



University of Southern Denmark

## The EuroSIDA study

### 25 years of scientific achievements

Laut, K.; Kirk, O.; Rockstroh, J.; Phillips, A.; Ledergerber, B.; Gatell, J.; Gazzard, B.; Horban, A.; Karpov, I.; Losso, M.; d'Arminio Monforte, A.; Pedersen, C.; Ristola, M.; Reiss, P.; Scherrer, A. U.; de Wit, S.; Aho, I.; Rasmussen, L. D.; Svedhem, V.; Wandeler, G.; Pradier, C.; Chkhartishvili, N.; Matulionyte, R.; Oprea, C.; Kowalska, J. D.; Begovac, J.; Miró, J. M.; Guaraldi, G.; Paredes, R.; Raben, D.; Podlekareva, D.; Peters, L.; Lundgren, J. D.; Mocroft, A.

*Published in:*  
HIV Medicine

*DOI:*  
10.1111/hiv.12810

*Publication date:*  
2020

*Document version:*  
Accepted manuscript

#### *Citation for published version (APA):*

Laut, K., Kirk, O., Rockstroh, J., Phillips, A., Ledergerber, B., Gatell, J., Gazzard, B., Horban, A., Karpov, I., Losso, M., d'Arminio Monforte, A., Pedersen, C., Ristola, M., Reiss, P., Scherrer, A. U., de Wit, S., Aho, I., Rasmussen, L. D., Svedhem, V., ... Mocroft, A. (2020). The EuroSIDA study: 25 years of scientific achievements. *HIV Medicine*, 21(2), 71-83. <https://doi.org/10.1111/hiv.12810>

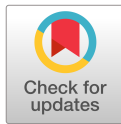
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MS KAMILLA GRØNBORG LAUT (Orcid ID : 0000-0001-7056-570X)

PROFESSOR ANDREW PHILLIPS (Orcid ID : 0000-0003-2384-4807)

DR ANTONELLA D'ARMINIO MONFORTE (Orcid ID : 0000-0003-0073-1789)

DR JUSTYNA DOMINIKA KOWALSKA (Orcid ID : 0000-0003-1166-4462)

DR GIOVANNI GUARALDI (Orcid ID : 0000-0002-5724-3914)

DR AMANDA MOCROFT (Orcid ID : 0000-0001-8316-1122)

Article type : Reviews in antiretroviral research

## The EuroSIDA study: 25 years' scientific achievements

**Running title:** The EuroSIDA study

### Authors:

K Laut<sup>1</sup>, O Kirk<sup>1</sup>, J Rockstroh<sup>2</sup>, A Phillips<sup>3</sup>, B Ledergerber<sup>4</sup>, J Gatell<sup>5</sup>, B Gazzard<sup>6</sup>, A Horban<sup>7</sup>, I Karpov<sup>8</sup>, M Losso<sup>9</sup>, A d'Arminio Monforte<sup>10</sup>, C Pedersen<sup>11</sup>, M Ristola<sup>12</sup>, P Reiss<sup>13</sup>, AU Scherrer<sup>4</sup>, S de Wit<sup>14</sup>, I Aho<sup>12</sup>, LD Rasmussen<sup>11</sup>, V Svedhem<sup>15</sup>, G Wandeler<sup>16</sup>, C Pradier<sup>17</sup>, N Chkhartishvili<sup>18</sup>, R Matulionyte<sup>19</sup>, C Oprea<sup>20</sup>, JD Kowalska<sup>7</sup>, J Begovac<sup>21</sup>, J Miro<sup>5</sup>, G Guaraldi<sup>22</sup>, R Paredes<sup>23</sup>, D Raben<sup>1</sup>, D Podlekareva<sup>1</sup>, L Peters<sup>1</sup>, JD Lundgren<sup>1</sup>, A Mocroft<sup>3</sup>

<sup>1</sup>CHIP, Centre of Excellence for Health, Immunity and Infections, Department of Infectious Diseases, Rigshospitalet, University of Copenhagen, Copenhagen, Denmark. <sup>2</sup>University of Bonn, Germany. <sup>3</sup>Centre for Clinical Research, Epidemiology, Modelling and Evaluation (CREME), Institute for Global health, UCL, London, UK. <sup>4</sup>Division of Infectious Diseases and Hospital Epidemiology, University of Zurich, University Hospital Zurich, Zurich, Switzerland. <sup>5</sup>Hospital Clinic – IDIBAPS. University of Barcelona, Barcelona, Spain. <sup>6</sup>St. Stephen's Clinic, Chelsea and Westminster Hospital, London, UK. <sup>7</sup>Hospital for Infectious Diseases in Warsaw, Medical University of Warsaw, Warsaw, Poland. <sup>8</sup>Department of Infectious Diseases, Belarus State Medical University, Minsk, Belarus. <sup>9</sup>Coordinación de Investigación Clínica Académica en Latinoamérica, Buenos Aires, Argentina. <sup>10</sup>Department of Health Sciences, Clinic of Infectious Diseases, ASST Santi Paolo e Carlo, University of Milan, Milan. <sup>11</sup>Department of Infectious Diseases, Odense University Hospital, Odense, Denmark. <sup>12</sup>Helsinki University Hospital, Helsinki, Finland. <sup>13</sup>Academic Medical Center, Div. of Infectious Diseases and

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the [Version of Record](#). Please cite this article as [doi: 10.1111/HIV.12810](https://doi.org/10.1111/HIV.12810)

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*Dept. of Global Health, University of Amsterdam, and Stichting HIV Monitoring, Amsterdam, The Netherlands. <sup>14</sup>CHU Saint-Pierre, Belgium. <sup>15</sup>Unit of Infectious Diseases, Department of Medicine Huddinge, Karolinska Institutet, SE-141 83, Stockholm, Sweden. <sup>16</sup> Department of Infectious Diseases, Bern University Hospital, University of Bern, Bern, Switzerland. <sup>17</sup>Hôpital de l'Archet, Nice, France. <sup>18</sup>Infectious Diseases, AIDS & Clinical Immunology Research Center, Tbilisi, Georgia. <sup>19</sup>Department of Infectious Diseases and Dermatovenerology, Faculty of Medicine, Vilnius University; Centre of Infectious Diseases, Vilnius University Hospital Santaros Klinikos, Lithuania. <sup>20</sup>“Victor Babes” Clinical Hospital for Infectious and Tropical Diseases, Bucharest, Carol Davila University of Medicine and Pharmacy, Bucharest, Romania. <sup>21</sup>University Hospital of Infectious Diseases, Zagreb, Croatia. <sup>22</sup>Department of Medical and Surgical Sciences for Adults and Children, Clinic of Infectious Diseases, University of Modena and Reggio Emilia, Modena, Emilia-Romagna, Italy. <sup>23</sup>Infectious Diseases Unit & IrsiCaixa AIDS Research Institute, Hospital Germans Trias i Pujol, Badalona, Spain.*

