, Rijnders BJA; ATHENA national observational HIV cohort.
EClinicalMedicine. 2019 Dec 13;17:100210. doi: 10.1016/j.eclinm.2019.11.003. eCollection 2019 Dec.

Impact of the M184V/I mutation on the efficacy of abacavir/lamivudine/dolutegravir therapy in HIV treatment-experienced patients
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AGE$_h$IV / COBRA

Predictive performance of cardiovascular disease risk prediction algorithms in people living with HIV

Van Zoest RA, Law M, Sabin CA, Vaartjes I, Van Der Valk M, Arends JE, Reiss P, Wit FW.

J Acquir Immune Defic Syndr. 2019 Apr 23. doi: 10.1097/QAI.0000000000002069. [Epub ahead of print]

Validation of a Novel Multivariate Method of Defining HIV-Associated Cognitive Impairment

Underwood J, De Francesco D, Cole JH, Caan MWA, van Zoest RA, Schmand BA, Sharp DJ, Sabin CA, Reiss P, Winston A; COmorBidity in Relation to AIDS (COBRA) Collaboration and the Pharmacokinetic and clinical Observations in PePle over fiftY (POPPY) Study Group.

Open Forum Infect Dis. 2019 May 3;6(6):ofz198. doi: 10.1093/ofid/ofz198. eCollection 2019 Jun.

aMASE

Disparities in access to and use of HIV-related health services in the Netherlands by migrant status and sexual orientation: a cross-sectional study among people recently diagnosed with HIV infection

Bil JP, Zuure FR, Alvarex-del Arco D, Prins JM, Brinkman K, Leyten E, van Sighem A, Burns F, Prins M.

BMC Infect Dis 19, 906 (2019) doi:10.1186/s12879-019-4477-2.

ART-CC

Albumin, white blood cell count, and body mass index improve discrimination of mortality in HIV-positive individuals

Tate JP, Sterne JAC, Justice AC; Veterans Aging Cohort Study (VACS) and the Antiretroviral Therapy Cohort Collaboration (ART-CC).

AIDS. 2019 Apr 1;33(5):903-912. doi: 10.1097/QAD.0000000000002140.

COHERE

Long-term virological suppression on first-line efavirenz + tenofovir + emtricitabine / lamivudine for HIV-1

Long-Term Virological Suppression Working Group for the Collaboration of Observational HIV Epidemiological Research Europe (COHERE) in EuroCoord.

AIDS. 2019 Mar 15;33(4):745-751. doi: 10.1097/QAD.0000000000002126.

Low compliance with hepatocellular carcinoma screening guidelines in hepatitis B/C virus co-infected HIV-patients with cirrhosis

Willemse S, Smit C, Sogni P, Sarcletti M, Uberti-Foppa C, Wittkop L, Raben D, D'Arminio Monforte A, Dabis F, Van Der Valk M; Hepatocellular Carcinoma Screening Project Working Group for the Collaboration of Observational HIV on behalf of Epidemiological Research Europe (COHERE) In EuroCoord.

J Viral Hepat. 2019 May 28. doi: 10.1111/jvh.13146. [Epub ahead of print]

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D:A:D

Serious clinical events in HIV-positive persons with chronic kidney disease (CKD)
Ryom L, Lundgren JD, Law M, Kirk O, El-Sadr W, Bonnet F, Weber R, Fontas E, Monforte AD, Phillips A, Reiss P, de Wit S, Hatleberg CI, Sabin C, Mocroft A; D:A:D study group.
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Predictors of ischaemic and haemorrhagic Strokes among People Living with HIV: the D:A:D international prospective multicohort study
Hatleberg CI, Ryom L, Kamara D, De Wit S, Law M, Phillips A, Reiss P, D'Arminio Monforte A, Mocroft A, Pradier C, Kirk O, Kovari H, Bonnet F, El-Sadr W, Lundgren JD, Sabin C for the D:A:D Study Group.
EClinicalMedicine. 2019 Aug 11;13:91-100. doi: 10.1016/j.eclinm.2019.07.008.

ECDC

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Presentations

IN 2019

ORAL PRESENTATIONS

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21st Bangkok International Symposium on HIV Medicine, Bangkok, Thailand, 16-18 January 2019

Introductions and transmission of different HIV-1 subtypes in the Netherlands
Bezemer D.
AIGHD Research Meeting, Amsterdam, the Netherlands, 1 February 2019

Introductions and transmission of different HIV-1 subtypes in the Netherlands
Bezemer D.
Virology Seminars, Amsterdam UMC, AMCsite , Amsterdam, the Netherlands, 21 February 2019

ECDC HIV Modelling Tool
van Sighem A.
ECDC/UNAIDS/WHO Regional Workshop for Europe HIV Estimates Workshop, Stockholm, Sweden, 20-22 March 2019

TasP effect from unrestricted DAA access suggested by trends in HCV incidence among the HIV-infected population in care in the Netherlands, on behalf of the ATHENA observational cohort
Smit C.
23rd International Workshop on HIV and Hepatitis Observational Databases, Athens, Greece, 28-30 March 2019

