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Review

A quarter century of public health research trends in developing countries: Bibliometric analysis

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Abstract: This research aims to identify the development of research theme trends that were carried out from 1999 to 2024. Thus, the study's results can provide recommendations regarding research themes that can be developed to meet theoretical and practical needs. Researchers use bibliometric analysis to obtain the appropriate analysis. This analysis method can be developed to support the dynamic development of public health science with settings and researchers from developing countries, both through quantitative and qualitative interpretation. The analysis results show that over 25 years, public health science, from the perspective of researchers and developing countries, has experienced dynamic development. This change was driven by the emergence of various issues in society itself. For example, the 1999–2009 shows that lifestyle changes have resulted in multiple diseases. In the following period, the concept of sustainability emerged, which encouraged awareness of sustainable development and resource scarcity that would affect public health quality. As for the 2020–2024 period, the emergence of Covid 19 changed the previous research paradigm.

Keywords: trend; bibliometric; public health

1. Introduction

Public health research has developed in the last 25 years. Analyzing development trends shows that health science should follow the development of society and its own theoretical needs. Where these changes are in line with various changes in society and the discovery of disease management itself, for example, the discovery of new diseases (Yang et al., 2020), developments in disease treatment technology (Dahlawi et al., 2021), and the use of the internet (Shen et al., 2021). In other cases, the characteristics of society itself also experience changes, for example, involving generations. (Bagnoli et al., 2011) and community diversity (Lundberg, 2008). Various aspects of these changes contribute to the direction of research development on the public health theme. Therefore, exploring scientific research collaborations in multiple countries is essential to improving public health. Furthermore, this research will identify developing research theme trends from 1999 to 2024.

Various bibliometric studies carried out before have never discussed the development of public health from the perspective of emerging countries. Public health in emerging countries has different characteristics, namely that the health service system experiences a combination of more significant dangers and a lower ability of health services to respond due to low per capita health spending, higher disease burden, and greater population density. Sultana et al. (2024) and Viviani et al.

(2023), another thing that is of concern is how the role of the government is developed in creating regulations; carrying out the functions, activities and regulatory expertise of clinical development and health programs is undoubtedly different from developed country governments (Simpson et al., 2020).

Time identification is based on the time of the first article successfully identified by researchers through Science Direct. The results of research conducted by researchers show that the first decade is still influenced by global public health research. Porte (2005) stated that public health research from developing countries in this decade was still influenced by studies conducted by researchers to investigate differences in epidemic experiences by social class, professional, scientific, and religious communities, as well as state politics and oligarchy. Then, the researchers continued in the following decade. The search results show that public health research themes from developing countries are affected by climate change (Li et al., 2020). As a result of the 5th World Congress on Disaster and Emergency Medicine in Amsterdam from 13–15 May 2007 (15WCDEM), the Red Cross/Red Crescent (RC/RC) Climate Center changed the direction of the public's view of health about development and climate change (Ebi et al., 2008). Furthermore, the themes in the last period show the influence of public health research themes from developing countries during the COVID-19 pandemic (Ayouni et al., 2021). Public health interventions and non-pharmaceutical measurements were effective in reducing the transmission of COVID-19 (Heymann and Shindo, 2020).

Bibliometric studies have their position in the development of science. In other cases, bibliometric studies are also crucial for scientific progress because they have the role of formulating conceptual progress for each scientific topic, updating themes, identifying research gaps, and looking for study changes. In other respects, bibliometric studies offer reference points that lead to conceptualizations (or reconceptualizations in the case of existing phenomena) and new understandings (Renaud et al., 2016). Bibliometric analysis is also used to understand this discourse (Omoregbe et al., 2020). In analyzing citations from scientific publications, methods and combinations of various frameworks are used to gain insight into intellectual structures based on broad academic disciplines to assess how they influence the development of multiple metrics (Widianingsih et al., 2021).

Therefore, this research aims to provide recommendations regarding research themes that can be developed to meet theoretical and practical needs. Researchers identified the development of themes that have been published during the period from 1999 to 2024. In other cases, this research can help identify research themes that could be published in scientific articles in Scopus journals. Researchers use bibliometric analysis to obtain appropriate analysis that can be developed to support the dynamic development of public health science with settings and researchers from developing countries, both through quantitative and qualitative interpretation.

2. Materials and methods

2.1. Study design and data source

This research is bibliometric research on articles in the Scopus database. Bibliometric analysis was chosen as a research design because it can provide a macro

overview or connection of several scientific literatures and help identify the most influential authors, journals, countries, institutions and references in the history of the development of scientific research in a particular field (Musa et al., 2021).

2.2. Search methodology

This study was carried out by searching through the Scopus database due to its accessibility and the ability to provide articles related to more public health themes that can be analyzed. In this research, we will use criteria, namely research articles published in journals with a Scopus ranking and entering the keywords "public health", "emerging countries", and "developing countries" in the search column shows a total of 513 research articles.

2.3. Statistical analysis

The data is exported in Research Information Systems (RIS) format to obtain a research map. The export data is then processed and analyzed using the VOSViewer program to find a bibliometric map of the development of public health research in emerging countries from 1999 to 2024. Next, bibliometric analysis is continued, which aims at three things: First, to find out the distribution of cumulative article publications and per period, cumulative tier distribution and period, cumulative publisher distribution and per period. In this way, researchers can identify the development of research articles and the potential for publishing future articles.

Second, the researcher provides an overview of the density of studies carried out in this research. To identify density and gaps in themes, researchers used Vosviewer. Vosviewer is software for creating maps based on network data and for visualizing research networks, organizations, countries, keywords, or terms (Effendi et al., 2021). Vosviewer analysis uses three visualization displays, namely network, overlay, and density visualization (Xie et al., 2020). The analysis results using Viosviewer help researchers describe which topics are more dominant or not in the data to be used. The basis for the study is keywords that appear at least five times in published articles for each period. This study also used the Bibliometrix package of the R program (2024) and the Biblioshiny application (2024) to design data visualizations, manipulate descriptive data, and provide conceptual monitoring of the collected data sets (Watrianthos et al., 2022).

Third, researchers use content analysis. What is meant by content analysis in bibliometric research is to review the content of each article (Leong et al., 2021). Content analysis analyzes many sources, such as text, images, and television programs. Several words from these sources are summarized into smaller content categories with coding based on determining rules (Goksu et al., 2022). Researchers use content analysis to examine research themes. In short, content analysis helps researchers to determine recommendations for research that can be carried out next.

Overall, the bibliometric implementation carried out is summarized in the following scheme (**Figure 1**):

Figure 1. Article review process.