**Corresponding author:**

Kamilla Grønborg Laut

[kamilla.groenborg.laut.01@regionh.dk](mailto:kamilla.groenborg.laut.01@regionh.dk)

Tel: +45 35 45 57 57

Fax: +45 35 45 57 58

Rigshospitalet, University of Copenhagen, CHIP, Department of Infectious Diseases, Section 2100  
Blegdamsvej 9, DK-2100 Copenhagen Ø, Denmark

**Word Count:**

**Abstract:** 230 words (max 250)

**Manuscript:** 3.496 words (max 3.500)

**Tables/figures:** 2/2

**Key words:** HIV, AIDS, surveillance, Europe, cohort studies

**Abstract:**

The EuroSIDA study was founded in 1994, and follows adult people living with HIV (PLHIV) in 100 collaborating clinics across 35 countries covering all European regions, Israel and Argentina. The study aims to study the long-term virological, immunological and clinical outcome of PLHIV, and to monitor temporal changes and regional differences in outcomes across Europe. Annually collected data includes basic demographic characteristics, information on AIDS- and non-AIDS-related clinical events, details about antiretroviral therapy (ART), hepatitis C treatment and other

medications, in addition to a range of laboratory values. The summer 2016 dataset held data from a total of 23,071 individuals contributing with 174,481 person-years of follow-up, while EuroSIDA's unique plasma repository held over 160,000 samples. Over the past 25 years, close to 300 articles have been published in peer-reviewed journals (h-index 52), covering a range of scientific focus areas, including monitoring of clinical and virological outcomes, uptake, efficacy and adverse events to ART, influence of hepatitis coinfection, variation in the quality of HIV care and management across settings and regions, and biomarker research. Recognizing that there remain unresolved issues in the clinical care and management of PLHIV in Europe, EuroSIDA was one of the cohorts to found the RESPOND cohort consortium on infectious diseases in 2017. In celebration of the EuroSIDA study's 25<sup>th</sup> anniversary, this article aims to summarize key scientific findings and outline current and future scientific focus areas.

## **Introduction**

The EuroSIDA study was founded in 1994 with the aims of studying the long-term virological, immunological and clinical outcomes for HIV-1 infected individuals, and of assessing the impact of antiretroviral drugs on the outcomes of people living with HIV (PLHIV) across Europe. The past two decades have seen dramatic changes to the HIV epidemic in Europe, but many issues on the clinical care and management of HIV remain unresolved. EuroSIDA has aimed to stay at the forefront of answering the questions most meaningful to the clinical care of PLHIV for the past 25 years. This has demanded a dynamic research agenda within a flexible cohort structure. Thus, while the main objectives of the study remain the same as in 1994, EuroSIDA has continuously reevaluated the scientific scope of the study, as well as the data needed to answer key scientific questions, and the objectives of the study have broadened to four major themes: monitoring the efficacy of antiretroviral therapy (ART), monitoring current or emerging late onset adverse events to ART, monitoring temporal changes and regional differences in HIV care and management across Europe, and monitoring the uptake and outcome of hepatitis C (HCV) therapy, particularly direct acting antivirals (DAAs). In celebration of the EuroSIDA study's 25<sup>th</sup> anniversary, this article aims to summarize key scientific findings and outline current and future scientific focus areas.

## **Sites and participants**

EuroSIDA currently has 100 participating clinics across 35 countries, each clinic headed by a principal investigator. The principal investigator is responsible for enrolling participants, collecting and reporting data, seeking and maintaining ethical approval, and for obtaining informed consent from all participants, according to local regulations. Any principal investigator is also eligible for the EuroSIDA Steering Committee, which is elected by the EuroSIDA study group for a five-year period. The EuroSIDA Coordinating Center is located at CHIP (Centre of Excellence for Health, Immunity and Infections) at Rigshospitalet, Copenhagen, Denmark.

As of June 2016 EuroSIDA held data from 23,071 participants contributing with 174,481 person years of follow-up (PYFU). Characteristics of EuroSIDA participants with ongoing follow-up are given in table 1. Participants are HIV-1 positive individuals aged 16 years or older, who have a planned appointment at the collaborating clinic. The first two cohorts included only participants with a CD4 cell count of less than 500 cells/ $\mu$ L in the previous 4 months before enrolment, but this inclusion criterion was dropped with the third cohort due to introduction of combination ART. People are consented and enrolled consecutively from each clinic during time-limited enrolment waves and thus both people diagnosed with HIV recently and decades ago may be included. The consecutive enrolment aims to ensure that no participant is excluded due to concern of irregular follow-up or included based on treatment status.

EuroSIDA began recruiting participants in 1994, and to ensure that EuroSIDA remains representative of the current HIV population, new cohorts have been enrolled with regular intervals, coming to a total 10 enrolment waves over 23 years (figure 1). EuroSIDA seeks to include centers from across Europe, ensuring that all European geographic regions are well represented in the study. The first participants from Central Europe were recruited in 1999 when collaborating sites from the Czech Republic, Hungary and Poland joined. The network has since expanded to include most countries from Central Europe and also many countries in the former Soviet Union. The latest enrolment wave included an additional 4,000 HIV/HCV coinfecting individuals, and ran from 2014 to 2016.

### **Data collection**

EuroSIDA is a non-interventional study which only collects data from participants' routine clinic visits. Until 2016, data was collected at enrolment and thereafter twice annually. To adapt to the clinical reality that many PLHIV now have less frequent clinic visits than when the study was initiated, data collection was reduced to once annually from autumn 2016 and onward.

Table 2 outlines data collected in EuroSIDA. This includes basic demographic characteristics, laboratory values, information on ART, and information about treatment related to cardiovascular diseases. Dates of diagnosis of all AIDS-defining illnesses are recorded, using the 1993 Centers for Disease Control and Prevention clinical criteria [1]. Since 1998, information about adverse events has been collected, according to the Data Collection on Adverse events of Anti-HIV Drugs (D:A:D) definitions [2], and detailed information about the cause of death is collected using the Coding of Death (CoDe) algorithm [3]. EuroSIDA started collecting more detailed data on anti-HCV treatment in the summer of 2014, and further, an adverse events form is completed for all participants who discontinue an anti-HCV treatment regimen earlier than scheduled due to toxicity or intolerance. In addition to data, most centers collect plasma samples twice annually as part of the routine clinical management.

By autumn 2014 EuroSIDA transitioned from collecting data on paper forms to using the electronic case report system, REDCap [4]. Alternatively, sites may transfer data electronically using the HICDEP format [5,6]. Throughout the study, the backbone of the EuroSIDA data collection has remained similar to that of the first data collection. However, the forms undergo regular revision, and questions have been added to or removed from the forms as specific research questions have arisen; e.g. serum-creatinine was included in the form as concerns of renal toxicity arose. In addition to the standard data collection, individual surveys have been conducted to address specific questions (table 2).

