

**A BIBLIOMETRIC STUDY ON HIV/AIDS  
LITERATURE IN SOUTH AFRICA  
FROM 1982-2002**

**by**

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**B.Bibl. Honours**

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## **Declaration**

This thesis is the original work of the researcher and has not been submitted in any other form to another university. Where use was made of works of others, this has been duly acknowledged in the text and included in the Bibliography.

A handwritten signature in black ink, reading "S. B. Mitha". The signature is written in a cursive style with a horizontal line underlining the name.

**Sara Bibi Mitha**

## Abstract

The pandemic of HIV/AIDS has been felt by nations throughout the world. It is a well-known fact that the AIDS epidemic is catastrophic in sub Saharan Africa, which heads the list of the most affected regions. As the epidemic imposes a strain on the already limited resources, a better understanding of the disease is continuously being sought out. This understanding is enhanced with better information dissemination. The present research aims to assist the information requirements of HIV/AIDS researchers in the country through a bibliometric study.

The present study comprised an investigation of the patterns of authorship and publications of academic institutions in the sciences, medical institutions and affiliated organizations in South Africa, focusing on HIV/AIDS literature for the two-decade period, 1982-2002. Published literature in the sciences and medicine from three internationally recognised databases were used for the assessment. They were: *AIDSearch*, *ISI Science Citation Index Expanded* and *MEDLINE (OVID)*.

A total of 2 281 documents formed the basis for the assessment. The results of the study are presented, as are their consequences for researchers and policy makers. Some recommendations are provided for the developers and designers of databases.

The results of the study demonstrate exponential growth in the literature as might be expected. Because of the multidisciplinary nature of the disease, research is scattered in a variety of discipline-based journals. Researchers publish mainly in journals and the *South African Medical Journal* is the most productive in the field of HIV/AIDS. Collaboration in research on the subject is evident. The results also demonstrate that South African researchers are fast becoming internationally recognized in the field of HIV/AIDS research. The Medical Research Council emerged as the leader in South Africa's research efforts on HIV/AIDS. Of the academic institutions, the University of the Witwatersrand is the most productive institution, followed by the University of Natal.

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## **List of Abbreviations**

AIDS	Acquired Immunodeficiency Syndrome
CAPRISA	Centre for AIDS Programme of Research in South Africa
CASE	Community Agency for Social Enquiry
CIPRA	Comprehensive International Programme for Research on AIDS
CSD	Centre for Science Development
CSIR	Council for Scientific and Industrial Research
ECI	Enhancing Care Initiative
FRD	Foundation for Research Development
HBUs	Historically Black Universities
HERDSA	Higher Education Research and Development Society of Australasia
HIV	Human Immunovirus
HWUs	Historically White Universities
IRDP	Institutional Research Development Programme
ISI	Institute for Scientific Information
LSTRC	Literature Selection Technical Review Committee
MEDUNSA	Medical University of Southern Africa
MeSH	Medical Subject Headings
MRC	Medical Research Council
NIAID	National Institute of Allergy and Infectious Diseases
NIH	National Institute of Health
NLM	National Library of Medicine
NRF	National Research Foundation

NWG	National Working Group
SAPSE	South African Post Secondary Education
SAUVA	South African University Vice-Chancellors Association
UFS	University of the Free State
UNAIDS	United Nations AIDS
UND	University of Natal (Durban)
UP	University of Pretoria

# **Chapter 1**

## **Introduction and Background to the Study**

### **1.1 Introduction**

This thesis presents a bibliometric study of HIV/AIDS research in South Africa. Chapter 1 provides the background to the study and defines the research problem. The purpose and objectives of the study are formulated and these are translated into appropriate research questions. A rationale is provided for the bibliometric assessment of HIV/AIDS research in South Africa.

### **1.2 Background**

Over the past two decades HIV/AIDS has spread rapidly among populations around the world. The UNAIDS Report projects that 68 million people will die of AIDS in the 45 most affected countries between 2000 and 2020, if prevention and treatment efforts are not increased (UNAIDS 2002 (a)). This figure is more than five times the 13 million deaths of the previous two decades of the epidemic in those countries. This pandemic has been felt by all nations throughout the world. Almost 90% of HIV infections are said to be in developing countries, where the resources required to combat HIV/AIDS infections are few and far between.

Dr. P. Piot, Executive Director of UNAIDS, commented, “The AIDS situation in Africa is catastrophic and sub-Saharan Africa continues to head the list as the world’s most affected region” (AEGiS 2000). This situation has not changed since then and is getting worse. The 2002 UNAIDS report (2002 (b)) states that the HIV/AIDS pandemic is even worse than originally projected. The report revealed that, in 2001, sub-Saharan Africa was most afflicted by the HIV/AIDS epidemic, as indicated by the following highlighted statistics:

- 3.5 million new infections occurred in the region
- 28.5 million people infected with HIV/AIDS at the end of 2001
- 2.2 million Africans died of AIDS in 2001

In South Africa, the toll of the epidemic is mounting. According to Marcus (2004?:6) the growth of HIV infection in South Africa has been startling with a prevalence of less than 1% in 1990 to 25% in 2000 among pregnant women attending public antenatal clinics. The UNAIDS (2002(c)) reports that AIDS-related deaths among young adults is expected to peak during the period 2010-2015. A Medical Research Council (MRC) report stated in 2001 that one third of the deaths in South Africa would be AIDS-related, increasing to two thirds by 2010, if no radical change takes place. This MRC Report also projected that AIDS will account for 44.7 percent of adult deaths in South Africa in 2001 and 78.6 percent by 2010. The report projects that by 2010 the death toll because of the disease would be 779 098 (Cohen 2001).

These consequences clearly illustrate that HIV/AIDS affects people, especially those in developing countries, both directly and indirectly. This is further emphasized by Marcus (1999:64), who concludes by saying that “the impact on individuals and institutions will vary, but none will remain unaffected”. The epidemic imposes a strain on the already limited resources and therefore a better understanding of the epidemic is continuously being sought. This understanding will be enhanced with better information dissemination. The present research aims to assist the information requirements of HIV/AIDS researchers in the country.

### **1.3 Research Problem**

Since the positive identification of HIV/AIDS in the early 1980s the quantity and variety of information dealing with the subject has grown vastly. Hardly a day goes by without a mention of HIV/AIDS in the media. The growth of the literature is also reflected in the work by Bierbaum and Brooks (1995:531). This exponential growth of the literature and the patterns of research on HIV/AIDS is becoming increasingly difficult to follow. This is further exacerbated by the fact that the research is generated in a variety of fields, such as economics, social sciences, medicine and many others. To indicate the rate of growth, in the field of medicine, AIDS literature in the MEDLINE database subset grew from approximately 700 entries for the period 1981-1983 to a cumulative total of 29 077 entries by the end of 1990 (Pratt 1992:380). A study presented by Elford, Bor and Summers (1991) illustrates the growth of the literature and, interestingly, states that

between the years 1981 and 1990 only three percent of the literature was concerned with the African population, even though a quarter of AIDS cases were from African countries. By 1996, more than 70% of the AIDS patients worldwide were in sub-Saharan Africa (African AIDS research...1996).

Not only is the growth of the literature extensive and uncontrollable, there is also the problem of the lack of literature or information identifying the persons who have expertise in the field of HIV/AIDS. If well managed and controlled, the literature can be used to communicate and link experts and expertise in the sub-areas or specializations concerning HIV/AIDS. In this way, the extent to which South Africa has contributed and continues to contribute to the research on HIV/AIDS literature, worldwide, may be established.

It is generally accepted that academic institutions encourage research in the field of HIV/AIDS. In South Africa, every academic institution either explicitly or implicitly encourages research in this field. Early research on HIV/AIDS was produced by medical academia, as shown by a cursory observation of the research. The economic, social and political aspects of the syndrome are the foci of more current research in the field. Governments, academics in all fields, persons from different NGOs, the public, societies and even business and industry are increasingly becoming aware of the importance of research on HIV/AIDS and have realized that it is a universal problem. National governments have an increased responsibility in preventing the spread of the epidemic and in mitigating the impact of HIV/AIDS in all sectors of the economy. However, governments cannot work on their own to overcome this problem. Marcus (1999:64) stresses this point as one of the conclusions and recommendations to her study. NGOs, societies and academics therefore play an important role in the fight against the spread of the disease.

Contributions in the form of policies, prevention programmes and interventions, as well as the support of the production and dissemination of information worldwide are tangible

results of the effort. Preventing the spread of HIV/AIDS is a matter of urgency for everyone. This emphasizes the importance of academic research on HIV/AIDS.

South Africa has eight medical faculties and/or schools attached to universities in the country. They are:

- University of Natal Medical School (now called The Nelson Mandela Medical School.)
- University of Cape Town - Faculty of Medicine.
- MEDUNSA (Medical University of Southern Africa).
- University of the Free State - Faculty of Health Sciences.
- University of the Witwatersrand - Faculty of Health Sciences
- University of Transkei - Faculty of Medicine and Health Sciences.
- University of Pretoria - Faculty of Medicine.
- University of Stellenbosch - Faculty of Medicine.

These South African medical institutions, as well as the Medical Research Council (MRC), have played, and continue to play, an important role in HIV/AIDS research. Other contributing organizations include the Department of Health and research centres affiliated to academic institutions. These contributions and their participation globally have made an impact in all spheres of medicine and science. The XIII International AIDS Conference was held in Durban, South Africa, in July 2000. South African medical institutions, together with academics, international organizations and the community at large participated in what was one of the largest conferences ever held in a developing country.

The AIDS pandemic has reached "crisis" proportions in South Africa. With a total of 4.2 million infected people, South Africa has the largest number of people living with HIV/AIDS in the world (UNAIDS 2000). This concern is demonstrated by examining the increased funding required and made available. The KZN (KwaZulu-Natal) Department of Education has spent R2.8 million on HIV/AIDS awareness programmes and training in 2000. In the following year an estimated amount of R14 million was to be set aside for

awareness programmes. This is an example of only one government department's commitment. The funds designated for HIV/AIDS in the national budget for 2003/4 is R 1.952 billion and for 2004/5 it is R 2.950 billion (Hickey 2003). Funding is also available from a variety of sources, external and internal, and the interest and awareness is mounting in HIV/AIDS research. Apart from government organizations that fund research on HIV/AIDS, there are various multinational aid agencies such as the World Bank, UNICEF and UNAIDS. NGOs include the Red Cross, OXFAM, Red Crescent and private foundations such as the Ford Foundation and many other individuals or corporations that provide funding for research.

The present study focuses on the time period 1982-2002. This includes the post-apartheid period in South Africa, which is marked by an incorporation of South African research into the various international citation indexes. It must be noted that, prior to 1994 (during the apartheid years), South African research that had been co-authored by international scholars was recorded in the *Science Citation Index* only. During this period there was also a discrepancy in funding and support of research institutions, with historically advantaged institutions being favoured with larger resources.

The bibliometric analysis which was done in this study, analyses research emanating from the field of medicine and science on HIV/AIDS. Medical and scientific research from South Africa is generally regarded as being at the cutting edge of knowledge. Moreover, medical and scientific research generally has international validity and greater impact, whereas social, economic research may apply to South Africa only.

With the increased attention and funding for HIV/AIDS research there has been an explosion of literature on the subject. Documented publications, conference proceedings, special reports, media coverage and grey literature abound in the field. The problem is the lack of assessment of the domain. There is no clear pattern of who is doing what. There is also no clarity on the clusters of expertise within the institutions involved in HIV/AIDS research in South Africa. It is therefore important to document the research output on HIV/AIDS in a manner that will highlight the patterns of authorship, identify expertise

and indicate the institutions which are the sources of the publications. Duplication and reproduction of the research on HIV/AIDS is very likely to occur, due to lack of communication or the urgency with which researchers approach the topic.

#### **1.4 Purpose**

The purpose of the present study was to investigate the patterns of authorship and publications of the academic institutions in the sciences, medical institutions and affiliated organizations in South Africa, focusing on HIV/AIDS literature or research from 1982-2002. This study analysed all published literature that appeared on *MEDLINE*, *AIDSearch* and the *ISI Science Citation Index Expanded* databases. These included journal articles and published conference proceedings and reviews, which have been contributed by South African authors, as well as those that have had international collaboration.

The study conducted a bibliometric analysis of HIV/AIDS literature in the field of medicine and the sciences.

#### **1.5 Research Objectives**

The objectives of the research were to:

- Establish the publication output of HIV/AIDS research in Africa and South Africa
- Identify the channels of delivery (publication types) of HIV/AIDS research
- Analyse patterns of authorship and collaboration
- Identify core journals publishing HIV/AIDS research
- Identify the country of publication of journal titles publishing HIV/AIDS research
- Identify the most highly cited publications on HIV/AIDS in South Africa
- Rank South African institutions in terms of their research output on HIV/AIDS
- Identify the sub-areas of the research on HIV/AIDS in South Africa

## **1.6 Research Questions**

- What is the publication output of HIV/AIDS research in Africa and, in particular, in South Africa?
- What are the types of publications in which researchers publish?
- What are the patterns of authorship and collaboration?
- What are the core journals in which HIV/AIDS literature appears?
- What are the countries of publication of the journal titles publishing the HIV/AIDS research?
- What are the most highly cited publications on HIV/AIDS research in South Africa?
- How does each South African institution rank in terms of HIV/AIDS research?
- What are the sub-areas in the field of HIV/AIDS literature in South Africa?

## **1.7 Justification**

From an examination of the literature, it is evident that no bibliometric analysis on HIV/AIDS research has been conducted in South Africa, although research of this nature has been conducted in other countries. Such a bibliometric study affords the researcher the opportunity to study the quality and quantity of work done by academics in academic and research institutions in South Africa. This will assist in preventing the duplication of research work and contribute to the organization of the body of knowledge that exists.

Productivity in terms of research output is becoming increasingly important to institutions. There is an awareness of the link between prestige and productivity, that is, the more productive institutions, in terms of research output, acquire a status of prestige. These prestigious institutions attract funds and researchers, which further increases the productivity of the institutions. There seems to be a direct correlation between prestige and productivity (Jacobs 1998:167). The present study will determine the prestige of institutions by ranking them in terms of their research output (productivity).

Funding for HIV/AIDS research is made available through various organizations. This study will identify productivity of the different institutions, which will enable funding organizations to recognize the research potential of applicants within an institution. It would also enable young researchers to identify core groups that have similar interests in terms of the sub-areas in the field of HIV/AIDS research.

Communication between researchers is important for the advancement of knowledge. This invisible college, which consists of people with similar interests and a number of communication channels, exists in the area of HIV/AIDS. This is further enhanced by technological innovation, namely the use of the Internet. However, not all researchers have access to this medium. The present study provides the information that could link researchers in their efforts.

Bibliometric analysis can be conducted with the aim of providing insight into the construction and organization of HIV/AIDS knowledge. It can be used to reveal the historical development in the area of study. Bibliometric studies are also used to evaluate research performance of individual academics, research groups, institutions and even countries, for example Jacobs (1998).

Research of this nature would enable HIV/AIDS researchers:

- To examine the quantity and, to some extent, the quality of the research published.
- To identify institutions as well as the areas of research within each institution.
- To reveal the contributions made by Africa and South Africa in HIV/AIDS literature.

Finally, the output of bibliometric analysis of HIV/AIDS literature will assist researchers in the field of medicine and science to identify the gaps in the knowledge and therefore research opportunities that are available. It also helps determine who the major researchers are and thus help to identify potential collaborators.

### **1.8 Limitations of the study**

The study is limited to the analysis of publications that appear in *Medline (OVID)*, *AIDSearch* and the *Institute for Scientific Information (ISI) Citation* databases. It would have been ideal if these three databases covered the majority of the science and medical research in South Africa, but this is not the case. They were chosen primarily because of the international recognition they hold as the most reputable databases for the sciences and for medicine. In South Africa there are no equivalent databases that can replace *ISI*, *AIDSearch* or *Medline*. Another motivating factor in justifying the use of the *ISI Science Citation Index* is the fact that the Department of Education is in the process of revising the accreditation of research output from tertiary institutions with regard to journal articles. It has declared its intention to integrate the ISI (Institute for Scientific Information) listing for all international journals, together with a South African journals list (UN 2002). A further notice by the Research Office of the University of Natal states that the Department of Education will recognize only those journals that are on the list of ISI (Institute for Scientific Information) and IBSS (International Bibliography for Social Sciences) for subsidization (Bharuthram 2003).

All three of the above databases have a list of journals, which they index. The consequence of this is that if a South African author publishes an article in a journal that is not on this list, the article would be excluded from all the databases.

A further limitation was that the *ISI Science Citation Index* on CDROM is only available to the University of Natal from 1992 to the present. The University of Natal received access to the *Web of Science* online for a trial period. The *Web of Science* includes the Citation databases from 1945 to the present. For the present study the *Science Citation Index Expanded* was accessed during the trial period, since the period under study was from 1980 to 2002. The *Medline* database is available from 1982 to October 2002.

The period chosen for the study was 1982 to 2002, some two decades of research on the HIV/AIDS literature in South Africa. As indicated earlier, this period is specified by virtue of the availability of information. This time period includes the period of political

transition in South Africa and such an analysis would therefore enable the researcher to make comparisons and determine the extent to which the political environment impacted on the research output of the institutions (both historically disadvantaged and advantaged).

## **1.9 Definition of Terms**

This section defines key terms used in the study. The terms that are included provide clarity and context for this piece of work.

### **Bibliometrics:**

It is the quantitative study or analysis of a body of literature as reflected in bibliographic databases. In the context of this research it attempts to examine the body of literature produced by country of publication, authorship patterns, publication types and subject areas over a particular time period.

### **Citations:**

A citation is a bibliographic reference which is used to cite the authority for statements used in the text. Citations take the form of a collection of references at the end of a publication or paper.

### **Citedness or Citations Rate:**

The citation rate is the number of times a publication has been cited. This is also referred to in the text as times cited.

### **HIV/AIDS Literature or HIV/AIDS Research:**

For the purpose of this study it was decided to define HIV/AIDS literature or research as those published items containing the terms “AIDS” or “HIV” in the subject or abstract field in the three databases. The study confined itself to HIV/AIDS literature from medicine and the sciences.

**Institutions:**

The term in this study refers to the eight academic medical institutions in South Africa.

**Literature:**

Literature refers to articles, papers or publications and these terms are used interchangeably depending on the context being described. The term includes various publication types which are listed below. Jacobs (1998:20) defines “publication” as the act of making known to the public the results of research through formal channels such as journals and reports. For the present study, these include, journal articles, letters, newspaper articles, editorials, reviews, abstracts, congresses, comments, notes, interviews, addresses and historical articles or bibliographies. Literature in the study did not include monographs.

**Productivity:**

This term refers to the research output or publications produced by researchers in the given field. These are measured by counting the number of publications produced by a researcher or an institution over a given time period.

**Records or Documents:**

These terms describe the publications in a database and are used interchangeably. Each publication being a separate “record” or a “document”.

**Research Institutes:**

These refer to those bodies that fall outside the academic institutions that produce research in the field of science and medicine such as the MRC.

**South Africa:**

In the present study, this refers to publications produced by South African researchers as well as research undertaken about or on South Africa. Essentially these would be publications with a South African connection.

### **1.10 Structure of the Thesis**

Chapter 1 introduced the study and outlined the research problem and the objectives of the study. Research output is the focus of this study. Chapter 2 deals with higher education institutions and affiliated organizations and research. Chapter 3 reviews the literature that is relevant to the study and Chapter 4 details the research methodology and data collection methods. Chapter 5 presents the data analysis and discusses the findings. Chapter 6 is the concluding chapter of the study.

### **1.11 Summary**

This introductory chapter revealed the importance and severity of the HIV/AIDS epidemic, which is the background to the study. Statistics prove that the AIDS pandemic affecting the world is of cataclysmic importance. As a result, research on the disease is being conducted at various levels, by different institutions, organizations and individuals. The result of all this research is that we are beginning to understand the disease on a medical and scientific level. We are also beginning to comprehend the economic, social and other impacts of the pandemic.

The information on HIV/AIDS is largely fragmented, disjointed and often duplicated. This forms part of the research problem. The research questions posed were followed by the justification for the study. The limitations of the study were discussed. The study aimed to identify the research being conducted, the institutions conducting the research and the areas of specialty or focus within the research. The information can then be integrated and communicated to all concerned. It allows the author to identify institutions and individuals who have expertise in a particular specialised area. The result of this study will be an analysis (within the defined parameters) of the research conducted, with the added understanding that individuals or institutions with a particular area of interest will be in a position to identify others with similar interests, resulting in a possible pooling of resources and elimination of further duplication of work.

## **Chapter 2**

### **Institutions that contribute to HIV/AIDS Research in South Africa**

#### **2.1 Introduction**

Chapter 2 provides a brief background of the medical institutions that contribute to the HIV/AIDS literature in South Africa. It also gives an account of the background to research at higher education institutions. It introduces the two funding organizations and gives an account of accredited journals. It gives an indication of medical research and thereafter concentrates on HIV/AIDS research.

#### **2.2 Higher Education Institutions**

It is evident that the apartheid system continues to burden the higher education system, which, as a consequence, is unable to meet the challenges of reconstruction and development. The National Plan (2001), proposed by the Minister of Education, intends to provide a higher education system which is based on the principles of non-racism, non-sexism and democracy, which will thus contribute to the human resource and knowledge needs of the new, democratic, South Africa. The National Plan for Higher Education is seen as a vision to face the challenges of the higher education system in South Africa and to address the inequalities of the past (Ministry of Education 2002). The question remains: Can the National Plan deliver on the transformation and does it address the critical issues that face South African higher education. The National Working Group (NWG), appointed by the Ministry of Education in March 2001 to advise on the restructuring of the higher education system, proposed mergers between the thirty-six higher education institutions, reducing the number of institutions to 21. The Report of the NWG proposed 11 universities, six technikons and four comprehensive institutions.

**The universities are as follows:**

- University of Cape Town
- University of Durban-Westville/University of Natal
- University of Fort Hare/Rhodes University, East London  
Campus/University of Transkei, Health Sciences Faculty

- University of the Free State/Vista University, Bloemfontein Campus/Qwa Qwa Campus of the University of the North
- University of the North-West/Potchefstroom University/Vista University, Sebokeng Campus
- University of the North/Medical University of Southern Africa/ University of Venda
- University of Pretoria/Vista University, Mamelodi Campus
- Rhodes University
- University of Stellenbosch
- University of the Western Cape
- University of the Witwatersrand

From the above list five of the eight medical schools will be affected.

Ntshoe (2002), in his guest editorial, raises questions about the National Plan. Some of them are: Why are only some Historically Advantaged Institutions (HAIs) asked to merge and not all? Why are the Historically Disadvantaged Institutions (HDIs) asked to merge with the HAIs and not the other way round? Why was there no option of collaboration rather than merger? Ntshoe (2002) concludes by stating that the National Plan has given little attention to the problem of “visionary management in higher education” and therefore the current crisis.

