"Meta-analysis of the literature related to SDG 3 and its investment"

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META-ANALYSIS OF THE LITERATURE RELATED TO SDG 3 AND ITS INVESTMENT

Abstract

2020 revealed the vulnerability of the healthcare systems in most countries. It also highlighted their failure to generate serious progress in the fulfillment of Sustainable Development Goal 3 (SDG 3): Ensure healthy lives and promote welfare for all at all ages. One of the key problems inhibiting its progress is the lack of financial resources. Based on a comprehensive meta-analysis of the literature related to SDG 3 and its investment, it aims to demonstrate that lack of appropriate academic support is a part of the failure to generate serious progress in the fulfillment of SDG 3. To do this academic literature published in the period 2010–2019 is analyzed. SciVal Elsevier, VosViewer, and Google Trends tools are applied for analysis. The results show that there is a significant interest in the academic circles on SDG 3 alone. However, this interest is concentrated toward its medical aspects while economic aspects, including investment, are poorly represented. This study shows that the reason for the current investment gap in SDG 3 is the lack of academic support to provide a theoretical, methodological, and analytical framework for tackling the financing problem for SDG 3.

Keywords	financial market, healthcare, investment, meta-analysis, SDG 3, responsible investment
JEL Classification	I18, Q01, H87, C42

INTRODUCTION

In 2015, the United Nations provided the main reference points for global human development until 2030, which included global food and sanitary challenges, improving healthcare systems, irreversible climate change, poverty, and gender inequality. These reference points took the form of 17 Sustainable Development Goals (SDGs) and their 169 targets at global and national levels (United Nations, 2015a, p. 1). One of the 17 SDGs is directly related to healthcare issues, namely SDG 3: "Ensure healthy lives and promote welfare for all at all ages". It aims "substantially to increase health financing and the recruitment, development, training, and retention of the healthcare workforce in developing countries, especially in the least developed ones…" (Target 3.8 and Goal 3.c). The COVID-19 pandemic in 2020 showed that the healthcare systems of most countries were on the cusp of collapse; thus, many countries failed to achieve serious progress in the fulfillment of SDG 3, one of the most crucial sustainable development goals (Seshaiyer & McNeely, 2020; United Nations, 2020a, p. 28).

One of the key problems in achieving SDG 3 is the lack of financing. To fill this gap, investment can be used as an alternative form of financing (alternative to government spending, etc.). Responsible investment is an investment approach that explicitly acknowledges the relevance to the investors of environmental, social, and governance factors, and it should be widely used in SDG 3 financing. The academic literature must provide the theoretical and methodological framework of these

issues. Therefore, this study aims to conduct a meta-analysis of the literature related to SDG 3 and its investment as one of the key instruments of financing.

Additional research is required to understand the scarcity of the literature on investment in SDG 3. Most academic activities are concentrated on the calculation of costs related to SDG 3 achievement (Stenberg et al., 2017; Peters et al., 2019; Edejer et al., 2020). The idea of this paper is to show that there has been no appropriate academic support to address the issue of SDG 3 and its investment. To do this, SciVal by Elsevier, VosViewer, Google Trends, and Google Books Ngram Viewer were used to uncover and analyze articles published during 2010–2019 on the respective topics. The methodology of meta-analysis includes static and dynamic analyses of publications by years and in geographical terms for a selected research area. The thematic focuses, keywords, and their clustering are explored, and a study of the research contributions to SDG 3 and its investment by countries, affiliates, and sectors is conducted. The results show significant interest in SDG 3 alone, but it is mainly focused on its medical aspects. The economic aspects of SDG 3 achievement, including investment, are poorly researched.

1. LITERATURE REVIEW

2020 has shown that the key issues challenging the achievement of SDG3 are a lack of financing. This is not a new problem as the limited financial resources (allocated by the government to the implementation of health-related sustainable development goals) is one of the most mentioned challenges in the academic literature (Aftab et al., 2020; Georgeson & Maslin, 2018; Siddiqi et al., 2020). As the number of large out-of-pocket expenses has increased and will continue to increase in the future, the United Nations has reported that the achievement of universal healthcare coverage remains a global challenge. Over 1 billion people are estimated to spend at least 10% of their household budget on healthcare in 2020, particularly in low- and middle-income countries (United Nations, 2020a, p. 31; United Nations, 2020b, p. 6). These statements underline the importance of financing and investments in healthcare systems worldwide to achieve SDG 3.

Bansal et al. (2020) and Smiianov et al. (2020) state that in the context of post pandemic recovery there is a huge influence of Covid-19 for the consumer's buying behavior, health and economic growth. In such conditions the concept of SDGs should be considered in terms of global threats (Stukalo et al., 2021) because SDGs could be an effective tool for strategic planning and further development (Petrushenko et al., 2020; Brin & Nehme, 2021). In order to enhance the ability to manage the efficient management decisions there is a need for implementation of innovative financing approaches for

sustainability of entities' performance (Lehenchuk et al., 2020; Chigrin et al., 2014).

During 2016–2020, five forums on Financing for Development at the UN level were conducted. The last was focused on the significant and systematic lack of investment to achieve the SDGs. Summits in Addis Ababa (United Nations, 2015b) and New York (United Nations, 2015a), the Conference of the Parties (COP21) of the UN Framework Convention on Climate Change in 2015 (United Nations, 2015c) also discussed the issues of sustainable development financing, including new investment technologies and financial products, to bridge the existing gaps. There are more than 300 instruments of responsible investment, including both individual financial products and technologies (green and energy bonds) as well as the comprehensive restructuring of the FM on a responsible basis (capital market union agenda, circular economy finance support platform, and 2030 climate and energy framework).

Despite these efforts and the general knowledge that new sources of funding are needed to (fully) achieve SDG 3 (Bhutta et al., 2020), considering that the financial resources are insufficient to meet the SDGs in general (Georgeson & Maslin, 2018), it is surprising that there are hardly any insights in the research or implementation proposals for practices that the policymakers can access as potential solutions. The World Health Organization estimates that the investments gap (necessary for the achievement of the SDG 3 targets) in countries across the world will be EUR

54 billion annually by 2030. One of the possible reasons for this failure is the lack of adequate academic support to provide a theoretical, methodological, and analytical framework to solve the problem of SDG 3 financing. Research in this regard is quite important as it increases the attention focused on current problems in society, provides best practices to solve these problems, develops methodology, and presents empirical results. All these factors are crucial to tackling current problems in the achievement of SDGs. Peters et al. (2019) have shown that the lack of data on the costs and comparative benefits of investing in health management reflects the reluctance to invest adequately in systems.

The present literature on SDG 3, its methodological and theoretical substantiation as well as its financing is rather fragmentary and unstructured. Thus, meta-analytical studies on the SDG 3 financial and investment support were conducted considering the progress in achieving all the 17 SDGs and their integration (Table 1).

López-Concepción et al. (2021) and García-Feijoo et al. (2020) found evidence of the existing academic gap in SDGs, especially SDG 3 systematic research. The analyzed studies differ in the sample size and the purpose of analysis: García-Feijoo et al. (2020) filtered articles by a special algorithm while Sweileh (2020) and Asatani et al. (2020) researched general arrays of Scopus and Web of Science publications.