With the autumn 2016 data collection, a modular data collection was introduced. The modular data collection means that a set of core values is collected for all patients in a core module, while other data is collected only for a relevant subset of patients, allowing sites and participants to opt in or out of specific modules. For example, data related specifically to HCV (including liver-specific laboratory values, anti-HCV treatment etc.) is only requested for HIV/HCV co-infected participants.

**Quality assurance:**

To ensure correct selection of participants and verification of collected data, an extensive quality assurance program has been in place since EuroSIDA was initiated. Monitoring previously included on-site visits to all participating centers. However, as the study has evolved, new processes have been formulated to adapt to new requirements of the study. Thus, since 2017 EuroSIDA has transitioned to centralized monitoring, building on the risk-based monitoring used in clinical trials [7]. The monitoring includes regular data checks, queries, central validation of events, and random event monitoring performed by investigators on-site, which ensures that EuroSIDA retains a high data quality. If a collaborating clinic continuously delivers poor data or continuously does not deliver data, that site may become inactivated from EuroSIDA, as described in the participation criteria, available online <https://chip.dk/Studies/EuroSIDA/Study-documents>. A site may also choose to discontinue its engagement in EuroSIDA.

**Loss to follow-up:**

The annual loss-to-follow-up (LTFU) rate (defined as no CD4 cell count measurement, HIV-RNA measurement or clinic visit for 365 days or more) has been relatively low throughout the study. Analyses performed in 2008 found that the incidence of LTFU within EuroSIDA was 3.72/100 PYFU, but varied substantially across countries [8]. In an attempt to minimize LTFU, clinics are queried if a participant has no recorded visit for more than one year, and again after 2 and 5 years.

## **Findings to date**

The EuroSIDA study group has published close to 300 articles in peer-reviewed journals (h-index 52) since 1997, on its own and in collaboration with other cohorts, if larger data sets have been required. A complete list of publications may be found on the EuroSIDA website: <http://www.chip.dk/eurosidea>. Some major focus areas for publications are summarized below.

### ***Temporal trends and regional differences in the clinical course of HIV:***

EuroSIDA was among the first studies to report on the dramatic declines in mortality following the introduction of new, potent antiretroviral regimens in the mid-1990's [9]. Studies published in 2000 and 2003 showed continued declines in mortality and AIDS-defining illnesses following the introduction of combination ART [10,11]. EuroSIDA continues the surveillance of trends in the prognosis for PLHIV, and has published several articles regarding cause-specific mortality [12], AIDS and non-AIDS related mortality [13–15], as well as short-term clinical disease progression [16,17]. In recent years, EuroSIDA has focused on regional differences in outcomes, and has shown significant variability in mortality rates across regions of Europe, Israel and Argentina [18].

### ***Uptake, efficacy of and adverse events to ART:***

Monitoring the usage and efficacy of ART is central to EuroSIDA's work, alongside surveillance of long-term adverse events [19]. EuroSIDA started to collect data on adverse events in 1998 and information on non-AIDS events have been routinely collected since 2001. In 1999, EuroSIDA was a founding partner of the D:A:D study together with nine other cohorts (<http://www.chip.dk/Studies/DAD/About>). This cohort collaboration has reported extensively on long-term adverse events to ART, including in particular cardiovascular disease [20,21]. EuroSIDA was among the first to demonstrate an increased incidence of chronic kidney disease with increasing exposure to tenofovir disoproxil fumarate (TDF), and also found an increased risk of chronic kidney disease in association with the use of either ritonavir-boosted atazanavir or lopinavir or unboosted atazanavir [22]. This work was later carried on in the D:A:D study with EuroSIDA as an important contributor. A recent study found an increased incidence of bone fractures among people ever exposed to TDF [23]. Other EuroSIDA work has included assessment of long-term efficacy of ART and predictors of virological success and failure [24,25], in addition to monitoring resistance across Europe, e.g. demonstrating geographical and temporal differences in resistance testing strategies and in detected drug resistance [26].

### ***Surveillance of AIDS and non-AIDS events and opportunistic infections:***

With follow-up accumulating since 1994, EuroSIDA has a unique opportunity to monitor trends in AIDS- and non-AIDS events, including cancers and organ-specific end stage diseases. EuroSIDA contributed evidence to suggest that pneumocystis pneumonia (PCP) prophylaxis as well as chemoprophylaxis for other common opportunistic infections could be safely discontinued in persons on ART with a sustained CD4 cell count above 200 cells/uL [27,28]. Further, EuroSIDA has published a number of articles exploring the influence of viral load and CD4 counts on the development of clinical events, suggesting that AIDS, non-AIDS and death rates are strongly influenced by the immunological and virological status, but vary minimally by ART-regimen for a given CD4 cell count and viral load [15,29,30]. Recent years have seen an increased focus on non-AIDS-related diseases as the HIV population ages. Two recent studies showed that the relative importance of factors other than those related to optimal HIV control (e.g. biological age and smoking), increases with increasing age in the development of non-AIDS-related clinical events, respectively cancers [31,32].

#### ***Assessing the influence of hepatitis co-infection:***

An important focus area for EuroSIDA is hepatitis research, with a particular focus on HCV co-infection [33–36]. One study found that around 1/4 deaths among HCV treatment-naïve individuals were attributable to HCV infection [33]. With the introduction of DAAs against HCV, EuroSIDA decided to enroll 4000 HIV/HCV co-infected individuals in 2014-2016, bringing the total number of HIV/HCV co-infected participants to forty-six percent (46.3%, n = 5,706) of the people under active follow-up. Thus, EuroSIDA follows one of the largest cohorts of HIV/HCV co-infected patients in the world. In total, around a quarter of all HIV/HCV co-infected individuals in EuroSIDA received anti-HCV treatment between 1998-2010, with an increasing trend over time and marked regional differences in the uptake of anti-HCV therapy across Europe [37]. Ongoing work aims to establish the continuum of HCV care, to monitor short-term and long-term uptake, efficacy, and adverse events to DAAs across Europe, and to monitor long-term risk of liver disease and other clinical outcomes [38,39].

#### ***Regional differences in the quality of HIV care and management:***

EuroSIDA is the only cohort of PLHIV that includes participants from all European geographical regions, including countries from the eastern part of Europe (figure 2). Recruitment of participants from this region started in 1999, and EuroSIDA has been at the forefront of showing the now well-known regional differences in the HIV-epidemic across Europe, with a continued poorer outcome for individuals in Eastern Europe [18,40,41]. Such findings have led to an increased focus on benchmarking quality of care [42]. Recent studies explored variation in ART coverage and virological suppression across countries of Europe, and across risk groups, and demonstrated substantial regional variation with particularly low levels of ART-coverage and virological suppression in Eastern Europe, and among people infected by injection drug use [43,44]. Results from a clinic survey showed differences in HIV care



and management across Europe, and it is possible that such differences may contribute to the observed poorer clinical outcomes in Eastern Europe [45]. Other quality of care work has looked at the optimal frequency of viral load monitoring [46]. Benchmarking and quality of care research remains a focus area for EuroSIDA, and work is ongoing to triangulate different data sources and to strengthen the cohort structure in Eastern Europe.

