**Sub-Saharan Africa's Biomedical Journal Coverage in Scholarly Databases: A comparison of Web of Science, Scopus, EMBASE, PubMed, African Index Medicus and African Journals Online**

**Abstract**

**Objectives:** This study aims to find out the coverages of biomedical journals published in Sub-Saharan Africa in four international databases-Web of Science, Scopus, PubMed and EMBASE and two Africa-focused scholarly databases-Africa Journals Online (AJOL) and African Index Medicus (AIM).

**Methods:** Lists of active journals that are published in the 46 Sub-Saharan African countries were retrieved from Ulrich periodical directory. The journal lists of the six databases were searched for active journals from Ulrich directory.

**Results:** Only 23 of the 46 Sub-Saharan African countries had at least a biomedical journal in Ulrich. Though Nigeria had more biomedical journals, South African journals were the most represented in the international scholarly databases- WoS, Scopus, EMBASE and PubMed. Scopus (8.77%) and AJOL (8.77%) contains the highest number of biomedical journals from Sub-Saharan Africa, followed by EMBASE (8.17%) and AIM (7.80%).

**Conclusion:** This is evidence of the underrepresentation of Sub-Saharan African journals in the gold-standard scholarly databases.

**Keywords:** Web of Science, Scopus, AJOL, MEDLINE, EMBASE, Sub-Saharan Africa

**Introduction**

Citation databases are important in academia because they contain citation and bibliographic data that are useful for bibliometric studies. At first glance, citation and bibliographic data can provide information about the productivity, visibility, authoritativeness, experience and prestige of an entity. Bibliometric studies through deeper analysis, also called "science of science", helps to evaluate science and scientific evidence, understand the "conceptual and professional evolution" of science (Larivière *et al.*, 2012, p. 1000), scope and characteristics of the scientific network and communities (Sun *et al.*, 2016; Wagner and Leydesdorff, 2005) and relationships between bibliographic entities (publications, authors, countries etc).

Quality assessment of research is primarily built around data from these citation and bibliographic data sources and the academic community have established the use of citation as the gold standard for quality. Understanding the coverage of these citation databases is important because readers could interpret the results of assessments on research productivity, impact or visibility using datasets from these databases. Secondly, analysis of the coverage of the citation databases could illuminate their weaknesses or biases. On the other hand, interpreting the results of bibliometric studies without understanding the biases and coverage of these databases could lead to an unfair assessment of science, especially at the dimensions where imbalances exist. For instance, a previous study by Mongeon and Paul-Hus, (2016) that evaluated the journal coverage of WoS and Scopus showed “WoS or Scopus for research evaluation may introduce biases that favour Natural Sciences and Engineering as well as Biomedical Research to the detriment of Social Sciences and Arts and Humanities”.

*Coverage of Sub-Saharan African' Biomedical Research in the Scholarly Databases*

Studies on the coverage of biomedical research from Sub-Saharan Africa in scholarly databases are scarce. Schoonbaert, (2009) focused on the coverage of biomedical research from Sub-Saharan Africa on PubMed database. Schoonbaert, (2009) found out only 30 of 5375 journals in PubMed were published in Sub-saharan Africa. This is similar to Hofman *et al.*, (2009) that found out the number of biomedical journals indexed in PubMed increased from ten in 1995 to twenty-seven in 2008. Another relevant article by Nwagwu, (2005) reported that only eight of 121 local Nigerian biomedical journals were indexed in PubMed between 1967 and 2002. A literature search shows that there is no research that reports the coverage of biomedical research in other major scholarly databases such as Web of Science, Scopus, and EMBASE.

The scope of this study is the biomedical journals from Sub-Saharan African countries in six databases-WoS, Scopus, EMBASE, PubMed, African Index Medicus[[1]](#footnote-1) (AIM) and the African Journal Online[[2]](#footnote-2) (AJOL). AJOL and AIM are two databases that focused primarily on research from Africa. AJOL is an African scholarly database of journals from Africa. AIM on the other hand is a database of biomedical research from Africa and it is owned by the World Health Organization. PubMed and EMBASE are international biomedical databases, while Scopus and Web of Science are general-purpose scholarly databases. Another gap is a comparative study of the Sub-Saharan African biomedical journal coverages of these major scholarly databases. This study tries to answer this important research question about comparison of the coverages of Sub-Saharan biomedical journals in these databases.

**Methods**

*Data Collection*

Journal lists of all the 46 Sub-Saharan African countries were retrieved manually from Ulrich periodical database using the "country of publication" field in the advanced search interface. Delimiters were used to limit the retrieved results to periodicals in the journal categories and with active status. Ulrich's database usually multiple records for the different formats (eg. online and print), or languages in which a single journal is published. Duplicates were removed from the retrieved results.

