



Situation assessment report

**Information systems analysis
to identify data sets, opportunities
for interoperability and needs for
IT solutions in the field of HIV/AIDS
response in Georgia, Kazakhstan,
Kyrgyzstan, Moldova, and Ukraine**

2023

TABLE OF CONTENTS

Abbreviations	4
Disclaimer	5
Acknowledgements	6
Introduction	7
Background and objectives	7
Methodology	7
Desk review	7
Collection of information using structured questionnaire	8
Semi-structured interviews	8
Analysis	8
Georgia	9
Overview	9
Georgian National Aids Health Information System (AIDS HIS)	9
System specification	10
System Design	10
Information and data quality	12
Software development and maintenance funding	13
Interoperability	13
HMIS HIV	13
System specification	13
System Design	13
Information and data quality	14
Software development and maintenance funding	15
Interoperability	15
Summary	15
Data availability	15
Personal data protection and audit mechanisms	16
Recommendations	16
Technical	16
Policies and Regulations	16
Kazakhstan	17
Systems overview	17
Information System for Electronic Tracking of HIV Cases	18

System specification	18
System design	19
Information and data quality	20
Software development and maintenance funding	20
Interoperability	20
Summary	21
Data availability	21
Personal data protection and audit mechanisms	21
Recommendations	21
Technical	21
Policies and Regulations	21
Kyrgyzstan	22
Systems overview	22
Medical Information System (MIS) for HIV cases monitoring	22
System specification	22
System design	23
Information and data quality	24
Software development and maintenance funding	24
Interoperability	24
Summary	25
Data availability	25
Personal data protection and audit mechanisms	25
Recommendations	25
Technological	25
Policies and Regulations	25
Moldova	26
Systems overview	26
Electronic registry for key populations monitoring activities	28
System specification	28
System design	29
Information and data quality	30
Software development and maintenance funding	30
Interoperability	30
Summary	31
Data availability	31
Recommendations	31
Technical	31
Policies and Regulations	31

Ukraine	32
Systems overview	32
MIS HIV	34
System specification	34
System design	34
Information and data quality	35
Software development and maintenance funding	36
Interoperability	36
Summary	36
Data availability	36
Personal data protection and audit mechanisms	36
SyrEx	36
System specification	36
System design	37
Information and data quality	37
Software development and maintenance funding	38
Interoperability	38
Summary	38
Data availability	38
Personal data protection and audit mechanisms	38
DATACHECK	39
System overview	39
System design	39
Information and data quality	40
Software development and maintenance	40
Interoperability	40
Summary	41
Data availability	41
Personal data protection and audit mechanisms	41
Recommendations	41
Technological	41
Policies and Regulations	41
Final notes	42
Enablers and obstacles	42
Gaps	43
Annexes	45
Annex A – Interviewed persons	45
Annex B – General questioner	46

ABBREVIATIONS

AGYW	Adolescent Girls and Young Women
AIDS	Acquired Immunodeficiency Syndrome
EHR	Electronic Health Record
EHCMS	Electronic HIV case monitoring system
FSW	Female sex workers
HIV	Human Immunodeficiency Virus
HTC	HIV testing and counselling
IS	Information System
ICAP	International Center for AIDS Care and Treatment Program, Columbia University
MIS	Management Information System
MOH	Ministry of Health
MSM	Men having sex with men
NASA	National AIDS Spending Assessment
NHA	National Health Accounts
NCDC	National Center for Disease Control and Public Health
PHC	Primary Health Care
PLHIV	People Living with HIV
PWID	People who inject drugs
SNU	Sub National Unit
TG	Transgender people, prisoners
TB	Tuberculosis

DISCLAIMER

The information provided in this text is current as of the date indicated below and is subject to change without notice. While we have made every effort to ensure the accuracy and completeness of the information presented, we cannot guarantee that it is free from errors or omissions.

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We appreciate the effort you put into completing the surveys, participating in interviews or focus groups, and providing us with your feedback. Your input has been instrumental in shaping our research findings and recommendations.

Once again, thank you for your contribution to this study. Your willingness to participate and share your perspectives has made a significant impact and has been greatly appreciated.

INTRODUCTION

This activity is part of the SoS project 2.0 (Sustainable Services for Key Populations in the EECA region), funded by the Global Fund to Fight AIDS, Tuberculosis and Malaria.

Alliance for Public Health (APH) is working within the Global Fund funded Eastern Europe and Central Asia HIV program on services sustainability, one of the components of which is digitalization of HIV services.

The development of a number of innovative IT solutions for use at the national and / or regional level to enhance the effectiveness of HIV response programs as a means of making health solutions more cost-effective, low-threshold and sustainable is a separate important part of the project.

The analysis was performed within the following countries: Georgia, Kazakhstan, Kyrgyzstan, Moldova, and Ukraine.

Background and objectives

The analysis aimed to identify the HIV related information systems, their status, workflows and processes implemented within the information systems, collected data sets and corresponding issues and needs of the countries.

Methodology

Desk review

The desk review was conducted to collect information about the information systems (IS) that exist in the HIV response in each country. The desk review was primarily intended to address the Questions from the questionnaire from Annex B – General questionnaire, and others indirectly. Criteria for inclusion of IS into the assessment were as follows:

- Designed to collect data related to HIV response
- Designed to produce data for one or more standard indicators included in the national HIV M&E Plan
- Planned or currently implemented at the national level (i.e. systems limited to specific projects, or used only at sub-national level were excluded)
- Being used or being developed at the time of evaluation.

For the desk review, the following documents were collected and analyzed by the team of evaluators, depending on their availability per country:

- TORs, manuals and other available documentation for ISs that matched the inclusion criteria

- National HIV M&E Plans (with responsible entities and data sources specified for each indicator)
- Latest reports on HIV response (e.g. GAM)
- Latest M&E system evaluation reports.

Using the collected documentation, evaluators filled in the IS Inventory, a table with key information about each IS included in the evaluation. The structure of the IS inventory (fields) was developed by the evaluators prior to the desk review, based on the evaluation questions, and was updated during the evaluation.

Collection of information using structured questionnaire

One questionnaire covers one IS. The questionnaires were emailed to technical specialists responsible for development and/or implementation of respective IS in each country.

Based on their responses, the remaining fields in the IS inventory were filled by the evaluators.

Semi-structured interviews

Semi-structured interviews were conducted to clarify the information collected in the IS inventory, and to collect the opinions of country stakeholders on specific aspects of the assessment scope. The interviews were conducted by the evaluators face-to-face (via zoom), using the Interview Guide, which consists of open-ended questions. During the interview, the interviewer asked additional and clarification questions to get a complete and comprehensive response to each evaluation question.

Relevant specialists with in-depth knowledge of the HIV response and IS role in it were interviewed, e.g., depending on the nomination per country:

- Senior level M&E specialists in the national program (e.g. head of the M&E or epidemiology departments at a National Center for HIV Control)
- Senior program specialists for HIV prevention and treatment programs
- Senior specialists responsible for HIV IS implementation (e.g. head of an IT department at a National Center for HIV Control).

Analysis

The evaluators triangulated and analyzed the results of the desk review and semi-structured interviews. Conflicting responses were resolved using the consensus method among the evaluators. The results of the analysis were summarized for each country and the regional level in this Report.

GEORGIA

PLWHIV	8100
PLWHIV who know their status	88%
PLWHIV receiving ART	71% (5746)



Source: <https://aidsinfo.unaids.org>

Overview

In Georgia, there are several information systems in use developed by state authorities and with the support of international partners.

The Georgian National AIDS Health Information System (AIDS HIS) is an information system developed by state authorities which collects information on HIV cases and treatment. Georgian National AIDS Health Information System (AIDS HIS) was established in 2011 by the Infectious Diseases, AIDS and Clinical Immunology Research Center, which is Georgia’s referral institution for HIV diagnosis, treatment and care.

The Health Management Information System HIV (HMIS HIV) is an information system developed with the support of international partners used mostly by NGOs which collects information on prevention services and distributed commodities and conducted rapid tests. The Health Management Information System HIV (HMIS HIV) was established in 2017 and developed with the support of Global Fund and NCDC. The system is used by the NGOs and mainly collects information on provided prevention services.

Georgian National Aids Health Information System (AIDS HIS)

The system traces its roots back to 1989 when the national AIDS registry was created following the first case of HIV diagnosed in the country. Over the years this registry evolved into a modern web-based health information system that connects all five HIV clinical care providers in Georgia. Currently AIDS HIS represents an observational electronic database that collects information on all reported cases of HIV. Demographic, epidemiological and routine HIV-related clinical and laboratory data are entered directly by each clinic. In 2022 AIDS HIS collected information about over 9700 patients with HIV.

AIDS HIS is the unique source of data both for informing and planning national programs and for research. The system is the source of key data for international reporting, including Global AIDS Monitoring (GAM), the European Surveillance System (TESSy) and Monitoring of Dublin Declaration. Data generated by the AIDS HIS resulted in a number of publications describing: impact of expanded ART access on disease outcomes, including spectrum of

cause-specific mortality; magnitude and impact of late HIV presentation and engagement in HIV care continuum.

According to the Georgia HIV/AIDS National strategy plan the National AIDS Health Information System will continue to be developed, maintained and improved.

Also it is considered to introduce a web-based database for prevention services which will enable service providers with tools for data standardization and disaggregation. In addition there are planned activities to explore the possibility of aligning databases used by both, health care facilities and civil society organizations to support client's progression along provided services.

System specification

Within the Infectious Diseases, AIDS and Clinical Immunology Research Center an information system - Georgian National Aids Health Information System (AIDS HIS) - was developed internally. The purpose of the information system is to collect high quality data on HIV/AIDS for Georgian patients.

The development and maintenance of the AIDS HIS is funded by the Infectious Diseases, AIDS and Clinical Immunology Research Center. The Center also has budgets for further system development and improvements. The information system has development plans developed and approved by the Center and the budgeting is done according to the approved plans and priorities. The releases are done periodically, or on demand and the next release is planned for 2023.

