

Growth, productivity, and scientific impact of sources* of HIV/AIDS research information, with a focus on eastern and southern Africa

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As channels of communicating HIV/AIDS research information, serial publications and particularly journals are increasingly used in response to the pandemic. The last few decades have witnessed a proliferation of sources of HIV/AIDS-related information, bringing many challenges to collection-development librarians as well as to researchers. This study uses an informetric approach to examine the growth, productivity and scientific impact of these sources, during the period 1980 to 2005, and especially to measure performance in the publication and dissemination of HIV/AIDS research about or from eastern or southern Africa. Data were collected from MEDLINE, Science Citation Index (SCI), Social Sciences Citation Index (SSCI), and Ulrich's Periodical Directory. The analysis used Sitkis version 1.5, Microsoft Office Access, Microsoft Office Excel, Bibexcel, and Citespace version 2.0.1. The specific objectives were to identify the number of sources of HIV/AIDS-related information that have been published in the region, the coverage of these in key bibliographic databases, the most commonly used publication type for HIV/AIDS research, the countries in which the sources are published, the sources' productivity in terms of numbers of papers and citations, the most influential sources, the subject coverage of the sources, and the core sources of HIV/AIDS-information.

Keywords: content analysis, databases, data mining, infometrics, information science, informetrics, library science, scholarly publishing

Introduction

While launching the global media initiative in response to HIV/AIDS, the former United Nations Secretary General, Kofi Annan, observed that "when you are working to combat a disastrous and growing emergency, you should use every tool at your disposal" (Kaiser Family Foundation, 2005). Indeed, as channels of communicating HIV/AIDS-related information, serials in general, and journals in particular, have increasingly become the major sources; hence, these information sources constitute an effective and reliable tool to be used in response to the HIV/AIDS pandemic. These sources have achieved tremendous reach and influence, and they provide the means to, as well as play a significant role in, an effective global campaign against the pandemic. Moreover, scientific journals especially play a vital role in the dissemination of research results, through publications whose importance in advancing the careers of scientists increases the possibilities of these journals to influence research priorities (Momen, 2004).

Since the first clinical case of AIDS was diagnosed in the United States in 1981, the amount of research, and by

extension the growth of literature in the HIV/AIDS subject area, has proliferated (Pratt, 1992; Begley, Check, Wingert & Conway, 2001; Konforti, 2001; National Institute of Allergy and Infectious Diseases [NIAID], 2003). This information explosion has changed the look and function of libraries, particularly biomedical libraries, bringing with it many challenges. The rapid increase in the number of journals publishing papers on HIV/AIDS research has left librarians and other information providers with the difficulty of choosing which sources to best supply to information users. Complicating matters, the cost of journal subscriptions has swelled over the years (Grant, 1994). Researchers are affected as well; although they now have a greater variety of sources in which to publish their findings, confusion reigns when it comes to choosing the right source to publish in — the source that can provide the broadest visibility and influence. Due to the financial constraints facing libraries, librarians have been urged to meticulously select sources in order to satisfy the dynamic and ever-increasing needs of patrons at a minimum cost. Davis (2002) recommends

* In this article, the term sources, which elsewhere is often used interchangeably with information resources or publications, herein refers only to items that publish or disseminate HIV/AIDS research findings and/or general information about the HIV pandemic. These items include: periodicals (e.g. science journals, magazines and newspapers), government reports, technical reports, conference proceedings, monographs, special publications, theses, books and audiovisual materials.

that librarians be discriminating selectors and spend limited financial resources on titles that are considered core to the collection.

This study examines the growth, productivity and scientific impact of HIV/AIDS-information sources, especially as related to eastern and southern Africa (henceforth referred to as E&S Africa), for the period 1980–2005. The results may provide information providers and seekers or users, in general, and, more especially, collection development librarians, in the two regions in particular, with a tool for selecting and developing HIV/AIDS-information sources. The specific objectives focused on the following questions:

- How many of the sources published in Africa are covered in each of the three electronic databases considered, namely MEDLINE, Science Citation Index (SCI) and Social Sciences Citation Index (SSCI)?
- How many sources publish HIV/AIDS research that is conducted in or about E&S Africa, and how much has each source contributed?
- Which sources are most-used to publish HIV/AIDS research that is conducted in or about E&S Africa?
- Which sources are most-used by published authors or researchers in E&S Africa in conducting their HIV/AIDS-related research?
- What percentage of different source types (e.g. journals, bulletins, newsletters, conference proceedings) includes HIV/AIDS research information, especially about E&S Africa?
- Where are these sources published, and what portion originates from African countries?
- What constitutes the core sources of HIV/AIDS-information on E&S Africa?
- What is each source's level of influence or scientific impact?

Literature review

There are as many reasons for evaluating information sources as there are different groups of people interested in information production, storage, dissemination and use. Researchers and other information users are advised to evaluate sources because not all 'information' is authoritative, objective, valid, reliable, timely or comprehensive (Kentucky Virtual Library, 2004a and 2004b). Sources of information have usually been primarily evaluated for content and scope; several informetric (or infometric) studies conducted to analyse the production, distribution, and influence of periodicals in general have shown the importance of conducting source evaluations. Pratt (1992) argued that an analysis of the number of periodicals publishing HIV/AIDS literature may be used to measure the disease's impact. Macias-Chapula (1990, p. 218) argued that in order for less-developed countries "to plan the allocation of resources for the development of their scientific programs" they "need to be aware of their scientific production and contribution," in terms of journals. Tague, Beheshti & Rees-Potter (1981) suggested that the growth in the number of publications (which can be measured in the form of articles or sources publishing those articles) can be used as an indicator of the growth of knowledge. Librarians, documentalists, and electronic database publishers are

particularly interested in evaluating sources for purposes of collection management (Thomson Scientific, 2002; Rousseau, 2002). Researchers, on the other hand, evaluate sources in order to discover the most-qualitative source in which they can publish their findings and, likewise, the ones in which they can access quality information relevant to their research activities (Rousseau, 2002). Rousseau (2002, p. 419, citing several authors) outlined several other purposes for which specific groups of people or institutions would evaluate a journal:

- Funding agencies and governments want their grantees to publish in the most prestigious journals;
- Editors and publishers may relate high citation scores to successful editorial practice and policy;
- Commercial publishers are interested in subscription data and sales;
- Information brokers are interested in finding the sources that have the greatest potential to satisfy their clients' needs;
- University research councils use journal impact scores and ratings of prestige as elements in local research-evaluation studies, with a view to enlarging the visibility of the university's research output.

Just as there are several purposes for which journals and other sources of information are evaluated, there are many approaches, techniques or methods that can be used to evaluate sources. Both non-bibliometric and bibliometric indicators can be used to judge the productivity, quality or influence of a source. Non-bibliometric indicators of source evaluation include circulation statistics, the prestige or reputation of the publishing company, the number of databases indexing a given source, the number of subscriptions and the corresponding amount of revenue, the number of interlibrary loan requests, and peer-review (Rousseau, 2002). Bibliometric indicators include citation-based measures, such as the "attraction-power of a source, the consumption factor, importance index, influence weight, source-standing, popularity factor, and the impact factors" (Garfield, cited in Pao & Goffman, 1990, p. 230; see also Diodato, 1994).

Source-evaluation studies date back to the 1920s when Gross & Gross analysed citation patterns in chemical education (Garfield, 1973; Thomson Scientific, 2004). In 1934, S.C. Bradford conducted a study of a bibliography of geophysics, and subsequently formulated what came to be known as Bradford's Law of Scattering or Bradford's Law of Dispersion. Since then, many studies have been conducted to evaluate journals in various subject disciplines (e.g. Rao, 1990). The ranking and identification of sources of HIV/AIDS-related research papers from or about particular geographic regions has been reported in certain bibliometric studies (e.g. Haiti: Macias-Chapula, 2000; Central Africa: Macias-Chapula & Mijangos-Nolasco, 2002). In a Haitian study, Macias-Chapula (2000) noted that most articles in the area of HIV/AIDS research were published in periodicals, which constituted about 84% of the total records. The author further observed that the title *International Conference on AIDS* was the leading source, followed by *New England Journal of Medicine*, *Journal of the American Medical Association (JAMA)*, *Analysis of Internal Medicine*, *The Lancet* and *Annals of the New York*

Academy of Science. Thus, *International Conference on AIDS* became the core source of HIV/AIDS literature for Haiti. The critical analysis of Haiti's sources indicates that most were general medical journals. A similar observation was previously made by Pratt (1992), who, upon excluding journals devoted entirely to AIDS research, found that leading medical journals, such as *The Lancet*, *JAMA* and *Nature*, published most HIV/AIDS-related papers.