3. Results and discussion

3.1. Description

This analysis provides an overview of the cumulative and per-period distribution of articles, cumulative and per-period tier distribution, and cumulative and per-period publisher distribution. In this way, researchers can identify the development of research articles and the potential for publishing future public health science articles.

Table 1. Number of the cumulative distribution of articles and per period.

Period	Articles	%
1999–2009	32	6.24
2010–2019	177	34.50
2020–2024	304	59.26
Total	513	100.00

Table 1 showed the identification results show that 513 public health science articles were published from 1999 to 2024. Furthermore, the distribution per period from 1999 to 2019 shows that 32 articles have been published. Thus, the percentage is 6.24%; from 2010 to 2019, it was 177 articles. Thus, the rate is 34.50%; the period from 2020 to 2024 shows 304 articles. Thus, the percentage is 59.26%.

Next, the researcher will identify journals and publishers cumulatively.

Table 2. Top 10 journals publishing research in cumulative.

Rank	Journal	Publisher	2020–2024
1	Journal of Cleaner Production	Elsevier	41 articles
2	Heliyon	Elsevier	15 articles
3	Technological Forecasting and Social Change	Elsevier	12 articles
4	World Development	Elsevier	12 articles
5	Journal of Environmental Management	Academic Press	9 articles
6	Resources Policy	Elsevier	9 articles
7	Science of The Total Environment	Elsevier	9 articles
8	Social Science & Medicine	Elsevier	8 articles
9	Technology in Society	Elsevier	8 articles
10	Energy Policy	Elsevier	7 articles

The results of identifying the Top 10 journals publishing research in cumulative on public health (**Table 2**) show that the most articles published in the Journal of Cleaner Production were 41 articles; next is Heliyon with 15 articles; World Development and Technological Forecasting and Social Change each with 12 articles; Journal of Environmental Management, Resources Policy and Science of The Total

Environment with 9 articles each; Social Science & Medicine and Technology in Society each with 8 articles; and Energy Policy with 7 articles.

The distribution spread across various journals with different scopes shows that the theme of Public Health science can be spread across multiple other sub-themes. For example, the Journal of Environmental Management, Resources Policy, and Science of the Total Environment has a scope related to environmental themes that threaten public health. The results of this identification are also an essential concern because they show that all of these journals are under the publisher Elsevier. Thus, Elsevier Publisher is still dominant in the environmental science community.

Henceforth, the identification of the top 10 journals publishing research in the 1999–2009 period on public health will be presented in the table below:

Table 3. Top 10 journals publishing research in the 1999–2009 period.

Rank	Journal	Publisher	Categories	1999–2009
1	Kidney International	Elsevier	Nephrology	4 articles
2	Social Science & Medicine	Elsevier	Medicine (miscellaneous)	2 articles
3	Waste Management	Elsevier	Environmental Science	2 articles
4	International Journal of Gynecology & Obstetrics	John Wiley and Sons	Obstetrics and Gynecology	2 articles
5	American Journal of Kidney Diseases	W.B. Saunders	Nephrology	1 articles
6	Biologicals	Academic Press	Medicine (miscellaneous)	1 articles
7	Blood Reviews	Churchill Livingstone	Hematology	1 articles
8	Current Problems in Cardiology	Elsevier	Cardiology and Cardiovascular Medicine	1 articles
9	Current Problems in Surgery	Elsevier	Surgery	1 articles
10	Hong Kong Journal of Nephrology	Elsevier	Nephrology	1 articles

Table 3 showed identification of the Top 10 journals publishing research in the 1999–2009 period is Kidney International (4 articles); Social Science & Medicine and Waste Management 2 articles each and American Journal of Kidney Diseases; Biologicals; Blood Reviews; Current Problems in Cardiology; Current Problems in Surgery; Hong Kong Journal of Nephrology; and International Journal of Gynecology & Obstetrics with 1 article each. Further identification shows that in the period from 1999 to 2009, Elsevier was the dominant publisher. Next are John Wiley and Sons, W.B. Saunders, Academic Press, and Churchill Livingstone.

Table 4. Top 10 journals publishing research in 2010–2019 period.

Rank	Journal	Publisher	2010–2019
1	Journal of Cleaner Production	Elsevier	16 articles
2	World Development	Elsevier	6 articles
3	Technology in Society	Elsevier	4 articles
4	Energy Policy	Elsevier	4 articles
5	American Journal of Infection Control	Elsevier	4 articles
6	Research Policy	Elsevier	4 articles
7	Social Science & Medicine	Elsevier	3 articles
8	Waste Management	Elsevier	3 articles
9	European Economic Review	Elsevier	3 articles
10	Procedia - Social and Behavioral Sciences	Elsevier	3 articles

The results of identifying journals included in the top 10 journals publishing research in the 2010–2019 period had a scope related to sustainable development and public health status, disease management and risk, and environmental changes on disease status (see **Table 4**). Journals identified as being in the top 10 journals publishing research in the 2010–2019 period are the Journal of Cleaner Production (16 articles), World Development (6 articles), Technology in Society; Energy Policy; American Journal of Infection Control; Research Policy (4 articles each); as well as Social Science & Medicine, Waste Management, European Economic Review and Procedia—Social and Behavioral Sciences (3 articles each). Further identification shows that, from 2010 to 2020, the dominant publisher was Elsevier.

Table 5. Top 10 Journals Publishing Research in 2020–2024 period.

Rank	Journal	Publisher	2020-2024
1	Journal of Cleaner Production	Elsevier	25 articles
2	Heliyon	Elsevier	15 articles
3	Technological Forecasting and Social Change	Elsevier	9 articles
4	Resources Policy	Elsevier	9 articles
5	Journal of Environmental Management	Academic Press	7 articles
6	World Development	Elsevier	6 articles
7	Science of The Total Environment	Elsevier	6 articles
8	Journal of Business Research	Elsevier	6 articles
9	Sustainable Production and Consumption	Elsevier	5 articles
10	Transport Policy	Elsevier	5 articles

The journals included in the Top 10 journals publishing research in the 2020–2024 period (**Table 5**) are the Journal of Cleaner Production with 25 articles; Heliyon with 15 articles; Technological Forecasting and Social Change and Resources Policy with 9 articles; Journal of Environmental Management with 7 articles; World Development, Science of The Total Environment, Journal of Business Research each with 6 articles; Sustainable Production and Consumption and Transport Policy each with 5 articles. Further identification shows that almost all publishers are under Elsevier. Only one other publisher is recorded, namely World Development.