#### ***Biomarker research and using the EuroSIDA plasma repository:***

EuroSIDA's large plasma repository contains in excess of 160,000 prospectively collected plasma samples from a majority of EuroSIDA clinics since the initiation of the study. The potential of this unique biobank is demonstrated by the diversity of the studies performed using samples from the repository: EuroSIDA investigators were among the first to show that hyaluronic acid strongly predicted the 5-year risk of liver-related events among people with HIV and chronic HBV and/or HCV [47]. Another study explored the role of resistance mutations in subsequent risk of virological failure to first line non-nucleoside reverse transcriptase inhibitor-based ART, identifying a novel mechanism for nevirapine resistance [48]. Current research draws on the repository to identify biomarkers predictive of clinical endpoints. Specifically this has yielded publications estimating the optimal cut-off for prostate specific antigen to predict prostate cancer among PLHIV [49], and exploring the role of B-cell dysfunction in developing lymphomas [50]. The plasma repository is likely to play an even bigger part in future research, allowing investigators to explore the natural history of a wide array of diseases and their underlying pathophysiology.

#### ***Public health impact***

EuroSIDA strives to make clinically relevant research, and several findings have made their way into treatment guidelines (including interruption of chemoprophylaxis for opportunistic infections). EuroSIDA has provided an up-to-date picture of clinical practice in HIV clinics across Europe over the past 25 years, which has helped to inform public health experts and target programmatic responses. Of particular importance, EuroSIDA has been a pioneer in establishing HIV research in Central and Eastern Europe and was among the first to show regional disparities and the burden of HCV- and TB-coinfection in Eastern Europe. Results from EuroSIDA have thus contributed to attracting political and public attention to the situation in Eastern Europe. Furthermore, strong collaborations with policy makers such as the European Centre for Disease Prevention and Control (ECDC), have supported research utilization in health care policy.

#### **Strengths and limitations**

The size and geographical distribution of the EuroSIDA study are among its major strengths, and EuroSIDA is the only cohort of PLHIV that includes participants from all European geographical regions, including Eastern Europe. Thus, EuroSIDA has a unique opportunity of analyzing the HIV epidemic in this region. The standardized data collection allows for comparing high quality data from collaborating sites in 35 countries, and the consistent collection of core data throughout the study's existence allows for monitoring temporal trends.

A limitation of the study is that data collected by nature is limited and reflects the availability of data as well as the steering committee expert opinion on which variables are most essential to collect. On the other hand, the clinical experts ensure a clinically driven research agenda, and the flexibility of the data collection allows that emerging questions may be addressed promptly. Clinics in EuroSIDA are not selected at random, and participating sites are primarily urban clinics, many of which are university-affiliated [45]. Also, while being instrumental to addressing questions related to coinfection with viral hepatitis, the decision to include only HIV/HCV coinfecting people in the latest enrolment wave may affect the generalizability of our findings to the whole HIV-positive population. On the other hand, this makes the cohort fit to address questions about one of the largest health threats affecting PLHIV today.

### **Lessons learned**

While some of EuroSIDA's limitations (e.g. the risk of selection bias, missing data, unmeasured confounding) are inherent to cohort research and cannot completely be avoided, some lessons for a strong cohort design have been learned.

Firstly, an international research collaboration of clinicians allows for combining clinical hypothesis-driven research with experience on the various public health challenges across Europe and facilitates a quick dissemination of knowledge into clinical practice. EuroSIDA's continuous expansion into new countries highlights the value of international knowledge sharing in addressing public health issues and establishing best practices. While EuroSIDA thus keeps a clinically driven research agenda, patient-centeredness and patient-involvement rightly plays a bigger part in health-care and research today than when EuroSIDA was founded, and it is evident that co-creation and a close involvement of patients should be central in any future cohort study.

In order to address the representativeness of the cohort, future studies may benefit from collecting information such as a typology of the participating clinics in addition to the size and demographic characteristics of cohort participants relative to all PLHIV followed at each clinic. Information about the number of people approached and reasons for accepting or refusing to participate would further help to address representativeness and describe the cohort population. The fact that EuroSIDA participants may be included at different stages of their HIV infection may be a strength in that it allows inclusion of a representative sample of people followed at each participating

clinic, but may also be a limitation in that differences in disease stages may affect clinical outcomes, treatment and management. This highlights the importance of considering the effects of inclusion and exclusion criteria. Further, future cohorts may wish to make additional efforts to ensure adequate representation of marginalized groups that may not access testing and care. Finally, the transition to electronic data collection allowed us to introduce data entry rules that have made it possible to discriminate incomplete reporting from missing data due to other reasons. This previously was not possible and has helped to minimize missing data.

### **EuroSIDA: The next 25 years?**

EuroSIDA's diverse research agenda over the past 25 years illustrates the ability of cohorts to provide real-life data that may be used by decision-makers and generate new hypotheses, as well as providing a significant contribution to clinical treatment guidelines. Cohort studies can provide long-term follow-up and clinical outcomes of a sample of the affected population, rather than the laboratory endpoints and short term outcomes that are often used in clinical trials. As the clinical treatment and management of HIV has improved, the relative importance of such long-term data has increased. Questions related to the prevention among those at risk of acquiring HIV, monitoring the safety and efficacy of pre exposure prophylaxis (PrEP), assessing the role of coinfections and comorbidities, and identifying drivers of inequalities in health are examples of questions not readily addressed in clinical trials, but which may be addressed in cohort studies. Recognizing that HIV remains a significant public health problem, EuroSIDA entered RESPOND as a founding partner. RESPOND, the International Cohort Consortium of Infectious Diseases (<https://www.chip.dk/Studies/RESPOND>), strives to continue 25 years of academic collaboration in HIV cohort studies and which includes many of the cohorts previously contributing to collaborations such as the D:A:D study, ART-CC and COHERE. The aim of RESPOND is to build an innovative, flexible and dynamic cohort consortium for the study of infectious diseases, including HIV and people at risk for HIV, as a generic structure for facilitating multi stakeholder involvement. Within RESPOND, EuroSIDA will continue to address unmet, innovative research questions that can only be met within a multi-cohort structure. There is a wide portfolio of research questions ongoing in research under three core themes: public health, outcomes with ART, and hepatitis. The modular data collection in RESPOND allows additional research modules to be added, as new research questions arise.

### **Collaboration**

More information about the study is available on EuroSIDA's website: <http://www.chip.dk/Ongoing-Studies/EuroSIDA/About>. Any investigator or external collaborator may submit a research proposal, which goes through feasibility checks and is reviewed by the steering committee before it may be carried out. Investigators must seek their own funding for specific research projects. Information on how to submit a research proposal is available online: <http://www.chip.dk/Studies/EuroSIDA/Submit-research-concept>.