Master journal lists for Web of Science indexes comprising of the Science Citation Index Expanded (SCIE), the Social Science Citation Index (SSCI) and the Arts and Humanities Citation Index (A&HCI) and Emerging Sources Citation Index ESCI. Master journal lists for Scopus, EMBASE and MEDLINE databases were downloaded from their respective publishers' websites. Master journal lists for AJOL was not available on the publishers' website. Therefore, the master journal list from AJOL was created manually by extracting journal information from the publishers' websites. Only active journals were included in the study, where active journals were defined as journals that have published at least an issue in 2021 or 2020. The master journal list for AIM was not available as well. The whole database comprising of 18,949 articles were downloaded with the source (journal names). Journals were sorted to identify unique journal names, where only 15,279 articles had identifiable journal names. Five hundred twenty-four unique journals were identified, with only 74 active journals. Journals that were not indexed in the AIM database in 2020 or 2021 were deemed inactive and were not included in the study. This study was not considered for ethics review because data used was collected from publicly available records.

*Journal Classification*

The Organization for Economic Cooperation and Development's (OECD) Frascati Manual 2015[[3]](#footnote-3), an international standard for classifying research disciplines and sub-disciplines, was adopted for classifying the journals. The Sub-disciplines were majorly drawn from the Medical and health sciences class- Basic Medicine, Clinical Medicine, Health Sciences, Medical biotechnology, and Other medical science. Other sub-disciplines were Biological sciences from the Natural sciences discipline and veterinary sciences from the Agricultural and veterinary sciences discipline.

**Result and Discussion**

Zero active journals were retrieved for twelve Sub-Saharan African countries -Burundi, Somalia, Sao Tome and Principe, Niger, Madagascar, Guinea, Guinea-Bissau, Gambia, Benin, Cote D'Ivoire, and Democratic Republic of Congo and Comoros) while one country (South Sudan) was not listed in the Ulrich periodicals directory. The following Sub-Saharan ten African countries: Eritrea, Botswana, Djibouti, Gabon, Lesotho, Swaziland/Eswatini, Liberia, Reunion, Angola and Burkina Faso were also not included in the study because they had no active biomedical journals. Only 23 Sub-Saharan African countries had at least one active biomedical journals and were included in the study. All the journals were written in English, some of them were also published in additional languages such as French (3.42%), Afrikaans (1.50%), Portuguese (0.86%), Arabic (0.21%) and Bengali (0.21%).

*Coverage by Country*

A total of 50% of all the Sub-Saharan African countries had at least one active biomedical journal in Ulrich. The representation of the 23 Sub-Saharan African countries with active biomedical journals on AJOL, PubMed, AIM, WoS, Scopus and EMBASE is presented in Table 1. There were 527 active biomedical journals from Sub-Saharan Africa on Ulrich. Nigeria (57.31%) had the majority of the journals, other countries with the highest number of journals are South Africa (19.88%), Kenya (7.02%), Ethiopia (4.29%), and Ghana (2.14%). Only the top five countries out of 46 Sub-Saharan countries accounted for 90.64% of all the journals and had more than 10 biomedical journals. AJOL (8.77%) and Scopus (8.77%), followed by EMBASE (8.19%) and AIM (7.80%) contained the highest number of journals from the Sub-Saharan African countries. Nigeria had almost three times more biomedical journals than South Africa. On the other hand, South Africa had more biomedical journals that were indexed in AJOL, PubMed, AIM, WoS, Scopus and EMBASE. For instance, the number of South African journals in Scopus, WoS, and PubMed were more than the number of journals from all other Sub-Saharan African countries put together. In addition, 50% of all the journals from Sub-Saharan African countries that were indexed in EMBASE are from South Africa. Only 11 (47.82%) of the 23 Sub-Saharan African countries featured in AIM, followed by EMBASE (10). AJOL (9), Scopus (9), WoS (7), and PubMed (6).

It is interesting to note that EMBASE (8.17%) contains more than double the journals that are published in Sub-Saharan Africa than PubMed (3.51%). The availability of data to compare these two databases is important because of the popularity of PubMed for research. This implies that EMBASE is potentially a more exhaustive of data source on research from Sub-Saharan Africa. Comparing the two general-purpose databases, it is not really a surprise that Scopus (8.77%) is more exhaustive than Web of Science (6.63%) in the coverage of journals from Sub-Saharan Africa bearing in mind that Web of Science is more selective than Scopus. A comparison of AIM and AJOL shows that the two Africa-based databases are comparable, though AJOL covered more journals than AIM.