3.2. Vosviewer analysis

In analysis using Vos Viewer, researchers will identify the density and interconnectedness of research themes. Vosviewer analysis uses network visualization overlay and is carried out in each period. Firstly, Network Visualization functions to show the network between visualized terms. If the path or network in the bibliometric analysis is in bold, then this indicates many strong relationships between one term and other terms. On the other hand, if the relationship between one term and another is in thin print with tiny dots, then this indicates a weak relationship between the terms being observed.

Second, the overlay functions to display the historical traces of research. The darker the visualization of the bibliometric analysis, the longer it shows that research has been carried out. If the visualization shows bright colours, the study will be conducted shortly. Third, density aims to get an overview of density visualization analysis of essential themes in this research. The significant differences in the

visualization shown show this. The larger the visualization, the denser or higher the density in that group. Conversely, the fainter it is, the lower the density in that group.

3.2.1. 1999–2009 period:

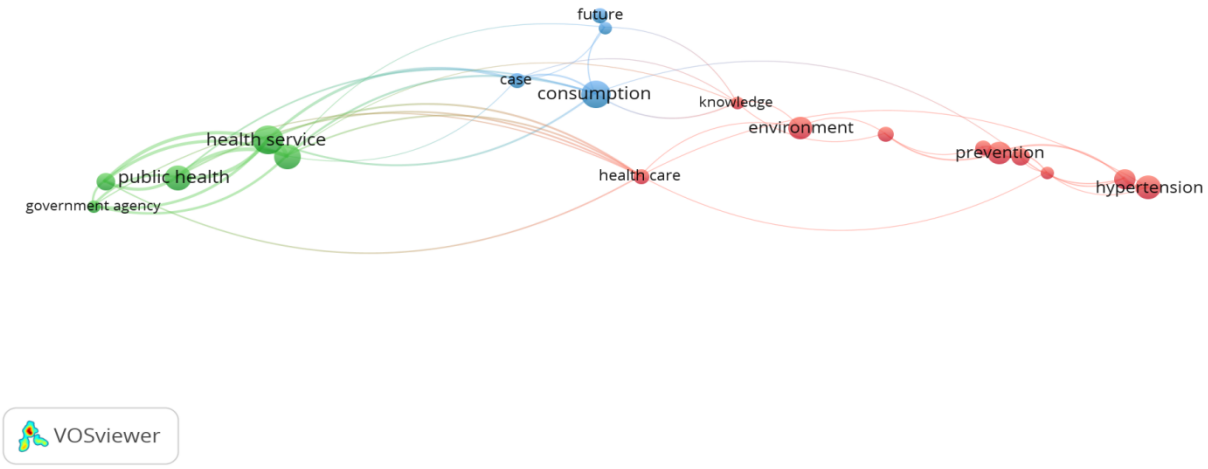

Figure 2. Network visualization analysis in the period 1999 to 2009.

Network visualization analysis in the period 1999 to 2009 shows that there are 3 groups formed, namely: First, the green group, which is indicated by the keywords public health service, public health agent, and government agency. Second, the blue group is indicated by the keywords future, age, and consumption. Third, the red group is indicated by the keywords health care, knowledge, environment, prevention, and hypertension (**Figure 2**). The red group has the most keywords compared to the other groups. Thus, this group has the most articles that are relevant to keywords.

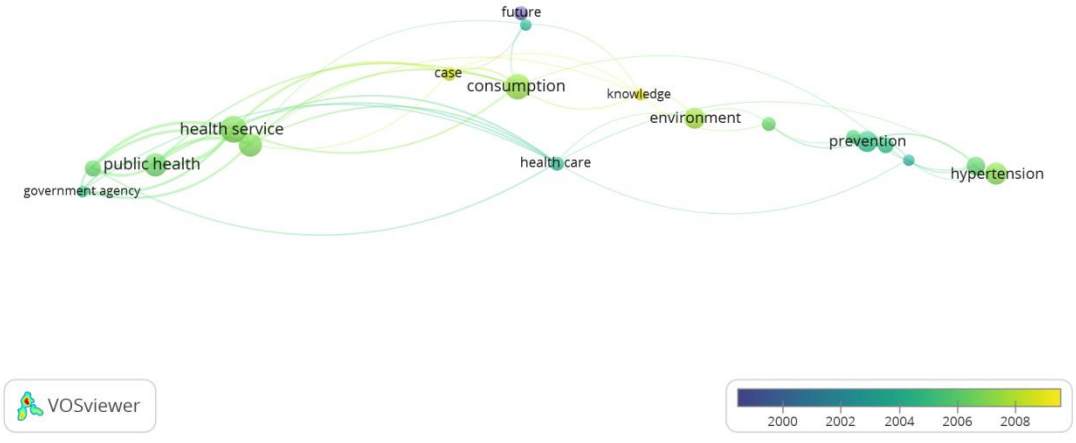

Figure 3. Overlay visualization analysis in the period 1999 to 2009.

Overlay visualization analysis (**Figure 3**) shows the keywords included in the first color group, which includes case, knowledge, consumption, and future. Thus, these keywords are related to the most recently conducted articles. On the other hand, those contained in the dark color group include prevention, hypertension, public health,

public service, and government agencies. Thus, this group's keywords are related to earlier articles.

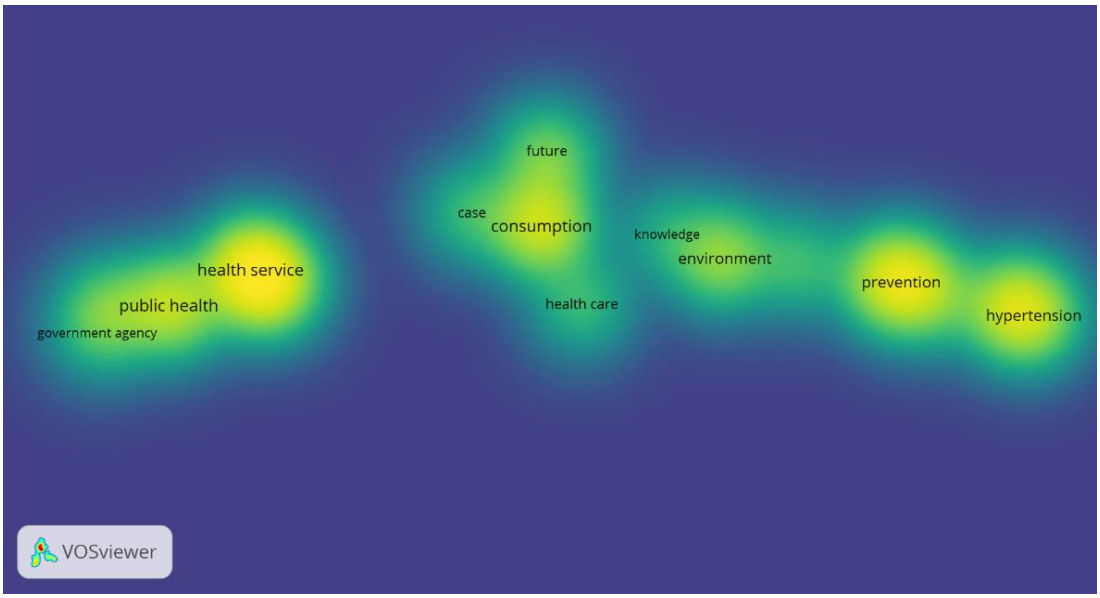

Figure 4. Density visualization analysis in the period 1999 to 2009.