System Design

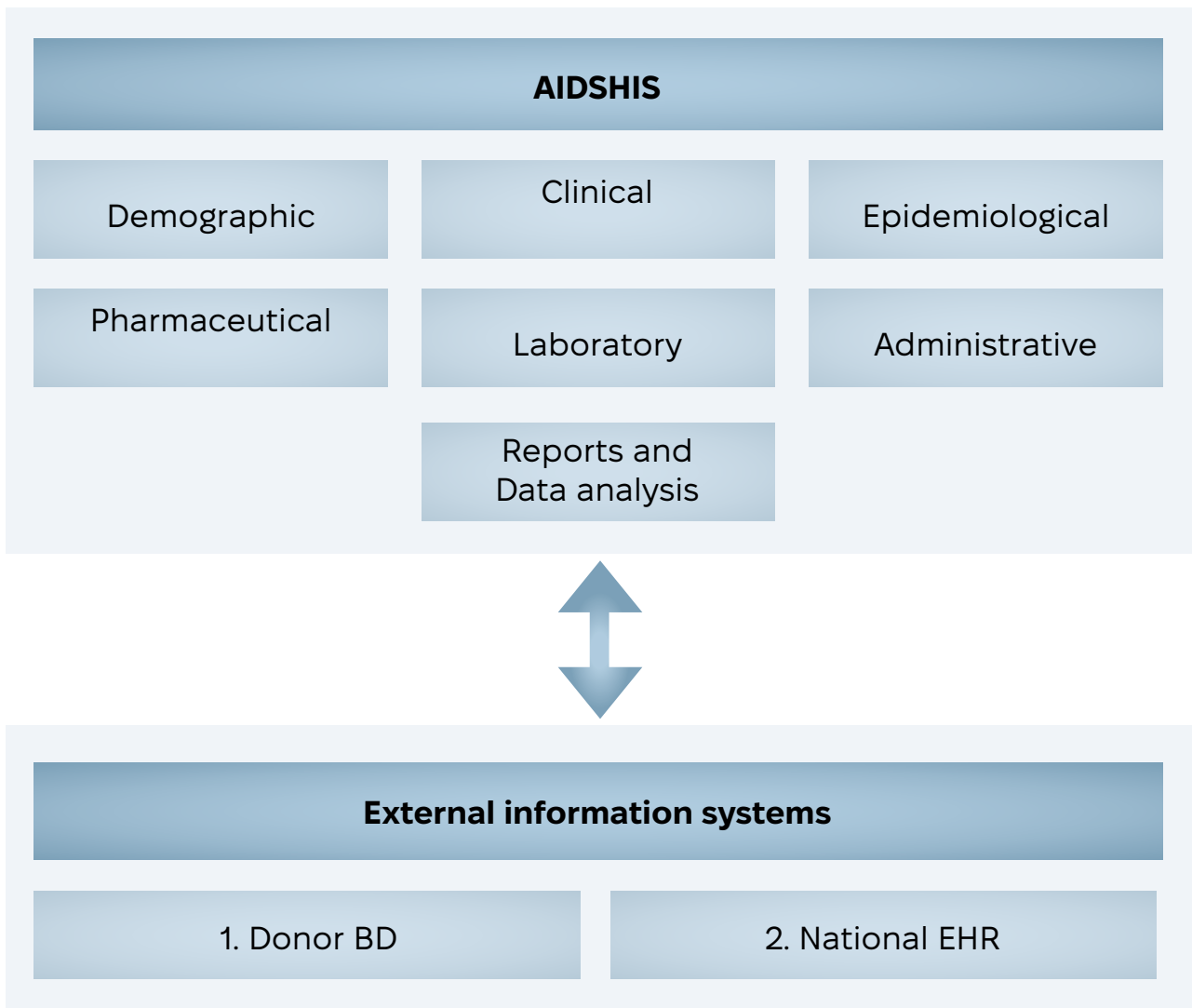
The AIDS HIS is a web application developed using open source technologies. The system is hosted on the servers of a national service provider. A dedicated team is administrating the information system and ensures its smooth performance. There are backup procedures in place and the backup is done overnight automatically.

The system functionalities are documented and the user guides are available and updated after each system update, or new functionalities releases. All the user manuals are available within the information system and are in Georgian language.

The information system is built using international classifiers approved by WHO as ICD10, by MOH and Cervical screening program and different national standards. This approach allows easy data exchange with third party information systems and generation of reports for international organizations. The data exchange with third party information systems is regulated by institutional agreements to which the information systems belong.

The system is used at the national wide level by all AIDS related centers. The implementation of the system at national level is 100%.

The AIDS HIS has a modular structure. Access to the system functionalities is granted according to user roles. AIDS HIS can exchange data with external information systems using standard data exchange protocols as SOAP and XML formats.



Information and data quality

The system collects the following categories of patient's data:

- Demographic data:
 - Personal identification data
 - First name
 - Last name
 - Age
 - Address
 - Contact details
- Clinical information:
 - Consultation
 - Diagnosis
 - Services
 - Treatment
 - Laboratory results
- Epidemiological records

- Pharmaceutical prescriptions:
 - Drugs
 - Medical devices
 - Treatment schemas
- Laboratory tests:
 - Patient data
 - Test type
 - Test results

The information system collects patient personal identification data. These are the personal id, name, address and contact details.

In terms of medical data, the system collects information on new cases, existing cases, deaths, diagnoses, tests, consultations, treatment schemas and medical care details. The users within the HIV medical centers register patient's data depending on their role within the organisation and access level to the system (demographic, clinical, laboratory, etc.). The completeness of data is assured by different means. The information system itself has a set of mandatory fields and the users need to fill them in, or the record will not be saved. Also the system has a set of logical validations implemented within the pages through which the data is recorded. And the last one are the cross validation reports which allow staff to verify the completeness and correctness of registered data. The collected information allows the medical personnel to see the "big picture" of a specific patient.

The information collected by the system allows it to generate indicators for the international bodies as ECDC, WHO, UNAIDS. At the same time the system generates different national reports on the HIV situation.

The access to the patient's data is also done strictly according to the user's permissions and roles within the medical center.

Software development and maintenance funding

The development and maintenance of the AIDSHIS is done by state authorities. The Infectious Diseases, AIDS and Clinical Immunology Research Center is planning yearly budgets for the improvement of the information system.

Interoperability

The AIDSHIS is connected to the national EHR system with which it exchanges the HIV status of the patient and to the national donor database.

HMIS HIV

System specification

Another information system for AIDS monitoring in Georgia, HMIS HIV, was developed with the support of the Global Fund and NCDC. The main purpose of the system is to collect information about patients with HIV, prevention, provided services, tests, brochures, etc.

The development of the system was funded by the Global Fund and started in 2017. To date, the system has had several updates with new features and reports added. The last update was done in 2020. The maintenance of the system is assured by the Georgian Information Technology Agency. At the moment there are no new developments planned.

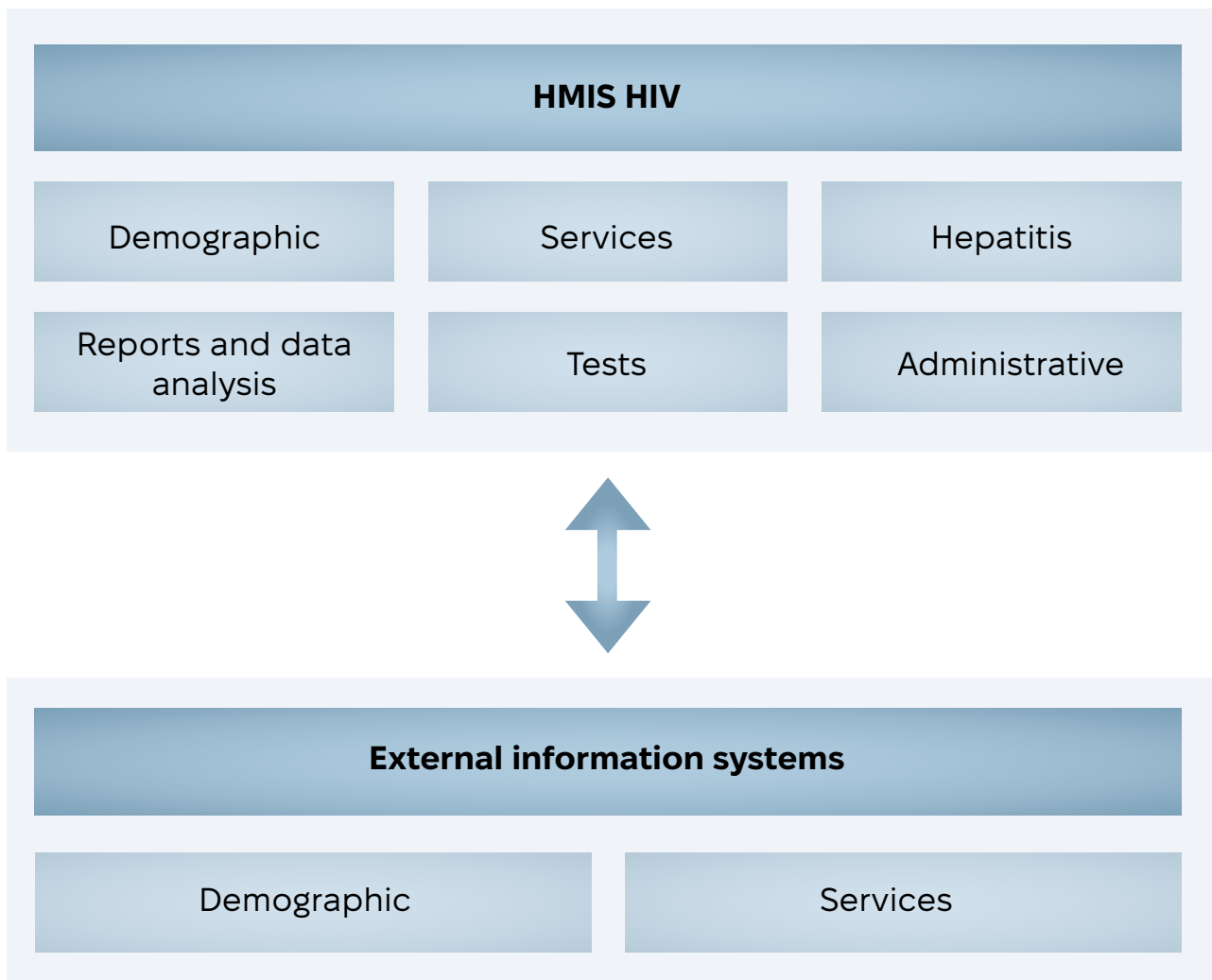
System Design

HMIS HIV is a web application developed using commercial solution technologies. The system's hosting is assured by funds from the NCDC. A dedicated team is administrating the information system and performs all the necessary activities for the system functioning. There are periodical system data backups. The solution is built on a custom engine and the process of development was documented in detail so that developers can implement new functionalities. At the same time user manuals are available, including videos. All the user manuals are available within the information system in Georgian language.

The information system is built using international classifiers approved by WHO, local Ministry of Health, Ministry of Justice and other state authorities. Through these classifiers internal and national registry of localities, regions, etc. This approach allows easy data exchange with third party information systems and generates reports for international organizations. The data exchange with third party information systems is regulated by institutional agreements to which the information systems belong. Through these integrations there is also a common information system for regions and user management.

The system is used at the national level by all NGOs, MOH and HIV specific medical centers.

The HMIS HIV has a modular structure. Access to the system functionalities is granted according to the user role. HMIS HIV can exchange data with external information systems using standard data exchange protocols and formats.



Information and data quality

The system collects the following categories of patient's data:

- Demographic data,
- Services (HIV, infections, psychological, etc.)
- Hepatitis
- Information about tests, provided brochures

Within the information system, patient personal identification data is collected. These are personal id, name, address and contact details. The system also allows the registration of anonymous patients if they don't want to disclose their identity.

In terms of medical data, the system collects information on new patients, existing patients, different types of services, HIV tests, information about hepatitis, brochures with patient information, etc.

The users within the NGOs have access to specific portions of patient data and can register information depending on their role and the designated permissions (demographic, services, tests, etc.). The completeness of data is assured by logical validations, mandatory fields and different reports.

