

Health economics in Africa from 1991 to 2020: A systematic review

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Abstract

This systematic review was conducted to identify, evaluate and characterize the overall progress of health economics research conducted for Africa. Health economics studies carried out from 1991 to 2020 for Africa were retrieved from the EconLit database using relevant searching strategies. According to the methodology of Preferred Reporting Items for Systematic Review and Meta-Analysis, qualified journal papers were included. Using bibliometrics, we ran a series of analyses on authorship, studied countries, affiliations, and countries of origin, journals, and research topics. A total of 2935 studies were screened, and 178 were included in this review. We observed that the determinants of illness is the most researched topics. The United States, World Bank, University of California Berkeley, are respectively the most influential countries, world organizations, and academic institutions in the field of health economics of Africa. HIV/AIDs is still the leading health issue in highly cited health economics studies in Africa. *Health Policy and Planning* is the most productive and academically influential journal, and Kenya is the most studied country by health economists among all African countries. African health systems are vulnerable compared to developed countries, as many of them are underfunded. The academic strength in Africa is much weaker than that of leading health economics countries. Even within the continent, the academic development and the attention it receives are uneven. More influential health economics studies of Africa should be published in addition to the disease focus of HIV/AIDS.

Introduction

Research into health economics has a long history since the 1940s and modern health economics emerged in 1963 with American Economist Kenneth J. Arrow's seminal paper *Uncertainty and the Welfare*

Economics of Medical Care. After almost sixty years of development, health economics shows a flourishing trend and has become an independent sub-discipline in economics and a leading interdisciplinary science that bridges the gap between economic theory and healthcare practice.^{1,2}

In 2011, Wagstaff and Culyer used bibliometric data from American Economic Association's electronic bibliography database (EconLit) and citation data from google scholar to examine the global development of health economics over the past 40 years from 1969 to 2012.³ They noted that despite the expanding geographic focus, health economics in central Asia, Africa, and the Middle East remained relatively under-researched. Although being relatively understudied, Africa is the fastest-growing continent in terms of its population,⁴ and the Gross Domestic Product (GDP) growth data for Sub-Saharan Africa has already ranked at 2nd place in 2020.⁵ However, behind these promising development indicators, Africa still faces a very high poverty rate and a heavy disease burden.⁶ Meanwhile, under the heavy burden, health systems in African countries are much weaker and equipped with fewer health resources than their developed counterpart. Therefore, in such a complicated context of both opportunities and challenges, it is of immense meaning and importance for African societies to efficiently allocate health resources and get the maximum of their social welfare.

A large and growing body of literature has investigated the developing status of health economics in Africa. These studies were conducted from different perspectives, like country-specific evaluations of health care economics in South Africa,⁷ systematic reviews of health economic evaluation research in Zimbabwe,⁸ Nigeria and South Africa,^{9,10} and bibliometric analyses on collaboration patterns in the evaluation of health economics among countries in Sub-Saharan Africa.¹¹ Despite the conclusions drawn from previous studies, little is known about the overall state of health economics across Africa in the past thirty years.

Considering the paucity of health economics research addressing Africa and the critical importance of African studies, this systematic review aims to clarify the recent development of health economics in Africa from 1991 to 2020, including analysis of research topics, authorship, and distribution of both the study and studied country. This review is expected to give an insight into future research directions.

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Materials and methods

Database search

This systematic review was conducted as per Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA).¹² The review protocol was registered at the PROSPERO database for systematic reviews (CRD42021244973). EconLit is selected as the database to extract the journal articles. As one of the monodisciplinary classified databases, it

provides the Journal of Economic Literature (JEL) classification system of publications in the field of economics,¹³ saving great effort on the demarcation of research areas. According to the survey by Kosnik,¹⁴ JEL category codes do appear to represent papers on the research topics and themes one would expect to be assigned to those codes. Therefore, we adopted the current version as the filtering code for this paper. There are several other online databases collecting journal papers on health economics. Due to the lack of a classification system for health economics and our research emphasis on economics rather than medical/epidemiological studies, we decided to choose EconLit as a data source, the same as used by Wagstaff and Culyer,³ and Rubin and Chang.¹⁵