Density visualization analysis using Vosviewer shows that the crucial themes studied in this research are related to the implementation of public health in emerging and developing countries, which is indicated by keywords with the brightest yellow background (see **Figure 4**). The analysis shows that health service, environment, and hypertension are the brightest keywords. This group of keywords has the highest research density. Furthermore, the keywords in the second group that are dimmer compared to the first group are public health, consumption, and prevention. Thus, this group has a lower density than the previous keyword groups. The keyword groups with the dimmest colors are government agency, case, future, and health care. This group has the lowest research density compared to the previous two groups.

3.2.2. 2010–2019 period:

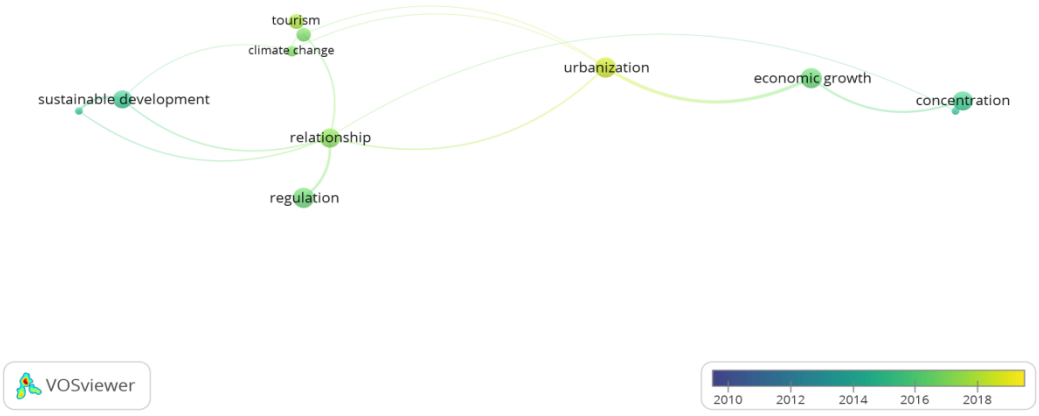

Figure 5. Network visualization analysis in the period 2010 to 2019.

Figure 5 showed network visualization analysis in the period 2010 to 2019 shows that there are 4 groups formed: First, the blue group, which is indicated by the keyword sustainable development; Second, the red group is indicated by the keywords tourism and climate change; Third, the yellow group is indicated by the keywords urbanization and economic growth; Fourth, the green group is indicated by the keyword concentration.

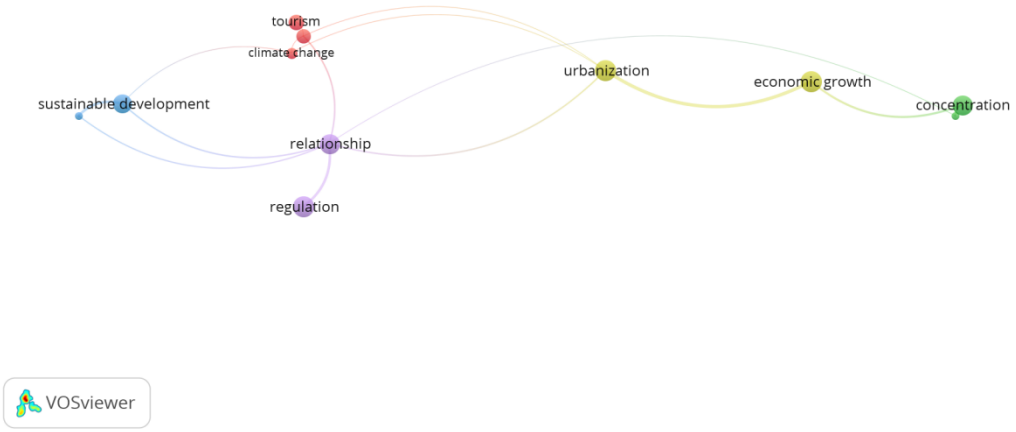

Figure 6. Overlay visualization analysis in the period 2010 to 2019.

Overlay visualization analysis shows that the keywords in the first color group include sustainable development, economic growth, and concentration. This group has the darkest color, which is the theme of previous research. The slightly lighter color group includes economic growth and concentration, regulation, relationships, tourism, and climate change, a newer research group than the first group of keywords (see **Figure 6**). Next, what is included in the third group is urbanization, which has the brightest color. Thus, this third group is the most recent research compared to other keyword groups.

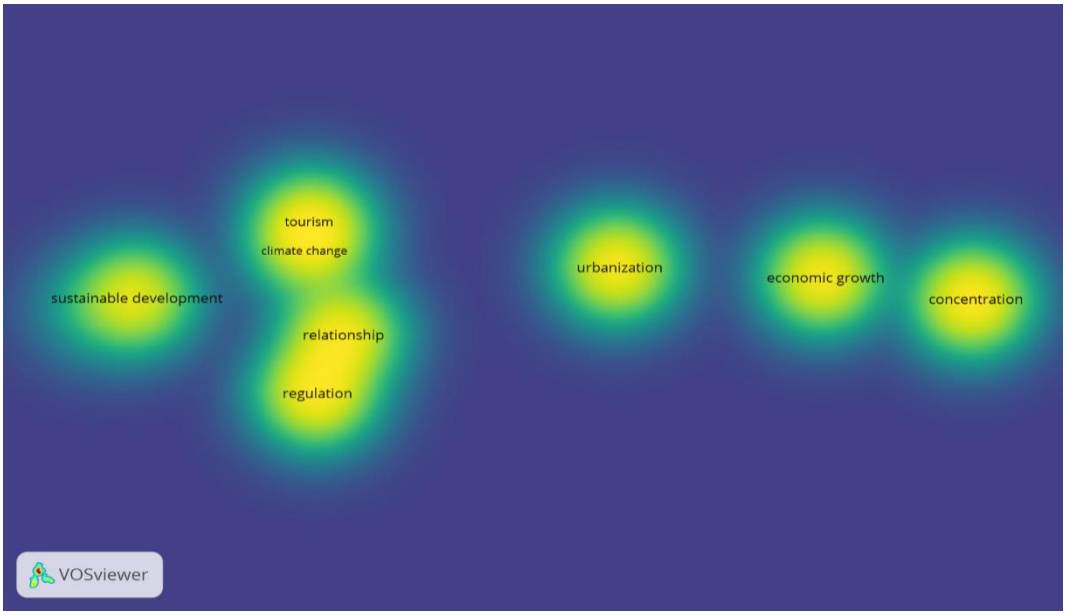

Figure 7. Density visualization analysis in the period 2010 to 2019.