The system generates two big categories of reports. The financial reports are generated within the system and are used to report the quantity of services provided. Based on the financial reports, the institutions are funded. The second group of reports are for internal use. The reports provide information per patient, institution, provided services, categories of services, with options to filter and groups by categories, etc. Same time, the NCDC has access to the statistical data recorded at any level.

The information collected by the system allows to generate indicators on HIV situations such as number of screenings, positive/negative test results, etc.

The access to the patient's data is also done strictly according to the user's permissions and roles within the medical center.

Software development and maintenance funding

The development and maintenance of the HMIS HIV is done with the support of the international partners (Global Fund).

Interoperability

The HMIS HIV is exchanging data with the Common data information system, Ministry of Justice, Common user management system and others.

Summary

The data collected by the countries corresponds to the minimum data set recommended by WHO according to the Consolidated guidelines on person-centered HIV strategic information: strengthening routine data for impact¹.

Data availability

The data collected by the information systems are used only by authorized users. The public society doesn't have access to the patient's data. However both systems generate statistical reports that can be provided to any interested authority.

Personal data protection and audit mechanisms

Both information systems implement audit and data protection mechanisms. Only authorized users, based on roles and permissions provided, have access to specific portions of data and user's activities in the information systems are logged.

Recommendations

The recommendations proposed as the result of interviews and assessment can be divided into two main groups:

- Technical
- Policies and Regulations

Technical

- Avoid direct data exchange with third party information systems;
- Implement new lightweight data exchange standards which will allow easier data exchange and integration with new equipment;
- Extend the exchangeable datasets;
- Free and open use of codes, standards for adaptation and development;
- Further software development, improvement and maintenance;
- End users periodical training.

Policies and Regulations

- Improve national policies and regulations on data collection, exchange and access;
- Providing open access to strategic data to improve global health;
- Ensure public access to strategic data to improve public health;
- Periodical data audit to ensure the quality of data does not suffer;

1 <https://www.who.int/publications/i/item/9789240055315>

KAZAKHSTAN

PLWHIV	35 000
PLWHIV who know their status	80%
PLWHIV receiving ART	64% (22 315)



Source: <https://aidsinfo.unaids.org>

Systems overview

Since 2010, ICAP has been supporting the Ministry of Health of Kazakhstan, with the development and implementation of an electronic HIV case management system (EHCMS). The funding for this initiative comes from PEPFAR through the Centers for Disease Control and Prevention (CDC). The EHCMS is a confidential system that allows health workers to track and manage individual HIV cases, while also providing health managers with the necessary data to evaluate HIV care and treatment indicators.

Initially, ICAP's work on the EHCMS began in 2011, building on the foundation set by the World Bank-funded Central Asia AIDS Control Project in 2009. The primary objective was to create a system that would provide clinicians with real-time, accurate, and easily accessible patient data, while also supporting data-driven decision-making by health managers and policymakers.

The system was implemented at the national level and used for case tracking and reports generation. Each patient that has visited an HIV care and treatment site that uses EHCMS has a patient record that includes socio-demographic data (name, age, education level, etc.), epidemiological data (HIV testing year and results, place of infection, mode of transmission, sexual and drug use behaviors), laboratory data (HIV, CD4, and viral load test results), and clinical data (vaccination record, TB history, physical exam results, ART-related data). The data is populated by clinicians from standardized paper patient case records that are entered into facility-level databases.

In Kazakhstan there are several information systems that co-exist and are managed and operated by several government entities, local institutions and/or external agencies/institutions. In some cases treatment and testing is tracked in one system, and interventions for key populations - in another (database for individual accounting of clients). The majority of funding is provided by the government, but there is a need for additional funding to improve information systems, and to develop NGO monitoring systems.

Another set of digital tools was developed with support from the Elton John AIDS Foundation, ICAP in Kazakhstan, the Almaty AIDS Center, and local NGOs. An online self-test service website hivtest.kz was launched in 2022 so that clients can access a convenient, anonymous HIV self-testing system. Clients simply go to the website and choose where they would like to pick up the HIV test kit based on a series of location options. All information related to the client's identity remains confidential and anonymous. This online service complements another web-based platform that ICAP in Kazakhstan has initiated for people who have tested positive for HIV to send anonymous messages to partners. Through the website www.sms.icapapps.kz,

a person who knows their HIV+ status can send an anonymous short message to their past and current partners to notify them about possible exposure to HIV. Next the online service coordinators provide the client with assistance and support in next steps for treatment and care. Individuals are then provided a link to the anonymous HIV self-test website so they can easily access testing services.

The information systems in Kazakhstan help to collect the HIV prevalence and incidence data:

- Age
- Sex
- Key populations (FSW, PWID, MSM, TG, prisoners, etc.)
- Priority populations (AGYW, clients of sex workers, military, mobile populations, non-injecting drug users)
- Sub-national units

Collect and report service delivery data for:

- HIV testing
- PMTCT
- Adult treatment
- Pediatric care and support
- Orphans and vulnerable children
- HIV prevention
- AIDS-related mortality

Information System for Electronic Tracking of HIV Cases

System specification

Management of the HIV cases using information systems leads to a more exact information on patients, patient cases, treatment and generated statistics. In Kazakhstan the Electronic HIV case monitoring system (EHCMS) has been implemented for more than ten years.

EHCMS represents an informational system for collection, storage, transfer and processing of epidemiological, laboratorial and clinical data for all registered HIV infection cases. The goal of the EHCMS system implies provision of timely access to necessary information on people living with HIV (PLHIV) and healthcare assigned services in order to make valid decisions and evaluate activities aimed at improving PLHIV life quality. It is planned to start funding the EHCMS further development and maintenance by the state authorities too. The EHCMS is in continuous development and improvement and during last years it switched from an outdated technology stack to a modern one. Now the state authorities are in the process of development of new Terms of References to update EHCMS with new functionalities and modules. The system will be integrated also with a mobile application through which the patients will be able to record their data. There is a development plan in place and new releases are planned for 2023.

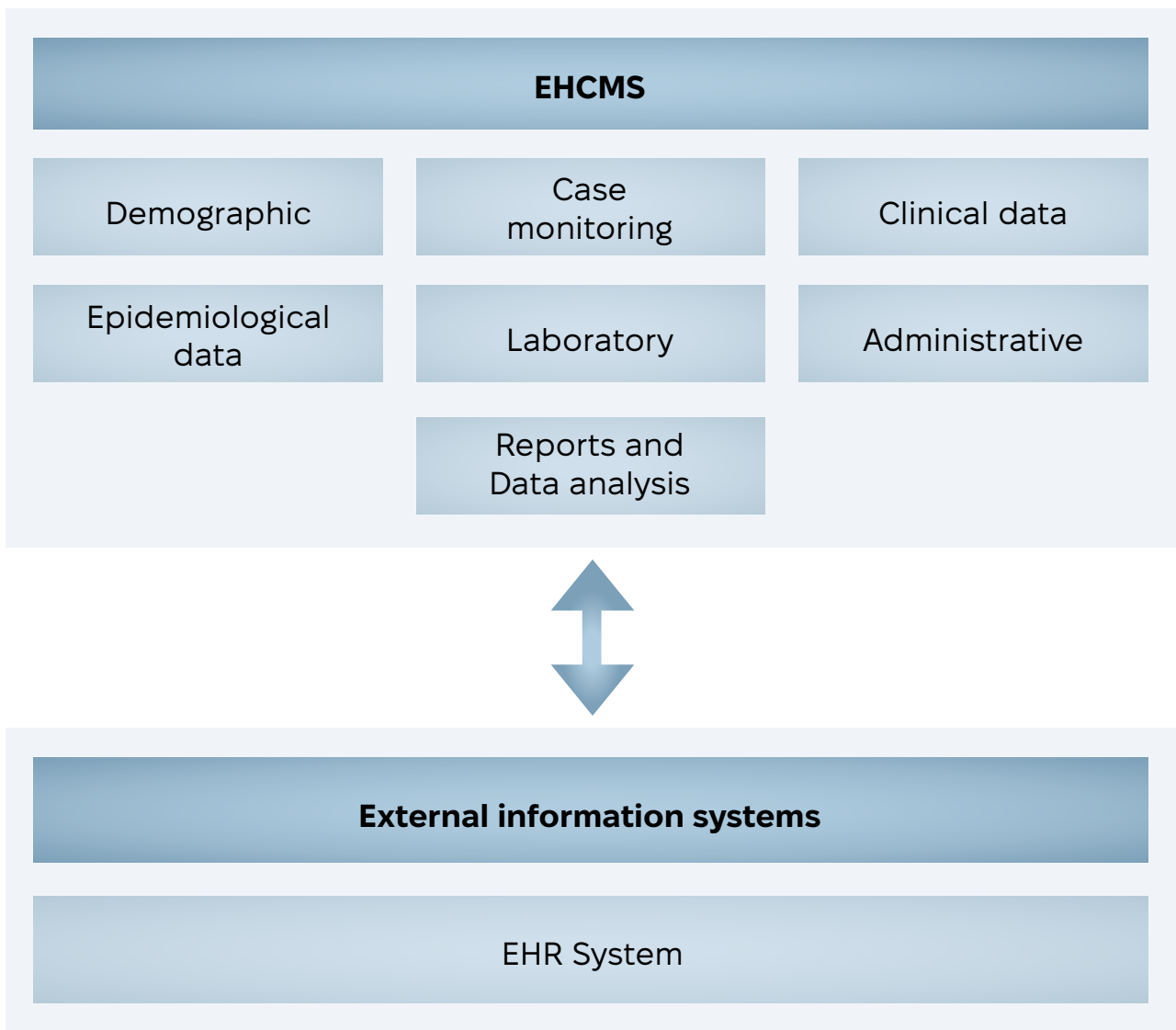
System design

Initially EHCMS was developed as a client-server application. The desktop client application had to be installed on each user's PC in every institution. In time the application technology stack switched to a web version which made the application easier to access, use and maintain. The application is hosted on servers inside the country and a dedicated team is administrating the information system and performs all the necessary activities to ensure the system's performance. There are periodical backups done to eliminate the risk of data loss.

The system functionalities are documented and the user guides are available and updated after each system update, or new functionalities releases. All the user manuals are available within the information system.

The information system is built using international classifiers approved by WHO and locally approved by MOH and other state authorities. The data exchange with third party information systems is regulated by institutional agreements to which the information systems belong. The system is used at a national wide level by all AIDS related centers.

The EHCMS has a modular structure. Access to the system functionalities is granted according to user roles. EHCMS can exchange data with external information systems using standard data exchange protocols and formats.



Information and data quality

The system collects the following categories of patient's data:

- Demographic data,
- HIV cases monitoring data,
- Clinical data
- Epidemiological data,
- Laboratory tests

Patient personal identification data is collected within the information system. These are the personal id, name, address and contact details, etc. The system also allows the registration of anonymous patients if they don't want to disclose their identity.

In terms of medical data, the system collects information on patients, new cases, existing cases, clinical data, epidemiological data, laboratory tests, etc. The system allows data exchange, but without providing personal identification details. That is done in order to keep the patient's identity private.

The users within the medical centers have access to a specific list of patient data and can register information depending on their role and permission (demographic, clinical, cases, etc.). The completeness of data is assured by logical validations, mandatory fields and different reports.

