REVIEW ARTICLE

Advocacy for Research Evidence in Academic Public Policy Development

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The World Ranking of Universities

The impetus for this review came from reading the July 2019 Webometrics global survey of universities[1]. The Webometrics survey is embraced widely in Africa, but it is less respected around the world when compared to more influential reviews like the Academic Ranking of World Universities, UK Times Higher Education World University Rankings and QS World University Rankings[2]. The low prestige is because Webometrics consider primarily institution web-presence and activities instead of the quality of instruction, student learning, and research productivity; the central core functions of the universities. In the most recent Webometrics survey, the University of Cape Town is the first mentioned university in Africa but ranked number 274 in the world[1]. The study also revealed the dominance of South African universities, capturing nine of the top ten institutions in Africa. The University of Ibadan first listed Nigerian university, ranked number 17 in Africa and number 1,233 in the world; outperformed by the University of Ghana, which ranked 16 in Africa and 1,209 globally[1].

After perusing through the report, I immediately called a colleague to share the bad news of the overall poor performance of African universities. We both agreed that the result of the survey is symbolic of the quality of education decline in Nigeria; a country with an educational system that was once the envy of most African nations. Given the dismal ranking of Nigerian universities, our conversation quickly shifted to another equally important academic topic - the recurring and apathetic lack of evidence when private and government establishments in Africa put forth public policies.

As I begin to write this review, the motion picture by Jerry Maguire titled "*Show me the Money*"[3] immediately came to mind. The film is a Hollywood romantic comedy-drama sports movie that grossed more than $273 million and ranked ninth highest in revenue in 1996. Cuba Gooding Jr. won the *Academy Award* for best-supporting actor role while Tom Cruise won the *Golden Globes* for best actor in a motion picture musical or comedy. He also bagged three other *Guild Awards* for his performance in the movie. But this review is not about Tinseltown, the land of make-believe. It is about the need to use empirical data when formulating public policies. For two decades now, evidence-based practice is globally accepted across different academic disciplines. Despite these developments, many academic policy decisions are still made in a vacuum without bibliometric research evidence by many science academies and government establishments in particular.

Measuring Productivity in the Scholarship Domain

Bibliometrics is a discipline that uses objective measures to evaluate academic productivity. The field is changing rapidly with the development of new assessment tools, parameters, and normative data, but its use in several academic disciplines is still in the developmental stage[4]. Today, bibliometric parameters are universally used to gauge scholarly productivity and contribution to disciplines. Of all the bibliometric measures, the h-index conceptualized by Hirsch[5] in 2005 has an impressive global appeal that led Harzing to infer that "*unless you have been hiding under a stone in the last ten years, you will probably have heard about the h-index*"[7]. H-index is a robust indicator of the importance and broad significance of a scientist's cumulative research contributions combining both quantity (number of publications) and quality (impact, or citations to this publication). Several bibliographic studies exist that compared the accomplishments of different countries in science and technology[8].

Many well-known bibliographic platforms, such as Elsevier's *Scopus*, Clarivate Analytics' *Web of Science*, *Google Scholar*, and Anne-Wil Harzing's *Publish or Perish*, are used to generate the h-index values for scholars. The *Web of Science* database requires a subscription fee to access. The *ResearchGate* and the *Google Scholar* provides the h-index of scholars who have created a profile. The *Publish or Perish* software is commonly used to retrieve and analyze several bibliometric parameters (h-index, citations, g-index, m-quotient, hc-index, e-index, g-index, and i-10 (i-n) index) derived from the *Google Scholar* database. *Publish or Perish* is convenient for obtaining the h-index of scholars who may not have a profile on *Google Scholar*[6, 7].

The Scopus provides a tracker feature that plots the chart for the h-index, citation and publication counts from 1970 to date. The *Web of Science* is used to generate the h-index for publications and citations from 1970 to date, but does not index published books, contribution to a book chapter, and conference proceedings. The h-index from the *Web of Science* does not reflect this scholarship sources. Before 1996, *Scopus* had limited publication coverage but better conference coverage. *Google Scholar's* conference coverage is the best because it has more journals, but like *Scopus*, it had limited publication coverage before 1990. The omission of conference proceedings in the databases is problematic for scholars in the computer science discipline, where conference proceeding is a critical component of their literature[9].