Introductions and transmission of different HIV-1 subtypes in the Netherlands
Bezemer D.
RIVM Meeting on HIV/STI Modelling Bilthoven, the Netherlands, 4 April 2019

HIV in de regio
van Sighem A.
Eerste GGD-dag "NL naar 0 nieuwe hiv-infecties", Utrecht, the Netherlands, 10 April 2019

Effectiviteit van een begeleide online zelfhulp interventie voor mensen met hiv en depressieve klachten
Van Luenen S, Kraaij V, Spinhoven P, Garnefski N.
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HIV transmission dynamics in the Netherlands - A combined mathematical model and phylogenetic analysis
Bezemer D.
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Living positive: The effectiveness and implementation of a guided online intervention for people with HIV and depressive symptoms
Van Luenen S, Kraaij V, Garnefski N.
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Gaten in het hiv-zorgcontinuüm
van Sighem A.
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Targeted screening and immediate start of treatment for acute HIV infection decreases time between HIV diagnosis and viral suppression among MSM at a Sexual Health Clinic in Amsterdam
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Wit, FWNM.
NVHB symposium: "Vrouwen met HIV- wat maakt ze bijzonder?, Utrecht, the Netherlands, 3 October 2019

Follow-up in de postpartum periode [Follow-up in the post-partum period]
Smit C.
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Highlights from the 2019 HIV Monitoring Report
van Sighem A, Boyd A, Smit C, Wit F.
12 th Netherlands Conference on HIV Pathogenesis, Epidemiology, Prevention and Treatment, Amsterdam, the Netherlands, 13 November 2019

Sexual behaviour and perceived risk of HIV between 1999 and 2018 among men who have sex with men in Amsterdam, the Netherlands
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Offering a choice of daily and event-driven PrEP for MSM: a cost-effectiveness analysis
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Impact and determinants of comorbidity clusters in people living with HIV
De Francesco D, Verboeket SO, Underwood J, Wit FW, Bagkeris E, Mallon PWG, Winston A, Reiss P and Sabin CA for the POPPY study group.
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Variability in cognitive impairment over time in people with HIV and matched controls
De Francesco D, Sabin CA , Underwood J, Gisslen M, Wit FW, van Zoest RA, Schouten J, Geurtsen G, Schmand B, Portegies P, Reiss P and Winston A for the Co-morBidity in Relation to AIDS (COBRA) collaboration.
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Cognitive development in perinatally HIV-infected children on long-term treatment compared to healthy matched controls: a longitudinal cohort study
Van den Hof M, ter Haar AM, Scherpbier J, van der Lee JH, Reiss P, Wit FWNM, Oostrom KJ, Pajkrt D.
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HIV infection and risk of recurrent venous thromboembolism: a national cohort study
Rokx C, Borjas Howard J, Smit C, Wit F, Pieterman ED, Cannegieter S, Lijfering W, Meijer K, Reiss P, Bierman W, Tichelaar V, Rijders B.
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Estimating population characteristics at the time of acquiring HIV
van Sighem A, Op de Coul E, Reiss P, for the ATHENA national observational HIV cohort.
23rd International Workshop on HIV and Hepatitis Observational Databases, Athens, Greece, 28-30 March 2019

PRESENTATIONS IN 2019

Cost-effectiveness of pre-exposure prophylaxis in MSM with event-driven and daily regimens
Reitsema M, Van Hoek AJ, Xiridou M, Wallinga J, Van Benthem B, Van Sighem A, Schim Van Der Loeff M, Prins M, Hoornenborg E.
STI & HIV 2019 World Congress, Vancouver, Canada, 14-17 July 2019

Estimating the HIV epidemic on a local level: the HIV care continuum in Amsterdam
van Sighem A, de Bree G, Op de Coul E, Hoornenborg E, Zuilhof W, Geerlings S, van Bergen J, Prins M, Reiss P, on behalf of the HIV Transmission Elimination AMsterdam (H-TEAM) initiative.
International Fast-Track Cities HIV conference, London, UK, 9-11 September 2019

Excellent quality of life among people living with HIV in the Netherlands
Popping S, Stempher E, Nichols BE, Versteegh L, van de Vijver DAMC, van Sighem A, Boucher CAB, Verbon A.
12th Netherlands Conference on HIV Pathogenesis, Epidemiology, Prevention and Treatment, Amsterdam, the Netherlands, 13 November 2019

Financial report

Income

In 2019, SHM's total income was €4,028,570. The majority of this income came from the structural institute grant for HIV monitoring in the Netherlands that is awarded each year to SHM by the Centre for Infectious Disease Control Netherlands of the National Institute for Public Health and Environment (*Centrum Infectieziektenbestrijding, Rijksinstituut voor Volksgezondheid en Milieu*, RIVM-CIb), on behalf of the ministry of Health, Welfare and Sport (*Ministerie van Volksgezondheid Welzijn en Sport*, VWS).

In 2019, the total institute grant awarded for main activities A and B (ACS) amounted to €3,793,531. During the course of 2019, the wage-sensitive part of both components of the institute grant was increased by 4.42%, equivalent to €90,817. Of this, €36,526 was allocated to main activity B, and the remaining €54,291 to HIV monitoring in the Netherlands, main activity A.