The system generates financial, clinical and non-clinical reports for internal use, that concern the persons, provided services, tests, clinical data, etc. The system has a business intelligence component that allows it to build different kinds of reports and statistics.

On the financial side, the system allows to generate different statistical reports on costs of provided services and items within provided services, provided medicines filtered by different periods of time, institutions, categories, etc.

The information collected by the system allows it to generate indicators on HIV situations such as number of new/existing cases, results on clinical data and laboratory tests, according to international requirements.

The access to the patient's data is also done strictly according to the user's permissions and roles within the medical center.

Software development and maintenance funding

The development and maintenance of the EHCMS is done with the support of the international partners (Global Fund).

Interoperability

The EHCMS is exchanging data with the national EHR system.

Summary

Data availability

The data collected by the information system are used only by authorized users. The public society doesn't have access to the patient's data. However, the system allows the generation of statistical reports which can then be provided to any interested authority.

Personal data protection and audit mechanisms

EHCMS implements audit and data protection mechanisms. Only authorized users, based on roles and permissions, have access to specific portions of data and user's activities in the information systems are logged.

Recommendations

The overall recommendations are to continue to support and develop the information systems and improve them with additional details and improvement of interoperability and statistics generation.

The recommendations proposed as the result of interviews and assessment can be divided into two main groups:

- Technical
- Policies and Regulations

Technical

- Improve data exchange between the information systems
- Potentially consider integration between existing systems
- Ensure the systems will be able to handle increasing volumes of data

Policies and Regulations

- Ensuring that data is collected and reported in a standardized way across different systems.
- Ensuring public access to strategic data to improve public health;
- Periodical data audit to ensure the quality of data do not suffer;

KYRGYZSTAN

PLWHIV	100 000
PLWHIV who know their status	75%
PLWHIV receiving ART	50% (5044)



Source: <https://aidsinfo.unaids.org>

Systems overview

The Medical Information System for HIV (MIS) was established for more than 10 years and has been continuously developed and improved since then. The system collects a wide range of data on HIV/AIDS cases, including demographic information (such as age, sex, and location), risk factors for HIV transmission, clinical information (such as the stage of disease and co-infections), and laboratory data (such as CD4 count and viral load).

The data collected by the MIS is used to monitor the HIV epidemic in Kyrgyzstan and to inform public health interventions aimed at preventing new infections and improving care and treatment for those living with HIV/AIDS. The system is also used for reporting to international organizations such as UNAIDS and the World Health Organization (WHO).

The system collects a wide range of data on HIV/AIDS cases, including demographic information (such as age, sex, and location), risk factors for HIV transmission, clinical information (such as the stage of disease and co-infections), and laboratory data (such as CD4 count and viral load).

Same time there are also some limitations to the system, including potential underreporting of cases due to stigma and discrimination, as well as challenges in ensuring data quality and completeness.

MIS plays a critical role in the country's efforts to prevent and control the spread of HIV/AIDS, and ongoing efforts to strengthen and improve the system are essential for ensuring that the data collected can be effectively used to guide public health interventions.

Apart from MIS, the country used the EHCMS system, the same system used in Kazakhstan. The implementation was done through the Centers for Disease Control and Prevention (CDC) project.

Medical Information System (MIS) for HIV cases monitoring

System specification

In Kyrgyzstan, a Medical Information System (MIS) for HIV cases monitoring was developed and implemented with the support of the UNDP and the Global Fund. The purpose of the MIS was

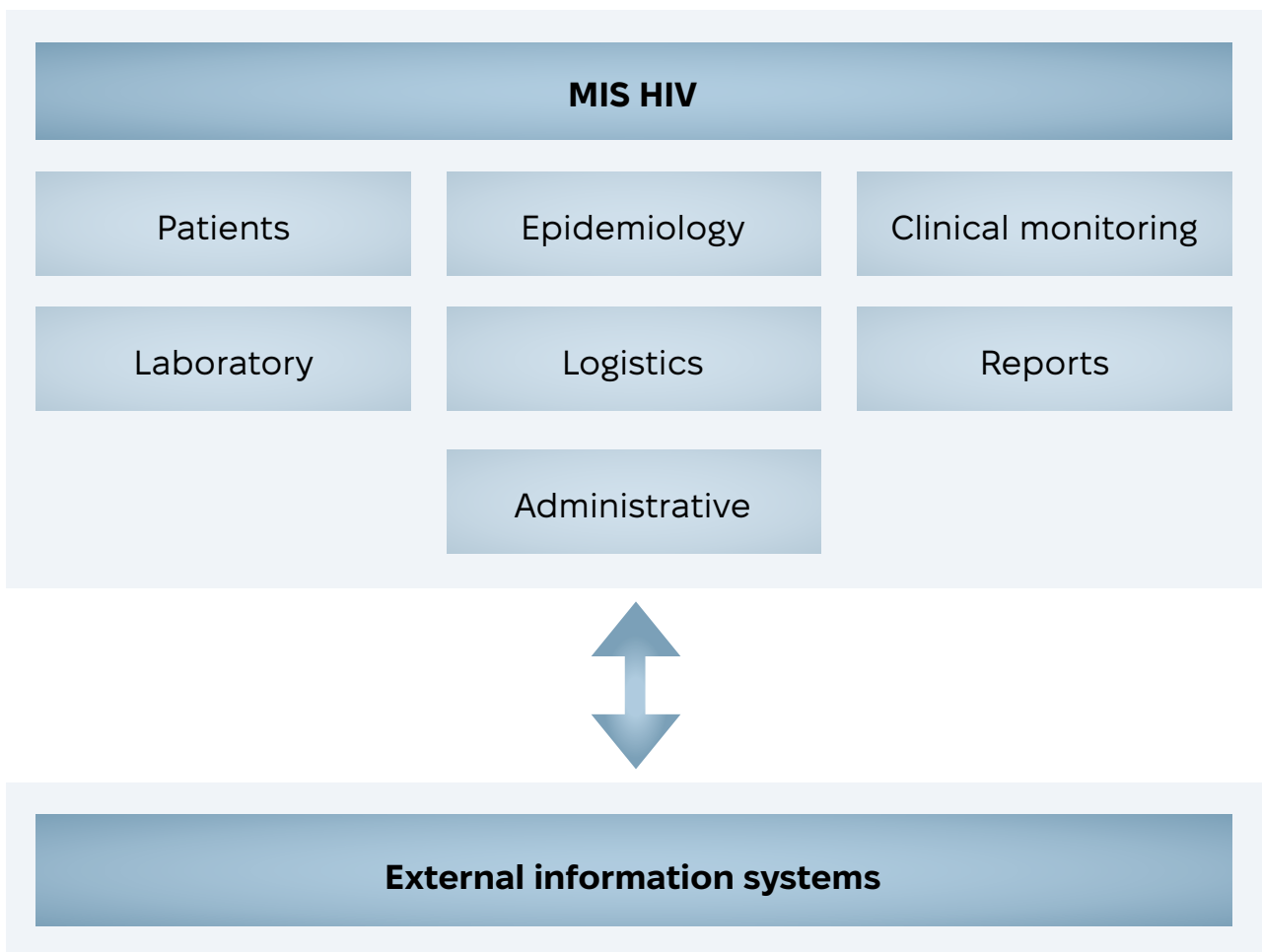
to collect information on patients with HIV, consultations, care and support services, treatment and prevention services provided by NGOs for different groups of persons living with HIV/AIDS.

The development, maintenance and hosting of the MIS is funded by UNDP. UNDP is also funding the system reengineering to develop an online version of the MIS.

System design

The first version of the MIS was developed as a client-server application and a desktop client had to be installed on all users PCs. The system is used mainly by the NGOs and medical institutions that provide HIV/AIDS specific services. The MIS is hosted by UNDP. The information system uses internal classifiers for services, categories, etc.

MIS has a modular structure and each user has access to the patient's information according to the role in the system and institution to which he/she belongs. MIS allows data exchange only through different exports in excel format.



Information and data quality

The system collects the following categories of patient's data:

- Demographic data:
 - Internal identification number
 - First Name
 - Last Name
 - Gender
 - Address
 - Contact details
- Consultations:
 - Service details
 - Medical devices
 - Information materials
- Treatment and prevention
- Clinical data

Within the information system, patient personal identification data are collected. These are the name, address and contact details.

In terms of medical data the system collects information on consultations, treatments and prevention services and clinical data. The users within the NGOs and medical institutions register patient's data depending on their role and permissions (demographic, consultations, services, etc.). The information system has a set of mandatory fields and a set of logical validations implemented within the pages through which the data is recorded.

The information collected by the system allows to generate indicators on provided services, consulted patients, employee's performance and provided medical commodities.

Monthly the data from the medical centers is exported and aggregated into the central database at the UNDP site where the system generates reports at a national level. The reports are used for national and international reporting.

The access to the patient's data is also done strictly according to the user's permissions and roles within the medical center.

Software development and maintenance funding

The development and maintenance of the MIS is done with the support of the international partners (UNDP).

Interoperability

The MIS does not exchange data with other information systems through web services or APIs. MIS allows only the export of data from the database and further processing the data by other information systems.

Summary

Data availability

The data collected by the information system are used only by authorized users. The public society doesn't have access to the patient's data. However from both systems are generated statistical reports with next can be provided to any interested authorities.

Personal data protection and audit mechanisms

Both information systems implement audit and data protection mechanisms. Only authorized users, based on roles and permissions, have access to specific portions of data and user's activities in the information systems are logged.

Recommendations

The overall recommendations are to continue to support and develop the information systems and improve them with additional details and improvement of interoperability and statistics generation.

The recommendations proposed as the result of interviews and assessment can be divided into two main groups:

- Technological
- Policies and Regulations


Technological

- Switch to a web based information systems;
- Implement real time data exchange instead of data exported in files
- Encrypt collected data
- Implement audit and data security standards
- Improve data exchange within information systems;
- Free and open use of codes, standards for adaptation and development;
- Further software development, improvement and maintenance;
- Software users periodical training.

Policies and Regulations

- Define common methodologies of data interpretation;
- Improve national policies and regulations on data collection, exchange and access;
- Providing open access to strategic data to improve global health;
- Periodical data audit to ensure the quality of data do not suffer;

MOLDOVA

PLWHIV	15 000	
PLWHIV who know their status	66%	
PLWHIV receiving ART	48% (7267)	

Source: <https://aidsinfo.unaids.org>

Systems overview

The development of Information System for Monitoring and Evaluation Registry (SIME HIV) started in 2007. It was developed with the support of international partners. The SIME HIV monitoring and evaluation system is an efficient tool for coordinating efforts between medical chains in the HIV response. It allows the considerable expansion of medical and epidemiological surveillance. During the following years the Ministry of Health of Moldova requested to the system administrator (Dermatological and Communicable Diseases Hospital) to develop additional functionalities.

The system was requested to have the following functions:

- Registration of information of PLHIV (HIV module)
- Storage, processing and reporting of PLHIV (HIV module)
- Management of medical history of PLHIV (HIV module)
- Registration and management of information regarding children of HIV+ mothers (HIV module)
- Automatization of laboratory activities
- Registration of new STD cases (STD module)
- Storage, processing and reporting of new STD cases (STD module)
- Management of medical history of new STD cases (STD module)
- Collection, storage, processing and medication reports generation
- Seamless integration of all aforementioned modules
- Integration with the TB information system of Moldova
- Creation of a base system for monitoring, evaluation and flexible reporting of the general HIV/STD situation in Moldova.