These databases are used to form a sample for the meta-analysis of SDGs articles. In this study, the Scopus database is used to describe the scientific landscape relating to SDG 3 financing. Most of the analyzed studies date back to the period 2015–2019 (2020) as the adoption of SDGs as a system of global guidelines for human development (except Pizzi et al., 2020) coincides with the research period 2012–2019. In the current study, the period 2015–2019 was extended to 2010–2019 due to SDG 3 and the paper views sustainable development financing as evolutionary and has its origins in the Millennium Development Goals system.

Table 1. Cross-SDGs meta-analysis results of relevant academic papers

Authors	No. of articles	Methodology	Instruments/database	Main insights
Bennich et al. (2020)	70 peer-reviewed articles	Network analysis, coding	Scopus	Research gaps are identified, especially in SDGs policy innovation, integrated monitoring, and evaluation
Sweileh (2020)	18,696	Cross-sectional descriptive bibliometric study	SciVerse Scopus	SDG 3 was the top researched SDG for the African region, the Eastern Mediterranean regions, and the South-Eastern Asian region Nevertheless these countries need to increase their funding and research collaboration concerning SDGs
Skevington and Epton (2018)	117	Effect sizes (Cohen's d)	Web of Science, PubMed, EMBASE, and Medline	Cross-cultural evidence from 11 samples shows that all WHOQOL-BREF is relevant for detecting, its suitability to assess SDG well-being targets
Asatani et al. (2020)	300,000	Citation network analysis and natural language processing	Scopus	Dynamic changes in sustainability science were detected emerging fields in SDGs researches were identified
López-Concepción et al. (2021)	Web of science (n = 152) SCOPUS (n = 126)	Preferred Reporting Items for Systematic reviews and Meta-Analyzes (PRISMA)	Web of Science, Scopus	Studies, based on the stakeholder approach and corporate social responsibility in connection with business sustainability and SDGs were identified
Pizzi et al. (2020)	266	VosViewer	Scopus	Four research directions on SDGs were described: technological innovation (cluster 1), firms' contributions in developing countries (cluster 2), non-financial reporting (cluster 3), and education for SDGs (cluster 4)
García-Feijoo et al. (2020)	16	Systematic review; EPPI Center methodology, PRISMA The JBI checklist VosViewer	Web of Science, Scopus, and ERIC	The academic gap in the SDGs literature was identified as well as two types of future research about the deployment of SDGs in the business schools
Siti and Rusnah (2020)	56	Content analysis	Web of Science, Scopus	96% of the studies contain a positive relationship between sustainability practices and SDGs disclosure and companies the financial performance

There are several methodological approaches used for cross-SDG meta-analysis. They include the descriptive methods of bibliometric analysis with built-in tools (Sweileh, 2020), network analysis (Bennich et al., 2020; Asatani et al., 2020), PRISMA (López-Concepción et al., 2021; García-Feijoo et al., 2020), and VosViewer (Pizzi et al., 2020; García-Feijoo et al., 2020). In addition to VosViewer, SciVal, Google Trends, and Google Books Ngram Viewer were used to analyze the informational and analytical provision of SDG 3. Sweileh (2020) paid special focus on SDG 3. However, the aspects of investment have not been disclosed. Moreover, currently, SDG 3 meta-analysis focuses on medical issues, rather than financial tools, to ensure progress in achieving this goal. This paper aims to fill in this gap showing that the shortage of financial resources in SDG3 achievement is partially caused by the lack of an appropriate academic framework.

2. METHODOLOGY

A meta-analysis is a general systematic summary of information drawn from different studies that have addressed a specific topic or several related topics (Browne & Rabash, 2009, p. 477). Card and Casper (2013, pp. 705-706) state that inclusion and exclusion criteria and search techniques should be used to find relevant literature. The keywords "SDG 3 good health and well-being", "SDG 3 and investment", "SDG 3 and responsible investment", "SDG 3 and finance (financing)", and "responsible investment" were employed. Their choice, as suggested by Adams et al. (2014, p. 46), is based on the goals and studies presented in Table 1.

SciVal by Elsevier, VosViewer, Google Trends, and Google Books Ngram Viewer were used for meta-analysis. SciVal by Elsevier and VosViewer are recognized as library catalogs of research publications (Card & Casper, 2013, p. 706; Flick, 2018, p. 156). SciVal by Elsevier is a software tool for complex research analysis and visualization of articles indexed in Scopus. It operates with the 48 million articles indexed in Scopus in 1996 grouped into 96,000 dynamic topics. The Scopus All Subject Journal Classification (ASJC) was used for the classification of a topic. To perform a meta-analysis based on SciVal instruments, the following

keywords with the logic operator AND are used: SDG AND 7 AND good health and well-being; SDG AND 3 AND investment; SDG AND 3 AND responsible AND investment.

VosViewer is a software tool for bibliometric construction and visualization; for example, based on the bibliography parameters of the articles indexed in Scopus. The current study used the following features of VosViewer: co-occurrence and co-authorship cluster analysis and visualization maps. The data and results from SciVal were imported into VOSViewer. Google Trends is an analytical instrument for comparing the terms searched via internet requests in different counties and languages. Using Google Trends, this paper provides a regional and dynamic comparative analysis of the internet requests concerning defined keywords in each area (SDG 3, investment, financing, and responsible investment). Google Books Ngram Viewer analyzes the frequency of terms appearing in Google Books from 1518 within a defined linguistic corpus (English 2019 is used in this study).

The period from 2010 to 2019 was chosen as the period for the meta-analysis. It includes the following steps:

1) SciVal was used to perform:

- Static analysis of the general parameters for the selected research area. These parameters are built in SciVal by Elsevier (number of topics and topics cluster in a specific research area, number of publications, and citations) on the date of analysis;

- Dynamic analysis of the publications by year and geographical terms (scholarly output in each research area during 2010–2019 worldwide and in Europe);

- Research contribution to SDG 3 and its investment by countries and affiliates (top 10 institutions, sectors, and countries in each research area based on scholarly output)

- Scientists' contribution to the development of this topic (top 10 authors based on scholarly output and citation in each research area).

2) SciVal and VosViewer are used to analyze the subject area, the thematic focus of research, keywords, and their clustering (the most prominent clusters were analyzed).

3) Google Trends and Google Books Ngram Viewer were used to analyze the existing trends in Internet queries and frequency of mentions in Google Books concerning predefined research areas.

Based on the obtained results, key authors and articles in this field were selected, and their results were analyzed solely.

3. RESULTS

3.1. SDG 3 and investment: static, dynamic, and structural analyses based on SciVal

The review is provided for three main search queries in three research areas: "SDG 3 good health and well-being" (predefined area), "SDG 3 and investment, SDG 3, and responsible investment as of March 31, 2021", and two additional supplementary research areas, namely "responsible investment and SDG 3" and "finance (financing)". The results are shown in Table 2.