In addition, SHM participates in various national and international scientific collaborations involving observational cohort studies for which additional funding and contributions are received.

STRUCTURAL INSTITUTE GRANT FOR HIV MONITORING IN THE NETHERLANDS

SHM is a ministry of VWS-recognised healthcare institute with a structural institute grant (RIVM-CIb grants framework). The grant for monitoring HIV in the Netherlands was set at €3,793,531 for 2019. Together with the above mentioned wage-sensitive increase of €90,817, the total institute grant for monitoring HIV in the Netherlands will amount to €3,884,348 (main activities A and B).

The RIVM officially established the final amount for the 2018 institute grant on 21 February 2020. As of 31 December 2018, the approved deferred VWS grant revenue stood at €379,353.

The deferred VWS grant revenue on 31 December 2019 amounts to €388.435.

STRUCTURAL INSTITUTE GRANT FOR THE AMSTERDAM COHORT STUDIES (MAIN ACTIVITY B)

Since 1984, the ACS have been carrying out multidisciplinary research into the epidemiology, psychosocial determinants, natural course and pathogenesis of HIV-1 infection and, more recently, other blood-borne and sexually-transmitted diseases. The collaborating institutes, including the Academic Medical Center (AMC) in Amsterdam, the Public Health Service of Amsterdam

INCOME

(*Geneeskundige en Gezondheidsdienst*, GGD Amsterdam), and SHM, make use of data and body samples provided by HIV-1 positive individuals and people at high risk of acquiring HIV. Following approval of research proposals that involve collaboration with one or several ACS partners, external parties can also gain access to the data and stored body samples.

The ACS' annual structural institute grant amount to €500,000 and after indexation in 2019 in total €536,526. In addition, the collaborating institutes within the ACS make a contribution to the coordination, management and financial management costs. GGD Amsterdam and the AMC each contribute individually to the storage of patient data and samples.

HIV MONITORING-RELATED COLLABORATIONS: GRANTS AND FINANCIAL CONTRIBUTIONS

SHM's participation in international and national collaborations is highly important for both individual patients and quality of care. Individual registration and monitoring programmes (such as SHM) are often too small to adequately address certain questions regarding individual comorbidities and prognosis associated with large-scale HIV treatment. Collaborations that combine data from various cohorts make it possible to answer questions that cannot be addressed by individual cohorts, and are also an efficient way of providing more reliable insight into the long-term effects of HIV treatment.

As such, participation in national and international studies is fully in line with SHM's mission and objectives.

In 2019, SHM received €119,000 as income from HIV monitoring-related collaborations.

In 2019, SHM contributed to the following scientific collaborations:

1. European Centre for Disease Prevention and Control (ECDC)

The ECDC framework contract, which is divided into three parts, continued in 2019 and runs through to May 2022. A total sum of €72,380 has been reserved for SHM, €9,900 of which can be allocated to the 2019 financial year.

2. Comorbidity and Ageing with HIV (AGE_hIV)

In 2019 SHM received a sum of €33,937 from the AGE_hIV study. This study aims to describe the incidence and prevalence of a wide range of comorbidities and known associated risk factors in ageing HIV-positive individuals compared with HIV-negative individuals. SHM plays an important role in this study, which is coordinated by the Amsterdam Institute for Global Health and Development (AIGHD) at Amsterdam UMC, AMC site.

INCOME

3. EuroSIDA and RESPOND study

IIn 2019, SHM supplied data for EuroSIDA and the RESPOND study, for which we have not received a contribution. This will be realized in 2020.

4. Hepatitis C pilot

As a pilot, SHM coordinates data collection focusing on the effectiveness of modern HCV treatments in people with HCV but without HIV, in a limited number of Dutch treatment centers with a significant volume of such patients

5. Other collaborations

SHM charged personnel costs (€5,937) relating to training and support to Stichting Rode Kruis Bloedbank in Curaçao. Personnel costs of €5,275 were also charged to AIGHD for data management work relating to the HIV Transmission Elimination Amsterdam (H-TEAM) initiative.

OTHER INCOME

In total, SHM received €24,975 from other sources of income. This sum represented compensation for SHM's contribution to organising the NCHIV 2019 conference.

Expenditure

In 2019, SHM's total expenses were €4,259,616. Three main expense categories for 2019 are outlined below:

1. PERSONNEL COSTS

A substantial portion of SHM's expenses comprises personnel costs. In 2019, personnel costs once again represented the largest expense for SHM at €2,476,658, equivalent to 58.14% of the total expenditure. As per 31 December 2019, SHM had a total of 45 employees (with an average of 35.15 full-time equivalents [FTEs]). This number does not include employees of HIV treatment centres that carry out their own data collection and data entry and for which the treatment centres receive a payment from SHM.

2. MATERIAL COSTS

In 2019, material costs amounted to €804,011 and comprised license and maintenance costs for the national HIV monitoring database, housing costs, administration and consultancy costs, and other operational costs.

3. PAYMENTS

Amsterdam Cohort Studies payment

SHM will transfer the RIVM funding earmarked for the ACS (€500,000) and the wage-sensitive increase of €36,526 to GGD Amsterdam and the AMC.

