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HEALTHCARE AND SOCIAL CARE DATABASE INTEGRATION IN GEORGIA

Master's thesis

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TERVISHOIU JA SOTSIAALHOOLEKANDE ANDMEBAASIDE INTEGRATSIOON GRUUSIAS

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Author's declaration of originality

I hereby certify that I am the sole author of this thesis. All the used materials, references to the literature and the work of others have been referred to. This thesis has not been presented for examination anywhere else.

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Abstract

Background: Modern medicine is developing constantly and Information and Communications Technologies (ICT) have a huge impact on it. The digitalization of healthcare enables better service coverage, as well as access to the data, moreover, it enables using various technics and methods to combine, aggregate, synthesize and analyze data for better understanding of the healthcare field and for providing a holistic view.

Aim: The aim of this paper is to map out and analyze relevant literature that is available online on healthcare and social care database integration and to generate recommendations for the Georgian government, policymakers, and researchers in regards to the possible benefits of the integration process.

Methods: Literature mapping is used as a method of analyzing the quality and discussing the results of research papers written on the subject by utilizing a free search engine PubMed to access the scientific literature on the MEDLINE database.

Results: There were 461 complete, freely available articles in the English language published on the MEDLINE database throughout the last 10 years and only 12 of them were related to healthcare and social care database integration.

Conclusion: Most of the articles are related to the topic of data sharing between various institutions and the data linkages; only a few studies have been conducted specifically about two or more database (healthcare and social care data) integration processes. Further studies are needed for a better understanding of the overall integration process.

This thesis is written in English and is 45 pages long, including 9 chapters, 5 figures, and 2 tables.

Annotatsioon

TERVISHOIU JA SOTSIAALHOOLEKANDE ANDMEBAASIDE INTEGRATSIOON GRUUSIAS

Taust: Kaasaegne meditsiin areneb pidevalt ning informatsiooni ja kommunikatsiooni tehnoloogiatel (IKT) on sellele suur mõju. Tervishoiu digitaliseerimine võimaldab paremat teenusega kaetust, samuti ka paremat ligipääsu andmetele. Peale selle see võimaldab tervishoiuvaldkonna paremaks mõistmiseks ja tervikliku ülevaate saamiseks kombineerida, koondada, sünteesida ja analüüsida andmeid kasutades erinevaid tehnikaid ning meetodeid.

Eesmärk: Käesoleva dokumendi eesmärk on kaardistada ja analüüsida asjakohast kirjandust, mis on võrgus saadaval tervishoiu ja sotsiaalhoolekande andmebaaside integratsiooni kohta ning genereerida soovitusi Gruusia valitsusele, poliitikutele ja teadlastele integratsiooniprotsessi võimalike eeliste osas.

Meetodid: Kirjanduse kaardistamist kasutatakse kvaliteedi analüüsimise ja antud teemal kirjutatud teadustöö tulemuste arutamise meetodina, kasutades vaba otsingumootorit PubMed, et pääseda ligi teaduslikule kirjandusele MEDLINE'i andmebaasis.

Tulemused: MEDLINE'i andmebaasis on viimase 10 aasta kohta avaldatud inglise keeles 461 terviklikku vabalt kättesaadavat artiklit ning neist ainult 12 olid seotud tervishoiu ja sotsiaalhoolekande andmebaasi integreerimisega.

Järeldus: Enamus artikleid on seotud erinevate institutsioonide vahelise andmete jagamise ja andmeside teemaga; ainult paar uuringut on läbi viidud spetsiaalselt kahe või enama andmebaasi (tervishoiu- ja sotsiaalhoolekande andmed) integratsiooniprotsesside kohta. Täieliku integratsiooniprotsessi paremaks mõistmiseks on vaja täiendavaid uuringuid.

Lõputöö on kirjutatud inglise keeles ning sisaldab teksti 45 leheküljel, 9 peatükki, 5 joonist, 2 tabelit.

List of abbreviations and terms

APP	Application (software/program)
CIS	Commonwealth of Independent States
EU	European Union
GDPR	General Data Protection Regulation
HFA-DB	Health for All database
HIV	Human Immunodeficiency Virus
ICT	Information and Communication Technologies
ID	Identity card
HMIS	Health Management Information System
MoH	Ministry of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia
NCDC	National Center for Disease Control and Public Health
NCDs	Noncommunicable disease
OOP	Out of pocket
SMIS	Social Management Information System
SSA	Social Service Agency
UHCP	Universal Health Care Program
UK	United Kingdom
WHO	World Health Organization

Table of Contents

List of figures

List of tables

1 Introduction

Data collection is an ongoing and rapidly growing process and nowadays more and more of it is being collected. Health data is needed for designing, implementing, and evaluating public health prevention programs, on the other hand, social data is related to provide basic assistance with various activities related to the daily living, social interactions and sustaining the independence of wellbeing [1].

1.1 Definition of terms

Healthcare or **health care** is a set of services such as prevention, diagnosis, treatment, etc., focused on the care and improvement of health by a country or an organization for physically and/or mentally ill people [2].

The Cambridge dictionary refers to **social care** as the "care by public organizations and private companies for people in the society who need special help in order to live comfortably" [3].

According to the definition, a **database,** also called an **electronic database**, can be any collection of data, that is specially organized for storage, accessibility, and retrieval of the information [4].

The **integration** stands for "the action or process of combining two or more things in an effective way [5]."

There are different types of databases, but in this paper, the main focus will be on the **integration of social care and healthcare databases**.

1.2 Background

Throughout the past decade, Georgia has gone through a lot of reforms in the public health and social welfare sector. According to the Ministry of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia (MoH) report in

2013-2014 [6], the main priority of the Government was to increase access to medical services for the general population and to improve its overall quality. This was largely due to the so-called "Georgia 2020" program, a part of the Health 2020 framework, which is a health policy approved by the World Health Organization (WHO) Regional Committee in 2012, and frames health, and wellbeing as fundamental human rights [7]. As a member of WHO since 1992 [8], Georgia naturally shares the responsibilities listed in the joined policy framework of the region by supporting action across government and society to "improve the health and well-being of populations, reduce health inequalities, strengthen public health and ensure people-centered health systems that are universal, equitable, sustainable and of high quality".

In Georgia, health care, social affairs, and labor go under one institution, MoH, which is responsible for a holistic care of health and social wellbeing. Under the same ministry, there are various databases generated (**Figure 1**), that enables a suitable platform for databases integration.

Since 2009, the Social Service Agency gathers and administers information via Social Management Information System (SMIS) [9], on the other hand, starting from 2011, health-related data is collected, stored and analyzed through the Health Management Information System (HMIS).