The search criteria used a combination of classification codes for health economics: 1*, journal article for publication type, Africa for the geographic region, and time range from 1991 to 2020. Citation data for extracted studies were retrieved from google scholar as one of the inclusion criteria. As we are using citation as the criteria for the academic impact of the health economics studies in Africa, the most comprehensive citation counts would be an important parameter for our analysis. Compared to other main citation data sources, Google scholar remains the best choice in terms of its coverage.¹⁶

Inclusion and exclusion criteria

Studies included in the review should have more than 100 citations and meet the requirements of a modified topic classification system from Wagstaff and Culyer:³ 1. health and its value; 2. efficiency and equity; 3. determinants of health and ill-health; 4. public health; 5. health and the economy; 6. health statics and econometric; 7. demand for health and health care; 8. medical insurance; 9. supply of health services; 10 human resources; 11. markets in health care; 12. economic valuation. Because their study put their emphasis on developed countries, we adjusted the detailed content of certain items to meet the regional characteristics of Africa (Appendix 1). All included studies were conducted for Africa (North and sub-Saharan Africa). We excluded the studies that are in the forms of book reviews, short papers, and conference papers because these types of publications often lack a complete qualitative and quantitative analysis process.

Screening process

The screening process was performed in two phases. Firstly, the titles and abstracts of all the identified records were screened

against the inclusion and exclusion criteria. Later, the full text of filtered bibliographic records was thoroughly read to ensure the criteria fulfillment. After these two rounds of screenings, the remaining studies were examined and included as eligible records for further data analysis. Because health economics is an interdisciplinary subject, it is often entangled with other economic sub-disciplines, like agricultural or educational economics. Due to the uncertainty and ambiguity of disciplinary scope, final decisions were reached via group discussion.

Risk of bias

Citation is a scientific tradition to identify those early researchers whose concepts, theories, methods, equipment, etc. inspired or were used by the author while conducting and presenting his or her research⁽¹⁷⁾. It represents the academic influence and quality of an article or an author, providing a criterion for paper inclusion. Therefore, we used the citation as the quality appraisal measure and one of the study's inclusion criteria.

Only journal articles were included as the study object. This selection increased the citation data accessibility. However, even with the wide coverage of google scholar, data missing still existed. In addition, the citation extraction tool used in this paper could only extract the first citation data in the result list, which showed that the corresponding citation is higher than the reality. To resolve the data incorrectness, we processed the extracted citation data as follows: sorted up the resulting data in descending order, filtered out journal articles with citations equal to or more than 100, and manually adjusted the citation data against google scholar to ensure the data accuracy.

Data extraction

Data were extracted independently by one reviewer and then checked by another. If there was any disagreement in the extracted data, two reviewers discussed to reach the final consensus. Author, institutions, journal name, year of publication, object country, country of origin, and research object were extracted via the following rules:

In terms of multi-author papers, we chose the first author because the first author was considered as the principal researcher of the study.¹¹ The author and affiliation information were checked manually. The research interests displayed on google scholar profiles were used as the author's background information. The displayed research interests are provided by the authors themselves at the time of record creation, but it can still

provide some clues about the authors' research background. The institution of targeted papers is the affiliation to which the paper belongs at the time of publication. The affiliation of the first author was extracted. In the case of multi-institutions of one author, the first one listed in the database record was adopted.

Country of origin represents the country of the corresponding extracted institution of that article.

In addition to total citations, the H-index (Hirsch index) was adopted as a numerical metric to evaluate the academic impact of authors and journals. This author-level indicator of research performance was proposed by Jorge Hirsch in 2005 and is defined as "*the number of papers with citation number > h*".¹⁸ The calculation logic is as follows: for an author A, all his/her publications are sorted in a descending order of the times cited, count from the beginning, when the sequence number is greater than or equal to its citation count, the value of h-index is the corresponding citation count.

Extrapolated from the logic of the h-index, the h-index of a journal for a given year is calculated by retrieving all source items of a journal in a given year, sorting them by the number of "Times Cited", and the number that ranks the highest yet remains below the corresponding "Times Cited" value is exactly the h-index of the journal in that year.¹⁹ Based on this logic, Google launched its journal ranking system, Google Scholar Metrics (GSM), in 2012. Using the information provided by Google Scholar, GSM summarizes the latest citations of many publications to help authors consider where to publish their new research. GSM has 6 metrics: h-index, h-core, h-median, h5-index, h5-core, and h5-median, where the last 3 items (h5*) of a publication are, respectively, the h-index, h-core, and h-median of its articles published in the last five complete calendar years. At the time of this paper, indicators are based on articles published between 2015 and 2019, both inclusive. Although there are many other journal ranking indicators and many criticisms against the limitations and errors of GSM, we use h5-index as the journal ranking indicator considering the data consistency with the citation data source, cover, age and ease of use. Data of these two indices in this paper were collected manually based on the author's name and journal name.