All bibliometric databases have different coverage reach, and but the parameters must not be compared directly. To test the fidelity of this statement, I obtained from the *ResearchGate*, *Scopus*, and the *Google Scholar* platforms the bibliometric data of seven scientists (Table1).

As shown in Table 1, the citation and h-index scores for each of the scientists on *Google Scholar* is consistently higher than the value for *ResearchGate* with the lowest amount reported by *Scopus*. For instance, scientists #1 had h-index of 80 on the *Google Scholar*, when evaluated on the *ResearchGate* garnered an h-index of 61 and 58 on *Scopus*. Next, the recent academic policy pronouncements made without supporting evidence by three African establishments will be discussed.

National Universities Commission

The accreditation and management of university education in Nigeria fall within the purview of the National Universities Commission (NUC). Nigeria has the most extensive higher education system in Africa but lags behind other emerging global economies like South Africa, Egypt, Thailand, Turkey, and Brazil. The decline performance in Nigerian universities is due to decades of underfunding, "brain drain" of lecturers in search of greener pastures and poorly conceived academic policies[10].

In furtherance of its regulatory mandate and consistent with global best practice, the NUC in June 2019 released new guidelines for the promotion of lecturers in Nigerian universities[11]. In the report, the NUC proposed the addition of bibliometric parameters to the less objective scholarship criteria presently used for appointment and promotion of lecturers. The Google Scholar's h-index of 40 and i10 index of 30 is the benchmark proposed for promotion of lecturers in the science disciplines to full professorial rank. For lecturers in the non-science disciplines, an h-index of 10 and i10 index of 18 is required. Oddly, the i10 indexes proposed for both the science and non-science lecturers are lower than the h-indexes. Typically, the h-index is higher than the i10-index.

To provide the answer to the question on the relationship between h-index and the i10-index scores, I accessed the Scopus and Google Scholar platforms to obtain bibliometric information for five Nigerian lecturers, each with over 30 years' experience as a full professor (Table 2). The result of my evaluation revealed that the h-index for highly accomplished lecturers is consistently higher than their i10 index. However, the stated relationship may not be valid for lecturers with h-index below 12.

In the example, the Google Scholar h-index of the three medical science lecturers was 30, 38 and 44. The non-science - English Literature and African History lecturers - had a Google Scholar h-index of 41 and 11, respectively. For promotion to full professor, the NUC proposed a Google Scholar h-index of 40 for the lecturers in the science disciplines and 10 in the non-science disciplines. With the h-index scores that the five lecturers accrued after three decades of academic experience, it is reasonable to conclude that the high benchmarks proposed by the NUC are unrealistic expectations for burgeoning Nigerian lecturers aspiring to be promoted to full professor.

Comparatively, the bibliometric parameters of the lecturers in the non-science disciplines are generally lower than those in the natural and health sciences (Table 2). The disparity is because non-science lecturers do not typically communicate their research in journals. Instead, they publish books and contribute to book chapters and conference proceedings - sources that are often not indexed by Google Scholar and

Table 1: Comparison of the bibliometric parameters of ResearchGate, Scopus and Google Scholar databases for selected scientists

S/N	***Research***	***Gate***			***Scopus***		***Google***	***Scholar***	
	Citations	Reads	H-index	Publications	Citations	H-index	Citations	H-index	i10-index
1	20,409	159,907	61	473	17,644	58	30,850	80	285
2	4,281	15,721	33	77	3,695	29	5,844	35	56
3	1,474	25,323	20	86	1,058	18	2,500	26	48
4	1,009	7,649	14	53	831	15	1,396	18	28
5	686	16,130	15	48	397	11	1,115	19	30
6	645	11,558	14	40	389	13	891	16	21
7	450	7,895	12	61	384	11	780	17	20

Table 2: Comparison of the Scopus and Google Scholar scores for science and non-science lecturers and Nobel Laureates in literature

