"Improving Healthcare Access through a Personal Health Monitoring System – EHEALTH Monitoring"»,

in the framework of the implementation of the "INTERREG V-A

Greece - Bulgaria 2014-2020" Cooperation Program »

Deliverable 3.3: Mapping & identification activities - data collection

CENTRE OF CARING AND SOLIDARITY MUNICIPALITY OF KOMOTINI

MUNICIPALITY OF KIRKOVO

EURORADAR ASSOCIATION

http://www.ehealthmonitoring.eu/

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1. Introduction

EHealth Monitoring project promotes innovative technologies to improve access to primary care in isolated and degraded communities in the Greece-Bulgaria cross-border area, providing a personal health care system. As part of the implementation of the eHealth Monitoring project, a comprehensive information system for monitoring the health of citizens at the transnational level has been developed, using modern and easy-to-use sensors even by users without a technical background, such as the elderly or patients with chronic diseases.

In order to implement the project, ie the remote monitoring of the health of the citizens through personal non-invasive sensors, the collection of the necessary data and information should be preceded. The result of mapping and data collection will be the creation of an electronic database that will present:

- potential end users (patients) and will concern the elderly, people with health problems, chronic diseases, mobility difficulties, etc.
- potential attending doctors who will be available to the collaborating medical and nursing staff

The selection of both patients and attending doctors will be implemented in full consultation with the other project partners.

2. eHealth Monitoring Project

''Improving Healthcare Access through a Personal Health Monitoring System – EHEALTH Monitoring'' project, aims to develop an information system for monitoring the health of citizens at the transnational level, which is based on ICT and personal non-invasive sensors. This system will not only provide remote monitoring of citizens' health outside the traditional hospital environment, but it will also create a permanent connection between citizens and medical staff, directly contributing to equal treatment and access of all citizens to modern health services, aiming at social and economic development of enlarged Europe.

The proposed system brings personalized and economical health monitoring to the entire population of the two states. The strategic goal is to improve public health and quality of life by adopting technologies that are tailored to personal needs and at the same time have increased reliability and reduced costs. The main purpose of the project is to study, design and develop an innovative, user-friendly, customizable, portable, personal and low cost electronic health system for all. This system will consist of a central information system and personal portable devices with sensors that will

provide: (1) remote monitoring of the citizen's state of health, (2) continuous monitoring of the patient's compliance with his treatment, (3) live connection with the medical staff.

The system will be able to adapt and enhance the provision of medical services to:

(1) general population (preventive medicine),

(2) short-term sufferers,

(3) chronic sufferers.

The devices that were selected are described below:

Tablet

The proposed type is "Lenovo TAB-4 7 Essential QuadCore 7"". Its features are WiFi internet connectivity, connectivity to other devices via Bluetooth Low Energy (BLE) and Android Operating System Version 7.0. RAM is 1GB and storage is 8GB.

Oxymeter

The proposed type is "Jumper JPD-500F". This is non-invasive, it has an LCD screen to display the results of measurement and it is designed for personal use at home. It is also portable, has CE certification and provides reliable measurements of oxygen saturation and heart rate. The biosensors connect to the UMUs and communicate with the application for transmitting data automatically, without user intervention.

Jumper JPD – 500F performs multiple measurements. This mode is followed by oximeters, which monitor one or more sets of biosimilars for a given time frame (from seconds to hours) and produce chronological monitoring data sets. Connectivity is usually necessary in such cases to promote raw data to the system in real time, especially because the majority of devices have limited internal storage capabilities.

Blood pressure monitor

The proposed type is "iHealth Track" and is non-invasive, with an LCD screen to display the measurement results. It is also designed for personal use at home and it has CE certification. It provides reliable measurements of heart rate and blood pressure and it sends data via BLE.

iHealth Track also implements separate measurements. Separate metering devices are used only when the user wants to measure the value of a biomass (or the values of discrete biomass in a single measurement). Most of the time, these devices can operate offline and after a measurement they are connected to the system and send or, if requested, synchronize all data.

Activity Tracker

The suggested type is "Smart Band H10 pro". It is non-invasive, it has an LCD screen for displaying the measurement results and is designed for personal use at home. It also has CE certification and can be connected to UMUs and application. Finally, Smart Band H10 Pro performs constant supervision.