Figure 1. Health and Social Management Information System in Georgia
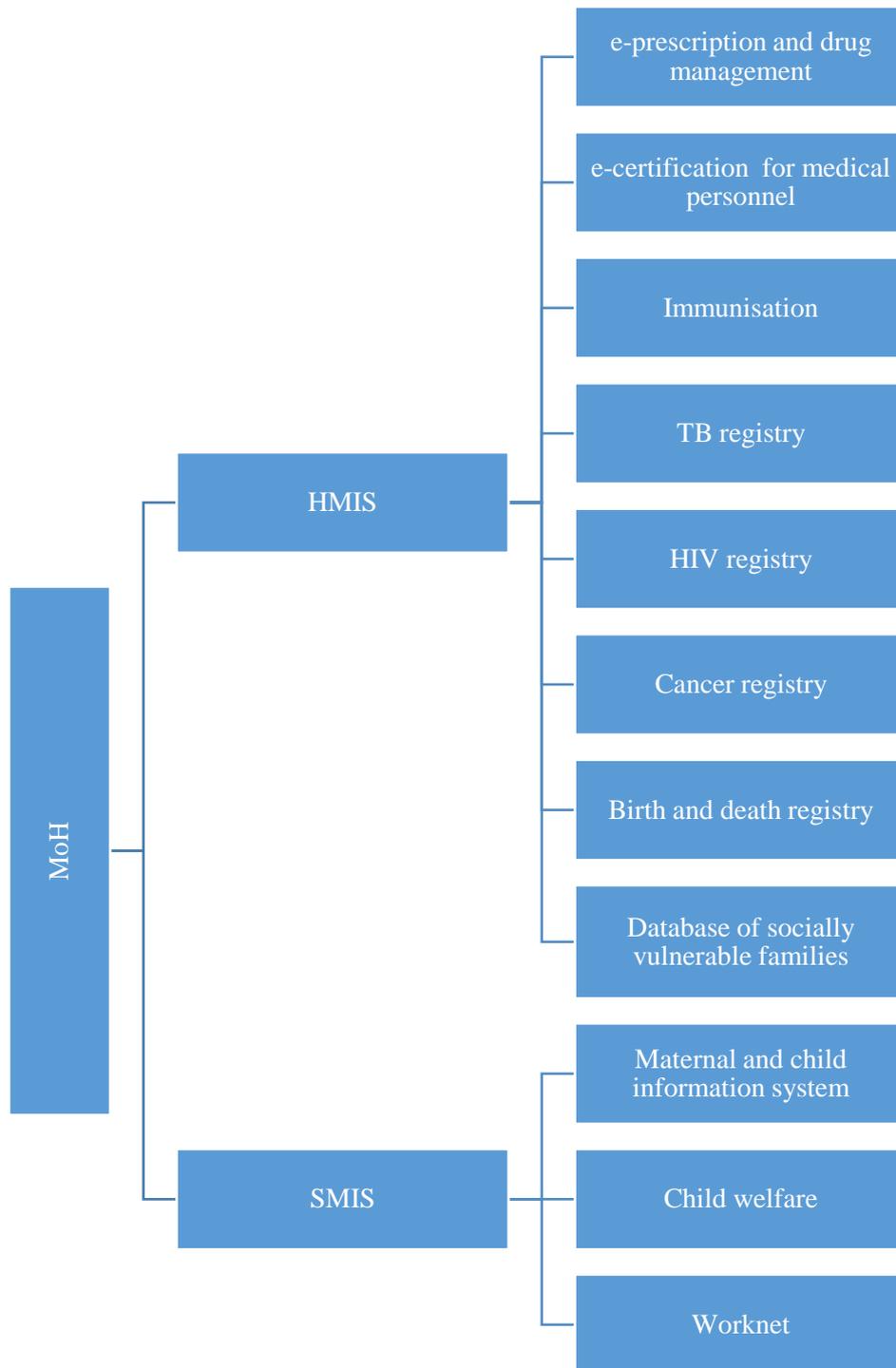
MoH=Ministry of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia; HMIS=Health Management Information System; SMIS=Social Management Information System; TB=Tuberculosis; HIV=Human Immunodeficiency Virus.

E-health[i] wise, supporting health care through electronic services and systems is an important element of the advancement of this field. The MoH has developed the "Health Management Information System (HMIS) Strategy of Georgia" in 2011.

Additionally, several electronic services were created for different departments, organizations, and citizens, all of which are provided through three different information portals:

- www.moh.gov.ge, which is the Ministry of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia Information Portal; and http://ehealth.moh.gov.ge – the HMIS portal,

- www.my.gov.ge, which is Legal Entity of Public Law "Data Exchange Agency" service,

- www.ncdc.ge, which is the National Center for Disease Control and Public Health.

Through these electronic services, information is provided on various topics, like the state pension, household subsidy, state aid, subsistence allowance, persons registered in general outpatient facilities, capacity, and profiles of medical institutions.

By the end of 2013, another Labor Market Management Information System was created to register job seekers and employers. and in 2014 – an electronic certification and qualification system was launched for medical personnel, where individuals can register online for exams. The centralized drug management system of recording medical prescription was also created, serving as an easier search engine to find appropriate medicine.

With an active financial and technical support of the United States Agency for International Development, the Universal Health Care System Enhancement Program has been functioning since 2013, which is designed to:

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[i] Also known as eHealth, is a concept of using information and communication technologies for health.

- Ensure transparency and quality of service standardization processes;

- Improve the effectiveness and control of health care programs;

- Make informed decisions;

- Reduce administrative expenses;

- Create unified information standards within the electronic government;

- Ensure the exchange of information between the agencies and the possibility of integration of other agencies (Ministry of Correction and Probation, Adjara Ministry of Health and Social Affairs, Tbilisi City Hall) into the unified electronic space;

- Receive and process information in real time;

- Obtain reliable information and statistics and analysis based on it [6].

The WHO Georgia Profile of Health and Wellbeing (2017) also highlights the universal health care reform in the country, and stresses, that aside from improving access to health services, it also reduced the financial barriers, as well as out-of-pocket costs for citizens [10]. Thus, this is regarded as one of the most successful steps forward for the country's overall heal care policy.

Since 2013, new components have been introduced to the HMIS portal - an electronic health care system, such as registering pharmaceutical products, infectious diseases (including tuberculosis), immunization/vaccination, monitoring, and managing the priority areas and public health programs (including psychiatry, drug abuse, Human Immunodeficiency Virus (HIV) infection, etc.), medical staff certification and accreditation systems. Since 2013, there is also an electronic system for supplying health care programs with special medicine, including regimens for mothers and newborns, diabetes management, dialysis, registering, and managing the state programs for rare disease beneficiaries, and registration of medicines. Similarly, from 2014 the system of issuing drugs at the preferential price of accounting for hepatitis C was administered.

In 2013 a cancer population registry was created and it was gradually introduced across the country. Similarly, the NCDC created a new, stationary patient-oriented statistical

accounting system the same year, in which all types of hospitals in the country have been participating since 2014.

The Strategy for socio-economic development, Georgia 2020, issued in the same year (2013) also outlines an inclusive economic growth in the development of human resources and the utmost effective use of the existing capitals as one of the top priorities to achieving the Health 2020 agenda [11]. The document addresses three main directions that require an active implementation of reforms from the state. These are as follows:

- Development of a workforce focused on the labor market demands,

- Improvement of the social security system, and

- Ensuring quality and affordability in the health care system.

It is hypothesized, that the growth of employment opportunities will create a solid foundation for improving the living standards of the entire population of Georgia. In order to overcome poverty and promote inclusive growth, social assistance is more effective in promoting new jobs and a full-scale involvement in the workforce. Thus, the database of socially vulnerable families was created, to identify the ratings of families who are eligible to receive social benefits. This data is also actively consumed and shared by other state agencies for the purpose of providing the benefits and allowance, the methodology of counting points is improved to identify the appropriate groups more correctionally and transparently.