### **2.3 Medical Universities**

There are eight medical schools in South Africa. Higher education institutions are categorized as either Historically Black Universities (HBUs) or Historically White Universities (HWUs). There were significant differences between the HBUs and the HWUs and Dorsamy (1999) lists them as being:

- High quality of teaching and research at HWUs
- Poor facilities and infrastructure at HBUs
- Discrimination in funding, which impacted on the efficiency of HBUs

- Geographic locations of the HBUs in rural locations, compared with the HWUs in urban areas
- Underqualified staff at the HBUs

These differences contribute or impact profoundly on the research output of HBUs, which will also be discussed further in this chapter. The medical universities, in terms of the above categorizations, are:

**Historically Black Universities:**

Medical University of Southern Africa

University of Transkei, Faculty of Medicine

**Historically White Universities:**

University of the Witwatersrand, Medical School

University of Stellenbosch, Faculty of Medicine

University of Pretoria, Faculty of Health Sciences

University of the Free State, Faculty of Medicine

University of Cape Town, Medical School

University of Natal, Nelson R Mandela School of Medicine

What follows is a brief description of each of the university's medical schools:

### **2.3.1 Medical University of Southern Africa**

A memorandum was submitted in 1974 for the creation of a Faculty of Medicine for the training of black doctors. The legislation for the creation of the Medical University of Southern Africa (MEDUNSA) was submitted to parliament in 1976 and was accepted. Initially, this university had a hundred medical (M.B.,Ch.B.) students (Van der Merwe 1987). The total number of students for the year 2000 was 3 501 (SAUVA 2000). To the present its student numbers continue to grow and it now has approximately 4000 students (Medunsa 2003)

### **2.3.2 University of Transkei (UNITRA)**

The University of Transkei is situated on the outskirts of the city of Umtata. It was established in 1976, as part of the University of Fort Hare. In 1977 it was officially

opened as an autonomous institution. It has six faculties, including the Faculty of Health Sciences, which is made up of four schools: School of Medicine, School of Nursing, School of Public Health and the School of Postgraduate Studies and Research (UNITRA 2003). The original enrolment was 132 students and this grew phenomenally to 6 000 in 1998. In 1999 student numbers had dropped to 4 650 and in 2000 student numbers dropped to 4 537 (SAUVA 2000). Imenda, Kongolo and Grewal (2002) give the reasons that contributed to the decline in these numbers. Several investigations confirm that the institution is in financial difficulties. The Department of Education tried to declare a moratorium on first-year enrolment in 2001, but withdrew the moratorium due to pressure from the community (Jansen 2001).

### **2.3.3 University of the Witwatersrand**

The origins of the University of the Witwatersrand lie with the South African School of Mines, which was established in Kimberley in 1896. In 1904 it was transferred to Johannesburg and in 1906 became known as the Transvaal University College. Four years later it was renamed the South African School of Mines and Technology. On 1 March 1922, it was granted full university status and became known as the University of the Witwatersrand. It had six faculties, one of them being Medicine. The University's enrolment figures increased from 6 275 in 1963 to 16 400 in 1985. In 2000 the enrolment of students was 16 497 (SAUVA 2000), while for the year 2001 it was 20 076. The Medical Faculty moved in 1964 and in 1969 the new clinical departments opened at the new Medical School. The Medical School moved again and is now situated in Parktown and has expanded into Braamfontein.

### **2.3.4 University of Stellenbosch**

In 1916 the University Act was passed and 503 students registered in 1917. On 2 April 1918 the University Act came into effect and Victoria College became the University of Stellenbosch. Enrolment for the year 2000 was 17 532 (SAUVA 2000) and in 2002 it increased to 24 348. On 1 January 2001 the Faculty of Medicine and Dentistry, at the Tygerberg Campus, was incorporated into the new Faculty of Health Sciences. The new

Faculty consists of five professional schools and is situated on the Tygerberg Campus of the University of Stellenbosch. The five schools are Basic and Applied Health Sciences, Medicine, Public and Primary Health Sciences, Allied Health Sciences and Oral Health Sciences.

### **2.3.5 University of Pretoria**

The University of Pretoria was originally the Pretoria Branch of the Transvaal University College. The University of Pretoria became a fully fledged university in 1930. The University of Pretoria has nine faculties, which comprise 20 schools (UP 2003). The Faculty of Medicine is made up of:

- 32 academic departments affiliated or associated with the Pretoria Academic Hospital
- 9 academic divisions
- 3 institutes
- 10 clinical departments associated with Kalafong Academic Hospital
- 2 research centres
- 8 administrative and services divisions.

The Faculty consists of 610 teaching staff and 590 non-teaching staff. There are 46 full-time professors or chief specialists, 237 associate professors and senior lecturers or specialists and 213 full-time junior staff. There are 114 part-time appointments and the Faculty has 257 registrars. The 590 non-teaching staff includes technologists, scientists, administrative and service staff. Enrolment for the year 2000 was 25 865 (SAUVA 2000).

### **2.3.6 University of the Free State**

This University was founded in 1904 and evolved from the Grey College School to the University of the Orange Free State (UOFS). The medium of instruction was English. In 1935 a resolution was passed and it was then called the University College of the Orange Free State. In the nineteen-forties the medium of instruction changed to Afrikaans. On 18 March 1950 the University of the Orange Free State became independent. The University concentrated on servicing the Orange Free State and, in particular, the Afrikaans

population of that area. It claimed to be the first Afrikaans university to open its facilities to all races. In 1993 the university changed to a parallel medium of instruction, in English and Afrikaans. It is now in the process of changing its name to the University of the Free State. The University has nine faculties, one of them being Medicine (Pavlich 1993). The enrolment for 2000 was 10 014 (SAUVA 2000) and for enrolment 2001 this increased to 12 083 (UFS 2003).

### **2.3.7 University of Cape Town**

The University of Cape Town was founded in 1829 and became a fully fledged university between 1880 and 1900. The University of Cape Town has six faculties, one of them being Health Sciences, which was founded in 1912. The Faculty of Health Sciences has three schools: School of Medicine, School of Nursing and the School of Allied Health Professions. Its campus extends from its main teaching hospitals, Groote Schuur and the Red Cross Children's Hospital, to clinics and secondary hospitals throughout the Cape Peninsula. The total enrolment for the year 2000 was 15 378 (SAUVA 2000).

### **2.3.8 University of Natal**

The University of Natal is regarded as a Historically White University, but in 1949 the creation of a "black faculty", that is the Medical School, was primarily aimed at training black doctors. A year later it was stipulated that state funding would be made available to the Medical School only on the condition that admissions were restricted to black students. While this contravened the University's admissions policy, the school opened in 1951 (Badat 1994). This Faculty produced doctors of international quality, who were referred to as the "intellectual elite of the country's oppressed community" (UND 2003). It survived the political turmoil, insufficient state funding, shortage of space and equipment and has emerged with an internationally strong academic reputation. The student enrolment for the year 2000 for the University of Natal was 15 378 (SAUVA 2000).

The Medical School graduates have made outstanding contributions to society, in terms of community-based projects, in the private sector, government and academic fields. On the 50<sup>th</sup> birthday of the Medical School, it was renamed the Nelson Mandela School of Medicine. This was one of the greatest moments for many, who knew that their struggle for democracy had culminated in the name change.

## **2.4 Research at Higher Education Institutions**

Research at higher education institutions in South Africa was governed and produced mainly by white males, in historically white universities (HWUs). Statistics provided by Badat *et al.* (1994) indicate that there were major differences in research output of historically white universities (HWUs), compared to historically black universities (HBUs). This was due to the inequalities of the past, in terms of access to resources, lack of research infrastructures, for example research institutes, units, or centres, as well as time available to academic staff for research purposes. Another contributing factor was the increase in student teaching loads. This was due to the fact that student enrolment increased from 23 400 in 1986 to 382 000 in 1996. The bulk of these enrolments were at historically black universities (Habib and Parekh 2000). In terms of financial rewards for research, the funding formulae rewarded institutions for publications published in accredited journals. Badat *et al.* (1994) further refers to the marked discrepancies in accredited research productivity between the HBUs and HWUs. It is clear that the HWUs commanded much larger research funds than the HBUs. There is no doubt that the HBUs have been disadvantaged by the apartheid system and therefore the new democratic government needed to address the inequalities of the past.

The mission statements of all higher education institutions mention “research”, in one form or another, as one of the fundamental functions of the institution. This stresses the importance of ongoing research and research productivity to maintain academic excellence. The diminishing financial resources for research at a national level, together with other factors, have contributed to the decrease in research in South Africa. As Bisseker (1999:38) notes, “medical research in South Africa is under enormous pressure and the country’s international research ranking is slipping”.

However, Waghid (1999:110) is of the opinion that there should be a shift from “breeding academics” to the concept of community service, so as not to be out of touch with the real problems of society. He believes that this would contribute to the effective preparation and continued development of academics in their teaching and research roles. Waghid (1999) raises the problem of financial constraints and questions the role of the university in the South African educational system, which is now being restructured to address the legacies of the past.

#### **2.4.1 Funding for Research**

The Department of National Education, which was, and is, responsible for the national educational research system, introduced a funding formula for universities that stimulated research output. There were 36 higher education institutions in total and each one received approximately 60% of their funding from the State, through the South African Post Secondary Education (SAPSE) funding formula. The formula takes into consideration student numbers, research output, student pass rate and subjects taught. Apart from the Department of Education, the other South African institutions that fund research are the National Research Foundation (NRF) and the Medical Research Council (MRC), and these are briefly described.

##### **2.4.1.1 Foundation for Research Development**

In 1984, the Foundation for Research and Development (FRD), as part of the Research Grants Division and the Co-operative Scientific Programmes, was established (Pouris 1991). The FRD was created to be used as a funding mechanism to reward individual researchers in science and engineering. It was also responsible for the support and promotion of scientific and technological research in tertiary institutions. The FRD’s aim was to achieve high-quality research output. A rating or evaluation system was used to identify individuals. Those obtaining the highest ratings would receive financial support. This meant that staff at the HBUs would be left out. As a response to this, the FRD introduced the Reconstruction and Development Programme (RDP) for the benefit of

HBU in 1986. Funding for HBUs was invited by the FRD in 1986 to participate in staff development. However, there were no takers and this was not surprising since, “A pitifully small number of blacks do sufficiently well in matric and science to qualify them to study science and engineering at university” (Tampering with ... 1995:29).

Therefore in 1989, the RDP, in response to fewer black students showing interest in mathematics and science, launched a pilot programme aimed at science and mathematics tuition in black secondary schools (Jacobs 1998). The FRD development programme for HBUs targeted research and postgraduate and undergraduate development. Even after this initiative, very few researchers were produced from the HBUs. The reason was obvious. The then vice-president of the FRD, Gerhard von Gruenewaldt admits that, “any black student showing potential would be welcomed at the traditionally white universities” (Tampering with ... 1995:29). The FRD then tried to correct this situation by arranging for white university researchers to help black researchers to develop science and engineering research.

Apart from local collaboration, the Foundation encouraged participation and collaboration among researchers internationally. The Government has also encouraged collaboration among historically advantaged and disadvantaged institutions, in order to promote the transfer of knowledge and expertise to black scholars (Mouton 2000:458). Mouton (2000:462) describes academic science in South Africa as an “isolationist system”, since the barriers to collaboration, developed during the apartheid years, are still in place.

#### **2.4.1.2 National Research Foundation**

In 1998 the FRD became part of the new structure, the National Research Foundation (NRF). The amalgamation of the Centre for Science Development (CSD) and the FRD into the NRF was provided by the NRF Act of 1998, which was enacted on 1 April 1999. The objective of the NRF is to support and promote research through funding, human resource development and the provision of research facilities. The NRF recognises the

need to redress the inequalities of the past by enabling and encouraging South Africa's black community to make a full contribution to research. The NRF has set out to create a conducive environment in order to encourage, maintain and develop a research culture at HBUs (NRF 2003).

As mentioned at the beginning of this chapter, the higher education system in South Africa had two distinct systems or institutions, the HWUs and the HBUs. The former had been well-resourced and well developed and the latter not. To address this imbalance the Institutional Research Development Programme (IRDP) was started in 1995. Its goal was to establish a research culture, improve infrastructure and build research capacity in the HBUs. This programme was introduced by the FRD and has since become the NRF (Breen 2001:7). This programme has, to a large extent, achieved its goals and objectives and has laid the foundation for research at the HBUs (NRF 2001:9).

#### **2.4.1.3 Medical Research Council**

The Council for Scientific and Industrial Research (CSIR) was and is responsible for funding and supporting of scientific research in South Africa. However, this did not include the field of medicine but the CSIR was instrumental through a committee (Committee for Research in the Medical Sciences) in establishing research units and sponsored research programmes in the medical schools. This was acknowledged in their first Annual Report in 1969/1970, and the MRC was established in 1970. Its role was established in terms of Acts of Parliament (no's 19 of 1969 and 58 of 1991). The most important function of the MRC was and is "to promote the improvement of the health and the quality of life of the population of the Republic and to perform other such functions as may be assigned to the MRC by or under this act" (Barker 2000:12). This was to be achieved through research, development and technology transfer. The MRC is funded solely by an annual government grant and coordinates medical research within the country. As is mentioned in 2.5 only six percent of the science vote is allocated to MRC (Bisseker 2000:38).

The MRC is a national organisation and has offices in Cape Town, Pretoria and Durban and a rural centre at Hlabisa in KwaZulu-Natal. It supports 250 scientist, and 100 technologists who operate through 22 units, research centres, and 15 research programmes. Currently, its research priorities are HIV/AIDS, ethics, tuberculosis, malaria and many other health related programmes or research. It is not only known for funding of research but also its contribution to research in the field of medicine.

## **2.5 Medical Research**

The importance of medical research is indisputable, since the solutions to many of the nation's problems come from South African medical researchers. Some of the problems experienced in Africa are unique to this continent and are therefore not a priority for the developed world. With the transitional government came new avenues for funding from various international organizations. As a result, researchers previously excluded are now able to access funds for research. Even though the Government has increased funds for health related research through the Medical Research Council (MRC) and NRF, this is insufficient for medical research in academic institutions (Kirsch 2000:112). Bisseker (1999:38) points out that South Africa's top medical scientists are among the best internationally and they have made scientific breakthroughs in medical research. Despite this, South Africa's international research ranking is falling. Makgoba (past MRC President) states that this is partly because of South Africa's international isolation, the drop in value of the rand and poor Government support (In: Bisseker 1999:38). The MRC is the main organization responsible for medical research in South Africa. In 1999, the MRC's budget of R84 million was only 6% of the science vote. Makgoba stated that Government recognised that medical research was underfunded. The MRC has been supporting and funding researchers based at medical universities and this support continues. There was no formal agreement between the universities and the MRC in place and this has now changed. There is now a formal collaborative research agreement between the MRC and the academic institutions (Leibowitz 2000:5). This would financially benefit the MRC, academic institutions and the individual researchers.

Academic institutions need to take action to stimulate medical research. An example of this would be the Medical Faculty of the University of the Witwatersrand, which has taken action by linking bonuses and promotions to research output. It has introduced research prizes, offered courses in research methodology and formed partnerships with the MRC and private companies, to obtain additional funding. As a result of this, the Faculty's research output has remained constant (Bisseker 1999). This seems to be an initiative which all academic institutions are following towards facilitating research development.

### **2.5.1 Funding for HIV/AIDS Research**

Research on the HIV/AIDS virus has been carried out for two decades. It is imperative for prevention programmes and research on treatment to be undertaken. South Africa has the finest researchers in the field of HIV/AIDS, who are globally recognized. Coovadia (2003), Chair of the Victor Daitz in HIV/AIDS Research, emphasises the importance of international collaboration, since this also enhances international funding.

On the 7<sup>th</sup> August 2003, the funds allocated to the Enhancing Care Initiative (ECI), KwaZulu-Natal, by the Global Fund to fight AIDS, Tuberculosis and Malaria, have finally been approved and signed by the South African Government. This project was led by, the ECI KZN team, Nelson R. Mandela, School of Medicine, and the KZN Department of Health (Announcement by ... 2003).

Thirty HIV/AIDS research grants were approved for funding to support HIV/AIDS research at the Witwatersrand University. These grants were provided by the Carnegie Corporation of New York. The AIDS Research Institute at the University of the Witwatersrand, awarded over R 2.1 million in research grants to support HIV/AIDS research (R 2 million to HIV/Aids research 2003).

Another recent development was the launch, on 29 July 2003, of the Doris Duke Medical Research Centre. The purpose of this centre was to create a dynamic research

environment for medical research and provide cutting-edge facilities, including an HIV/AIDS library. Funding for the project began in September 2000 and, as the Dean of the University of Natal Medical School, Prof Barry Kistnasamy, states, "It will provide the infrastructure for strategic research and it will focus primarily on diseases affecting the poor and vulnerable in South Africa and, indeed, all of Africa" (Kistnasamy 2003). Research will be relevant to South Africa's needs and this would include HIV/AIDS, tuberculosis, malnutrition, malaria, cancers and other non-communicable diseases (UND HomePage 2003).

In 2002, the National Institute of Allergy and Infectious Diseases (NIAID) awarded a Comprehensive International Programme for Research on AIDS (CIPRA) grant to the University of Natal, Durban. The award was approximately, R11 million for five years, to support South African researchers conducting research on HIV/AIDS prevention and treatment. This collaboration is called the Centre for the AIDS Programme of Research in South Africa (CAPRISA). CAPRISA grants are awarded to developing countries to conduct research and to increase capacity for research on HIV/AIDS prevention and treatment. This project complements other South African HIV/AIDS research which is supported by NIAID (NIAID 2002:1).

## **2.6 Accredited Journals**

The subsidy system has been met with much criticism from research academics at the different institutions. They are of the opinion that the subsidy system is the cause for the decline in the standard of research. The subsidy was the incentive for academics to publish. The motive for writing was nothing but money and this, in turn, produced poor-quality research. Attwell (In: Byrne 1996) points out that publications have increased in quantity but not in quality. In the mid-1980s, in some institutions, academics, as part of their Conditions of Service were compelled to publish at least one article a year in a specialist journal.

In 1986, with the revised SAPSE formula, there were severe cuts in university subsidies and a new, revised system of subsidizing research was established. This was to encourage

high levels of research. UNISA's research output has trebled since this system was established. The consensus was that the system was working for them. However, many academics do not know how the system operates and the administration can be very bureaucratic. The subsidy consists of three amounts, which are given to a university on an annual basis. One is called the "blind component", which is for an institution to set up an infrastructure for research. The second is an amount which is based on student numbers and pass rates. The third is earned by research published. This research needs to be of a very high standard and is subjected to stricter, and a greater number of, selection procedures to keep up with "international standards". The publication has to be refereed by a panel of experts or distinguished scholars in the field. Initially, the selection was done by the Department of Education, but this has evolved and now peers in the university structure complete the selection. The system of peer evaluation is, however, open to abuse (Byrne 1996).

An article will be subsidized if it is published in an approved journal. Byrne (1996) outlines the process that a journal article has to go through in order to be subsidized. She states clearly that, even after it has been accepted in an accredited or approved journal, this does not guarantee a subsidy and there is still the "selection" procedure. She also noted that the amount of money generated by the publication received by the university was not disclosed. It is assumed to be between R10 000 and R12 000 and it is at the discretion of the university how these funds are allocated. Universities have different methods or systems to allow academics access to these funds. Byrne (1996) explains this by using UNISA, the University of Natal, Rand Afrikaans University and the University of the Western Cape as examples. She is of the opinion that the subsidy system can be exploited.

The ranking of journals seems to be yet another problem. Some institutions were not in favour of the list of SAPSE-approved journals and also granted funds to articles in journals that did not appear in the SAPSE-approved listing. In these cases the SAPSE-approved journals would be rated "A" and the journals that did not appear in the SAPSE listing would be rated "B". Articles that appeared in listing "B" would receive half the

subsidy and were called “semi-accredited” publications. Subsidization was at the discretion of the individual universities. Academics claimed that the SAPSE-accredited lists were outdated and not relevant for South African conditions. There was also the problem of *new* journals that did not appear on the SAPSE lists, especially if they originated from the HBUs (Byrne 1996). It is important for the accreditation process to be more transparent. Byrne (1996) identified the deficiencies of the subsidy system, but she conceded the point made by Swanepoel (in charge of research in the sub-faculty of languages at UNISA) that, although the system has disadvantages, it eventually benefited the researcher.

According to the Department of Education, the completed list in 1986 consisted of all journals which appeared in the three citation indexes of the Institute for Scientific Information (ISI), as well as journals from the supplementary list (Department of Education 1997). The Department of Education is currently reviewing the policy and procedures for measuring the research output of higher education institutions. The Chief Director of Higher Education, Development and Support, Molapo Qhobela, has visited academic institutions to inform academics about the review. In his addresses he explains the policy and reviews regarding Research Support for Universities and Technikons, which include the New Academic Policy in terms of reviewing a funding formula and a review of measurements of research outputs. The reasons for the review was that the mid-nineteen-eighties list of journal titles was outdated and there was a need for improved accountability, efficiency and transparency in evaluation (Qhobela 2002). In a letter addressed to Prof. Abdul Karim (Deputy Vice-Chancellor for Research, University of Natal), he pointed out the criteria recommended by the review committee with respect to accredited journals. The main recommendation is that international journals will only be accredited should they be indexed in an internationally reputable indexing system. The Department of Education is in the process of deciding to use ISI Indexes, which has a total listing of approximately 8 600 titles. There are currently 26 South African journal titles that appear in the ISI listing. Therefore, if the journal appears in the ISI list of journals, it will be accredited for subsidy allocation (more information on ISI is provided in Chapter 4). Should a journal be published out of South Africa, the Department of

Education will not evaluate it for subsidy purposes. At the time of writing, the Department was in the process of evaluating South African titles for inclusion in a secondary list, should they meet certain criteria (Qhobela 2002). The system of having a list of subsidy-earning journals will be used for 2003 research output. The new Higher Education Act on the policy and procedures for the measurement of research output, which was Gazetted on 10 October 2003, will come into effect in 2005 (RAU 2003). The subsidy-earning journals list will change and include the approved South African journals list, ISI journals list and the IBSS journals list. According to Merrett (2002:5) the SAPSE list is "largely governed by ISI's choice of journals". Publishing houses like ISI exploit academics by selling their research back to universities at enormous profit in the form of journals.

## **2.7 Summary**

This Chapter provided a brief background of the institutions that contribute to the HIV/AIDS literature in South Africa. South Africa's higher education system is still feeling the effects of inequalities of the past. These have led to institutions being classified as HBUs or HWUs. Due to the apartheid system, HBUs were not able to produce the quality or quantity of research expected. The government, using the National Plan, is attempting to address these inequalities. With the funding of research, done primarily through the NRF, MRC and other organisations, academic institutions are now entering into strategic alliances with private institutions in order to fund some of their research activities. The MRC is primarily responsible for co-ordinating and funding medical research. This Chapter concludes with a brief discussion of accredited journals and the subsidy system.

## **Chapter 3**

### **Review of the Literature**

#### **3.1 Introduction**

Chapter 3 reviews the literature and research in the broad field of bibliometrics and focuses particularly on the subject of this research.

#### **3.2 History and Origin of Bibliometrics**

According to Egghe and Rousseau (In: Osareh 1996: 149), bibliometrics had its origins in the West, and arose from statistical studies of bibliographies. Pritchard (In: Ravichandra Rao 1983: 179) stated that “statistical bibliography” was the phrase used for the application of quantitative techniques to libraries. The term “statistical bibliography” was originally used as early as 1923 by Humes, when he referred to the study of Cole and Eales, done in 1917 (Narin and Moll 1977; Ravichandra Rao 1983; Osareh 1996) and again in 1962 by Raisig. However, bibliometric use can be traced back to Campbell’s 1896 work, in which he used statistical methods to study subject scattering in publications. According to Sengupta (In: Osareh 1996:149), this is probably the earliest attempt to carry out bibliometric studies. The other earlier work, mentioned above, was that of Cole and Eales in 1917, which studied the growth of literature in comparative anatomy from 1550 to 1860, using bibliographical citations (Narin and Moll 1977; Osareh 1996).

In 1948, Ranganathan suggested the term “librametry”, which would be compatible with terms such as, biometry, psychometry and econometry, in other disciplines. In spite of his efforts, the scope for this type of analysis only developed in the nineteen-seventies (Ravichandra Rao 1983; Osareh 1996).

Statistical bibliography was defined as:

- “to shed light on the process of written communication and of the nature and course of development of a discipline,...by means of counting and analyzing the various facets of written communication” (Pritchard 1969:348).

- “the assembling and interpretation of statistics relating to books and periodicals...to demonstrate historical movements, to determine the national or universal research use of the books and journals, and to ascertain in many local situations the general use of books and journals” (Raisig 1962:450).