According to the quantitative parameters of each area, the widest in terms of topics, there are several

publications and citations on SDG 3 Good Health and Well-being. It has 6.227 million publications, grouped under 74,831 topics in 1,495 thematic clusters. Within its framework, it has been identified as a narrow research area related to SDG 3 and investment (61 publications, which is 0.0009% of the total number of SDG 3 publications on 43 topics in 30 clusters). Against the background of related topics, the request-responsible investment publications on SDG 3 are uncommon. The allocation of the field "SDG 3 and responsible investment" depicts underdevelopment in the scientific sphere and there are a small number of publications (seven publications within six topics and thematic clusters). Dynamic analysis of these areas in terms of publication number (scholarly output, Table 3) allows drawing the following conclusions:

1) While the topics related to the prevention and treatment of human disease in the context of SDG 3 were studied before the adoption of the UN Global Goals in 2015, investment support in this area became a research subject only after the New York Summit 2015;

2) Academic attention is growing; however, issues of SDG 3 and its investment are unexplored;

3) Half of the publications on SDG 3 and its investment are published by European scholars.

The topics of "responsible investment and SDG 3" and "SDG 3 and finance (financing)" are in-

Table 2. Static analysis of SDG 3 and investment coverage in academic literature over the period 2010–2019 as of March 31, 2021

Source: Compiled by authors via SciVal by Elsevier.

Research area	Topics (%)	Topic clusters	Publications worldwide	Citations worldwide
SDG 3: good health and well- being	74,831 (100%)	1,495 (100%)	6,227,401 (100%)	103,591,574 (100%)
SDG 3 and investment	43 (0.06%)	30 (2.01%)	61 (0.00%)	4,210 (0.00%)
SDG 3 and responsible investment	6 (0.01%)	6 (0.40%)	7 (0.00%)	1,349 (0.00%)
SDG 3 and finance (financing)	30 (0.04%)	22 (0.01%)	33 (0.00%)	805 (0.00%)
Responsible investment	8,124 (10.86%)	1,099 (73.51%)	20,855 (0.33%)	286,021 (0.27%)

Note: This table presents the overall results of the static analysis of SDG 3 and investment coverage in the academic literature. The first column reports the research area being considered, and the second, third, and fourth columns show the results for the parameters of interest. In parentless percentages of an analyzed query to basic query SDG 3, good health and well-being are presented.

Table 3. Dynamic analysis of SDG 3 and investment coverage in academic literature over the period 2010–2019 as of March 31, 2021

Source: Compiled by authors via SciVal by Elsevier.

Region	Overall	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
SDG 3: good health and well-being											
World	6,227,401	491,332	522,636	561,728	594,722	622,203	650,391	666,299	674,709	702,245	741,136
SDG 3 and finance (financing)											
World	33	0	0	0	0	0	1	2	4	12	14
Europe	17	0	0	0	0	0	1	2	2	4	8
SDG 3 and investment											
World	63	0	0	0	0	0	5	6	10	20	22
Europe	34	0	0	0	0	0	2	3	5	11	13
SDG 3 and responsible investment											
World	7	0	0	0	0	0	2	0	0	1	4
Europe	5	0	0	0	0	0	2	0	0	1	2
Responsible investment											
World	20,855	1,620	1,890	1,886	1,953	2,010	2,205	2,462	2,521	2,780	1,528
Europe	8,171	586	689	709	744	856	922	987	1,068	1,088	522

sufficiently researched. This is confirmed by the structural analysis of publications by countries, affiliates, and sectors (Appendix B, Table B1). Most articles on SDG 3 are concerning the study of academic institutions. It constitutes 80% of all the areas researched. While medical institutions also conduct research on SDG 3 and responsible investment, their share is insignificant. The United States and the United Kingdom are leaders in the publications related to SDG 3 (57% of all studies). At the same time, the share of Australian institutions reaches one-third of the most well-known studies concerning "SDG 3 and investment" and "SDG 3 and responsible investment". Unlike the United States and the United Kingdom, Malawi, India, Singapore, Brazil, and South Africa focus their research on the investment component of

SDG 3. While the leader in the study of SDG 3 is Harvard University, the leader in the study of SDG 3 investment is the World Health Organization. In the field of SDGs and responsible investment, each of the 10 institutions published two types of research, indicating a lack of topic development.

The most productive and cited authors in each of the research areas are presented in Appendix C, Table C1. Each of the 10 most-cited authors worked only in their research area. The study of the three outlined research areas shows the prevalence of medical sciences within them (Appendix A, Figures A1-A3). The share of research in the fields "SDG 3: good health and well-being" is over 48%, "SDG 3 and investment" has 30%, and "SDG 3 and responsible investment" – 27%. At the same time, only

Source: Compiled by authors via SciVal by Elsevier.

Figure 1. Results of the analysis of keyphrases for "SDG 3: good health and well-being" from 2015 to 2020

Table 4. Economic topics and topic clusters in each research area during 2010–2019 by prominence percentile

Research area topic cluster	Prominence percentile	Scholarly output	Publication share, %	Topics
SDG 3: good health and well-being				
Industry; Research; Marketing	98.394	3286	3.89	Brand Community; Consumer Culture; Netnography Socioemotional Wealth; Family Firms; Familiness
Industry; Innovation; Entrepreneurship	98.795	1.892	1.76	Servicescape; Customer Experience; Mall
Corporate Social Responsibility; Corporate Governance; Firms	96.653	1106	1.58	Audit Committee; Corporate Governance; Board Independence Environmental Disclosure; Sustainability Reporting; Global Reporting Initiative Cause-Related Marketing; Corporate Social Performance; Corporate Philanthropy
Monetary Policy; Economic Growth; Exports	93.507	1.452	1.60	Sharing Economy; Collaborative Consumption; Peer to Peer
Models; Risks; Finance	93.173	723	1.0	Crowdfunding; Lending; Fintech
SDG 3 and investment				
Industry; Innovation; Entrepreneurship	98.795	1	0.00	Social Entrepreneurship; Hybrid Organizations; Impact Investing
Monetary Policy; Economic Growth; Exports	93.507	4	0.00	IMF; Multilateral Development Banks; Investment Banks Foreign Direct Investment; Bilateral Investment Treaties; Outward FDI
Sustainability; Sustainable Development; Students	61.914	1	0.00	Sustainable Development Goals; Agenda; United Nations
Poverty; Inequality; Development	39.558	3	0.03	Aid Allocation; Official Development Assistance; International Cooperation
SDG 3 and responsible investment				
Industry; Innovation; Entrepreneurship	98.795	1	0.00	Social Entrepreneurship; Hybrid Organizations; Impact Investing

within the last two fields, purely economic sciences areas are considered such as economics, econometrics and finance, business, management, and accounting. In the field of "SDG 3 and investment," the share of economics, econometrics, and finance is 4%; in "SDG 3 and investment," the share of the business, management, and accounting is 9%. This indicates that the study of SDG 3 is largely beyond the economic context. This fact is confirmed by the analysis of key phrases (Figure 1) for SDG 3 from 2015 to 2020. The font size in the figure indicates the frequency of the presence of the studied keywords, which are selected from the subject area based on the Elsevier fingerprint engine, natural language processing, and document abstracts.