## **Conclusions and future perspectives**

For the past 25 years, the EuroSIDA study has been instrumental in providing knowledge about HIV and AIDS in Europe. EuroSIDA strives to continue generating science to improve outcomes for PLHIV. Current focus areas roughly fall into the following categories: i) hepatitis co-infection, ii) tuberculosis co-infection, iii) biomarkers of cancer and clinical outcomes, and iv) quality of care and public health issues. In addition, EuroSIDA continues to have a specific focus on the HIV-epidemic in the eastern part of Europe and in expanding the network into countries with poor or no existing HIV surveillance. With the key role in the cohort collaboration, RESPOND, EuroSIDA aims to continue to be at the forefront of HIV observational research in the coming years.

## **Competing interests:**

Court Pedersen received a research grant from Gilead. Jose M Miro received a personal 80:20 research grant from the Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Barcelona, Spain during 2017–19. Ole Kirk had prior/present board membership at ViiV Healthcare, Gilead Sciences, Jansen and Merck, received payment for lectures and/or for development of educational presentations from Abbott, Gilead Sciences, Tibotec and Quagen, and had travel/accommodations/meeting expenses paid by Abbott, BMS, Gilead Sciences, Merck and ViiV Healthcare. Peter Reiss through his institution has received independent scientific grant support from Gilead Sciences, Janssen Pharmaceuticals Inc., Merck & Co, and ViiV Healthcare; honoraria to his institution for serving on scientific advisory boards for Gilead Sciences and ViiV Healthcare, as well as a data safety monitoring committee for Janssen Pharmaceuticals Inc. Other authors declared no competing interests. No authors have any conflicts of interest related to this article.

**Funding:** EuroSIDA was supported by the European Union's Seventh Framework Programme for research, technological development and demonstration under EuroCoord grant agreement n° 260694. Current support includes unrestricted grants by ViiV Healthcare LLC, GlaxoSmithKline R&D Limited, Janssen Scientific Affairs, Janssen R&D, Bristol-Myers Squibb Company, Merck Sharp & Dohme Corp, Gilead Sciences. The participation of centres from Switzerland was supported by The Swiss National Science Foundation (Grant 148522). The study is also supported by a grant [grant number DNRF126] from the Danish National Research Foundation.

## **Acknowledgements:**

**The multi-centre study group, EuroSIDA (national coordinators in parenthesis).**

Argentina: (M Losso), M Kundro, Hospital JM Ramos Mejia, Buenos Aires.

Austria: (B Schmied), Otto Wagner Hospital, Vienna; R Zangerle, Medical University Innsbruck, Innsbruck.

Belarus: (I Karpov), A Vassilenko, Belarus State Medical University, Minsk, VM Mitsura, Gomel State Medical University, Gomel; D Paduto, Regional AIDS Centre, Svetlogorsk.

Belgium: (N Clumeck), S De Wit, M Delforge, Saint-Pierre Hospital, Brussels; E Florence, Institute of Tropical Medicine, Antwerp; L Vandekerckhove, University Ziekenhuis Gent, Gent.

Bosnia-Herzegovina: (V Hadziosmanovic), Klinicki Centar Univerziteta Sarajevo, Sarajevo.

Croatia: (J Begovac), University Hospital of Infectious Diseases, Zagreb.

Czech Republic: (L Machala), D Jilich, Faculty Hospital Bulovka, Prague; D Sedlacek, Charles University Hospital, Plzen.

Denmark: G Kronborg, T Benfield, Hvidovre Hospital, Copenhagen; J Gerstoft, T Katzenstein, Rigshospitalet, Copenhagen; C Pedersen, IS Johansen, Odense University Hospital, Odense; L Ostergaard, Skejby Hospital, Aarhus, L Wiese, NF Moller, Sjællands Universitetshospital, Roskilde; L N Nielsen, Hillerod Hospital, Hillerod.

Estonia: (K Zilmer), West-Tallinn Central Hospital, Tallinn; Jelena Smidt, Nakkusosakond Siseklinik, Kohtla-Järve.

Finland: (M Ristola), I Aho, Helsinki University Central Hospital, Helsinki.

France: (J-P Viard), Hôtel-Dieu, Paris; P-M Girard, Hospital Saint-Antoine, Paris; C Pradier, E Fontas, Hôpital de l'Archet, Nice; C Duvivier, Hôpital Necker-Enfants Malades, Paris.

Germany: (J Rockstroh), Universitäts Klinik Bonn; G Behrens, Medizinische Hochschule Hannover; O Degen, University Medical Center Hamburg-Eppendorf, Infectious Diseases Unit, Hamburg; HJ Stellbrink, IPM Study Center, Hamburg; C Stefan, JW Goethe University Hospital, Frankfurt; J Bogner, Medizinische Poliklinik, Munich; G Fätkenheuer, Universität Köln, Cologne.

Georgia: (N Chkhartishvili) Infectious Diseases, AIDS & Clinical Immunology Research Center, Tbilisi

Greece: (H Sambatakou), Ippokration General Hospital, Athens; G Adamis, N Paissios, Athens General Hospital "G Gennimatas"

Hungary: (J Szlávik), Szent László Hospital, Budapest.

Iceland: (M Gottfredsson), Landspítali University Hospital, Reykjavik.

Ireland: (F Mulcahy), St. James's Hospital, Dublin.

Israel: (I Yust), D Turner, M Burke, Ichilov Hospital, Tel Aviv; E Shahar, G Hassoun, Rambam Medical Center, Haifa; H Elinav, M Haouzi, Hadassah University Hospital, Jerusalem; D Elbirt, ZM Sthoeger, AIDS Center (Neve Or), Jerusalem.

Italy: (A D'Arminio Monforte), Istituto Di Clinica Malattie Infettive e Tropicale, Milan; R Esposito, I Mazeu, C Mussini, Università Modena, Modena; F Mazzotta, A Gabbuti, Ospedale S Maria Annunziata, Firenze; V Vullo, M Lichtner, University di Roma la Sapienza, Rome; M Zaccarelli, A Antinori, R Acinapura, M Plazzi, Istituto Nazionale

Malattie Infettive Lazzaro Spallanzani, Rome; A Lazzarin, A Castagna, N Gianotti, Ospedale San Raffaele, Milan; M Galli, A Ridolfo, Osp. L. Sacco, Milan.

Latvia: (B Rozentale), Infectology Centre of Latvia, Riga.

Lithuania: (V Uzdaviniene) Vilnius University Hospital Santaros Klinikos, Vilnius; R Matulionyte, Centro poliklinika, Vilnius, Vilnius University Hospital Santaros Klinikos, Vilnius.

Luxembourg: (T Staub), R Hemmer, Centre Hospitalier, Luxembourg.

Netherlands: (P Reiss), Academisch Medisch Centrum bij de Universiteit van Amsterdam, Amsterdam.