Data synthesis

A descriptive data analysis of the extracted data was conducted in a narrative report. Referring to the influence analysis,³ we used the number of journal articles and

citations as two bibliometric parameters for the academic impact analysis. The results were presented in the following logic: the general data characteristics were firstly interpreted, followed by an analysis of the topic categories specific studies, and an overall description of health economics for Africa.

Results

The initial database search yielded a total of 2935 references. 24 studies were excluded due to duplication and 2673 studies were excluded as their cited times count was below 100. The remaining 256 studies underwent the following two-round screening process against the inclusion and exclusion criteria, based on the title, abstract and full-text. In the first round of title and abstract screening, 78 studies were excluded because they were not in the field of economics (41 pieces), not in the field of health economics (32 pieces), not accessible (2 pieces), not specific to Africa (2 pieces) or not full text (1 piece). After the full-text screening, we finally included 178 for data analysis. The flow of study selection as per PRISMA is presented in Figure 1. The full selected paper list is in Appendix 2.

Authorship

There are 150 economists among the 178 articles selected, of which 52 authors' records were not found in Google Scholar Profile and 9 authors' areas of interest were not listed. From 1991 to 2020, Harold Alderman, Pascaline Dupas, and Kenneth L. Leonard each published four health economics articles on Africa, cited more than 100 times. Nineteen authors each produced more than one article that was cited over 100 times. Excluding authors with no record in the Google Scholar Profile, 98 authors by name, area of interest, H-index, total times cited of selected articles, and maximum citations of selected articles are in Appendix 2. The top five authors for the three indicators (H-index, total citation, and maximum citation) combined are: Esther Duflo, William Easterly, Michael Kremer, Harold Alderman, John Hoddinott, Martina Bjorkman, and Paul Glewee. It is worth noting that Duflo (a French-American economist at Massachusetts Institute of Technology) and Kremer (an American economist at Harvard University) shared the 2019 Nobel Memorial Prize in Economic Sciences with another economist Abhijit Banerjee, for their new experiment-based approach to fighting global poverty.²⁰

Figure 2 illustrates the top 50 words in their research interests, providing clues to the research background of leading researchers in the health economics of Africa.

Studied countries

East African countries account for the largest portion of highly cited articles, with Kenya and Tanzania leading the two countries. South Africa dominates the Southern African region as it accounts for more than 80% of the highly cited journal articles (18 pieces) from Southern African countries (22 pieces). In the Western African region, Ghana (16 pieces) and Nigeria (7 pieces) are easily distinguished as the focus countries for health economics research (Figure 3).

Affiliation and countries of origin

Altogether 106 institutions, including 16 in Africa, published more than one article with more than 100 times cited. The top 5 in terms of the article quantity were the World Bank (16 pieces), Harvard University (9 pieces), IFPRI -International Food Policy Research Institute (6 pieces), University of Chicago (5 pieces), and London School of Hygiene and Tropical Medicine (5 pieces). University of California, Berkeley was the clear winner,

beating all other institutions from a perspective of maximum citation.

On the origin of country, firstly from the perspective of highly cited health economics paper quantity, USA (75 pieces) takes a substantial lead. Leaving aside various world organization groups, the UK (21 pieces) and Canada (7 pieces) ranked in second and third place. South Africa (6 pieces) follow closely after Canada in the production of high cited paper, despite the domination from leading global north countries. Among all the listed 24 countries (except organizations), only 8 African countries are included, i.e. South African, Kenya, Tanzania, Ghana, Nigeria, Zimbabwe, and Uganda. Secondly, in terms of academic impact, the USA undoubtedly tops than all the other countries or organizations on maximum citation and total citation. Within African countries, Nigeria is the highest-ranking country on the maximum citation while South Africa comes out top on the total citation.