**Table 1: Representation of the Sub-Saharan African Journals in the selected Databases**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Country |  |  | AJOL | MEDLINE | AIM | WoS | Scopus | EMBASE |
|  |  | N | % | N | % | N | % | N | % | N | % | N | % | N | % |
| 1 | Nigeria | 294 | 57.31 | 20 | 6.80 | 2 | 0.68 | 11 | 3.74 | 3 | 1.02 | 8 | 2.72 | 11 | 3.74 |
| 2 | South Africa | 102 | 19.88 | 8 | 7.84 | 10 | 9.80 | 16 | 15.69 | 24 | 23.53 | 27 | 26.47 | 21 | 20.59 |
| 3 | Kenya | 36 | 7.02 | 5 | 13.89 | 0 | 0 | 3 | 8.33 | 1 | 2.78 | 2 | 5.56 | 1 | 2.78 |
| 4 | Ethiopia | 22 | 4.29 | 5 | 22.73 | 1 | 4.55 | 3 | 13.64 | 2 | 9.09 | 3 | 13.64 | 1 | 4.55 |
| 5 | Ghana | 11 | 2.14 | 2 | 18.18 | 2 | 18.18 | 1 | 9.09 | 1 | 9.09 | 1 | 9.09 | 2 | 18.18 |
| 6 | Uganda | 8 | 1.56 | 1 | 12.5 | 2 | 25 | 1 | 12.5 | 2 | 25 | 1 | 12.5 | 2 | 25 |
| 7 | Sudan | 5 | 0.98 | 1 | 20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 8 | Mozambique | 4 | 0.78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9 | Tanzania | 4 | 0.78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 25 | 1 | 25 |
| 10 | Zambia | 4 | 0.78 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11 | Cameroun | 3 | 0.59 | 2 | 66.67 | 0 | 0 | 1 | 33.33 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | Malawi | 3 | 0.59 | 1 | 33.33 | 1 | 33.33 | 1 | 33.33 | 1 | 33.33 | 1 | 33.33 | 1 | 33.33 |
| 13 | Senegal | 3 | 0.59 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 14 | Zimbabwe | 3 | 0.59 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 15 | Republic of the Congo | 2 | 0.39 | 0 | 0 | 0 | 0 | 1 | 50 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 | Namibia | 2 | 0.39 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 17 | *Papua New Guinea* | 1 | 0.20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 18 | Mali | 1 | 0.20 | 0 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 0 | 0 | 1 | 100 |
| 19 | Mauritius | 1 | 0.20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 100 |
| 20 | Rwanda | 1 | 0.20 | 0 | 0 | 0 | 0 | 1 | 100 | 0 | 0 | 1 | 100 | 0 | 0 |
| 21 | Seychelles | 1 | 0.20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 22 | Sierra Leone | 1 | 0.20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23 | Togo | 1 | 0.20 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
|  | **Total** | **513** |  | 45 | **8.77** | 18 | **3.51** | 40 | **7.80** | 34 | **6.63** | 45 | **8.77** | 42 | **8.19** |

*Coverage by Sub-discipline*

Overall, using data from Ulrich, Clinical Medicine (46.98%), followed by Basic Medicine (37.23%), Health Sciences (35.67%), Biological Science (22.22%), and other Medical Sciences (11.69%) sub-disciplines were the most covered sub-disciplines in Sub-Saharan Africa. In contrast, Veterinary (4.09%) and Medical Biotechnology (5.26%) sub-disciplines were the least popular.

Figure 1 shows the all the sub-disciplines are well represented in AJOL's coverage of the journals. In contrast to AIM and PubMed that were heavy on the medical journals (Clinical Medicine, Basic Medicine, and Health Sciences). The focus of AIM and PubMed on Clinical and Basic Medicine and Health Sciences is surprising because the two databases included biomedical research. A comparison between Nigeria and South Africa was included to understand the country coverages of these databases at the sub-discipline level using visualization in Figure 1. Other countries were left out because data was not big enough for this category of comparison.Nigeria had more biomedical journals in total, about three times more than South Africa. More South African biomedical journals indexed in the international databases- PubMed, WoS, Scopus, and EMBASE in contrast to journals that are published in Nigeria, which are published in scholarly databases (AJOL and AIM) with an African focus. For instance, more than 20% of the journals from South Africa were indexed in WoS, Scopus and EMBASE, compared to less than 4% of journals from Nigeria.

Data from the top five countries were examined for trends using data from Table 2. Countries outside the top five were left out of this comparison because of the sparseness of data. Though the leading country (Nigeria) focused more on Basic Medicine than other sub-disciplines, it could be observed from Table 2 that the most popular sub-disciplines among the other four of the top five countries (South Africa, Kenya, Ethiopia, and Ghana) are clinical medicine and Health Sciences. Biotechnology sub-discipline journals were only existent in four Sub-Saharan African countries (Nigeria, South Africa, Kenya and Ghana). On the other hand, Basic Medical journals exist in 18 of the 23 Sub-Saharan African journals. Similarly, Clinical and Health Sciences journals exist in 17 of the 23 Sub-Saharan African countries.