Payments to HIV treatment centres

SHM employees now carry out data collection and entry for 16 treatment centres. In 2019, SHM paid the remaining HIV treatment centres that carry out their own data collection and entry of data into SHM's database a sum of €54.29 per patient per year, based on the number of patients in active follow up on 31 December 2018. In 2019, a number of these hospitals requested data collection assistance from SHM. The associated costs were deducted from the payment made by SHM to the hospitals in question for patient data collection and entry. In addition, HIV treatment centres received a sum as a contribution towards the costs of collecting and storing patients' plasma.

In 2019, SHM paid HIV treatment centres a total of €506,582 for patient data collection and entry and for storage of patients' samples. An amount of €64,161 was deducted from the above-mentioned sum for the assistance in data collection provided by SHM employees.

Operating result

The operating result (€-231,718) indicates that the total costs in 2019 exceeded SHM's income. The depreciation charges associated with the development of the new data entry system, DataCapTree, (€236,824) will be deducted from the designated reserve earmarked for this project. A sum of €9,082 will be added to the deferred grant revenue, bringing this reserve to its maximum of 10% of the institute grant (€388,435). The remainder of the operating result will be deducted from the general reserve.

RESERVES

SHM's total financial reserves (i.e., the deferred grant revenue, eligible costs reserve, general reserve, and designated reserve) amounted to €3,449,222 on 31 December 2019.

1. Deferred VWS grant reserve

As of 31 December 2019, the accumulated deferred grant revenue had reached the maximum permitted amount of 10% of the awarded institute grant and amounted to €388,435. The deferred grant revenue is intended to guarantee operational continuity over a certain period of time.

2. Eligible costs reserve

From 2002 through 2007, SHM built an eligible reserve of €382,206. This sum arose through financing from the Healthcare Tariffs Board (Tarieven Gezondheidszorg) and, later, the Dutch Healthcare Authorities (Nederlandse Zorgautoriteit). In 2020, SHM intends to release this reserve to the general reserve.

3. Designated reserve

In 2019, depreciation costs for the DataCapTree IT project (€236,824) were charged against the designated reserve. Consequently, as per 31 December 2019, the designated reserve earmarked for this project amounted to €826,446.

4. General reserve

The general reserve is not earmarked for a specific purpose and, on 31 December 2019, amounted to €1,852,135.

CONTINGENCY RESERVE AS OF 31 DECEMBER 2019

To cover the financial obligations and risks, SHM must have a sufficiently large contingency reserve. The governing board has decided that, based on SHM's obligations and risks, the target necessary for the contingency reserve should be €1.4 million.

Balance sheet

AFTER APPROPRIATION OF PROFITS

Assets	31-Dec-19 (€)	31-Dec-18 (€)
Fixed assets		
Intangible fixed assets	719,563	956,387
Tangible fixed assets	25,237	17,156
Total fixed assets	**744,800**	**973,543**
Current assets		
Accounts receivable	21,803	2,814
Receivables and accrued assets	193,687	186,972
Liquid assets	3,652,666	3,681,608
Total current assets	**3,868,156**	**3,871,394**
Total assets	**4,612,956**	**4,844,937**

Liabilities	31-Dec-19 (€)	31-Dec-18 (€)
Capital reserves		
Deferred grant revenue	388,453	379,353
General reserve	1,852,135	1,856,111
Eligible costs reserve	382,206	382,206
Designated reserve	826,446	1,063,270
Total capital reserves	**3,449,222**	**3,680,940**
Short-term liabilities		
Accounts payable	243,112	227,837
Short-term liabilities and accrued expenses	920,622	936,160
Total short-term liabilities	**1,163,734**	**1,163,997**
Total liabilities	**4,612,956**	**4,844,937**

Profit and loss account

Profits	2019 (€)	Budget 2019 (€)	2018 (€)
Structural institute grants	3,884,348	3,793,500	3,769,845
Other grants and financial contributions	119,297	203,000	47,397
Other revenue	24,925	20,200	1,964
Total profits	**4,028,570**	**4,016,700**	**3,819,205**
Operating costs			
Personnel costs	2,476,658	2,623,700	2,468,441
Depreciation of fixed assets	244,557	266,000	221,333
Other operating costs	540,500	448,000	479,965
Project-related costs	18,954	2,500	-183
Payments	978,947	905,500	962,604
Total operating costs	**4,259,616**	**4,245,700**	**4,132,160**
Year result	**-231,046**	**-229,000**	**-312,955**

Financial profit and loss	2019 (€)	Budget 2019 (€)	2018 (€)
Interest and similar revenue	518	2,000	681
Interest and similar expenses	-1,190	-1,500	-1,134
Total financial profit and loss	**-672**	**500**	**-453**
Year result	**-231,718**	**-228,500**	**-313,408**

Risk disclosure

SHM's governing board and director/deputy director are primarily responsible for avoiding and detecting fraud, ensuring that legislation is adhered to, and identifying any risks that may pose a threat to SHM. It is important that the management of SHM, under the auspices of those responsible for governance, devote the necessary attention to these risks. This approach requires the commitment to develop a culture of integrity and ethical conduct, and can be reinforced by active supervision. As such, SHM's governing board maintains a culture of honesty and ethical conduct and has taken management measures to limit SHM's risk as far as possible.

