# Information literacy: perceptions of Brazilian HIV/AIDS researchers

Maria do Carmo Avamilano Alvarez*, Ivan França Junior*, Angela Maria Belloni Cuenca*,
Francisco I. Bastos[†,‡], Helene Mariko Ueno[§], Cláudia Renata Barros*
& Maria Cristina Soares Guimarães[†]
*School of Public Health, University of São Paulo, São Paulo, Brazil, [†]Institute of Scientific and Technological Communication
and Information in Health, Fundação Oswaldo Cruz, Rio de Janeiro, Brazil, [‡]Imperial College, London, UK, and [§]School of
Arts, Sciences and Humanities, University of São Paulo, São Paulo, Brazil

## Abstract

*Background*: Information literacy has evolved with changes in lifelong learning. Can Brazilian health researchers search for and use updated scientific information?

*Objectives*: To describe researchers' information literacy based on their perceptions of their abilities to search for and use scientific information and on their interactions with libraries.

*Methods*: Semi-structured interviews and focus group conducted with six Brazilian HIV/AIDS researchers. Analyses comprised the assessment of researchers as disseminators, their interactions with librarians, their use of information and communication technology and language.

*Results*: Interviewees believed they were partially qualified to use databases. They used words and phrases that indicated their knowledge of technology and terminology. They acted as disseminators for students during information searches. Researchers' abilities to interact with librarians are key skills, especially in a renewed context where libraries have, to a large extent, changed from physical spaces to digital environments.

*Discussion*: Great amounts of information have been made available, and researchers' participation in courses does not automatically translate into adequate information literacy. Librarians must help research groups, and as such, librarians' information literacy-related responsibilities in Brazil should be redefined and expanded.

*Conclusions*: Students must develop the ability to learn quickly, and librarians should help them in their efforts. Librarians and researchers can act as gatekeepers for research groups and as information coaches to improve others' search abilities.

*Keywords*: Information literacy, library and information professionals, lifelong learning, qualitative, research

---

**Key Messages**

- Research groups and librarians can contribute to information literacy by working together.
- Librarians should increase their awareness of information literacy and strongly support its development.
- Information literacy should be evaluated in a comprehensive manner. It should not be evaluated solely based on course participation.

---

## Introduction

The Internet, online databases, digital publications and other technologies have made the search for

scientific information more accessible and, simultaneously, more complex.[1] The area of information science, as well as other knowledge areas, continues to examine this complex Web of systems to learn new ways to facilitate practical activities. Questions raised by recent studies include the following: What will happen to research libraries as a

Correspondence: Maria do Carmo Avamilano Alvarez, Faculdade de Saúde Pública, Universidade de São Paulo, Av. Dr. Arnaldo, 715, CEP 01246-904, São Paulo, SP, Brazil. E-mail: malvarez@usp.br

result of the development of technological marvels such as Google? How we do position ourselves in the face of so much information?

Librarians and researchers are being challenged because production, distribution, and consumption of information continue to grow at a rapid pace. Only a few solutions have been offered. However, a number of initiatives have been instituted to help scholars develop their abilities to navigate the world of scientific information more competently and effectively.

The concept of information literacy emerged during the 1970s. It was based on the experiences of users during training on information search methods conducted in libraries. Later training addressed methods to search databases. Currently, the term 'information literacy' describes a set of skills and knowledge employed to discover relevant information, to accurately evaluate retrieved information and to apply it correctly.[2] This type of literacy requires lifelong learning because it relies on psychosocial thinking and development that is either interdisciplinary or multidisciplinary. In theory, a person who is information literate should be able to locate and interpret factual information and transform it into knowledge. According to the guidelines of the International Federation of Library Associations (IFLA),[3] an information literate individual should possess the ability to use information to create ideas, develop actions, and act as a disseminator of learning. In academia, the freshmen students' skill development begins when they enter universities. They are taught methods they can use to search for information so they can solve problems, assimilate what they have learned, and subsequently, act as disseminators among peers and future colleagues in their professions.