Norway: (DH Reikvam), A Maeland, J Bruun, Oslo University Hospital, Ullevaal

Poland: (B Knysz), J Gasiowski, M Ingot, Medical University, Wroclaw; E Bakowska, Centrum Diagnostyki i Terapii AIDS, Warsaw; R Flisiak, A Grzeszczuk, Medical University, Bialystok; M Parczewski, K Maciejewska, B Aksak-Was, Medical University, Szczecin; M Beniowski, E Mularska, Osrodek Diagnostyki i Terapii AIDS, Chorzow; T Smiatacz, M Gensing, Medical University, Gdansk; E Jablonowska, J Kamerys, K Wojcik, Wojewodzki Szpital Specjalistyczny, Lodz; I Mozer-Lisewska, B Rozplochowski, Poznan University of Medical Sciences, Poznan.

Portugal: (L Caldeira), Hospital Santa Maria, Lisbon; K Mansinho, Hospital de Egas Moniz, Lisbon; F Maltez, Hospital Curry Cabral, Lisbon.

Romania: (R Radoi), C Oprea, Carol Davila University of Medicine and Pharmacy Bucharest, Victor Babes Clinical Hospital for Infectious and Tropical Diseases, Bucharest

Russia: (A Panteleev), O Panteleev, St Petersburg AIDS Centre, St Peterburg; A Yakovlev, Medical Academy Botkin Hospital, St Petersburg; T Trofimora, Novgorod Centre for AIDS, Novgorod, I Khromova, Centre for HIV/AIDS & and Infectious Diseases, Kaliningrad; E Kuzovatova, Nizhny Novgorod Scientific and Research Institute of Epidemiology and Microbiology named after Academician I.N. Blokhina, Nizhny Novogrod; E Borodulina, E Vdoushkina, Samara State Medical University, Samara.

Serbia: (D Jevtovic), The Institute for Infectious and Tropical Diseases, Belgrade.

Slovenia: (J Tomazic), University Clinical Centre Ljubljana, Ljubljana.

Spain: (JM Gatell), JM Miró, J. Mallolas, E. Martinez, F. Garcia, JL Blanco, M. Laguno and M. Martinez-Rebollar, Hospital Clinic – IDIBAPS. University of Barcelona, Barcelona; S Moreno, JM Rodriguez, Hospital Ramon y Cajal, Madrid; B Clotet, A Jou, R Paredes, C Tural, J Puig, I Bravo, Infectious Diseases Unit & IrsiCaixa AIDS Research Institute, Hospital Germans Trias I Pujol, Badalona; P Domingo, M Gutierrez, G Mateo, MA Sambeat, Hospital Sant Pau, Barcelona; JM Laporte, Hospital Universitario de Alava, Vitoria-Gasteiz.

Sweden: (K Falconer), A Thalme, A Sonnerborg, Karolinska University Hospital, Stockholm; CJ Treutiger, Venhälsan-Sodersjukhuset, Stockholm; L Flamholc, Malmö University Hospital, Malmö.

Switzerland: (A Scherrer), R Weber, University Hospital Zurich; M Cavassini, University Hospital Lausanne; A Calmy, University Hospital Geneva; H Furrer, University Hospital Bern; M Battegay, University Hospital Basel; P Schmid, Cantonal Hospital St. Gallen.

Ukraine: A Kuznetsova, Kharkov State Medical University, Kharkov; G Kyselyova, Crimean Republican AIDS centre, Simferopol; M Sluzhynska, Lviv Regional HIV/AIDS Prevention and Control CTR, Lviv.

United Kingdom: (B Gazzard), St. Stephen's Clinic, Chelsea and Westminster Hospital, London; AM Johnson, E Simons, S Edwards, Mortimer Market Centre, London; A Phillips, MA Johnson, A Mocroft, Royal Free and University College Medical School, London (Royal Free Campus); C Orkin, Royal London Hospital, London; J Weber, G Scullard, Imperial College School of Medicine at St. Mary's, London; A Clarke, Royal Sussex County Hospital, Brighton; C Leen, Western General Hospital, Edinburgh.

**The following centers have previously contributed data to EuroSIDA:**

Infectious Diseases Hospital, Sofia, Bulgaria

Hôpital de la Croix Rousse, Lyon, France

Hôpital de la Pitié-Salpêtrière, Paris, France

Unité INSERM, Bordeaux, France

Hôpital Edouard Herriot, Lyon, France

Bernhard Nocht Institut für Tropenmedizin, Hamburg, Germany

1st I.K.A Hospital of Athens, Athens, Greece

Ospedale Riuniti, Divisione Malattie Infettive, Bergamo, Italy

Ospedale di Bolzano, Divisione Malattie Infettive, Bolzano, Italy

Ospedale Cotugno, III Divisione Malattie Infettive, Napoli, Italy

Dérer Hospital, Bratislava, Slovakia

Hospital Carlos III, Departamento de Enfermedades Infecciosas, Madrid, Spain

Kiev Centre for AIDS, Kiev, Ukraine

Luhansk State Medical University, Luhansk, Ukraine

Odessa Region AIDS Center, Odessa, Ukraine

**EuroSIDA Steering Committee:** I Aho, J Begovac, N Chkhartishvili, G Guaraldi, I Karpov, JD Kowalska, M Losso, J Lundgren, R Matulionyte, JM Miró, C Oprea, R Paredes (co-chair), C Pradier, LD Rasmussen, J Rockstroh, V Svedhem, G Wandeler (chair).

**EuroSIDA staff:** O Kirk, L Peters, A Bojesen, D Raben, D Kristensen, K Laut, JF Larsen, D Podlekareva, B Nykjær, EV Hansen. **Statistical Staff:** A Mocroft, A Phillips, A Cozzi-Lepri, L Shepherd, S Amele, A Pelchen-Matthews

