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Alina Bukhtiarova,


PhD in Economics, Sumy State University, Ukraine

 ORCID ID, 0000-0003-2631-3323

email: a.bukhtiarova@biem.sumdu.edu.ua

Viktorii Shcherbachenko,


PhD in Economics, Sumy State University, Ukraine

 ORCID ID, 0000-0002-4570-3389

email: v.shcherbachenko@macro.sumdu.edu.ua

Artem Artyukhov,


PhD in Technical Sciences, Sumy State University, Ukraine

 ORCID ID, 0000-0003-1112-6891

email: a.artukhov@biem.sumdu.edu.ua

Jan Krmela,


PhD in Technical Sciences, University of Pardubice, Czech Republic

 ORCID ID, 0000-0001-9767-9870

email: jan2.krmela@post.cz

Iurii Volk,

PhD in Physical and Mathematical Sciences, Sumy State University, Ukraine

 ORCID ID, 0000-0002-0262-762X

email: y.volk@mss.sumdu.edu.ua

OPEN SCIENCE INVESTIGATION OF THE HEALTH ECONOMICS SECTOR

Abstract. This paper summarizes the arguments and counterarguments within the scientific discussion on the issue open science in health economics in the reality of the Covid-19 pandemic. The aim is to study the openness of the results of scientific work in the field of health economics. To achieve this goal, the following tasks have been set: to conduct a bibliometric analysis of the concepts of open science, health, health economics, research, education; author's structuring of the concept of open science in the context of health economics; identification of the main stakeholders and their role in the field of open science in the field of health economics. The object of research is the field of health economics. The subject of research is the determinants of the impact of open science on the health economy. In order to identify the vectors of scientific developments in recent years in the field of open science and health economics, the method of bibliometric analysis was used using the tools of the Scopus database and the software VOSviewer v.1.6.10. Based on the selected works, terminological maps were constructed for individual categories and the main clusters were identified, as a result of which the intensity of the use of one term with others was assessed. Scientific discoveries play an important role in health care. Especially in a pandemic, access to up-to-date data will save more lives and preserve the health of the world's population. After all, the level of economic well-being of a country depends on the level of health of the population and its ability to work. It is determined that open science should include combining knowledge and efforts to support research in the field of health economics and reduce the knowledge gap between countries; mobilizing decision-makers, researchers, innovators, publishers and civil society representatives to ensure free access to scientific data, research results, educational resources and research facilities in the field of health economics; strengthening the links between science and political decisions to meet societal needs; ensuring open science for society, despite the fact that the borders between countries are closed. The results of the study can be useful for researchers who have been conducting study on this topic, and students majoring in "Health Economics".

Keywords: open science, research, education, health economics, health care, COVID-19.

Introduction. In the context of pressing global and socio-economic problems, sustainable and innovative solutions require effective, transparent and vigorous scientific efforts not only by the scientific community but also by society as a whole. The issue of Open Science, a concept aimed at making science

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more open, accessible, efficient, democratic and transparent, is particularly relevant in the context of the pandemic caused by COVID-19. In particular, UNESCO has developed recommendations that highlight the main principles of open science. They are a legal instrument in which “the General Conference formulates the principles and norms of international regulation of any particular issue and invites Member States to take any legislative or other steps that may be required in accordance with the constitutional practices of each State and the nature of the matter. of the above principles and norms within their respective territories” (Report on UNESCO’s global online consultation on open science, 2020).

Scientific discoveries play an important role in health care. Especially in a pandemic, access to up-to-date data will save more lives and preserve the health of the world's population. After all, the level of economic well-being of a country depends on the level of health of the population and its ability to work.

The aim is to study the openness of the results of scientific work in the field of health economics.

To achieve this goal, the following tasks have been set:

1. bibliometric analysis of the concepts of "open science", "health", "health economics", "research", "education";
2. author's structuring of the concept of open science in the context of health economics;
3. identification of the main stakeholders and their role in the field of open science in the field of health economics.

The object of research is the field of health economics.

The subject of research is the determinants of the impact of open science on the health economy.

Literature Review. There have been many relevant studies in open science (Allen & Mehler, 2019) in the field of medicine and health care in the last 2 years (Brock et al., 2021; Hicks, 2021; Elliott et al., 2019). The paper (Besançon et al., 2021) reveals the essence of the achievements of open science, and also expressed concern about the violation of some principles of open science and its potential impact on the quality of research results.