However, the general feeling was that the term “statistical bibliography” was unsatisfactory. Pritchard (1969) and Broadus (1987:373) mention four reasons for this:

- the expression had been used only four times in the literature at that time
- the term was clumsy
- it was not very descriptive
- it could be taken to mean bibliographies on statistics.

Therefore, in 1969, Pritchard coined the term “bibliometrics”, to describe “all studies which seek to quantify the process of written communication” (Narin and Moll 1977:35). Distinguishing between librmetry and bibliometrics, Ravichandra Rao (1983:179) states that “librametry primarily aims at the quantitative analysis of the management of libraries and bibliometrics is limited to recorded knowledge”.

However, to the present author’s knowledge, there are just two articles that dispute the fact that it was Pritchard who coined the term. Fonseca (In: Osareh 1996) and Jimenez-Contreras and Plugarin-Guerrero (1998:341) claimed that it was Otlet in 1934 who had coined the term bibliometrics, in his pioneering work, entitled “*Traite de documentation le livre sur le livre theorie et pratique*”.

### **3.3 Definitions of Bibliometrics**

The change of the term to “bibliometrics” was accepted by all in the field. Pritchard himself defined the term bibliometrics as “the application of mathematical methods to books and other media of communication” (In: Narin and Moll 1977:35). Lancaster (1977:353) defined bibliometrics as “the application of various statistical analyses to study patterns of authorship, publication, and literature...”. He elaborates, saying that the

“use was once referred to as ‘statistical bibliography’”. White (1985:35) defines bibliometrics as: “the measurement of books or compositional entities according to methods that yield comparable results.” Jacobs (1998) gives an account of the different definitions of the term “bibliometrics”, including that of the British Standards Institution, which defines bibliometrics as “the study of the use of documents and patterns in which mathematical and statistical methods have been applied”. Jacobs (1998:54) explains the concept “bibliometrics” as having two roots:

“biblio”: derived from the Greek and Latin word “biblion”, which means book

“metrics”: derived from the Latin and Greek words “metricus” or “metrikos”, respectively, which means measurement (Jacobs 1998:54).

A further definition by Gauthier (1998:9) is “bibliometrics is a branch of scientometrics that focuses principally on the quantitative study of scientific publications for statistical purposes”. Braun (In: Osareh 1996:150) mentions the importance of distinguishing the difference between scientometrics and bibliometrics and states that their methods are similar and may be identical. He regards the major purpose of bibliometrics as being to improve scientific documentation, information and communication by quantitative analysis. Scientometric techniques involve a quantitative analysis of the generation, propagation and utilization of scientific information, in order to contribute to a better understanding of the mechanism of scientific research as a social activity.

### **3.4 Scope of Bibliometrics**

Bibliometrics can be used for the most basic of analyses. White (1985) and Narin and Moll (1977) provide an account of Cole and Eales’ study in 1917. Their study analysed comparative anatomy publications during the years 1543 to 1860. They counted the number of titles or publications, both of journals and books, and grouped them by countries.

Another early application of bibliometrics was that of Price (1963). Borgman (2000) and Narin, Olivastro and Stevens (1994) mention Derek Price’s 1963 book called *Little Science Big Science*. In this study, Price indicated the growth and patterns of scientific

activity or research published. He pointed to the exponential growth and rapid expansion of scientific research. This exponential growth in scholarly communication is evident in every field of research. Narin, Olivastro and Stevens (1994) stated that every day there are more than 5 000 scientific articles and approximately 1 000 new patent documents published. They are of the opinion that it is beyond the ability of a person or group to comprehend this new knowledge without the use of bibliometrics or quantitative indicators.

According to Gauthier (1998:9), bibliometric methods fulfil three functions, namely describing, evaluating and monitoring scientific and technological research. She elucidates that, as a descriptive tool, it presents the publishing activities of a country, province, city or institution and can be used for comparative studies. The data can also be used to assess the evaluation of research units. Lastly, the data can be used to monitor science and technology, that is, to identify research that is developing or not progressing.

### **3.5 Bibliometrics and Scholarly Communication**

Diodato (In: Osareh 1996:151) explained that scholarly communication examines the ways that scholars, scientists and other professionals communicate with each other. Traditional scholarly communication during the nineties appears to be moving from paper based to electronic forms and this will give rise to new ways of sharing ideas and cooperative research.

Bibliometrics has been, and can be, applied to a wide range of different studies of scholarly communication and for a great variety of reasons. Scholarly communication is the study of how authors or scholars in any field use and disseminate information through formal or informal channels. Borgman (1989) cites various authors and explains that scholarly communication includes the growth of scholarly information, relationships among research fields, information needs and use of individual groups and the relationships among formal and informal methods of communication. Bibliometrics can only be applied to the study of formal channels of scholarly communications in a written record of communication (Potter 1981(a):5).

The importance of scholarly communication relating to a discipline can be for 'internal' or 'external' reasons. Borgman (1989:584) defines the 'external' reason as being the competition in science for research funds and the pressure of international competitiveness. The 'internal' reason is that of "continued introspection about its constituency and viability as a discipline" (Borgman, 1989:585).

### **3.6 Bibliometrics as a Research Method**

Bibliometrics is a type or form of research method, which utilizes quantitative analysis and statistics to describe patterns of publication within a given field, for example, the HIV/AIDS literature. Bibliometrics also reveals historical development, patterns of authorship, publication and use. Some bibliometric studies use descriptive quantitative analyses leading to a more qualitative subject and citation analysis.

Potter (1988:238a) identifies two types of bibliometric studies:

#### **3.6.1 Evaluative Studies or Qualitative Analyses**

These attempt to analyze the use of a body of literature by employing citation analysis. For example, if a journal article on HIV/AIDS is cited in a large number of subsequent articles, then it can be concluded that this article is of importance in the field of HIV/AIDS. Another example is that of two or more articles which are often cited together. This is referred to as co-citation.

#### **3.6.2 Descriptive Studies or Quantitative Analyses**

These attempt to study a body of literature by enumerating the body of literature produced by country, time period, and subject or discipline. An example would be to count the number of articles in the field of HIV/AIDS that are produced by the medical faculties in South Africa or to analyze the number of articles on HIV/AIDS that appear in a particular journal.

In the arena of descriptive or quantitative application of bibliometric studies, there are three laws of bibliometrics that are used:

### 3.6.2.1 Bradford's Law

Usually referred to as the Law of Scattering and later as the Law of Distribution (White 1985:36). Bradford introduced a law that stated that journals in a field can be divided into:

- a core of journals devoted to a subject field which produce one-third of the articles.
- two successive zones that will each contain the same number of articles as the core.

The mathematical relationship of the number of journals in the core to the first zone is a constant  $n$  and to the second zone it is  $n^2$ . Therefore, Bradford's formula is  $1:n:n^2$ .

Bradford's Law shows how articles are dispersed or scattered throughout a collection of journals.

### 3.6.2.2 Lotka's Law

Referred to as the Law of Scientific Productivity, it describes the distribution of the number of authors of varying productivity. It also describes the frequency of publication by authors in a given field. Lotka proposed a general formula: the number of authors making  $n$  contributions is about  $1/n^2$  of those making one. The proportion of all contributors that make a single contribution is about 60%. This means that, of all the authors in a field, 60% will have one publication, 15% will have two publications, 7% will have three publications and so on. Lotka's law is a good predictor of author productivity (Potter 1988:238a-238c).

### 3.6.2.3 Zipf's Law

Referred to as the Law of Occurrence, it describes word frequency rankings. This law is used to predict the frequency of words within a text. If a lengthy text is examined and the words occurring within that text are listed in order of decreasing frequency, the rank of a word on that list, multiplied by its frequency, will equal a constant. The equation for this relationship is:  $r \times f = k$ , where  $r$  is the rank of the word,  $f$  is the frequency and  $k$  is the

constant. The practical application of this law is predicting the occurrence and frequency of indexing terms in a computerized database (Potter 1988:238a-238c).

Bradford's Law of Dispersion, which requires an examination of how articles appear throughout a set of publications, falls outside the scope of the present study. The same applies to Zipf's Law, which requires an examination of the frequency of words within a set of texts.

Lotka's Law is appropriate in establishing author productivity in a given field. There is considerable literature surrounding the application, validity and reliability of Lotka's Law (Vlachy, 1978; Potter, 1981(b); Nicholls, 1989). Nicholl's (1989) study, in particular, proposes a consistent methodology and empirical test for the validation of Lotka's Law. For Lotka's Law to be applied to the present study, would require one to personally examine and note each author individually, since the Endnote database search function does not allow for automatic searching by author particularly where an author appears as the second or third author. The method of examining the author field is time consuming and therefore could not be undertaken for the present study.

Another major method used in bibliometrics is citation and co-citation analysis which is discussed in 3.8 below.

### **3.7 Application of Bibliometrics**

Bibliometrics can be applied to a wide range of areas. Lawani (In: Osareh 1996:151) mentions that the application of bibliometrics can be used for the selection of materials; to access study of communication patterns; to identify specialities; to identify influential authors and publications; to note obsolescence of the literature and to assess the quality of material used in publications. To be more specific, Kim and Kim (2000:111) state that bibliometric analysis can be used to identify emerging research areas, to evaluate research performance of individual scientists, research groups and countries, to map the cognitive or intellectual structure of a research area and to study relationships among authors, institutions and journal articles. Sengupta (In: Jacobs 1998:57) enumerates the areas that

bibliometric studies are applied to, which are in keeping with the above applications. The additional applications would be to forecast past, present and future publishing trends and to identify core periodicals in the different disciplines.

Many researchers of academic institutions, globally, have been using bibliometrics as a method of evaluating research performance and research policy at their institutions (Moed *et al.*, 1985; King 1987; Spruyt, de Bruin and Moed 1996; Van Den Burghe *et al.*, 1998; Kim and Kim 2000; Moed, Luwel and Nederhof 2002). Scientific productivity or research performance (as measured by research output) of academic institutions, research centres, authors and even countries, have used bibliometrics for their analyses (Karisddappa, Gupta and Kumar, 2002; Jeevan and Gupta, 2002; Narvaez-Berthelemot *et al.*, 2002). A study by De Arenas, Castanos-Lomnitz and Arenas-Licea (2002) used citation analysis to measure country productivity and international impact for Mexico in terms of research in the health sciences.

Publication and citation counts have been used to assess scientific activity since the early years (Narin 1976:1). This method is used to measure productivity and impact. In addition to publication and citation counts, another important method of measuring impact and productivity is that of citation analysis and co-citation analysis.

### **3.8 Citation Analysis**

Citation analysis method is used to establish relationships between authors or their work. When an author cites another author, then a relationship is established. A common use of citation analysis is to determine the impact of a single author on a given field. This is achieved by counting the number of times the author has been cited by other authors. Citation analysis is used as an important method of evaluating a given research field.

Productivity is referred to as the quantity of research outputs and publications of a researcher. It involves counting the number of articles, books and/or chapters in books produced by an author over a given period of time. Productivity is dependent on area of

expertise, age and economic aspects such as funding. In order to measure productivity one common method used is citation counts.

Garfield (1979) discussed the use and controversy of citation analysis. Some of the criticisms of its use are negative citations, self-citations and methodological papers. Another paper, by Folly *et al.* (1981), discussed the problems of citation analysis and builds on Garfield's observations. Garfield (1979) discussed the many problems: of counting citations of multiple authored papers, distinguishing between persons with the same surnames and the broader question of what exactly citation analysis measures. He concluded by stating that scientific enterprises are becoming larger, more complex and more critical to society. Therefore it becomes more difficult to evaluate and identify productivity. According to Garfield, citation analysis, when properly used, can lend itself to objective measures in the evaluation process and is relatively inexpensive.

An issue of importance in calculating citation counts is the fact that citations of a publication are dependent, to some extent, on the year of publication. This issue arises as citations are accumulated over a period of time. Marx, Schier and Wanitschek (2001:62) point out the reality that citations of scientific papers increase substantially one or two years after its publication, and reach their maximum after three to five years and thereafter decrease. They also mention the fact that most publications produce a relatively small impact (as measured by the number of citations), but it is possible that the citations can last for many years. The reason they advance for this is that the publications that they examined were, after a decade of non-observance, cited again. Additionally, a large number of publications may never be cited, but these publications could have made an important contribution to research.

The present author had limited time to use the *Science Citation Index Expanded* database online. This was due to the fact that part of the data acquired for this study was taken from this database, which was available on trial to the University of Natal for a short period of time, only. During this trial period, the records were downloaded into the Endnote database. It was subsequently determined that the Endnote package does not

have the capacity to perform statistical calculations, despite the author initially being advised to the contrary. By this time the trial period had expired and it was not possible to redo the search and capture the data in another format. Therefore, detailed citation analysis, as discussed above, could not be undertaken. In addition, while the *Science Citation Index* online database allows extensive citation analysis, this analysis was not possible with the CD-ROM version (which is available at University of Natal) or with the *Web of Science* (Marx, Schier and Wanitschek 2001:60). Positively, though, records downloaded (during the trial session) had citation counts and these were used for the assessment in this study.

### **3.9 Co-Citation Analysis**

This method is used to recognize and establish the similarity between two articles. If two articles are cited by a third it is possible that the articles may be related to one another. This may occur despite the fact that the first two may not cite each other. If the articles in question are cited in many other articles, then it may be assumed that the articles have a stronger relationship. Therefore, the more frequently they are cited the stronger their relationship. For the present study, co-citation analysis was not used, as the database employed in this study was only available for a short period of time and it was not possible to collect the level of detail required to measure co-citations.

### **3.10 Bibliometrics and HIV/AIDS Literature**

A literature search was performed on *Library Literature*, *MEDLINE*, *AIDSearch*, *ISI Science Citation Index*, *SABINET*, *Ebsco Host* and the Internet. This survey of the literature revealed that the first paper on bibliometrics and HIV/AIDS was published in 1989 (Self, Filardo and Lancaster). In total there were fourteen published articles and one unpublished article on bibliometrics and AIDS. A summary of the research studies on the HIV/AIDS literature in the different fields is presented in Table 1.

**Table 1: Summary of Bibliometric Studies on HIV/AIDS Literature**

No.	Authors	Year of Publication	Source of Data	Years Covered	No. of Records Examined	Subject Covered
1.	Self, Filardo & Lancaster	1989	Medline	24/09/82-31/12/87	8 510	General
2.	Small & Greenlee	1989	SSCI and SCI	1982-1987		Co-citation
3.	Forney	1990	National Library of Medicine AIDS Bibliographies	1980-1984	2 122	General
4.	Brooks, Bierbaum & Brooks	1990	AIDSLine and Medline	October 1986-October 1989	14 621	Journal frequency
5.	Sengupta & Kumari	1991	Collected Papers on AIDS Research	1976-1986	6 114	General
6.	Pratt	1992	Medline	1981-1990	29 077	General
7.	Bierbaum, Brooks & Brooks	1992	AIDSLine	1983-1989	21 114	Subj. Control
8.	Small	1994	ISI	1989-1991	23 689	Mapping of AIDS research
9.	Bierbaum & Brooks	1995	AIDSLine	1992	12 987	Subj. Access and Publication Patterns
10.	Gillaspy & Huber	1996	AIDSLine, BIOSIS, Cinahl, Embase, PsychInfo, Socio Abstracts	1980-1993	6 099	Women
11.	Huber, Gillaspy & Fogel	2000	AIDSLine & Cinahl	1981-1997	6 986	Nursing
12.	Huber, Schoonover & Kashka	2000	AIDSLine, Medline, Embase, Cinahl	1980-1998	1 292	Nutrition
13.	Macias-Chapula	2000	AIDSLine	1980-1998	443	Haiti
14.	Macias-Chapula & Muangos-Nolasco	2002	AIDSLine	1980-2000	1 052	Central Africa
15.	Macias-Chapula et al.	2003? (unpublished)	Medline	1980-2001	1 820	Africa, Southern

Source: Adaptation of Gillaspy and Huber (1996:26)

Table 1 is adapted from the work by Gillaspy and Huber (1996:26). Bibliometric literature on HIV/AIDS is sparse, as is clear from the summary. The studies are unanimous that there was, and still is, growth in the literature. Brooks, Bierbaum and

Brooks (1990) and Pratt (1992) studied the growth of the literature, which increased in every field of study. The work by Huber, Schoonover and Kashka (2000) observed the growth of the literature but stated that the literature was fractured or fragmented. Their study focused on AIDS and nutrition.

Self, Filardo and Lancaster (1989) were concerned with the terminology used to find the first written communication on the subject. They traced the literature on the presence of the virus to 1959 in Africa and 1969 in the USA and commented on the terminology used for the disease. Small and Greenlee's (1989) publication studied co-citation analysis of AIDS research, with the use of SCI and SSCI. They followed the development of the literature on AIDS and the growth by co-citation clusters. They further tracked the literature on AIDS, which was found to be focused on clinical aspects and transmission and prevention. Their study also revealed innovations in AIDS research.

Bierbaum, Brooks and Brooks (1992) analysed the MeSH (medical subject headings) used to index the literature on AIDS. They studied the variance in indexing terms and stated that this variance reflected the turbulence and uncertainty in the early stages of development of knowledge in the field. A study by Small (1994) revealed the network of AIDS literature built topic by topic. This study revealed where the AIDS literature connects to the literature in other fields. Small (1994) used an SCI-map to chart the literature to perform cluster-based retrieval, using co-citation or other measures to link documents with each other.

Table 1 shows that from 1996 to more recent years the emphasis of the research has changed. This change is reflected in the research, which is no longer of a general nature, but is more focused. The more recent research concentrated on HIV/AIDS, combined with other subjects. The study by Gillaspay and Huber (1996) chiefly concerned women and AIDS. In 2000, Huber, Gillaspay and Fogel studied the literature on AIDS and nursing, followed by another study by Huber, Schoonover and Kashka (2000), on AIDS and nutrition. More recent studies seem to concentrate on AIDS in different geographic

areas, namely Haiti, Central Africa and Southern Africa. These regions appear to be those worse hit by the disease and hence the focus of the research above.

Another facet of bibliometric analysis is that of the language of the publications. Self, Filardo and Lancaster (1989) state that until the end of 1982 only three languages contributed to the AIDS literature and, by the end of 1987, twenty-five different languages contributed. Forney (1990), Sengupta and Kumari (1991) state that the majority of the publications were in English.

Brooks, Bierbaum and Brooks' (1990) study attempted to quantify scholarly journals as information channels for the literature on AIDS. Their analysis indicated that the core of maturing literature concerning AIDS comprised a strong, persisting cohort of medical journals, augmented by AIDS speciality journals, and two general science news journals. The two specialised journal titles were *AIDS* and the *Journal of Acquired Immuno Deficiency Syndrome*. Forney (1990) revealed a core list of eighteen journal titles, which accounted for 52% of the total literature covered during the period 1980 to 1984. He also revealed that there was just one specialised journal title before 1984, which was devoted exclusively to AIDS. This was called *AIDS Research*. Sengupta and Kumari (1991) noted that primary journals contributed to 62.7% of the total number of references in their study. Bierbaum and Brooks (1995) state that in their study the greatest increase in productivity came from a group of specialised journals. The study by Huber, Schoonover and Kashka (2000) concluded that the literature was scattered and published in a wide variety of scholarly journals and community-based AIDS services organizations' newsletters. Macias-Chapula (2000) confirms in his study that most documents were published in periodicals or journals and that the *International Conference on AIDS* had the highest frequency.

Two studies concentrated on authorship patterns. Sengupta and Kumari (1991) conducted one of the studies examining authorship patterns. Their research revealed that the majority of the literature on HIV/AIDS was undertaken by multiple authors. It was also

shown by Macias-Chapula and Muangos-Nolasco (2002) that there were high patterns of collaboration through multiple authorship.

### **3.11 Summary**

From the above review of previous research in the field of bibliometrics it may be concluded that there has been substantial growth in the knowledge of bibliometrics. The methodology has advanced to the level of being recognised as a science. The applications have been varied and the methodology has the capability of being applied across disciplines and across time. From the review of bibliometric studies of HIV/AIDS publications it may be concluded that there has been exceptional growth in research work on the subject and thus growth in the appearance of bibliometric studies on HIV/AIDS but this growth is slow and the number of studies remain surprisingly low.

## **Chapter 4**

### **Research Methodology**

#### **4.1 Introduction**

Chapter 4 presents the research methodology and data collection procedures carried out for the study. The data collection is a critical part of bibliometric studies and determines the success of the study. The purpose of the study was to investigate the growth of the literature and patterns of authorship of HIV/AIDS literature of institutions in the sciences and medicine and other organizations in South Africa. The period of investigation was from 1982 to 2002, to present a comprehensive picture. The computerized bibliographic databases used for the study were *MEDLINE (OVID)*, *ISI Science Citation IndexExpanded* and *AIDSearch*. These are accepted and popularly used databases in academic institutions.

#### **4.2 Research Design**

To achieve the objectives of the study, a combination of the survey method and a bibliometric analysis of the documents was considered appropriate. Bibliometrics (discussed in Chapter 3) is a research method which utilizes quantitative analysis and statistics to describe patterns of publication within a given field. Bibliometrics reveals historical development, patterns of authorship, publication and use. Some bibliometric studies use descriptive quantitative analyses which could lead to a more qualitative subject and citation analysis, with the use of the bibliometric laws discussed in Chapter 3. Narin (1976:2) states that, among other things, evaluative bibliometrics reveals scientific activity and productivity trends.

Bibliometric research is sometimes categorized as unobtrusive or non-reactive research. Bibliometric studies, according to Martyn and Lancaster (1981:77), are concerned with indirect or unobtrusive methods of researching a phenomenon of interest to librarians and information practitioners. The empirical research in bibliometrics thus gathers data by means that do not involve direct physical contact with research subjects. This study

generated data from computerized bibliographic databases on the subject under investigation authored by South African academics and those affiliated institutions and organizations in South Africa.

### **4.3 Data Collection**

This section describes the data collection procedure used in the study. The population descriptions are presented as are the three databases used in the study. The limitations of these are described.

#### **4.3.1 Identification and Description of the Population**

The population used for the study was defined as the HIV/AIDS research output of the eight South African medical faculties in South Africa, as well as other contributing institutions, over a specific time period, as reflected in the above-mentioned databases. These institutions are listed and described in Chapter 2 and will therefore not be dealt with here.

#### **4.3.2 Sources Used**

This section deals with the sources that were used for the study. Their coverage and limitations are presented.

##### **4.3.2.1 Online Information Retrieval Systems**

The advent of large, computerized bibliographic databases has resulted in an increase in the number of bibliometric studies. The emergence of the CD-ROM versions of bibliographic databases were followed rapidly by online databases. Literature searching on these computerized bibliographic databases revolutionized information retrieval techniques and provided a wonderful opportunity for bibliometric studies. Electronic databases are widely and heavily used in subject-oriented, author name, corporate author or affiliation, journal title, publication type and date searching. The technologically advanced databases lend themselves to the quantitative analysis of the bibliographic features of a body of literature.

Although computerized databases provide a rich source of data, caution must be exercised in their use (Martyn and Lancaster 1981:86). These authors explained that it is important to examine or analyze database coverage policies to determine the selectivity of their input. This is important, as not all databases include all publications in an area of research. Journals that are indexed may be included because of their commercial value rather than by their academic worth.

Computerized bibliographic databases are not without drawbacks or limitations. As Cunningham (2003?) points out, full-text documents are very rarely available and some abstracts are not available. The databases limit their citations to formally published documents and disregard other documents. Cunningham (2003?:3) is of the opinion that this hampers the analysis of these important forms of scientific communication. Some of the shortcomings for digital libraries in bibliometric application, as described by Cunningham (2003?:6-8), could also apply to some databases:

- Lack of consistency in field formatting: there is no standard format to produce citations and therefore different databases have different formats. An example of this is the varying methods of author entry; sometimes entered with full given names and sometimes only with initials. There is no standard convention for separating authors' names. Some databases use commas and some spaces. These inconsistencies cause problems for bibliometric applications.
- Duplicate entries: different databases often draw documents from various sources, as was the case in the present study. When records from the three databases used in this study (see below) were combined, there were many duplicates. Sometimes, because of irregularities in formatting, it is difficult to detect these duplicates.
- Lack of standardized fields: although the majority of databases have fields that are standard, not all do. Some databases, for example, have a specific field for document type, while others place it in a note field.