S/N		**Scopus**		**Google**	**Scholar**	
	Publications	Citations	H-index	Citations	H-index	i10-index
	Science		Discipline		Lecturers	
1	206	3,490	29	7,855	44	135
2	150	10,583	24	14,475	38	106
3	106	2,391	23	3,834	30	56
	Non-Science		Discipline		Lecturers	
4	12	15	4	20,867	41	78
5	23	311	9	308	11	11
	Noble	Laureates	in	English	Literature*	
1	17	23	4			
2	2	2	1			

*Google Scholar values not available because the Nobel Laureates did not set up an account

Scopus[4, 12]. To discern this point of view, I also obtained on Scopus the bibliometric data of two Noble Laureate in English Literature. The journal publications, citations, and h-index scores for the non-science lecturers and Noble Laureates are much lower when compared to the medical science lecturers (Table 2).

Nigerian Academy of Science

The Nigerian Academy of Science (NAS) is one of the foremost independent educational organizations in Africa. The Academy shapes the policies and strategic direction of the development and advancement of science, technology, and innovation in the country. The current members consist of 245 distinguished Nigerian and three foreign academicians[13]. Recently, NAS adopted a Google Scholar h-index of 15 as an additional requirement for Fellowship status. Unfortunately, this recommendation is not based on any empirical evidence.

African Academy of Sciences

The African Academy of Sciences (AAS) is the flagship science academy on the African continent with the mission to use science and technology to transform lives and pursue excellence by identifying and recognizing deserving scholars through the election of Fellows and Affiliates. The 384 members of the AAS are the most talented scientists from 59 countries across the globe[14]. They are highly respected power players in the education and health sectors of their respective countries. They engage with government officials and policymakers to foster the technological development of the African continent. It is surmised that AAS Fellows have contributed significantly to the knowledge base in their disciplines, but there is presently no empirical data to bolster this speculation.

In 2019, the AAS for the first time required scientists applying for Fellowship to have a minimum Scopus h-index score of 20 and one of the scientist journal publications must have more than 100 citations[14]. Again, the decisions on the bibliometric requirements were made without any objective data on African scientists.

Literature Analysis

The minimum Web of Science h-index score required for membership of the USA National Academy of Sciences is 45. In 2005, the median h-index for 36 newly inducted members of the USA National Academy of Sciences in the biological and biomedical sciences was 57. On the other hand, the American

Table 3: Bibliometric profile of scientists from different academic disciplines

S/N	Citation	Country	Sample, year of study, and database used	Bibliometric indexes and salient findings
I	*Mugnaini* et al. *Comparison of scientists of the Brazilian Academy of Sciences and of the National Academy of Sciences of the USA on the basis of the* **h-** *index. Braz J Med Biol Res, April 2008, Volume 41(4) 258-262 http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0100-879X2008000400001*	Brazil	389 Brazilian Academy of Sciences (BAS) members from 10 disciplines. Data was collected in August 2006 from the Web of Science database. Data was compared with the USA National Academy of Sciences (UNAS).	Median H - index Disciplines / BAS / UNAS Biomedical 22 66 Health Sci. 20 83 Chemistry 18 56 Physics 16 37 Biology 12 44 Agriculture 10 36 Earth Science 9 37 Engineering 8 40 Mathematics 8 19 Human Service 3 16
ii	*Kellner and PoncianoI.* H-*index in the Brazilian Academy of Sciences - comments and concerns.* An. Acad. Bras. Ciênc. vol.80 no.4 Rio de Janeiro Dec. 2008 http://www.scielo.br/scielo.php?pid=S0001-37652008000400016&script=sci_arttext	Brazil	405 Brazilian Science Academy members from 10 distinct disciplines. Data was collected in January 2008 from the Web of Science database.	Mean Score Disciplines / H-index / Discipline / H-index Physics 16 Maths. 7 Chemistry 19 Earth Sc. 9 Agriculture 12 Human S 1 Biomedical 23 Biology 13 Engineering 8 Health 20
iii	Thompson DF. Publication Records and Bibliometric Indices of Pharmacy School Deans. Am J Pharm Educ. 2019 Mar; 83(2):6513, doi: 10.5688/ ajpe6513.	USA	124 Deans of pharmacy schools. Data was extracted from the Web of Science in 2016.	Attributes / Mean / Median / Range Publications 60 21 0-599 H-index 13 8 0 - 72 Citations 1,394 223 0–23,407 m-Quotient 2 1 0 - 15 Citations/yr. 431 112 0-571
iv	Tetè *et al*. Characterizing scientific production of Italian Oral Surgery professionals through evaluation of bibliometric indices. Ann Stomatol (Roma). 2014 Mar 31;5(1):23-9.	Italy	260 Italian oral surgeons. Data was collected from the Scopus data base in 2013.	Median Score Attributes / Academics / Clinicians / Range Publications 37 6 0-584