As can be seen from the analysis of the keyword, SDG 3 investment is not mainstreamed in the publications. Key phrase analysis operates with the Elsevier Fingerprint Engine to extract distinctive key phrases within the research area. Size font is correlated to the key phrase frequency in academia. While green color phrases are more recent, blue ones are older. The top 50 key phrases by relevance to SDG 3 do not include any finance or investment keywords.

The cluster presentation of topics for each of the research areas is made using bubble size by scholarly output (Appendix D, Figure D1). The results are consistent with the analysis of the subject areas. In the mode of displaying topics and thematic clusters in the research field of SDG 3 within the top 100 topics by scholarly output, subject areas such as BUSI Business, Management and Accounting, ECON Economics, Econometrics and Finance, DECI Decision Sciences, and MULT Multidisciplinary are not highlighted in general. The study's broader focus confirms the presence of an economic context in the study of SDG 3 and its investment (Table 4).
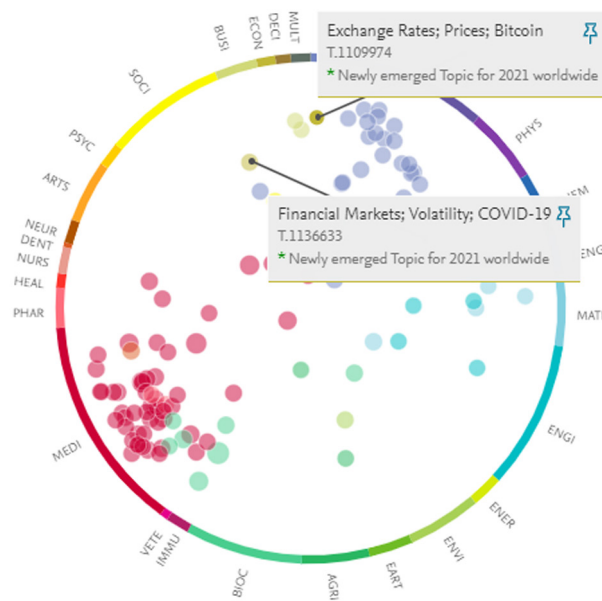
Figure 2. Newly emerged topics for SDG 3 in 2021

The presentation of thematic clusters in the descending order of the prominence percentile (scholarly output, citation, publication share, %) indicates the prevalence of industry, marketing, business research, and CSR research in the field of "SDG 3 and investment." The topics of social entrepreneurship, hybrid organizations, and impact investing need special attention. The study of the topics of the most recent publications in 2021 is presented in Figure 2. This indicates the financial and economic context in SDG 3 study, particularly in terms of financial markets, volatility, and exchange rates during the Covid-19 pandemic.
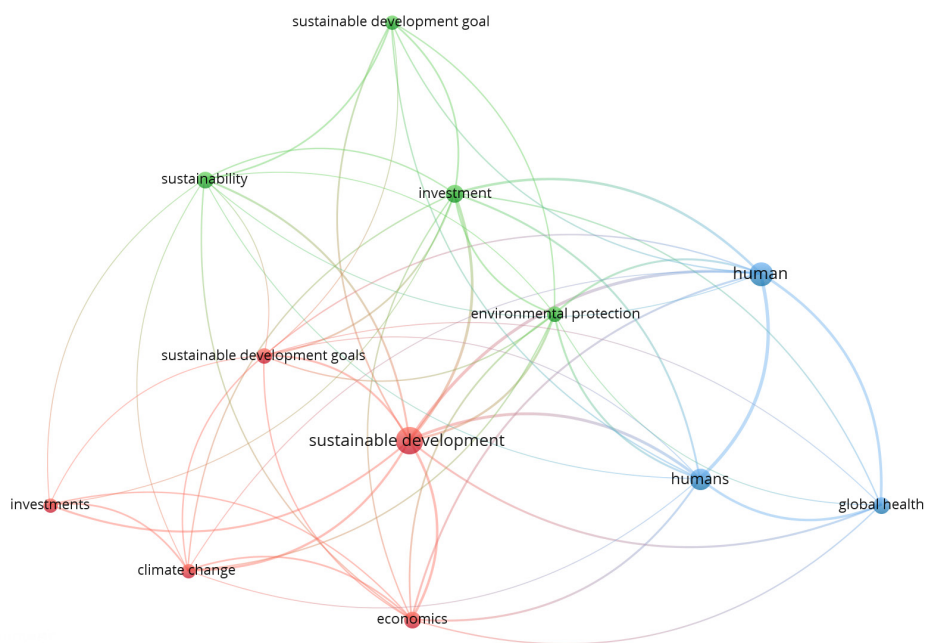
Figure 3. Bibliometric map of the publications concerning "SDG 3 and investment" and "SDG 3 and responsible investment" by keywords
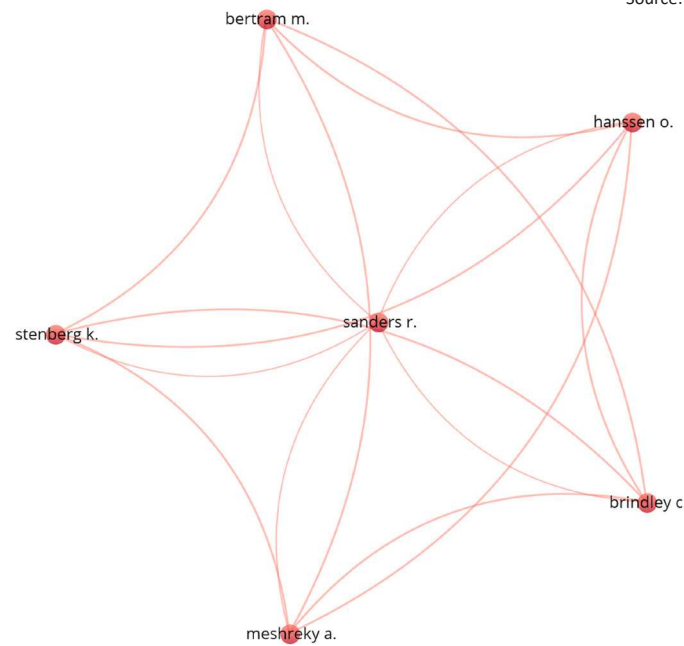
Figure 4. Bibliometric map of publications concerning "SDG 3 and investment" and "SDG 3 and responsible investment" by authors

3.2. SDG 3 and investment: cluster analysis based on VosViewer

Analysis of the publication clusters by keywords and scientific scholars is carried out using VosViewer for two research fields: "SDG 3 and investment" and "SDG 3 and responsible investment" (Figures 3 and 4). The results show that "SDG 3 and investment" is insufficiently researched.

Thus, the network links between the keywords in these areas were rather weak, and the number of keywords itself was insignificant. VosViewer has identified three main research fields on "SDG 3 and investment": climate change, environment protection, and global health.