The density visualization analysis (**Figure 7**), using Vosviewer shows that the keyword with the brightest color is sustainable development. This group of keywords has the highest research density. Next, the darker color groups are tourism, climate change, relationships, regulation, urbanization, economic growth, and concentration. This group has a lower density than the first group (mentioned previously).

3.2.3. 2020–2024 period:

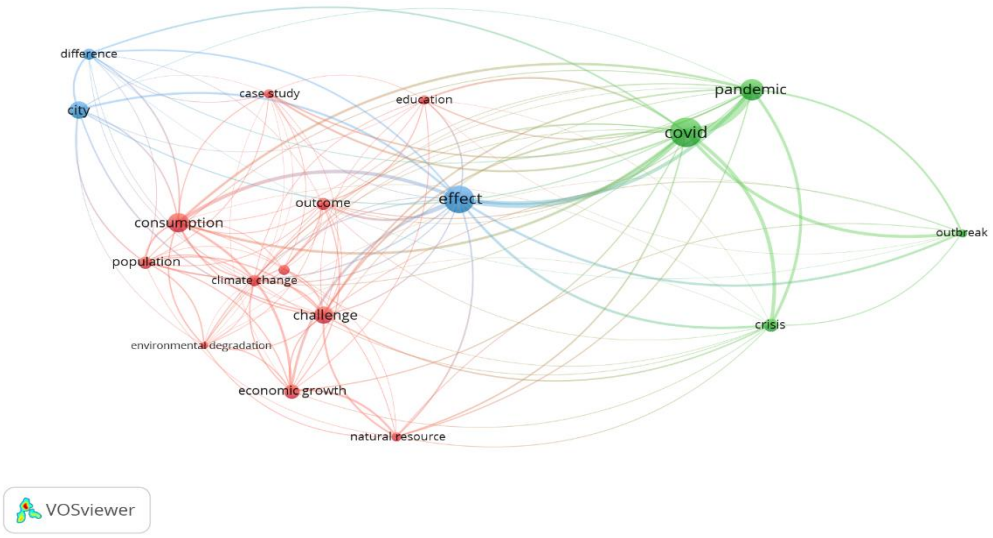

Figure 8. Network visualization analysis in the period 2020 to 2024.

Figure 8 showed network visualization analysis in the period 2020 to 2024 among 3 groups formed, namely: The green group consists of the keywords pandemic, covid, crisis, and outbreak. Next, the red group includes economic growth, challenge, natural resources, climate change, environmental degradation, population, outcome, case study, and education. The new color group consists of the keywords difference, city, and effect.

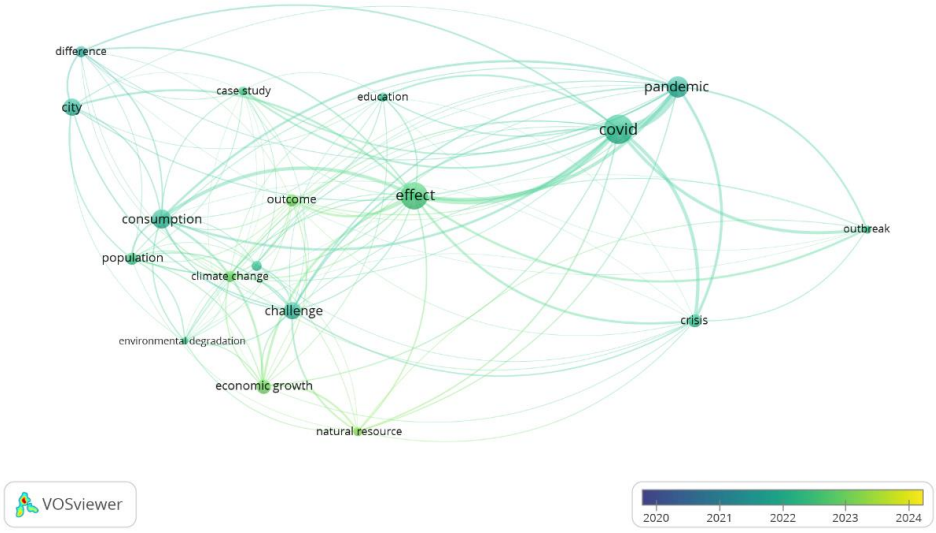

Figure 9. Overlay visualization analysis in the period 2020 to 2024.

Overlay visualization analysis shows that all the keywords mentioned in this analysis have almost the same period of research implementation. Thus, color groups that have differences in brightness are not formed compared to the study carried out in the previous period. Overlay visualization could be related to the reasonably short implementation period, namely, 2020 to 2024 (see **Figure 9**).