By 1992 the pattern had begun to change. HIV/AIDS-specific journals began to dominate the scene. For example, in 1989 the *Journal of Virology* did not merit noticeable ranking, yet ranked number one in 1992 (Bierbaum & Brooks, 1995). This change has been attributed to the increased specialisation of HIV/AIDS-information sources. Other leading journals by the mid-1990s included *AIDS (Acquired Immune Deficiency Syndrome)*, *Journal of Acquired Immune Deficiency Syndromes*, *AIDS Research and Human Retroviruses*, and *International Journal of STD & AIDS*. Onyancha & Ocholla (2005) observed that, apart from *Journal of Adolescent Health*, the most productive journals of HIV/AIDS-information were HIV/AIDS-specific. In the order of their ranking, they were *International Conference on AIDS*, *AIDS Education and Prevention*, *AIDS*, and *International Journal of STD & AIDS*. Other specialised sources at present are *AIDS Care*, *Journal of Acquired Immune Deficiency Syndromes*, *National Conference on Women and HIV*, *AIDS Patient Care and STDs*, and *HIV-Infected Women's Conference* (Onyancha & Ocholla, 2005).

Assessments of journals have also ranked them according to their country of publication. The major contributing geographical regions have been developed countries. For instance, in Onyancha & Ocholla's (2004a) study, Switzerland led with 276 sources of HIV/AIDS-information, followed by Canada, Japan, The Netherlands, Germany, The United States and Italy. And Kenya, South Africa and Uganda were the only African countries that published HIV/AIDS literature on E&S Africa.

Methods

Records of HIV/AIDS-related documents from three databases (namely MEDLINE, Science Citation Index [SCI] and Social Sciences Citation Index [SSCI]) and specific to eastern and southern (E&S) Africa were identified and downloaded using two sets of keywords: 1) names of countries, and 2) HIV/AIDS terms, including the earliest terms with which AIDS was known. A combination of 26 keywords with 22 geographic names, using an advanced search mode, was adopted in extracting the data.

MEDLINE is an electronic database created by the National Library of Medicine on the campus of the National Institutes of Health in Bethesda, Maryland, USA. MEDLINE offers a wide range of information on such subjects as medicine, nursing, dentistry, veterinary medicine, the healthcare system and pre-clinical sciences, indexed from over 4 600 medical journals. SCI and SSCI, produced by Thomson Scientific (formerly, and herein, referred to as ISI [Institute for Scientific Information]), are multidisciplinary indexes to journal literature in, respectively, the sciences (SCI) and the social sciences (SSCI). SCI fully indexes 5 900 major journals, across 150 scientific disciplines (such as

biochemistry, biology, biotechnology, chemistry, medicine, paediatrics and pharmacology). SSCI indexes more than 1 725 journals, across 50 social science disciplines (including anthropology, history, library and information science, law, psychology and psychiatry, public health, social issues, social work, sociology, substance abuse, urban studies and women's studies). Whereas MEDLINE has medical subject headings that allow ready identification of articles on a specific topic, the use of SCI and SSCI (herein combined as ISI) requires proper selection of keywords to search for records in a given subject domain. Additionally, the three databases (MEDLINE, SCI and SSCI) do not share search platforms, a situation that prompted two separate strategies to be employed to search for HIV/AIDS-information records. MEDLINE's search platform differs from that of ISI's databases (SCI and SSCI). Therefore, during this study, data was extracted from SCI and SSCI using the same search platform, whereas data from MEDLINE was downloaded separately.

In each case the search was limited to author's address, title, abstract, and subject fields. The databases allow users to combine search terms/keywords using Boolean operators (AND, OR, AND NOT, and SAME [the latter in the case of ISI]) when one uses the advanced search mode. The following is an illustration of the search queries adopted for this study to download records (in the example, TI is an abbreviation for title, as the search was conducted within the title field):

TI Angola OR TI Botswana OR TI Djibouti OR TI Eritrea OR TI Ethiopia OR TI Kenya OR TI Lesotho OR TI Malawi OR TI Mozambique OR TI Namibia OR TI Somalia OR TI South Africa OR TI Sudan OR TI Swaziland OR TI Tanzania OR TI Uganda OR TI Zambia OR TI Zimbabwe.

Similar searches were conducted within the other fields, using the field's abbreviated form:

1. Subject/Topic *SU* (in MEDLINE) or *TS* (in ISI);
2. Abstract = *AB* (in MEDLINE);
3. Author's address = *AD* (in ISI) or *AF* (in MEDLINE), applied to geographic names only.

Relevant data were downloaded by year of publication and saved in .txt file format. This was done so that the files containing the downloaded data would be compatible with the bibliographic management software programmes that were used to analyse the data. The data were then 'cleaned' to remove duplicate and irrelevant records, and thereafter analysed as follows:

- By year of publication of the sources, in order to examine the growth trends of the sources;
- By the place of publication, to help determine the geographic distribution of the sources and the dissemination of the research findings;
- By number of citations, so as to measure a source's productivity in terms of the number of citations received;
- The citation impact (derived from the *Journal Citation Reports* [JCR]), provided by ISI only, was used to approximate a source's influence;
- By document type, in order to discover the most-preferred type of source in publishing HIV/AIDS-information from or about E&S Africa.

In addition, a Bradford analysis was conducted to identify

the core sources of HIV/AIDS-information, using both the number of papers and citations. A Bradford analysis refers to the analytic approach used by S.C. Bradford, in 1934, in his empirical study on the scatter of relevant articles within a subject domain in sources of information. He formulated what has come to be the most commonly used law in library activities and information studies, called Bradford's Law of Dispersion (or Law of Scatter). Bradford's Law states that:

"If scientific journals are arranged in order of decreasing productivity of articles on a given subject, they may be divided into a nucleus of periodicals more particularly devoted to the subject, and several groups or zones containing the same number of articles as the nucleus, when the number of periodicals in the nucleus and succeeding zones will be as 1:k:k², where the constant k is known as Bradford's constant or multiplier" (Ungern-Sternberg, 2000, Bradford's Law, para. 2).

Two periodical lists were also used to amass additional information about the sources (that is, facts that were not readily available in the databases, e.g. places of publication, number of sources published in E&S Africa, and subjects/disciplines that each source publication dealt with). The first was Ulrich's Periodicals Directory™ (© 2004), a comprehensive and continuously updated source of information on over 271 000 periodicals and serials, from 80 000 publishers, in over 200 countries. Ulrich's list includes annuals, continuations, conference proceedings, academic/scholarly publications, trade publications, consumer magazines, newsletters and bulletins. The directory also provides each publication's title, status, name of publisher, address and contact telephone numbers, name of editor, year of first publication, international standard serial number (ISSN), Dewey Decimal number, Library of Congress classification number, and British Library shelf mark. In addition, the directory identifies the subjects in which a given journal specialises, and these subjects are used in this study to classify the sources. The second was ISI's complete list of journals, which was appropriately used to provide required information that was not available in Ulrich's Periodicals Directory. ISI's list provides the journal title, frequency, ISSN, publisher, and place of publication of the journals indexed in the ISI main databases (these are the Arts and Humanities Index, Science Citation Index [SCI], and Social Sciences Citation Index [SSCI]).

The scope of the current study included all forms of HIV/AIDS-information sources as indexed and reflected in the MEDLINE, SCI and SSCI databases. The sources studied include journals, magazines, proceedings and newspapers. Newspapers and magazines, which are largely viewed as non-research/scholarly publishing sources, were included in the final analysis with the belief that they publish a great deal of biomedical research (Lewison, 2002). According to Lewison (2002, p. 179), newspapers are valuable sources of biomedical research: "Newspaper articles tend to focus on fashionable topics and to offer premature hopes of cures to disease, but they can also provide a valuable service in showing the importance of animal experiments to biomedical progress." That media's readership includes politicians, healthcare professionals, the general public and researchers. In view of the above, all document types (e.g. articles,

editorials, news items, reviews, comments, letters to the editors) were included in the analysis.

Finally, the citation impact factor and immediacy index were obtained from the ISI's *Journal Citation Reports* (JCR) for 2004.¹ The JCR is a unique resource for journal comparison and evaluation; it uses citation data from over 7 000 scholarly and technical journals worldwide; its coverage is multidisciplinary and international, as it incorporates journals produced by more than 3 000 publishers in 60 nations.

Finally, the data were analysed using the following software: Sitkis version 1.5 (© 2005), Microsoft Office Access (© 2003), Microsoft Office Excel (© 2003), Bibexcel (© 2005) and Citespace version 2.0.1 (© 2005).