3. Municipality of Kirkovo – General Characteristics and Profile

Municipality of Kirkovo was established on March 26, 1914 as a rural municipal administration of Kirkovo, Gyumyurjin district. Numerous administrative-territorial reforms lead it to regional subordination to Smolyan, Krumovgrad, Momchilgrad. After September 9, 1944, it was transformed into the Kirkovo Village Municipal People's Council. In 1956 the municipality was annexed to the District of Kardzhali, and after 1979 it existed as the Kirkovo Settlement System. Since 1987, the municipality unites the three settlement systems Kirkovo, Podkova and Benkovski (Municipal Development Plan of the Municipality of Kirkovo 2014-2020).

Municipality of Kirkovo is located on the territory of Kardzhali District and is one of the 57 municipalities in the South Central Region (NUTS 2). Kirkovo Municipality is second in population and third in territory in Kardzhali District.

Kardzhali District occupies an area of 3,209.1 sq. Km in the southeastern part of the Republic of Bulgaria, which represents 2.9% of the territory of Bulgaria. Located in the South Central region. It borders on the west with Smolyan region, on the north with Haskovo and Plovdiv regions, on the south and southeast with the state border of the country with the Hellenic Republic (Regional Strategy for Development of Kardzhali District for the period 2014-2020, 2017).

Today the municipality consists of 73 settlements, covering an area of 538 sq. Km. and inhabited by 21,582 people (as of 31.12.2012, NSI), placing it second in population and third in territory in the district of Kardzhali.

The municipality of Kirkovo includes the village of Kirkovo, the village of Apriltsi, the village of Benkovski, the village of Bregovo, the village of Valchanka, the village of Varben, the village of Varli dol, the village of Gorno Kirkovo, the village of Gorno Kapinovo, the village of Gorski izvor, the village of Grivyak, village of Dedets, village of Delvino, village of Djerovo, village of Dobromirtsi, village of Dolno Kapinovo, village of Domishte, village of Drangovo, village of Druzhintsi, village of Dryanova Glava, village of Dyulitsa, village of Erovete, village of Zavoya, the village of Zagorski, the village of Zdravchets, the village of Kayaloba, the village of Kitna, the village of Kozlevo, the village of Kosturino, the village of Kran, the village of Kremen, the village of Krilatitsa, the village of Kukuryak, the village of Karchovsko, the village of Lozengradtsi, The village of Malkoch, the village of Medevtsi, the village of Metlichina, the village of Metlichka, the village of

Mogilyane, the village of Maglene, the village of Nane (as of 31.12.2016 it has 0 inhabitants, but has not yet been deleted), the village of Orlitsa , Ostrovets village, Plovka village, Podkova village, Preseka village, Parventsi village, Parvitsa village, Rastnik village, Samodiva village, Samokitka village, Svetlen village, Sekirka village, Sredsko village, Stareishino, Starovo village, Stomantsi village, Strizhba village, Tihomir village, Fotinovo village, Hadjiysko village, Tsarino village, Chavka village, Chakalarovo village, Chichevo village, Chorbadjiysko village, Shipok village , the village of Shoptsi, the village of Shumnatitsa, the village of Yakovitsa and the village of Yanino.

3.1. Demographic Characteristics and Statistics

According to the data of the National Statistical Institute, as of 31.12.2018, 21,044 people live in the municipality of Kirkovo, of which 10,527 men and 10,517 women. Figure 1 presents the number of population in the municipality in the period 2011 - 2017 and reveals the declining population, which is due to two main factors - negative natural growth and mechanical growth. The average population density in Kirkovo Municipality is 43.5 people per sq. km. For comparison, the average population density in Bulgaria is 70.3 people per sq. km, while the EU average is 112 people per sq. km.

According to the gender structure, the ratio between men and women in the municipality of Kirkovo has hardly changed over the years, ie. these figures are approximately the same, although their absolute value changes. For example, NSI data as of 31.12.2018 show that 10,553 men and 10,701 women live in the municipality.

The natural increase, reflecting the difference between live births and deaths on the territory of Kirkovo Municipality is negative throughout the period under review. The natural growth rate at the end of 2016 is negative - 8.23 %. In the next two years there is a positive trend in the natural growth rate, as in 2017 its value was -6.27 ‰, and in 2018. - -5.45 %.