Domestic researchers have studied the issues of crisis management in health care facilities in the context of the coronavirus pandemic (Prokopenko et al., 2020) on the basis of open data. Actual tools of health emergency and disaster risk management were described in (Chan and Wong, 2020; Woynarowska-Soldan et al., 2018).

Methodology and research methods. To identify the link between open science and health economics, a method of bibliometric analysis was used using Scopus database tools and VOSware v.1.6.10 software. Based on the selected works, terminological maps were constructed for individual categories and the main clusters were identified, as a result of which the intensity of the use of one term with others was assessed.

Results. It is estimated that 80% of human health is related to socio-economic, environmental and behavioral factors that are outside the scope of traditional health systems. Focusing on the effectiveness of the use of health potential, it is rightly treated as a driving force of the economy.

Thus, as a result of the COVID-19 pandemic, the inextricable link between public health and the well-being of the country's economy as a whole became apparent.

The pandemic has changed not just one aspect of the health care system, but has changed the very nature and methods of that system. In fact, the pandemic is changing the very genetic basis of health systems around the world and accelerating the formation of the so-called new health economy, which involves the transformation and openness of all data.

Outbreaks of infectious diseases are known to cause great damage to the population and the economy, but at the same time contribute to the introduction of large-scale innovations. The crisis caused by the COVID-19 outbreak has accelerated current trends, thus bringing the future of healthcare closer to Open science.

Open access in the UNESCO Draft Recommendations means “full and unhindered access to research results, including scientific publications, data, software, source codes and protocols published anywhere in the world, which can be reused without any restrictions on free user-based” (Report on UNESCO’s

global online consultation on open science, 2020).

Thus, it was decided to conduct a bibliometric analysis to study cross-sectoral areas of research in the field of health economics and open science. The Scopus Citation Overview tool was chosen as the database for analysis as one of the most authoritative sources of scientific information. Thus, 17,256 publications in the Scopus database focused on the context of health economics and open science were processed (Fell, 2019; Homolak et al., 2020; Kim&Koh, 2021; Scherp et al., 2020; Smaldino et al., 2019).

As a result of bibliometric analysis by keywords, the following results were obtained (Fig. 1):