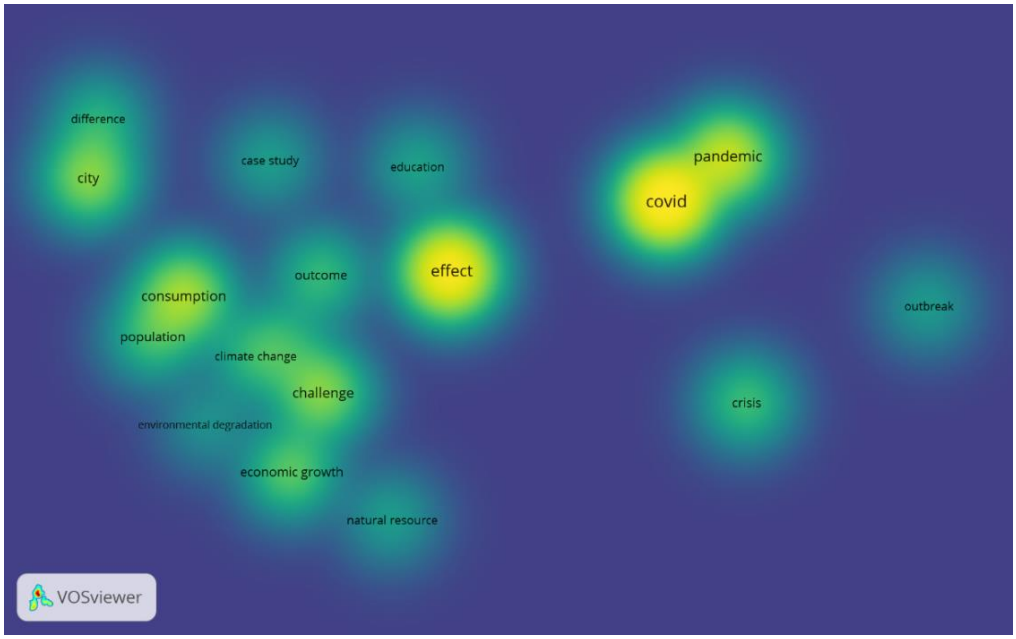

Figure 10. Density visualization analysis in the period 2020 to 2024.

The density visualization analysis using Vosviewer shows that the keywords with the brightest colors are effect, COVID-19, and pandemic (see **Figure 10**). Thus, research with this keyword has the highest density. Next, the keywords that have a dimmer color are consumption, challenge, city, and economic growth. Followed by the keywords crisis, outbreak, natural resources, environmental degradation, outcome, case study, education, and difference, the group with the dimmest color. Therefore, the dimmest color group is the research group with the lowest density.

3.3. Biblioshiny analysis

Longitudinal analysis of themes in articles published in various journals (Aria and Cuccurullo, 2017; Huzenko and Kononenko, 2024) on public health in developing countries is visualized through an alluvial diagram in the following **Figure 11**:

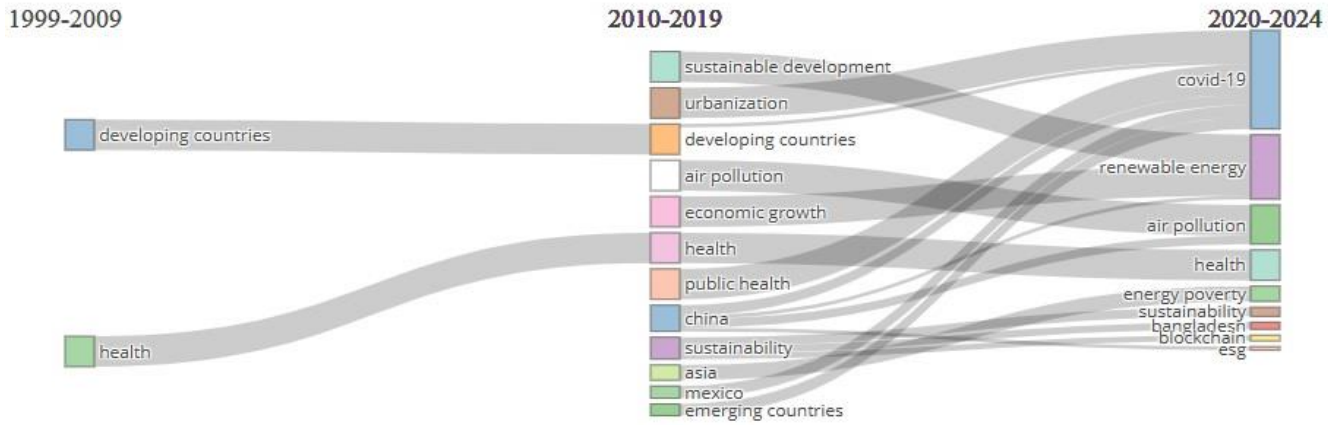

Figure 11. Longitudinal Thematic Map Analysis of Publication in Public Health in developing countries.
Source: Developed by the author (based on the Scopus database using the Biblioshiny Application).

Figure 11 showed the publication year differentiation interval of the articles is based on previous considerations, namely 1999–2009 then 2010–2019 and 2020–2024. The analysis allows us to conclude that 2 subtopics for 1999–2009 changed to 12 subtopics for 2010–2019. The subtopics "health" and "developing country" remain the subtopics "health" and "developing country". In addition, new subtopics have emerged, namely, "sustainable development", "urbanization", "air pollution", "economic growth", "public health", "china", "sustainability", "asia", "mexico" and "emerging countries". All subtopics from 2010–2019 changed to only 8 subtopics from 2020–2024, namely "covid 19", "air pollution", "health", "energy poverty", "sustainability", "Bangladesh", "blockchain" and "esg". The results of this analysis are in line with the findings of previous Vos Viewer analysis.

4. Discussion

The analysis in this research aims to provide recommendations regarding research themes that can be developed to meet theoretical and practical needs. Researchers identified the development of themes that have been published during the period from 1999 to 2024. In other cases, this research can help identify research themes that could be published in scientific articles in Scopus journals. Henceforth, discussions will be carried out at each predetermined period.

4.1.1. 1999–2009 period

From 1999 to 2009, 41 public health research articles were published from the perspective of researchers and developing countries' settings. The publisher that publishes the most public health research is Elsevier. The journals that publish the most are Kidney International, Social Science & Medicine, Waste Management, International Journal of Gynecology & Obstetrics, and American Journal of Kidney Diseases and Biologicals. Most of these research journals have a scope that discusses disease (risk identification and treatment).

The results of the advanced Vos Viewer analysis strengthen the previous frequency analysis. The four groups of keywords formed refer to the significant research themes in this period, namely, discussing the disease and its treatment, as well as lifestyle changes that cause the disease. Several articles published in this period

included, for example, the treatment of heart disease (Dearani et al., 2010; Leon-Wyss et al., 2009), kidney disease (Bakris and Ritz, 2009; Zhang et al., 2008); hypertension (Elliott, 2007); and changes in lifestyle and consumption that affect public health as well as research on the importance of whole grain consumption (Topping, 2007). Another theme that was also identified was the role of government and community groups in improving the quality of public health. Among them are the role of farmer organizations in improving food quality (Moustier et al., 2010), the role of government in providing antiretrovirals (Beaulière et al., 2010), handling the production of people's alcoholic beverages (Kanteres et al., 2009).

Further analysis shows that the first group of research carried out in this period was the theme that discussed disease and its treatment: Lifestyle changes that also cause disease. Therefore, the highest research density in this theme refers to the keyword health service, environment and hypertension, public health, consumption, and prevention. Next, analysis of the newest research themes with the lowest density relates to government and community groups' role in improving public health quality. This research is interesting to carry out from the perspective of researchers and developing countries' settings, remembering that developing countries have unique characteristics shared by the government and society. These findings are strengthened by density analysis, which shows that research using the keywords government agency, case, future, and health care is still low.