Extensive publication research involved in the fields of "SDG 3 and investment", "SDG 3", and "responsible investment" and their filtering based on citation indicators and relevance to the "SDG 3 and investment" allowed the formation of a final list of articles for the analysis of scholarly output (Appendix E, Table E1). Based on this list, the key findings are summarized. Most of the authors focused on cost estimations to achieve SDG 3 and its targets. Bertram et al. (2018) and Stenberg et al.

(2017) estimated that an additional USD 274 billion (progress scenario) or USD 371 billion (ambitious scenario) spending on health is needed per year by 2030 to achieve SDG 3 targets. Stenberg et al. (2017) estimated that, while an additional USD 274 billion spending on health is needed per year by 2030 to achieve SDG 3 targets (progress scenario), USD 371 billion is needed to achieve the health system targets in the ambitious scenario. Peters et al. (2019) found costs of health emergency and disaster risk management to range from an additional USD 4.33 capital and USD 4.16 annual recurrent costs per capita in low-income countries to USD 1.35 capital and USD 1.41 annual recurrent costs per capita in upper middle-income countries. Stenberg et al. (2019) explored primary health care as a driving force for advancing universal health coverage and estimated the requirement of an additional USD 200–328 billion per year for the various measures of primary healthcare from 2020 to 2030. Boyle et al. (2015) estimated what the grand convergence investment case might achieve and what investment would be required by 2030 for low-income or lower-middle-income countries. Edejer et al. (2020) attempted to project the additional financial resources needed for an effective response to COVID-19.

Another group of academics focused on the relationship between different variables, includ-

ing economic and SDG achievement. Meurs et al. (2019) examined the incoherence between the economic growth and health goals of SDGs and found that GDP increases do not automatically mean increases in the countries' health spending. Lim et al. (2016) examined the relations between the socio-demographic index (SDI, a summary measure based on average income per person, educational attainment, and total fertility rate) and each of the health-related SDG indicators, and found SDI to be a good predictor of the SDG 3 indicators. Thus, it can be used for monitoring the progress in achieving SDG 3. Some academics have explored the contributions of health-care companies toward SDG 3 (Consolandi et al., 2020). Miralles-Quirós et al. (2020) focused on the assets related to sustainable development goals as investment opportunities and highlighted the profitability of developing an investment strategy based on two main SDGs: good health and well-being (Goal 3) and industry, innovation, and infrastructure (Goal 9).

The role of investment in SDG 3 achievement in the literature is usually discussed as a general recommendation. For example, Sachs et al. (2019) introduced six SDG transformations as modular building blocks for SDG achievement, including SDG 3. These transformations identify priority investments and regulatory challenges. Meara et al. (2015) discussed the role of life-saving surgical and anesthesia care in SDG 3 achievement and claimed that investing in sur-

gical services is a key element for saving lives and promoting economic growth. Based on the cross-cutting nature of surgery, obstetrics, and anesthesia, Roa et al. (2019) have claimed that investing in these services will speed up SDGs achievement. For Asi and Williams (2018), when it comes to meeting the ambitious health targets of SDG 3, digital health can help bridge the healthcare gaps in conflict-affected areas. This in turn requires a greater investment in data collection efforts. Nugent et al. (2018) discussed the issue of non-communicable disease reduction and concluded that a strengthened effort (across multiple sectors) with effective economic tools is necessary to achieve progress in meeting target 3.4.

Lozano et al. (2018) discussed the non-investment aspects of SDG 3 achievement. The progress of 41 out of the 52 health-related SDG indicators was measured and the health-related SDG index of 195 countries and territories during 1990–2017 was estimated. González-Pier et al. (2016) analyzed Mexico's mortality to assess the feasibility of reducing premature mortality and proposed a path to meet the SDG 3 related target (40% reduction in adult mortality by 2030). As can be seen, the academic literature related to the role of investment (including responsibility) in SDG 3 achievement is very fragmentary. Calculations of costs related to SDG 3 goals and target achievement are only the first step. Many important aspects are beyond the scope of cur-
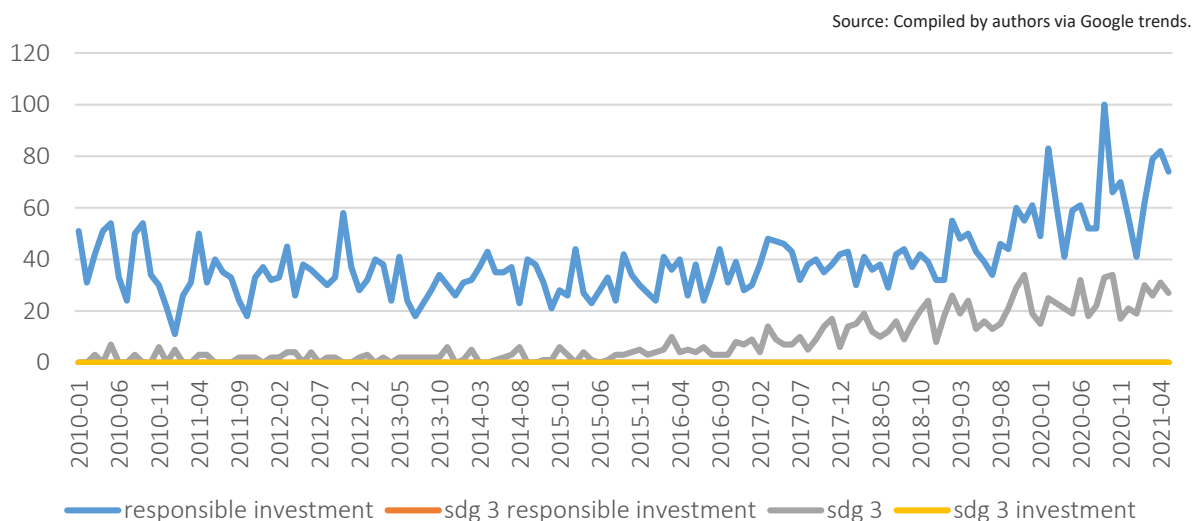
Source: Compiled by authors via Google trends.