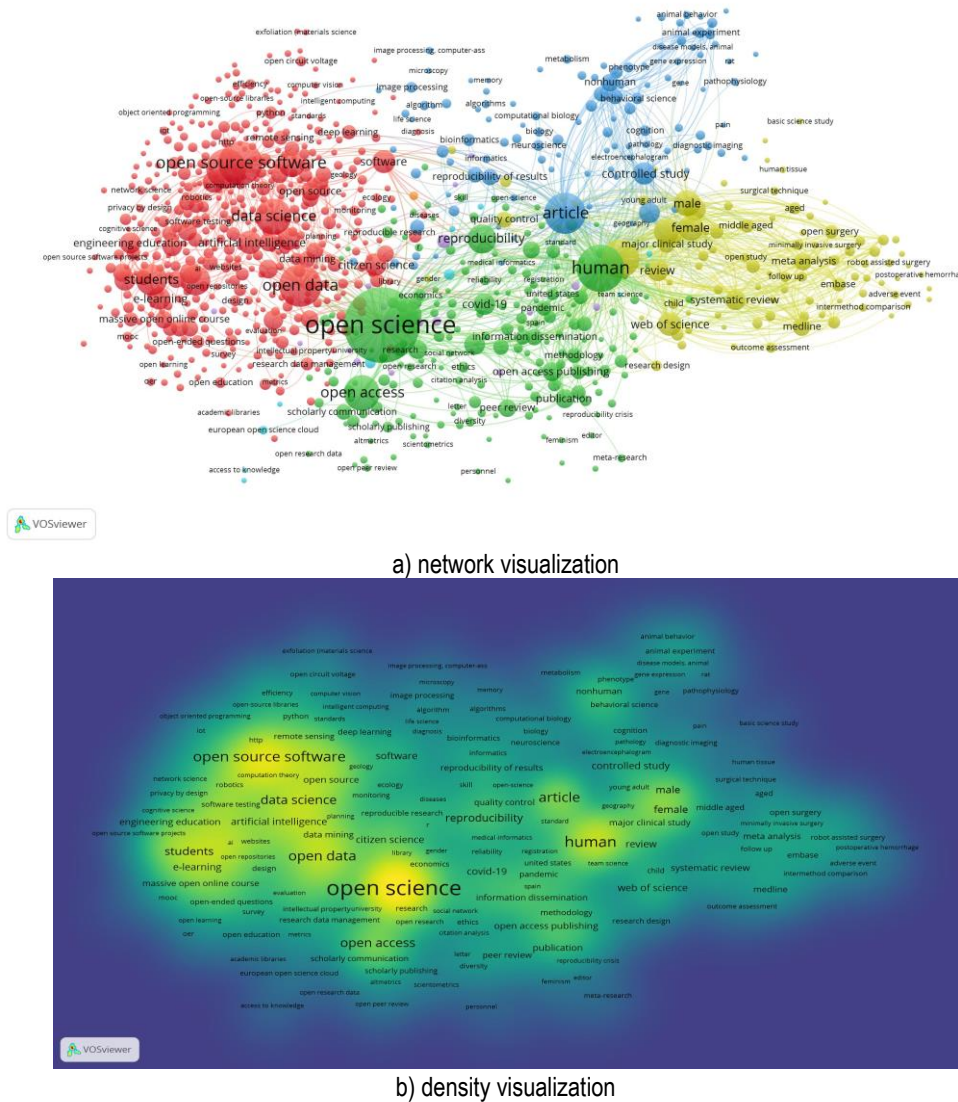


Figure 1. Results of bibliometric analysis by keywords “Open science”
Sources: developed by the authors.

Thus, based on the results of the bibliometric analysis of the concept of Open science, it is possible to form its structure (Fig. 2). The peculiarity of this structure is that it consists of two blocks: resources (Fig. 2a) and activities to ensure the concept of open science (Fig. 2b). Resources are the basis for building research strategies in the chosen field of research, including those stated in this article, activities provide an understanding of the tools to achieve the quality of certain resources.