The number of men born for the period 2016-2018 increased in 2018 to 98 from 84 in 2017 and 69 in 2016. The number of dead men in each of the three years is almost twice as high as in live births. In 2016, the number of male deaths was 162, after which their number increased to 164 persons in 2017 and decreased to 162 male deaths in 2018. In 2016, 74 female children were born, in the following 2017 - 101 children, and in 2018 their number is 89 live-born girls. The number of women who died in the three years studied was also approximately equal. In 2016, 155 women died, in 2017 the number slightly decreased to 153, then in 2018 it decreased to 141 women who died.

In conclusion, the current demographic situation in the Municipality of Kirkovo is characterized by a continuing decline and aging of the population, increasing birth rate and maintaining a high level of overall mortality and negative natural increase.

- In the period 2011 – 2018 the population in the Municipality of Kirkovo the tendency to decrease the population. Gradually, positive trends are imposed in the demographic development of the municipality, which is expressed in slowing down the rate of population decline and positive values of mechanical growth.

- As of 31.12.2018 the distribution in the gender structure of the population is balanced, with a small predominance of women (50.35%) compared to men.

- The natural growth rate at the end of 2018 is negative -5.45 %. In the last three years there has been a positive trend in the natural growth rate in the municipality of Kirkovo.

- Unlike the natural one, which throughout the period has negative values, the mechanical growth on the territory of Kirkovo municipality has a positive value in 2018.

- There is a tendency of continuing aging of the population. It is expressed in a decrease in the relative share of the working age population and an increase in the share of the working age population during the studied period 2014 - 2018.

- The number of live births and the total birth rate are increasing.

According to data of the National Statistical Institute as of 31.12.2018, in the Municipality of Kirkovo the mortality rate is 14.25 %. This indicator puts the municipality in third place in Kardzhali District in the negative statistics. It is highest in the Municipality of Ardino - 15.0 %, followed by the municipalities: Chernoochene - 14.67 %, Kirkovo - 14.25 %, Krumovgrad - 13.58 %, Momchilgrad - 12.92 ‰, Djebel and Kardzhali - 11 %.

In 2014 the number of dead is 306, as in 2015. The number decreases by 6 people. In 2016 and 2017 there is an increase in the number of deaths to 317, which fell significantly in 2018 of 303 persons.

The increase in mortality forms the negative natural increase - minus 5.45 %. The difference in the values of the indicators mortality and birth rate forms as a result a drastic decrease in the natural increase minus 5.45 %.

There is no registered infant mortality on the territory of Kirkovo municipality.

Statistics on deaths by cause is the main source of information for analyzing the health status of the population. National statistics do not have data on the causes of death at the municipal level. According to the Health Report 2018 of the National Statistical Institute, the structure of mortality by causes in the district of Kardzhali is revealed. The leading causes continue to be circulatory diseases (65%) and neoplasms (14.2%), followed by symptoms, signs and abnormalities found in clinical and laboratory studies, not elsewhere classified (11.33%), respiratory diseases system (3.72%), diseases of the digestive system (2.94%) and external causes of morbidity and mortality (2.71%)

Diseases of the circulatory system are the first leading cause of death in the district of Kardzhali with an average of 806 deaths per 100,000 population in 2018. The main diseases of the circulatory system are (1) cerebrovascular diseases, (2) ischemic heart disease, (3) acute myocardial infarction.

Malignant diseases are the second leading cause of death in the district - an average of 175 deaths per 100,000 population in 2018. Among the major diseases in this class are malignant neoplasms of (1) the trachea, bronchi and lungs, (2) stomach, (3) the large intestine, (4) the pancreas.

The statistical data show that the main chronic non-communicable diseases - cardiovascular diseases, malignant neoplasms, chronic respiratory diseases and diabetes are the cause of over 80% of deaths in the district of Kardzhali.

The number of medical specialists on the territory of the municipality is 35, of which 9 doctors, 14 dentists, 12 medical specialists (including 10 nurses and 2 paramedics).

The qualifications of senior and mid-level medical staff are insufficient. There is a high turnover among doctors. The main burden, especially in the branches, is borne by the medical staff. To improve the quality of emergency medical care, it is necessary to provide resources, increase the qualification of staff, readiness for rapid response to accidents, disasters and catastrophes in accordance with European standards (District Development Strategy of Kardzhali District for the period 2014-2020).