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	All	Western Europe	Southern Europe incl Israel/Argentina	Northern Europe	East Central Europe	Eastern Europe
<b>Number under follow-up at 01/01/2016</b> n (% of total)	12,327 (100)	2,955 (24)	3,258 (26)	2,473 (20)	1,853 (15)	1,788 (15)
<b>Number of clinics included</b>	100	24	21	22	16	17
<b>Sex</b> n (% of all)						
Male	8,993 (73.0)	2,281 (77.2)	2,362 (72.5)	1,968 (79.6)	1,365 (73.7)	1,017 (56.9)
Female	3,334 (27.0)	674 (22.8)	896 (27.5)	505 (20.4)	488 (26.3)	771 (43.1)
<b>Current age in years</b> , median (IQR)	50 (42-56)	53 (47-59)	51 (45-56)	53 (47-59)	44 (38-51)	38 (34-43)
<b>HIV transmission category</b> n (% of all)						
MSM	4,493 (36.4)	1,309 (44.3)	1,032 (31.7)	1,352 (54.7)	719 (38.8)	81 (4.5)
IDU	3,351 (27.2)	515 (17.4)	1,065 (32.7)	364 (14.7)	526 (28.4)	881 (49.3)
Heterosexual	3,615 (29.3)	795 (26.9)	961 (29.5)	622 (25.2)	462 (24.9)	775 (43.3)
Other/unknown	868 (7.0)	336 (11.4)	200 (6.1)	135 (5.5)	146 (7.9)	51 (2.9)
<b>Ethnic origin white</b> n (% of all)	10,650 (86.4)	2,251 (76.2)	2,961 (90.9)	1,823 (73.7)	1,838 (99.2)	1,777 (99.4)
<b>Years since HIV-diagnosis</b> , median (IQR)	16.6 (10.1-23.1)	19.9 (13.0-24.5)	19.6 (12.0-24.8)	20.1 (13.7-25.2)	12.8 (7.9-18.1)	9.6 (5.4-13.6)
<b>Years on ART</b> , median (IQR)	13.3 (7.0-19.1)	17.0 (9.5-20.2)	16.3 (8.2-20.0)	16.9 (9.8-19.9)	10.4 (5.9-15.3)	5.5 (3.2-8.3)
<b>Date of enrolment into EuroSIDA</b> MM/YY, median (IQR)	06/08 (11/01-04/14)	07/08 (03/99-03/12)	03/08 (05/99-09/14)	12/05 (03/97-05/12)	07/08 (10/02-05/12)	04/12 (04/08-10/14)
<b>CD4 cell nadir</b> median (IQR) cells/mm <sup>3</sup>	218 (105-354)	188 (63-320)	248 (129-402)	200 (96-331)	242 (129-370)	210 (115-324)

<b>CD4 at enrolment</b> median (IQR) cells/mm <sup>3</sup>	410 (258-604)	421 (252-628)	435 (273-655)	380 (240-570)	412 (277-580)	395 (251-562)
<b>On ART at 01/01/2016</b> n (% of all)*						
Yes	11,741 (95.2)	2,896 (98.0)	3,177 (97.5)	2,406 (97.3)	1,766 (95.3)	1,496 (83.7)
No	586 (4.8)	59 (2.0)	81 (2.5)	67 (2.7)	87 (4.7)	292 (16.3)
<b>HIV-RNA at enrolment</b> n (% of all)**						
< 500copies/mL	7,181 (69.0)	1,961 (75.7)	1,919 (71.3)	1,384 (69.2)	1,171 (69.7)	746 (51.4)
≥ 500copies/mL	3,233 (31.0)	628 (24.3)	774 (28.7)	617 (30.8)	508 (30.3)	706 (48.6)
<b>HIV-RNA at 01/01/2016</b> n (% of all)**						
< 500copies/mL	11,383 (93.9)	2,864 (98.1)	3,075 (96.1)	2,404 (98.0)	1,722 (93.4)	1,318 (77.1)
≥ 500copies/mL	742 (6.1)	56 (1.9)	125 (3.9)	48 (2.0)	121 (6.6)	392 (22.9)
<b>Previous AIDS diagnosis at 01/01/2016</b>						
n (% of all)	3,308 (26.8)	899 (30.4)	865 (26.6)	658 (26.6)	452 (24.4)	434 (24.3)
Yes	9,019 (73.2)	2,056 (69.6)	2,393 (73.5)	1,815 (73.4)	1,401 (75.6)	1,354 (75.7)
No						
<b>HCV status</b>						
Anti-HCV negative	6,403 (51.9)	1,641 (55.5)	1,613 (49.5)	1,611 (65.1)	1,022 (55.2)	516 (28.9)
Anti-HCV positive	5,706 (46.3)	1,269 (42.9)	1,597 (49.0)	815 (33.0)	812 (43.8)	1,213 (67.8)
Unknown	218 (1.8)	45 (1.5)	48 (1.5)	47 (1.9)	19 (1.0)	59 (3.3)
<b>People with ≥1 plasma sample</b> n (% of all)	7,767 (63.0)	2,056 (69.6)	1,627 (49.9)	2,009 (81.2)	1,635 (88.2)	449 (25.1)

**Table 1: Characteristics of EuroSIDA participants under ongoing follow-up as per 1<sup>st</sup> January 2016.** Enrolment is enrolment into the EuroSIDA study. Regions are as defined in figure 2. \* ART defined as taking any ART-regimen, regardless of the number of antiretroviral drugs. \*\* HIV-RNA among those with an available measurement.

**Demographics and basic clinical information**

- Date of birth\*
- Sex\*
- Country of origin\*
- Ethnicity\*
- Date first seen at department\*
- Date of most recent clinic visit
- Date of first positive HIV1-Ab test\*
- If known, date of last negative HIV-1 Ab test\*
- Mode of HIV-infection\*
- Mode of HCV-infection†
- Body weight
- Height\*
- Blood pressure
- Smoking status
- Alcohol abuse\*\*
- Injection drug use\*\*
- Pregnancy and mother to child transmission‡

**Laboratory values**

HIV-RNA  
 CD4 cell count  
 CD8 cell count§  
 Haemoglobin\*\*  
 Serum creatinine  
 Platelets  
 ALT (alanine transaminase)  
 AST (aspartate transaminase)  
 Albumin  
 Bilirubin  
 INR\*\*  
 Total cholesterol  
 HDL cholesterol  
 LDL cholesterol  
 Serum triglycerides  
 HbA1c  
 Plasma glucose  
 Urine dipstick  
 HBsAg (hepatitis B virus s-antigen)  
 HBV-DNA, anti-HBs (hepatitis B surface antibody), HBe-IgG (hepatitis B core antibody), IgM + IgG anti-HBc (hepatitis B core antibody total)‡  
 Anti-HCV IgG (anti-hepatitis C virus antibodies)  
 HCV-RNA  
 HCV genotype and subtype  
 Parathyroid hormone‡  
 Prostate specific antigen‡

**Other tests**

Resistance test  
 Plasma samples  
 HLA B\*5701§  
 Bone mass density§  
 Fibroscan†  
 Liver biopsy



	CT and/or Ultrasound of abdomen/liver performed?†
<b>Antiretroviral therapy</b>	Start- and stop-dates Reason for discontinuation Adherence to antiretroviral therapy‡ Hypersensitivity reactions and liver toxicity to integrase inhibitors‡
<b>Treatment related to risk of cardiovascular disease</b>	Start- and stop-dates of antihypertensives, ACE-inhibitors, insulin or derivatives hereof, oral antidiabetic agents, antiplatelets, statins, fibrates, lipid lowering agents (not further specified)
<b>Treatment of hepatitis C</b>	Start- and stop-date† Start- and stop dosage† Discontinuation of anti-HCV treatment before scheduled, and reason for discontinuation† Adherence to anti-HCV treatment† Adverse events to anti-HCV treatment and outcome of adverse event†
<b>Other medical treatment</b>	Opiate substitution therapy† Antipsychotic therapy‡ Antidepressant drugs‡ Benzodiazepines‡ Vitamin D‡ Bisphosphonates‡ Treatment against infections (including primary prophylaxis)‡
<b>Clinical events and adverse events to antiretrovirals</b>	All AIDS-defining events (according to the CDC 1993 definition) [1] AIDS- and non-AIDS defining malignancies Cause of death Cardiovascular events (myocardial infarction (MI), invasive coronary procedure (ICP)) Diabetes mellitus End stage renal disease (ESRD) End stage liver disease (ESLD) Fractures Avascular necrosis‡ Pancreatitis‡