Journals

There are 49 journals from the selected 178 health economics papers. All the journals were issued by the United States, the

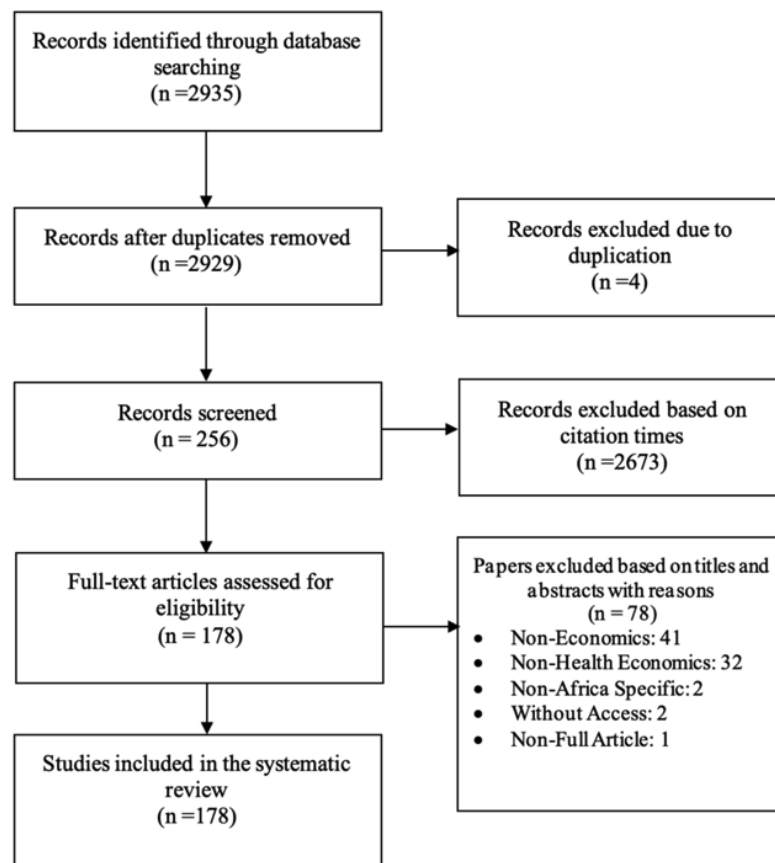


Figure 1. Flowchart of the study selection process.



Figure 2. Top 50 words in the area of interest.