Additionally, the database for the promotion of the demographic situation was created in 2014, which still to this day provides money to all third and subsequent children in the rural community as defined by this program.

Finally, a new electronic system of birth and death registration was created together with a Public Service Development Agency [12], which must correctly and accurately record information about all birth and death cases. The agency is functioning under the management of Ministry of Justice of Georgia and is responsible for delivering digitalized civil acts and innovative solutions for the public services and products, such as the registry of citizens and new identity card (ID) equipped with electronic functions.

It is particularly encouraging to see the government of Georgia aligning national health policies and systems to the Health 2020 targets and goals.

1.3 Problem

Similarly, to the rest of the European Region, Georgia's population has followed the same patterns in their overall health status for the past three decades, "however, despite noticeable improvements since 2000, the country still faces multiple health challenges", states the WHO 2017 report. Despite making significant progress on a number of indicators, such as maternal and infant mortality, an incidence of tuberculosis, etc., other indicators still remain below average compared to both the Region and the Commonwealth of Independent States.

WHO report lists several major events have contributed to Georgia's health-indicator pattern:

(a) the country's reform of health care service delivery, which admittedly has "improved population health status and narrowed the gap between Georgian and regional averages for many indicators". The main goals for this reform were to make sure each and every citizen had access to high-quality medical services, that the primary health care system was improved, and that no citizen had to pay out of pocket for receiving emergency health services.

(b) the change in population size recorded in its 2014 census, which was mainly due to the fact that back in 2011, the country introduced a new electronic system to register both birth and death cases, as well as a policy that issued fines for late or non-registrations in cases of death. According to the NCDC, these changes "led to an increase in the number of registered deaths and to a decrease in reported population size".

(c) improvements in the coverage of the case and death registrations and quality of data in the health information system, due to increased and gradual efforts by the government to introduce new data-reporting technologies in several areas of the health information system since 2014. These include:

• The 2014–2016 electronic case-based reporting systems for in- and outpatients in health care institutions;

- The 2015 population-based cancer registry; and

- The 2016 new electronic registration module for antenatal and obstetric services and the surveillance of maternal and newborn health.

However, it is also stated, that even more effort is needed to improve the overall quality of the health data. The WHO report makes an interesting argument, that while these "improved registration and reporting systems can give more accurate information on Georgia's population health", they could also lead us to "short-term analytical problems when attempting to compare the trends against historical patterns."

Despite the fact that the overall health status of the population has steadily improved for some health indicators; the most recent data still show some specific areas of concern. For example, the country has a higher than average Gini index[i], that shows an obvious social inequality, in addition to which, there is a high percentage of primary school age children not being enrolled in schools, and last but not least, a high rate of unemployment. Effective policies are needed to combat these health inequities in the country.

Moreover, unemployment still remains one of the biggest concerns for the society, besides a decreased level of unemployment rate by 1,2 % and reaching the lowest indicator for past 10 years with 12,7%, for 2018 [13], the absolute poverty level is considerably high – 21,9%, that directly affects the Georgian population, states the National Statistics Office of Georgia in their annual report.

Additionally, lack of knowledge and a skeptical attitude of the society towards innovation and digitalization remains an issue. For instance, new ID cards caused big dissatisfaction among citizens, as they identified on it the Number of the Beast, three six in a row (666) and refused to update from old cards to a new one with digital functions. Moreover, Georgian legislation strictly defines the limits of the data available on the ID card and is available only within the consent of an interested person [14].

There is still, however, an opportunity for Georgia to solve most of the described issues, and to reach health standards defined by WHO; "Health is a state of complete physical,

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[ii] The Gini index or Gini coefficient is a statistical indicator of economic inequality or wealth distribution among a population, developed by the Italian statistician Corrado Gini in 1912.

mental and social well-being and not merely the absence of disease or infirmity [15]." Integrating available primary, hospital and social care databases will enable a holistic approach to managing a person´s health and social needs analyzing and utilizing all the necessary data.

1.4 The Aim and Rationale

The aim of the literature review is to map and analyze relevant literature available online on healthcare and social care database integration, predict the next steps for the Georgian e-health strategy, based on evidence and best practice, and lastly, provide strategic recommendations for creating a better, more equal, and accessible e-Health and social care environment in Georgia. Additionally, the integrated comprehensive approach, by considering different social and health-related aspects, could support residents of Georgia to turn back to the labor market.

Research question:

What empirical evidence exists on the healthcare and social care database integration?

Hypothesis:

H_1 – Integration of healthcare and social care databases will be cost-effective for the government;

H_2 – Social care and healthcare database integration will be beneficial for engaging socially vulnerable groups into everyday community life.

2 Methods

2.1 Selecting the method

After defining the research goal and question, the proper literature review method was selected according to the relevance of the method and topic by assessing the 'Handbook of eHealth and Evaluation: An Evidence-based Approach' [16] and the 'Typology of the Reviews [17]'. Comparing various Review types, Overarching goals, Search strategy, Appraisal of included studies, Analysis and synthesis, the strengths and weaknesses, the Mapping review was selected as the most applicable literature review type to reach the goal of this study [18].

2.2 Description of the Mapping review

The mapping review was developed by the Evidence for Policy and Practice Information and Co-ordinating Centre, Institute of Education, London. The aim of the particular review was to identify and map publications related to the topic [17]. Additionally, Anderson, Allen, Peckham, and Goodwin (2008) described the mapping review for medical informatics and health sciences to record relevant publications and trends on a particular topic [16].

The strengths of this method are a systematic literature search and review of published articles for a broader understanding of the research question. After analyzing the results, it gives policymakers a valuable tool for better understanding of the topic.

The weakness of this mapping review, however, is related to the limitations in time and a lack of analysis and synthesis of the findings [17]. Nevertheless, to make this study more sufficient, a qualitative analysis part would be conducted.

2.3 Mapping review search strategy

In Georgia, health and social care go under one ministry – Ministry of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia.

It was assumed, that there are three ways of integration:

1) Physical merging of two systems;

2) Integration of databases and

3) Universal integration – covering both physical and database integration.

To identify the relevant literature related to the study question, a search was done for the articles written on the subject by utilizing a free search engine PubMed to access the scientific literature on the MEDLINE database. An initial search included papers published between January 2009 to December 2018, and only in English with the keywords in the Title/Abstract: *Integration of social care and healthcare database* or *social care and health care data integration*.

The available search results for these criteria were only two articles. As a sufficient number of relevant articles was not found, the search method was modified to a wider scope in All Fields, with results of 1843 articles.

Additionally, Google Scholar was used for accessing the grey literature[i], freely available on the internet.

2.4 Inclusion and exclusion criteria

The inclusion criteria (**Table 1**) for the PubMed search were articles published in the English language between January 2009 and December 2018. After applying the inclusion criteria, 1224 search results were left.

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[i] "That which is produced on all levels of government, academics, business and industry in print and electronic formats, but which is not controlled by commercial publishers," defined at the 4th International Conference on Grey Literature, October 1999, Washington, DC.

The exclusion criteria for the PubMed search (**Table 1**) were:

- Article types - *Any type of article;*

- Text availability - *Free full articles;*

- Species – *Humans only;*

Table 1. Inclusion and exclusion criteria for the PubMed search

Screening questions	Is the citation about the Integration of social care and healthcare database or social care and health care data integration?
Article types	Any type of article
Text availability	Free full articles
Species	Humans only
Inclusion of languages	Only English is accepted
Timeline	2009-2018

Source: Own table

After applying the inclusion and exclusion criteria it narrowed down the PubMed search results to 461 articles.