Given the number and age structure of the population, doctors and dentists are insufficient and they are not able to provide effective pre-hospital health care to the population.

The large distances between small settlements make it difficult for the population to access medical care in remote and inaccessible settlements and neighborhoods. Some of the residents in the villages do not really have access to primary medical care.

4. Current Situation of the Health Care System and Main Challenges in the Smolyan District

The health care system in the Smolyan district consists of:

1. Primary health care institutions - individual and group primary medical and dental care practices;

2. Medical establishments for specialized medical and dental care - individual and group practices, medical centers, diagnostic and consulting centers;

3. Hospitals - 4 hospitals for active treatment, 3 specialized hospitals for rehabilitation and a Center for Mental Health;

4. Emergency Medical Assistance - Emergency Medical Center with 9 branches for emergency medical care and Emergency Department of "Dr Bratan Shukerov" Hospital;

5. Emergency medical care, implemented by Smolyan Diagnostic consultative Center, "MBAL-Devin" EAD and individual practices for primary care.

The population in Smolyan District amounts to 105421 persons or around 1.5% of the total population of Bulgaria (31/12/2018). The demographic trends are extremely negative and are connected with the decrease and aging of the population, accompanied by very low birth rates and increased mortality. The population in Smolyan Region is decreased with 19374 persons (or 15.5%) for the period 2008-2018, while the average rate for the country is 7.45%

4. Data Collection and Database Creation

4.1. Database

The term "database" is used in two senses. One refers to the organized collection of data that is created, maintained, and searched. The other refers to the software that is used to create and maintain the data. Database management systems are often simply called "databases." This entry concentrates on large, publicly available databases, together with the services that make them available.

The term "data" refers to facts, numbers, letters, and symbols that describe an object, idea, condition, situation, and so on. Data elements, which are the smallest units of information to which reference is made, are combined to create records. Data elements in a bibliographic reference include the names of the author or authors, the title of referenced work, the journal name, the pagination, the volume number, the issue number, and the date of publication.

A data set is a collection of similar and related data records or data points that have not yet been organized for computer processing. A data file is an aggregation of data sets or records treated as a unit. While databases are also collections of related data and information, the difference between a data file and a database is that a database is organized (by a database management system) to permit the user to search and retrieve or process and reorganize the data.

The discussion in this entry is concerned primarily with digital data, although a large portion of raw data is recorded as analog data, which also can be digitized. Digital data are represented by the digits zero to nine. In the case of analog data, numbers are represented by physical quantities (e.g., the lengths obtained from a slide rule, the measurements of voltage currents). These physical quantities can be converted to digital data through an analog-to-digital converter.

Because word-oriented, numeric, image, and sound databases differ, they are processed by different types of software that are specific to each type of data. Digital data may be processed or stored on

various types of media, including magnetic media (e.g., tapes, hard drives, diskettes, random access memory) and optical media (e.g., CD-ROMs, digital video discs). Users can access the data either through portable media or, more generally, through online sources.

The range of public databases has grown to the extent that it is now possible to find data on almost any subject. Databases have been created for nearly every major field and many subfields in science, technology, medicine, business, law, social sciences, politics, arts, humanities, and religion as well as for news (worldwide, regional, or subject-related), problems (specific to topics and organizations), missions (such as transportation, defense, shipping, robotics, oil spills, solid waste), and consumer interests such as shopping and automobile repair.

A database has the following functions:

- Add new data to a database, such as a new item in an inventory
- Processing existing data in the database, such as changing the current location of an item
- Deleting information, for example if an item is sold or misused
- Organize and view data in different ways
- Sharing data with others via reports, emails, an intranet or the Internet

4.2. Electronic Healthcare Database

Healthcare databases are systems into which healthcare providers routinely enter clinical and laboratory data. One of the most commonly used forms of healthcare databases are electronic health records (EHRs). Practitioners enter routine clinical and laboratory data into EHRs during usual practice as a record of the patient's care. Other healthcare databases include claims databases, which are maintained by payers for reimbursement purposes, pharmacist databases and patient registries. Healthcare databases can be used as data sources for the generation of real-world evidence (RWE).