				H-index 7 2 0 - 41 Citations 196 31 0 - 7,187
V	Opthof and Wilde. Bibliometric data in clinical cardiology revisited. The case of 37 Dutch professors. Neth Heart J. 2011 May;19(5):246-55. doi: 10.1007/s12471-011-0128-y.	Netherlands	37 Dutch cardiology faculty members (full professors). Data was collected in 2010 from the Web of Science of Thomson Reuters.	Mean / Score Attributes: Articles published and cited 1971 - 2010 / Articles published and cited 2005-2009 Publications: 276 / 103 H-index: 40 / 19 Citations: 3,245 / 1,360 Citation/paper: 30 / 15
vi	Masic I. Evaluation of the Medical Academic Community of Bosnia and Herzegovina Based on Scopus Parameters. Med Arch. 2017 Jun;71(3):164-168. doi: 10.5455/ medarh. 2017.71.164-168.	Bosnia and Herzegovina	48 academicians from four Medical, Science and Arts Academies (AMNUBIH, ANUBiH, ANURS and HAZU B&H). Data collected on Scopus in 2016.	Attributes / Mean / Min. / Max. Publications: 83 / 5 / 432 H-index: 13 / 2 / 63 Citations: 1,694 / 3 / 31,113
vii	Khurshid *et al*. Gender Differences in the Publication Rate Among Breast Imaging Radiologists in the United States and Canada. AJR Am J Roentgenol. 2018 Jan; 210(1):2-7. doi: 10.2214/AJR.17.18303. Epub 2017 Nov 1.	USA and Canada	370 (male =112, women = 258) faculty in Diagnostic Radiology. Data was collected on Scopus between July 2016 -Jan. 2017.	Median Score Rank/Gender / Publication / Citations / H-index Asst. Prof Males: 13 / 109 / 17 Females: 9 / 81 / 4 Assoc. Prof Males: 57 / 295 / 19 Females: 10 / 117 / 6 Professor Males: 21 / 227 / 8 Females: 14 / 137 / 6
viii	Kamdem *et al*. Scientific performance of Brazilian researchers in pharmacology with grants from CNPq: A comparative study within the Brazilian categories. An Acad Bras Cienc. 2016;88(3 Suppl):1735-1742. doi: 10.1590/0001-3765201620150534. Epub 2016	Brazil	82 (men = 45, women = 37) pharmacology faculty members with varying national grantsmanship track record experience: 1A (Senior), 1B, 1C and 1D (Junior). Data was collected on	Mean Score Grant category / Publication / Citations / H-index 1A (Senior): 250 / 5,530 / 37