Figure 5. Internet queries concerning "SDG 3," "SDG 3 and investment," "SDG 3 and responsible investment," and "responsible investment" in 2010–2021
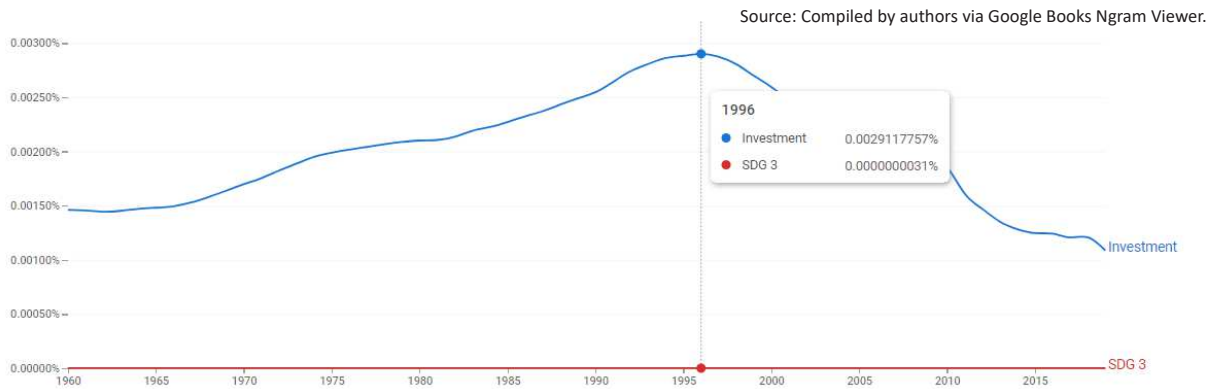
Figure 6. Ngram concerning "SDG 3 and investment" in 1960–2019
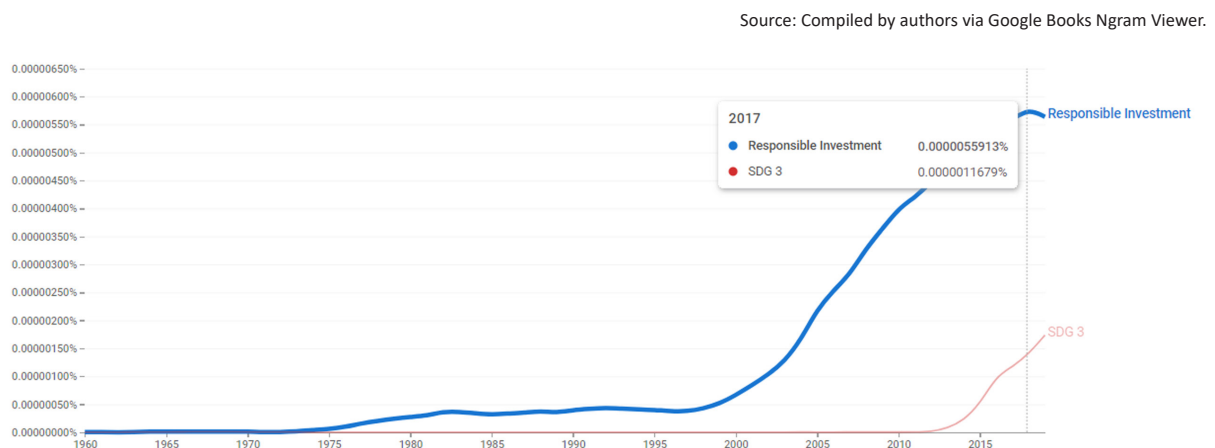
Figure 7. Ngram concerning "SDG 3 and responsible investment" in 1960–2019

rent literature. For example, financial and investment instruments to be used, efficiency estimations, new financial products and technologies, specifics of investment processes, and many others. These aspects are not usually discussed in the academic literature related to SDG 3. While Walker (2016) justified the necessity of shifting health funding sources from aid and loans to innovative domestic funding sources that prioritize health, he provided no concrete recommendations and steps. To fill these gaps, academics should shift the focus of research activity towards investment and responsible investment as the key elements of SDG 3 achievement.

3.3. SDG 3 and investment: analysis using Google Trends and Google Books Ngram

The modern data analysis tools enable the assessment of the priority and popularity of the research subject given the internet queries (Google Trends) and the frequency of the use of certain language units based on sources in Google Books (Google Books Ngram Analysis). Figure 5 shows the search queries for "SDG 3 good health and well-being", "SDG 3 and investment", "SDG 3", and "responsible investment", confirming the findings of the bibliometric analysis on the lack of popularity of investment and responsible investment in SDG 3.

However, responsible investment is more popular than SDG 3. The surge in search activity for these queries was observed during 2019–2021, which is due to the economic challenges of the COVID-19 pandemic. Google Books Ngram Viewer (Figure 6) allowed emphasizing that SDG 3 is not sufficiently highlighted in Google Books in the context of traditional investments.

Concerning SDG 3 and responsible investment, a significant frequency increase in thematic areas has been observed since 2000 for responsible investment, and since 2015 for SDG 3. A special surge has been observed in recent years.

CONCLUSIONS

Achievement of the 17 SDGs and their 169 targets by 2030 is of extreme importance at global and national levels. It solves the most crucial issues of humanity, such as global food and sanitary challenges, the need to improve healthcare systems, irreversible climate change, poverty, and gender inequality. In 2020, due to the COIVD-19 pandemic, special attention has been directed towards SDG 3. The inability of national healthcare systems to counteract pandemics reveals the serious problems hindering the achievement of SDG 3 (United Nations, 2020a, p. 28). One of the key reasons for this is the lack of financial resources. The size of the current investment gap measures hundreds of billions of dollars.

This paper aims to show that one of the possible reasons for this failure is the lack of sufficient academic support to provide a theoretical, methodological, and analytical framework for tackling the financing problem for SDG 3. Thus, a meta-analysis of SDG 3 and investment literature was conducted. Using SciVal Elsevier, VosViewer, Google Trends, and Google Books Ngram Viewer, articles published during 2010–2019 on SDG 3 and investment were analyzed. While there is significant interest in academic circles towards SDG 3 alone, it is focused mainly on medical aspects. The economic part, including investment, is poorly researched. This leads to the lack of theoretical support and proper empirical evidence to tackle the financing problem that hinders SDG 3 achievement.

Therefore, it is concluded that there is a research gap in this economically highly relevant policy field, which must be filled in to counter the problems outlined in the introduction. Without viable solutions in the area of financing and investment, there is a risk that the SDG 3 targets will not be achieved to the full extent, which will particularly affect the population in low- and medium-income countries (Nabukalu et al., 2020; United Nations, 2020a, p. 31). To fill in the financial gaps and thereby trigger the achievement of SDG 3, other (non-governmental) sources of funding are needed in addition to public finance (Cerf, 2019; United Nations, 2019, p. 32).

A very limited number of articles (less than 0.01% of publications are devoted to SDG 3) discuss the issue of investment and related topics. To fill these gaps, academics should shift the focus of research activity towards investment and responsible investment as the key elements necessary for achieving SDG 3. The most prominent objects of future research are financial and investment instruments (green and energy bonds, ESG-related ETFs, etc.), efficiency estimations, new financial products and technologies, specifics of investment processes, and others that are yet to be researched in academic literature.

AUTHOR CONTRIBUTIONS

Conceptualization: Inna Makarenko, Alex Plastun, Mario Situm, Giuseppe Sorrentino.
Data curation: Alex Plastun.
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Writing – original draft: Inna Makarenko, Alex Plastun, Yuliia Serpeninova, Giuseppe Sorrentino.
Writing – review & editing: Inna Makarenko, Alex Plastun, Mario Situm, Giuseppe Sorrentino.