- Implicit field tagging: some databases do not explicitly tag items with certain types of information. For instance, institutional affiliation of the author may appear in the note field and special processing may be required to append this field information to the correct field for bibliometric analysis. Sometimes this has to be done manually, as was the case for the present study.
- Lack of consistency in Keywords or Subjects: databases use different methods for assigning keywords or subjects. Some databases, for example, use abbreviations instead of the subjects in full. This creates a problem for application of bibliometric analysis.

All of these problems need to be resolved before the application of bibliometrics.

The databases or online information retrieval systems used for this study were:

*ISI Science Citation Index Expanded* 1982-2002

*MEDLINE (OVID) Database* 1982-2002

*AIDSearch Database* 1982-2002

A brief description of these follow.

#### **4.3.2.2 ISI Science Citation Index Expanded**

The *ISI Science Citation Index Expanded* is a multidisciplinary index to the journal literature of the sciences. It is produced by the Institute for Scientific Information in Philadelphia. It fully indexes 5 900 major journals across 150 scientific disciplines. The Expanded version of *ISI Science Index* indexes 2 100 more journals than the print and CD-ROM versions of SCI, includes all cited references from the articles indexed and provides access to current information and retrospective from 1945 to the present. For this study, the years 1982 to 2002 were searched. Approximately 70% of the articles have searchable English abstracts. The University of Natal subscribes to the CD ROM version of *ISI Science Citation Index* for the years 1992 to the present. Access to the *ISI Web of Science* was made available for a trial period. The *ISI Web of Science* includes *ISI Science Citation Index Expanded*, which was used for the study. Therefore the period 1982-2002 was accessed during the trial period.

Hjorland (2002: 433) points out that databases can be limiting and uses ISI as an example, stating that it has a very low coverage of monographs. In the present study, this was not a problem, since monographs were excluded. Another limiting factor of ISI is that, mainly, journals of high impact are indexed and ISI does not favour non-English journals. As ISI predominately indexes mainly scientific journals, articles published in non-scientific journals are excluded from the database (Jacobs 1998:82). In the present study, since the majority of the articles were published in English and a small number in Afrikaans, this was not a limitation for the study.

#### **4.3.2.3 MEDLINE**

The National Library of Medicine (NLM) produces a database of medical literature called *MEDLINE*. This database covers the fields of medicine, nursing, dentistry, veterinary medicine, the health care system and the pre-clinical sciences. *MEDLINE* contains bibliographic records and author abstracts from more than 4 500 biomedical journals published in the United States and 70 other countries. Selection of journal articles for inclusion in the *MEDLINE* database is based on the advice of the Literature Selection Technical Review Committee (LSTRC), a National Institute of Health (NIH) chartered advisory committee, which reviews all biomedical and health related journal titles and recommends those to be indexed. The committee uses some critical factors to select journals to be indexed. The Fact Sheet (National Library of Medicine 2002) states that “the LSTRC considers the quality of the scientific content, including originality and the importance of the content for Index Medicus/Medline audiences throughout the world”.

Literature from 1971 onwards can be searched online. Citations to articles indexed from 1966 to the present are included. Coverage is worldwide and most records are from English-language sources. Citations are assigned MeSH terms and publication types from the NLM’s controlled vocabulary. *PubMed*, also produced by the National Library of Medicine, provides access to Medline bibliographic information and uses Medline citations and abstracts as the primary component of the database. *PubMed* provides access to some additional life sciences journals. *PubMed* is available on the Internet

(National Library of Medicine 2002). For this study, the CD-ROM version of *MEDLINE(OVID)* was used.

Use of this database made it possible for the author to examine the contribution made by South African academics to the field of HIV/AIDS research on an annual basis and revealed the significance of that contribution.

#### **4.3.2.4 AIDSearch Database**

The *AIDSearch* database is a combination of databases and includes the subset of *MEDLINE* called *AID/HIV subset*, as well as *AIDSDRUGS* and *AIDSTRIALS*. These databases are compiled by the National Library of Medicine of the United States, Department of Health and Human Services. The *MEDLINE HIV/AIDS* subset includes citations from journal articles, government reports, letters, technical reports, meeting abstracts, monographs, theses and audiovisual material covering research, clinical aspects and health policy issues related to AIDS. The citations are derived from the *MEDLINE* file. *AIDSDRUGS* is a dictionary of chemical and biological agents currently being evaluated in the AIDS clinical trials covered in the companion *AIDSTRIALS* database. *AIDSTRIALS* includes information about the clinical trials of substances being tested for use against AIDS, HIV infection and AIDS related diseases. Coverage is from 1980 to present with monthly updates. The database contains approximately 300 000 references. The above facts were provided by Hulley (2003), an employee of NISC, Communication and Sales.

#### **4.4 Limitations of the Databases**

Not all articles published in South Africa in the field of medicine and the sciences are included on *MEDLINE (OVID)*, *AIDSearch* and *ISI Science Citation Index Expanded*, because of the limited number of journals that are indexed (especially by *ISI* and *Medline*). This means that a fair amount of research on HIV/AIDS is not covered by these databases. In the Institution Field, it is only the address of the first author that appears. The consequence of this is that, should the second or third author be a South African, the search might not retrieve it. Despite their lack of comprehensive coverage, these

bibliographic databases are internationally regarded by medical researchers and scientists as providing the best coverage of the literature.

The use of multiple databases (while presenting the problems of duplication, as discussed) ensures the development of an inclusive and comprehensive database of papers and articles and also offsets the limitations of using one database, even if it is a popular one.

#### **4.5 Endnote and Microsoft Excel**

Endnote 5 is a software package used by researchers, writers, students and librarians as an online bibliographic database. It is used to store the citations and it organizes citations and creates bibliographies. An unlimited number of databases can be created, with approximately 32 000 records per database. Each record has up to 38 fields for entering bibliographic data. Citations can be downloaded from *ISI Web of Science* database, *PubMed*, *Medline*, *Library of Congress* and other University catalogues into Endnote. Citations that are downloaded can be searched for specific fields. Microsoft Excel was used to construct spreadsheets with the results of the searches. These spreadsheets were structured to allow for the analysis of the data by year of publication and other parameters.

#### **4.6 Data Collection Procedure**

The databases described above, namely *ISI Science Citation*, *MEDLINE* and *AIDSearch*, were used to identify the literature on HIV/AIDS in South Africa. Each of the three databases had to be searched individually, since they are not standardized in terms of their searching facilities. The period searched for in each of the databases was 1982-2002. This search identified the different institutions and organizations contributing to HIV/AIDS research in South Africa.

These were the steps undertaken in the data collection:

#### **4.6.1 Step 1: Data from the Online Databases**

Data on HIV/AIDS research may be obtained from a variety of sources. This section describes the search processes used to generate data on HIV/AIDS in South Africa.

##### **4.6.1.1 Data on HIV/AIDS in Africa**

A search was performed on two of the databases, that is, *ISI Science Citation Index Expanded* and *AIDSearch*. The search on *MEDLINE (OVID)* could not be done, since the database was cancelled and while the author requested on numerous occasions to the Information Technology Division to load the relevant CDs, this was not possible. Therefore, for the HIV/AIDS and Africa search, instead of *MEDLINE(OVID)*, *PubMed* was used. It is important to note that the software for the two packages are not the same and the results would probably have differed.

##### **4.6.1.2 Data on HIV/AIDS in South Africa**

###### **4.6.1.2.1 Data from *MEDLINE (OVID)* Database**

a) The first database to be searched was *MEDLINE (OVID)*. The University of Natal has *MEDLINE* via OVID from 1982 to October 2002 on CD-ROM. These CDs are available on the University network for medical students. Since the author was not based at the University of Natal Medical School campus, there were problems accessing the databases. The author then decided to try using *PubMed* instead, but because this database is available on the Internet the response time was slow. It was difficult to restrict the searches to focus. *PubMed* allowed downloading of only 500 citations at a time. Medline has a more powerful capacity of search, compared to *PubMed*. For this reason, the author had to return to the Durban Campus to perform the *MEDLINE* searches.

b) The seven *MEDLINE (OVID)* CD-ROMs are broken down into these years:

1982-1988, 1989-1992, 1993-1995, 1996-1997, 1998-1999, 2000-2001 and 2002-Oct 2002

Each of the above CD-ROMs were searched, using the subject field and institution field. The search terms used were: AIDS or HIV or HIV1 or HIV2 in the Subject Field. All documents or records were chosen and were not restricted to focus. Another search was

performed using South Africa as a term in the Institution and Abstract Field (the reason the Abstract Field was searched for South Africa is clarified below). The results of the two searches were combined. Unfortunately, the database ended in October 2002, leaving out citations from November to December of 2002. This was compensated for by the use of the *AIDSearch* database. Another limitation was the fact that *MEDLINE* gives only the first author's address in the Institution Field. This meant that should the second author be a South African the citation would not be picked up. Therefore the author decided to search "South Africa" in the Abstract Field as well. In view of the fact that the country may not appear in the institution field or the address field, a further search was performed using each of the eight medical institutions and the MRC. The names of each of the institutions were entered in the Institution Field or the Address Field. These searches ensured a comprehensive inclusion of South African records.

The citations were downloaded onto the hard-drive (and subsequently imported into the Endnote 5 package – see Step 2 below).

#### **4.6.1.2.2 Data from *ISI Science Citation Index***

The University of Natal has the *ISI Science Citation* database on CD-ROM from 1992 to the present. A similar procedure was followed as for the *Medline* database.

A literature search was conducted for each year, on *ISI Science Citation*, to retrieve the relevant documents. The terms AIDS or HIV were searched under Keyword Field or under Topic Search. Since the research was restricted to South Africa, South Africa was searched in the Address Word field as well as under Topic Search Field. The results of both searches were combined. A limitation, that the years 1982-1991 were not included, was fortunately overcome by a free trial access to *ISI Web of Science* databases, as mentioned before. To ensure accuracy, the author repeated the searches from 1982 through to 2002. The citations were downloaded onto the hard-drive.

**4.6.1.2.3 Data from *AIDSearch* Database**

The University of Natal subscribes to the *African Health Anthology* Database (now called *African HealthLine*), which allows free access to the *AIDSearch* database through NISC Biblioline. The *AIDSearch* database provides citations of articles from 1980 to the present. This database includes *MEDLINE HIV/AIDS* subset, *AIDSDRUGS* and *AIDSTRIALS*. A Boolean search was performed, using the terms HIV or AIDS in the Subject, Title and Abstract Fields. The results were then restricted to South Africa and finally downloaded onto the hard-drive.

**4.6.2 Step 2: Importing the Citations into Endnote 5**

The results downloaded onto the hard drive from the three databases were then imported into the Endnote 5 package. This, as described earlier, is a bibliographic database containing several bibliographic fields. Each citation contained full bibliographic details, namely author/s, title, journal title, institution or address of the author, Mesh Headings and abstracts. These fields are searchable and were used for analysing the data. Table 2 lists the three databases and the number of citations each database yielded. The total number of citations was 3 235. This included the duplicate and triplicate records.

**Table 2: Results from the Three Databases**

<b>Name of Database</b>	<b>Period Searched</b>	<b>Total Number of Records</b>
<i>ISI Science Citation Index</i>	1982 – 2002	1 451
<i>MEDLINE</i>	1982 – 2002	339
<i>AIDSearch</i>	1982 – 2002	1 445

The number of records generated by the *Medline* search appears significantly low relative to that generated by the other two databases. A few possible reasons are advanced for this:

- The *ISI Science Citation Index* and *AIDSearch* databases are comprehensive databases incorporating a wider range of publication types
- These two databases in addition cover a wide subject area whereas *MEDLINE* is confined to publications in the field of medicine

- Articles on HIV/AIDS in the *MEDLINE* database may not include South Africa as a keyword. Therefore, these will not appear in the results
- Another contributing factor is that there are just seven South African journal titles that are indexed on *MEDLINE* (National Library of Medicine 2004:290).

The newly constructed Endnote database presented problems. The following had to be undertaken:

- Preferences had to be set, the Reference Type modified and the filters had to be set for each database
- For the *MEDLINE* database the Ovid Filters had to be set
- For the *ISI* and *AIDSearch* the Procite filters had to be set.

These had to be done before the downloading procedure. This solved some of the problems, but not all. Further problems encountered related to lost data. As some of the fields were not compatible, data was lost. A rerun of the search was undertaken, with close monitoring of the data to ensure no exclusions (refer to Step 1 above).

A downloading problem encountered resulted in data entered into fields incorrectly. The author field was one of the problems because of the use of semi-colons in one database. *AIDSearch* Endnote did not recognize it to be a separate author. This meant that for some citations all the authors appeared in one line, separated by commas or semi-colons. The comma and tab delimiters needed to be set, but this only worked for two of the databases. In order for Endnote to search authors, each author had to appear independently for searching and retrieving purposes. This meant that each of the citations had to be browsed and each author manually entered in the correct field. This meant reformatting manually for field analysis (this was time-consuming but there was no other way to resolve the problem).

The Publication Type, Language of Article and Times Cited fields appeared in the Note Field, even though on Endnote there are set fields for type of publications. In order for publication types, collaboration, number of authors, language of articles and times cited

to be searched, independent searchable fields had to be created for them. The creation of separate fields also assisted the data export into EXCEL, which does not import the Note Field. In Endnote one can customize a field that is not available.

Thus, for all the citations the following fields had to be created:

- Custom 1= Institutions

Initially, this was used for the address of the authors, but Endnote had a designated field for the Author Address. It was decided to leave Custom 1 as is for the Institution of the author and manually type in the Institution of the first author's address.

- Custom 2= Times Cited

This field revealed the number of times the article was cited by other authors. If the Times Cited was "0" (zero) this indicated that no articles in the *ISI* database cited the article. Should the Times Cited Field be indicated by "X", this meant that the article did not appear in the *ISI Science* and *Social Science Citation Index* (the reason for the use of *Social Science Citation Index* is the inter-disciplinary nature of research covered by the Index).

- Custom 3= Number of Authors

These had been put into three categories, "single" representing single authored publications, "2" representing co-authored publications and "more than 2" representing 3 or more authored publications.

- Custom 4=Collaboration

These have been identified and placed into four categories, "local" representing authors that collaborate within their locality, for example within their institution or place; "national" representing authored publications from within South Africa; "international" representing authored publications whose addresses are international and "no address" for those publications that have no author (anonymous publications, as well as those that have no address).

#### **4.6.3 Step 3: Removing the Duplicates and Irrelevant Citations**

The next step in the process was to remove all the duplicates. A search on Endnote indicated that there were 882 duplicate or triplicate records or citations. This was not an

easy procedure, even though Endnote highlighted the duplicates. Each one of the 881 records had to be browsed, so that missing fields could be completed. Since there were three databases searched some citations appeared three times. While browsing through the citations any irrelevant citations or records were deleted. Table 3 indicates the result of this process, which presents the eventual number of unique records analysed in Chapter 5.

**Table 3: Triplicate, Duplicate and Unique Records**

Total number of Records	3 235
Duplicate or Triplicate Records	882
Irrelevant Records	72
Unique Records	2 281

**4.6.4 Step 4: Verification of the Date of Publication Field**

Some anomalies were discovered in the date fields. As most of the inconsistencies appeared to have arisen as a result of the conversion process, especially in the date field of the *MEDLINE* records, a verification process was undertaken for these *MEDLINE* records only. Each of the publications with incorrect dates had to be searched on *MEDLINE* by Author and the Titles matched, in order to find the correct date of publication. This verifications process was cumbersome, but critical to ensure correctness in this field.

**4.6.5 Step 5: Times Cited Field**

Initially the Times Cited appeared in the Note Field for the *ISI Science Citation* database records. In order for the Times Cited to be analysed, a field for Times Cited had to be created. This meant manually filling in the Times Cited field with the data from the Note Field. Articles or publications indexed on both *MEDLINE* and *AIDSearch* did not have this data. A total of 882 citations had to be searched on *ISI Web of Sciences*, using both *ISI Sciences Citation* and *Social Science Citation* database for the Times Cited data. Each of the 882 citations was searched, using the author’s surname, with an initial and the date

of publication. The publications that did not appear on the *ISI Science Citation Index* or the *Social Science Citation Index* were indicated by an “X” in the Times Cited Field.

#### **4.6.6 Step 6: Number of Authors Field**

The software packages of Endnote and Excel do not lend themselves to making distinctions between single, co-authored and multiple authored citations. A field had thus to be created for the Number of Authors for the data analysis purposes. Each of the records in this field had to be completed. Again, this had to be done manually for each of the records.

#### **4.6.7 Step 7: Author Address Field**

The Authors’ Addresses determined whether the citation had international, national or local collaboration. It was assumed that, should one of the addresses be an international address, the collaboration would be of an international nature.

The Address Field of each record was used to identify the institutions producing the literature on HIV/AIDS.

#### **4.6.8 Step 8: Anonymous Publications**

All publications with no authors were identified and in the Collaboration and Author’s Address Field were indicated by “No author”. This was required for the analysis of the data to be correct.

#### **4.6.9 Step 9: Keyword Field**

Some of the records did not have any subjects or keywords in the Keyword Field.

The *MEDLINE (OVID)* records had Medical Subject Headings (MeSH headings), but the *ISI Science Citation* database and the *AIDSearch* database had keywords. The limitation in this field was that the Subjects or Keywords were not standardized. However, they did to some extent enable the author to identify the expertise and experts of the institutions.

#### **4.6.10 Step 10: Ranking of Institutions**

The ranking of the medical institutions was carried out in terms of the number of publications, indicating the research output on HIV/AIDS in the different institutions. Here the Institution Field was used.

#### **4.6.11 Step 11: Authorship Patterns**

Records were analysed to identify the distribution in terms of authorship patterns, year of publication, institutions and the number of publications for each author.

#### **4.6.12 Step 12: Importing Data into Excel**

The database was constructed in the categories mentioned above. The records were imported into a database in EXCEL, containing full bibliographic details, namely author/s, title, journal title, institution of the author, volume, page numbers and number of citations for each author's article. Microsoft EXCEL was used to identify the following data:

- Production and distribution throughout the period of study
- Distribution by type of document
- Language of publication
- Distribution of publications by authorship and institution.

With EXCEL, data can be manipulated and searched and graphs created.

### **4.7 Summary**

The process of collecting data from an individual computerized bibliographic database is a simple one. However, the use of multiple databases is difficult and presents numerous problems, which have been presented in detail in this chapter. Multiple databases are critical in ensuring the development of a comprehensive and inclusive set of records for analysis and assessment. The process described in this chapter, with the procedures and methods devised to overcome the limitations, resulted in a comprehensive database made up of 2 281 discrete or unique citations that formed the population of the study. This large

population, in all probability, represents the most comprehensive set of records on HIV/AIDS research produced by medical and allied institutions in South Africa.

## Chapter 5

### Presentation and Discussion of Findings

#### 5.1 Introduction

A number of bibliometric studies concerned with HIV/AIDS have been undertaken over the past decade, with a significant number concentrated in 2000 to 2002 (Macias-Chapula and Mijangos-Nolasco, 2002; MacKenzie, 2000; Macias-Chapula, 2000; Huber, Schoonover and Kashka, 2000). These studies identified trends in the research, demonstrated the growth of literature by leading institutions and examined the collaboration of authors in the field of HIV/AIDS. These, amongst other studies, are discussed in detail in the literature review chapter. However, the only study dealing with a bibliometric analysis of HIV/AIDS literature in Africa, and specifically Central Africa, was undertaken by Macias-Chapula and Mijangos-Nolasco in 2002. The present study is the first general assessment of the HIV/AIDS literature in South Africa.

The purpose of this study was to undertake a bibliometric analysis of HIV/AIDS literature in South Africa. More specifically, the study attempted to determine the patterns of authorship and publications of the academic institutions in the sciences, medical institutions and affiliated institutions or organizations in South Africa. The study focused on two decades of HIV/AIDS literature published between the years 1982 and 2002. The literature assessment used three internationally recognized databases: the *ISI Science Citation Index Expanded*, *MEDLINE* and *AIDSearch* through Biblioline. The citations included journal articles, letters, reviews, congress presentations, reports, news items, editorials and meeting abstracts contributed by South African and international authors. It is important to note that, even though these databases do not cover all South African publications, the publications they cover are internationally recognised.

The objectives of the study were specified as follows:

- Establish the publication output of HIV/AIDS research in Africa and South Africa
- Identify the channels of delivery (publication types) of HIV/AIDS research
- Analyse patterns of authorship and collaboration

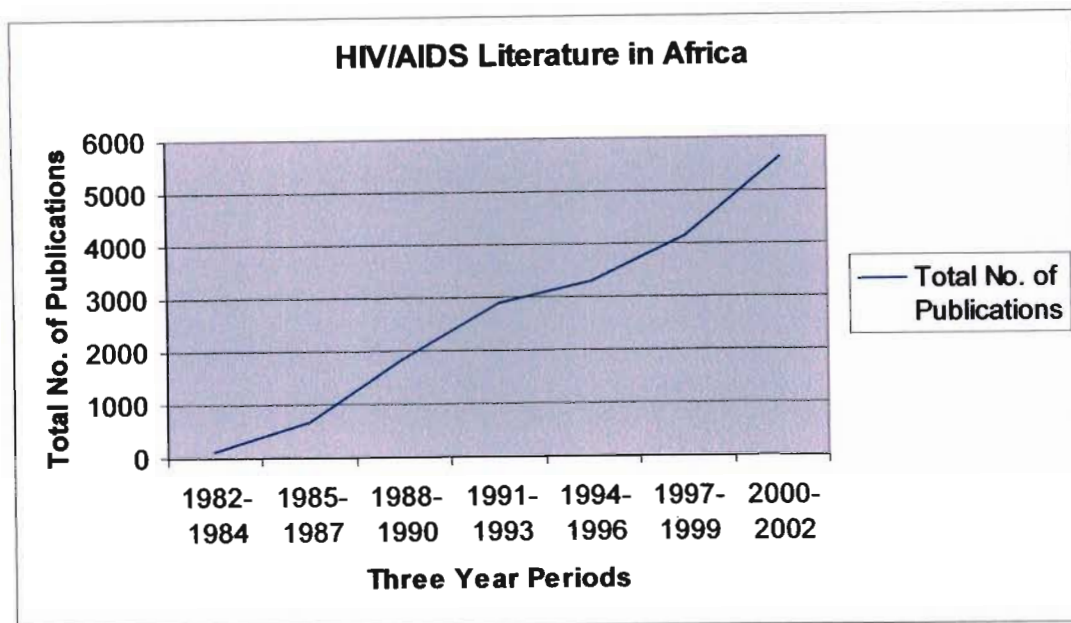
- Identify core journals publishing HIV/AIDS research
- Identify the country of publication of journal titles publishing HIV/AIDS research
- Identify the most highly cited publications on HIV/AIDS in South Africa
- Rank South African institutions in terms of their research output on HIV/AIDS
- Identify the sub-areas of the research on HIV/AIDS in South Africa

The findings of the study are now presented and discussed.

## **5.2 Total Production (Output) of HIV/AIDS Literature in Africa**

The sudden emergence of this dreaded disease and its severe consequences has led to an explosion of research and literature on the subject. Internationally, the growth of the literature is revealed in many studies. Pratt (1992) demonstrates this growth of the literature on AIDS using the subset of the Medline database. In his summary he states that from 1983 to mid-1991 more than 200 000 Medline entries were AIDS-related. These entries recorded work undertaken throughout the globe. Pratt's study does not present an analysis of the literature by geographic location. There is thus no record in Pratt's study of work undertaken in or on Africa. Macias-Chapula (2002) retrieved a total of 10 268 records for the period 1980-2000 for Africa (south of the Sahara), from the *AIDSLINE* database. The *AIDSLINE* database had approximately 200 000 records, in total, for the period 1980-2000. Thus, within a period of two decades, only 5% of entries in the *AIDSLINE* database related to research done in or on Africa. This demonstrates the paucity of published research dedicated to HIV/AIDS in South Africa. This is inconsistent with the global trend demonstrated by Pratt (1992).