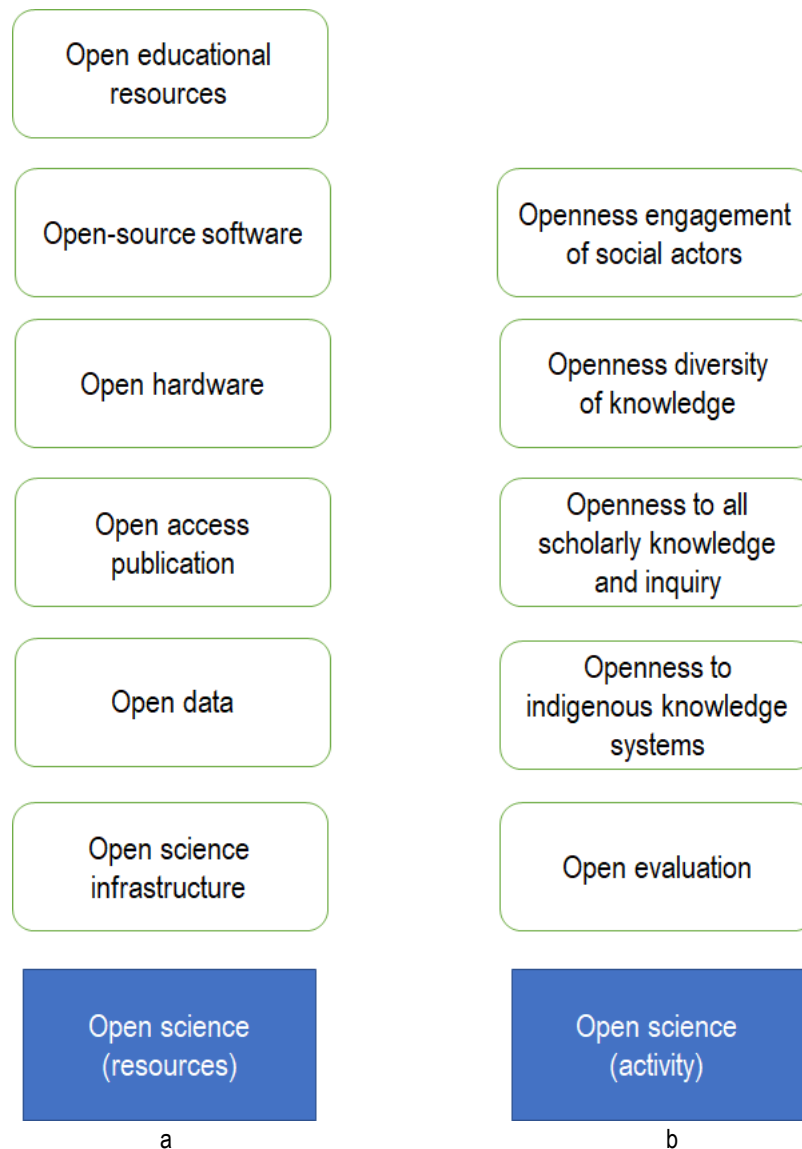
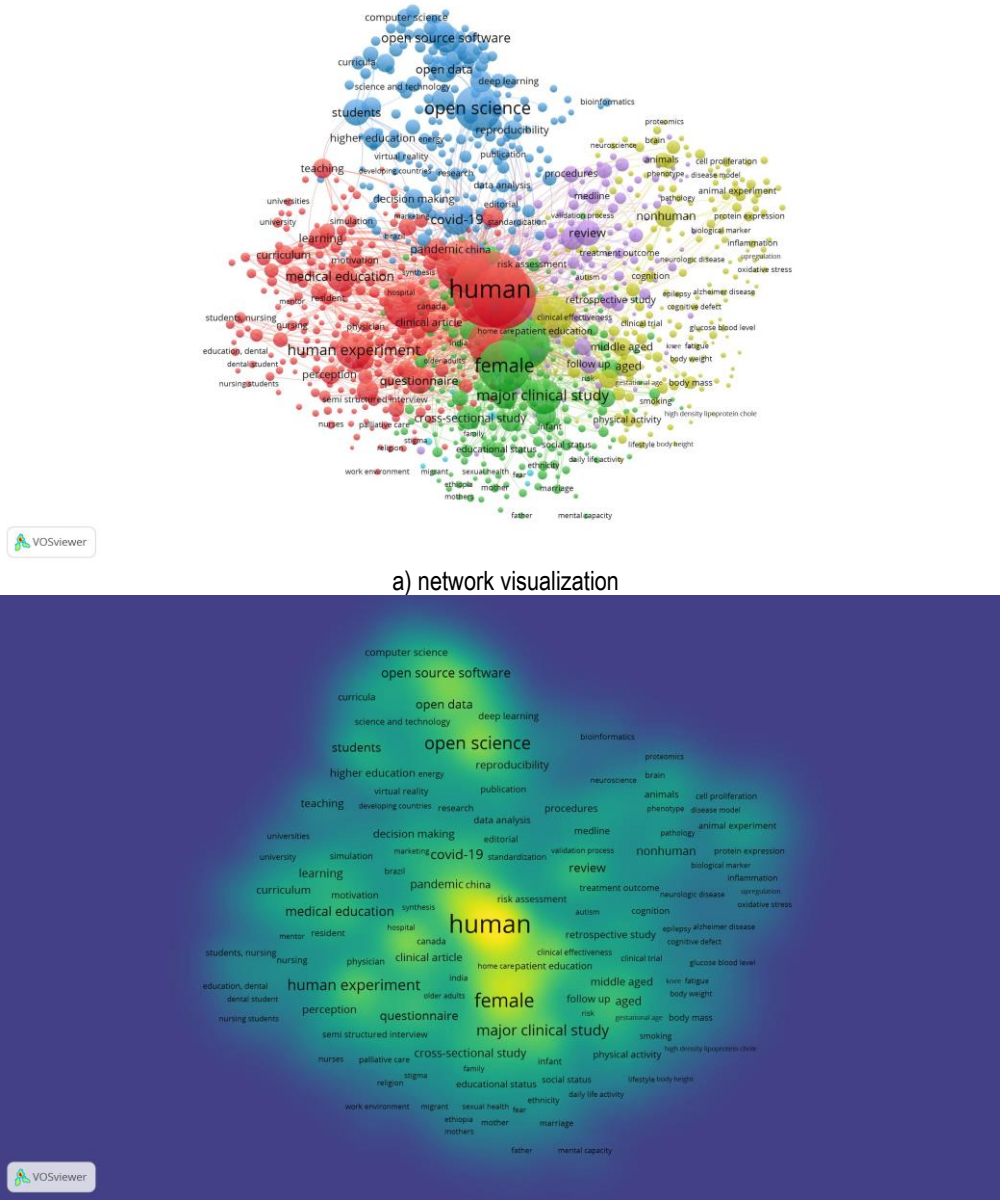


Figure 2. Open science: resources (a) and activities (b)
Sources: developed by the authors.