In order to cover a wider range of publications, a grey literature was also reviewed by using Google Scholar search engine with the keywords *healthcare and social care database integration* occurred anywhere in the article, as there was no article available with the same name in the title.

After applying these inclusion/exclusion criteria, additional 1,780 results were found between 2009 to 2018 (**Table 2**) via Google Scholar search engine.

Table 2. Inclusion and exclusion criteria for the Google Scholar search

Screening questions	Is the citation about the Integration of social care and healthcare database?
with all of the words	healthcare and social care database integration
with the exact phrase	database integration
where my words occur	anywhere in the article
Timeline	2009-2018

Source: Own table

As the next steps, the results will be described and analyzed accordingly. Based on the conclusion, a coherence with the study goal and hypothesis will be checked and recommendations will be generated according to the analysis, discussion and conclusion.

3 Results

3.1 Findings from the searches

A title, or title and abstract screening of the initial 2,241 results 461 from the PubMed search (**Figure 2**) and 1,780 from the Google scholar (**Figure 3**) narrowed it down to 21 articles for full-text review, 12 papers from PubMed and 9 from the Google scholar.

To filter eligible search results, all article titles were reviewed individually by using a keyword engine filter for the following keywords: *integration; social care, healthcare; database.* If any of these keywords were mentioned in the title, the article was accessed separately and the abstract was reviewed. If the article matched the study question and was relevant, it was included in the final sample. In order to avoid repetition, duplicated results were removed. As a final result, 21 documents were analyzed and included in this paper.

Figure 2. Flow diagram of the PubMed search results
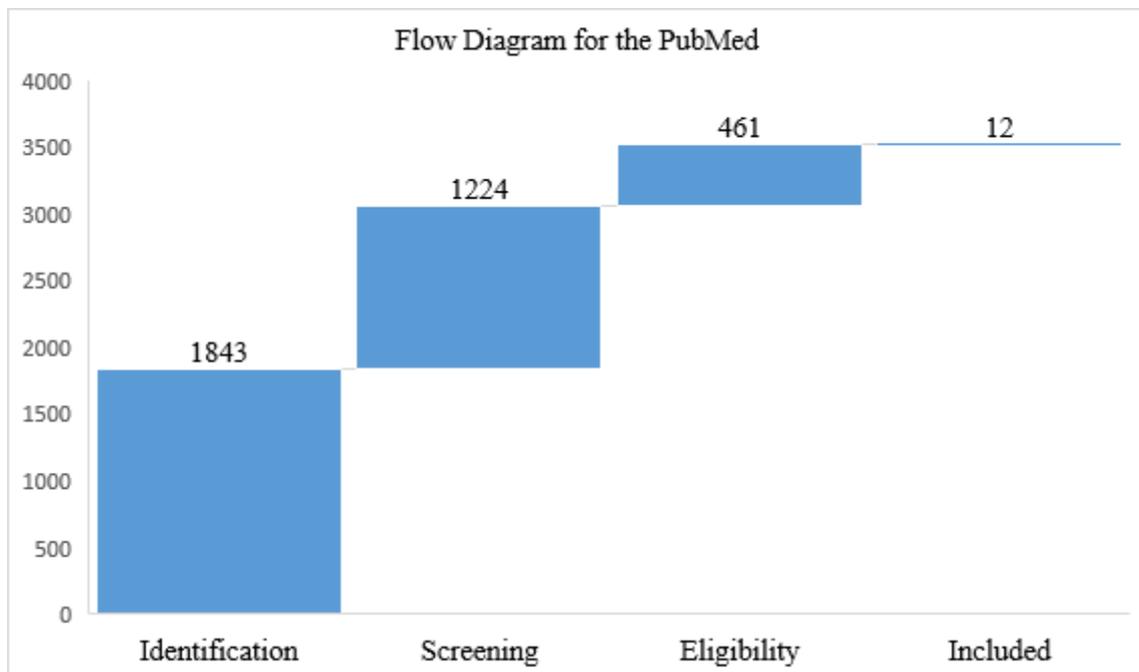
Source: Own diagram

Figure 3. Flow diagram of the Google Scholar search results
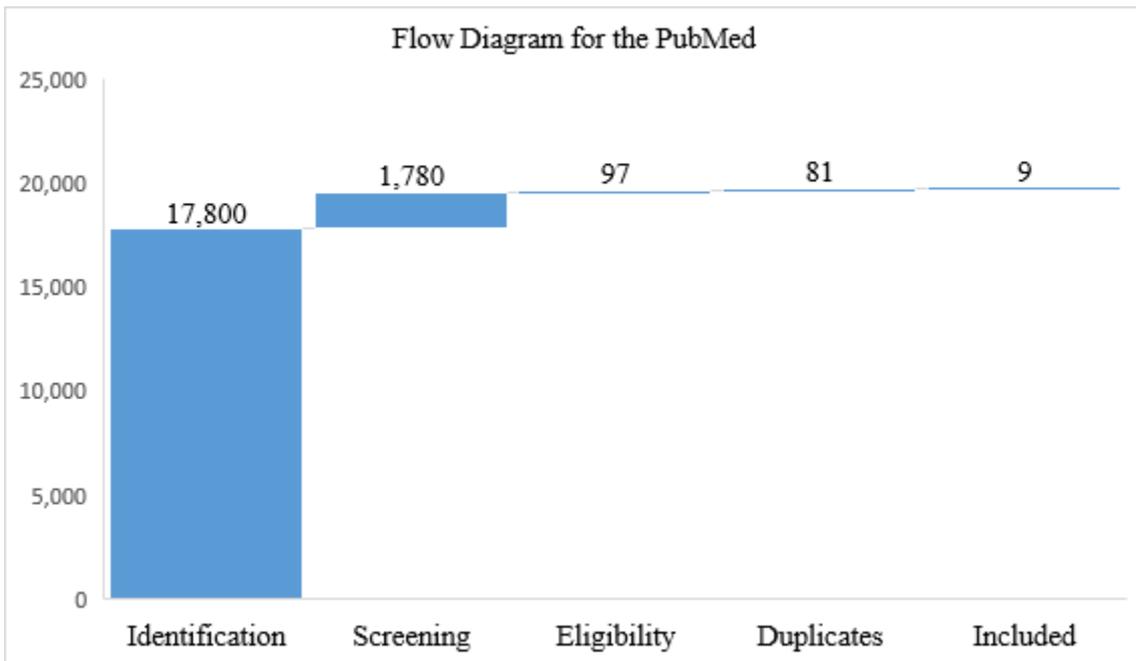
Source: Own diagram

Besides the increased trend of published scientific articles at the MEDLINE database (**Figure 4**), the final number of selected papers were considerably low.