Searches were carried out on the three databases to disclose the growth of the literature on HIV/AIDS in Africa. *AIDSearch* is a database which includes *AIDSDRUGS*, *MEDLINE AIDS/HIV* subset and *AIDSTRIAL*. The *MEDLINE* search was done through PubMed for this examination only. The reason for this was that *MEDLINE* (OVID) was cancelled at the University of Natal at the time this particular search was carried out. Table 4 and Figure 1 presents the distribution of literature on HIV/AIDS in Africa over two decades.



**Figure 1: Distribution of Literature on HIV/AIDS in Africa**

**Table 4: Growth of HIV/AIDS Literature in Africa over 3-Year Periods**

<i>Three Year Period</i>	<i>AIDSearch</i>	<i>ISI Science</i>	<i>MEDLINE (PubMed)</i>	<i>Total No. of Publications</i>
1982-1984	15	14	78	107
1985-1987	198	85	379	662
1988-1990	788	151	903	1 842
1991-1993	992	576	1 337	2 905
1994-1996	997	651	1 646	3 294
1997-1999	1 274	913	1 951	4 138
2000-2002	1 567	1 467	2 581	5 615
<b>Total</b>	<b>5 831</b>	<b>3 857</b>	<b>8 875</b>	<b>18 563</b>

A total of 18 563 entries were recorded for the period in Africa. This is reflected in both the table and the graph. This appears to be much greater than the Macias-Chapula (2002) study cited above. However, the total of 18 563 is inclusive of duplicate and triplicate records. The total number of records in this examination is probably only somewhat higher than the Macias-Chapula (2002) study. Macias-Chapula (2002) appears to have

searched the database by Africa, then by geographic region and countries within the regions. In addition, African researchers are only recently focusing increasing attention on the disease. This is evident in the figures in Table 4, from 1994 to 2002. The focus of the present study is concentrated on the geographical region of South Africa.

### 5.3 Total Production (Output) of HIV/AIDS Literature in South Africa

South Africa ranks among the most productive of all African countries, in terms of scientific output in general. This was concluded from a study carried out with the use of *Science Citation Database* by Narvaez-Berthelemot *et al.* (2002). The result of this study revealed that of the 15 most productive African countries, in terms of research in the sciences, for the period 1991-1997, South Africa ranked the highest, followed by Egypt. Contributions were mainly in the field of clinical medicine, biology, chemistry, and biomedical research. The study established South Africa as the main scientific producer on the African continent.

As noted in Chapter 4, several literature searches were performed on each of the databases used for this study. Since all three databases are not standardised in terms of their search facilities, each database was searched individually. The output is presented in Table 5.

**Table 5: Distribution of HIV/AIDS Publications Over 3-Year Periods (South Africa)**

YEAR	<i>AIDSearch</i>	<i>ISI Science</i>	<i>MEDLINE (OVID)</i>	Total over 3 Years
1982-1984	0	7	1	8
1985-1987	10	40	7	57
1988-1990	83	67	32	182
1991-1993	160	144	37	341
1994-1996	176	166	47	389
1997-1999	368	362	75	805
2000-2002	648	665	140	1 453
<b>Total</b>	<b>1 445</b>	<b>1 451</b>	<b>339</b>	<b>3 235</b>

A total number of **3 235** citations were generated from the three databases, *MEDLINE*, *AIDSearch* and *ISI Science Citation*. These are inclusive of duplicates, triplicates and irrelevant citations. Upon examination, duplicate and triplicate citations were removed. In the process of removing the duplicates and triplicates, irrelevant citations were also removed and data for the missing fields were inserted for the remaining documents. Wherever possible, each citation had to have their relevant field completed in order for the data to be analysed. This resulted in a total of **2 281** unique citations, which formed the basis for further assessments.

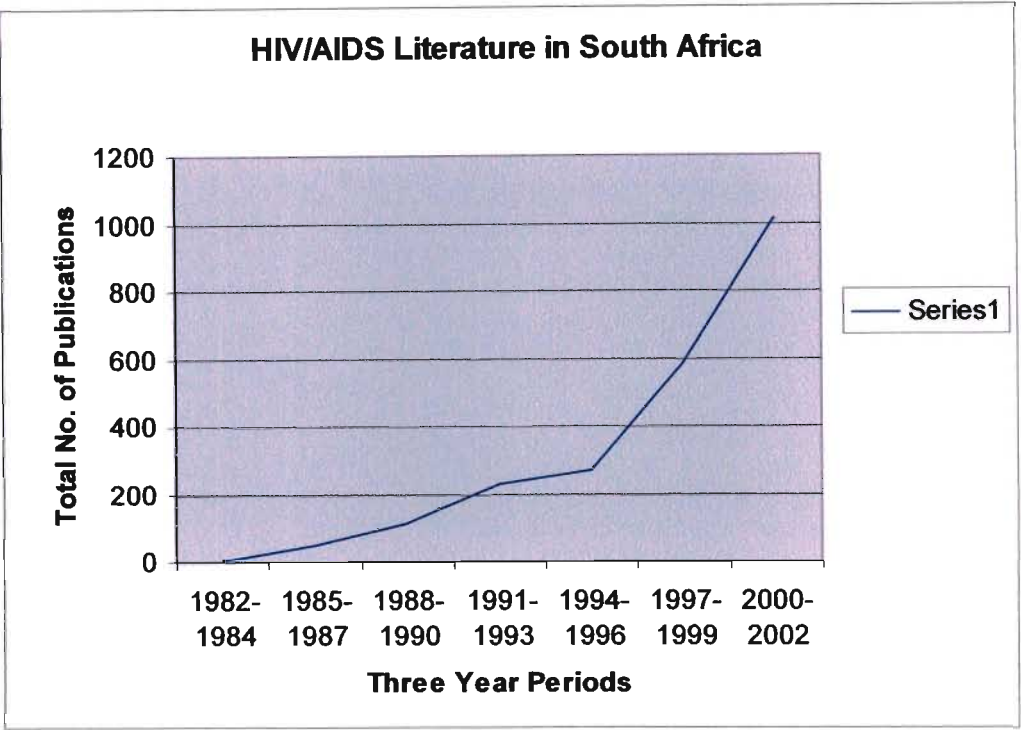
The low number (**2 281**) appears a surprising finding, particularly in view of the work naming South Africa as one of the leading producers of scientific output in Africa. It must, however, be noted that the international databases recording scientific output are not comprehensive, in that they do not include all publications (even when they are SAPSE approved) in the fields of AIDS. This issue is referred to later in this chapter.

Table 6 shows the distribution of HIV/AIDS literature of the **2 281** unique records or citations over a three-year period.

**Table 6: Distribution of HIV/AIDS Literature of Unique Citations**

<b>Year</b>	<b>No. of Records</b>	<b>%</b>	<b>Cumulative %</b>
1982-1984	5	0.2	0.2
1985-1987	50	2.2	2.4
1988-1990	118	5.2	7.6
1991-1993	234	10.3	17.9
1994-1996	275	12.1	30
1997-1999	585	25.6	55.6
2000-2002	1 014	44.4	100
<b>Total</b>	<b>2 281</b>	<b>100</b>	<b>100</b>

It is interesting to observe that the largest increase in the number of publications (44.4%) occurred during the years 2000 to 2002. This dramatic increase in the production of literature is reflected in Figure 2 below.



**Figure 2: Growth in the Number of Publications by 3-Year Periods in South Africa**

An analysis over three-year periods reveals that in a single three-year period (1985 to 1987), there was a tenfold increase in the production of HIV/AIDS-related literature. While this is small relative to the total output, it demonstrates the attention being dedicated to the subject in those early years. The years between 2000-2002 appears as the most productive period for publications of HIV/AIDS literature in South Africa, in that the research output increased by 18.8%. One can conclude that there was an exponential growth in HIV/AIDS research in South Africa in the last decade.

#### 5.4 Publication Types (Citation Distribution)

The unique citations of **2 281** included journal articles, editorial material, letters, reviews, meeting abstracts, notes, news items, interviews and congress presentations.

Table 7 presents a distribution of the publication types of HIV/AIDS literature of the total number of **2 281** citations.

**Table 7: Distribution of Publication Types**

<b>Publication Types</b>	<b>No. of Publications 1982-1988</b>	<b>No. of Publications 1989-1995</b>	<b>No. of Publications 1996-2002</b>	<b>Total No. of Publications 1982-2002</b>	<b>% of the Total No. of Publications 1982-2002</b>
Journal Articles	31	221	894	<b>1 141</b>	<b>50.02</b>
Letters	31	111	219	<b>361</b>	<b>15.82</b>
News or Newspaper Articles	0	25	285	<b>310</b>	<b>19.59</b>
Abstracts(69)or Meeting Abstracts(159)	7	66	145	<b>228</b>	<b>9.99</b>
Editorials	7	27	118	<b>152</b>	<b>6.66</b>
Reviews	0	12	79	<b>91</b>	<b>3.98</b>
Papers from Congresses	0	3	39	<b>42</b>	<b>1.84</b>
Comments	0	9	32	<b>41</b>	<b>1.79</b>
Notes	2	13	0	<b>15</b>	<b>0.65</b>
Interviews	0	0	7	<b>7</b>	<b>0.30</b>
Addresses	0	0	4	<b>4</b>	<b>0.17</b>
Historical Articles or Biographies	0	1	4	<b>5</b>	<b>0.21</b>

(Note: the results do not add up to 100%, as some of these records have more than one publication type.)

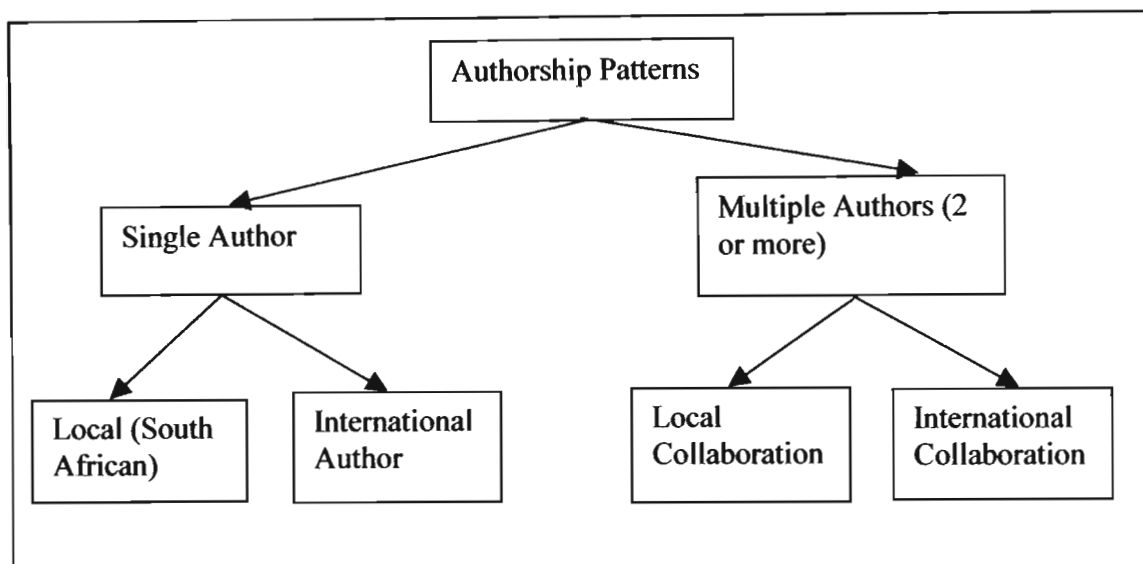
Table 7 shows that, the majority of the citations or documents were *journal articles*. These form just over 50% of the total number of documents. This is followed by *letters* (15.8%). In the study done by Sengupta and Kumari (1991) almost one-third of the

literature that they analysed comprised *conferences, symposia or colloquia* documents. The reason they attributed to this is that proceedings of conferences are becoming more important and a good forum for communication of scientific knowledge. In the present study, conferences or *papers from congresses* (42) and *meeting abstracts* (159: *this does not include abstracts*) yielded a total of 201 (8.8%) records. (Of the 228 *abstracts* or *meeting abstracts*, the *International Conference on AIDS* yielded 159 publications followed by the *Journal of Dental Research*, with 30 *abstracts*. The remaining 39 *abstracts* were published in a variety of journals which yielded between one and four *abstracts* each). Perhaps South African symposia and conferences are not documented sufficiently or are not indexed in the databases under study. A cursory examination of current events in South Africa reveals a large number of conferences and meetings dedicated to HIV/AIDS. The small percentage indexed by this study suggests that this may not represent a comprehensive picture of the conference scene. Future examination of this matter will further assist health scientists to determine the true level of activity occurring through conferences and symposia.

Letters are the second most popular publication type in South Africa. This publication type represents the debate or discussion on current studies in the country. This reflects the currency of the research effort in the country. It may also be a reflection of the ease with which *Letters* may be published, compared with full journal articles or papers. However, one can conclude that South African authors and researchers on HIV/AIDS publish their findings as journal articles rather than as letters.

## **5.5 Authorship Patterns**

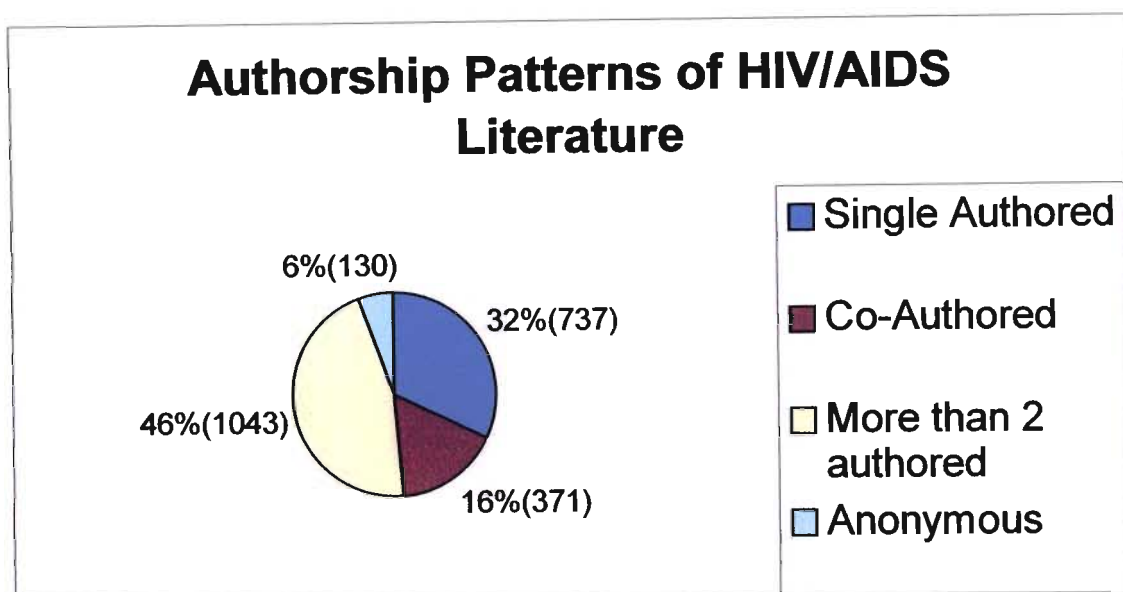
Authorship patterns are important as they reflect institutional commitment and patterns of collaboration. They provide insight into and an understanding of the interdisciplinary nature of research in that subject or field (Sengupta and Kumari 1991). Authorship patterns are measured firstly by the number of authors and secondly by the collaborations among authors. A framework for the analysis of authorship is presented below.



**Figure 3: Framework for the Assessment of Authorship Patterns**

At the first level of assessment, the number of authors is examined. The second level of assessment refers to the home country of the authors of the publications. Both these are important in that they highlight the researchers in the field and the collaborations among them.

In the present study, analysis of the HIV/AIDS literature reveals that 32% (737) were single-authored publications, while 16% (371) were co-authored. The remaining 46% (1 043) of the total publications were contributed to by more than two authors. There were 6% (130) publications that were anonymous. These statistics are presented in Figure 4.



**Figure 4: Authorship Patterns in HIV/AIDS Literature in South Africa**

### **5.5.1 Single Authored Publications**

Single authored publications as noted above, contributed to 32% of the total literature on HIV/AIDS in South Africa. De Solla Price's early prediction (In: Sengupta and Kumari 1991), that during the 1980s single authored publications would be extinct, does not hold true for this study.

#### **5.5.1.1 Local or International Single Authored Publications**

The address of the author establishes whether the author was from South Africa or not. A non South African address may, however, reflect two possibilities. Either the author is based out of South Africa and has an affiliation with a South African institution, or the author has an interest in South Africa. Only 11.6% (86) of the 737 single-authored publications were authored by an international author; 43.4% (320) of the publications were produced by South African authors and 45% (331) of the single-authored publications had no addresses. Further investigation of the 'no address documents' revealed the majority 63.7% (211) to be news items or newspaper articles. Of these documents, 23.5% (78) were journal articles, the remaining 9.9% (33) editorials, followed by letters 6.3% (21). It may be concluded that the majority of the publications

on the subject were authored by South Africans (in view of the fact that news items and editorials are generally authored by locals).

### **5.5.2 Multiple Authored Publications/ Collaboration**

Glanzel (2002) claims that authorship is a primary bibliometric descriptor of a scientific publication and that recently there is a tendency towards intensifying scientific collaboration. The majority of the literature reported in this study was published by more than two authors as reflected in Figure 4. This demonstrates the degree of collaboration in HIV/AIDS research in South Africa. These findings are in agreement with Sengupta and Kumari (1991), whose research demonstrated modern research in the health sciences as being collaborative and interdisciplinary in nature.

It has been established that 62% of the publications were produced by more than one author. Co-authored publications are the trend in modern research. Glanzel (2002) undertook a comprehensive review of bibliometric studies that analysed authorship patterns with particular reference to collaborative authorship. His analysis of Hicks *et al.* (1994) and Hicks and Katz (1997) were concerned with co-authorship patterns at institutional level, while his references to Gomes, Fernandez and Mendez (1995); REIST-2 (1997); and Glanzel (2001) reviewed studies on a national level. These have shown a growing co-authorship trend. The above-mentioned studies show scientific collaboration between universities and industries, at local, national and international level which is evident in this study too.

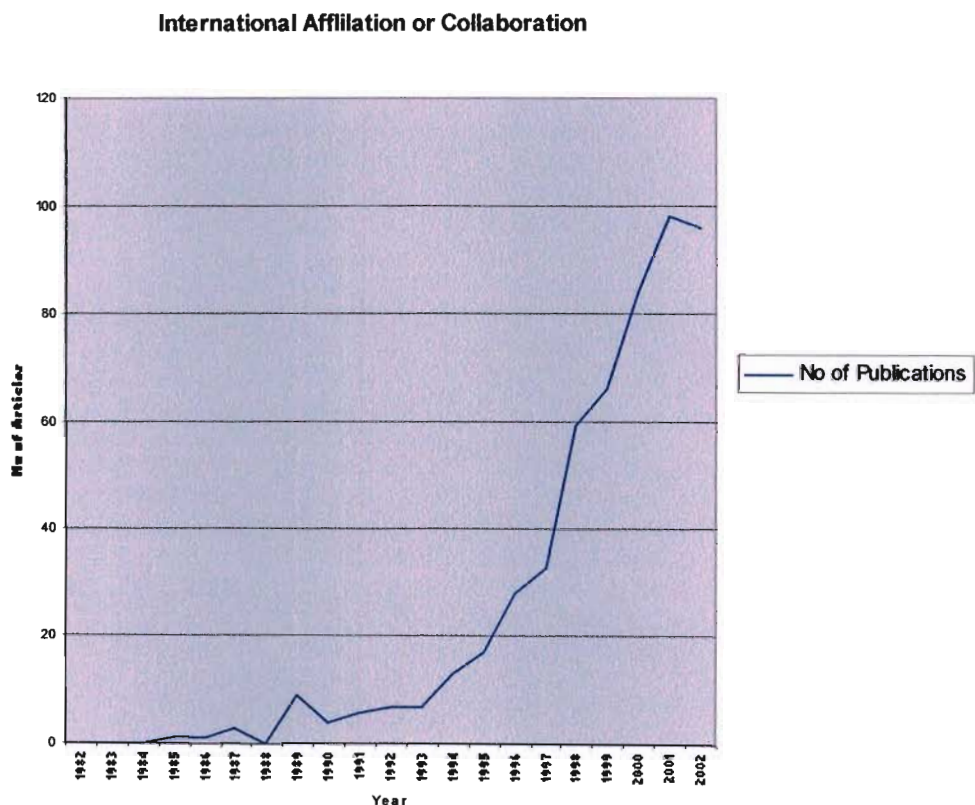
The collaboration is further established by the fact that five or more authors contributed 23% of the total literature, four authors 10.9% and three authors 12.1%. These authors operate in different disciplines in the sciences and medicine and at various levels of specialization.

#### **5.5.2.1 Local or International Collaboration**

The levels of collaboration in this study are local and international, reflected by a combination of authors from within and outside of South Africa. It can be concluded that

HIV/AIDS research in South Africa represents the efforts of interdisciplinary researchers, working in collaboration locally and internationally. This finding is consistent with the study by Sengupta and Kumari (1991), of international research.

Figure 5 presents the growth of publications with International Affiliation or Collaboration.



**Figure 5: International Affiliation or Collaboration**

It is interesting to observe the steep increase in collaboration of research in the field of HIV/AIDS after 1994. This is understandable, as South Africa was readmitted into the global arena since the end of apartheid in 1994, which also marked the end of sanctions against the country.

**Table 8: Total Number of Publications By Local and International Authors**

<b>Authors Address</b>	<b>No. of Publications</b>	<b>Percentages</b>
International (including single-authored publications/papers)	617	27.05%
Local (South African authored)	1 160	50.85%
Authored Publications (No Address)	374	16.40%
Anonymous Publications (No Address)	130	5.7%
<b>Total</b>	<b>2 281</b>	<b>100%</b>

Studies cited by Glanzel (2002) also proved that international collaboration is linked with higher citation impact. Glanzel (2002:470), in his conclusion, observed an increase of citation impact in papers published through international collaboration. Kim and Kim (2000:116) affirm the fact that internationally co-authored papers receive more citations. (Highly cited publications are examined later in this chapter). It is evident that collaboration between authors, be it local or international, is vital for continuous research on HIV/AIDS.

## **5.6 Journal Productivity Ranking (HIV/AIDS Literature)**

Scholarly communication is important as it documents the evolution of a discipline. This communication occurs through publications. Osburn (1984) and Horowitz (1991), cited in Herubel (1999), note that publications include both monographs and journals, but journals generally comprise the majority of published research. Journals are therefore an important form of communication between scientists and scholars and the general research community.

There is generally a hierarchy of journals in a discipline. This ranking is determined by a number of factors (popularity, income earning, funding mechanisms and review process). However, a formal ranking of journals in South Africa is based on whether the journal is

SAPSE-approved or not. Authors prior to 2004 almost always aimed to publish their work in SAPSE-approved journals. In 2004 the SAPSE listing will be replaced by ISI, IBSS and the Approved South African Journals list for funding purposes (University of KwaZulu-Natal 2004). Therefore, researchers will attempt to publish in journals that appear on these lists.

### 5.6.1 List of Journals publishing HIV/AIDS Literature

Ranking may also be established by the number of papers published on a subject. Table 9 presents a list of the journals publishing five or more articles on HIV/AIDS literature in the present study. The SAPSE status of the journals is also reflected in the table.