RISK MANAGEMENT

From the administrative responsibility of SHM for the ACS, there is a risk that the annual contribution will still have to be paid for a period to be determined if RIVM funding ends at any time. This risk concerns the annual operation of the ACS and is maximum €536,526.

Currently, the impact of the coronavirus (SARS-CoV-2) has relatively little negative impact on income, results and cash flows in 2020. Although we do not expect such effects in the short term it remains uncertain as to how long the effects of the coronavirus will last. Therefore we cannot exclude a possibility that we may still be confronted with longer-term negative effects as result of the coronavirus.

2020 Budget

The budget for 2020 was adopted by SHM's governing board on 30 September 2019. The most important components of the 2019 budget are described in further detail below.

BOARD RESOLUTIONS

As of May 2019, SHM had registered 21,241 individuals. Here, the term registered refers to all people for whom data were collected during the past two years. These included 218 children and 271 individuals who had died. Excluding those who had died, as of May 2019, a total of 20,970 registered individuals were still in care. This represents an increase of 555 compared with May 2018.

In 2020, the number of registered individuals is predicted to increase by 1.0% compared with 2019. This increase is based on the average increase in the number of HIV-positive individuals over time since 2004. Since 2004, the rate of increase has been dropping and it is expected to become negative for the first time in 2022. As a result, the number of individuals in care is expected to decline from that year onwards.

The gradual increase in the proportion of older individuals in SHM's database and the associated increase in age-related comorbidity makes it increasingly important to adequately collect clinical information on age-related comorbidity and associated risk factors and medication use. In particular, interactions between antiretroviral drugs and comedication prescribed for comorbidities may adversely affect the effectiveness of HIV treatment. Moreover, comorbidity and multimorbidity, as well as poly-pharmacy, may also reduce treatment compliance in people living with HIV, further underlining the importance of collecting high-quality data on this topic. Furthermore, even when an HIV infection is well suppressed with antiretroviral therapy, HIV-positive individuals remain at increased risk of age-related comorbidity.

In addition to collecting information on non-infectious comorbidity (including cardiovascular disease, diabetes mellitus, renal function and malignancies [other than the traditionally registered AIDS-defining malignancies such as Kaposi's sarcoma and non-Hodgkin's lymphoma]), it is also necessary to collect information on chronic liver disease, which is frequently, but not exclusively, associated with hepatitis B virus (HBV) and hepatitis C virus (HCV) co-infection. Moreover, with the advent of the now rapidly expanded arsenal of direct-acting antiviral agents (DAAs) against HCV, registration and monitoring of the use of these agents have become extremely important. Equally, of increasing importance is the registration of the short and longer-term impact of these agents on the incidence of new HCV infections and on that of long-term liver complications.

2020 BUDGET

In recent years, SHM has invested in measures to allow efficient and effective registration of relevant data on HBV and HCV, including the use of DAAs in HCV treatment and the impact of this treatment. In the future, this invest- ment will also make it possible to register the effect of interventions to 'cure' HBV, which, similar to HIV, is a persistent viral infection. Research into such interventions is currently making rapid progress.

As described in the 2017 and 2018 working plan and following an intensive preparatory period involving drafting a statement of requirements, carrying out market research, reference visits, negotiations and a legal review, SHM's board and the RIVM approved the development and implementation of a LogicNets-based system to replace the data entry system, Oracle Clinical (for which AMC's support was due to terminate on 1 January 2018). The project, which involved a collaboration between LogicNets, ICT Automatisering, SHM and the AMC's ADICT (abbreviated to 'LISA'), officially started on 24 May 2016 and was successfully completed on time on 5 February 2018. The tailor-made LogicNets data entry system, named DataCapTree, went live on 5 February 2018.

DataCapTree is built on a decision-support system. In other words, collection of information is guided by decision trees programmed within the system. This should mean that data collectors will spend less time on the data collection process. A total of 107 data collection protocols have been developed for the full data collection process, of which 36 essential protocols were built, tested and accepted by all test groups by the time the system went live.

In 2018 and in the first half of 2019, the remaining protocols will continue to go into production on a rolling basis, following test and acceptance by all test groups. Once all the protocols are live, it will be possible to carry out an evaluation of the system including effects measurement. Depending on the results coming out of the evaluation, an update of the system may be scheduled in 2020. In addition, functional adjustments will also be carried out in 2020 and, where necessary, the system will be expanded.

At the end of 2019, the complete system has been in use for a full year and it will be then be possible to measure the anticipated improvement in efficiency in the various data collection processes. In preparation, a method by which to measure the effect of DataCapTree is developed during the course of 2019.

Another part of the LISA project involved the construction of a new and more modern structure within the data warehouse to allow for the possibility of importing data from external sources in the future. This functionality means SHM will be prepared for future developments that may allow more data to be imported directly from the HIV treatment centres' clinical data warehouses.