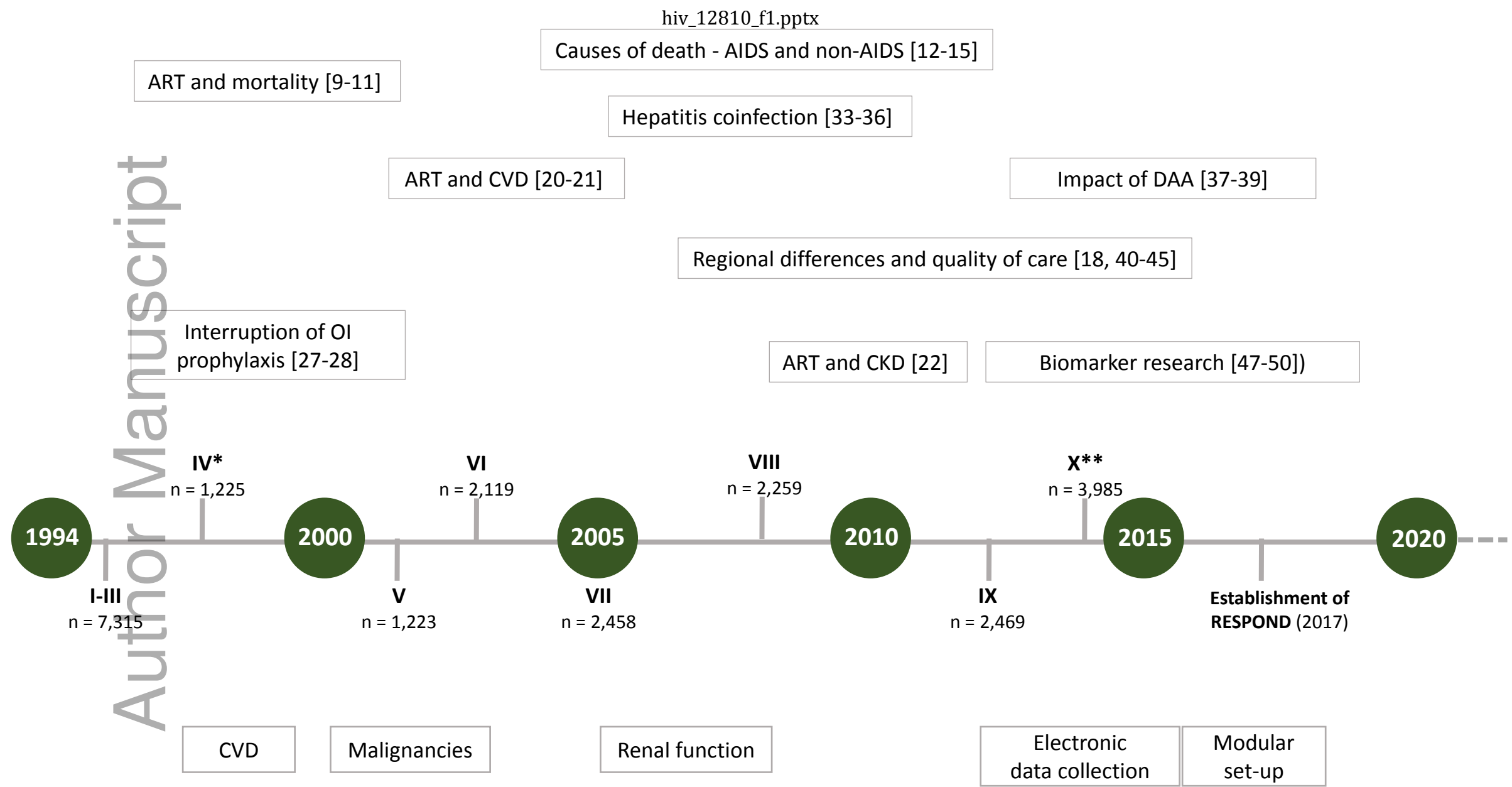
## Lipodystrophy‡

<b>Plasma samples</b>	Plasma samples collected twice annually from majority of clinics
<b>Selected specific surveys and laboratory measurements</b>	<p>EuroSIDA clinic survey [45]</p> <p>Centrally tested prostate specific antigen [49]</p> <p>Survey of ATRIPLA use as first-line therapy [51]</p> <p>Centrally tested HCV RNA and HCV genotype [36,52]</p> <p>Centrally tested Vitamin D levels [53,54]</p> <p>Centrally tested hyaluronic acid [47,55]</p> <p>Centrally tested hepatitis delta [56]</p> <p>Centrally tested resistance [48]</p> <p>Survey of dialysis and renal transplantation [57]</p>

**Table 2: Data available in EuroSIDA** \* collected only at enrolment into EuroSIDA. \*\* collected for all at enrolment into EuroSIDA, thereafter only for HIV/HCV-coinfected participants. † from dataset 44 (2016) and onward collected for HIV/HCV-coinfected participants only. ‡ not collected after dataset 44 (2016). § collected since dataset 45 (2017). ¶ collected since dataset 43 (2015). Numbers in brackets refer to references.

Major scientific focus areas

Data collection



**Figure 1: The EuroSIDA Study – scientific achievements, cohorts and data collection.** Cohorts (enrolment waves) are indicated by roman numerals I-X. ART: antiretroviral therapy, CKD: chronic kidney disease, CVD: cardiovascular disease, HCV: hepatitis C virus, OI: opportunistic infections. \* Inclusion of first sites in Eastern Europe. \*\*Inclusion of only HIV/HCV coinfecting people.

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**Figure 2: Map of current EuroSIDA clinics, countries and regions.** Countries are grouped into the following regions: *Western Europe (light blue)*: Austria, Belgium, France, Germany, Luxembourg, Switzerland. *Southern Europe (red)*: Argentina, Greece, Israel, Italy, Portugal, Spain. *Northern Europe (brown)*: Denmark, Finland, Iceland, Ireland, Netherlands, Norway, Sweden, United Kingdom. *East Central Europe (green)*: Bosnia-Herzegovina, Croatia, Czech Republic, Hungary, Poland, Romania, Serbia, Slovenia. *Eastern Europe (dark blue)*: Belarus, Estonia, Georgia, Latvia, Lithuania, Russia, Ukraine. An up-to-date list of the EuroSIDA study group may be found on the website: <http://www.chip.dk/Studies/EuroSIDA/Study-group>