Research recommendations for this period can still be found, including discussing disease management. There are still gaps in research that can be carried out despite the high density. The Recommendation is related to changes in how to treat a disease that continues to develop—for example, applying a holistic concept (Komulainen et al., 2023). Another theme that can be recommended is how the government and community groups face challenges in improving the quality of society and considering the dynamic changes in policy and community life that can influence how the government and community groups play their role in improving the quality of public health (Komulainen et al., 2023; Kumar and Bhasker, 2015).

4.1.2. 2010–2019 Period

From 2010 to 2019, it shows that the number of public health research articles from the perspective of researchers and developing countries' settings was 177. The publisher that publishes the most public health research is Elsevier. The most targeted journals in this period were the Journal of Cleaner Production (16 articles), World Development (6 articles), Technology in Society, Energy Policy, American Journal of Infection Control; Research Policy (4 articles each) as well as Social Science & Medicine, Waste Management, European Economic Review and Procedia - Social and Behavioral Sciences (3 articles each). Most have a scope related to sustainable development and public health status, disease management and risk, and environmental changes on disease status.

The results of the advanced Vos Viewer analysis strengthen the previous frequency analysis. The keyword groups that were successfully identified were: First, the blue group was indicated by sustainable development; Second, the red group was suggested by tourism and climate change. Third, the yellow group is indicated by the keywords urbanization and economic growth; Fourth, the green color group is

indicated by the keyword concentration theme. The keyword groups formed are relevant to the content analysis carried out by researchers. The research themes identified by researchers include sustainable development and public health status (Bourgeois et al., 2014; Galadanci, 2013; McMahon and Thorsteinsdóttir, 2013); the role of certain groups in public health (Moustier et al., 2010); the influence of changes in environmental conditions on the potential for the emergence or worsening of disease (Pahl-Wostl et al., 2012); drug handling and its dangers in the future (Mbinze et al., 2013; McMahon and Thorsteinsdóttir, 2013). In other cases, articles still discuss treatment and risks, including the treatment of cardiovascular disease (Castellano et al., 2014).

Analysis of which research theme was carried out first shows that: First, the theme of sustainable development is the theme that was carried out first compared to other themes. Second, the themes of economic growth and concentration, regulation, relationships, tourism, and climate change are newer research groups than the first keywords. The three urbanizations with the brightest colors indicate the most recent research themes compared to other keyword groups. The keyword sustainable development suggests the highest research density. Next, the darker color groups are tourism, climate change, relationships, regulation, urbanization, economic growth, and concentration. This group has a lower density than the first group (mentioned previously).

Thus, research themes that still have a high opportunity to be explored are related to improving public health, which is influenced by changes in regulation, urbanization, and economic growth. Other themes that can be developed include the quality of public health linked to tourism. Therefore, research recommendations that can be created are related to the themes that have been identified, including how improving public health is influenced by changes in regulation. The topic of environmental health is connected to other theme suggestions that can be created. where the degree of public health can be impacted by changes in the environment. One of these is how to lower the expenses associated with the organic agricultural system (Asfawi et al., 2021).

4.1.3. 2020–2024 period

From 2020 to 2024, it shows that the number of public health research articles from the perspective of researchers and developing countries' settings is 304. Elsevier is still the dominant publisher. The journal most frequently targeted is the Journal of Cleaner Production; Heliyon with Technological Forecasting and Social Change and Resources Policy; Journal of Environmental Management with 7 articles; World Development, Science of The Total Environment, Journal of Business Research; Sustainable Production and Consumption and Transport Policy. In contrast to previous periods, the central theme of public health research is related to the COVID-19 pandemic. In-depth analysis shows that the Covid-19 pandemic has encouraged researchers to develop research themes according to the magnitude of the multidimensional impact felt by society. Therefore, based on the perspective of researchers and developing countries' settings, there were significant variations in themes from the researchers' point of view and developing countries settings.

The results of identifying the immense journal scopes are supported by content analysis, which shows that the most frequently published themes are related to changes

before, during, and after COVID-19 (Chowdhury et al., 2022; Zhang et al., 2021) Another dominant theme is sustainable development (Espinoza Pérez et al., 2021). The results of the theme identification are supported by network visualization analysis, which shows that 3 groups are formed, namely: The green group consists of the keywords pandemic, covid, crisis, and outbreak. Next, the red group includes economic growth, challenge, natural resources, climate change, environmental degradation, population, outcome, case study, and education. The new color group consists of the keywords difference, city, and effect.

Furthermore, analysis of which research theme came first shows that all research themes have almost the same period for conducting research. Thus, color groups that have differences in brightness are not formed compared to the analysis carried out in the previous period. For density analysis, research shows that the keywords effect, covid, and pandemic have the highest density. Then, the keywords consumption, challenge, city, and economic growth have a lower research density than the first group. They were followed by the keywords crisis, outbreak, natural resources, environmental degradation, outcome, case study, education, and difference, which have the lowest research density.

Thus, research recommendations that can be submitted during this period include finding out how the multidimensional impact of post-Covid-19 can be consistent. Then, the use of the internet also changes how people behave, which also affects people's health. Another exciting research theme is that reflecting on the Covid 19 pandemic crisis, it is necessary to develop scenarios for facing the situation and test the readiness of society and the government to face crises threatening the quality of public health (Nugroho et al., 2022).

5. Conclusion

The analysis in this research aims to provide recommendations regarding research themes that can be developed to meet theoretical and practical needs. Researchers identified the development of themes that have been published during the period from 1999 to 2024. In other cases, this research can help identify research themes that could be published in scientific articles in Scopus journals. Henceforth, discussions will be carried out at each predetermined period.

5.1. 1999–2009 period

From 1999 to 2009, 41 public health research articles were published from the perspective of researchers and developing countries' settings. The publisher that publishes the most public health research is Elsevier. The journals that publish the most are Kidney International, Social Science & Medicine, Waste Management, International Journal of Gynecology & Obstetrics, and American Journal of Kidney Diseases and Biologicals. Most of these research journals have a scope that discusses disease (risk identification and treatment).