2020 BUDGET

In contrast to the previous situation with Oracle Clinical, functional management of the new data entry system is now carried out by SHM. This means that SHM is able to programme new query lists and data entry screens independently. This functionality and associated work processes will be further defined in 2020. Finally, in 2020, the possibility of adding new protocols will be put to the test in practice when SHM implements the pilot project for the registration of viral hepatitis C mono-infection.

GRANTS/OTHER FINANCIAL CONTRIBUTIONS IN 2020

The structural institute grant provided to SHM by the ministry of VWS through the RIVM-CIb for HIV monitoring in the Netherlands represents the largest portion of SHM's income in 2020. In 2019, the RIVM awarded SHM a sum of €3,793,531. In addition, on 12 September 2019, the wage-sensitive part of the 2019 grant was indexed by 3.42%, providing a structural addition of €90,817. This brings the total 2019 institute grant for HIV monitoring in the Netherlands to €3,884,348. The 2020 budget was based on this sum.

In addition to these structural institute grants, SHM's income consists of project-related grants and contributions, including both national and international grants.

Following the National Health Council's advice and the associated Nationaal hepatitisplan to register viral hepatitis, a steering committee set up by the Dutch Society for Internal Medicine (*Nederlandse Internisten Vereniging*, NIV) and the Dutch Association of Gastroenterologists and Hepatologists (*Nederlandse Vereniging Van Maag-Darm-Leverartsen*, NVMDL) reached consensus in 2017 to work together with SHM to collect high-quality data on people with a hepatitis mono-infection. Consequently, in the third quarter of 2018, SHM started a pilot registration of people in care with a hepatitis C mono-infection. The costs of this pilot study, estimated to be €124,900, will be financed (€65,000) by the working group of internists/infectious disease specialists and gastroenterologists with hepatitis expertise that was established by the NIV. This means a benefit of €28,000 for 2019 and €37,000 for 2020.

Contributions totaling €90,500 have been budgeted for the following projects in which SHM is involved: AGE$_h$IV, ECDC, H-TEAM, CIPHER/EPPICC, Curaçao data collection, and EuroSIDA and RESPOND study (to which SHM contributes data and expertise).

STAFFING IN 2020

The budgeted number of SHM staff for 2020 is equivalent to 37.28 FTEs. Compared with 2019, this represents an increase of 2.13 FTEs. This increase is mainly due to the appointment of additional data collectors.

2020 BUDGET

EXPENSES IN 2020

The budget for 2020 takes into account the salary increases announced in the newly-approved 2018-2020 collective labour agreement (CAO) for university medical centres in the Netherlands. As such, SHM has included a 2.75% salary increase as of 1 January 2020 in the budget. SHM also follows the CAO by increasing salaries by one periodic step on the salary scale for employees with good performance and who have not yet reached the maximum on their salary scale.

In 2020, the gross salaries will amount to €1,978,352. A total of 16.48% of the gross salaries, equivalent to €326,085, has been budgeted for social security contributions. The budgeted sum for pension costs for 2019 is €226,633, which is equivalent to 11.46% of the gross salaries.

A sum of €47,750 has been budgeted for 2020 to cover other personnel costs, comprising travel expenses (home-office commute and business travel), training, occupational health and safety services, and staff insurances.

The budget approved by SHM's governing board for the LISA/DataCapTree IT project, namely €1,291,000, was not exceeded. The investment amounted to €1,285,000 and depreciation of these costs will be spread across 5 years, starting from 5 February 2018 (the date on which the system went live). The depreciation costs will be charged against the designated reserve for this project.

The estimated costs for 2020 for the use and maintenance of all automation systems (LogicNets system, data warehouse, website hosting, development and maintenance, administration software, and office IT equipment) are €4,453 higher than in 2019 (€199,030 versus €194,577) due to implementation of DataCapTree.

Other operating costs for 2020 (housing, consultants, office supplies, reporting, and conferences) are, due to efficiency gains lower to those of 2019 (€311,390 versus €345,923).

Payment to those HIV treatment centres that carry out data collection themselves will decrease in 2020 because SHM will no longer refund the fee for support and coordination. As a result, a sum of €392,970 has been budgeted for these payments, compared with €442,421 in 2019.

2020 BUDGET

FINANCIAL RESULTS

SHM's estimated financial result for 2020 is €-229,068.

This 2020 financial result is distributed across the following SHM activities and projects:

HIV monitoring in the Netherlands	7,756
LISA/DataCapTree IT project	-236,824
Total result for 2020	**-229,068**

2020 BUDGET

Profits	Budget 2020 (€)
VWS / RIVM grant for HIV monitoring in the Netherlands	3,84,348
Project-based grants and financial contributions	130,500
Other revenue	20,200
Total profits	**4,035,048**
Operating costs	
Personnel costs	2,531,070
Other personnel costs	47,750
Subtotal personnel costs	*2,578,820*
Depreciation of fixed assets	244,610
IT expenses	199,030
Third party services	120,760
Subtotal third party costs	*319,790*
Housing expenses	112,210
Travel and conference expenses	25,720
Reporting	22,920
Office expenses	18,680
NCHIV contribution	4,100
Project-specific expenses	7,000
Subtotal other operating costs	*190,630*
Payments Amsterdam Cohort Studies	536,526
Payments HIV treatment centres	392,970
Subtotal payments	*929,496*
Total operating costs	**4,263,346**
Year result	**-228,298**
Financial profit and loss	
Interest and similar revenue	500
Interest and similar expenses	-1,270
Total financial profit and loss	**-770**
Year result	**-229,068**

Appendix

Terminology & definitions

Acute infection
Any infection that begins suddenly, with intense or severe symptoms, is called acute (or primary). If the illness lasts more than a couple of weeks, it is called chronic.