Figure 4. Number of identified articles via PubMed
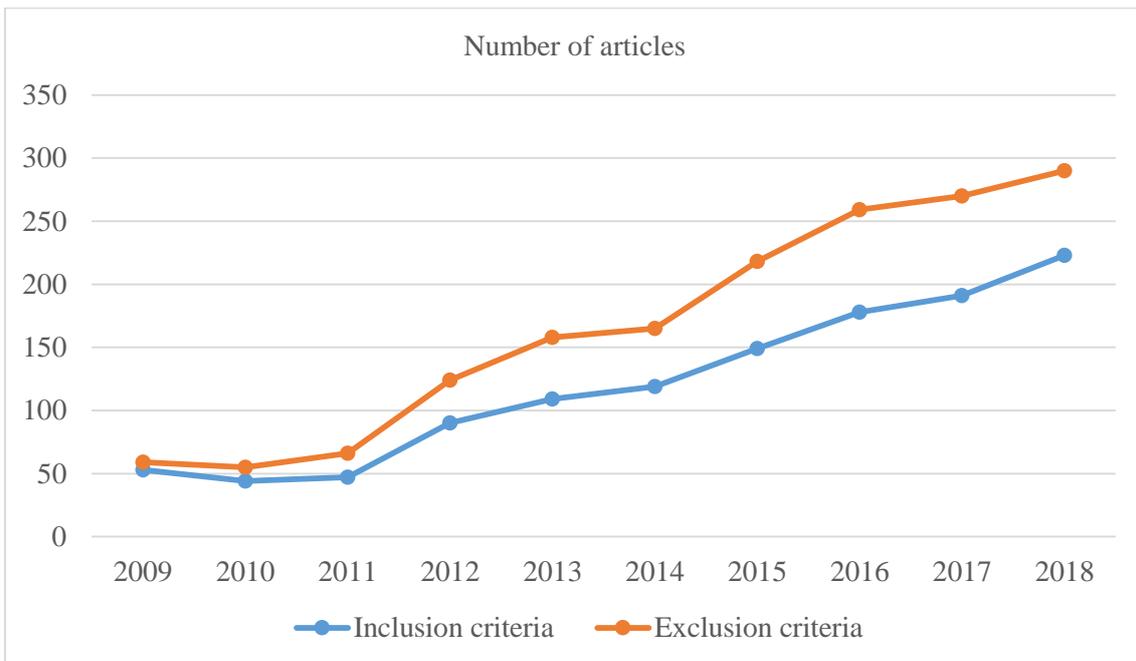
Source: Own diagram

3.2 Findings from the articles

Most of the articles were related to the data sharing and linkage between various institutions, as a part of the databases integration process. However, only a few studies have been conducted specifically on two or more database – healthcare and social care - integration process.

In this section below, the most relevant articles on healthcare and social care database integration will be addressed from the final sample of included studies (**Figure 5**).

Figure 5. Global distribution of identified articles included in the analysis
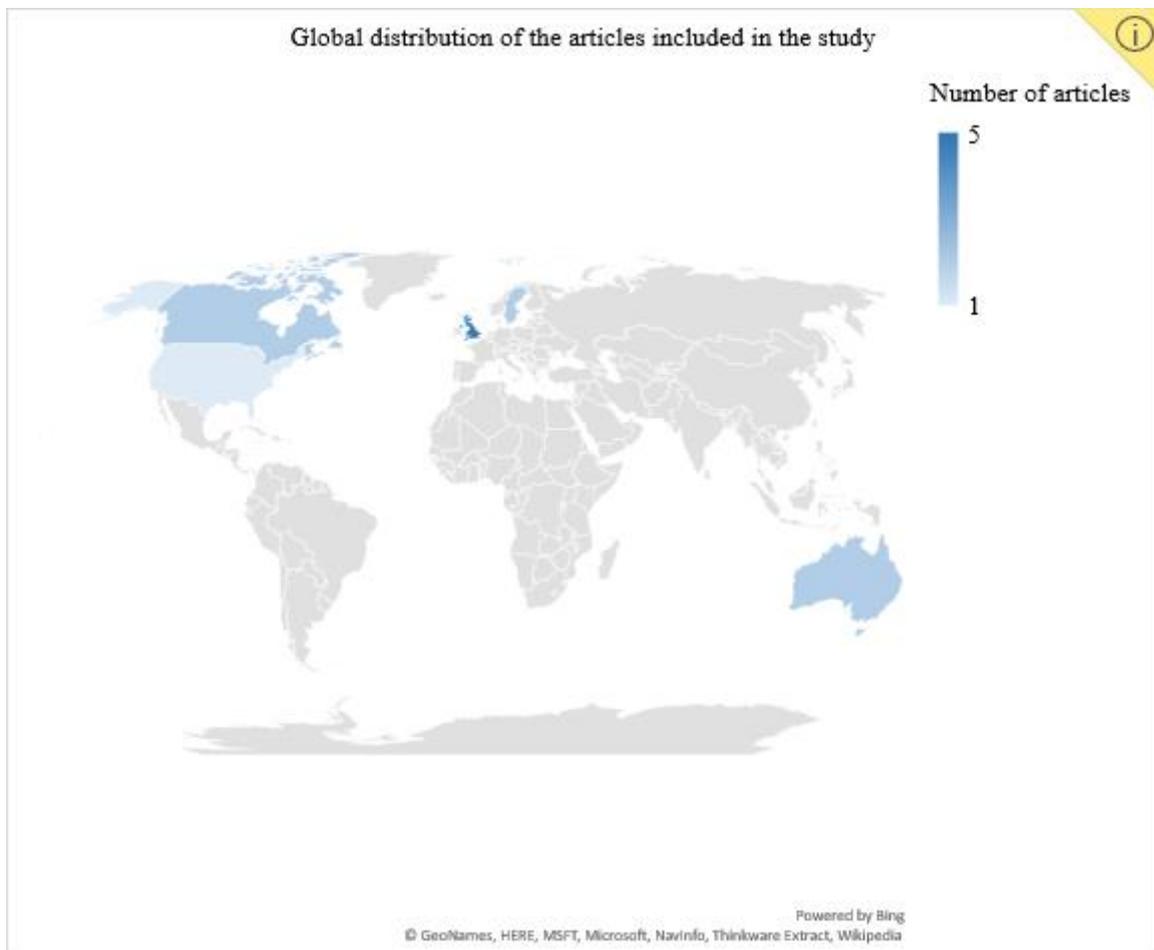
Source: Own table, Powered by Bing

3.3 Integration examples

3.3.1 PH. D Work

Xiang. Ji - Social Data Integration and Analytics for Health Intelligence [19]

The author defined the aim of the paper to develop The Social Health Analytics framework, - a framework for healthcare by utilizing social data. The Social Health Analytics framework contains three main components:

• Data Integration Component

• Population Analytics Component

• Predictive Analytics Component

For Data Integration Component there are few steps to be done: 1. To extract various heterogeneous data (social health data, open government health data, and clinical data); 2. To link and combine them; 3. To develop an integrated semantic web-based network model [19].

Data Integration Component - S. Chun *at al.,* 2012 described patient community based social media data integration in healthcare. Authors stated that there is clear evidence that the Semantic Web[i] has been used as a framework for data integration in previous studies and can help in interpreting social and health blogs [28].

Population Analytics component – Nowadays, a lot of data is generated daily. Besides health records and social care databases, people are sharing their thoughts through different platforms and social media is widely used. To predict upcoming outbreaks, The Sentiment Mining and Monitoring Disease Outbreak is used. That focusses to the monitor public sentiments and disease outbreaks through various channels. As it is hard to fully detect and monitor health-related concerns and changes via surveillance methods

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[i] A framework of common data formats, developed by the World wide web for data sharing and reusing.