The system was supposed to integrate information about newly recorded HIV and STD cases and already existing HIV and STD cases. Integration with the TB system (SYMETB) was also planned.

The end goals of SIME HIV were:

- Improvement of the quality of collected data regarding HIV and STD cases
- Improvement of the analysis and administration process
- Improvement of the reporting process
- Creation of a set of applications in order to facilitate routine procedures (data collection, data evaluation and monitoring)

At the present moment there is no functioning information system used in the HIV and STD cases management process. All of the collected information is stored in excel files, which can be accessed through the Dermatological and Communicable Diseases Hospital network.

The only existing application is a unique ID generator for every new patient that is added to the existing system. The number is generated automatically, however it is manually entered into the excel files.

The existing system has the following issues:

- The collected data does not have a standardized format
- The collected data has to be entered based on local reports to a central excel file
- All of the data is completed on paper and is sent to the M&E specialist of Dermatological and Communicable Diseases Hospital to be entered into the system
- Every public medical institution has its own excel file, not connected to any central database
- The central excel file is updated by the M&E Specialist of Dermatological and Communicable Diseases Hospital, who manually enters received data.
- The excel file does not have any backups, thus its deletion would lead to the loss of all data collected (since 1987)
- Due to the current working model, there is basically no data security, as it is stored unencrypted in the excel files
- There are no records of the rapid tests performed
- No ability to keep records of people from breakaway states (Transnistria)
- Due to the current working model, it takes 2-3 days from the diagnostic of the patient to the addition of their data in the central database

The information system requires additional data to be collected and functionalities to be added:

- Management of the system users' list, their roles and access privileges
- Access to the application for multiple types of users:
 - Medical center that does rapid tests
 - Regional diagnostic and treatment centers
 - Infections disease doctor
 - General practitioner
 - Other specialists
 - System administrator
 - Possible patient
- Registration of suspect cases

- Patient identification
- Patient anonymization
- Rapid tests record
- Record of regional diagnostic centers' results
- Integration with primary medicine systems
- Records of the treatment process
- Records of pregnant women with HIV
- Records of HIV+ born kids until their HIV status is determined
- Records of people receiving PEP
- Records of people receiving PrEP
- Registration, storage, distribution, processing and reporting of medication

The current working model is far from a good one, and the creation of a new model which would correspond to international standards would greatly benefit everyone in the working chain. Integration with already existing services such as MConnect.

Apart from the SIME HIV in Moldova with the support of international partners and local NGOs were developed and other projects in the HIV fields. The electronic registry for key populations monitoring activities is an information system developed with the support of the NGO Positive initiative and is designed to collect data on clients, harm reduction programs, on the services provided and medical materials. The system is connected to a BI platform <https://scorecard-hiv.md/>. The Scorecard provides information on coverage, output and outcome indicators for key components of the Global AIDS Monitoring System, serve as a useful model tool for a periodic review of performance at all levels, as well as inspiring countries to adopt national instruments for monitoring the most representative indicators in the field.

Besides these in Moldova are developed several small projects providing different services to the PLHIV as Piloting the prototype for the provision of risk reduction services in the pharmacy network, Non-formal education and mentoring for effective reintegration of vulnerable population groups and others.

Electronic registry for key populations monitoring activities

System specification

The NGO Positive Initiative funded the development of the electronic registry for key populations monitoring activities (ER).

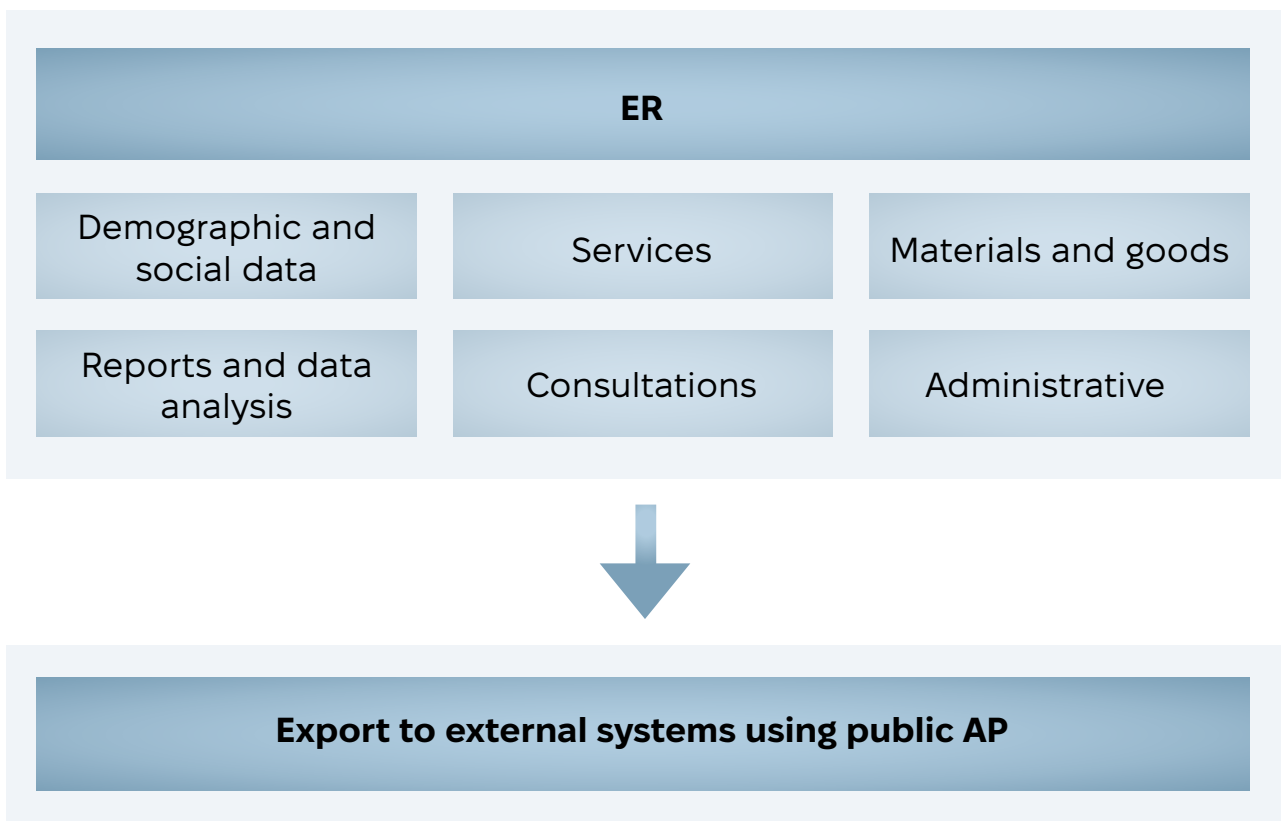
The purpose of the ER is to collect information on patients with HIV, consultations, prophylaxis services, tests and provided materials for different groups of persons living with HIV/AIDS.

The development, maintenance and hosting of the ER is funded by NGO Positive Initiative. The ER is hosted at the Dermatology and Communicable Diseases Hospital from Moldova. The NGO Positive Initiative is also funding any additional updates and maintenance services. It is planned to connect the ER to vending machines.

System design

The ER is developed as both a desktop and web application and is used by NGOs. The coverage at the national level is 100%. The system uses custom developed classifiers for different services, categories of products, etc.

ER has a modular structure and each user has access to the patient's information according to the role in the system and institution to which he/she belongs. ER allows data exchange via a public exposed API using JSON format.



Information and data quality

The system collect the following categories of patient's data:

- Demographic data (excluding personal identification data),
- Services,
- Consultations
- Materials and goods

The information system collects patient demographic data, but no personal identification data. The Moldova regulations on personal medical data are very restrictive and imply 2 factor authentication on medical data if a patient's personal data is collected. Avoiding collecting personal data allows the system to work according to the national legislation. But the system collects information about the gender, age and locality of the patient. Each patient gets an internal code.

In terms of medical data the system collects information on patients, existing patient's cases, clinical data, different types of services, HIV tests, provided materials, etc.

The users within the NGOs have access to specific parts of patient data and can register information depending on their role and permission (demographic, services, tests, etc.). The completeness of data is assured logical validations, mandatory fields and different reports. The information in the system is also registered by two state institutions: the Drug dispensary and the Administration of prisons.

The system generates several types of reports and statistics. The financial reports are generated within the system and are used to report the quantity of provided services and goods (in and out). Based on the financial reports the institutions are funded. Other group of reports are for internal use and are about the persons, provided services by categories, etc. The MOH and National Company for Medical Assurance use the reports for statistical and financial scope.

The information collected by the system allows the generation of HIV specific indicators such as number of visits, provided services, groups of risks, etc. The system is also integrated with a Business Intelligence platform (SCORECARD) which presents a lot of information and indicators grouped by different fields.

The access to the patient's data is also done strictly according to the user's permissions and roles within the medical center.

Software development and maintenance funding

The development and maintenance of the systems is done with the support of NGOs and international partners.

Interoperability

The ER does not exchange data with other information system through web services or APIs. Same time ER exports data to a public dashboard system and exposes a public API. ER is ready to exchange data with third party solutions.

Summary

Data availability

The data collected by the information systems are used by authorized users and periodically the aggregated data is exported to a dashboard system.

Personal data protection and audit mechanisms

ER implements audit and data protection mechanisms. Only authorized users, based on roles and permissions have access to specific portions of data and user's activities in the information systems are logged.

Recommendations

The overall recommendations are to continue support and develop the information systems and improve them with additional details and improvement of interoperability and statistics generation.

The recommendations proposed as the result of interviews and assessment can be divided into two main groups:

- Technical
- Policies and Regulations

Technical

- Re-engineer the SIMIE HIV using modern technologies and integrate it with the national EHR system;
- Implement the complete set of audit and data security requirements;
- Integrate the ER with national EHR system;
- Improve data exchange within information systems;
- Extend the exchangeable datasets through interoperability platform;
- Further software development, improvement and maintenance;
- Software users periodical training.

Policies and Regulations

- Define common methodologies of data interpretation;
- Improve national policies and regulations on data collection, exchange and access;
- Support and promotion of free and open use of best practices, codes, standards for adaptation and development in the field of digital health;
- Providing open access to strategic data to improve global health;
- Scaling up best practices in digital public health services;
- Ensuring public access to strategic data to improve public health;
- Periodical data audit to ensure the quality of data do not suffer;

UKRAINE

PLWHIV	240 000
PLWHIV who know their status	75%
PLWHIV receiving ART	62% (152 226)



Source: <https://aidsinfo.unaids.org>

Systems overview

One of the key problems in the field of combating HIV/AIDS in Ukraine is the lack of completeness, efficiency and reasoning of management decisions. The reason for the current situation is the lack of a unified approach to the mechanism for collecting and processing information in state medical institutions of the national (Public Health Center of the Ministry of Health of Ukraine (CPH of the Ministry of Health of Ukraine)), regional (regional and city centers for the prevention and control of AIDS) and local levels.