Adherence
Adherence measures how faithfully a person takes all antiretroviral medications at the right time. Poor adherence is one of the main reasons antiretroviral combinations fail.

AIDS
Acquired Immunodeficiency Syndrome. A disease caused by a retrovirus, HIV (human immunodeficiency virus), and characterised by failure of the immune system to protect against infections and certain cancers.

AIGHD
Amsterdam Institute for Global Health and Development.

Antibody
An immune system protein formed in response to invading disease agents such as viruses, fungi, bacteria, and parasites. Usually antibodies defend the body against invading disease agents, however, the HIV antibody does not give such protection.

Antigen
An invading substance that may be the target of antibodies.

Antiretroviral therapy (ART)
A treatment that may prevent HIV from further damaging the immune system by blocking or hampering the reproduction of the virus.

Antiviral
A substance that stops or suppresses the reproduction of a virus.

ATHENA
AIDS Therapy Evaluation in the Netherlands project (ATHENA). Stichting HIV Monitoring was founded in 2001 as a result of the successful ATHENA project.

Baseline
An initial measurement used as the basis for future comparison. For people infected with HIV, baseline testing includes CD4 count, viral load (HIV RNA), and resistance testing. Baseline test results are used to guide HIV treatment choices and monitor effectiveness of antiretroviral therapy (ART).

cART
Combination antiretroviral treatment.

TERMINOLOGY & DEFINITIONS

CD4 (T4) cell
CD4+ T-lymphocyte, or T4 cell or T-helper cell. A white blood cell that plays a vital role within the immune system and can be infected by HIV. In the course of the HIV infection the number of CD4 cells may drop from normal levels (> 500 per mm^3) to dangerously low levels (< 200 CD4 cells per mm^3 blood).

CDC
US Centers for Disease Control and Prevention.

CIb
Centre for Infectious Disease Control Netherlands, National Institute for Public Health and Environment.

Co-infection
When a person has two or more infections at the same time. For example, a person infected with HIV may be co-infected with hepatitis C (HCV) or tuberculosis (TB) or both.

Comorbidity
When a person has two or more diseases or conditions at the same time. For example, a person with high blood pressure may also have heart disease.

DAAs
Direct-acting antivirals (DAAs) are new-generation drugs that treat hepatitis C virus infection by targeting specific steps in the hepatitis C virus life cycle. There are different classes of DAAs, defined by their mechanism of action and therapeutic target.

DNA
Deoxyribonucleic acid. A complex protein that carries genetic information. HIV can insert its own genetic material into the DNA molecules inside human cells and establish dormant infection.

Epidemiology
The study of the distribution, causes, and clinical characteristics of disease or health status in a population.

Genotype
The genotype is the underlying genetic makeup of an organism.

GGD
Dutch public health service (*Geneeskundige en Gezondheidsdienst*).

Half-life
The time it takes a drug to lose half its original concentration or activity after being introduced into the body. Drug half-life is considered when determining drug dosing.

Hepatic
Pertaining to the liver.

TERMINOLOGY & DEFINITIONS

Hepatitis B virus (HBV)
A viral infection that affects the liver and is transmitted only through blood-to-blood and sexual contact.

Hepatitis C virus (HCV)
A viral infection that affects the liver and is transmitted primarily by blood and blood products, as in blood transfusions or intravenous drug use, and sometimes through sexual contact.

HIV
Human Immunodeficiency Virus; the virus that causes the Acquired Immunodeficiency Syndrome (AIDS). HIV attacks and destroys the immune system by entering and destroying the cells that control and support the immune response system.

HIV type 1 (HIV-1)
The HIV type responsible for the majority of HIV infections worldwide.

HIV Vereniging
Dutch HIV association.

Immunological failure
A type of HIV treatment failure. There is no consensus on the definition of immunological failure. However, some experts define immunological failure as the failure to achieve and maintain adequate CD4 counts despite viral suppression.

Interferon
Interferons are naturally-occurring proteins (cytokines) produced by immune cells in response to an antigen, usually a virus. Although they don't directly kill viral cells, they boost the immune response by signalling neighbouring cells into action and inhibiting the growth of malignant cells. There are three types of interferons: alpha, beta, and gamma. Laboratory-made interferons are used to treat certain cancers and opportunistic infections.

Addition of polyethylene glycol to interferons prolongs the half-life of interferon. Pegylated interferon alpha is used to treat chronic hepatitis C infection.

Mono-infection
When a person has only one infection.