Results

The results presented cover: production of source publications in eastern and southern (E&S) Africa; coverage in the three databases of the sources that are published in Africa; coverage of HIV/AIDS-information sources in MEDLINE, SCI and SSCI; distribution of records by document type; growth and distribution of sources according to publication year; geographic distribution of sources; sources' productivity; an approximation of sources' influence; distribution of sources by subject category; and, core sources of HIV/AIDS literature over the period 1980–2005.

Production of source publications in eastern and southern (E&S) Africa

According to Ulrich's Periodical Directory, as of April 2006, E&S African countries publish a total of 1 393 sources of HIV/AIDS-information (see Table 1). South Africa leads with a total of 916 sources, followed by Kenya (113), Zimbabwe (78), Tanzania (48), Malawi (40), Ethiopia (36), Zambia (35), and Uganda (30). There were no sources published in Somalia, while Djibouti and Eritrea (with one periodical each) did not produce any scholarly source.

A categorisation of the types of sources produced the following tally for those published in E&S Africa: 546 academic/scholarly, 278 newsletter/bulletin, 271 trade/business-to-business, 257 consumer, and 205 newspaper sources (Table 1). By comparison, the United Kingdom alone yielded 15 773 sources, consisting of 6 646 academic/scholarly, 572 newspaper, 2 134 newsletter/bulletin, 2 876 consumer, and 4 561 trade periodicals. On its part, the United States published a total of 52 604 sources, comprising 13 671 academic/scholarly, 9 856 newspaper, 12 375 newsletter/bulletin, 9 131 consumer, and 13 353 trade periodicals.

Coverage of sources published in Africa

As of February 2006, MEDLINE indexed a total of 27 HIV/AIDS-information sources published in Africa, which accounted for only 0.557% of the total number indexed in the database, with South Africa leading (with 9), followed by Nigeria (5) and Egypt (4), and Kenya and Tunisia producing two source publications each (Table 2). The thesaurus indexed one source publication each from Algeria, Ethiopia, Madagascar, Uganda and Zimbabwe. ISI (i.e. SCI and SSCI combined) indexed a total of 28 HIV/AIDS-information sources, consisting of South Africa's 23, two each from Kenya and Ethiopia, and one from Egypt.

Distribution of HIV/AIDS-information sources by database

As of 2005, there were 804 MEDLINE-indexed sources and 823 ISI-indexed sources publishing HIV/AIDS research about E&S Africa. Figure 1 shows that 430 sources were commonly indexed by the databases, while MEDLINE indexed 374 unique titles, and ISI 393.

Distribution of HIV/AIDS records by document type

There were a total of 38 of document types, with MEDLINE yielding 31 types and ISI producing 12 types. Table 3 ranks the 10 most common document types. Journal articles were the leading type of HIV/AIDS-information, with 4 770 records indexed in MEDLINE (about 77%), and 5 082 records indexed in ISI (about 80%). Other highly ranked document types were: letters to the editor, reviews, news items, editorials, comments, and meeting abstracts.

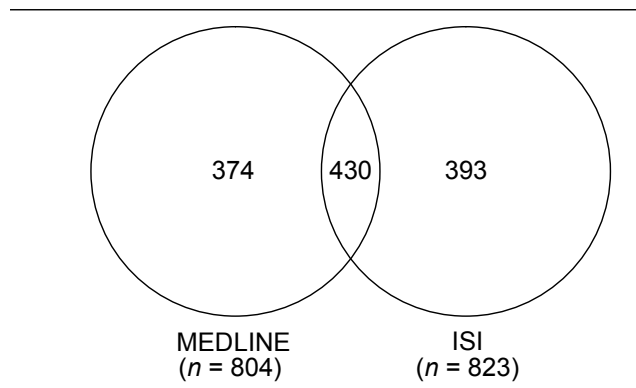


Figure 1: Distribution of HIV/AIDS-information sources from or about eastern and southern Africa, by database (ISI = SCI and SSCI databases combined), 1980–2005

Table 1: Number of sources published in eastern and southern African countries, according to source types, as of April 2006 (data source: Ulrich's Periodical Directory™). (Note that the totals in column 8 are not the sum of the figures in columns 3 to 7 because some sources can belong to more than one type category)

Rank	Country	Academic/ scholarly	Newspaper	Newsletter/ bulletin	Consumer	Trade/business- to-business	Total
1	South Africa	354	96	156	163	224	916
2	Kenya	50	15	36	16	9	113
3	Zimbabwe	33	14	10	16	22	78
4	Tanzania	31	7	9	3	4	48
5	Malawi	13	14	10	10	5	40
6	Ethiopia	13	6	16	7	1	36
7	Zambia	12	10	9	7	2	35
8	Uganda	10	15	3	11	0	30
9	Botswana	9	6	9	4	1	27
10	Namibia	9	10	2	8	2	24
11	Lesotho	3	6	3	3	0	13
12	Swaziland	3	3	3	4	0	10
13	Mozambique	1	1	6	3	0	9
14	Sudan	4	0	3	0	1	7
15	Angola	1	1	2	2	0	5
16	Djibouti	0	1	0	0	0	1
16	Eritrea	0	0	1	0	0	1
17	Somalia	0	0	0	0	0	0
Total		546	205	278	257	271	1 393

Table 2: Current coverage of HIV/AIDS-information sources published in Africa in three databases (MEDLINE, SCI and SSCI), as of February 2006

	MEDLINE (n = 4 844)	SCI (n = 6 474)	SSCI (n = 1 847)
South Africa	9 (0.186%)	19 (0.293%)	4 (0.217%)
Nigeria	5 (0.103%)	0	0
Egypt	4 (0.083%)	1 (0.015%)	0
Kenya	2 (0.041%)	2 (0.031%)	0
Tunisia	2 (0.041%)	0	0
Algeria	1 (0.021%)	0	0
Ethiopia	1 (0.021%)	2 (0.031%)	0
Madagascar	1 (0.021%)	0	0
Uganda	1 (0.021%)	0	0
Zimbabwe	1 (0.021%)	0	0
Total	27 (0.557%)	24 (0.371%)	4 (0.217%)

Growth and distribution of HIV/AIDS-information sources, 1980–2005

Table 4 shows the growth and distribution of HIV/AIDS-information sources, in each database, for each African country researched. Except for a few instances where the number of sources decreased in some countries, during the last 2½ decades, E&S African countries have generally witnessed continued growth in the number of sources that publish HIV/AIDS research. That pattern is most apparent in the countries that were highly ranked. For instance, sources in South Africa that published HIV/AIDS research increased from just two in the period 1983–1985, to a peak of 221 sources in 2001–2003 (MEDLINE); the same pattern was seen in ISI records, where the number of South African sources grew from three in 1983–1985, to 271 sources in 2001–2003. Similar patterns were recorded for Uganda and Kenya, ranked 2nd- and 3rd-most-productive, respectively, followed in rank by Tanzania, Zimbabwe, Zambia, Malawi and Ethiopia. The other African countries showed a mixed (rise/fall) pattern of growth in sources. The countries least-productive in publishing HIV/AIDS-information sources were Lesotho, Somalia, Angola and Eritrea.

Geographic distribution of sources

Consideration of the geographic distribution of sources was meant to identify countries in which HIV/AIDS research on E&S Africa is published, as well as to measure the extent of HIV/AIDS research visibility in those countries. The analysis excluded 30 sources in the MEDLINE database and two in the ISI database, for lack of information on the sources' place of publication.

In the MEDLINE database, there were 744 non-African source publications of HIV/AIDS research produced (i.e. 92.54% of the total 804 sources), and 803 sources in ISI (97.57% of the total 823 sources). Table 5 lists the 20 non-African countries found to be most-productive in publishing HIV/AIDS-related literature about E&S Africa. The United States was the most productive country, producing more than one-third of all the HIV/AIDS source publications indexed in MEDLINE (299 sources, or about 37% of the total) and in ISI (320 sources, or about 39% of the total). Second-most-productive was Great Britain (MEDLINE: 223 sources, or about 28% of the total; ISI: 270, or about 33% of the total), followed by The Netherlands, Switzerland,

Germany and Denmark (Table 5).

In Africa, only eight countries contributed to the publication of a total of 30 sources of HIV/AIDS-related information indexed in MEDLINE (3.73% of the database's total) and 18 in ISI (2.19% of the database's total) (Table 6). South Africa led with 16 sources recorded in MEDLINE (1.99% of the total) and 14 in ISI (1.7% of the total); the next-most-productive countries, in descending order, were Kenya, Zimbabwe, Nigeria, Malawi, Egypt, Uganda and Ethiopia.