The development and introduction of the medical information system “HIV-infection in Ukraine” (MIS HIV) aimed to solve this problem with the creation of a unified repository for routine HIV/AIDS epidemiological surveillance data and medical results of PLHIV, to help to optimize monitoring and evaluation, drug procurement planning and the registration and control of medical drugs and devices. MIS HIV is used national wide by the medical institutions. The system stores information on more than 150 000 patients diagnosed with HIV, and the results of 370 000 laboratory tests and 350 000 consultations with infectious disease physicians.

It is worth mentioning that Ukraine had previously introduced a system to record and keep track of PLHIV, called EpidAIDS. However, this system failed to meet the requirements of HIV/AIDS specialists for a number of reasons. First, it only allowed for local data management without any centralized control. Secondly, for data to be analyzed at the national level it had to be manually downloaded and transmitted. EpidAIDS was viewed as a registry; recording individual HIV cases, but without the availability of a patient’s electronic medical record (EMR), thus, no other medical data, such as other diagnoses, results of laboratory tests and physical examinations, were accessible from the system. Moreover, the programme had limited analytic capabilities and failed to take into account the management system behind antiretroviral medicine supply and its various sources of funding. Thus, the need arose to create a system that would optimize the health-related monitoring and control of PLHIV.

Prior to the development of MIS HIV, medical institutions faced a number of problems with information management, such as the lack of a unified approach to the design of standard documents; a low level of efficiency in information exchanges between medical institutions; the multiple entry and duplication of medical information; the inability to get an overview of the HIV situation in Ukraine, or on the number of drugs and medical devices; labor-intensive reporting; and the need to generate data manually for it to be entered into international information systems. Developing the new system allowed for the elimination of these problems as well as improving the quality of care for PLHIV.

The development of MIS HIV involved achieving the following goals:

- enhancing the reliability of medical information about patients by minimizing possible errors;
- ensuring the collection and storage of information concerning the health status of PLHIV and the medical services provided to them;
- optimizing budget management, and monitoring the logistics of providing antiretroviral medicine;
- efficiently providing doctors with relevant data on the health status of PLHIV;
- provide supporting information for epidemiological surveillance and clinical monitoring systems.

The purpose and capabilities of MIS HIV modules is to collect the following information:

- Information about patients with HIV - introduction to the information in the medical records of PLHIV registered with medical institutions (results of primary and follow-up examinations, diagnosis, prescribed ART regimen, confirmation that medicines were received, etc.)
- Epidemiology - Search electronic medical records using specified parameters (for example, ART regimen); view patients' medical indicators in summary form; generate analytical reports using standardized state forms. The module allows epidemiological studies to be conducted and the subsequent development of methods and procedures for effectively combatting HIV.
- Clinical monitoring - Search electronic medical records, monitoring the registration and management of PLHIV patients (examination, diagnosis, prescribed treatment plan and ART regimen, and treatment monitoring). The module simplifies the treatment process by storing dosage regimen data, and has the capability to remind the patient about it through messaging or notifications via a mobile app.
- Laboratory - Recording of referrals for laboratory tests, the registration of samples and the results of laboratory analysis, as well as the subsequent generation of reports taking into account the laboratory logbook used.
- Logistics - Storage of information about directives from the MOH concerning the distribution of drugs and medical devices. The module can record warehouse acceptance of inventory items, track movement between warehouses, conduct inventories, generate write-off certificates, and monitor the balance of drugs and devices.
- Reports - Generating statistical reports for internal use at medical institutions and for submission to the State Statistics Service. The module simplifies the generation and collection of national reports and minimizes the possibility of errors in aggregating data by using standards described in directives from the MOH of Ukraine.
- Administration - Granting users their appropriate rights within the system, delimiting access rights to information, and configuring user authentication. The module allows an administrator to configure user rights and mode access according to professional duties.

Besides the MIS HIV in Ukraine were developed several information system by different NGOs supported by international partners. We can name here DATACHECK, Ehealth, Case++ and SyrEx. These systems are mainly oriented on prophylaxis services, consultant tracking and increase the transparency of findings. The systems collect similar information and are used by different networks. Same time integration with the MIS HIV are available only for DATACHECK and Case++. However the Case++ application will be deprecated and not used any more in 2023.

MIS HIV

System specification

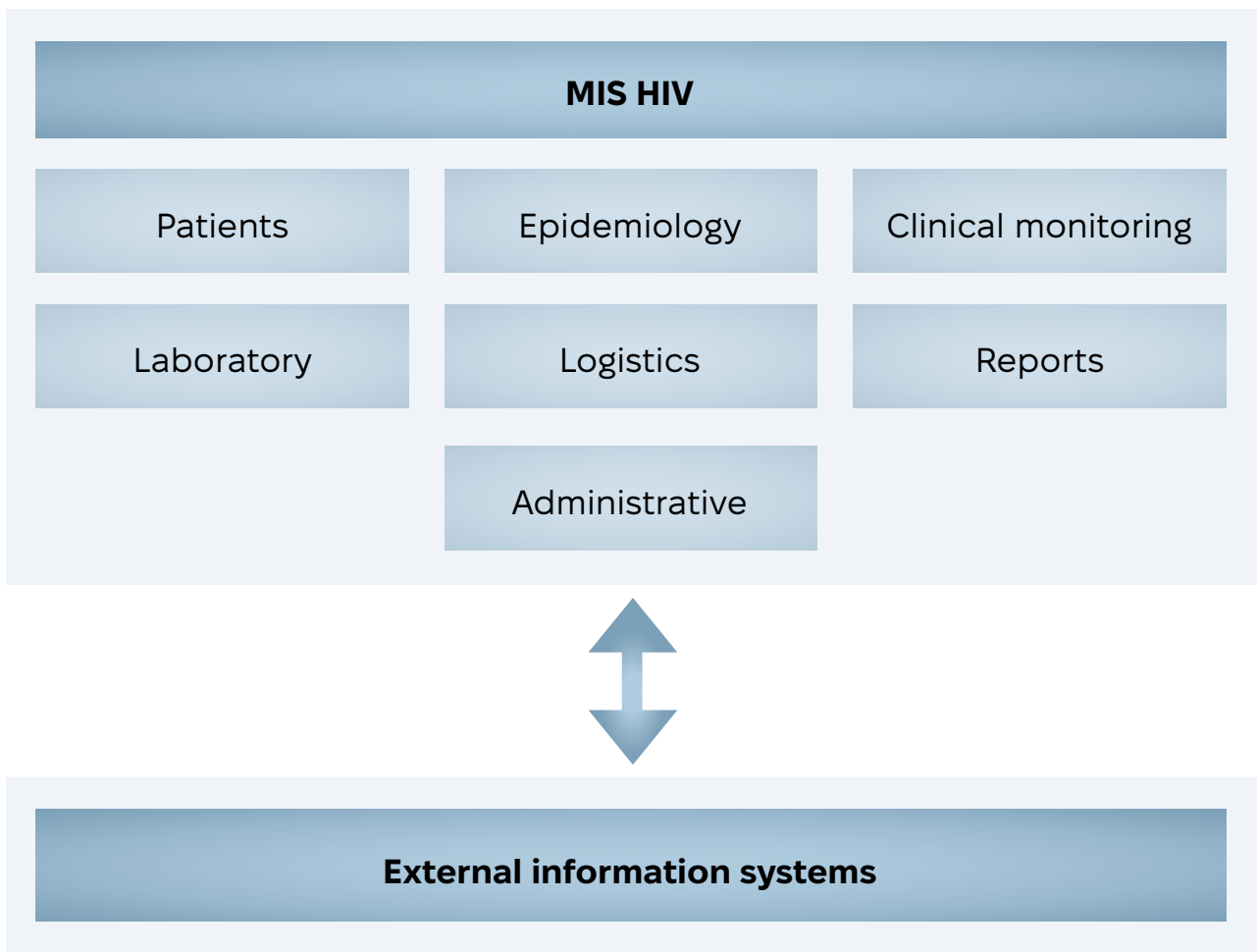
The work on the creation of MIS HIV began in 2015 with the support of the Global Fund grant “Development of a long-term system for the provision of comprehensive services for HIV/AIDS prevention, treatment, care and support among the most at risk groups and PLHIV in Ukraine”. The scope of MIS HIV is to create a single data repository for routine epidemiological surveillance of socially significant diseases and medical surveillance data, as well as information support for monitoring and evaluation processes, procurement planning, accounting and control of the movement of medical drugs and medical devices.

MIS HIV is used nationwide by medical institutions. The development, the maintenance and further improvement of the application is supported by the state authorities.

System design

MIS HIV is developed as a collection of applications with a client for the users and a set of APIs used for different integrations with third party applications. MIS HIV has a modular architecture:

- The information about patients - Introduction of medical information from the cards of PLHIV registered in medical institutions (results of initial and repeated examinations, diagnosis, prescribed regimen of ART; the fact of dispensing medications, etc.).
- Epidemiology - Search of electronic medical records according to the specified parameters (for example, ART scheme); viewing the medical indicators of patients in a generalized form; formation of analytical reports on standardized state forms. The module allows you to conduct epidemiological studies with the subsequent development of methods and procedures for effective prevention of HIV infection.
- Clinical monitoring - Search of electronic medical records, control of registration and management of patients from among PLHIV (examination, diagnosis, appointment of treatment plan and ART scheme, monitoring of the course of treatment). The module simplifies the treatment process by storing data on the schedule of taking the drug, the possibility of reminding the patient about it through a message or a notification in the mobile application.
- Laboratory - The account is directed to laboratory studies, registration of samples, results of laboratory analysis and subsequent formation of reports taking into account the forms of laboratory journals.
- Logistics - Storage of information on the orders of the Ministry of Health on the distribution of medical preparations and medical devices. The module allows you to record the fact of inventory acceptance by the warehouse, track their movement between warehouses and carry out inventory, create write-off documents and keep records of drug and product balances.
- Reports - Formation of statistical reports for internal use in a medical institution and for submission to the State Statistics Service. The module simplifies the collection and formation of national reports, minimizes the probability of error when calculating aggregated data according to the forms established by the Ministry of Health of Ukraine.
- Administration - Provision of appropriate rights to users within the framework of the system, delineation of access rights to information, user authentication settings. The module allows the administrator to configure the rights and access modes of users according to their work responsibilities



Information and data quality

The system collect the following categories of patient's data:

- Demographic data,
- Consultations and services,
- Epidemiological data,
- Clinical monitoring data,
- Care and support,
- Treatment and prophylaxis

Within the information system are collected patient demographic data. The system collect information about the name, address, contact details, gender, age and locality of the patient. Each patient get an internal code.

In terms of medical data the system collect information on patient's new cases, existing patient's cases, clinical data, treatment schemas, medicines, care and support services , HIV tests, provided materials, etc.

The users have access to patient data and can register information depending on user associated with the medical institution. The completeness of data is assured logical validations, mandatory fields and different reports.

The system generates several types of reports and statistics. The reports generated within the system are used to report the quantity of provided services and general statistics used for national statistical reporting.

This information system is also used to collect information on PLHIV. There are over 2000 users working with this information system.