Many academic institutions include information literacy in their official curricula. This fact generates several theoretical questions: Who and/or what are the objects and the subjects of information literacy? Therefore, some studies conducted on information literacy are now considered research related to the area of education. They are no longer solely considered user studies restricted to the field of library sciences.[4] Wilson[4] hoped to contribute to the available literature on information search behaviour and information literacy. By returning to the theory of the activity, Wilson examined the

individuals who served as the subjects of these studies: the self-taught student, the teacher or the librarian. He also investigated possible objects of these studies: Was each skill possessed solely by an individual student? Alternatively, were collective skills possessed by a group?

In Brazil, information literacy has not yet been added to the official curricula of schools and universities. Some libraries develop their own programmes to guide users. However, these are usually individual efforts.

Traditionally, the field of health maintains an intensive profile with respect to the consumption and production of scientific information. This profile has been strengthened by the field's increasing use of information and communication technologies. Researchers serve as authors, referees and consumers of scientific information. Their abilities guide their careful and critical behaviour during the search, evaluation and use of information. However, some questions have emerged:

- Do researchers believe they are information literate?
- Do they possess the skills required to discover accurate information?
- Do researchers possess sufficient skills to update their bibliographies?
- Do researchers serve as disseminators of these skills?

Many issues have been raised. Yet, users' perceptions of information literacy have received only limited attention.

This current study hopes to describe the information literacy of researchers who work in the field of health based on their own perceptions of their abilities to search for and use academic/scientific information. This study also describes these researchers' interactions with libraries.

## Method

The current study employed qualitative research methods to examine the topic of information literacy. Data were collected from a focus group and from semi-structured interviews conducted with a group of researchers who work in the area of HIV/AIDS.

The interviewees in the study consisted of six researchers who have worked in the area of AIDS for more than 10 years, as shown in Table 1.

These researchers are employed at two centres of research excellence located in Brazil: the University of São Paulo (USP), located in São Paulo, and the Oswaldo Cruz Foundation (Fiocruz), located in Rio de Janeiro. The majority of scientific productivity in Brazil is concentrated in these two states. In Brazil, 12 research groups focusing on AIDS are linked to the area of public health. Half of these groups are located in the states of Rio de Janeiro and São Paulo. The remaining half is distributed throughout the other states in the country.

The choice to study researchers working in the area of HIV/AIDS was inspired by the characteristics of this research field. Research conducted in this area requires constant updates. Scientific progress is determined by groups of interdisciplinary researchers who work in areas such as medicine, psychology, nursing, statistics, biology, education and sociology, among others. The selected researchers are considered senior professionals because they publish in respected scientific journals, serve as peer reviewers and/or editors of publications and/or are leaders of research groups. They play influential roles in the education of new researchers. They are considered experienced because they have developed skills in the area of scientific information search during their academic careers. With the exception of interviewee A, all remaining selected researchers participated in training programs focused on the use of library-based bibliographic information. The selected group exerted great influence within the Brazilian scientific community in the area of HIV/AIDS. The group was small, but its size facilitated data collection.

## Interviews

Semi-structured interviews were conducted with six selected researchers in 2009. The general structure of each interview consisted of three parts, (see the Appendix): (i) an open discussion that explored each interviewee's career trajectory as a researcher in the field of HIV/AIDS; (ii) questions related to how interviewers searched for information; and (iii) interviewees were asked to describe retrospective scenarios, and to describe prospective scenarios (e.g. how they expected to conduct information searches 10 years ago and 5 years in the future). The prospective scenario was devised as a method that would place interviewees at ease. The goal was for interviewees to express themselves freely, without having to compromise with administrative structures already established. Interviewees were asked to imagine ways they would search for information in the future. The use of scenarios during interviews is a technique that is widely used by psychologists to analyse behaviour.