An EHR is the systematized collection of patient and population electronically-stored health information in a digital format. These records can be shared across different health care settings. Records are shared through network-connected, enterprise-wide information systems or other information networks and exchanges. EHRs may include a range of data, including demographics, medical history, medication and allergies, immunization status, laboratory test results, radiology images, vital signs, personal statistics like age and weight, and billing information.

A decade ago, EHRs were touted as key to increasing of quality care. Today, providers are using data from patient records to improve quality outcomes through their care management programs. Combining multiple types of clinical data from the system's health records has helped clinicians identify and stratify chronically ill patients. EHR can improve quality care by using the data and analytics to prevent hospitalizations among high-risk patients.

EHR systems are designed to store data accurately and to capture the state of a patient across time. It eliminates the need to track down a patient's previous paper medical records and assists in ensuring data is accurate and legible. It can reduce risk of data replication as there is only one modifiable file, which means the file is more likely up to date, and decreases risk of lost paperwork. Due to the digital information being searchable and in a single file, EMRs (electronic medical records) are more effective when extracting medical data for the examination of possible trends and long term changes in a patient. Population-based studies of medical records may also be facilitated by the widespread adoption of EHRs and EMRs.

Deliverables related to the component Electronic Health Database are as following:

- ✓ **Online platform and data sets:** development of an online platform to be use by all health personnel involved in the piloting exercise of the Personal Health Record (PHR). The platform will support the use of the electronic PHR by facilitating data entry and the retrievably of specific PHR when needed. The electronic health database will ensure availability of migrant health assessment records at transit and destination countries, and national and cross-border disease surveillance and response capacities, by allowing extraction of data sets for analysis.
- ✓ **Training on the utilization of the PHR and data collection requirements**: it includes sessions on data collection and entry requirements, validation and quality control and is provided by experienced IOM health information system personnel.

Examples of initiatives for healthcare databases

The following initiatives aim to improve routinely collected data for use in research:

- The TRANSFoRm Project aims to develop a 'rapid learning healthcare system' that can improve both patient safety and the conduct and volume of clinical research in Europe.
- The Electronic Health Records for Clinical Research (EHR4CR) Project of the EU's Innovative Medicines Initiative (IMI) has developed a technological platform that combines hospital data across countries, to identify sites and patients for trials.
- A tool developed by the EHR for Clinical Research Functional Profile Project (EHRCR) allows doctors to evaluate the quality and security of their EHR systems and provide study teams with this information.
- The Sentinel Initiative is a system developed by the US Food and Drug Administration (FDA) that links existing healthcare data from multiple databases, to actively monitor the safety of medical products in real time and to help address the heterogeneity of data collection that currently exists.

- The EHDEN (European Health Data and Evidence Network) project, part of the EU's Innovative Medicines Initiative (IMI), is developing a federated network of databases, standardised to a common data model, to improve the ability to study real world health outcomes across diverse healthcare systems and to support open science collaboration in Europe.

Healthcare databases are useful as the use of routinely collected data, such as data from EHRs, allows assessment of the benefits and risks of different medical treatments, as well as the relative effectiveness of medicines in the real world. In addition, studies based on real-world data (RWD) are faster to conduct than randomised controlled trials (RCTs).

The approval of the user selection criteria took place on 29/01/2020 during the second meeting of the Board of Directors of KEMEA on ''Approval or non-approval of the criteria for selecting users of remote monitoring devices in the context of implementation'' of the project ''Improving Healthcare Access through a Personal Health Monitor System'' with acronym ''EHEALTH Monitoring''.

The decision which was made pointed out that the 100 devices would be distributed to a representative sample of the population in the first phase, which is primarily related to the project, but also the services offered by the devices.

The categories are:

1. The elderly over 67 years old
2. Children with health problems
3. People suffering from chronic health problems
4. People with disabilities
5. Residents of isolated areas
6. Homeless people

The aforementioned categories are in line with the nature of the project, but also with the logic of remote medical monitoring. It should be noted that the use of devices requires the use of the Internet at home, otherwise the devices cannot be used.