Software development and maintenance funding

The development and maintenance of the systems is done with the support of state authorities.

Interoperability

The MIS HIV exchange data with the national EHR system, Laboratory system and with the DATACHECK application. The system uses Web API for data exchange and uses HL7 data standard.

Summary

Data availability

The data collected by the information system is used by authorized according to the permissions and level of access. The data collected by MIS HIV is also used to generate public dashboards for any interested bodies.

Personal data protection and audit mechanisms

MIS HIV implements audit and data protection mechanisms. Only authorized users, based on roles and permissions have access to specific portions of data and user's activities in the information systems are logged.

SyrEx

System specification

In Ukraine with the support of the Non-Governmental Organization Alliance for Public Health was developed the information system SyrEx. SyrEx is a database management system used for monitoring and recording information on clients reached and services provided in community-based HIV prevention programmes.

The purpose of the SyrEx is to collect information on management of treatment and prophylaxis, care and support services provided by NGOs of persons living with HIV/AIDS. Within SyrEx the users register data about patients, collect data on the commodities (syringes and condoms) and provided services (counseling and information).

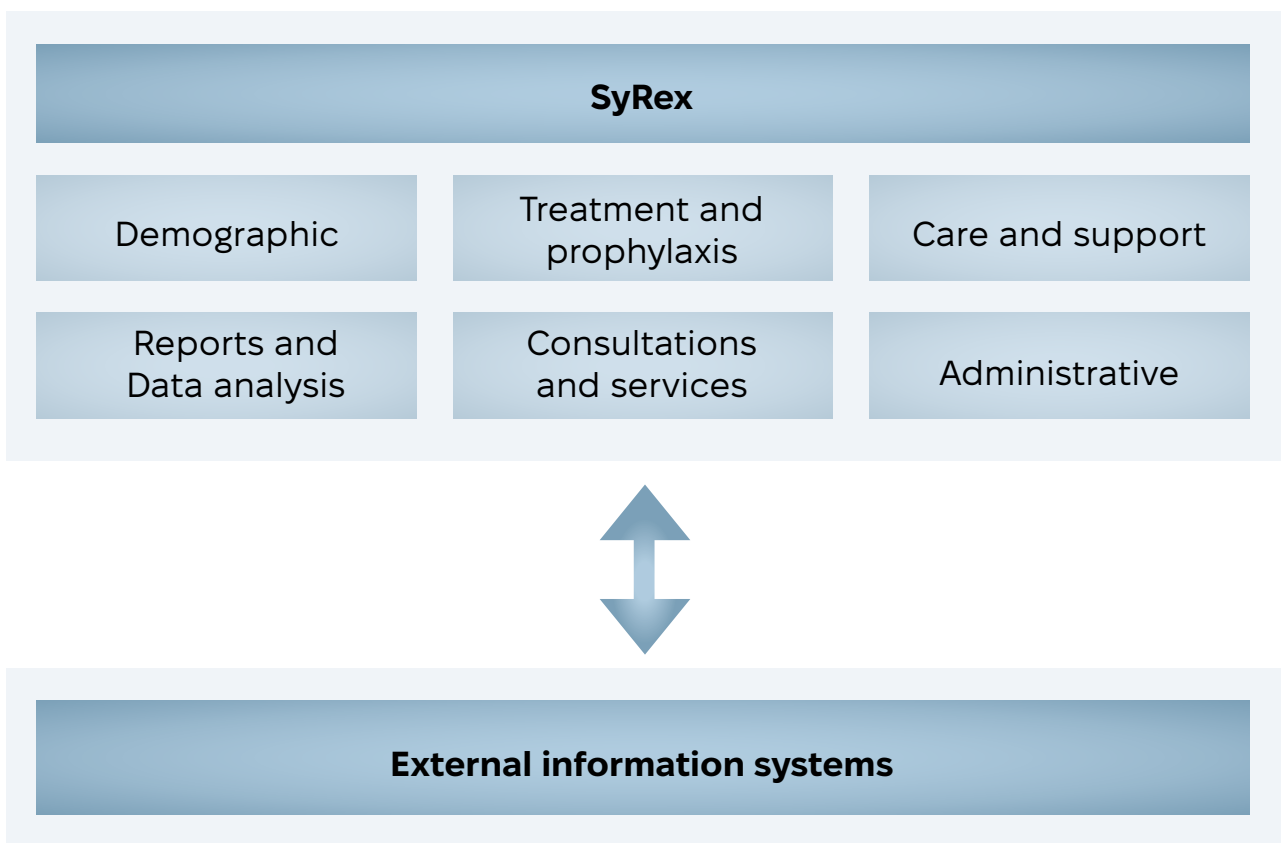
SyrEx was developed and implemented in Ukraine more than 10 years ago and is used by most of NGOs providing services in the HIV/AIDS area. The development of new functionalities, modules,

reengineering and the maintenance of the SyrEx was supported by the Alliance of Public Health. The Alliance of Public health is planning the development of a mobile application which will come to replace the existing version of SyrEx. The new version will be cloud compatible.

System design

Initial SyrEx was developed as as both desktop and web application and is used by NGOs. The coverage at the national level is 100%. The system uses custom developed classifiers for different services, categories of products, etc.

SyrEx has a modular structure and each user has access to the patient's information according to the role in the system and institution to which he belongs. SyrEx allow data exchange with other information systems using standard data exchange protocols.



Information and data quality

The system collect the following categories of patient's data:

- Demographic data,
- Consultations and services,
- Care and support,
- Treatment and prophylaxis

Within the information system are collected patient demographic data. The system collect information about the name, address, contact details, gender, age and locality of the patient. Each patient get an internal code.

In terms of medical data the system collect information on patient's new cases, existing patient's cases, clinical data, treatment schemas, medicines, care and support services , HIV tests, provided materials, etc.

The users within the NGOs have access to patient data and can register information depending on user associated with the NGO. The completeness of data is assured logical validations, mandatory fields and different reports.

The system generates several types of reports and statistics. The reports generated within the system are used to report the quantity of provided services and goods/materials. Medical reports are for internal use and are about the patients, cases, treatments, HIV tests, new patients, leaving patients, etc.

The information collected by the system allow the generation of HIV specific indicators as number of visits, provides services, groups of risks, region, sex, treatment regime, etc.

The access to the patient's data is also done strictly according to the user's permissions and roles within the medical center.

Software development and maintenance funding

The development and maintenance of the systems is done with the support of NGOs and international partners.

Interoperability

The SyrEx do not exchange data with other information system through web services or APIs, but can be exported to third party solutions.

Summary

Data availability

The data collected by the information systems are used by authorized users.

Personal data protection and audit mechanisms

ER implements audit and data protection mechanisms. Only authorized users, based on roles and permissions have access to specific portions of data and user's activities in the information systems are logged.

DATACHECK

System overview

DATACHECK" is a system that provides means of accounting for consultations and services, as well as control and confirmation by participants of consultations or provision of services.

The main characteristic of the system is the correctness, reliability and transparency of the data obtained as a result of the implementation of projects of social support for clients and various target groups. Data, respectively, program indicators - checked/verified, which makes it impossible to falsify program monitoring data for the provision of medical and social support services.

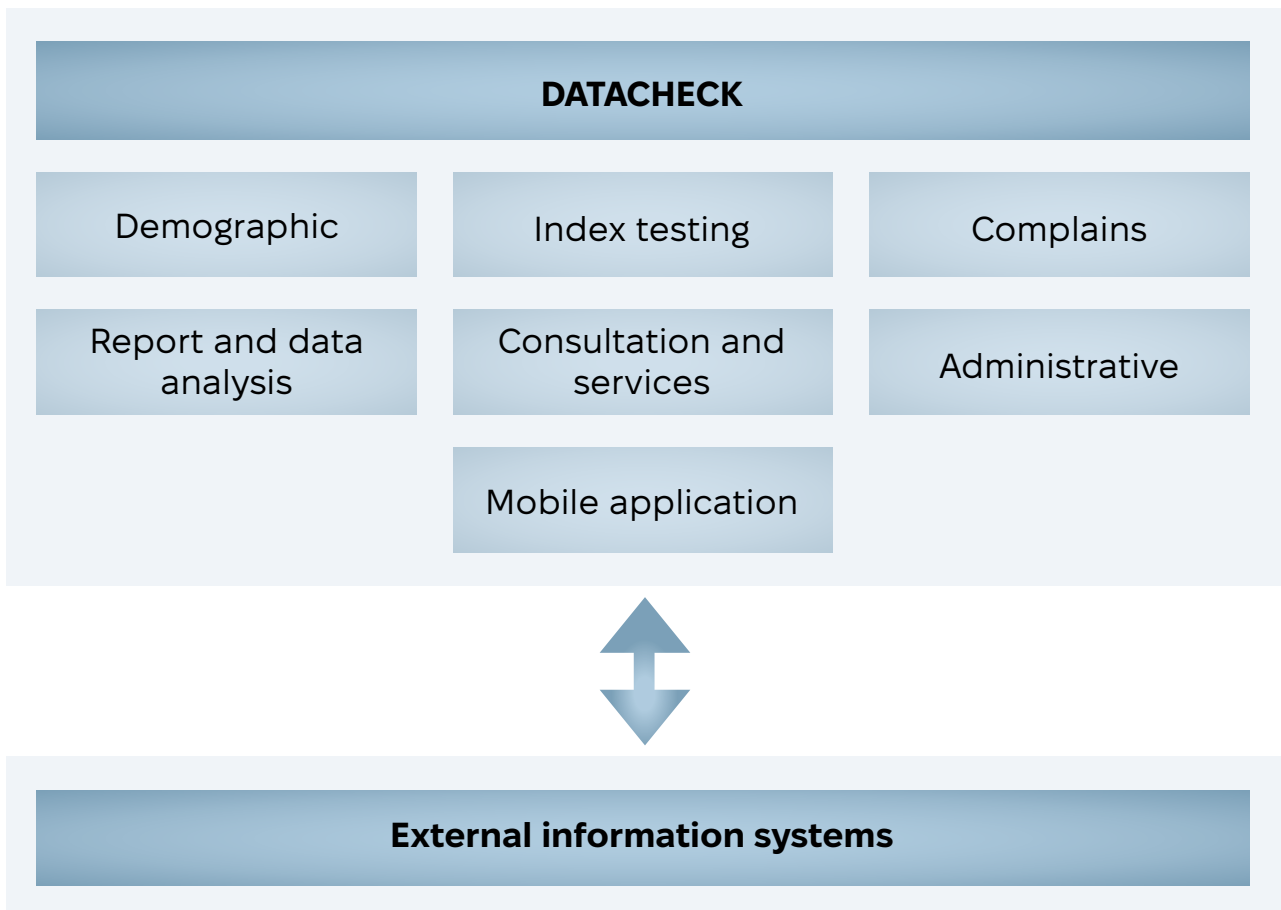
The object of ITC "DATACHECK" automation is processes and services provided by subcontracted non-commercial organizations within the framework of providing social services, as well as their accounting and reporting.

DATACHECK is an important tool that provides two-way communication with the recipients of services. Using a mobile application, they can see what services have been provided to them and evaluate the quality of their provision.