(questionnaires and clinical tests), a novel framework, the Epidemics Outbreak and Spread Detection System was developed. The main advantage of the framework is mining the data of Twitter – a social network. It provides a tool to measure, monitor and identify spreading diseases expressed in the tweets (Twitter user posts) [21].

Predictive Analytics Component – Research has shown that there is an association of comorbidities - some medical conditions are connected and linked with each other [22] [23]. In the existence of predictive systems, comorbidity relationships can be foreseen in advance and the potential conditions could be discovered more quickly. In that case, the treatments could be more effective in the early stages of a disease. As a solution, a Recommender System is used [24]. For instance, Davis et al. [25] have described the Collaborative Assessment and Recommendation Engine. The system is based on the patient's medical history and using ICD-9-CM codes to predict upcoming disease risks. However, for better understanding the impact of the solution, long-term study is needed [25].

3.3.2 Case study

Klinga at al., - Understanding the dynamics of sustainable change: A 20-year case study of integrated health and social care [26]

This 20-year analyses frames data integration as a gradual adaptation process, that can eventually lead to sustainability. The authors argue, that integrated health and social care services lead to more people-centric, holistic service deliverance, which must be the government's top priority. However, to reach that goal, extensive cross-sectoral, and interprofessional collaborations are needed, as well as a policy change. However, it is also noted, that peer-evaluated, longitudinal studies are necessary to prove the long-term benefits of integrated data systems [26].

3.3.3 The integration process at the country level

3.3.3.1 The United Kingdom

A. Hobbs and R. Bermingham - Integrating health and social care [20]

The authors of the review paper evaluated the integration across health and social care for improving health outcomes and focusing on benefits for the aging population in the United Kingdom (UK). The article evaluates existing policies that enable the integration process and brings examples of integrated care pilots done in the UK.

In the UK, according to the 2015 Spending Review, for every part of the country, an obligation was made to integrate health and social care further through proposing an integration plan by 2017 with compulsory implementation by 2020.

To achieve the goal, there are two possible ways:

➤ sharing electronic patient data between health and social care personnel working in different locations; or

➤ a physical integration of health and social care professionals in a single location to improve multidisciplinary working.

To meet the requirements, various pilot programs were done, thus identifying some challenges to integration.

Data sharing - Health and social care centers permanently collect personal and confidential information about people, which is regulated under the Data Protection Act. Sharing such sensitive information might need some changes in the law to give permission on access to the data. Another challenge is semantic operability of heterogeneous data. As health care data is structured according to international standards provided by WHO, integration with social care data might be problematic.

Physical integration - health and social care providers have different employment terms and merging staff seems challenging. In addition, these two sectors have different payment models and audit systems, which can lead conflicts of interests and a lack of motivations for building services [20].

In the end, effectiveness is assessed based on available literature. Controversial results were identified [20]. Some studies have shown that successful care integration has a positive impact on reducing costs and improving user outcomes and experiences [21] [22]. However, increased costs were also demonstrated in some reviews [27] [28].

Cameron at al., - Factors that promote and hinder joint and integrated working between health and social care services: a review of research literature [29].

This article analyses the evidence and benefits of joined services in the field of adult health and social care in the UK. While there is some promise, that the joined work can be beneficial for both the users and the caretakers, there is still a consistent lack of strong evidence and understanding of the objectives of data integration. This, in turn, forces us to believe, that in order to review the full potential of data integration, more work still needs to be done [29].

Ward at al., - Developing a framework for gathering and using service user experiences to improve integrated health and social care: the SUFFICE framework [30]

This study describes the UK's increasing efforts to combine healthcare, and social care services, but relatively little has been in order to improve their impact on the users. Poor coordination between service deliverance often causes duplications between health and social services and increases the financial burden on the UK government. Additionally, the authors argue that the UK's integration system has thus far have not been especially positive. There are still lots of barriers in the way of complete integration, as well as professional mismatches, and overall vagueness about the purpose of integration, as well as the individual roles of the caretakers [30].

This paper makes an overview of the many isolated, and fragmented health and social care services present in the UK. Authors highlight the fact that there is still not enough evidence regarding data integration, and despite the fact that there might be some consistencies in the findings, further research is very much needed [31].

3.3.3.2   Nordic countries

Integrated care is well developed in Nordic countries, a variety of strategies and policies enable the integration process at different levels via various ICT channels [32].

Smart Digital Health is a unitive technological system, available in Nordic countries that creates a network and a framework for various stakeholders, such as healthcare providers and patients. Smart Digital Health contains e-health, m-health[i], telehealth, and e-social care branches. Each of these consists of various applications focusing on their specific fields [33].

For instance, e-health covers an electronic healthcare record, a clinical decision support service, and a radiology information system. On the other hand, m-health applications provide administration and personalized services for patients. In addition, patient-centered e-social care provides merged social and health care services to the population [33].

3.3.3.3   Denmark

The SAM:BO solution, available in the Region of Southern Denmark, is a patient-centered formal framework of care cooperation, establishing vertical collaboration between various institutions, such as local authorities, hospitals, and general practitioners. The framework provides all essential guidelines and support to health and social wellbeing related national projects in the development and implementation process. Under SAM:BO agreement, social and health care partnership enables better care for patients with dementia. SAM:BO protocols allow safe and anonymized patient data

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[i] A healthcare service on a mobile device, using an app or apps for service delivery.

sharing among institutions for better planning, monitoring and administering patient care plans [34].

After the implementation of SAM:BO agreement, patients satisfaction level has been improved in the Region of Southern Denmark. In addition, the annual report showed a significant lower length of hospital stay among patients from the same region. However, other health and social care indicators should be measured for better analysis of the impact [34].

Besides achievements, some barriers that still need to be overcome are a readiness to the change, as it requires to implement ICT solutions, and moving to a more shared digitalized work, that might be challenging for some hospitals and professionals. In addition, legal issues related to data security, safety, and exchange remain obstacles in the integration process [34].

3.3.3.4   Sweden

The MigMed 2 database available in Sweden more than 50 years and covers linked person-level data from several national Swedish data registers. It provides to the government a perfect tool for better understanding the health and social issues of the country's residents [35].

In addition, an empirical longitudinal study in Sweden investigating the development of integrated health and social care under one organization, found structural and process changes, that might lead to improved outcomes. However, the study design was not able to identify any cost or patient outcome benefits [36].

3.3.3.5   The United States of America

The Illinois Interoperability and Integration Project established and implemented a new person-centered horizontally integrated governing model for improved health and human services access and delivery at the state level [37].

3.3.3.6 Canada

In Ontario, most pilots and data integration initiatives focus on the data linkage and are considered as one of the most common and powerful ways of databases integration and analysis. The Institute for Clinical Evaluative Sciences controls a Data Repository and is responsible for social and health data linkage. The institute provides support for researchers and policymakers in making well-versed decisions [38].

Another research unit is available in Manitoba, the Manitoba Centre for Health Policy, that developed a repository for collecting, combining and linking the data around 100 databases, including healthcare, justice and social data. The center is able to conduct high-quality population-based research on various topics and identity ongoing health and social problems among citizens [39].