The devices were delivered to users with user or relative billing protocols when it comes to minors, the disabled or the elderly in need of ongoing care. Users and their relatives received the devices, as well as instructions for use and a brief demonstration of how they are used took place. Finally, the devices will remain with the user for a certain period of time, and then they will be delivered to KEMEA, in order to be used by other citizens who are in need. **Appendix I** includes the Approval Decision for user selection.

4.3. Invitation KEMEA

KEMEA issued an invitation to the interested bodies, which was drafted on 26/02/2020, which is cited in **Appendix II**. The content was as follows:

INVITATION

The Center of Care and Solidarity of Komotini Municipality within the implementation of the project entitled "Improving Healthcare Access through a Personal Health Monitoring System - EHEALTH Monitoring" of the INTERREG VA Greece-Bulgaria 2014-2020 Cross-Border Territorial Cooperation Program will distribute 100 sets of devices (blood pressure monitors, oximeters, activity trackers and tablets) to a representative sample of the population and you are kindly requested to indicate us users / beneficiaries in order for the distribution to commence.

The categories the devices distributed concern the following:

- The elderly over 67 years old
- Children with health problems
- People suffering from chronic health problems
- People with disabilities
- Residents of isolated areas
- Homeless people

These categories are in line with the nature of the project, but also with the logic of remote medical monitoring.

 It has to be underlined that the **use of the devices requires the use of the Internet at home**, otherwise the devices cannot be used.

The devices will be delivered to users with user or relative billing protocols when it comes to minors, the disabled or the elderly in need of ongoing care.

Finally, the devices will remain with the user for a certain period of time (initially for a month), and then they will be delivered to KEMEA, in order to be used by other citizens who need it.

Please send us the names of the people who want to use the system **no later than Monday 9th March, 2020.**

4.4. Data Collection KEMEA

Distribution of equipment to the selected users was supposed to commence in February 2020, however due to the pandemic that broke out and the strict restrictive measures imposed by the government throughout the country, this was not feasible. Nevertheless, the representatives of KEMEA made an effort to distribute a small number of devices to people from their environment in

March. The distribution process officially started in October 2020, however, due to the coronavirus, various issues arose with respect to some of the users in some of the selected organizations, as they were very hesitant to receive the sensors due to the prevailing situation.

Whereas the process was scheduled to be completed in the first days of November, the Greek government once again imposed a lockdown throughout the country, due to the increased spread of the coronavirus and the thousands of cases of infected people recorded on a daily basis. For this reason the JS approved an extra extension of one month and the new end date was December, 30th 2020.

The equipment was distributed to the following bodies:

- ✓ KEMEA
- ✓ B Open Care Center for the Elderly
- ✓ Help at Home of Komotini
- ✓ Help at Home of Aigeiros
- ✓ Help at Home of Sidirochori
- ✓ Help at Home of Fanari

Appendix III includes the table with personal information of those who received the sensors.

The process of distribution of devices was accompanied by the completion of a delivery and receipt protocol filled in by the contracting parties. More precisely, this document includes the name of the person who received the devices, date and time of delivery as well as date and time that they were given back to KEMEA. It is worth mentioning that the procedures were carried out in accordance with the law and the rules for the protection of personal data. **Appendix IV** includes the delivery and receipt protocol signed by the users.

4.5. Data Collection Municipality of Kirkovo

Within Work Package 4 "Joint Monitoring System", delivery D4.5.1 under the project „Improving Healthcare Access through a Personal Health Monitoring System"/eHealth Monitoring/, beneficiary 5 Kirkovo Municipality will purchase 40 sets containing (1) biosensors and (2) User Mobile Unit (UMU) (patients) and (3) Expert Mobile Unit (EMU) (doctors, medical specialists) for monitoring the health status of persons on the territory of the municipality.

The successful implementation of the activity requires the identification of 40 individuals, users who will be provided with (1) biosensors, to measure heart rate, oxygen saturation, blood pressure (systolic and diastolic) and physical activity (number of steps and duration of sleep) and (2) mobile units for consumers (patients).

The development of social services in the municipality play an important role in the process of prevention and social inclusion of vulnerable groups. The Law on Social Assistance and the Regulations for its implementation define the role of social services in helping the population to lead a dignified life, to protect people from risks related to their social integration and to support reintegration in cases of existing risks, to reduce the risks of social isolation and marginalization of certain groups in society.