<table>
<tr><td></td><td>Aug 15.</td><td></td><td>Scopus, Nov. 2013.</td><td>
<table>
<tr><td>1B</td><td>132</td><td>2,208</td><td>24</td></tr>
<tr><td>1C</td><td>103</td><td>1,622</td><td>22</td></tr>
<tr><td>1D (Junior)</td><td>91</td><td>1,527</td><td>22</td></tr>
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</td></tr>
<tr><td>ix</td><td>Oliver von Bohlen und Halbach How to judge a book by its cover? How useful are bibliometric indices for the evaluation of "scientific quality" or "scientific productivity"? Ann Anat. 2011 May;193(3):191-6. doi: 10.1016/j.aanat.2011.03.011. Epub 2011 Apr 1. https://www.sciencedirect.com/science/article/abs/pii/S0940960211000768?via%3Dihub</td><td>Germany</td><td>32 members of the “German Anatomical Society.” Among them were 21 members of the Editorial Board of the “Annals of Anatomy” journal. Data was collected from the Web of Science database on September 11, 2010.</td><td>
<table>
<tr><th>Attributes</th><th>Mean</th><th>Range</th><th>SD</th></tr>
<tr><td>Publications</td><td>113</td><td>28 - 368</td><td>19.9</td></tr>
<tr><td>Citations</td><td>2190</td><td>256 - 11,198</td><td>387.1</td></tr>
<tr><td>Citations per paper</td><td>17</td><td>3.51 -35.3</td><td>3.0</td></tr>
<tr><td>H-index</td><td>23</td><td>10 - 61</td><td>4.1</td></tr>
</table>
H-index was significantly related to the total number of citations ($R^2 = 0.9104$; $p < 0.0001$).
</td></tr>
<tr><td>x</td><td>Kamdem et al. Productivity of CNPq Researchers from Different Fields in Biomedical Sciences: The Need for Objective Bibliometric Parameters-A Report from Brazil. Sci Eng Ethics. 2019 Aug;25(4):1037-1055. doi: 10.1007/s11948-018-0025-5. Epub 2018 Feb 5</td><td>Brazil</td><td>323 biomedical scientists from 4 fields with grantsmanship track records levels (1A to 1D). The data was collected between December 2013 to June 2014 from the Scopus database.</td><td>
<table>
<tr><th></th><th>Mean</th><th>Score</th><th></th></tr>
<tr><td>Discipline</td><td>Publications</td><td>Citations</td><td>H-index</td></tr>
<tr><td>Biochemistry</td><td>110</td><td>1,737</td><td>20</td></tr>
<tr><td>Pharmacology</td><td>131</td><td>2,172</td><td>21</td></tr>
<tr><td>Biophysics</td><td>93</td><td>1,331</td><td>17</td></tr>
<tr><td>Physiology</td><td>104</td><td>1,283</td><td>17</td></tr>
</table>
</td></tr>
<tr><td>xi</td><td>Rad et al. The H-index in academic radiology. Acad. Radiol. 2010; 17, 817–821</td><td>USA</td><td>683 radiologists from 47 programs. The data was obtained from the Scopus database between October and November 2009.</td><td>
<table>
<tr><th></th><th>Mean</th><th>Score</th><th></th></tr>
<tr><td>Academic rank</td><td>Publications</td><td>Citations</td><td>H-index</td></tr>
<tr><td>Chairperson</td><td>92</td><td>1,359</td><td>12</td></tr>
<tr><td>Instructor</td><td>15</td><td>125</td><td>1</td></tr>
<tr><td>Assistant Professor</td><td>18</td><td>209</td><td>2</td></tr>
<tr><td>Associate Professor</td><td>36</td><td>542</td><td>6</td></tr>
<tr><td>Full</td><td>105</td><td>1,443</td><td>13</td></tr>
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<table>
<tr><td></td><td></td><td></td><td></td><td>professor</td></tr>
<tr><td>xii</td><td>Lee et al. Use of the h index in neurosurgery. Clinical article. J. Neurosurg. 2009; 111, 387–392</td><td>USA</td><td>30 randomly selected programs; one faculty chosen randomly from each tenure rank. Data were obtained from the Google Scholar and Scopus database between March and April 2008. For comparison, the Google Scholar h index for the first five physicians on the editorial advisory board of the two leading journals in each medical specialty; editors-in-chief and associate editors were excluded.</td><td>
<table>
<tr><th></th><th>Mean</th><th>H-index</th></tr>
<tr><td>Academic rank</td><td>Google Scholar</td><td>Scopus</td></tr>
<tr><td>Chairperson</td><td>25</td><td>15</td></tr>
<tr><td>Assistant Professor</td><td>11</td><td>5</td></tr>
<tr><td>Associate Professor</td><td>17</td><td>8</td></tr>
<tr><td>Full professor</td><td>25</td><td>10</td></tr>
</table>
<table>
<tr><th></th><th>Mean</th><th>H-index</th></tr>
<tr><td>Specialty</td><td>Google Scholar</td><td></td></tr>
<tr><td>General Surgery</td><td>33</td><td></td></tr>
<tr><td>Urology</td><td>33</td><td></td></tr>
<tr><td>Oncology</td><td>29</td><td></td></tr>
<tr><td>Cardiology</td><td>28</td><td></td></tr>
<tr><td>Neurosurgery</td><td>27</td><td></td></tr>
<tr><td>Orthopedics</td><td>16</td><td></td></tr>
</table>
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Physical Society, require only an h-index of 15–20 to qualify for Fellowship.[9] Hirsch[5] posited that with 20 years' experience, "successful scientists" would typically have an h-index of 20, "outstanding scientists" have 40, and "truly unique scientists" would have h-index of 60.