Mortality
Mortality rate is a measure of the frequency of occurrence of death among a defined population during a specified time period.

MSM
Men who have sex with men.

Nederlandse Federatie Universitair Medische Centra (NFU)
Netherlands Federation of University Medical Centres.

TERMINOLOGY & DEFINITIONS

Non-AIDS events
Diseases and clinical events that are not related to AIDS (i.e., that are not listed as being associated with AIDS by the Centers for Disease Control and Prevention) and include conditions such as malignancies, end-stage renal disease, liver failure, pancreatitis, cardiovascular disease.

Non-nucleoside reverse transcriptase inhibitor (NNRTI)
Antiretroviral HIV drug class. Non-nucleoside reverse transcriptase inhibitors (NNRTIs) bind to and block HIV reverse transcriptase (an HIV enzyme). HIV uses reverse transcriptase to convert its RNA into DNA (reverse transcription). Blocking reverse transcriptase and reverse transcription prevents HIV from replicating.

Nucleoside reverse transcriptase inhibitor (NRTI)
Antiretroviral HIV drug class. Nucleoside reverse transcriptase inhibitors (NRTIs) block reverse transcriptase (an HIV enzyme). HIV uses reverse transcriptase to convert its RNA into DNA (reverse transcription). Blocking reverse transcriptase and reverse transcription prevents HIV from replicating.

Nucleotide
A building block of nucleic acids. DNA and RNA are nucleic acids.

Nucleotide reverse transcriptase inhibitor (NtRTI)
A type of antiretroviral (ARV) HIV drug. Nucleotide reverse transcriptase inhibitors (NtRTIs) interfere with the HIV life cycle in the same way as NRTIs. Both block reverse transcription. NtRTIs are included in the NRTI drug class.

NVHB
Dutch Association of HIV-Treating Physicians (*Nederlandse Vereniging van HIV Behandelaren*).

Person year
A measure of time used in medical studies that combines the number of persons and their time contribution (e.g., in years) to the study. In the ATHENA cohort, person years generally refer to the cumulative number of years that individuals were followed by SHM.

Perinatal transmission
Perinatal transmission of HIV refers to the passage of HIV from an infected mother to her child during pregnancy, labour and delivery, or breastfeeding (through breast milk).

TERMINOLOGY & DEFINITIONS

Protease
A type of enzyme that breaks down proteins into smaller proteins or smaller protein units, such as peptides or amino acids. HIV protease cuts up large precursor proteins into smaller proteins. These smaller proteins combine with HIV's genetic material to form a new HIV virus. Protease inhibitors (PIs) prevent HIV from replicating by blocking protease.

Protease inhibitor (PI)
Antiretroviral HIV drug class. Protease inhibitors (PIs) block protease (an HIV enzyme). This prevents new HIV from forming.

Pseudonymisation
Pseudonymisation is a privacy-enhancing technique that replaces personal identifiers with coded data. Certain identifiers (such as gender and age) are included in the record, but personal information is removed or replaced by a randomised string of characters. The data collected from people living with HIV are stored in SHM's database in a pseudonymised form. Pseudonymisation takes place within the HIV treatment centre and the key to the code is only available to the HIV treating physician.

Retrovirus
A class of viruses which includes HIV. Retroviruses are so named because they carry their genetic information in RNA rather than DNA, and the RNA information must be translated "backwards" into DNA.

Reverse transcriptase
After infecting a cell, HIV uses an enzyme called reverse transcriptase to convert its RNA into DNA and then replicates itself using the cell's machinery.

RIVM
The Netherlands' National Institute for Public Health and the Environment (*Rijksinstituut voor Volksgezondheid en Milieu*).

Seroconversion
The change from an absence of HIV antibodies in the blood to the presence of those antibodies.

SHM
Stichting HIV Monitoring, the Dutch HIV Monitoring Foundation.

Sustained virologic response (SVR12 or SVR24)
A measure of the response to hepatitis C virus (HCV) treatment. SVR12 or SVR24 indicates an undetectable level of HCV in blood 12 or 24 weeks, respectively, after completion of antiviral therapy for chronic HVC infection.

Sustained viral suppression
The continuous, long-term suppression of a person's viral load (HIV RNA), generally to undetectable levels, as the result of treatment with antiretroviral drugs.

TERMINOLOGY & DEFINITIONS

Tolerability
The extent to which a drug's side effects can be tolerated by the patient.

Viraemia
The presence of a virus in the blood.

Virological failure
A type of HIV treatment failure. Virological failure occurs when antiretroviral therapy (ART) fails to suppress and sustain a person's viral load to less than 200 copies/ml. Factors that can contribute to virologic failure include drug resistance, drug toxicity, and poor treatment adherence.

Viral load
The number of HIV particles in a millilitre of blood or another body fluid, such as semen or cerebrospinal fluid.

Viral suppression or virologic control
When antiretroviral therapy (ART) reduces a person's viral load (HIV RNA) to an undetectable level. Viral suppression does not mean a person is cured; HIV still remains in the body.

VWS
Dutch ministry of Health, Welfare and Sport.

Some of the above definitions were taken from www.aidsinfo.nih.gov

HIV Monitoring