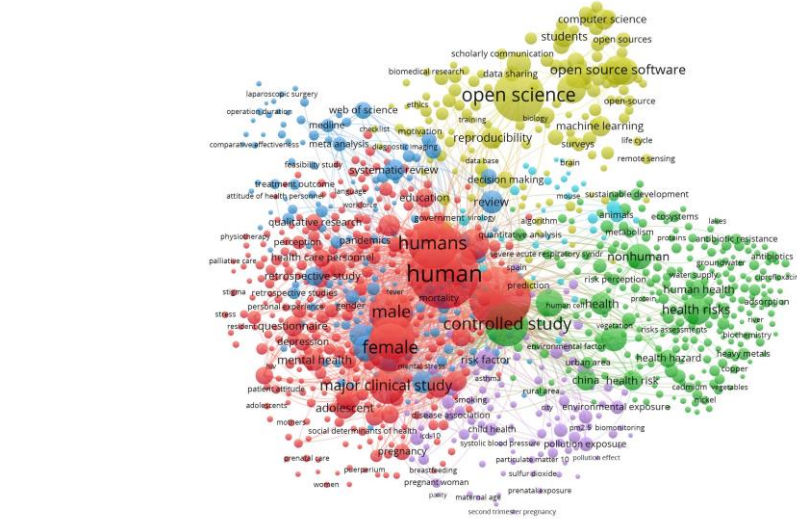
a) network visualization
 b) density visualization
Figure 3. Results of bibliometric analysis by keywords "Open science", "Research" and "Education"

Sources: developed by the authors.

As the COVID-19 pandemic has heightened instability and uncertainty in the global economy, all countries now need more openness and cooperation than ever before (Yeo-Teh & Tang, 2019).

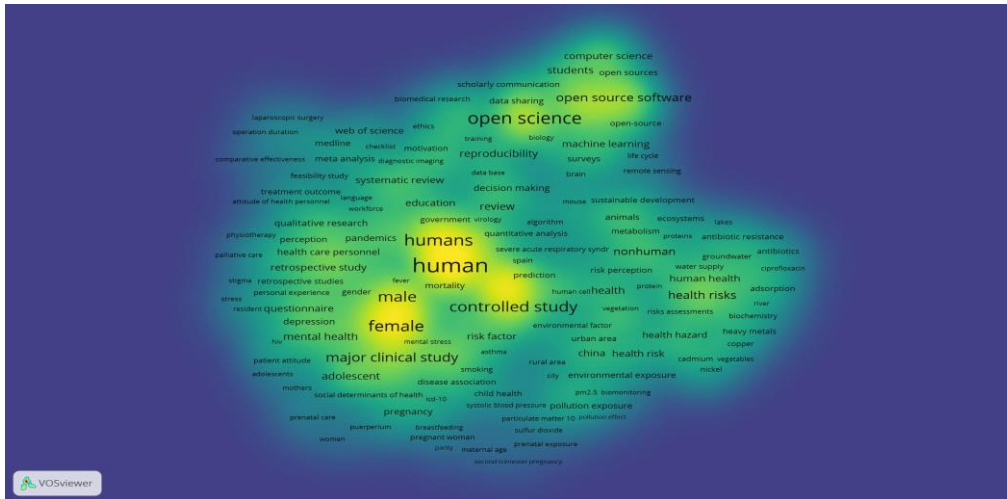
Cooperation for common openness is an important guarantee of moving forward. During this special period, efforts must be made to maximize the role of each player in global governance.

Healthcare systems, payers, pharmaceutical and biomedical companies need to make an increasing effort to develop their own analytical tools or companies with medical platforms and data skills to obtain the necessary analytics.