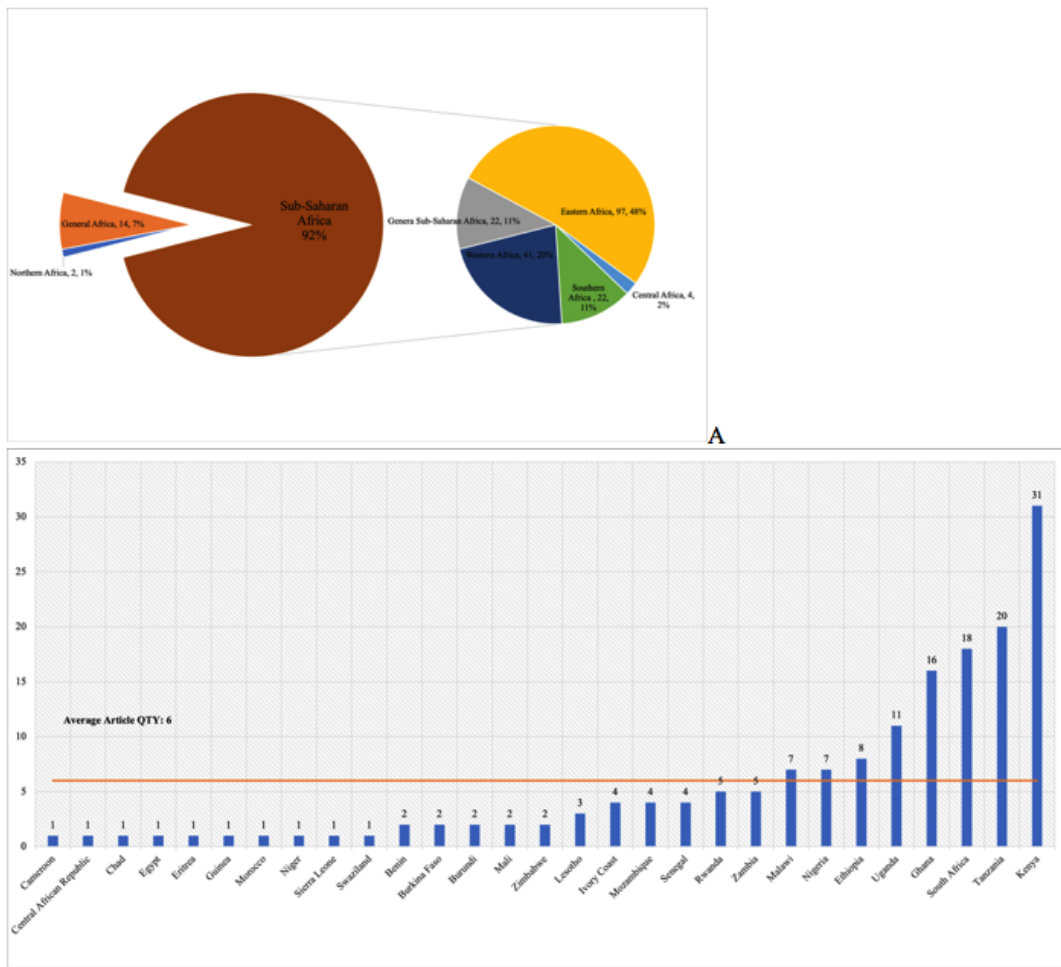


Figure 3. Studied-Country distribution for health economics for Africa. A) Regional distribution; B) Country distribution.

UK, Netherlands, and Germany. The five “African” journals, *South African Journal of Economics*, *African Development Review*, *Review of African Political Economy*, *Development Southern Africa*, and *Journal of African Economies*, were all issued by the UK. Among the selected papers, there were no journals issued by African countries. The top 3 journals with the highest number of papers were *Health Policy and Planning*, *World Development*, and *Health Economics*. From the perspective of maximum citations, *Econometrica*, *Oxford Economic Papers*, and *Quarterly Journal of Economics* occupied the top 3 positions. However, according to the H5 index, *American Economic Review*, *Quarterly Journal of Economics*, and *Journal of Political Economy* were the most influential journals for health economics studies in Africa. *Journal of Health Economics (JHE)* was the top-ranked journal in health economics by Wagstaff and Culyer,³ but did not rank as high as expected. JHE published only 4 papers on African countries with more than 100 citations and ranked in 8th place on the MaxCitation (Appendix 2).

Topic analysis

“Determinants of health and ill-health” had the largest share (31%) with 56 papers. Within this category, the most cited paper written by Glewwe studies the mother’s education and children’s health in Morocco

with Grossman’s function of health production.²¹ Various factors were analyzed for their correlation with health (mainly children and women): income shock, behavior determinants (mostly sexual behavior), agriculture, socioeconomic status, natural disasters (drought), cultural elements, political events (war), education, and refugees. “Health and the economy” had the second-largest share (18%) with 33 papers. The most cited paper in this category was from Alderman *et al.*,²² examining the impact of pre-school malnutrition on subsequent human capital formation in rural Zimbabwe. The economic impact of HIV/AIDs was the most frequently studied topic in this category and the following three top-cited papers in this category are all on HIV/AIDs: Young simulated the impact of the AIDS epidemic on future living standards in South Africa,²³ Yamano and Jayne studied the relationship between adult mortality and HIV/AIDs,²⁴ and Arndt and Lewis analyzed the macroeconomic effects of the AIDS epidemic for South Africa.²⁵ In addition to the economic impact of disease, there were papers on health expenditures analysis and healthcare financing. In the “Health statistics and econometric” category, which ranked at 3rd place, there were 17 papers. Edward Miguel and Michael Kremer jointly contributed three papers with randomized evaluation. On the Kenyan deworming program, they analyzed its educational and health exter-

nalities,²⁶ estimated peer effects in technology adoption, and clarified the movement of foreign aid donors towards sustainable community provision of public goods.²⁷ Kremer *et al.*²⁸ used the same methodology to measure the health impact and household valuation of spring water conservation in Kenya, an investment in improving source water quality. These three papers ranked among the top 5 highly cited papers.²⁶⁻²⁸ Using randomized field experiments, Björkman and Svensson were cited 904 times (2nd place) as it emphasized the importance of community monitoring on the health service quality in Uganda,²⁹ while Dupas tested whether and what information has changed teenagers’ sexual behavior in Kenya.³⁰ In the fourth category “Public Health”, foreign aid, health policy, non-profit government organizations, government, health systems, and health infrastructure were the main research topics. The most cited paper in this group was Easterly’s paper on the western aid efforts towards Africa.³¹ He contrasted two different aid approaches: the “transformational” and “marginal” approaches, and identified the two themes: escalation and the cycle of ideas.³¹ Led by Meenakshi *et al.*³² cost-effectiveness analysis on bio-fortification evaluation, the “economic evaluation” category contains 11 papers. Similarly, “Demand for health and health care” includes 10. The following category, “Supply of health services”, focuses on the