## Focus group

A focus group was conducted in 2010 with the six senior researchers who had previously participated in the interviews conducted in 2009. The focus group meeting was filmed. It lasted one hour and was moderated and observed by two researchers. The participants already knew one another because they worked in the same subject area. However, all participants were employed at different institutions. These factors did not affect the way the focus group meeting was conducted. No intimidating or manipulating views were expressed. The focus of the meeting was to discover what research groups require to successfully manage information overload and to compare the opinions expressed during individual interviews with the collective opinions expressed by the group. The analysis was aimed at the selection of information related to information literacy.

**Table 1** Academic and demographic characteristics of Brazilian HIV/AIDS researchers interviewed in 2009

| Interviewee | Gender | Institution city | Age | Undergraduate | Master | Doctorate | Researcher since |
|---|---|---|---|---|---|---|---|
| A | Male | Rio De Janeiro | 56 | Medicine | Public Health | Public Health | 1988 |
| B | Female | Rio De Janeiro | 60 | Mathematics | Statistics | Public Health | 1975 |
| C | Female | Rio De Janeiro | 44 | Psychology | Public Health | Public Health | 1991 |
| D | Male | São Paulo | 42 | Nutrition | Public Health | Public Health | 1992 |
| E | Male | São Paulo | 48 | Medicine | Medicine | Medicine | 1988 |
| F | Female | São Paulo | 64 | Psychology | Psychology | Psychology | 1983 |

## Analytical categories

Based on a review of the literature related to information literacy,[3] the following analytical categories were identified. They were used to classify the content of the interviews and the focus group:

- The researcher as a disseminator: Identify whether the researcher passes on his/her knowledge related to the search for and use of information to his/her students.
- Interactions with librarians: Does the researcher require the assistance of librarians to perform his/her research? What types of interactions occur between the researcher and libraries/librarians?
- Use of information and communication technology: Identify whether the researcher is familiar with the types of information technology required to interact with databases and Internet portals and to collaborate with research groups.
- Use of language: Because use of a particular language can identify the researcher's actual ability to use technology, as well as the researcher's familiarity with search methods used to search databases, the purpose of this category is to identify whether the researcher is familiar with and uses the technical terms employed in information science, such as controlled vocabularies, descriptors, keywords and database query.

## Ethical considerations

The study was approved by the ethics committee of both institutions involved in the research. The free and informed consent form was read and signed by the six senior researchers. To guarantee anonymity, all interviewees were identified by a letter allocated on a random basis.

## Results

It was established that although interviewee A had not previously participated in any education programme for library users, he considered himself information literate. He commented that these programmes are not provided regularly in the majority of Brazilian libraries. Therefore, he had to learn on his own: 'I never took part in any form of training or course. I learned along the way'. He explained that he employs a general approach when searching. He filters results empirically. However, when he needs to perform a systematic search for bibliographic reviews, he employs a more sophisticated method, consulting several databases.

Alternatively, interviewee B, who had previously participated in training focused on the use of databases in academic libraries, stated that she had experienced difficulties with information searches. She stated that she had used PubMed database. However, she acknowledged that she was unfamiliar with basic search methods, such as Boolean searching and use of a controlled vocabulary. This was confirmed when the author of this paper suggested solutions that had already been incorporated into PubMed: '…You are looking for a subject and a thousand things begin to appear… if there was a way to use intersection…' She appeared unaware of basic search techniques. It was apparent that she had not become self-sufficient with various search methods.

Interviewee C did not clarify whether she considered herself self-sufficient with database searches, although she had previously participated in training provided in libraries.

Interviewee D stated that he had no need to use the bibliographic review services provided by the library.

Interviewee E stated that his training began when he was a student and continued with his continued use of the library. He stated that he had learned how to use controlled vocabulary and had become familiar with several databases, in addition to the traditional databases used in the biomedical field. He added that he continually passed this knowledge on to his students.

The interviewees considered themselves skilled in conducting bibliographic searches required to fulfil their information needs. However, only two of the interviewees demonstrated that they possessed those skills. All of the interviewees highlighted one major difficulty: information overload. Interviewee B stated, 'I am much more a person bombarded by information than a person searching for information'.