3.3.3.7 Australia

The Western Australia Data Linkage System was formally established in 1995 with more than 20 years of previous experience on data linkage. The system covers demographic and clinical data, such as medical records, and a maternal and newborn health database. The linkage is done by using the personal identification unique numbers given to each individual in the population. The main purpose of data linkage is to support research by sufficient information, as well as policy makers and government to plan and evaluate social and health care services [40].

4 Limitations

Limited amount of sufficient literature is available about social and health care database integration. Most of the findings were related to the physical integration of two institutions, service integration or data linkage. In addition, only a restricted number of literature was freely available specifically about social and health care database integration. It limits to see the whole process widely, as well as minimizes the comparison between various international solutions and approaches for better analyses of the integration process.

5 Analysis

The study results demonstrated innovative approaches and different level of integrations of health and social data through ICT solutions. For instance, the Sentiment Mining and Monitoring Disease Outbreak system in the United States seem to be useful in the prediction process of outbreaks, but it is just a tool to use a social media for promoting better health.

Most articles show that there is a need for social and health care integration, however, besides data/database integration, the main focus is on the data linkages. It is a fact, that the patient-centered approach is highly recommended from various international authorities and most of the countries described above strive towards it. As a tool of a holistic view of patient's needs, database integration is used for either physical integration as administering under one authority or data linkage. In both cases, well-developed ICT infrastructure is needed for safe and secure data collection, storage and sharing. Most of the papers demonstrated a positive scientific value of linked/integrated data. In addition, the Denmark example showed an improved patients' satisfaction level with minimized cost of care. However, further studies are needed to fully understand the whole benefits of the integration process.

Despite the willingness to integrate, some issues should be solved in advance:

- Legal aspects – proper policy and framework are needed to integrate the data from different institutions;

- Data security – appropriate secure protocols needed while collecting, sharing and storing sensitive data;

- Semantic interoperability – while sharing and linking heterogeneous data from various sources;

- Financing – besides financial support, that is essential to implement any innovation, a source of funding and cost-share among institutions should be clearly defined;

- Readiness for the change – suitable infrastructure is needed to implement an ICT solution, besides personnel should be informed, trained and prepared for such changes;

After analyzing the available literature on the subject, there was not enough information to make conclusions and answer to the hypothesis, if the integration of healthcare and social care databases will be cost-effective for the government.

Besides articles demonstrating benefits to the integration process, it is hard to rely on patient's satisfaction level; More sophisticated indicators should be observed and analyzed in the long run to have a comprehensive answer on if the social care and healthcare database integration will be beneficial for engaging socially vulnerable groups in everyday community life.

As a literature review results, controversial outcomes are presented and further sufficient studies are required for a better understanding of the cost-effectiveness and other benefits of the integration process.

6 Discussion

Comparatively to the UK model, Georgia has done some further steps, allocating health and social care under one institution, that simplifies the integration process and skips the need for the physical merging of these institutions. Another advantage might be seen funding. As there is a same source of funding for health and social care in Georgia, the government is responsible for centralized financing of the institution and no financial conflict will arise in this process.

However, similar issues might arise while integrating two different databases, as they are regulated through different national and international standards, acts and regulations.

The Nordic example – Smart Digital Health is enabling the same holistic view on wellbeing as it is planned to be reached in Georgia. However, the current ICT infrastructure needs further development to make integration smoothly. In addition, e-health services and solutions are not widely known in Georgia and before implementation, health and social care personnel should be trained in advance. New smart solutions need proper promotion as well, to be clear all benefits and to make it acceptable for Georgian society.

Other good examples that should be considered are the MigMed 2 database, available in Sweden, the Canadian and Australian solutions for heterogeneous data collection, linkage and analysis. Data has been collected and linked more than 50 years from several national databases in Sweden. Meanwhile, the Manitoba Centre for Health Policy in Canada links the data from more than 100 various databases. Whereas the Western Australia Data Linkage System has sufficient background using personal identification numbers for data linkage. The MigMed 2, Canadian and Australian broad experience will be beneficial for Georgian government and policy makers for better structuring and developing the ICT solutions, in order to collect linked person-level data from several national data registers.

The current situation in Georgia creates the basis for the further development of the health and social care through implementing new ICT solutions. Political stability and economic growth of Georgia are fundamental leading factors to establish a vision and a scope of person-centered health and social care field. Besides the lack of internal experience, international knowledge in this field should be considered. Following all pre-defined

milestones towards the integration process will guarantee Georgia to reach the goal of a holistic view of the wellbeing.

7 Recommendations

After evaluating the current situation in Georgia, as well as reviewing available literature about an international experience on this topic, some recommendations with possible next steps were generated based on **Analysis** and **Discussion**.

At the moment, Georgia has advantages at some problematic aspects described in the **Analysis** section:

- ✓ There is no need for the additional physical integration of two institutions;

- ✓ No additional legal framework is needed, as social and health sectors are already existing under one ministry;

However, some further steps are suggested in order to fulfill all standards of healthcare and social care database integration:

- ➢ It is necessary that integrated data systems are adequately protected and in line with the European commission's General Data Protection Regulation. Personal information protection must be of utmost importance;

- ➢ Georgia needs to show stronger political commitment to data integration because health care and well-being is a basic human right;

- ➢ There must be sufficient funding in order to implement complex data integration systems, as proved by many research papers;

- ➢ The modern ICT infrastructure is needed in order to develop data integration systems,

- ➢ Data quality – since various heterogeneous data is required for the integration process, high quality of data should be generated, by following international standards and guidelines,

➢ User identification – despite the fact that the ID card is widely available in Georgia and is equipped with a unique personal identification number, the proper campaign should be initiated to promote full population coverage,

➢ User interface – simple and user-friendly interface is recommended, in order to implement new e-health solutions accessible for regular use.

In addition, for further development of the integration process, consultation with the Nordic countries is also recommended.

8 Conclusions

To sum up, it is clear, that integrated care is well developed in Nordic countries, a variety of strategies, frameworks, and policies enable the integration process at different levels through numerous ICT channels that are focused on the person-centric approach.

A successful integration should have a positive impact on reducing costs and has to improve user outcomes. Integration of health and social care is a complex procedure, and the implementation can be difficult because of building a trustful, ICT environment based on semantic interoperability.

However, further sufficient studies are required for a better understanding of the cost-effectiveness and other benefits of the integration process.

9 References

1   WHO | Data collection. WHO.
    https://www.who.int/violence_injury_prevention/surveillance/en/ (accessed 1 Apr 2019).

2   HEALTHCARE | meaning in the Cambridge English Dictionary.
    https://dictionary.cambridge.org/dictionary/english/healthcare (accessed 1 Apr 2019).

3   SOCIAL CARE | meaning in the Cambridge English Dictionary.
    https://dictionary.cambridge.org/dictionary/english/social-care (accessed 16 Mar 2019).

4   DATABASE | Definition, Types, & Facts. Encyclopedia Britannica.
    https://www.britannica.com/technology/database (accessed 1 Apr 2019).

5   INTEGRATION | meaning in the Cambridge English Dictionary.
    https://dictionary.cambridge.org/dictionary/english/integration (accessed 16 May 2019).

6   Ministry of Health, Labor and Social Affairs of Georgia, 2013-2014 Report.
    Ministry of Health, Labor and Social Affairs of Georgia 2014. Available in Georgian:
    http://gov.ge/files/288_46485_730625_%E1%83%AF%E1%83%90%E1%83%9C
    %E1%83%93%E1%83%90%E1%83%AA%E1%83%95%E1%83%90.pdf

7   World Health Organization, Regional Office for Europe. *Health 2020: a European policy framework and strategy for the 21st century.* Copenhagen:: World Health Organization, Regional Office for Europe 2013.