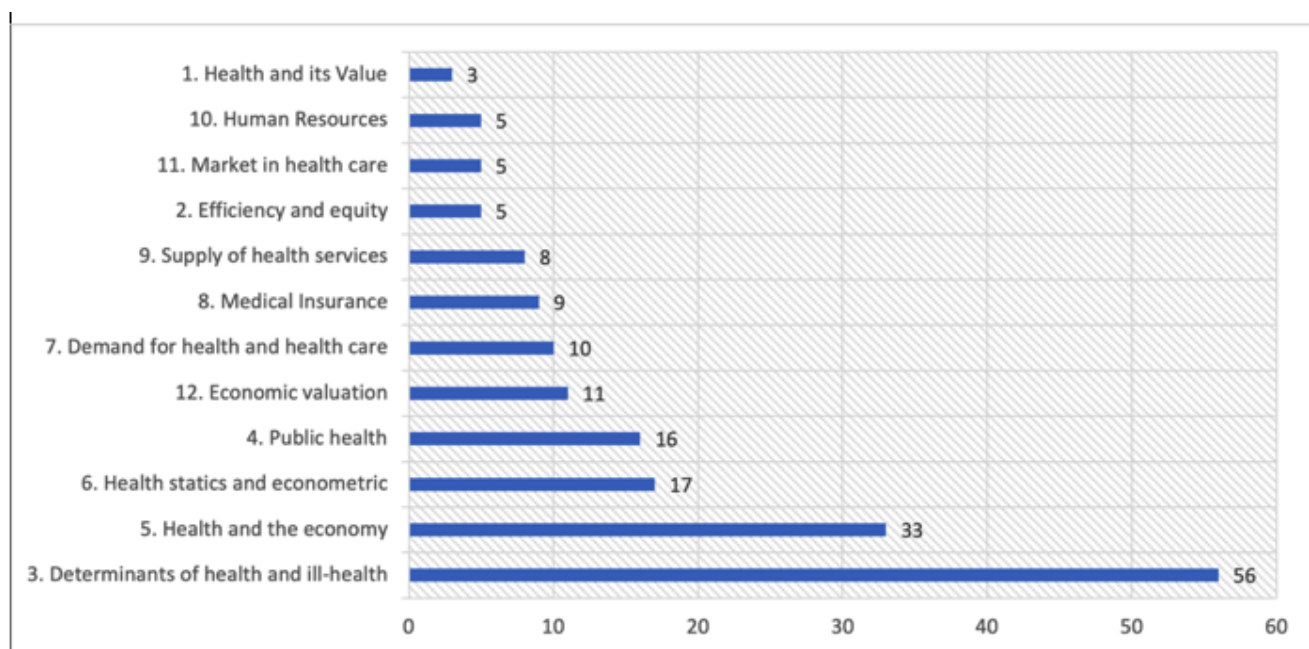


Figure 4. Topic distribution for health economics in Africa.

quality of healthcare and hospital management. “Efficiency and equity”, “Market in health care” and “Health resources” shared the same portion of papers (5 pieces), while “Health and its value” had the smallest part (3 pieces) (Figure 4).

Of the 178 selected health economics papers, health economists focused their attention on: HIV/AIDs (46 papers); Malnutrition/nutrition (40 papers); MNCH - maternal, newborn, and children health (15 papers); Infectious disease- malaria, pneumonia and vector-borne diseases (7 papers); non-communicable diseases- mental health and obesity (3 papers) and intestinal worms (2 papers).