VOSviewer

a) network visualization



VOSviewer

b) density visualization

Figure 4. Results of bibliometric analysis by keywords “Open science”, “Health”
Sources: developed by the authors.

Private companies, government agencies, independent organizations and universities today are responding quickly to the needs of the medical field. Prior to the pandemic, medical organizations began to study (and sometimes implement) the capabilities of artificial intelligence and analytics, which dictates, to obtain forecast data at the community level (health, consumers, economic indicators) and companies (strategic, financial and operational issues). The crucial role that these instruments played during the pandemic will accelerate their implementation.

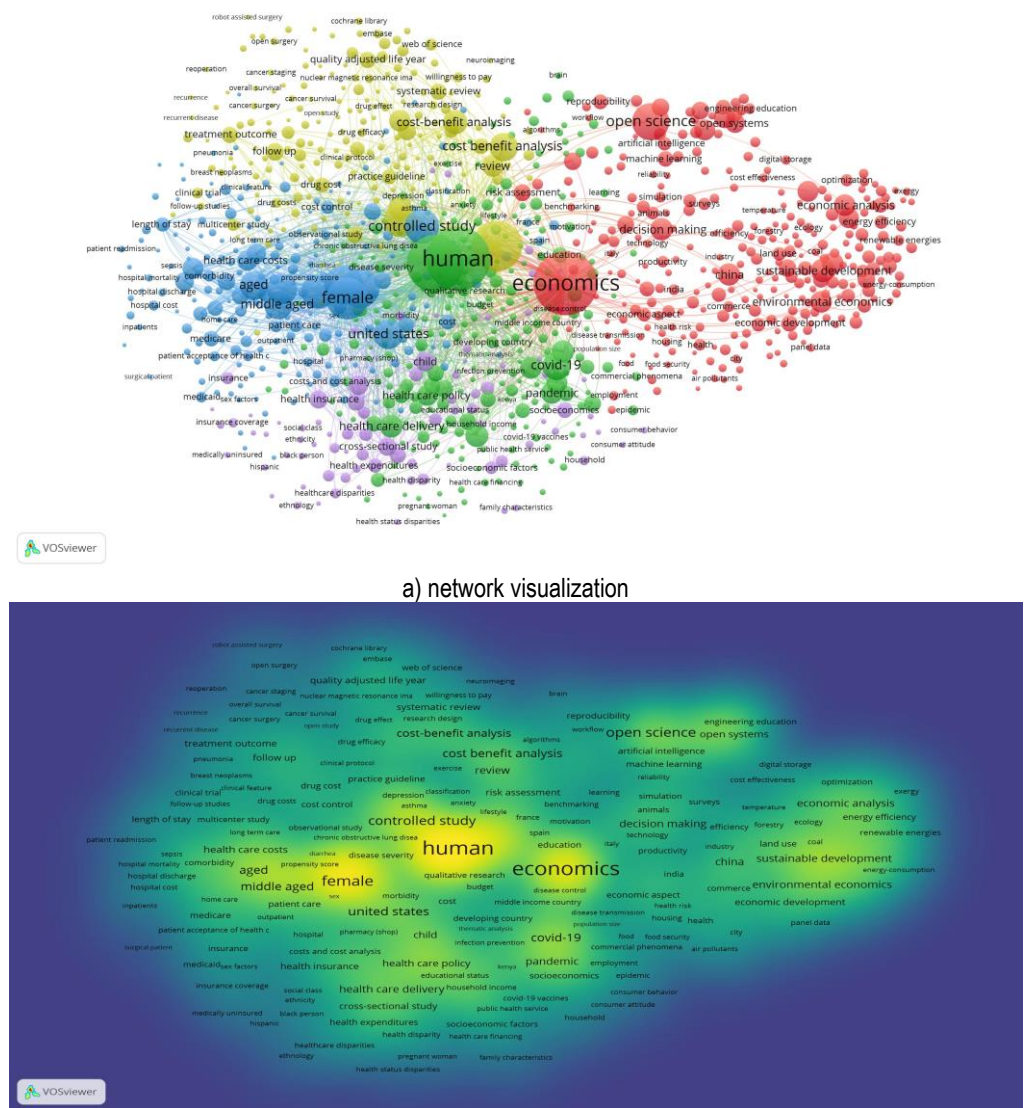


Figure 5. Results of bibliometric analysis by keywords “Open science”, “Health”, “Economics” Sources: developed by the authors.