**Table 9: Journals Ranking List in Terms of HIV/AIDS Publications**

<b>Journal Title</b>	<b>No of publications</b>	<b>%</b>	<b>SAPSE</b>
SAMJ (South African Medical Journal)	537	23.54	Yes
Int Conf AIDS	159	6.97	No
Lancet	136	5.96	Yes
AIDS	81	3.55	Yes
British Medical Journal	58	2.54	Yes
Nature	49	2.15	Yes
International Journal of Tuberculosis and Lung Disease	43	1.89	No
South African Journal of Science	39	1.71	Yes
Nursing R S A Verpleging	35	1.53	No
Journal of Dental Research	30	1.32	Yes
Aids Research and Human Retroviruses	29	1.27	Yes
International Journal of STD and AIDS	24	1.05	No
Bulletin of the World Health Organization	21	0.92	Yes
Pediatric Infectious Disease Journal	21	0.92	Yes
Genitourinary Medicine	19	0.83	Yes
SADJ (South African Dental Journal)	19	0.83	No
Annals of Tropical Paediatrics	17	0.75	Yes
Clinical Infectious Diseases	17	0.75	Yes
Oral Diseases	17	0.75	No
Journal of Infectious Diseases	15	0.66	Yes
Social Science and Medicine	15	0.66	Yes
Journal of Tropical Pediatrics	14	0.61	Yes
Transactions of the Royal Society of Tropical Medicine and Hygiene	14	0.61	Yes
AIDS Treatment News	13	0.57	No
Nature Medicine	13	0.57	No
Sexually Transmitted Diseases	13	0.57	Yes
AIDS Care	12	0.53	No
Dental Association of South Africa. Journal	12	0.53	No

Curationis	11	0.48	Yes
Journal of Acquired Immune Deficiency Syndromes (Jais)	11	0.48	Yes
Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology	11	0.48	Yes
Lancet Infectious Diseases	11	0.48	No
Science	11	0.48	Yes
South African Journal of Surgery	11	0.48	Yes
AIDS Policy and Law	10	0.44	No
American Journal of Public Health	10	0.44	Yes
East African Medical Journal	10	0.44	Yes
Psychological Reports	10	0.44	Yes
Sexually Transmitted Infections	10	0.44	No
Tropical Medicine and International Health	10	0.44	No
Journal of Medical Virology	9	0.39	Yes
International Journal of Gynecology and Obstetrics (Use &)	8	0.35	Yes
Journal of Virology	8	0.35	Yes
New England Journal of Medicine	8	0.35	Yes
AIDS Patient Care and STDs	7	0.31	No
Archives of Disease in Childhood	7	0.31	Yes
JAMA: the journal of the American Medical Association	7	0.31	
Journal of Virological Methods	7	0.31	Yes
Medicine and Law	7	0.31	Yes
New Scientist	7	0.31	Yes
Tropical Doctor	7	0.31	No
Journal of the International Association of Physicians in Aids Care	7	0.31	Yes
American Journal of Respiratory and Critical Care Medicine	6	0.26	No
Canadian Medical Association Journal	6	0.26	Yes
Clinical and Diagnostic Laboratory Immunology	6	0.26	Yes
Journal of Clinical Pathology	6	0.26	Yes
Journal of Infection	6	0.26	Yes
QJM-Monthly Journal of the Association of Physicians	6	0.26	Yes
AIDS Alert	5	0.22	No
Conf Retroviruses Opportunistic Infect	5	0.22	XX
Health Policy and Planning (Health Policy & Planning)	5	0.22	No
International Journal of Cancer	5	0.22	Yes
Pediatric Research	5	0.22	Yes
Pharmacoeconomics	5	0.22	Yes
Research in Virology	5	0.22	Yes
AIDS Reader	5	0.22	No

**\*Complete list appears in Appendix 1**

It can be observed from Table 9 that, of the total number of publications (2 281) more than half (57% ,1 300) of the publications were concentrated in 16 journal titles and the remaining 43% (981) of the articles or publications were scattered among 397 journal

titles. Of the 2 281 total publications, 537 (23.54%) were published in the *South African Medical Journal*. This high number of publications in a South African journal can be accounted for by the fact that the *South African Medical Journal* is an important and influential journal in the field of medicine. The South African Medical Association, a prominent body in the medical profession in South Africa, publishes this journal. The journal appears on the SAPSE approved list. The monetary reward of SAPSE provides additional incentive to researchers to publish. This, in turn, contributes to the popularity of the publication. The present study shows that the *South African Medical Journal* is the most popular journal for the publication of HIV/AIDS research in the country.

Some 60% (250) of the journal titles are SAPSE-approved, while the rest earn no subsidies for their authors. It is understandable that South African authors aim primarily at publishing in SAPSE-approved journals, as this would qualify them for funding.

The second most popular target for publication, after the *South African Medical Journal*, is the *International Conference on AIDS*. Table 9 discloses that 159 (6.97%) of the publications are published in this source. It should be noted that the *International Conference on Aids* is not SAPSE-approved, but an important forum for the communication of HIV/AIDS research. This is followed by *Lancet*, a British journal and also SAPSE-approved journal, which published 136 (5.96%) of the total number of publications.

### **5.6.2 Country of Publication of Journals**

In terms of national and international targets of publication, just under three-quarters (70%) of the publications were published in international journals. The remaining 30% appeared in South African journals. This is consistent with Arunachalam and Garg's study (In: Kim and Kim 2000:114), which found that scientists in the peripheral science countries publish much of their work in international journals. The same observation was made in the study by Kim and Kim (2000), where Seoul National University chemists published many of their papers in prestigious international journals. In this study the majority of the publications appear in international journals, in particular in the United

States, United Kingdom, Netherlands and Germany. Understandably, South African authors (like their counterparts in other developing countries) publish in international journals in order to gain recognition and prestige. Furthermore, these international publications could be subsidy-earning in the home country, thus delivering the additional monetary reward for the publication.

It is important to note that, of the top 10 producing journal titles in this study, three are South African titles. These are *South African Medical Journal*, *South African Journal of Science* and *Nursing RSA*. This clearly reflects the choices of researchers on HIV/AIDS in South Africa in terms of the journals they publish in. It is far more rewarding for researchers to be publishing locally in publications that earn productivity awards.

Table 10 presents data on the country of publication of source journals in which HIV/AIDS literature were published. The table also displays the number of publications published in the journals of the different countries.

**Table 10: Country of Publication of Source Journals**

Country	No. of Journals	% of Journals	No. of Publications
United States	168	40.2%	614
United Kingdom	129	30.86%	590
Netherlands	19	4.5%	50
Germany	15	3.6%	33
South Africa	12	2.9%	670
France	9	2.15%	56
Canada	8	1.91%	64
Norway	8	1.91%	11
Denmark	7	1.68%	8
Australia	6	1.43%	8
Switzerland	6	1.43%	67
Ireland	5	1.2%	13
Japan	5	1.2%	17
Italy	3	0.71%	10

Brazil	2	0.48%	2
Israel	2	0.48%	8
New Zealand	2	0.48%	6
Algeria	1	0.24%	1
Bangladesh	1	0.24%	4
Belgium	1	0.24%	1
Hungary	1	0.24%	1
India	1	0.24%	4
Kenya	1	0.24%	10
Nigeria	1	0.24%	4
Poland	1	0.24%	1
Slovakia	1	0.24%	1
Spain	1	0.24%	2
United Nations	1	0.24%	21
Zimbabwe	1	0.24%	4
<b>Total</b>	<b>418</b>	<b>100%</b>	<b>2 281</b>

In total, the 2 281 publications in this study were published in 418 different journals. (Note: papers appearing in the *International Conference on AIDS*, published in different countries, would be treated as individual journal titles. These are included in the total count of 418.)

The large number of journals publishing HIV/AIDS literature shows the spread of countries publishing on the subject. Table 10 presents data on country of publication of the journals in which authors published, as well as the number of records by country. United States journals were the most popular and accounted for 40% of the journals, followed by United Kingdom, journals which accounted for 31%. Next were journals from the Netherlands (4.5%), Germany (3.6%), South Africa (2.9%) and France (2.15%). The rest of the 23 countries have less than nine titles of journals in which South African authors, or documents relating to South Africa from international authors, publish. This comprises 16% (66) of the titles of journals. It must be noted that South African titles account for only 3% of the journals on the subject, but the study reflects a significant number of articles published in the few South African journal titles. This confirms the

earlier observation that authors from developing countries publish more in international journal titles.

## **5.7 Citedness of HIV/AIDS Publications in South Africa for the Period 1982-2002**

This section reports on the number of times a piece of research is cited. The data used for the analysis was taken from the *Times Cited* field in the Endnote database. Of the total number of publications 357, (15.65%) did not appear or were not indexed on *ISI Science Expanded* and *ISI Social Science*. The reason for the use of *ISI Social Sciences Index* was the interdisciplinary nature of the area under study. Of the total number of documents (2 281), 159 (6.97%) had no citation count, as these were *Abstracts* and *Meeting Abstracts* of the International Conference on AIDS. Therefore 516 (22.6%) of the total number of publications on HIV/AIDS were not included in this analysis. The publication type breakdown of the 357 publications not appearing in the two indexes is as follows: journal articles (159), news or newspaper articles (135), editorials (20), letters (15), abstracts or meeting abstracts (12), congresses (11) and interviews (5).

The analysis was undertaken using the documents that appeared on *ISI Science Expanded* and *ISI Social Science*, since these documents had a *Times Cited* field. There were 1 765 (77.3%) documents or publications that had a *Times Cited* field, which was used for this analysis. As noted above the balance of 516 (2 281 – 1 765) records are thus excluded from the following analysis.

### **5.7.1 Times Cited = Zero**

This field refers to documents that had a zero citation count. This is not the same as “no citation” as explained in 5.7. The type, authorship and year of publication was analysed. Of the 1 765 documents, 642 (36.37%) had a citation count of zero (0).

#### *Publication Types*

The following types of publications appeared in this count: journal articles (213), letters (175), news or newspaper articles (122), editorials (62), abstracts or meeting abstracts (54) and reviews, comments and congresses (16).

### *Authorship Patterns*

The data for this analysis was taken from the *Author* field in the Endnote database. There were 301 single authored publications, 94 co-authored publications, 220 publications with more than two authors (multiple authored) and 27 anonymous publications.

### *Year of Publication*

An important factor to be taken into consideration is the fact that the most recent articles would have a low citation count, as can be observed in Table 11. Between the years 2000 and 2002 (inclusive) there were 394 documents (of the 642 documents) with a citation count of zero. Table 11 presents the number of documents per year with a citation count of zero.

**Table 11: Number of Documents by Year with Citation Count of Zero**

<b>Year</b>	2002	2001	2000	1999	1998	1997	1996	1995	1994	1993	1992
<b>No. of documents</b>	182	92	120	65	39	31	21	14	12	13	8

The more recent publications or papers appear to have a greater chance of not being cited.

### **5.7.2 Times Cited = 1 to 29**

Here, again, the data for this analysis was retrieved from the Endnote database. The search retrieved 1 062 publications that were cited from 1 to 29 times. Table 12 presents data on the number of times an article was cited. It also displays the authorship patterns or trends.

**Table 12: Authorship Patterns of Publications With Citation Count of 1 to 29**

<b>Times Cited</b>	<b>Single Author</b>	<b>Co-Authored</b>	<b>Multiple Authors</b>	<b>Total Publications</b>
29	0	2	3	5
28	0	0	2	2
27	0	1	7	8
26	0	0	5	5
25	0	0	4	4
24	1	1	6	8
23	0	0	2	2
22	0	2	9	11
21	4	0	5	9
20	0	1	9	10
19	0	1	8	9
18	2	0	7	9
17	1	3	10	14
16	0	1	11	12
15	0	0	8	8
14	0	2	8	10
13	2	3	8	13
12	4	5	13	22
11	5	3	19	27
10	5	1	23	29
9	3	0	35	38
8	5	10	25	40
7	4	8	25	37
6	4	13	27	44
5	7	8	42	57
4	15	18	41	74
3	24	25	69	118
2	54	38	95	187
1	95	46	109	250
<b>Total</b>				1062

It may be observed from the above table that a small number of publications had a high citation count. In particular, five publications were cited twenty-nine times. All five of

these publications were either co-authored or multiple authored. This shows that the more collaboration there is the higher the citation count. Publications receiving citation counts of 14 to 29 have very few single authored publications (8), with the vast majority being multiple or co-authored.

### 5.7.3 Times Cited = 30 to 131 (Most Highly Cited)

The table below reveals the most highly cited publications. In view of the high citation counts, reflecting the prestige attached to the publications, the analyses are presented in greater detail than of the earlier ones.

**Table 13: Distribution of Highly Cited Publications with Citation Counts of 30-131**

First Author	Journals (Year)	Time Cited	Collaboration	Institution of First Author
Gray, C.M. (SA)	<i>Journal of Immunology</i> (1999)	131	International(C)	National Institute of Virology, Aids Unit, Johannesburg, SA
Janssens, W.	<i>AIDS</i> (1997)	119	International(C)	Inst. Trop Med, Dept Microbiol, Belgium
Coutsoudis, A. (SA)	<i>Lancet</i> (1999)	119	International(C)	Univ. Natal, Sch Med, Dept. of Paediat & Child Hlth, SA
Kanki, P.J.	<i>Lancet</i> (1985)	115	International (C)	Harvard Univ, Sch Publ Hlth, Dept Canc Biol, Boston, US
Vonbriesen, H.	<i>Journal of Medical Virology</i> (1987)	102	International(C)	Chemotherapeut Forschungsinst, Georg Speyer Haus, Germany
Grez, M.	<i>Journal of Virology</i> (1994)	99	International(C)	
Sitas, F. (SA)	<i>New England Journal of Medicine</i> (1999)	96	International(C)	S African Inst Med Res, Dept Anat Pathol, Johannesburg, SA
Wabinga, H.R.	<i>International Journal of Cancer</i> (1993)	93	International(C)	Int Agcy Canc, Lyon, France
Dietrich, U.	<i>AIDS</i> (1993)	82	International(C)	Chemotherapeut Forschungsinst Georg Speyer Haus, Frankfurt, Germany
Coutsoudis, A. (SA)	<i>American Journal of Public Health</i> (1995)	67	International(C)	Univ. Natal, Sch Med, Dept. of Paediat & Child Hlth, SA
Rubsamenwaigmann, H.	<i>Journal of Virology</i> (1986)	66	International(C)	Chemotherapeut Forschungsinst, Georg Speyer Haus, Germany
Peeters, M.	<i>AIDS</i> (1997)	59	International(C)	Orstom, Retrovirus Lab, 944 BLVD

				Agropolis,F-34032 Montpellier 1, France
Mofenson, L.M.	<i>Lancet</i> (2000)	58		NICHHD, Pediat Adolescent & Mat AIDS Branch, Ctr Res Mothers & Children, NIH, 6100 Execut Blvd,Room 4B11, Rockville, MD 20852 USA
Goulder,P.J. R.	<i>Journal of Experimental Medicine</i> (2000)	58	International(C)	Massachusetts Gen Hosp, Partners AIDS Res Ctr, 13th St,Bldg 149,Rm 5218, Charlestown, MA 02129 USA
Morse, S.A.	<i>Journal of Infectious Diseases</i> (1997)	57	International(C)	Ctr Dis Control & Prevent, Div Aids, Sexually Transmitted Dis &TB Lab, Atlanta, US
Bentwich, Z.	<i>Immunology Today</i> (1999)	57	International(C)	Hebrew Univ Jerusalem, R Ben Ari Inst Clin Immunol, AIDS Ctr, Kaplan Med Ctr,Hadassh Med Sch, Rehovot, Israel
Morris, L.	<i>Journal of Experimental Medicine</i> (1998)	55	International(C)	Rockefeller Univ, Aaron Diamond AIDS Res Ctr, New York, NY 10016 USA.
Hazelhurst, J.A.(SA)	<i>British Journal of Dermatology</i> (1985)	54	Local	Univ. Pretoria, Pretoria, SA
Chen, C.Y.	<i>Sexually Transmitted Diseases</i> (2000)	53	International(C)	Ctr Dis Control & Prevent, Natl Ctr Infect Dis, Atlanta, GA USA.
Van Harmelen, J.(SA)	<i>AIDS</i> (1997)	52	Local(C)	Department of Medical Microbiology, University of Cape Town, Observatory, SA
Dye, C.	<i>Lancet</i> (1998)	52	International(C)	WHO, Global TB Programme, CH-1211 Geneva 27, Switzerland
Gorenflot, A.	<i>Annals of Tropical Medicine &amp; Parasitology</i> (1998)	50	International	Univ Montpellier 1, UFR Pharm, Biol Cellulaire & Mol Lab, EA 2413, 15 Ave Charles Flahault, F-34060 Montpellier 2, France
Wilkinson, D.(SA)	<i>American Journal of Public Health</i> (1996)	48	Local(C)	South African MRC, Ctr Epidemiol Res, SA
Coutsoudis, A.(SA)	<i>AIDS</i> (1999)	48	International(C)	Univ Natal, Dept Paediat & Child Hlth, Private Bag 7, ZA-4013 Congella, SA
Decock, K.M.	<i>Lancet</i> (1995)	47	International(C)	Univ London, Sch Hyg & Trop, UK
Smulian, A.G.	<i>Journal of Infectious Diseases</i> (1993)	46	International(C)	Univ Cincinnati, Coll Med, Dept Internal Med, Cincinnati, US
Jochelson, K.	<i>International Journal of Health Services</i> (1991)	46	International(C)	St. Antony's College, Oxford, England.

Novitsky, V.A.	<i>Journal of Virology</i> (1999)	45	International(C)	Harvard Univ, Sch Publ Hlth, Dept Immunol & Infect Dis, Harvard AIDS Inst, Boston, MA 02115 USA.
Moodley, J.(SA)	<i>Journal of Infectious Diseases</i> (1998)	44	International(C)	Univ Natal, Pregnancy & Hypertens Res Dept, ZA-4001 Durban, South Africa.
Wilkinson, D.(SA)	<i>South African Medical Journal</i> (1997)	43	Local(C)	Centre for Epidemiological Research in Southern Africa, South African Medical Research Council, Hlabisa, KwaZulu-Natal, SA
Wilkinson, D.(SA)	<i>British Medical Journal</i> (1998)	42	International(C)	S African Med Council, Ctr Epidemiol Res So Africa, ZA-3935 Mtubatuba, SA
Mertens, T.E.	<i>Bulletin of the World Health Organization</i>	42	International(C)	Division of Development of Policy, World Health Organization, Geneva, Switzerland
Coutsoudis, A.(SA)	<i>AIDS</i> (2001)	42	International(C)	Univ Natal, Dept Paediat & Child Hlth, Private Bag 7, ZA-4013 Congella, SA
Soderland, N.(SA)	<i>British Medical Journal</i> (1999)	40	Local(C)	Univ Witwatersrand, Ctr Hlth Policy, POB 1038, ZA-2000 Johannesburg, SA.
Mizrahi, V.(SA)	<i>Nucleic Acids Research</i> (1990)	40	Local(C)	South African Inst Med Res, Sch Pathol, Molec Biol Lab, Johannesburg, SA
Ijsselmuiden, C.B.(SA)	<i>New England Journal of Medicine</i> (1992)	40	International(C)	Med Univ South Africa, Medunsa, SA
Cosivi, O.	<i>Emerging Infectious Diseases</i> (1998)	40	International(C)	Div Emerging & Other Communicable Dis Surveillanc, CH-1211 Geneva 27, Switzerland
Bobat, R.(SA)	<i>AIDS</i> (1997)	40	Local(C)	Univ Natal, Dept of Paediatrics & Child Health, SA
Bassett, M.T.	<i>International Journal of Cancer</i> (1995)	40	International(C)	Int Agcz Res Canc, Descript Epidemiol Unit, Lyon, France
Post, F.A.(SA)	<i>Tubercule and Lung Disease</i> (1995)	37	Local(C)	Department of Medicine, UCT Medical School, Cape Town, South Africa.
Goulder, P.J.R.	<i>Journal of Virology</i> (2000)	36	International(C)	Massachusetts Gen Hosp, Partners AIDS Res Ctr, 13th St,Bldg 149,Rm 5218, Charlestown, MA 02129 USA.
Wilkinson,	<i>Tropical Medicine &amp;</i>	35	Local(C)	Centre for Epidemiological

D.(SA)	<i>International Health(1997)</i>			Research in South Africa, South African Medical Research Council, Hlabisa, SA
Van Harmelen, J.H.(SA)	<i>Aids Research &amp; Human Retroviruses(1999)</i>	35	Local(C)	Department of Medical Microbiology, University of Cape Town, Observatory, SA
CreweBrown, H.H.(SA)	<i>Clinical Infectious Diseases(1997)</i>	35	Local(C)	Department of Medical Microbiology, School of Pathology, South African Institute for Medical Research, Johannesburg, SA.
Bobat, R.(SA)	<i>Pediatric Infectious Disease Journal(1996)</i>	35	Local(C)	Department of Paediatrics and Child Health, University of Natal Medical School, Durban, South Africa.
Martins, D.J.(SA)	<i>Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology(1995)</i>	34	Local(C)	MRC AIDS Virus Research Unit, National Institute for Virology, Sandringham, SA
Kenyon, T.A.	<i>International Journal of Tuberculosis and Lung Disease(1999)</i>	34	International(C)	US Dept State, BOTUSA TB Project, Amer Embassy Gaborone, Washington, DC 20521 USA.
Wilkinson, D.(SA)	<i>South African Medical Journal(1996)</i>	33	Local(C)	Hlabisa Hospital, Hlabisa, KwaZulu-Natal. SA.
Sitas, F.(SA)	<i>British Journal of Cancer(1997)</i>	33	International(C)	National Cancer Registry and Department of Anatomical Pathology, South African Institute for Medical Research, University of the Witwatersrand, Johannesburg, SA
O'Farrell, N.(SA)	<i>Genitourinary Medicine(1994)</i>	33	Local(C)	City Health STD Department, King Edward VIII Hospital, Durban, South Africa.
Lepage, P.	<i>Pediatric Infectious Disease Journal(1998)</i>	33	International(C)	Univ Bordeaux 2, INSERM, U330, F-33076 Bordeaux, France.
Haffejee, I. E.(SA)	<i>Journal of Pediatric Gastroenterology and Nutrition(1995)</i>	33	Local(S)	Univ Natal, Fac Med, Dept Pediat & Child Hlth, Durban, SA
Floyd, K.	<i>British Medical Journal(1997)</i>	33	International(C)	Univ Liverpool, Sch Trop Med, Div Trop Med, Liverpool, England, UK
Ras, G.J.(SA)	<i>South African Medical Journal(1984)</i>	31	Local(C)	HF Verwoerd Hosp, Dept Internal Med, Pretoria, SA
PhamKanter, G.B.T.(SA)	<i>Genitourinary Medicine(1996)</i>	31	Local(C)	National AIDS Research Programme, Medical Research Council,

				Johannesburg, SA
Mathews, C.(SA)	<i>South African Medical Journal</i> (1990)	31	Local(C)	Centre for Epidemiological Research in South African Medical Research Council, Parowvallei, CP, SA
Goldie, S.J.	<i>JAMA</i> (2001)	31	International(C)	Harvard Univ, Sch Publ Hlth, Ctr Risk Anal, Dept Hlth Policy & Management, 718 Huntington Ave, Suite 2, Boston, MA 02115 USA
Dudding, L.R.(SA)	<i>Biochemistry</i> (1991)	31	Local(C)	Univ Witwatersrand, Sch Med, S African Inst Med Res, Molec Bio Unit, SA
Williamson, C.(SA)	<i>Lancet</i> (1995)	30	Local(C)	Univ Cape Town, Dept Med Microbiol, Rondebosch, SA
Arendorf, T. M.(SA)	<i>Journal of Oral Pathology &amp; Medicine</i> (1998)	30	Local(C)	Univ Western Cape, Fac Dent, Dept Oral Med & Periodontol, Private Bag X08, Mitchells Plain 7785, Cape Town, SA.