Past years, within DATACHECK were created the following modules: index testing, analytics, collection and processing of complaints regarding violation of the rights of patients and key groups. These important improvements not only allow for qualitatively new monitoring of the implementation of programs and projects, but also increased the potential of using the system in Ukraine.

System design

DATACHECK is composed from a set of components as a web portal, API and mobile applications for both Android and iOS.



Information and data quality

Within DATACHECK are collected the following groups of data:

- demographic:
 - First name
 - Last name
 - Birth date
 - Mobile phone
 - Gender
- Services data
- Confirmations of provided services
- Complains

Within the information system are collected patient demographic data. The system collect information about the name, contact details, gender, age and contact details. Each patient get an internal code. The service providers register data about services that have to be provided and once the service is provided the patients records into the mobile application the confirmation details. The application do not collect medical data.

The application is mainly used by NGOs and state authorities' social assistants that provide services. The completeness of data is assured logical validations, mandatory fields and different reports.

The system generates several types of reports and statistics. The reports generated within the system are used to report the quantity of provided services.

Software development and maintenance

The system is in an active phase of implementation. The systems came to replace the outdated Case++ information system. The support of the system is assured by the "DATACHECK UKRAINE" ITS provider. The active development is ended, but there are plan to develop new functionalities in the future. . DATACHECK has all the necessary support and maintenance.

Interoperability

The system exchange depersonalized data with the national EHR system. The system uses Web APIS for data exchange and implements partially the HL7 protocol.

Summary

Data availability

The data collected by the information systems are used by authorized users.

Personal data protection and audit mechanisms

DATACHECK implements audit and data protection mechanisms. Only authorized users, based on roles and permissions have access to specific portions of data and user's activities in the information systems are logged. On the mobile applications are implemented native operating system specific security mechanisms.

Recommendations

The overall recommendations are to continue support and develop the information systems and improve them with additional details and improvement of interoperability and statistics generation.

The recommendations proposed as the result of interviews and assessment can be divided into two main groups:

- Technical
- Policies and Regulations

Technological

- Do a full switch to web based applications;
- Extend the exchangeable datasets through interoperability platform;
- Free and open use of codes, standards for adaptation and development;
- Further software development, improvement and maintenance;
- Software users periodical training.

Policies and Regulations

- Define common methodologies of data interpretation;
- Support and promotion of free and open use of best practices, codes, standards for adaptation and development in the field of digital health;
- Providing open access to strategic data to improve global health;
- Scaling up best practices in digital public health services;
- Promoting public health data protection and security technologies with free and open access to depersonalized data;
- Ensuring public access to strategic data to improve public health;
- Periodical data audit to ensure the quality of data do not suffer;

FINAL NOTES

The implementation of HIV/AIDS information systems helps the countries in a better management of the services and improve the quality of medical care provided to PLHIV. Using information systems has had positive outcomes in the field of HIV/AIDS at each administrative level.

At the local level, the information systems guarantees a reduction of errors in completing medical documentation and the efficiency of information exchange. At the regional level the systems allows the maintenance of medical records and the auditing of provided drugs and medical devices. At the national level the systems allow to see “The big picture”. That is done because are used unified approaches of coding PLHIV, avoided repeated registration, and are monitored the needs for drugs and medical devices. All together that increase the accessibility and accuracy of information on the HIV epidemic in the countries. The data obtained from information system also helps to enhance the effectiveness of management decisions based on factual evidence and availability of data.

Over the last years the national HIV/AIDS information systems demonstrated the effectiveness compared to traditional paper based approaches.

Within each country are present several information systems that collect information on PLHIV. In the interview were covered only a part of these systems. The information systems covers two areas which are treatment and prevention.

The evaluation of national HIV/AIDS information systems leads to the conclusion that countries with the state support, with the support of international partners are able to collect the information about PLHIV and provided services. The information systems allow the countries to generate statistics and key indicators.

In all countries the information systems on PLHIV benefits on funds for development and maintenance with the support of funds from state budget or international partners.

Enablers and obstacles

In addition to the listed information systems each country have national EHR systems and other HIV/AIDS patients tracking systems.

Depending on the financial situation and the status of the healthcare information system the countries have enablers and obstacles that are specific to a country, or common to several countries. In these countries the support of the international organization is significant and lots of developments and studies are funded by them (WHO, WB, USAID, Global Fund, UNFPA, etc.).

The information systems are one of the core enablers in developing modern healthcare systems. Collecting data from all medical fields is very important in prescribing the right treatment and making the right decisions based on truthful information. In this context it is important to have a national wide database that store data about all patients and their interaction with different healthcare providers.

The next important aspect is the information. The result of healthcare digitalization is the collection of complete data about patient. The data should be correct and credible. The

information systems should validate the data at their recording. From clinical point of view the information system should allow the longitudinal tracking of the patients. From statistical point of view the system provide to the decision makers of all levels the necessary information to administrate their medical units take decision and local and national level.

That leads us the next factor, policy, policy makers and regulatory frameworks. The Digital Health, Artificial Intelligence, Information systems that implements the digital tools need to work in framework that is regulated from different aspects. The most important aspects are: legal, data protection, interoperability. All these aspects are important because in the modern world the personal data should be protected, processed according to the national data protection laws and exchanged only when needed and in the volume that don't exceeds the needs. Same time the policy makers should be a proactive part. The initiatives should come from top to down.

One of the last enablers are the human resources and infrastructure: doctors, academic environment, specialists in digital healthcare, bioengineers, and providers of technical solutions (software and hardware).

Gaps

The situation in the assessed countries is different, but same time it is possible to create a list of gaps that will be valid for all countries. The gaps can be also divided by categories.

Software gaps:

No.	Current situation	Target	Action plan
1.	Chaotic development of the software solutions	An integrate solution for the healthcare system	Develop a concept for the entire solution and approve it. Develop solution according to the concept considering the fact that components of the integrated solution will be developed in time and need to be easy coupled with already developed components.
2.	Chaotic changes	Documented changes, with clear descriptions, needs and reasons to be implemented	Implement a change management procedure with clear roles and steps to evaluate the need of change, benefit of change and its priority
3.	Solutions without maintenance	Maintained solutions	Elaborate plans for funding solutions that are in productions and ensure that authorities allocate sufficient funds for maintenance and that maintenance contracts are always present.

Human resources gaps:

No.	Current situation	Target	Action plan
1.	Poor knowledge of modern technologies from elementary to complicated (computer use, sophisticated medical equipment use)	Well trained personnel	Develop continuous training strategies and training materials. Establish schedules for regular training of existing and new coming personnel.
2.	Poor remunerate personnel and high staff turnover	Motivated personnel willing to work in the healthcare system	Action plans and concrete activities to stimulate the personnel (financial, social, etc.) to retain the people in the system

ANNEXES

Annex A – Interviewed persons

Name	Position	Organization	Country
Otar Chokoshvili	Doctor of Public Health	Infectious Diseases, AIDS and Clinical Immunology Research Center, Department of Epidemiology	Georgia
Tamar Gakhokidze	Analyst	Information Technology Agency	Georgia
Vazha Ezugbaia	Master Developer	Consulting & IT Innovations	Georgia
Sairankul Kassymbekova	Head of Clinical Monitoring Department	The Republican AIDS Centre	Kazakhstan
Inga Babicheva	Program coordinator	United Nations Development Programme (UNDP).	Kyrgyzstan
Aida Karipova	M&E specialist	United Nations Development Programme (UNDP).	Kyrgyzstan
Tatiana Fomina	Manager of the M&E department	Initiativa Pozitiva Non-Governmental Organization	Moldova
Oleksandr Kurdus	Expert	Ukraine Public Health Institute	Ukraine
Valentin Minialo	Consultant	Alliance of Public Health Non-Governmental Organization	Ukraine

Annex B – General questioner

Domains	Sub-Domains
System Specifications	Country
	What is the system name?
	What is the main unit/object/domain covered by the system?
	What is the main purpose of the system?
	What modules does the system contain?
	What roles are present in the system
	Who is the owner of the system?
	Who owns the data?
	What is the current coverage of the system (partial, national, etc.)?
	What is the last version of the system?
	Level of implementation (0/25/50/100%)
System Design	What architecture type is used to build the system?
	On what Operating System is the system set?
	What is the Database Engine?
	What is the system programming language?
	What are the development Frameworks, packages used to build the system?
	What software development components are used (custom, 3rd party, etc.)?
	Who has the Ownership over source code?
	Are there any other software requirements?
	What are the Required CPUs (how many servers)?
	What is the required RAM?
	What is the required HDD?
	What are the network requirements?
	Where is the system hosted?
	What other resources are used?
	What is the backup's periodicity?
Is there any availability of technical documentation?	
What are the Unique IDs to identify persons?	

Interoperability	What are the technical data exchange methods?
	What are the data exchange standards?
	Is the Information exchange process documented?
	What are the data categories Exchange with other systems?
	Are the Information exchange policy documents defined?
Documentation and support	Does the owner have a System support service?
	Is the System documentation/User guides available?
Information management	What processes and functions are fully automated?
	What processes and functions are not automated?
	What are the impediments to automate the processes?
	What impediments can be overcome?
	What are the Key indicators reported?
	What are the HIV specific indicators collected by the system?
	What is the periodicity of collection?
	What are the data sources (software/paper/questionnaire) and their name?
	What data is collected?
	Does the system have any data analysis component?
	Is a business intelligence component present?
	Is the collected data publicly available?
	What is the number of units already entered?
	What is the estimated number of units in the country?
	Who enters the data (institution/roles)?
	Who can see the data (institution/roles)?
	What Personally identifiable information (PII) is collected?
	Who can access PII?
	Who can access reports?
	Is there any data export availability?
	Data quality assurance procedures are available?
	Is Real-time access possible?
	How is the data used by state authorities?
	Is the data used by civil society?
	Is cross boarding data sharing in place?
	Is cross boarding data sharing planned?

Security	Is the collected data encrypted?
	Are the communication channels encrypted?
	Are audit logs available?
	Is the data access limited by role?
Policies/ Standards/ regulations	What data standards are used in the information system?
	What software standards are used to build the system?
	What healthcare data standards are used?
	What international classifiers are used?
	What national classifiers are used?
	What is the level of integration of implementation of data standards?
	Compliance with standards
	Is the system usage regulated by a framework?
	Is the data exchange regulation in place?
	Is the data protection regulation respected?
	Is the system aligned with the National e-health policy or strategy?
	Is the system aligned with the HIV response strategies?
Funding	Who funded the development?
	Who funds the maintenance?
	Who funds the system upgrade?
	Are short term budgets available?
	Are long term budgets available?
	Are development plans created?
Implementation plans	If the system is in development then what are the Implementation terms?
	When are new releases planned?
	Are new modules planned?
	What will be the system usability in future?
Data quality	What are the collected data sets?
	Do the collected data sets respond to the needs of HIV programs?
	Does the system respect usability principles?
	What is the completeness of data in %?
	Are data validation processes implemented in the system?
	What additional business intelligence is needed?
Interviewer details	What is the interviewer's intuition?
	What is the Interviewer position?
	What is the Interviewer role?
	How many years of experience in the field domain does the interviewer have?