**Figure 1: Representation of Biomedical Journals published in all the Sub-Saharan African countries, Nigeria and South Africa in the selected Databases**

|  |  |  |
| --- | --- | --- |
|  | Journals published in all the Sub-Saharan African countries |  |
|  |  |  |
| Journals published in Nigeria | Journals published in South Africa |
|  |  |
| Chart  Description automatically generated |

**Table 2: Journal Distribution by Country and Sub-Discipline**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S/N | Country | Journals in Ulrich Database | Basic Medicine | Clinical Medicine | Health Sciences | Medical Biotechnology | other Medical Sciences  | Biological Sciences | Veterinary Science |
|  Without duplicates | Biomedical |
| 1 | Nigeria | 970 | 294 | 128 | 117 | 101 | 21 | 35 | 75 | 11 |
| 2 | South Africa | 513 | 102 | 15 | 62 | 27 | 3 | 9 | 19 | 3 |
| 3 | Kenya | 198 | 36 | 18 | 21 | 18 | 1 | 6 | 7 | 1 |
| 4 | Ethiopia | 81 | 22 | 6 | 9 | 6 | 0 | 4 | 2 | 4 |
| 5 | Ghana | 72 | 11 | 4 | 8 | 6 | 2 | 2 | 1 | 0 |
| 6 | Uganda | 23 | 8 | 2 | 2 | 3 | 0 | 3 | 2 | 0 |
| 7 | Sudan | 6 | 5 | 2 | 4 | 3 | 0 | 0 | 0 | 0 |
| 8 | Mozambique | 11 | 4 | 1 | 2 | 2 | 0 | 0 | 0 | 1 |
| 9 | Tanzania | 43 | 4 | 2 | 2 | 4 | 0 | 0 | 0 | 0 |
| 10 | Zambia | 21 | 4 | 0 | 2 | 2 | 0 | 0 | 0 | 0 |
| 11 | Cameroun | 9 | 3 | 2 | 1 | 1 | 0 | 0 | 2 | 0 |
| 12 | Malawi | 18 | 3 | 2 | 1 | 1 | 0 | 0 | 1 | 0 |
| 13 | Senegal | 16 | 3 | 2 | 3 | 2 | 0 | 0 | 0 | 0 |
| 14 | Zimbabwe | 37 | 3 | 1 | 1 | 1 | 0 | 1 | 0 | 1 |
| 15 | Republic of the Congo | 2 | 2 | 2 | 2 | 2 | 0 | 0 | 0 | 0 |
| 16 | Namibia | 11 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| *17* | *Papua New Guinea* | 9 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 18 | Mali | 2 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 19 | Mauritius | 15 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 20 | Rwanda | 12 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 |
| 21 | Seychelles | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 22 | Sierra Leone | 3 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| 23 | Togo | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |

**Conclusion and Recommendations**

This study focused on finding out the coverage of biomedical journals that are published in the 46 Sub-Saharan African countries by six scholarly databases with two general-purpose, international databases-WoS, Scopus, two international biomedical databases- PubMed, EMBASE, and two Africa-focused databases-AIM and AJOL. In summary, this study found out that none of the databases covered up to 10% of the biomedical journals that are published in the Sub-Saharan African countries. EMBASE and AJOL scholarly databases covered biomedical journals from Sub-Saharan African than others, followed by Scopus and AIM. PubMed and WoS contained the least proportion of biomedical journals from Sub-Saharan Africa. Similarly, Nigeria housed more than half of all the biomedical journals from Sub-Saharan Africa. However, South Africa housed the highest number of journals that were indexed in the international scholarly databases-WoS, Scopus, PubMed, and EMBASE, more than all other Sub-Saharan African countries put together. Lastly, AJOL covered all biomedical sub-disciplines-Basic Medicine, Clinical Medicine, Health Sciences, Medical Biotechnology, other Medical Sciences, and Veterinary Sciences.

It goes without saying that Sub-Saharan Africa is underrepresented in science, including biomedical sciences globally. For instance, recent studies show that the contribution of Sub-Saharan Africa to global COVID-19 science is just 2.97% (Asubiaro and Shaik, 2021), while in 2013, it was reported by Confraria and Godinho (2015) that the whole of Africa, including Sub-Saharan Africa, contributed 2.6% of the global research. These studies base their assertions on data collected from the international databases, which this study have shown they index less than 10% of the journals from Sub-Saharan Africa. There is a need to establish re-think global research assessment using these scholarly databases that unfairly represent biomedical journals from Sub-Saharan Africa.

**Data Availability**

Data is freely available online doi: 10.17632/52pncd8zmy.1

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