It was also apparent that libraries had been performing their roles as educators in the area of information literacy in a somewhat timid manner.

## Researchers as disseminators

The interviewees work in university teaching environments as teachers and mentors of graduate students. The results of this study confirmed that they serve as disseminators of knowledge related to information search with respect to their students.

Interviewee A prepares material on a CD that he distributes to his students. This material includes bibliographical references, a description of the databases used and relevant tutorials. He also includes an orientation guide to the preparation of graphics and other information required to conduct research:

'…I tell my students that I search in ways that require the least amount of work'.

One method that requires the least amount of work is the method I use with Medline… I use those filters for review and meta-analysis a great deal (Interviewee A).

Interviewee B teaches students how to search and provides guidance in the choice of databases.

'…I identify a number of databases. I literally show one person how to conduct the search'.

Interviewee C explained that she sets aside 1 day of class time during each of her courses to explain how to conduct a bibliographic review. She added, 'You provide a general overview, ask for the results, and evaluate the results'.

Interviewee D believed that a graduate student should already know how to search for bibliographic information. He expected students to be independent with respect to searching. He provided direction to his students by referring to PubMed and Google Scholar. He then would add refinements to bibliographic research.

Interviewee E explained that she passes on training she had already received to her students and project team members because she realised the difficulties involved for individuals just beginning to conduct research. She stated, 'Because I felt the students were not able to deal with the vocabulary of the software…'

In the interviews and in the focus group, two interviewees (Interviewees A and D) were identified as disseminators of information on HIV/AIDS. Interviewee A was considered a 'library' by the other interviewees because he sends updated and relevant information to the members of the group. Interviewee A was also the researcher who indicated that he had never participated in trainings related to database use. The group considered Interviewees A and D to be references for research related to AIDS. Some words used to describe this role included 'oracle', 'hub of the group' and 'our Google'.

Therefore, the interviewees demonstrate their abilities to function as disseminators during their regular teaching. Some interviewees excelled in this role.

## Interactions with information professionals

All interviewees stated that they had maintained contact with libraries or librarians. The librarians either assisted them with bibliographic searches or helped them locate particular publications. In their reflections of past methods used to conduct bibliographic reviews, the interviewees described the assistance they had received from librarians and reflected on their visits to libraries and their use of printed bibliographies. Interviewee A stated, 'I would come down to the library'. Interviewee D stated, 'I made many visits to the library to look for these things… I knew which titles would arrive… I kept myself updated and I frequently used internal mechanisms provided by the library during that time'.

Interviewee E stated, 'I reviewed the Index Medicus in paper form… I also remember the librarian consulted data on microfiche at my university. Sometimes, we wanted an article and the librarian would consult a microfiche'. Interviewee-B stated, 'I was a library rat at the beginning of my career… At that time, I would spend the afternoon in the library'.

As the availability of resources on the Internet increased, the image of the library changed from

the actual structure of the building to the image of a computer. Interviewee B described reading scientific articles she accessed on her own computer.

Interviewee D considered libraries to be inherent managers of information portals. In the past, these services were provided on-site. Currently, libraries replicate the services provided by virtual portals.

In the focus group, during a discussion related to the education of librarians, Interviewee E commented that some libraries are attempting to prepare librarians in their areas of specialisation. Interviewee F stated that, in her university, librarians have begun to participate in events in their areas of specialisation. She stated that she has been enjoying this partnership.

Two interviewees described the need for a 'search assistant' to provide guidance to research groups. They confirmed that a professional librarian should be contracted for this activity, rather than the current practice of employing trained students. The interviewees believed this professional librarian could organise information for research groups. Interviewee C presented an example of a librarian who created a blog for the research group. This interviewee demonstrated a good understanding of the supporting role of libraries in the training of researchers necessary during undergraduate studies to improve the quality of education.

She noted that meetings between libraries and researchers are very important. However, they frequently do not occur due to a lack of dialogue. She stated, 'I think the library could play a supporting role in the education of these people. Of course, to qualify, you cannot address this issue in one or two lessons'.