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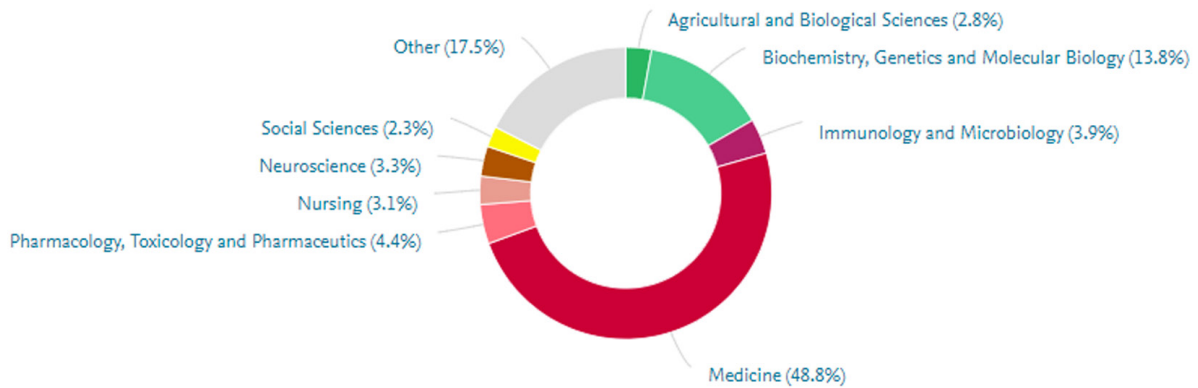# APPENDIX A. Research area by subjects, 2010–2019

Figure A1. Structural analysis by subjects for "SDG 3"
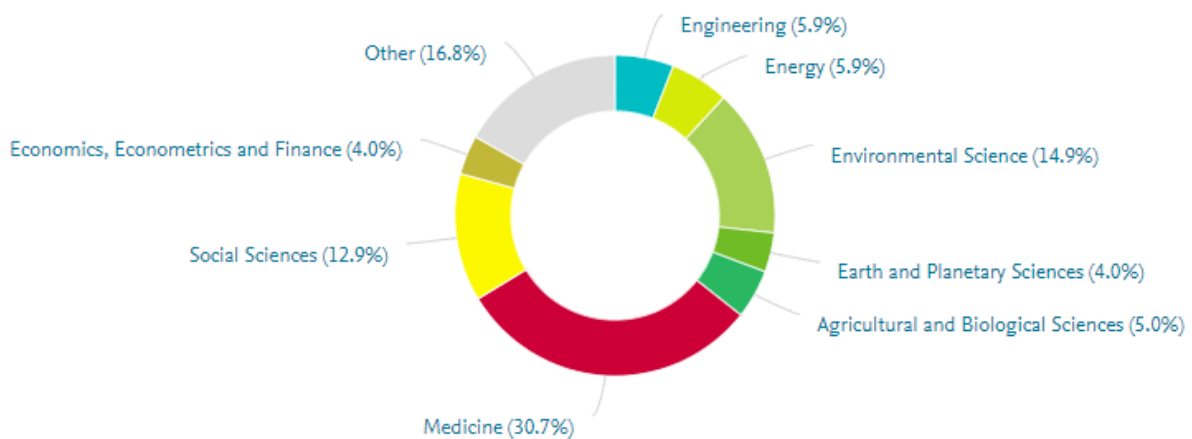

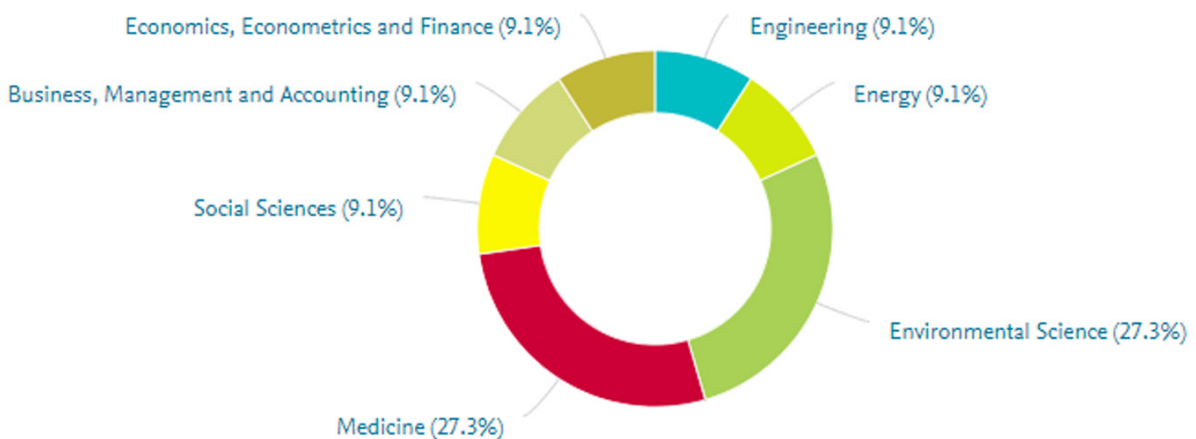**Figure A2.** Structural analysis by subjects for "SDG 3 and investment"

Figure A3. Structural analysis by subjects for "SDG 3 and responsible investment"

APPENDIX B

Table B1. Top 10 institutions, sectors, and countries in each research area by scholarly output, 2010–2019

Source: Authors' compilation.

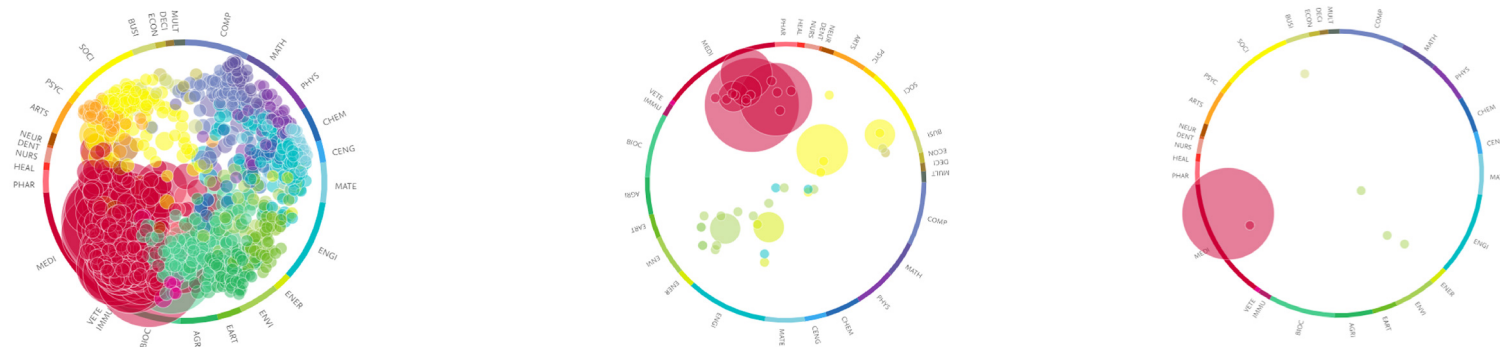| No.	SDG 3: good health and well-being				SDG 3 and investment				SDG 3 and responsible investment			
	Institution	Sector	Country	Output	Institution	Sector	Country	Output	Institution	Sector	Country	Output
1	Harvard University	A	US	156,860	World Health Organization	G	Switzerland	11	University of Malawi	A	Malawi	2
2	Institut national de la santé et de la recherche médicale	G	France	87,447	Imperial College London	A	UK	9	Deakin University	A	Australia	2
3	University of Toronto	A	Canada	78,737	Harvard University	A	US	9	Monash University	A	Australia	2
4	Johns Hopkins University	A	US	74,617	Stanford University	A	US	9	Alfred Hospital	M	Australia	2
5	National Institutes of Health	G	US	69,992	University of California at San Francisco	A	US	8	Royal North Shore Hospital	M	Australia	2
6	University College London	A	UK	60,566	King's College London	A	UK	7	Bhabha Atomic Research Centre	G	India	2
7	University of Pennsylvania	A	US	55,471	University of Oxford	A	UK	7	Nanyang Technological University	A	Singapore	2
8	University of California at San Francisco	A	US	53,946	Universidade de São Paulo	A	Brazil	7	Imperial College London	A	UK	2
9	University of Washington	A	US	52,446	University of the Witwatersrand	A	South Africa	6	King's College London	A	UK	2
10	University of Michigan, Ann Arbor	A	US	50,249	Monash University	A	Australia	6	University of Oxford	A	UK	2
	Total			740,331	Total			79	Total			20