The results of the advanced Vos Viewer analysis strengthen the previous frequency analysis. The four groups of keywords formed refer to the significant research themes in this period, namely, discussing the disease and its treatment, as well as lifestyle changes that cause the disease. Several articles published in this period

included, for example, the treatment of heart disease (Dearani et al., 2010; Leon-Wyss et al., 2009), kidney disease (Bakris and Ritz, 2009; Zhang et al., 2008); hypertension (Elliott, 2007); and changes in lifestyle and consumption that affect public health as well as research on the importance of whole grain consumption (Topping, 2007). Another theme that was also identified was the role of government and community groups in improving the quality of public health. Among them are the role of farmer organizations in improving food quality (Moustier et al., 2010), the role of government in providing antiretrovirals (Beaulière et al., 2010), handling the production of people's alcoholic beverages (Kanteres et al., 2009).

Further analysis shows that the first group of research carried out in this period was the theme that discussed disease and its treatment: Lifestyle changes that also cause disease. Therefore, the highest research density in this theme refers to the keyword health service, environment and hypertension, public health, consumption, and prevention. Next, analysis of the newest research themes with the lowest density relates to government and community groups' role in improving public health quality. This research is interesting to carry out from the perspective of researchers and developing countries' settings, remembering that developing countries have unique characteristics shared by the government and society. These findings are strengthened by density analysis, which shows that research using the keywords government agency, case, future, and health care is still low.

Research recommendations for this period can still be found, including discussing disease management. There are still gaps in research that can be carried out despite the high density. The Recommendation is related to changes in how to treat a disease that continues to develop—for example, applying a holistic concept (Komulainen et al., 2023). Another theme that can be recommended is how the government and community groups face challenges in improving the quality of society and considering the dynamic changes in policy and community life that can influence how the government and community groups play their role in improving the quality of public health (Komulainen et al., 2023; Kumar and Bhasker, 2015).

5.2. 2010–2019 period

From 2010 to 2019, it shows that the number of public health research articles from the perspective of researchers and developing countries' settings was 177. The publisher that publishes the most public health research is Elsevier. The most targeted journals in this period were the Journal of Cleaner Production (16 articles), World Development (6 articles), Technology in Society, Energy Policy, American Journal of Infection Control; Research Policy (4 articles each) as well as Social Science & Medicine, Waste Management, European Economic Review and Procedia-Social and Behavioral Sciences (3 articles each). Most have a scope related to sustainable development and public health status, disease management and risk, and environmental changes on disease status.

The results of the advanced Vos Viewer analysis strengthen the previous frequency analysis. The keyword groups that were successfully identified were: First, the blue group was indicated by sustainable development; Second, the red group was suggested by tourism and climate change; Third, the yellow group is indicated by the

keywords urbanization and economic growth; Fourth, the green color group is indicated by the keyword concentration theme. The keyword groups formed are relevant to the content analysis carried out by researchers. The research themes identified by researchers include sustainable development and public health status (Bourgeois et al., 2014; Galadanci, 2013; McMahon and Thorsteinsdóttir, 2013); the role of certain groups in public health (Moustier et al., 2010); the influence of changes in environmental conditions on the potential for the emergence or worsening of disease (Pahl-Wostl et al., 2012); drug handling and its dangers in the future (Mbinze et al., 2013; McMahon and Thorsteinsdóttir, 2013). In other cases, articles still discuss treatment and risks, including the treatment of cardiovascular disease (Castellano et al., 2014).

Analysis of which research theme was carried out first shows that: First, the theme of sustainable development is the theme that was carried out first compared to other themes. Second, the themes of economic growth and concentration, regulation, relationships, tourism, and climate change are newer research groups than the first keywords. The three urbanizations with the brightest colors indicate the most recent research themes compared to other keyword groups. The keyword sustainable development suggests the highest research density. Next, the darker color groups are tourism, climate change, relationships, regulation, urbanization, economic growth, and concentration. This group has a lower density than the first group (mentioned previously).

Thus, research themes that still have a high opportunity to be explored are related to improving public health, which is influenced by changes in regulation, urbanization, and economic growth. Other themes that can be developed include the quality of public health linked to tourism. Therefore, research recommendations that can be created are related to the themes that have been identified, including how improving public health is influenced by changes in regulation. Rekomendasi tema lainnya yang dapat dikembangkan berkaitan dengan tema kesehatan lingkungan. Dimana perubahan lingkungan dapat mempengaruhi derajat kesehatan masyarakat. Diantaranya adalah bagaimana penurunan biaya yang dikeluarkan dalam sistem pertanian organik (Asfawi et al., 2021).

5.3. 2020–2024 period

From 2020 to 2024, it shows that the number of public health research articles from the perspective of researchers and developing countries' settings is 304. Elsevier is still the dominant publisher. The journal most frequently targeted is the Journal of Cleaner Production; Heliyon with Technological Forecasting and Social Change and Resources Policy; Journal of Environmental Management with 7 articles; World Development, Science of The Total Environment, Journal of Business Research; Sustainable Production and Consumption and Transport Policy. In contrast to previous periods, the central theme of public health research is related to the COVID-19 pandemic. In-depth analysis shows that the Covid 19 pandemic has encouraged researchers to develop research themes according to the magnitude of the multidimensional impact felt by society. Therefore, based on the perspective of

researchers and developing countries' settings, there were significant variations in themes from the researchers' point of view and developing countries settings.

The results of identifying the immense journal scopes are supported by content analysis, which shows that the most frequently published themes are related to changes before, during, and after COVID-19 (Chowdhury et al., 2022; Zhang et al., 2021). Another dominant theme is sustainable development (Espinoza Pérez et al., 2021). The results of the theme identification are supported by network visualization analysis, which shows that 3 groups are formed, namely: The green group consists of the keywords pandemic, covid, crisis, and outbreak. Next, the red group includes economic growth, challenge, natural resources, climate change, environmental degradation, population, outcome, case study, and education. The new color group consists of the keywords difference, city, and effect.

Furthermore, analysis of which research theme came first shows that all research themes have almost the same period for conducting research. Thus, color groups that have differences in brightness are not formed compared to the analysis carried out in the previous period. For density analysis, research shows that the keywords effect, covid, and pandemic have the highest density. Then, the keywords consumption, challenge, city, and economic growth have a lower research density than the first group. They were followed by the keywords crisis, outbreak, natural resources, environmental degradation, outcome, case study, education, and difference, which have the lowest research density.

Thus, research recommendations that can be submitted during this period include finding out how the multidimensional impact of post-Covid 19 can be consistent. Then, the use of the internet also changes how people behave, which also affects people's health. Another exciting research theme is that reflecting on the Covid-19 pandemic crisis, it is necessary to develop scenarios for facing the situation and test the readiness of society and the government to face crises threatening the quality of public health (Nugroho et al., 2022).

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