(c) refers to co-authored or multiple authored papers

(s) refers to single authored papers

Local-within South Africa

A method used for evaluating publications was citation counts. The citation count was an indication of the research quality. Therefore the more often a paper was cited the higher its quality was seen to be. Although there is much criticism of this method it is still used to evaluate research. Table 13 shows that 32 (53%) of the 60 most highly cited publications have as first or principal author a South African. This indicates that South African researchers or authors are internationally recognized, and increasingly so in the last decade as six papers of the 32 were published before 1994, whereas 26 papers were published after 1994. The assumption is that, since the change in government in 1994, South African researchers or authors are considered part of the international research community.

Table 13 further indicates that 22 papers of the 32 have local or national collaboration (that is, within South Africa). This reveals that there is intra-national collaboration, among provinces, cities and institutions.

Glanzel (2002:472) noticed an increase of citation impact in papers published with international co-operation or collaboration. The findings of the present study are consistent with Glanzel (2002), since from Table 13 we observe that the top 17 most highly cited papers have international collaboration and are authored by more than one author.

### **5.8 Productivity as measured by Research Output (Institutions)**

The benefits of research output generally accrue to individual researchers (researcher productivity) and the institutions they belong to (institution productivity). Individual researchers attempt to increase their output of published research, as this establishes their reputation as scientists in the field. The research output of individual researchers is an obvious measure of author productivity. However, the large number of multiple-authored publications in the field of HIV/AIDS in South Africa (62%) made it difficult to establish individual productivity in the present study. The difficulty occurred as the Endnote package used for this study cannot distinguish (apart from simple, straight counts) author contributions to a single publication. This is an area for further research in which Lotka's Law may be applied.

Institution productivity rates institutions on publications output. The institutions included academic establishments, hospitals and affiliated organizations. For the present analysis, the address field and only the first author's address was used. Each document did not have all the addresses of the authors. The following publications were omitted: *news and newspaper articles (306), abstract and meeting abstracts (228), notes or comments (41), anonymous publications (44), congresses (13) and publications that had no address (77)*.. The reason for the omission of these documents is that authors in the field of bibliometrics do not consider these types of publications sufficiently academic in nature and therefore do not include them in their analyses. Glanzel (2002:463) is of the viewpoint that for bibliometric analysis these types of publications are not "conveyers of relevant scientific information ... and are thus not regarded as citable items".

The data used for this analysis was 1 649 publications of which the total number of South African publications was 1 280. Of the 1 280 publications, 369 documents were publications whose first author or principal author's address was other than South African.

**Table 14: Institutions Involved in the Production of HIV/AIDS Literature in South Africa**

<b>Institutions</b>	<b>No. of Publications</b>	<b>Percentage</b>
Universities and Technikons	750	58.6
Research Institutes, Associations, Programmes, Societies, Groups, Councils and Research Units	255	19.9
Hospitals, Clinics and Medical Centres	167	13
No Address	77	6
Blood Transfusion Services	11	0.9
Government Health Services	11	0.9
Private Addresses	9	0.7
<b>Total</b>	<b>1 280</b>	<b>100</b>

Table 14 indicates that the majority of research on HIV/AIDS in South Africa, in terms of the present study, is produced by academic institutions (750), followed by research groups and research institutes (255) and then by hospitals (private and government) and clinics and medical centres (167). This is understandable, as academic researchers are vigorously encouraged to publish their research. It is evident from the table that there is great interest from a variety of sectors in South Africa.

A further analysis of the number of publications by academic institutions appears in Table 15, which shows the productivity ratings of academic institutions based on their publications output on HIV/AIDS.

**Table 15: Academic Institutions Rating based on Publications output of HIV/AIDS Literature in South Africa**

Rating	Academic Institutions	No. of Publications	Percentage
1	University of the Witwatersrand	196	26
2	University of Natal	185	25
3	University of Cape Town	144	19.2
4	University of Stellenbosch	75	10
5	University of Pretoria	46	6.1
6	University of the Free State	25	3.3
7	University of the Western Cape	20	2.6
8	Medical University of Southern Africa	19	2.5
9	University of the North	9	1.2
10	Other (with less than 9 publications)	31	4.1
<b>Total</b>		<b>750</b>	<b>100</b>

In the present study, the University of the Witwatersrand is the top-producing or ranking academic institution in terms of the number of publications on HIV/AIDS in South Africa. The University of the Witwatersrand is followed closely by the University of Natal. This is consistent with the research conducted by Macias-Chapula *et al.* (2003?), who found that the University of the Witwaterand was the top producing institutions

Of the total number (255) of publications by research institutes, the Medical Research Council was the most productive institute. It should be noted that some of the Medical Research Council's publications may be included in the academic institutions to which the academics are affiliated. The high productivity of research from the MRC is understandable, since the Medical Research Council has received over the years local and international funding for HIV/AIDS research.

In conclusion, the University of the Witwatersrand is the top-producing academic institution, closely followed by the University of Natal, which is only 1% behind the

leader, and a little way ahead of the next contender, which is the University of Cape Town. Close competition in academic institutions is also noted. The Medical Research Council is the most productive research institute.

## 5.9 Distribution of HIV/AIDS Literature by Subject for the period 1980-2002

Keywords or subject headings were used to compile the data for the present study. The total number of documents examined, as mentioned, was 1 649 and the Keyword Field was used. The same criteria were applied for the elimination of records, as in the previous analysis (see 5.7). Of the 1 649 documents, 176 documents had no subjects in the Keyword Field. The majority of the 176 documents were *letters* (129) and *editorials* (25), followed by *notes and reviews* (6).

Table 16 presents the distribution of HIV/AIDS literature by subject of the publications. The Subject Headings refer to topical subheadings used by MeSH.

**Table 16: Distribution of HIV/AIDS publications by Subject**

Range	Subject Heading (MeSH)	No. of Publications
1	Acquired Immunodeficiency Syndrome	660
2	HIV Infection	522
3	Adults	410
4	Tuberculosis or TB	275
5	Support, Non-U.S. Gov't	270
6	HIV-1	242
7	Risk or Risk Factors	197
8	Prevalence	173
9	HIV Seropositivity	109
10	Anti-HIV Agents	91

Table 16 shows that the subject areas with greatest coverage were those concerned with studies on *Adults, Tuberculosis, HIV-1, Risk or Risk Factors, Prevalence, HIV Seropositivity* and *Anti-HIV Agents*.

A further analysis of the 660 documents containing the term or subject, *Acquired Immunodeficiency Syndrome*, in the Keyword Field, with the use of topical subheadings, reveals that between the years 1982 and 2002 the majority of publications were on *epidemiology* (see Table 17). It continues its popularity until today. This is understandable, since epidemiology, in general, established the methodology and basis for research. The second most popular topical subheading was *prevention and control*, followed by *transmission, complication* and *psychology*.

In the table below, the column reflecting the 1992 ranking contains some cells without a ranking but with an asterisk. These reflect a ranking of lower than 10. Empty cells reflect no ranking.

**Table 17: Distribution of AIDS Publications by Subject (A Further Analysis)**

Rank 1992	Rank	Subject	1982- 1988	1989-1995	1996- 2002	Total
3	1	Epidemiology	8	47	62	117
2	2	Prevention & Control	3	40	56	99
4	3	Transmission	3	23	28	54
1	4	Complication	4	11	26	41
7	5	Psychology	0	11	14	25
6	6	Drug Therapy	0	1	22	23
*	7	Mortality	0	1	21	22
8	8	Therapy	1	6	11	18
*	9	Economics	0	2	16	18
9	10	Diagnosis	4	5	8	17
	11	Virology	0	2	9	11
5	12	Immunology	0	0	10	10
	13	Nursing	0	1	7	8
	14	Blood	2	1	2	5
10	15	Microbiology	1	1	2	4
	16	Classification	0	0	2	2

Note: Asterisks indicate a subheading not present in the top 10 ranking in 1992

The first column, “Rank 1992”, in Table 17 was taken from the article by Bierbaum and Brooks (1995:534). Their work presented the frequency rankings of topical subheadings of *Acquired Immunodeficiency Syndrome*. Table 17 reveals a shift in research focus and interest in *epidemiology*, which has moved from Rank 3 in 1992 (Bierbaum and Brooks, 1995) to Rank 1 in the present analysis. This shows concern and more attention committed to public health. *Prevention and Control*, *Drug Therapy* and *Therapy* remain the same, with no change in their ranking. This indicates that there is still continuing concern in this area. The above shows the varying degrees of importance of the different aspects of the disease over a period of time.

## 5.10 Summary

Chapter 5 presented the findings and discussion of the findings, in the context of the objectives laid out for the study. An examination of the research output on HIV/AIDS in

Africa and in South Africa was presented. The topic of citation distribution and a presentation of publication types were covered. Authorship patterns formed the subject of the next analysis. Single authored and multiple authored publications were analysed and the results presented. The analysis then examined journal productivity ranking, displaying the most productive journals. Citation analysis was presented next. Citation counts formed the basis of these assessments. Productivity by research output was discussed. This was measured for institutions and the findings presented. An assessment of the distribution of HIV/AIDS literature by subject concluded the findings of the study.

## Chapter 6

### Conclusion

#### 6.1 Introduction

Bibliometric analyses are important in analysing and highlighting patterns of authorship and publication. They give insight into the state of knowledge of a discipline, for example, the assessments will help determine the leading researchers in the discipline and alert researchers to gaps in the knowledge. The development of scientific knowledge rests on critical activities such as these. A bibliometric assessment of HIV/AIDS, in particular, is important in view of the need to develop and advance knowledge of the dreaded disease referred to by Kofi Annan, Secretary General of the United Nations, as the “weapon of mass destruction”, in a UN report on HIV/AIDS (HIV/AIDS Barometer 2003).

Chapter 6 highlights the major issues arising from the findings of the bibliometric analysis of the HIV/AIDS literature in South Africa. The study, the first of its kind, has generated some interesting findings, which have implications for policy-makers, researchers and database designers and managers. Recommendations for these stakeholder groups are presented, as are areas and topics for further research.

#### 6.2 Revisiting the Research Purpose and Objectives

This study was an attempt to establish the knowledge base of HIV/AIDS research work in and on South Africa. The purpose of the study was to trace the patterns of authorship and publications of academic institutions and affiliated organisations in the sciences and medicine in South Africa. The study focused on HIV/AIDS literature or research spanning a period of two decades, from 1982 to 2002. The source of the research comprised three widely accepted international databases, in which most scientific researchers publish and rely on. These databases were *MEDLINE*, *AIDSearch* and *ISI Science Citation Index Expanded*.

### **6.3 Summary of the Study**

The thesis was presented as follows. Chapter 1 provided the background to the study. The research problem, purpose and objectives of the study were presented. The chapter also discussed the justification for, and limitations of, the study. The importance of the HIV/AIDS literature globally was revealed and the global nature of the disease, with particular reference to the crisis facing South Africa, was emphasized.

Chapter 2 provided a brief description of the institutions that contribute to HIV/AIDS research in South Africa. The importance of research at higher education institutions was discussed and how research activity leads to the knowledge development of a country. In order for this knowledge development to continue, funding organizations play a vital role. A brief description of the FRD, NRF and the MRC was provided. Their objective is to support and promote research through funding human resource development and the provision of research facilities. The subsidy system accruing to accredited journals in South Africa was described. The importance of medical research, particularly on HIV/AIDS, was outlined.

Chapter 3 reviewed the literature on the science of bibliometrics. It reflected on the importance of bibliometrics, as the science makes it possible to quantify research productivity. This gives an indication of the national productivity in a discipline. This is important to policy-makers, who need to be aware of the nature, levels and concentration of research activities at national level. Policy-makers also need to be cognisant of the country's ranking in terms of research output globally. Bibliometrics can identify researchers who are active in a given field, the foci of their research and the type of collaboration that they are, or could be, involved in. Financial commitments of funding agencies may be determined using such information. Chapter 3 also reviewed the bibliometric studies which have been applied to HIV/AIDS research. The review demonstrated the dearth of bibliometric studies on HIV/AIDS research.

Chapter 4 described the research design deployed in the study. It explains the methodology and the data collection techniques used. Online databases were used for the present study. Background information on the three databases, as well as their limitations, and the Endnote package were described in the chapter. The limitations of online databases, in general, were discussed. A detailed explanation of the steps involved in the data collection procedure was given.

Chapter 5 presented and discussed the findings of the study.

## **6.4 Conclusions**

The results of bibliometric assessments may be used to identify the current state of the knowledge and the acceptability of the knowledge in the scientific community (by virtue of the publications being accepted for publication) and may serve to highlight the gaps in knowledge by identifying new areas for research. The assessments may highlight the need for research topics that focus on nuances of the problem that might be experienced in a particular geographic region, or which might be important at a particular point in time. From the perspective of the researchers, bibliometric studies establish the rankings of publications, as researchers strive to publish in publications of status and recognition. This, in turn, contributes to their own status and recognition and that of their institution, a phenomenon experienced in the research world globally. What follows are the major conclusions which emerged from the study.

### **6.4.1 Growth in the Literature**

It has been established that, while the science of bibliometrics is established and applied to a wide range of disciplines, there is a dearth of bibliometric studies on HIV/AIDS. Moreover, bibliometric studies on HIV/AIDS that have been conducted emanate from the developed world, mainly the USA. Very little has been undertaken in and on the developing world and especially in Africa, the continent most seriously affected. To the present researcher's knowledge, this is the first attempt at a bibliometric assessment of HIV/AIDS research in South Africa. Macias-Chapula (2002) is the only other researcher

who has attempted an assessment of Central Africa and who is currently working on an assessment of HIV/AIDS literature for Southern Africa.

One of the major areas of the study reflects the demographic stature of the body of literature on HIV/AIDS. There is an exponential growth in the literature on HIV/AIDS in South Africa and particularly in the last decade. This is highlighted in the findings as applicable not only to South Africa, but to the whole of Africa.

#### **6.4.2 Fragmentation of the Literature**

Given the multidisciplinary nature of the subject of HIV/AIDS, the literature is scattered and published in a wide variety of different discipline based scholarly journals. A surprising find was that just two of the speciality journals in the field of HIV/AIDS appeared in the top 10 of the journals ranking list. The possibility for this is the fact that the two journals titles in question are SAPSE approved titles. This shows that there is fragmentation of the literature. The results of the assessment reflect a large number of different discipline based journals in which the research work of scholars is published. Clinical medicine, biology and pharmacy are only some of the disciplines where research work on the subject is published. The difficulty in attempting broad generalisations establishes the need to be aware of different databases to undertake bibliometric studies on the subject and the importance of understanding the complementary nature of the databases available. This problem may be resolved in the future, as the SAPSE listing of journals in South Africa is to be replaced by the approved South African journals list, international journal listings of ISI and IBSS. This will encourage the move of South African researchers' efforts towards submitting and publishing in journals titles that appear in the approved South African journals list, ISI and/or IBSS. It may be some time before the system is established and the scientific research community becomes aware of the changes. Future bibliometric studies will have to take this "transition period for publications" into careful consideration.

### **6.4.3 Channel of Communication**

The type of publication that contains the research work is of interest to the research community. One of the major findings is that research scholars working in the field of HIV/AIDS publish their work mainly in journals and especially in international journals (that is, journals published outside South Africa). This is understandable and it can be concluded that journals are and will continue to be, the major channel of communication between researchers. It is also understandable, as journal publications have been the 'earners' of financial remuneration for researchers in South Africa. They are therefore the targets of aspiration of the research community. Journals are followed by letters, which is a brief form of communication, with 'currency' being the major aim of letters. This finding was not consistent with the results of researchers Sengupta and Kumari (1991), who found an increase in publications in conference proceedings and symposia. It is speculated that their findings could well be the case for developed countries, where the research and knowledge is well advanced. However, *The International Conference on AIDS* features in the majority of the bibliometric studies on HIV/AIDS and is therefore an important publication.

### **6.4.4 Collaboration**

An issue of importance to bibliometric studies is that of collaboration. The nature of collaboration is both interesting and important in a discipline. A major finding, which was consistent with that of other international research in the field, is that the majority of the publications (62%) were co-authored or multiple authored publications. Co-authored and multiple authored publications reflect collaboration in research and demonstrates the sharing of effort between researchers in a particular field. The exchange of knowledge and ideas emerging from collaboration could be undertaken locally, nationally or internationally. National and international collaboration provides recognition for researchers and the institutions to which they belong.

An assessment of the nature of collaboration reveals that collaboration takes place within the country. A large number of papers were the result of local collaboration (that is, with

researchers from within South Africa). This is encouraging, as it is in the national interest for local researchers to be working together to advance knowledge of HIV/AIDS. However, actual figures could not be ascertained by virtue of the problems experienced in identifying the address field of the principal and/or other authors. This problem was highlighted previously and further discussed in the next paragraph.

A limitation of the study arose from the fact that the databases did not specify the author's affiliation to an institution or research institute. This made it extremely difficult to identify the address from the address field. The link between the first author and the first address could not be concluded with certainty. The *MEDLINE* and *AIDSearch* database includes the address of the first author only. The *ISI* database lists all the addresses of the authors of a given publication, but with no reflection of the relationship between author and address. Such information on author status (lead or first author) and address would have enabled one to describe productivity within and among academic institutions and research groups or institutes in greater detail. It would also have contributed to a measurement of national productivity by country, as the address would have identified contributions from a specific country. Institutional and country comparisons of productivity are therefore not presented in this study. This was a limitation of the present study and consideration of the issue is recommended for further research.

#### **6.4.5 Journal Ranking**

A particular journal's standing is generally widely known in a discipline. Bibliometric studies enable a publication's ranking to be assessed. Scientists generally measure the top journals in a discipline by output. In an examination of all 2281 publications, just under three-quarters (70%) were published in international journals (published outside South Africa). It is obvious that South African researchers *do* target international journals for the publication of their research. The prestige and recognition generated from international publication provides a strong motivation for this effort.

However, an examination of the rankings of journals revealed interesting findings. The 2281 publications occurred in 418 journal titles. These were ranked by output. Of the top ten journal titles by productivity, three were South African journal titles. Some 91% (611 of the 670) of the South African publications appeared in titles that were in this top ten. Of the South African journals, the *South African Medical Journal* is the most productive journal in terms of research on HIV/AIDS. This is a clear reflection of the stature of the journal as an important and influential journal in the field of medicine. The second most productive South African journal title is the *South African Journal of Science*. This title is another important journal for South African scientists. It may be concluded, and unsurprisingly so, that South African medical researchers and scientists are inclined to publish their research in South African journals. This may be a reflection of the importance local researchers attach to the communication of their research to audiences with the greatest interest and where the research has the greatest impact, namely locally. It may also be a reflection of the relative ease with which South African scientists may be able to publish their work. It is noted that the top South African titles are on the SAPSE- approved listing. Publishing in these journals generate additional financial reward for the authors. It can be concluded that South African researchers publish in the mainstream journals in their fields.

#### **6.4.6 Country of Publication of Journal Titles**

The present research reveals that the United States is still the leading country for the production of HIV/AIDS research output. Some 40% of the journal titles in this study were from the United States, followed by the United Kingdom, with 31% of the journal titles. It may well be that the databases used in the study have comprehensive coverage for both these countries, as well as for France and Germany. If this is true there could be an under-representation or coverage of titles from developing countries. Further research needs to examine whether journal titles from developing countries are under-represented in the international databases.

#### **6.4.7 Citations**

The number of times a piece of research is cited reflects the importance of the work to scholars. This analysis was attempted in the study. The most cited publications were examined. Two observations are noted: Firstly, co-authored and multiple authored publications receive more citation counts than single-authored papers. Of the 60 most highly cited publications or papers in this study, 38 were produced with international collaboration and were either co-authored or multiple authored. Secondly, papers that have international collaboration and are co-authored or multiple authored are likely to have higher citation counts. Interestingly, of the 60 publications 21 (35%) were produced through local collaboration. Another interesting find is that a number (53%) of the most highly cited publications had as first or principal author a South African. South African researchers are fast becoming internationally recognized in the field of HIV/AIDS and the findings underscore this development. This is understandable because of the prevalence and consequences of the disease in South Africa.

The results of this study reveal that more recent publications receive fewer citation counts. This is also understandable, as research work takes some time before it permeates through the research community.

#### **6.4.8 Productivity (Researchers and Institutions)**

The output of individual researchers is generally used to assess their academic performance. This is measured by the number of research papers, reports and books published by individual academics. Researcher productivity was not attempted, as this study was defined as a descriptive study for which an attempt to apply Lotka's Law was deemed inappropriate.

While researcher productivity reflects the productivity of individual researchers it also contributes to the reputation of an academic institution. Academic institutions are eager to encourage the productivity of their researchers. The productivity of academic institutions in terms of HIV/AIDS research is, in turn, represented by the sum total of their academic output. This is presented in the present study.

Topping the list of institutions that are the most productive in South Africa is the Medical Research Council (a research institute). This is a prestigious ranking and establishes the MRC as the leader in South Africa's research efforts on HIV/AIDS. Of the academic institutions, the University of the Witwatersrand is the most productive institution, followed by the University of Natal. This information is important for research scholars and funding agencies.

#### **6.4.9 Subject Analysis**

It is interesting to examine the range of topics being investigated by researchers in the broad field of HIV/AIDS research. This assessment is presented in the findings. The findings indicate a greater coverage in the studies on the subtopics *Adults* and *Tuberculosis*. Macias-Chapula (2003?) states in his introduction that of the 35 million persons living with HIV, 95% live in developing countries and the majority are from Africa south of the Sahara. He states that one-third of the persons infected with the virus are young adults. This may be a contributing factor to the increased interest in research on adults. There was also an increase in the production of literature on the subject of *Tuberculosis* and *HIV or AIDS* between the years 1997 and 2002.

A further analysis of the *AIDS* literature revealed that there was a shift in research focus from *complications* in the study by Bierbaum (1995) to *epidemiology* in the present study. However, it is noted that South African researchers have concentrated mainly on *epidemiology* over the past two decades. *Prevention and Control* ranked second in importance. It appears the subheading of *Prevention and Control* is the arena in which the research is continuing. It can be concluded that *Prevention and Control* was a priority and still is a priority today.

An issue of major importance to the results of the present study relates to the level of specificity and detail of the data in the database. *MEDLINE* and *AIDSearch* database have medical subheadings while *ISI* uses keywords. This complicates the ability to undertake proper assessment of the trends occurring in the research on a given topic. It is

important for database managers to obtain consistency of data for good bibliometric assessment.

### **6.5. Recommendations**

Bibliometric analyses are important in that they provide an accurate and comprehensive assessment of the state of knowledge of an arena of investigation. The emergence of databases and in recent years of online databases, provide the perfect opportunity for bibliometric assessments of a topic. Policy-makers, funding agencies and research scholars can be provided with information that will enable them to make informed decisions relating to a particular topic.

It has now become clichéd to talk about the importance of HIV/AIDS, particularly in South Africa. The crisis proportions that the disease has reached has made it the subject of research in a large number of areas and with vast applications. There is, at present, no other health problem that is more important than Acquired Immunodeficiency Syndrome (AIDS) in South Africa. Research on HIV/AIDS is ongoing and will continue to dominate the research arena for the foreseeable future. Bibliometric assessments help unfold the effort to control the disease, as they reflect the progression of knowledge in all its applications.

Policy-makers such as the Department of Health, research agencies and funding agencies should acknowledge the MRC as the leader in the production of research output on HIV/AIDS in South Africa for the two decades spanning 1982 to 2002. The MRC is followed by the University of the Witwatersrand and then the University of Natal. These are the established leaders in the production and dissemination of scientific and technological research activities of the country, based on the three databases used. These institutions should be lauded and encouraged and further funded in the research effort to ameliorate the disease. Policy-makers should play a role in attracting newer and younger researchers into the field, by encouraging national and international collaboration with established scholars and researchers from these institutions.