Productivity per source

Table 7 provides the number of records each journal source produced, covering the period 1980 to 2005, in different databases. In the ISI database, the five-most-productive journal sources of HIV/AIDS research, in descending order of the number of records, were: *AIDS* (633), *The Lancet* (297), *South African Medical Journal* (273), *Journal of Infectious Diseases* (228) and *East African Medical Journal* (220). Seven journal titles were common to the 10 highest-ranking (most-productive) sources in each database. A notable difference between the bibliographic databases is in the outcome of their productivity-ranking for individual titles; for instance, whereas the *South African Medical Journal* ranked first in MEDLINE, it ranked third in ISI.

Journal influence

This section considers only the source (or record) type 'journal,' since ISI's 2004 *Journal Citation Record* (JCR) provides impact factors only for academic journals. Thus, journal influence was measured by the number of citations that a journal received and the journal's citation impact. Both regional (African) and international influence were measured. The impact factors listed in Table 8 were calculated based on citations made in 2004, referring to papers published in 2002 or 2003. Table 8 has been compiled to illustrate whether or not HIV/AIDS research papers published in or about E&S Africa are published in high-quality journals. Thus, a journal's impact factor is used here as a surrogate measure of influence and/or quality.

Among the journals that published HIV/AIDS research on E&S Africa, the *New England Journal of Medicine* had the highest impact factor (IF = 38.57), derived from 159 498 citations in 2004 of papers that had been published in 2002 or 2003. The journals with the next-highest IFs

Table 3: Proportions of document types in sources of HIV/AIDS-information, 1980–2005

Rank	Document type	MEDLINE (n = 6 178 records)		SCI and SSCI (n = 6 367 records)	
		No. of articles	%	No. of articles	%
1	Journal article	4 770	77.21	5 082	79.82
2	Letter to the editor	607	9.83	553	8.69
3	Review	329	5.33	273	4.29
4	News item	495	8.01	58	0.91
5	Editorial	125	2.02	308	4.84
6	Comments	292	4.73	0	0
7	Meeting abstract	0	0	265	4.16
8	Review, tutorial	258	4.18	0	0
9	Clinical trial report	245	3.97	0	0
10	Newspaper article	189	3.06	0	0

Table 4: Growth and distribution of HIV/AIDS source publications in Africa from 1980 to 2005 (M = MEDLINE; ISI = Institute for Scientific Information [SCI and SSCI databases combined])

Rank	M	ISI	Country	1980-82		1983-85		1986-88		1989-91		1992-94		1995-97		1998-2000		2001-03		2004-05	
				M	ISI	M	ISI	M	ISI	M	ISI	M	ISI	M	ISI	M	ISI	M	ISI	M	ISI
1	1	1	South Africa			2	3	11	10	34	25	52	54	85	86	154	160	221	271	152	242
2	2	2	Uganda	3		5		18	4	44	26	50	49	77	67	85	71	75	117	65	108
3	3	3	Kenya	1		5	1	18	9	32	26	37	43	48	61	57	78	72	84	49	77
4	4	4	Tanzania	1		2		12	5	28	13	45	38	57	52	58	73	48	91	40	81
5	5	5	Zimbabwe			1		7	4	32	17	38	38	44	48	41	43	49	90	32	63
6	6	6	Zambia			1		19	7	28	17	43	40	50	50	30	49	38	68	42	48
7	7	7	Malawi	1				2	1	12	9	24	19	35	40	34	43	40	66	46	58
8	8	8	Ethiopia	2				3	2	15	6	23	22	29	19	27	27	37	45	29	29
9	9	9	Botswana							2	1	6	3	9	2	16	11	33	43	24	27
10	10	10	Mozambique					3		4	2	5	6	12	5	4	8	13	16	9	12
11	11	11	Sudan			1		4	1	4	3	4	2	5	7	3	11	6	17	2	7
12	12	12	Swaziland							1	1	2	3	1	2	7	4	3	8	5	13
13	13	13	Namibia					1	1	2	1	2	3	8	5	8	8	5	6	3	3
14	14	14	Djibouti							4	5	6	3	1	4	1	5	2	2	2	2
15	15	15	Lesotho							4	5	6	3	2	2	2	3	4	6	4	4
16	16	16	Somalia					3	1	6	4	2	3	2	2	2	2	2	1	1	1
17	17	17	Angola					4	2	2	1	2		2	2	2	2	1	1	4	2
18	18	18	Eritrea													3	3	1	1	1	1
			Total	9	0	17	4	105	47	250	157	346	326	465	454	532	601	648	932	510	777

were *Nature* (IF = 32.182; 363 374 citations), *Science* (IF = 31.853; 332 803 citations) and *Nature Medicine* (IF = 31.223; 38 657 citations). Notably, no African journal featured among the top 52 journals, based on impact factors. The *South African Medical Journal* ranked 55 (IF = 1.107), based on 2 143 citations referring to 65 papers; the journal received an average of 32.97 citations per paper; its immediacy index was 1.123, and its cited half-life (see footnote 7, Table 8) was less than 10. Another African journal covered in the 2004 JCR was the *Ethiopian Medical Journal* (IF = 0.174), which received 153 citations referring to 28 papers; the journal generated an average of 5.46 citations per paper; its immediacy index was 0.071, and cited half-life was 8.8.

Table 9 (column 3) contains the number of citations that the ranked sources (journals) received in 823 total source publications for HIV/AIDS-related literature about E&S Africa; column 5 provides the total number of citations that the 823 sources received. The former has provided information on the sources used by HIV/AIDS researchers in E&S Africa, the latter is meant to measure the scientific impact

of HIV/AIDS-literature produced in or about E&S Africa, by totalling the number of citations the records published in each source received. Column 5 provides each journal's citation contribution (given in column 4) as a percentage of the total citations (i.e. 72 450).

Table 9 shows that the most-used journal by authors of HIV/AIDS literature was *AIDS*, which received 11 576 citations, followed by *The Lancet* (9 492), *Journal of Infectious Disease* (4 802), *New England Journal of Medicine* (4 093), and *Journal of Virology* (2 960). A total of 75 450 citations were made for the 823 sources that published HIV/AIDS-literature on E&S Africa. The biggest share of these citations was for papers published in *AIDS*, whose HIV/AIDS-related records attracted a total of 12 413 (17.3%) citations, followed by *The Lancet* (9 746 citations or 13.45%), and *Journal of Infectious Disease* (5 242 citations or 7.24%). The *South African Medical Journal* (1 804 citations) and *East African Medical Journal* (876 citations), which ranked poorly in the JCR, were among the most-consulted journals by authors of HIV/AIDS research from or about E&S Africa. Two other local journals that performed

Table 5: Number of source publications of HIV/AIDS research from the 20 most-productive non-African countries

	MEDLINE (<i>n</i> = 804 sources worldwide)			ISI (<i>n</i> = 823 sources worldwide)		
	Rank	No.	%	Rank	No.	%
United States	1	299	37.19	1	320	38.88
United Kingdom	2	223	27.74	2	270	32.81
Netherlands	3	31	3.86	4	34	4.13
Switzerland	4	23	2.86	8	13	1.58
Germany	5	22	2.74	3	35	4.25
Denmark	6	19	2.36	6	19	2.31
France	7	16	1.99	5	20	2.43
Canada	8	14	1.74	8	10	1.22
Ireland	9	12	1.49	7	14	1.70
Norway	10	11	1.37	11	6	0.73
Japan	11	9	1.12	13	4	0.49
Australia	11	9	1.12	9	8	0.97
Italy	11	9	1.12	10	7	0.85
Russia	12	6	0.75	14	2	0.24
Spain	13	5	0.62	12	4	0.49
Israel	14	4	0.5	14	2	0.24
India	14	4	0.5	13	3	0.36
Sweden	15	3	0.37	–	0	0
Belgium	15	3	0.37	15	1	0.12
Brazil	15	3	0.37	15	1	0.12
Total		725			773	

Table 6: Number of sources of HIV/AIDS-related publications from African countries, 1980–2005

	MEDLINE (<i>n</i> = 804 sources worldwide)			ISI (<i>n</i> = 823 sources worldwide)		
	Rank	No.	%	Rank	No.	%
South Africa	1	16	1.99	1	14	1.70
Kenya	2	4	0.50	2	2	0.24
Zimbabwe	3	2	0.25	3	1	0.12
Nigeria	3	2	0.25	–	–	0
Malawi	3	2	0.25	–	–	0
Egypt	3	2	0.25	–	–	0
Uganda	4	1	0.12	–	–	0
Ethiopia	4	1	0.12	3	1	0.12
Total		30	3.73		18	2.19

fairly well were the *Central African Journal of Medicine* and *Ethiopian Medical Journal*, which received 238 and 225 citations, respectively.