In the new health economy, data analysis and analytics help deliver the right services, at the right time, in the right place, and in the right patient. The pandemic has exposed the challenges facing health systems around the world in collecting accurate real-time data, modeling scenarios, and finally deciding where and when to direct resources.

Infection curves, mortality scenarios, estimates of the need for ventilators and personal protective equipment all this was not enough at the beginning of the pandemic.

5 clusters can be distinguished based on the bibliometric analysis:

1. Open science cluster. The cluster is formed on the basis of keywords open educational resources, open science, open source software and technical concepts such as machine learning, big data etc.

2. Health economics cluster. The cluster is formed on the basis of keywords economics, health care cost, public health, health care policy and related, mainly related to pandemic, terms such as epidemiology, pandemic, etc. Today there is a lack of domestic research on health as an economic category and capital of the economy, and the establishment of the Institute for Health and Human Capital Assessment opens wide opportunities for modernization of the Ukrainian economy and its social sphere, which requires regulatory, legislative and organizational development.

3. Open access publication cluster. The cluster is formed on the basis of keywords.

4. Controlled study cluster is formed around the keyword controlled study, and includes specific objects of research in the medical field (immunology, depression, brain etc.)

5. Clinical study cluster formed on the basis of retrospective study, open study, population research and treatment outcome.

Conclusions. According to the results of the bibliometric analysis of the concept of Open science, its structure in the context of health economics (resource block and activity block) was formed and 5 clusters were identified: Open science cluster; Health economics cluster; Open access publication cluster; Controlled study cluster; Clinical study cluster.

Thus, a bibliometric study of the phenomenon of open science, which should perform the following functions in terms of ensuring sustainable development of the health economy:

- integrating knowledge and efforts to support research in the field of health economics and reduce the knowledge gap between countries;
- mobilizing decision-makers, researchers, innovators, publishers and civil society to ensure free access to scientific data, research results, educational resources and research facilities in the field of health economics;
- strengthening the links between science and political decisions to meet societal needs;
- ensuring open science for society, despite the fact that borders between countries are closed.

The health economy needs resource support, new research tools and, most importantly, high quality statistical and research data for its further development. The latter thesis leads to the search for acceptable activities to improve the quality of research results that can form the basis of new stages in the development of the health economy.

Some of these activities are presented in this paper, but the list of activities should be expanded and detailed depending on the nature of the relationship between the phenomenon of open science and its application in a particular field.