From the finding of this study, researchers should note the wide and varied opportunities in the field of HIV/AIDS research. While research work has been somewhat fragmented, this is really a reflection of the large number of facets for further investigation. The sub-fields or sub-topics for investigation provide an indication of the direction in which the research agendas in the sciences and medicine are headed.

A further significant consequence of the study is the comment which should be noted by database designers and managers. Bibliometric studies are only as good as the data and the quality of the data in the databases used for the assessments. As noted earlier, some in depth assessments were not possible in this study because of the absence of the same levels of specificity in the data across the databases used. While it is acknowledged that database owners are independent and value their freedom to construct the database for their target audiences (as any business would), comprehensive bibliometric assessments can only be undertaken across all databases that contain related information on a topic. This is particularly relevant for a topic like HIV/AIDS in South Africa. A request is made to database designers to attempt standardization of data. In other words, databases need to be complementary rather than competitive. There should be consistency in the level of specificity of data collected. The present study has highlighted this in two particular aspects, namely that of author names and addresses. Author names should be entered by the same rules across databases. In similar vein, author address, linked to author status, is recommended for all databases.

Comparisons of productivity for individuals and countries were not presented in this study. This is a limitation to this study and a consideration of the issues are recommended for further research. An assessment of individual researcher productivity requires a comprehensive dataset, with a defined approach to measure attribution of authorship, particularly in the case of multiple authored publications, which are in the majority in this field of inquiry. The correct approach, with a comprehensive dataset, will allow statistical manipulation of the data and the application of bibliometric laws such as Lotka's Law. Quantitative bibliometric studies, with the application of bibliometric laws, form topics for further research.

To allow comparison of the output of countries, there must be some mechanism in place that identifies author and author status and links the author to his/her address. A simple modification of the database is recommended, to enable better data access and a more detailed analysis.

These recommendations require fairly simple modifications to the databases, but will allow reasonably comprehensive and accurate bibliometric studies to be undertaken.

An assessment of the research output of academic institutions may be better achieved by an examination of the annual research reports of these institutions. Academic and research institutions are required to produce these reports on an annual basis. They will provide a far more comprehensive set of research output records (both published and commissioned) than the international databases. Such an assessment will provide an accurate picture of the research output of academic institutions in the field of HIV/AIDS literature and could form the topic of a future study.

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## Appendix 1

### Journals Ranking List

Journal Title	No of Publications	%	SAPSE
SAMJ (South African Medical Journal)	537	23.54	Yes
Int Conf AIDS	159	6.97	No
Lancet	136	5.96	Yes
AIDS	81	3.55	Yes
British Medical Journal	58	2.54	Yes
Nature	49	2.15	Yes
International Journal of Tuberculosis and Lung Disease	43	1.89	No
South African Journal of Science	39	1.71	Yes
Nursing R S A Verpleging	35	1.53	No
Journal of Dental Research	30	1.32	Yes
Aids Research and Human Retroviruses	29	1.27	Yes
International Journal of STD and AIDS	24	1.05	No
Bulletin of the World Health Organization	21	0.92	Yes
Pediatric Infectious Disease Journal	21	0.92	Yes
Genitourinary Medicine	19	0.83	Yes
SADJ (South African Dental Journal)	19	0.83	No
Annals of Tropical Paediatrics	17	0.75	Yes
Clinical Infectious Diseases	17	0.75	Yes
Oral Diseases	17	0.75	No
Journal of Infectious Diseases	15	0.66	Yes
Social Science and Medicine	15	0.66	Yes
Journal of Tropical Pediatrics	14	0.61	Yes
Transactions of the Royal Society of Tropical Medicine and Hygiene	14	0.61	Yes
AIDS Treatment News	13	0.57	No
Nature Medicine	13	0.57	No
Sexually Transmitted Diseases	13	0.57	Yes
AIDS Care	12	0.53	No
Dental Association of South Africa. Journal	12	0.53	No
Curationis	11	0.48	Yes
Journal of Acquired Immune Deficiency Syndromes (Jaids)	11	0.48	Yes
Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology	11	0.48	Yes
Lancet Infectious Diseases	11	0.48	No
Science	11	0.48	Yes
South African Journal of Surgery	11	0.48	Yes
AIDS Policy and Law	10	0.44	No
American Journal of Public Health	10	0.44	Yes
East African Medical Journal	10	0.44	Yes
Psychological Reports	10	0.44	Yes
Sexually Transmitted Infections	10	0.44	No
Tropical Medicine and International Health	10	0.44	No
Journal of Medical Virology	9	0.39	Yes
International Journal of Gynecology and Obstetrics (Use &)	8	0.35	Yes
Journal of Virology	8	0.35	Yes
New England Journal of Medicine	8	0.35	Yes

AIDS Patient Care and STDs	7	0.31	No
Archives of Disease in Childhood	7	0.31	Yes
JAMA: the journal of the American Medical Association	7	0.31	
Journal of Virological Methods	7	0.31	Yes
Medicine and Law	7	0.31	Yes
New Scientist	7	0.31	Yes
Tropical Doctor	7	0.31	No
American Journal of Respiratory and Critical Care Medicine	6	0.26	No
Canadian Medical Association Journal	6	0.26	Yes
Clinical and Diagnostic Laboratory Immunology	6	0.26	Yes
Journal of the International Association of Physicians in Aids Care	7	0.31	Yes
Journal of Clinical Pathology	6	0.26	Yes
Journal of Infection	6	0.26	Yes
QJM-Monthly Journal of the Association of Physicians	6	0.26	Yes
AIDS Alert	5	0.22	No
Conf Retroviruses Opportunistic Infect	5	0.22	XX
Health Policy and Planning (Health Policy & Planning)	5	0.22	No
International Journal of Cancer	5	0.22	Yes
Pediatric Research	5	0.22	Yes
Pharmacoeconomics	5	0.22	Yes
Research in Virology	5	0.22	Yes
AIDS Reader	5	0.22	No
African Journal of Reproductive Health	4	0.18	No
Annals of Oncology	4	0.18	Yes
Central African Journal of Medicine	4	0.18	Yes
Clinical Chemistry and Laboratory Medicine	4	0.18	No
Emerging Infectious Diseases	4	0.18	No
Health & Human Rights (Health and Human Rights)	4	0.18	No
IAPAC Mon	4	0.18	XX
International Journal of Epidemiology	4	0.18	Yes
IUBMB Life	4	0.18	No
Journal of Clinical Microbiology	4	0.18	Yes
Journal of Health Population and Nutrition	4	0.18	No
Journal of Medicine and Philosophy	4	0.18	Yes
National Medical Journal of India	4	0.18	No
Newsweek	4	0.18	No
Nursing Standard	4	0.18	No
Reproductive Health Matters	4	0.18	Yes
Transfusion	4	0.18	Yes
Archives of Andrology	3	0.13	Yes
Archives of Internal Medicine	3	0.13	Yes
Association of Nurses in AIDS Care. Journal	3	0.13	No
Baillieres Clinical Infectious Diseases	3	0.13	No
Can HIV AIDS Policy Law Rev	3	0.13	No
Current Opinions in Infectious Diseases	3	0.13	No
Diagnostic Microbiology and Infectious Disease	3	0.13	No
European Journal of Vascular and Endovascular Surgery	3	0.13	No
Gastroenterology	3	0.13	Yes
Hoskins HIV Report	3	0.13	No

Infection	3	0.13	Yes
International Journal of Dermatology	3	0.13	Yes
International Journal of Gynecological Cancer	3	0.13	Yes
International Journal of Health Services	3	0.13	Yes
Journal of Clinical Pathology-Molecular Pathology	3	0.13	XX
Journal of Pathology	3	0.13	Yes
Journal of Pediatric Gastroenterology and Nutrition	3	0.13	Yes
Medical Hypotheses	3	0.13	Yes
NATL CONF HUM RETROVIRUSES RELAT INFECT	3	0.13	No
Neurology	3	0.13	Yes
Annals of the New York Academy of Sciences	3	0.13	Yes
Nursing Times	3	0.13	No
Pathology	3	0.13	Yes
Positive Living	3	0.13	No
Scandinavian Journal of Gastroenterology	3	0.13	Yes
Thorax	3	0.13	Yes
Time	3	0.13	No
Transplantation Proceedings	3	0.13	Yes
Trends in Parasitology	3	0.13	No
Tubercle and Lung Disease	3	0.13	Yes
Vox Sanguinis	3	0.13	Yes
Acta Paediatrica	2	0.09	Yes
AIDS Clinical Care	2	0.09	No
AIDS Education and Prevention	2	0.09	Yes
American Journal of Dermatopathology	2	0.09	Yes
Annals of the New York Academy of Sciences	2	0.09	Yes
Annals of Tropical Medicine and Parasitology	2	0.09	Yes
Annu Conf Australas Soc HIV Med	2	0.09	No
Australian Nursing Journal	2	0.09	No
Biochemistry	2	0.09	Yes
Blood	2	0.09	Yes
British Journal of Cancer	2	0.09	Yes
British Journal of Dermatology	2	0.09	Yes
British Medical Bulletin	2	0.09	Yes
Bulletin De La Societe De Pathologie Exotique	2	0.09	No
Chemotherapy	2	0.09	Yes
Clinical and Diagnostic Virology	2	0.09	Yes
Clinical and Experimental Immunology	2	0.09	Yes
Clinics in Chest Medicine	2	0.09	Yes
Current Opinions in Pulmonary Medicine	2	0.09	No
European Journal of Clinical Microbiology and Infectious Diseases	2	0.09	Yes
European Journal of Gastroenterology & Hepatology	2	0.09	No
European Journal of Obstetrics Gynecology and Reproductive Biology	2	0.09	Yes
Gynecologic Oncology	2	0.09	Yes
H I V Medicine	2	0.09	No
Health Affairs	2	0.09	No
Histopathology	2	0.09	Yes
Humane Health Care International	2	0.09	No
Infection and Immunity	2	0.09	Yes
International Journal of Infectious Diseases	2	0.09	No
International Journal of Radiation Oncology,	2	0.09	Yes

Biology, Physics			
International Nursing Review	2	0.09	No
Journal of Bone and Joint Surgery-British Volume	2	0.09	Yes
Journal of Clinical Gastroenterology	2	0.09	Yes
Journal of Clinical Immunology	2	0.09	Yes
Journal of Cutaneous Pathology	2	0.09	Yes
Journal of Experimental Medicine	2	0.09	Yes
Journal of General Virology	2	0.09	Yes
Journal of Health Economics	2	0.09	Yes
Journal of Hospital Infection	2	0.09	Yes
Journal of Immunological Methods	2	0.09	Yes
Journal of Neurology Neurosurgery and Psychiatry	2	0.09	Yes
Journal of the Neurological Sciences	2	0.09	Yes
Journal of Vascular Surgery	2	0.09	Yes
Kidney International	2	0.09	Yes
Medical Anthropology Quarterly	2	0.09	No
Medical Mycology	2	0.09	No
Medicine	2	0.09	Yes
Methods of Information in Medicine	2	0.09	Yes
Nederlands Tijdschrift voor Geneeskunde	2	0.09	No
Nucleic Acids Research	2	0.09	Yes
Nutrition	2	0.09	No
Nutrition Reviews	2	0.09	Yes
P W A Coalition Newslite	2	0.09	No
Proj Inf Perspect	2	0.09	No
South African Statistical Journal	2	0.09	Yes
Stroke	2	0.09	Yes
Vaccine	2	0.09	Yes
Virus	2	0.09	No
Abdominal Imaging	1	0.04	No
ABNF Journal	1	0.04	No
Acta Chirurgica Belgica	1	0.04	No
Acta Crystallographica Section e-Structure Reports Online	1	0.04	No
Acta Oncologica	1	0.04	No
Acta Tropica	1	0.04	Yes
Acta Virologica	1	0.04	Yes
Age and Ageing	1	0.04	Yes
AIDS Weekly	1	0.04	No
American Journal of Epidemiology	1	0.04	Yes
American Journal of Forensic Medicine and Pathology	1	0.04	Yes
American Journal of Law & Medicine	1	0.04	Yes
American Journal of Tropical Medicine and Hygiene	1	0.04	Yes
American Medical Women's Association. Journal	1	0.04	No
Analytical Cellular Pathology	1	0.04	No
Antiviral Research	1	0.04	Yes
Antiviral Therapy	1	0.04	No
Archives of Neurology	1	0.04	Yes
Archives of Ophthalmology	1	0.04	Yes
Archives of Sexual Behavior	1	0.04	Yes
Archivum Immunologiae et Therapiae Experimentalis	1	0.04	Yes
Arzneimittel-Forschung/Drug Research	1	0.04	No

Australian and New Zealand Journal of Public Health	1	0.04	No
Australian Health Review	1	0.04	No
Baillieres Clinical Haematology	1	0.04	No
Beta	1	0.04	No
Biochemical and Biophysical Research Communications	1	0.04	Yes
Bioessays	1	0.04	Yes
Bioinformatics	1	0.04	No
Biological Psychiatry	1	0.04	Yes
Biomedicine and Pharmacotherapy	1	0.04	Yes
Biotechniques	1	0.04	Yes
Blood Reviews	1	0.04	No
Bmc Infectious Diseases	1	0.04	No
British Journal of Anaesthesia	1	0.04	Yes
British Journal of Clinical Pharmacology	1	0.04	Yes
British Journal of General Practice	1	0.04	No
British Journal of Haematology	1	0.04	Yes
British Journal of Nutrition	1	0.04	Yes
British Journal of Obstetrics and Gynaecology	1	0.04	Yes
British Journal of Radiology	1	0.04	Yes
Bulletin Du Cancer	1	0.04	Yes
Burns	1	0.04	Yes
Cadernos de Saude Publica	1	0.04	No
Canadian Family Physician	1	0.04	No
Canadian Journal of Gastroenterology	1	0.04	No
Cancer	1	0.04	Yes
Cancer Treatment and Research	1	0.04	No
Cell Biology International	1	0.04	Yes
Chemical & Engineering News	1	0.04	Yes
Chest	1	0.04	Yes
Child Welfare	1	0.04	Yes
Clinica Chimica Acta	1	0.04	Yes
Clinical and Experimental Dermatology	1	0.04	Yes
Clinical and Laboratory Haematology	1	0.04	Yes
Clinical Excellence for Nurse Practitioners	1	0.04	No
Clinical Neurophysiology	1	0.04	No
Clinical Radiology	1	0.04	Yes
Clinical Rheumatology	1	0.04	Yes
Clinical Transplantation	1	0.04	Yes
Communicable Disease and Public Health	1	0.04	No
Comptes Rendus De L Academie Des Sciences Serie Iii-Sciences De La Vie-Life Sciences	1	0.04	Yes
Computers and Biomedical Research	1	0.04	No
Contraception	1	0.04	Yes
Cost Qual	1	0.04	No
Critical Care Medicine	1	0.04	Yes
Critical Path AIDS Project	1	0.04	No
Current Opinions in Investigational Drugs	1	0.04	No
Cytometry	1	0.04	Yes
Cytopathology	1	0.04	No
Dermatology	1	0.04	No
Diabetes-Metabolism Research and Reviews	1	0.04	No
Disability and Rehabilitation	1	0.04	Yes
DNA and Cell Biology	1	0.04	No

Drug Development Research	1	0.04	Yes
E&Mj-Engineering and Mining Journal	1	0.04	No
Epidemiology and Infection	1	0.04	Yes
European Journal of Cardio-Thoracic Surgery	1	0.04	Yes
European Journal of Clinical Nutrition	1	0.04	No
European Journal of Haematology	1	0.04	Yes
European Journal of Surgery	1	0.04	No
Eye	1	0.04	Yes
Focus	1	0.04	No
Fordham Law Review	1	0.04	Yes
Gene	1	0.04	Yes
Gmhc Treatment Issues	1	0.04	No
Gynecological Endocrinology	1	0.04	No
Haemophilia	1	0.04	No
Hastings Center Report	1	0.04	Yes
Hautarzt	1	0.04	Yes
Health Care for Women International	1	0.04	Yes
Health Education Research	1	0.04	No
Healthcare Forum Journal	1	0.04	No
Hematologic Pathology	1	0.04	Yes
Hematology Oncology Clinics of North America	1	0.04	Yes
HIV Clin Trials	1	0.04	No
HIV Prev Plus	1	0.04	No
Hospital Medicine	1	0.04	No
Human Mutation	1	0.04	Yes
Human Pathology	1	0.04	Yes
Immunology	1	0.04	Yes
Immunology Today	1	0.04	Yes
Intensive Care Medicine	1	0.04	Yes
International Clinical Psychopharmacology	1	0.04	Yes
International Journal of Experimental Pathology	1	0.04	No
International Journal of Obstetric Anesthesia	1	0.04	Yes
International Journal of Occupational and Environmental health	1	0.04	No
International Journal of Pediatric	1	0.04	Yes
Otorhinolaryngology			
International Journal of Prosthodontics	1	0.04	Yes
International Journal of Psychiatry in Clinical Practice	1	0.04	No
International Journal of Psychiatry in Medicine	1	0.04	Yes
International Journal of Rehabilitation Research	1	0.04	Yes
International Journal of Sport Nutrition	1	0.04	No
International Journal of Trauma Nursing	1	0.04	No
International Ophthalmology	1	0.04	Yes
International Orthopaedics	1	0.04	Yes
Intersci Conf Antimicrob Agents Chemother	1	0.04	No
Invertebrate Biology	1	0.04	No
Israel Journal of Medical Sciences	1	0.04	Yes
Journal of Adolescent Health	1	0.04	No
Journal of Advanced Nursing	1	0.04	Yes
Journal of Biological Chemistry	1	0.04	Yes
Journal of Cellular Biochemistry	1	0.04	Yes
Journal of Clinical Nursing	1	0.04	No
Journal of Clinical Pharmacology	1	0.04	Yes
Journal of Clinical Virology	1	0.04	No

Journal of Dermatology	1	0.04	No
Journal of Epidemiology and Community Health	1	0.04	Yes
Journal of Hand Surgery-American Volume	1	0.04	Yes
Journal of Human Lactation	1	0.04	No
Journal of Human Nutrition and Dietetics	1	0.04	Yes
Journal of Immunology	1	0.04	Yes
Journal of Investigative Medicine	1	0.04	No
Journal of Leukocyte Biology	1	0.04	Yes
Journal of Medical Microbiology	1	0.04	Yes
Journal of Medical Screening	1	0.04	No
Journal of Natural Products	1	0.04	Yes
Journal of Nephrology	1	0.04	No
Journal of Neurovirology	1	0.04	No
Journal of Nutrition	1	0.04	Yes
Journal of Oral Pathology and Medicine	1	0.04	Yes
Journal of Pediatric Surgery	1	0.04	Yes
Journal of Pediatrics	1	0.04	Yes
Journal of Periodontology	1	0.04	Yes
Journal of Public Health Management and Practice	1	0.04	No
Journal of Public Health Policy	1	0.04	No
Journal of Social Psychology	1	0.04	Yes
Journal of Sports Sciences	1	0.04	Yes
Journal of the American Academy of Dermatology	1	0.04	Yes
Journal of the National Cancer Institute	1	0.04	Yes
Journal of the Royal Society for the Promotion of Health	1	0.04	No
Journal of the Royal Society of Medicine	1	0.04	Yes
Journal of the South African Institute of Mining and Metallurgy	1	0.04	Yes
Journal of the South African Veterinary Association- Tydskrif Van Die Suid-Afrikaanse Veterinere Vereniging	1	0.04	Yes
Journal of Travel Medicine	1	0.04	No
Journal of Ultrasound in Medicine	1	0.04	Yes
Journal of Urban Health-Bulletin of the New York Academy of Medicine	1	0.04	Yes
Kennedy Institute of Ethics. Journal	1	0.04	No
Leprosy Review	1	0.04	Yes
Leukemia	1	0.04	Yes
Lupus	1	0.04	Yes
Medical Anthropology	1	0.04	Yes
Medical Science Research	1	0.04	Yes
Medicine and Science in Sports and Exercise	1	0.04	Yes
Memorias Do Instituto Oswaldo Cruz	1	0.04	No
Midwifery	1	0.04	Yes
Midwifery Today with International Midwife	1	0.04	No
Molecular Immunology	1	0.04	Yes
Molecular Medicine Today	1	0.04	No
Natl HIV Prev Conf	1	0.04	No
Natural Product Reports	1	0.04	Yes
Nature Immunology	1	0.04	No
Nephrology	1	0.04	No
Neurosurgery	1	0.04	Yes
Norske Laegeforening. Tidsskrift	1	0.04	No
Nuclear Medicine Communications	1	0.04	Yes
Nursing Ethics	1	0.04	No

Nutrition Research	1	0.04	Yes
Nutrition Research Reviews	1	0.04	No
Obstetrical & Gynecological Survey	1	0.04	No
Occupational and Environmental Medicine	1	0.04	Yes
Occupational Medicine-Oxford	1	0.04	Yes
Oncology	1	0.04	Yes
Oral Microbiology and Immunology	1	0.04	Yes
Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontics	1	0.04	Yes
Orl-Journal for Oto-Rhino-Laryngology and Its Related Specialties	1	0.04	No
Orvosi Hetilap	1	0.04	No
Paediatric Drugs	1	0.04	No
Pathology Oncology Research	1	0.04	No
Patient Education and Counseling	1	0.04	No
Pediatric Allergy and Immunology	1	0.04	No
Pediatric Annals	1	0.04	No
Pediatric Pathology & Laboratory Medicine	1	0.04	Yes
Pediatric Radiology	1	0.04	Yes
Pediatric Surgery International	1	0.04	Yes
Pharmacoepidemiology and Drug Safety	1	0.04	Yes
Philosophical Transactions of the Royal Society of London Series B-Biological Sciences	1	0.04	Yes
Postgraduate Medical Journal	1	0.04	Yes
Proceedings of the National Academy of Sciences of the United States of America	1	0.04	Yes
Public Health	1	0.04	Yes
Public Health Nutrition	1	0.04	No
Qld Nurse	1	0.04	No
Qualitative Health Research	1	0.04	Yes
Quality of Life Research	1	0.04	No
Reflections on Nursing Leadership	1	0.04	No
Res Initiat Treat Action	1	0.04	No
Respiration	1	0.04	Yes
Resuscitation	1	0.04	No
Royal Society of Tropical Medicine. Transactions	1	0.04	Yes
Sante	1	0.04	No
Scandinavian Journal of Immunology	1	0.04	Yes
Scandinavian Journal of Infectious Diseases	1	0.04	Yes
Scandinavian Journal of Public Health	1	0.04	No
Seminars in Neonatology	1	0.04	No
Seminars in Oncology	1	0.04	Yes
Social Work in Health Care	1	0.04	Yes
South African Journal of Communication Disorders	1	0.04	Yes
die Suid Afrikaanse Tydskrif vir Kommunikasieafwykings			
South African Journal on Human Rights	1	0.04	Yes
Statistics in Medicine	1	0.04	Yes
Studies in Family Planning	1	0.04	Yes
Surgical and Radiologic Anatomy	1	0.04	No
Surgical Neurology	1	0.04	Yes
Surviv News (Atlanta Ga)	1	0.04	No
American Journal of Gastroenterology	1	0.04	Yes
European Respiratory Journal	1	0.04	Yes
Journal of Law, Medicine & Ethics	1	0.04	No

Theochem-Journal of Molecular Structure	1	0.04	Yes
Thrombosis Research	1	0.04	Yes
Transfusion Science	1	0.04	Yes
Transplant International	1	0.04	Yes
Transplantation	1	0.04	Yes
Trends in Biotechnology	1	0.04	Yes
Trends in Cell Biology	1	0.04	Yes
Trends in Plant Science	1	0.04	No
Tuberculosis	1	0.04	No
Tumori	1	0.04	Yes
Virology	1	0.04	Yes
Virus Genes	1	0.04	No
Women Alive	1	0.04	No
World	1	0.04	No
Zentralblatt Fur Bakteriologie Mikrobiologie Und Hygiene Series a-Medical Microbiology Infectious Diseases Virology Parasitology	1	0.04	No