Distribution of sources by subject category

The data were analysed according to the subject categories of source-affiliation in order to measure the multidisciplinary nature of published HIV/AIDS research as well as to determine the subjects or disciplines that utilise HIV/AIDS research. There were 49 broad subject categories that included HIV/AIDS-related literature. Table 10 shows that the majority of sources belonged to the category Medical Sciences, which produced 488 sources in MEDLINE (60.70%) and 462 in ISI (56.14%). Ranking second was the category Biology, and the category Public Health and Safety was third. Other important categories including HIV/AIDS-information were Pharmacy and Pharmacology, Business and Economics, Psychology, and Nutrition and Dietetics.

A special analysis was conducted on the medical sciences-oriented sources. Table 11 provides the distribution pattern of the sources that fall into the category Medical Sciences. Overall, there were 30 subcategories of medical sciences, to which a total of 488 and 441 HIV/AIDS sources in MEDLINE and ISI belonged, respectively, with leadership taken by the category Medical Sciences – General, which recorded the highest posting: 132 and 117 sources in MEDLINE and ISI, respectively. The category Communicable Diseases was second, followed by the categories Obstetrics and Gynaecology, Allergology and Immunology, Oncology, Psychiatry and Neurology, Paediatrics, and Nurses and Nursing.

Core sources of HIV/AIDS literature from and about E&S Africa

Figure 2 compares the HIV/AIDS-related core sources in ISI and MEDLINE by the total number of records in each Bradford zone². In this analysis, Zone 1, otherwise known as Bradford's nucleus, consisted of 8 sources (1.00%) in MEDLINE and 9 sources (1.09%) in ISI (see Table 7: the top-eight journals in MEDLINE or ISI form Zone 1). Zone 2 comprised 47 (5.85%) and 38 (4.62%) sources, while Zone 3 produced 749 sources (93.15%) and 776 (94.29%) — in MEDLINE and ISI, respectively. Approximately 1% of the sources accounted for between 31% and 35% of the records and about 99% of the sources produced between 64% and 69% of the HIV/AIDS-related records in each database. In terms of citations, a total of 18 374 sources were cited by journals publishing HIV/AIDS research from or about E&S Africa, between 1980 and 2005. In other words, authors of HIV/AIDS-literature used a total of 18 374 sources to prepare their papers. These sources recorded a total of 149 631 citations, which amounts to approximately eight citations per source. An analysis of these sources showed that only 5.5% (1 016 sources) accounted for 80% (119 704) of the citations. Figure 3 shows the distribution of sources according to Bradford's zones. The results in Zone 1 show that 13 sources (0.07%) accounted for one-third (i.e. 50 072 or 33.46%) of the total citations. (Zone 1 therefore would comprise of the top-13 journals listed in Table 9.) Zone 2 consisted of 194 sources (1.06%), which attracted about one-third of the total citations (i.e. 49 840 or 33.31%), while Zone 3 produced 181 167 sources (98.87%), which received 49 719 citations (33.23%).

Table 7: Top-ranking journal sources of HIV/AIDS-literature according to the number of records in different bibliographic databases, 1980–2005

ISI		MEDLINE	
Rank	Source	Rank	Source
1	<i>AIDS</i>	1	<i>South African Medical Journal</i>
2	<i>The Lancet</i>	2	<i>AIDS</i>
3	<i>South African Medical Journal</i>	3	<i>The Lancet</i>
4	<i>Journal of Infectious Diseases</i>	4	<i>Journal of Acquired Immune Deficiency Syndromes</i>
5	<i>East African Medical Journal</i>	5	<i>AIDS Analysis Africa</i>
6	<i>International Journal of Tuberculosis and Lung Disease</i>	6	<i>East African Medical Journal</i>
7	<i>AIDS Research and Human Retroviruses</i>	7	<i>Journal of Infectious Diseases</i>
8	<i>Journal of Acquired Immune Deficiency Syndromes</i>	8	<i>AIDS Research and Human Retroviruses</i>
9	<i>International Journal of STD & AIDS</i>	9	<i>AIDS Care</i>
10	<i>Transactions of the Royal Society of Tropical Medicine and Hygiene</i>	10	<i>British Medical Journal</i>
11	<i>AIDS Care</i>	11	<i>Central African Journal of Medicine</i>
12	<i>Social Science and Medicine</i>	12	<i>International Journal of STD & AIDS</i>
13	<i>Clinical Infectious Diseases</i>	13	<i>Transactions of the Royal Society of Tropical Medicine and Hygiene</i>
14	<i>Sexually Transmitted Diseases</i>	14	<i>Social Science and Medicine</i>
15	<i>Sexually Transmitted Infections</i>	15	<i>Tropical Doctor</i>
15	<i>British Medical Journal</i>	16	<i>International Journal of Tuberculosis and Lung Diseases</i>
16	<i>Tropical Medicine & International Health</i>	17	<i>Nature</i>
17	<i>Bulletin of the World Health Organization</i>	18	<i>Bulletin of the World Health Organization</i>
18	<i>Journal of Virology</i>	19	<i>Tropical Medicine & International Health</i>
19	<i>Tropical Doctor</i>	20	<i>Pediatric Infectious Disease Journal</i>
20	<i>Ethiopian Medical Journal</i>	21	<i>Ethiopian Medical Journal</i>

Discussion, conclusions and recommendations

Ulrich's Periodical Directory™ reveals that eastern and southern (E&S) Africa published a total of 1 393 periodicals, as of April 2006. The majority were scholarly/academic periodicals, having recorded 546 postings. This source type (i.e. journal) is the one most commonly used to disseminate scholarly or scientific findings. Behrens (2000, p. 226) observes that scholarly periodicals "concentrate on articles which inform and report." Also important, particularly in biomedical research, are newspapers and newsletters.

Newspapers have increasingly become a major source of information on biomedical research; their readership includes politicians, healthcare professionals, the general public, and researchers who may value the immediacy of the reporting (Lewison, 2002).

The number of sources that are published in a given country will depend on a country's research output. This may account for the higher output from South Africa as compared to other countries in the two regions of study. Further research is recommended to study the correlation between the number of sources that are published in a

Table 8: Estimated impact of journals that published at least one article on HIV/AIDS research, for the period 1980–2005, ranked according to the impact factor (IF) given in the 2004 *Journal Citation Reports* (JCR); calculations are based on 823 total source publications of HIV/AIDS literature

Rank	Journal title*	2004 JCR					
		No. of citations ¹	No. of papers	Journal's average no. of citations	Impact factor (IF) ²	Immediacy index ³	Cited half-life ⁴
1	NEW ENGL J MED	159 498	316	504.74	38.570	10.478	6.9
2	NATURE	363 374	878	413.87	32.182	6.089	7.2
3	SCIENCE	332 803	845	393.85	31.853	7.379	7.0
4	NATURE MED	38 657	168	230.10	31.223	5.720	4.7
5	J AM MED ASSOC (JAMA)	88 864	351	253.17	24.831	5.499	6.3
6	LANCET	126 002	415	303.62	21.713	5.827	6.8
7	J EXP MED	63 416	321	197.56	14.588	2.436	7.0
8	J CLIN INVEST	78 271	350	223.63	14.204	2.554	7.8
9	J NATL CANCER INST	29 516	159	185.63	13.856	3.031	7.0
10	ANN INTERN MED	36 932	189	195.41	13.144	3.545	8.6
11	P NATL ACAD SCI USA	345 309	3 084	111.97	10.452	1.923	6.7
12	AM J RESP CRIT CARE	33 673	330	102.04	8.123	2.824	5.0
13	ARCH INTERN MED	26 525	282	94.06	7.508	1.262	7.0
14	BRIT MED J	56 807	623	91.18	7.038	3.039	7.3
15	J IMMUNOL	108 602	1 793	60.57	6.486	1.096	5.5
16	AIDS	17 503	359	48.75	5.893	1.128	4.5
17	CLIN INFECT DIS	23 917	431	55.49	5.594	1.684	4.6
18	AM J CLIN NUTR	26 010	377	68.99	5.433	0.960	7.3
19	J VIROL	74 388	1 464	50.81	5.398	0.985	5.9
20	J INFECT DIS	32 704	581	56.29	4.943	1.105	6.5
21	AM J EPIDEMIOL	22 292	266	83.80	4.933	0.842	9.2
22	CANCER	49 773	627	79.38	4.434	0.770	9.8
23	INT J CANCER	29 420	667	44.11	4.416	0.826	5.7
24	ANTIMICROB AGENTS CH	28 261	786	35.95	4.216	0.800	5.8
25	AM J MED	21 000	285	73.68	4.179	1.053	>10
26	J ACQ IMMUN DEF SYND	7 267	243	29.90	4.100	0.646	4.4
27	INFECT IMMUN	44 011	929	47.37	4.033	0.633	6.4
28	PEDIATRICS	28 316	661	42.84	3.903	0.935	6.6
29	INT J EPIDEMIOL	7 079	130	54.45	3.735	1.962	7.3
30	OBSTET GYNECOL	17 298	310	55.80	3.512	0.716	8.7

* ISI's abbreviations for journal titles

¹ A citation is an acknowledgement that a document, author or source receives from another. Citation counts are considered recognised units of influence or impact on technological and scientific (scholarly) development (Thomson Scientific, 2007).