The h-index values vary widely among academic disciplines. Between 1983 and 2002, the h-index of the top ten most highly cited scientists in the life sciences range from 120 to 191.[5] Among the 22 science disciplines, space science had the highest citations, followed by physics. Between 2000 and 2010, a physicist with 2,073 citations will be among the most cited 1% of physicists in the world. Space science has the highest citation threshold at 2,236, followed by physics and clinical medicine each at 1,390 and molecular biology and genetics in 1229. Environmental Science and ecology have fewer scientists and publication output with only 390 citations. These disciplines have lower citation thresholds with the smallest being social sciences (154), computer science (149), and multidisciplinary sciences (147). For promotion to associate professor in physics in the early 1980s, institutions in the USA recommend an h-index of 12 and 18 for promotion to full professor[9].

In the 1990s, at the London School of Economics the social science disciplines had lower h-indexes. For full professors, the h-indexes on *Google Scholar* ranged from 2.8 (in-law), 3.4 (in political Science), 3.7 (in sociology), 6.5 (in geography) and 7.6 (in economics). Professors in the social sciences typically have h-index that is about twice the value for a Lecturer 1 or a Senior Lecturer; the difference was smallest in geography[9].

In Search of the Evidence

H-index values of Science Academy scholars

The purpose of my analysis of the literature is to evaluate the relevance and veracity of the h-index benchmarks adopted by the NUC, NAS, and AAS. Using combination key-words of h-index, publication, and citation, I conducted an exhaustive search of the literature on the PUBMED and CINAHL databases to ascertain the academic productivity of African scientists. I obtained 27 "hits," but only 12 of them are related to my line of inquiry. Surprisingly, none of the 12 publications is from the African continent. Even though, as far back as 2008, two separate studies from Brazil, a developing country like many African nations, documented the h-index of the ten disciplines within their Academy of Sciences and compared the data with the USA National Academy of Sciences[12,15]. The bibliometric data that I obtained for scholars from different academic disciplines around the world are summarized in Table 3.

The Web of Science median h-index for the Brazilian Academy of Sciences ranges from three for human service scholars to 22 for biomedical science professionals. The h-index of the USA National Science Academy ranges from 16 (human service) to 83 (health science). For the biomedical professionals, the median score for the Brazilians was 22 and 66 for the Americans (Table 3i). The h-indexes for the Brazilians were substantially lower when compared to the Americans.

Another study from Brazil also reported that their Academy of Sciences scholars, had mean h-indexes on the Web of Science, which ranged from one (human service) to 23 (biomedical science). The mean h-index for the Brazilian biomedical scholars was 23 (Table 3ii). The Scopus h-index of the Bosnia and Herzegovina Academy scholars ranged from two to 63, with a mean score of 13 (Table 3vi).

H-index values of scientists from different academic disciplines

The Web of Science mean h-index for the deans of the School of Pharmacy in the USA was 13 and their median score was 8 (Table 3iii). The mean h-index for Dutch cardiology faculty was 40 for articles published and cited between 1971 and 2010 and 19 for manuscripts published and cited between 2005 and 2009 (Table 3v). The successful German scientists in Anatomy and Cell Biology had a mean h-index of 23 (Table 3ix).

The Scopus median h-index for the Italian oral surgeon faculty was seven and two for the clinicians (Table 3iv). In North America, the Scopus median h-index for diagnostic radiology assistant professor was four for women and 17 for men. At the associate professor level, the median h-index was six for women and 19 for men. Paradoxically, the median h-index for full professors were much lower; only eight for men and six for women (Table 3vii). The Scopus mean h-index for Brazilian pharmacology faculty with grantsmanship track records was 37 for those classified as 1A (senior), 24 for 1B experience, and 22 for those classified as 1C and 1D (Table 3viii).