Note: A – academic; G – government; M – medical.

APPENDIX C

Table C1. Top 10 authors by scholarly output and citation in each research area, 2010–2019

No.	SDG 3: good health and well-being			SDG 3 and investment			SDG 3 and responsible investment		
	Name	Output	Citations	Name	Output	Citations	Name	Output	Citations
1	Wiwanitkit Viroj, V.	1,472	1,332	Bhutta, Zulfiqar A.	5	1,829	Ismail, Edna Adan	2	1,210
2	Lip, Gregory Y.H.H.	1,305	73,401	Majeed, Azeem	5	1,851	Grimes, Caris E.	2	1,210
3	Hofman, Albert	1,178	98,674	Esteghamati, Alireza	4	1,814	Wilson, Iain H.	2	1,210
4	Raoult, Didier A.	957	28,204	Kinfu, Yohannes	4	1,814	Verguet, Stéphane	2	1,210
5	Brenner, Hermann	956	78,244	Meretoja, Atte	4	1,814	Dare, Anna J.	2	1,210
6	Kantarjian, Hagop M.	901	56,421	Roshandel, Gholamreza H.	4	1,814	el-Halabi, Shenaaz	2	1,210
7	Wong, Tienyin	893	54,288	Bertram, Melanie Y.	4	288	Kamara, Thaim Buya	2	1,210
8	Shariat, Shahrokh F.	890	30,096	Majdan, Marek	4	1,814	Alkire, Blake C.	2	1,210
9	Wareham, Nicholas J.	882	74,636	Eshrati, Babak	4	1,814	Weiser, Thomas G.	2	1,210
10	Serruys, Patrick W.	877	48,584	Kaul, Anil K.	4	1,814	Hagander, Lars E.	2	1,210

APPENDIX D

SDG 3: Good Health and Well-being

SDG 3 and Investment

SDG 3 and Responsible Investment

Note: COMP – Computer Science, MATH – Mathematics, PHYS – Physics and Astronomy, CHEM – Chemistry, CENG – Chemical Engineering, MATE – Materials Science, ENGI – Engineering, ENER – Energy, ENVI – Environmental Science, EART – Earth and Planetary Sciences, AGRI – Agricultural and Biological Sciences; BIOC – Biochemistry, Genetics, and Molecular Biology; IMMU – Immunology and Microbiology, VETE – Veterinary, MEDI – Medicine, PHAR – Pharmacology, Toxicology, and Pharmaceutics; HEAL – Health Professions; NURS – Nursing; DENT – Dentistry; NEUR – Neuroscience; ARTS – Arts and Humanities; PSYC – Psychology; SOCI – Social Sciences; BUSI – Business, Management, and Accounting; ECON – Economics, Econometrics, and Finance; DECI – Decision Sciences; MULT – Multidisciplinary.

Figure D1. Topics and topics clusters in each research area, 2010–2019

APPENDIX E

Table E1. List of articles based on the bibliometric map of publications concerning "SDG 3 and investment" and "SDG 3 and responsible investment"

No	Article	Bibliometric
1	Asi and Williams (2018)	The role of digital health in making progress toward sustainable development goal (SDG) 3 in conflict-affected populations. *International Journal of Medical Informatics, 114,* 114-120.
2	Bertram et al. (2018)	Investing in non-communicable diseases: An estimation of the return on investment for prevention and treatment services. *The Lancet, 391*(10134), 2071-2078.
3	Boyle et al. (2015)	Achieving a "grand convergence" in global health: Modeling the technical inputs, costs, and impacts from 2016 to 2030. *PLoS ONE, 10*(10).
4	Consolandi et al. (2020)	Material ESG outcomes and SDG externalities: Evaluating the health care Sector's contribution to the SDGs. *Organization and Environment, 33*(4), 511-533.
5	González-Pier et al. (2016)	Mexico's path towards the sustainable development goal for health: An assessment of the feasibility of reducing premature mortality by 40% by 2030. *The Lancet Global Health, 4*(10), e714-e725.
6	Lim et al. (2016)	Measuring the health-related sustainable development goals in 188 countries: A baseline analysis from the global burden of disease study 2015. *The Lancet, 388*(10053), 813-1850.
7	Lozano et al. (2018)	Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related sustainable development goals for 195 countries and territories: A systematic analysis for the global burden of disease study 2017. *The Lancet, 392*(10159), 2091-2138.
8	Meara et al. (2015)	Global surgery 2030: Evidence and solutions for achieving health, welfare, and economic development. *The Lancet, 386*(9993), 569-624.
9	Meurs et al. (2019)	How healthy is a 'healthy economy'? incompatibility between current pathways towards SDG3 and SDG8. *Globalization and Health, 15*(1), 1-13.
10	Miralles-Quirós et al. (2020)	Sustainable development goals and investment strategies: The profitability of using five-factor fama-french alphas. *Sustainability, 12*(5), 1-16.
11	Nugent et al. (2018)	Investing in non-communicable disease prevention and management to advance the sustainable development goals. *The Lancet, 391*(10134), 2029-2035.
12	Roa et al. (2019)	Global surgery and the sustainable development goals. *British Journal of Surgery, 106*(2), e44-e52.
13	Sachs et al. (2019)	Six transformations to achieve the sustainable development goals. *Nature Sustainability, 2*(9), 805-814.
14	Stenberg et al. (2017)	Financing transformative health systems towards achievement of the health sustainable development goals: A model for projected resource needs in 67 low-income and middle-income countries. *The Lancet Global Health, 5*(9), e875-e887.
15	Stenberg et al. (2019)	Guide posts for investment in primary health care and projected resource needs in 67 low-income and middle-income countries: A modelling study. *The Lancet Global Health, 7*(11), e1500-e1510.
16	Walker (2016)	Achieving health SDG 3 in Africa through NGO capacity building - insights from the gates foundation investment in partnership in advocacy for child and family health (PACFaH) project. *African Journal of Reproductive Health, 20*(3), 55-61.