Discussion

Summary of evidence

This review provides an overview of the most influential studies on health economics research in Africa from 1991 and 2020. It is easy to find from the authorship data that authors in health economics for Africa have a great academic impact and contributed to the discipline development. Compared to Michael Grossman (cited 2478 times), the top health economists given by Wagstaff and Culyer,³ American Economist Edward Miguel received the highest number of times cited (2501) through a single paper *Worms: identifying impacts on education and health in the presence of treatment externalities*. Besides, his co-author Michael Kremer, together with Esther Duflo and Abhijit Banerjee shared the 2019 Nobel prize in economic science for their experimental approaches to alleviate global poverty. However, researchers were quite diverse in their areas of interest. Except for health economics, development/ agricultural/ environmental/behaviour economics, global health, nutrition, and food security appeared with high frequency. This phenomenon can be understood in several aspects. On the one hand, health economics, as an independent sub-discipline in economics, developed at a high rate only after the mid-1960s. It uses traditional economic theory to consider health care issues.³³ In the context of Africa and globalization, health issues are so sophisticated to understand and require interdisciplinary knowledge support. On the other hand, economic development and poverty alleviation are the most important targets for African countries. Studying the determinants of disease and the relationship between health and the economy are of great importance for maximizing social welfare and benefits. The traditional theo-

ries and methodologies from econometrics contribute to the analysis in health care. In the topic analysis, the economic evaluation category ranked only at 5th in the number of papers. This result is inconsistent with the result of Wagstaff and Culyer,³ in which “economic evaluation” characterized by cost-effective/cost-benefit/cost-utility analysis is the second largest category. One important problem with economic evaluation in health is its publication bias: most evaluations are supported by pharmaceutical companies or by other means, favouring new drug treatment over control treatment.³³ As a result, economic evaluations of drugs and health intervention are less influential from an academic impact perspective than studies that are significant for economic development and social welfare.

As a general impression of the USA and UK in the field of health economics, these two countries remain the most influential in the development of health economics in Africa from the quantity of papers and citations. World organizations also play an important role in this area, especially the World Bank and the International Food Policy Research Institute (IFPRI), which is hardly mentioned by other literature. The vision and mission of both organizations – reducing poverty are aligned with the development goals of African countries. Comparing with these two organizations, the academic influence of the CARE International, the International Monetary Foundation (IMF), the Nevin Scrimshaw International Nutrition Foundation, the United Nations Economic Commission for Africa (UNECA), and the World Health Organization (WHO), in this field is much.

Most of the heavily cited health economics studies in Africa focus on HIV and malnutrition. According to WHO, 25.7 million people were living with HIV in 2018, which made the African region the most affected region.³⁴ However, due to the rapid expansion of antiretroviral therapy in high-prevalence countries and the extended life expectancy of people living with HIV, the global rate is declining in new HIV infections.³⁵ Meanwhile malnutrition, especially children’s nutrition status, a key role in human capital formation, is often used as an indicator of economic development and economic growth is conversely often considered a leading factor in reducing malnutrition. Other public health issues, such as mental health, obesity, and intestinal worms, did not receive much academic attention. Within Africa, health economics is unequally developed both internationally and intra-continently. Papers from local research institutions in Africa are at a disadvantage from total citations and paper quan-

ty. None of the journals issued in Africa are included in our review. Even journals titled with Africa, such as *South African Journal of Economics*, *African Development Review*, *Review of African Political Economy*, *Development Southern Africa*, and *Journal of African Economies*, are all issued from the UK. Finally, the development of health economics studies is varied within the African continent. Health care problems in Kenya, Tanzania, South Africa, and Ghana are much more studied and South Africa is the most influential African country in the field of health economics.

Limitations

This study has several limitations. Although EconLit and the latest version of the JEL code provide a reliable classification system, we still missed published health economics articles for Africa from other databases and studies before 1991. Besides, papers with relatively low citation rates or more recent topics were likely excluded due to the selection bias caused by citation times, which narrowed down the topic range. Despite the explicit topic classification guidelines, the complete correctness of topic classification cannot be guaranteed due to our subjectiveness and research topics overlapping.

Conclusions

Health care issues in African countries are of great significance and provides a good context for discipline development, particularly in poverty alleviation. However, the academic strength in Africa is much weaker than in leading health economics counties like the US and the UK. The academic development and attention received are also imbalanced within the continent. South Africa, Kenya, and Tanzania receive much more attention, with South Africa being the leading for a long time. Besides, HIV/AIDs are the top researching object in the field of health economics in Africa. Other health issues, such as non-communicable are less studied by health economists. Furthermore, compared to other world organizations, the study found that the World Bank plays an important role in health economics in Africa. We are hoping that the information given in this study can work as a guide for future researchers to explore further in health economics.

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