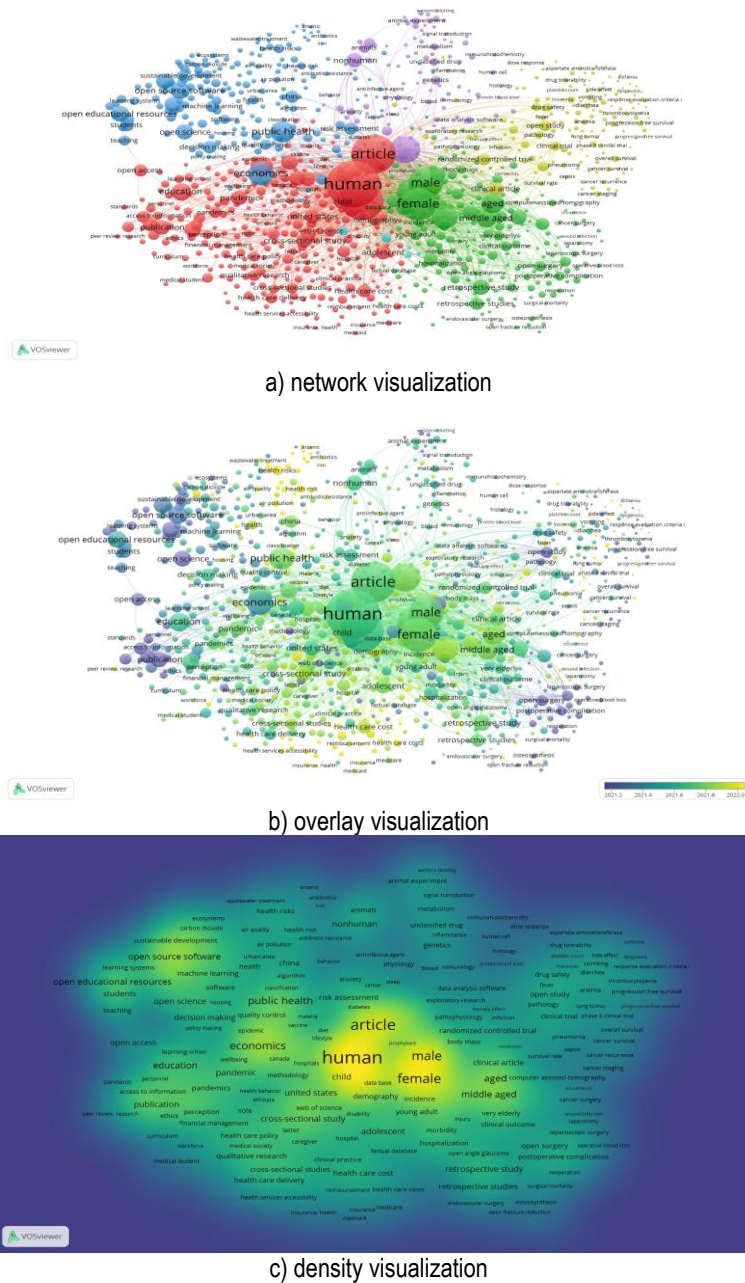


Figure 6. Results of bibliometric analysis by keywords “Open science”, “Health”, “Economics”, “Research” and “Education”

Sources: developed by the authors.

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Аліна Бухтіарова, к.е.н., Сумський державний університет, Україна
Вікторія Щербаченко, к.е.н., Сумський державний університет, Україна
Артем Артюхов, к.т.н., Сумський державний університет, Україна
Ян Крмела, PhD, Пардубіцький університет, Чехія
Юрій Волк, к.ф.-м.н., Сумський державний університет, Україна
Відкрита наука в сфері дослідження сектору економіки здоров'я

У статті розглядаються питання ролі відкритої науки в економіці здоров'я в умовах викликів пандемії Covid-19. Метою є дослідження відкритості результатів наукової роботи в галузі економіки здоров'я. Для досягнення цієї мети поставлені такі завдання: провести бібліометричний аналіз понять відкритої науки, охорони здоров'я, економіки охорони здоров'я, досліджень, освіти; сформулювати концепцію відкритої науки в контексті економіки охорони здоров'я; визначити основних зацікавлених сторін та їх ролі у сфері відкритої науки в галузі економіки охорони здоров'я. Об'єктом дослідження є галузь економіки здоров'я. Предметом дослідження є детермінанти впливу відкритої науки на економіку здоров'я. З метою виявлення векторів наукових розробок останніх років у сфері відкритої науки та економіки охорони здоров'я використано метод бібліометричного аналізу наукових публікацій з бази даних Scopus та програмного забезпечення VOSviewer v.1.6.10. На основі відібраних праць побудовано термінологічні карти для окремих категорій та визначено основні кластери, у результаті чого оцінено інтенсивність вживання одного терміну з іншими. Важливу роль в охороні здоров'я відіграють наукові відкриття. Особливо в умовах пандемії доступ до актуальних даних врятує більше життів і збереже здоров'я населення планети. А вже від рівня здоров'я населення та його працездатності залежить рівень економічного добробуту країни. Визначено, що відкрита наука повинна включати об'єднання знань і зусиль для підтримки досліджень у сфері економіки охорони здоров'я та зменшення розриву в знаннях між країнами; мобілізація осіб, які приймають рішення, дослідників, новаторів, видавців та представників громадянського суспільства для забезпечення вільного доступу до наукових даних, результатів досліджень, освітніх ресурсів та науково-дослідних засобів у сфері економіки охорони здоров'я; посилення зв'язків між наукою та політичними рішеннями для задоволення потреб суспільства; забезпечення відкритості науки для суспільства, незважаючи на те, що кордони між країнами закриті. Результати дослідження можуть бути корисними для науковців, які здійснюють дослідження на цю тему, та студентів спеціальності «Економіка охорони здоров'я».

Ключові слова: відкрита наука, дослідження, освіта, економіка здоров'я, охорона здоров'я, COVID-19.