² The annual JCR impact factor (IF) is the average number of citations in a given year, of articles published in a journal in the preceding two years (Rousseau, 2002; Thomson Scientific, 2007). Thus, the IF of a journal is calculated by dividing the number of current-year citations into the source items published in that journal during the previous two years.

³ According to Thomson Scientific (2007), the immediacy index is the average number of times that an article, published in a specific year within a specific journal, is cited over the course of that same year. This calculation, published in the *Journal Citation Reports* (JCR), is one developed for the ISI database as an indicator of the speed with which citations to a specific journal appear in the published literature. Such information is useful in determining which journals are publishing in emerging areas of research.

⁴ Cited half-life is a measurement used to estimate the impact of a journal. It is the number of years, going back from the current year, that account for 50% of the total citations received by the cited journal in the current year. ISI developed this calculation to provide an indicator of the long-term value of source items in a single journal publication (Thomson Scientific, 2007).

country or geographic region, and the number of papers that originate from that respective country or geographic region. Other factors that will influence research output in a country include funding and criteria for the promotion of scientists.

Coverage of HIV/AIDS-information sources was evenly distributed among the two indexing services — MEDLINE and ISI. Each database indexed almost an equal number of HIV/AIDS-information sources. Both databases index both article abstracts and full-text papers. Coverage overlap (36%) was relatively high. Approximately 50% of the titles indexed in each database were in common. This scenario has important implications for collection development librarians, especially as they must selectively choose database subscriptions, considering that electronic databases are relatively expensive, particularly for institutions in developing countries. Hence, it would be easier to decide on subscribing to two different databases if their number of commonly indexed sources is few, for instance below 20%; in that case, one may opt to subscribe to both.

An analysis of the data by document types was meant to identify the most-used sources in disseminating HIV/AIDS research. However, this approach provided partial results since some document types did not readily lead to the identity of the type of source publication (for instance, the document type 'editorial' could be affiliated to journals or newspapers). Nevertheless, the results do identify journals as the most-used means of disseminating HIV/AIDS

research findings, while other important sources included newspapers, conferences and conference proceedings, and books. Similar findings have been reported by Macias-Chapula & Mijangos-Nolasco (2002) and Onyanha & Ocholla (2004a and 2004b). Arguably, this pattern implies that much of the HIV/AIDS-literature is peer-reviewed, given that most (if not all) journal articles are peer-reviewed before publication. However, a substantive amount of HIV/AIDS-related literature from or about E&S Africa is not peer-reviewed, especially literature that is published in newspapers, as this study found a total of 189 records in MEDLINE.

Concerning the growth in sources publishing HIV/AIDS research papers from or about E&S Africa, the results indicate that most countries have witnessed a tremendous growth in the number of sources emanating from them. Exponential growth was also observed in the general trend of sources (as illustrated in the last row in Table 4). Notably, the average number of HIV/AIDS-related papers produced per source has kept an upward trend since 1980 to 2005. Similar findings were observed in previous studies by Self, Fildardo & Lancaster (1989) and Pratt (1992). Those studies reported a rapid growth of the journals that publish HIV/AIDS literature on an international level. For instance, Pratt (1992) observed that the number of journals indexed by MEDLINE rose quickly, from 17 in 1982 to 217 in 1983, and by 1990 more than 2 000 journals had published

Table 9: Most-used journal sources for HIV/AIDS research in eastern and southern Africa, 1980–2005 ($n = 72\ 450$)

No.	Journal title*	No. of cites in HIV/AIDS papers	Journal average cites	Total cites	%
1	<i>AIDS</i>	11 576	20.38	12 413	17.13
2	<i>LANCET</i>	9 492	34.81	9 746	13.45
3	<i>J INFECT DIS</i>	4 802	23.42	5 242	7.24
4	<i>NEW ENGL J MED</i>	4 093	72.64	1 816	2.51
5	<i>J VIROL</i>	2 960	37.07	2 521	3.48
6	<i>J ACQ IMMUN DEF SYND</i>	2 847	12.52	2 305	3.18
7	<i>JAMA-J AM MED ASSOC</i>	2 688	42.63	1 151	1.59
8	<i>AIDS RES HUM RETROV</i>	2 198	13.41	2 226	3.07
9	<i>SCIENCE</i>	2 150	9.36	131	0.18
10	<i>BRIT MED J</i>	2 121	16.45	1 382	1.91
11	<i>S AFR MED J</i>	1 804	4.76	1 377	1.90
12	<i>SOC SCI MED</i>	1 693	9.98	958	1.32
13	<i>J CLIN MICROBIOL</i>	1 648	17.85	928	1.28
14	<i>T ROY SOC TROP MED H</i>	1 391	9.21	1 114	1.54
15	<i>NATURE</i>	1 288	4.17	25	0.03
16	<i>CLIN INFECT DIS</i>	1 253	10.51	946	1.31
17	<i>ANN INTERN MED</i>	1 250	59.33	178	0.25
18	<i>B WORLD HEALTH ORGAN</i>	1 225	9.12	657	0.91
19	<i>INT J TUBERC LUNG D</i>	1 220	6.59	1 167	1.61
20	<i>SEX TRANSM DIS</i>	1 149	10.55	918	1.27
21	<i>P NATL ACAD SCI USA</i>	1 141	27.67	83	0.11
22	<i>TUBERCLE LUNG DIS</i>	1 081	24.53	785	1.08
23	<i>AM REV RESPIR DIS</i>	1 010	80	560	0.77
24	<i>J IMMUNOL</i>	1 006	45.55	410	0.57
25	<i>INT J STD AIDS</i>	989	7.70	1 009	1.39
26	<i>PEDIATR INFECT DIS J</i>	933	13.67	793	1.09
27	<i>AM J PUBLIC HEALTH</i>	909	15.06	467	0.64
28	<i>E AFR MED J</i>	876	3.82	630	0.87
29	<i>GENITOURIN MED</i>	861	15.48	681	0.94
30	<i>AIDS CARE</i>	786	5.06	541	0.75

* ISI's abbreviations for journal titles

at least one HIV/AIDS-related article; Self, *et al.* (1989) observed that only 14 journals published HIV/AIDS papers in 1982, but this figure surged, and within a span of five years it had reached 1 170 journal sources. The implications of such rapid growth of journals for libraries and librarians are enormous. The situation requires librarians to spend as little money as possible to acquire most of what is published in the sources. Researchers, too, are affected by the rapid growth of HIV/AIDS literature. They may find

Table 10: Distribution of the sources by main subject categories, 1980–2005

Subject	MEDLINE (<i>n</i> = 804)		ISI (<i>n</i> = 823)	
	No.	%	No.	%
Medical Sciences	488	60.70	462	56.14
Biology	81	10.07	101	12.27
Public Health and Safety	32	3.98	31	3.77
Pharmacy and Pharmacology	18	2.24	23	2.79
Business and Economics	18	2.24	20	2.43
Psychology	16	1.99	22	2.67
Nutrition and Dietetics	11	1.37	14	1.70
Chemistry	10	1.24	13	1.58
Education	8	1.00	12	1.46
Social Services and Welfare	12	1.49	8	0.97
Sciences (comprehensive works)	6	0.75	11	1.34
Population Studies	7	0.87	7	0.85
Social Sciences	3	0.37	11	1.34
Women's Health	10	1.24	4	0.49
Law	12	1.49	1	0.12
Veterinary Science	5	0.62	7	0.85
Anthropology	5	0.62	6	0.73
General-interest periodicals	10	1.24	0	0
Political Science	2	0.25	8	0.97
Sociology	3	0.37	6	0.73
Agriculture	3	0.37	5	0.61
Geography	1	0.12	7	0.85
Occupational Health and Safety	3	0.37	5	0.61
Philosophy	7	0.87	0	0
Birth Control	4	0.50	2	0.24
Engineering	1	0.12	5	0.61
Health Facilities and Administration	5	0.62	1	0.12
Drug Abuse and Alcoholism	1	0.12	4	0.49
Computers	0	0	4	0.49
Environmental Studies	1	0.12	3	0.36
Gerontology and Geriatrics	2	0.25	2	0.24
Statistics	1	0.12	3	0.36
Alternative Medicine	2	0.25	1	0.12
History	2	0.25	1	0.12
Housing and Urban Planning	2	0.25	1	0.12
Mathematics	0	0	3	0.36
Religion and Theology	3	0.37	0	0
Children and Youth	1	0.12	1	0.12
Handicapped	1	0.12	1	0.12
Linguistics	1	0.12	1	0.12
Technology	1	0.12	1	0.12
Water Resources	0	0	2	0.24
Women's Studies	1	0.12	1	0.12
Beauty Culture	0	0	1	0.12
Clubs	1	0.12	0	0
Fish and Fisheries	0	0	1	0.12
Humanities	1	0.12	0	0
Metrology and Standardization	1	0.12	0	0
Women's Interests	1	0.12	0	0

it difficult to make the right choice of a journal in which to publish, and may be unable to subscribe given meagre financial resources.