Similarly, in the USA, the Scopus mean h-index for academic radiologists was one for instructors, two for assistant professors, six for associate professors, 13 for full professors, and 12 for chairpersons. The mean h-index of the radiology faculty was significantly lower when compared with the other medical specialties (Table 3xi). The Scopus mean h-index for Brazilian pharmacologists was 21, closely followed by biochemists with 20, while the biophysicists and physiologists each had 17 (Table 3x).

In the USA, within the discipline of neurosurgery, the Google Scholar mean h-index was five for assistant professors, 11 for associate professors, 16 for professors, and 25 for department chairpersons. The Scopus mean h-index was also found to be five for assistant professors, eight for associate professors, 10 for professors, and 15 for department chairpersons. The Google Scholar mean h-index for physicians in other medical specialties was significantly higher than the neurosurgeons. The Google Scholar mean h-index in general surgery and urology was 33, oncology was 29, cardiology was 28, neurosurgery was 27, and orthopedic surgery was 16. The h-indexes obtained from Google Scholar was significantly correlated ($r = 0.77$, $df = 113$; $p < 0.0001$) with those obtained from the Scopus database (Table 3vii).

Conclusions

In this review, I advocated for the use of research evidence when developing academic public policy. It is not clear why the NUC and NAS selected the Google Scholar database instead of the Web of Science or Scopus platforms that are more credible and universally respected. Eleven of the 12 studies that I analyzed obtained their bibliometric data on the Web of Science or the Scopus; only one study obtained data from both the Scopus and Google Scholar (Table 3vii). The Scopus is known to have comparable citations with the Web of Science,[16] but the Google Scholar cannot exclude self-citations[17].

All the studies that I reviewed from the science academies obtained their bibliometric data from the Web of Science or Scopus. Consequently, it is difficult to put in a global context the Google Scholar h-index benchmark proposed by the NAS. The Scopus h-index of 20, adopted by the AAS, is relatively higher than the mean h-index reported for the Bosnia and Herzegovina and Brazilian Academies, but much lower than the values for the USA National Academy of Sciences.

The data presented in Table 3 should be interpreted with caution because the data collection process occurred at different periods. For example, one of the studies[12] from the Brazilian Academy of Sciences was implemented in 2006, while the review of the Bosnia and Herzegovina Academies was in 2016 - a decade apart. Thus, comparing the bibliometric parameters of the two Academies from data obtained ten years apart may not reflect the current realities in both countries. Be that as it may, the information presented is useful in ascertaining the global benchmarks used by science academies and the criteria used for faculty appointment in different academic disciplines and ranks at a particular period. Nonetheless, the information presented can serve as a guide pending the outcome of bibliometric studies of scientists from different African (public and private) universities, academic disciplines, and science academies. Findings from such studies will enhance the comparability of the scholarship productivity of African scientists with their peers around the world.[8] After all, research output is now the yardstick for measuring the scientific and technological advancement of nations; countries with low research productivity remain underdeveloped[18].

It is pertinent to note here that previously published research findings from Africa are often not translated into any meaningful policy, patents, commercialized products, or tangible outcomes that create employment, or prevent diseases[19]. Consequently, ongoing research studies in Nigerian universities and research centers should henceforth focus on addressing local developmental challenges, promote economic growth, and improved the quality of life of the people. Furthermore, a national publications database and a functional National Research Council should be established and charged to formulate research priorities and oversee collaboration at national and international levels. The implementation of these recommendations will go a long way in jump-starting the nation's technological and social developments.

The take-home lesson from this review is that when presented with any public policy recommendation that is not fact-based, do not be intimidated to ask, show me the evidence? And when asking, feel free to be as animated as Tom Cruise, and Cuba Gooding Jr. in saying "show me the money"[3]! With concerted demands from several quarters, the career administrators, and technocrats will hopefully begin to use available research evidence when putting forth public policy recommendations. When the evidence is not readily available, it will be prudent to commission an investigation to search for it. A change in behavior by using empirical evidence in policy formulation coupled with increased funding of the universities will no doubt improve the global ranking of African universities.

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