8   The WHO Country Office in Georgia, history
    http://www.ungeorgia.ge/eng/UN_in_Georgia/un_agencies?info_id=23#.XKIL3Jgz
    aUl (accessed 1 Apr 2019).

9   Social Service Agency of Georgia, info about the agency, available only in Georgian: http://ssa.gov.ge/index.php?lang_id=GEO&sec_id=14 (accessed 16 Mar 2019).

10 Georgia. Profile on health and well-being (2017).
    2018.http://www.euro.who.int/en/publications/abstracts/georgia.-profile-on-health-and-well-being-2017 (accessed 1 Apr 2019).

11 On Approval of Socio-Economic Development Strategy of Georgia - 'Georgia 2020' and Associated Activities. Legislative Herald of Georgia, Ordinance No 400; 17 June 2014. https://matsne.gov.ge/en/document/view/2373855 (accessed 1 Apr 2019).

12 LEPL Public Service Development Agency – About Agency.
    HTTPS://sda.gov.ge/?page_id=7466&lang=en (accessed 12 May 2019).

13 Circle. Employment and Unemployment - National Statistics Office of Georgia. https://www.geostat.ge/en/modules/categories/38/employment-and-unemployment (accessed 16 May 2019).

14 LEPL Public Service Development Agency – ID card. HTTPS://sda.gov.ge/?page_id=7411&lang=en (accessed 10 May 2019).

15 The constitution of the World Health Organisation. https://www.who.int/about/who-we-are/constitution (accessed 10 May 2019).

16 Paré G, Kitsiou S. *Chapter 9 Methods for Literature Reviews*. University of Victoria 2017. https://www.ncbi.nlm.nih.gov/books/NBK481583/ (accessed 9 Mar 2019).

17 Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Information & Libraries Journal* 2009;**26**:91–108. doi:10.1111/j.1471-1842.2009.00848.x

18 Paré G, Kitsiou S. Table 9.1, Typology of Literature Reviews (adapted from Paré et al., 2015). 2017.https://www.ncbi.nlm.nih.gov/books/NBK481583/table/c9.t1/ (accessed 12 May 2019).

19 Ji X, Geller J, Chun SA. Social Data Integration and Analytics for Health Intelligence. 2014. New Jersey Institute of Technology, Newark, NJ, 07032, USA

20 Hobbs A, Bermingham R. Integrating Health and Social Care. Published Online First: 2 August 2016. https://researchbriefings.parliament.uk/ResearchBriefing/Summary/POST-PN-0532 (accessed 1 Apr 2019).

21 Ji X, Chun SA, Geller J. Monitoring Public Health Concerns Using Twitter Sentiment Classifications. In: *2013 IEEE International Conference on Healthcare Informatics*. 2013. 335–44. doi:10.1109/ICHI.2013.47

22 Ritzwoller DP, Crounse L, Shetterly S, *et al.* The association of comorbidities, utilization and costs for patients identified with low back pain. *BMC Musculoskelet Disord* 2006;**7**:72. doi:10.1186/1471-2474-7-72

23 Lankarani MM, Assari S. Association between number of comorbid medical conditions and depression among individuals with diabetes; race and ethnic variations. *J Diabetes Metab Disord* 2015;**14**. doi:10.1186/s40200-015-0171-0

24 Isinkaye FO, Folajimi YO, Ojokoh BA. Recommendation systems: Principles, methods and evaluation. *Egyptian Informatics Journal* 2015;**16**:261–73. doi:10.1016/j.eij.2015.06.005

25 Davis DA, Chawla NV, Christakis NA, *et al.* Time to CARE: a collaborative engine for practical disease prediction. *Data Min Knowl Disc* 2010;**20**:388–415. doi:10.1007/s10618-009-0156-z

26 Klinga C, Hasson H, Andreen Sachs M, *et al.* Understanding the dynamics of sustainable change: A 20-year case study of integrated health and social care. *BMC Health Serv Res* 2018;**18**. doi:10.1186/s12913-018-3061-6

27 Mason A, Goddard M, Weatherly H, *et al.* Integrating funds for health and social care: an evidence review. *J Health Serv Res Policy* 2015;**20**:177–88. doi:10.1177/1355819614566832

28 Ae Chun S, MacKellar B. Social Health Data Integration Using Semantic Web. In: *Proceedings of the 27th Annual ACM Symposium on Applied Computing*. New York, NY, USA: : ACM 2012. 392–397. doi:10.1145/2245276.2245351

29 Cameron A, Lart R, Bostock L, *et al.* Factors that promote and hinder joint and integrated working between health and social care services: a review of research literature. *Health Soc Care Community* 2014;**22**:225–33. doi:10.1111/hsc.12057

30 Ward V, Pinkney L, Fry G. Developing a framework for gathering and using service user experiences to improve integrated health and social care: the SUFFICE framework. *BMC Res Notes* 2016;**9**. doi:10.1186/s13104-016-2230-0

31 Mackie S, Darvill A. Factors enabling implementation of integrated health and social care: a systematic review. *Br J Community Nurs* 2016;**21**:82–7. doi:10.12968/bjcn.2016.21.2.82

32 Dates M, Lennox-Chhugan N, Sant'Ana Pereira H. Health system performance assessment – Integrated Care Assessment (20157303 HSPA). *Consumers, Health, Agriculture and Food Executive Agency EU Health Programme (2014-2020)*;**108**. doi:10.2875/627462

33 Nordic White Paper: Smart Digital Health. Nordic Innovation. http://nordicinnovation.org/Publications/nordic-white-paper-smart-digital-health/ (accessed 17 May 2019).

34 Rudkjøbing A, Olejaz M, Birk HO, *et al.* Integrated care: a Danish perspective. *BMJ* 2012;**345**:e4451. doi:10.1136/bmj.e4451

35 Ji J, Sundquist K, Sundquist J, *et al.* Comparability of cancer identification among Death Registry, Cancer Registry and Hospital Discharge Registry. *International Journal of Cancer* 2012;**131**:2085–93. doi:10.1002/ijc.27462

36 Øvretveit J, Hansson J, Brommels M. An integrated health and social care organisation in Sweden: creation and structure of a unique local public health and social care system. *Health Policy* 2010;**97**:113–21. doi:10.1016/j.healthpol.2010.05.012

37 State of Illinois Interoperability and Integration Project. Administration for Children and Families. https://www.acf.hhs.gov/state-of-illinois-interoperability-and-integration-project (accessed 17 May 2019).

38 Schull M, Paprica AP, Victor CJ, *et al.* Institute for Clinical Evaluative Sciences (ICES) Exploratory Data & Analytic Services Private Sector Pilot Project. *1* 2017;**1**. doi:10.23889/ijpds.v1i1.88

39 Marchessault G. The Manitoba Centre for Health Policy: A Case Study. *Healthc Policy* 2011;**6**:29–43.

40 Holman CDJ, Bass AJ, Rosman DL, *et al.* A decade of data linkage in Western
    Australia: strategic design, applications and benefits of the WA data linkage system.
    Aust Health Rev 2008;**32**:766–77.