An investigation of the geographic distribution of sources produced interesting results. Most sources publishing HIV/AIDS research are published outside the African continent; even within the 'foreign' category, the distribution was skewed in favour of the United States and Great Britain. Those two countries published over 65% of the total source publications recorded in each database. Several scholars have proposed that this pattern has been enhanced by the desire of authors from developing countries to publish their research findings in foreign (or international) sources, which are thought to be superior in quality to regionally published sources (Onyancha & Ocholla, 2004a).

This pattern is also attributed to the journal-selection-process criteria used by the indexing services. The majority of the sources indexed in MEDLINE and ISI originate largely from the United States and Great Britain, most probably because the databases are published in the United States. Although this may be a hearty pattern concerning international visibility and the impact of HIV/AIDS research conducted in or about Africa, nevertheless it can deny policy and decision-makers in Africa free access to research findings that were specifically meant to improve health standards in their respective countries.

In order to allow international visibility and increase impact, as well as provide free access to research findings, it is highly recommended that authors/researchers on the African continent be encouraged by way of incentives to present their findings in regionalised conferences, and to publish in both print and electronic conference proceedings when publishing papers in foreign sources. Another option is to publish research papers through open-access platforms. The University of Maryland/Health Sciences and Human Services Library (2004) opines that by using open access, works are created with no expectation of direct monetary gain and they are made available on the Internet at no cost to the reader for the purposes of education or research. Open access therefore permits users to read, download, copy, distribute, print, search or link to the full texts of works, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal or technical barriers other than those inseparable from gaining access to the Internet itself. Although this may seem an infringement of the author's copyright, according to the University of Maryland/Health Sciences and Human Services Library (2004, paras. 3–4):

"Authors own the original copyright in their works.

In the process of publishing, authors can transfer to publishers the right for publishers to post the work freely on the Web, or authors can retain the right to post their own work on institutional or disciplinary servers. They (authors) retain control over the integrity of their work and have the right to be properly acknowledged and cited."

Institutional repositories are other avenues through which researchers can disseminate their research findings without infringing copyright laws.

An investigation of productivity per the source publication revealed the participation of both non-African and African

Table 11: Distribution of the number of source publications and journal papers by subcategories of medical science, indexed in different databases

Overall ranking	Subjects	MEDLINE		ISI	
		No. of sources	No. of papers	No. of sources	No. of papers
1	Medical Sciences (general)	132	1 862	117	1 578
2	Communicable Diseases	72	1 734	44	1 967
3	Obstetrics and Gynaecology	27	103	26	124
4	Allergology and Immunology	24	98	29	148
5	Oncology	25	43	21	53
6	Psychiatry and Neurology	17	31	23	45
7	Paediatrics	21	154	20	219
8	Nurses and Nursing	44	196	9	22
9	Surgery	11	26	20	44
10	Gastroenterology	10	15	13	37
11	Dentistry	14	67	10	90
12	Respiratory Diseases	11	135	10	263
13	Haematology	7	9	12	20
14	Dermatology and Venereology	9	124	10	22
14	Rheumatology	7	16	11	30
15	Cardiovascular Diseases	9	19	6	14
15	Orthopaedics and Traumatology	6	14	8	19
16	Ophthalmology and Optometry	6	11	7	14
17	Radiology and Nuclear Medicine	4	5	8	11
18	Otorhinolaryncology	5	9	5	7
18	Experimental Medicine, Laboratory Techniques	6	10	4	9
19	Endocrinology	3	3	6	219
19	Urology and Nephrology	3	4	6	9
19	Forensic Sciences	5	6	4	9
20	Internal Medicine	3	6	4	13
21	Abstracting, Bibliographies, Statistics	3	29	2	11
22	Anaesthesiology	2	2	2	2
23	Computer Applications	1	1	2	3
24	Physical Medicine and Rehabilitation	1	2	1	2
25	Cardiology			1	1
Total no.		488	4 734	441	5 005

sources in the publication of HIV/AIDS-related research papers. African journals that ranked among the top-10 included the *South African Medical Journal* (South Africa) and *East African Medical Journal* (Kenya); others that ranked among the top-40 were *Central African Journal of Medicine* (Zimbabwe), *Ethiopian Medical Journal* (Ethiopia) and *South African Journal of Science* (South Africa). Some recently introduced sources, such as the *African Journal of AIDS Research* (AJAR) and *SaharaJ*, do not yet feature among the most-productive local journals, although they publish HIV-specific papers. Also missing were bulletins and regular publications that contain much material on African HIV/AIDS, namely *AIDS Bulletin*, *Reproductive Health Matters*, *AIDS and Behavior*, and *Culture, Health and Sexuality*, among others. Whereas the most recently established journals may have missed inclusion because of their relative newness in the market, journals in the latter category may have been excluded because, perhaps, they do not meet the selection requirements set by the National Institutes of Health, on the one hand, and Thomson Scientific, on the other. Generally, whereas the ISI and EBSCO select periodicals on the basis of the highly rated periodicals, the difference lies on who determines which periodical should be included in the ISI and EBSCO databases. ISI database-editors use the vast information

at their disposal through the highly cited journals to select journals, while the EBSCO Publishing Company selects periodicals (i.e. magazines and journals) on the basis of the demand and/or request from the subscribers (Kummerer, 1992; Thomson Scientific, 2004).

The supposition that African researchers prefer to publish in foreign sources was discernible, although some locally published sources registered visibility. For instance, the *South African Medical Journal* ranked as the most-productive source in MEDLINE and third in ISI. The *East African Medical Journal* also performed fairly well, with ranks of 5th and 6th in ISI and MEDLINE, respectively. If we calculated the proportion of the locally published sources' contribution to the total number of publications in the top-40-ranked sources (Table 7), the six journals contributed 763 out of 3 224 (or 23.7%) in MEDLINE, and 593 out of 4 057 (or 14.6%) in ISI. Also notable was that majority of the highly ranked sources are general medical sources followed by specialty journals (i.e. AIDS-specific journals). The emergence of AIDS-specific sources among the top-ranking sources in the late 1980s was also noted by Bierbaum & Brooks (1995). As those authors stated, these sources are increasingly becoming the major publishers of HIV/AIDS research, which should be encouraging news for collection management and development librarians. Further-

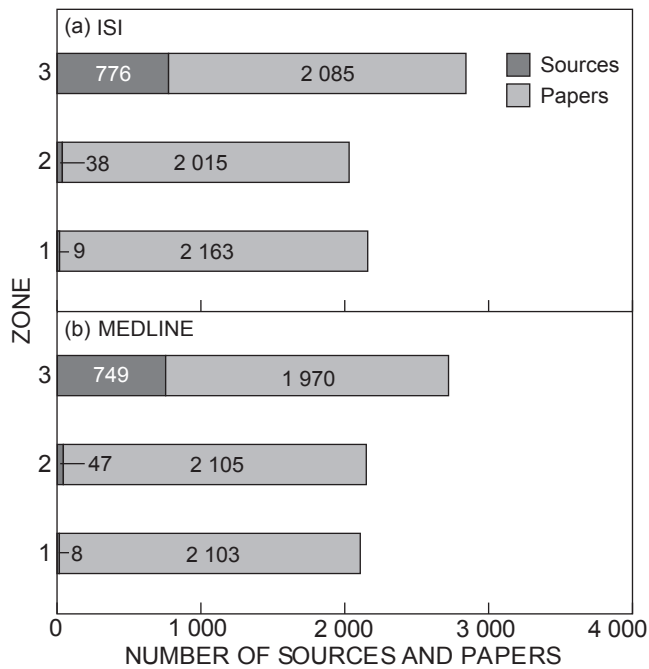


Figure 2: Bradford analysis of the HIV/AIDS-related literature, using a) ISI records, and b) MEDLINE records