In the framework of the present study, Advance Business Consulting Ltd. conducted an analysis that outlined certain risk socio-economic factors (Table 5) which in turn lead to the identification of the target group of the project and its specific categories.

Table 5 Factors causing risk for the population of Kirkovo municipality

Low income
Age - an increase in living alone among the elderly, in need of daily support, especially in isolated small towns, with extremely limited access to health care and services
A person with a disability
Presence of one or more chronic diseases of the face (cardiovascular diseases, malignant neoplasms, chronic respiratory diseases and diabetes)
Family structure - complete or incomplete family, large families
Belonging to vulnerable communities that are in social isolation
Low education (including illiteracy), lack of professional qualifications, which lead to unequal position on the labor market
Unemployment among people of working age
Place of residence – remoteness and isolation of the settlement

Income is the main factor increasing the risk of falling into the group of the poor. This is related to the economic activity of people and their participation in the labor market. Unemployed people with limited income opportunities are most seriously affected. The social cost of unemployment is expressed in loss of income and deterioration of the living standard of the family, loss of qualifications (especially among the long-term unemployed), unwillingness to maintain a high professional level).

Access to employment is most restricted for several specific groups of unemployed: - people with low education, people over the age of 55, people with disabilities of working age, as well as people from

remote and hard-to-reach settlements. People with disabilities continue to be a risk group in the labor market.

The structure and number of members in a household are also directly reflected in the formation of risk groups. This determines to a large extent the income and the distribution of expenses between them. The structure of households also plays a significant role due to the fact that most people with social problems rely on their relatives, as social assistance and services do not solve the problems they face and do not compensate for the risks they face.

With regard to the health factor, the following risk groups can be identified: (1) persons with physical disabilities, (2) persons with chronic diseases and / or serious health problems.

The territorial structure of the municipality includes 73 settlements, some of which are sparsely populated (Table 3), which leads to difficulties for the population to use health and social services. The remoteness and isolation of the settlement creates difficult access to health and social services, forming the following risk groups in the municipality: (1) Lonely elderly people, (2) Persons with disabilities living in remote settlements, (3) families with low and / or without income.

The analysis made in the present study defines the target group of the project "Improving access to health services through a personal health monitoring system": (1) people with disabilities, (2) elderly people in need of care, (3) single people in small, remote settlements, without access to social and health services, (4) persons suffering from chronic diseases.

The identified specific categories of target noise are in accordance with:

- The demographic and socio-health analysis set out in this report,
- Application form of the project "Improving access to health services through a personal health monitoring system",
- Strategic goal 1 "Raising the standard of living through competitive education and training, creating conditions for quality employment and social inclusion and ensuring affordable and quality health care", the National Development Program "Bulgaria 2020"
- Strategic goal 2 "Social cohesion and reduction of regional disparities in the social sphere by creating conditions for development and realization of human capital", National Strategy for Regional Development 2012-2022,
- Strategic goal 2: Social cohesion and reduction of inter-regional inequalities through investments in human capital and social infrastructure, Regional Development Plan of the South Central Region 2014-2020.

- Priority 1. Improving the quality of services provided to the population, Specific objective 1.2 - Social responsibility and protection, Municipal Development Plan of the Municipality of Kirkovo 2014-2020;

- Priority Area 2: Social Inclusion of Disadvantaged Communities and Vulnerable Groups, District Strategy for Development of Social Services in Kardzhali District 2016-2020;

- Priority axis 4 – "A Socially inclusive cross-border area" investment priority 9a "Investing in health and social infrastructure which contributes to national, regional and local development, reducing inequalities in terms of health status, promoting social inclusion through improved access to social, cultural and recreational", Interreg V-A "Greece-Bulgaria 2014-2020" Cooperation Programme.

Table 6 contains current data on the adult population at risk in the municipality of Kirkovo. The most numerous is the group of persons who are retired (7752), followed by the registered unemployed (1441), of whom 819 are long-term unemployed and 547 are unemployed persons over 55 years of age. The number of persons living below the poverty line and who are assisted with targeted heating assistance is 1290. There is a large number of elderly people subject to social assistance - 866, as well as the elderly living alone in the municipality - 861.

Appendix I – Decision of Approval

Appendix IV – Delivery and Receipt Protocol