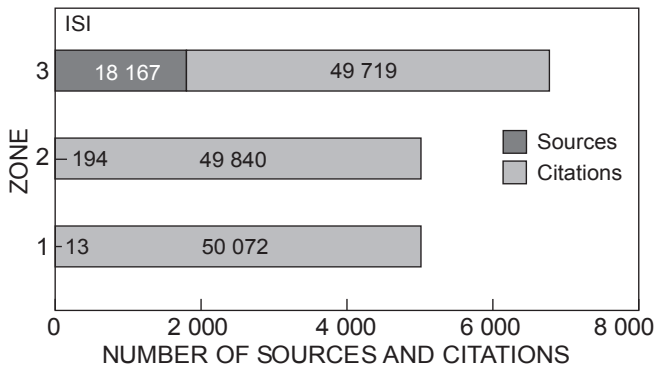


Figure 3: Bradford analysis of the HIV/AIDS-related literature, using number of sources and citations

more, they argued that “in times when economic considerations influence subscription purchases and continuations, the increasingly vital role of the specialty journals’ narrow and developing fields requires careful vigilance by medical-collection selectors” (Bierbaum & Brooks, 1995, p. 533).

Citation- and impact-wise, the JCR revealed that journals published in E&S Africa have had little international impact. None of these sources ranked among the top-52 journals (requiring an impact factor [IF] of 1.484 and above). The *South African Medical Journal* (IF = 1.107) and the *Ethiopian Medical Journal* (IF = 0.174) were the only African-produced journals covered in the 2004 JCR. Whether this means that these sources are less influential than non African ones with a higher IF is debatable, as questions have been raised concerning the use of IF as an indicator of journal quality;

in some instances, a small IF-value may not necessarily mean little influence (for instance, what of citations of locally published sources that are not indexed in the ISI?). Table 9 shows that the *South African Medical Journal* and the *East African Medical Journal* were the most-used journals by authors that published HIV/AIDS research in or about E&S Africa. The *South African Medical Journal* was used 1 804 times while *East African Medical Journal* was cited 876 times. A study of references to these sources by locally published sources that are not indexed by ISI would likely produce different results concerning the influence of these and many more sources that are published and cited locally. (Also worth noting is that the IFs provided in Table 8 do not necessarily reflect the influence of the HIV/AIDS-related papers published in the respective journals.)

Regarding the investigation of the subject categories (or fields/disciplines) of sources, it was observed that most sources belonged to the medical sciences category; this was not surprising since, as a sexually transmitted disease, HIV and AIDS is widely regarded as a medical condition. The subject category accounted for approximately 60% of the sources in each database, which implies that most HIV/AIDS research is published in medical sources. This is easily attributable to the fact that HIV and AIDS has largely remained a medical concern, as its prevention or cure is still a subject of medical investigation. This pattern occurs in relation to most of the human epidemic diseases. Nonetheless, the high ranking of sources from other fields/disciplines (e.g. business and economics, psychology, education, chemistry, social services and welfare, population studies) shows the scatter of HIV/AIDS-information in many sources, but also sources from many different fields/disciplines, as well as the contribution of other professionals in responding to the pandemic.

Concerning the scatter of HIV/AIDS-information in many sources and several disciplines, it is worth noting that modern methods of information storage (e.g. electronic databases that provide multiple search options) have greatly improved retrieval, making it much less difficult or time consuming. Nowadays, one can search for information within many databases as long as the databases share a search platform (e.g. EBSCOHOST databases). As regards the involvement of other professionals in HIV/AIDS research, Farmer’s (1999) advice to professionals from other disciplines to render discipline-specific approaches to understanding the HIV epidemic seems to have been heeded. Several categories of professionals seem to have joined their medical counterparts in HIV/AIDS research, as illustrated in the number of non-medical sources of HIV/AIDS-related literature. Onyancha (2006) noted that several kinds of professionals (e.g. social workers, educationists, economists, lawyers/advocates, and library and information scientists) are currently engaged in HIV/AIDS research. This scenario augurs well when it comes to designing effective intervention programmes. A special analysis of medical sources revealed a total of 30 categories. The main one was General Medical Science sources, followed by sources in communicable diseases, obstetrics and gynaecology, allergology and immunology, oncology, psychiatry and neurology, and paediatrics, and many more. This may imply that most research activities are carried out to study

the general medical aspects of HIV and AIDS; to study its characteristics as a communicable disease; to study its effect on pregnant mothers; or to study aspects related to immunology. A subject content-analysis of the literature is recommended to reveal more about the specific sub-fields of HIV/AIDS research in the region.

A Bradford analysis was conducted to identify the core sources of HIV/AIDS-information, employing both the number of papers published and their citations. In the first instance, Bradford's nucleus or core sources totalled eight sources in the MEDLINE database, while the SCI and SSCI databases yielded nine core sources. Interestingly, the majority of the core sources appeared in both databases. Except for one source (*AIDS Analysis Africa*), all core sources in the MEDLINE database were also core sources in ISI. There were two core sources in ISI (*International Journal of Tuberculosis and Lung Disease* and *International Journal of STD & AIDS*) which did not feature among MEDLINE's core sources. The common core sources in the two databases were: *AIDS*, *AIDS Research and Human Retroviruses*, *East African Medical Journal*, *Journal of Acquired Immune Deficiency Syndromes*, *Journal of Infectious Diseases*, *The Lancet* and *South African Medical Journal*.

Citation-wise, 13 core sources were identified; these sources contributed 50 072 citations, which accounted for 33.46% of the total citations (or 149 631). They are, in descending order: *AIDS*, *The Lancet*, *Journal of Infectious Diseases*, *New England Journal of Medicine*, *Journal of Virology*, *Journal of Acquired Immune Deficiency Syndromes*, *Journal of the American Medical Association (JAMA)*, *AIDS Research and Human Retroviruses*, *Science*, *British Medical Journal (BMJ)*, *South African Medical Journal*, *Social Sciences and Medicine*, and *Journal of Clinical Microbiology*. Interestingly, some core sources in the former analysis (in terms of the number of papers) do appear in the second list of core sources (i.e. using citations). However, there are a few sources that were not common in the two analyses; this raises the question of whether we should use the number of publications (or published papers) or else the number of citations to determine the core sources in a particular field/discipline. In my view, for the purpose of conducting research that is localised, citation analysis can be satisfactorily used to identify the core sources in a specific discipline. This approach is likely to engage the journals that are the most-preferred by researchers in a given region to help conduct their research.

In conclusion, the coverage of HIV/AIDS sources published in Africa in the MEDLINE and ISI databases is minimal. Whether or not this is attributable to indexing bias on the part of the indexing services, or the poor quality of African sources, could not be derived from the data analysed. However, since the indexing services highly regard those journals with high international impact (see Onyancha & Ocholla, 2004a; Thomson Scientific, 2004; National Institutes of Health, 2005), it can be inferred that journals that are published on the African continent do not yet meet the quality standards set by the indexing services. This calls for a reassessment of the journals' editorial policies, among other issues.

Most journals that are gaining in popularity are ones that

are electronically available; this perhaps explains why some African journals, which are largely available only in print, are not easily internationally visible — thus affecting their impact. To achieve wider circulation, visibility and impact, I recommend that such journals be published online. Thus, I concur with Rosenberg (2002, summary, para. 1) as she advises that in order for African journals to “compete successfully with journals published elsewhere, they need to offer access to full text online.”

Finally, it is recommended that countries in the region endeavour to create regionalised bibliographic databases that can be used for evaluating research. South Africa has done well in this regard through the South African Bibliographic and Information Network (SABINET).

Notes

- 1 Impact factors were obtained from the 2004 *Journal Citation Reports* (JCR) because they were the latest at the time of the study. Previously published JCRs were not used as they might have provided citation reports of only 'old' journals, thereby excluding newly introduced journals that may have greater impact.
- 2 Bradford zones are also called Bradford groups. The zones are created during an analysis according to Bradford's Law. Bradford's law states that in a given subject field, over a given period of time, a few journals publish a relatively high percentage of articles in a field, while many journals publish only a few articles each. Each zone, therefore, contains approximately the same number of articles or papers. The upper zones are the most productive and contain relatively few journals. The core, or Bradford's nucleus, is the first and most-productive zone.

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