In the discussions that occurred during the focus group, interviewee E stated that the intention should be to bring libraries closer to researchers.

Therefore, with respect to the interactions between researchers and libraries, the librarian is perceived to be a service provider. The library is perceived as a building, a construction, a place, a collection of printed material. This situation differs from situations in the past, when researchers could not function without libraries and librarians because they were essential to the conduct of bibliographic searches. The interviewees described past situations with a certain nostalgia. However,

the interviewees emphasised the importance of a greater deployment of librarians as educators in the field of information literacy. They also believed that librarians should provide increased assistance to research groups.

## Use of information and communication technology

The interviewees are integrated in the information society. They demonstrated this by citing databases and software. They also discussed ways they organised information on their personal computers. They referred to statistical databases, as well as to databases such as Medline, Web of Science and Scopus, among other technical resources used for bibliographic searches.

None of the interviewees were opposed or averse to technological development. However, they demonstrated a lack of critical insight and expert knowledge in this area. Interviewee E defended technology as a facilitator in the administration of information: We were trying to replicate the physical world of libraries in this obsession to catalogue everything. That is what we wanted to do in the virtual world. Google shocked everyone with its motto: 'Do not store, search'. To put it differently, 'put it out there, more or less, and the rest is just to search and search'.

In the context of information technology, the interviewees considered themselves a part of the virtual world. They considered technology to be a facilitator in searches, as well as the organiser and administrator of scientific information.

## Use of language

The use of language corresponds to the specialised terminology used in information retrieval. It indicates the researcher's level of familiarity with search resources and with the use of databases. Some specific terms taken from the domain of information science were mentioned by several interviewees. These terms included 'key word', 'descriptors', 'related abstracts', 'indexes' and 'thesaurus'.

Interviewee C believed it was important to create a systematic method when conducting bibliographic searches. She described this step-by-step

method in some detail. She mentioned that she uses words in an attempt to filter search results. However, she did not explain whether she uses the words as descriptors based on the thesaurus of the databases. She also mentioned the specific search portals she used: 'CAPES', 'SciELO' and 'PubMed'.

When Interviewee E was asked whether he used a particular controlled vocabulary, he provided the name of his preferred thesaurus. Interviewee F believed that controlled vocabularies do not address the needs of her thematic area.

Other international databases were also cited. These included 'Scopus' and 'Web of Science'. In addition, interviewees mentioned certain types of software used to manage bibliographies. These included 'Endnote' and 'Zotero'. Interviewee D stated that he frequently used the search tools, Google and PubMed.

Therefore, based on their use of language, this group of interviewees could be considered familiar with the resources available for health information searching. Some indicated their active use of new and emerging programs. They stated that they stayed informed about the releases of these new tools. These efforts to stay up-to-date were apparent during both individual interviews and during the focus group. Some interviewees admitted having some difficulties with staying informed due to the rapid development of these tools. However, they were up-to-date enough to obtain the information they required.

## Discussion

The interviewees considered themselves information literate. However, they also noted that they experienced some difficulties. What are these shortcomings and difficulties?

The main difficulty appeared to relate to methods required to address and manage information overload. Each researcher must act independently when searching for, selecting, filtering and storing information, primarily because of the need for speed. To facilitate research, researchers must be familiar with and have access to sources of scientific information. They must know how to conduct search strategies and understand how to use the filtering resources of specialised databases.

Information literacy is fundamental[3] to all scholarly efforts, whether they include information required to write an article or information required to inspire and suggest new thematic avenues. On the one hand, researchers must search for information that can help them understand their environments and close gaps in decision-making. On the other hand, researchers must search for information they can use to create meaning and build knowledge.

The creation of a new research project is framed by the use of digital documents. This framework will develop as information searches occur. Exhaustive information searches are not always required during research. Green[5] observes that if a researcher possesses a few well-selected sources, he or she can find other sources cited in the references or footnotes without reducing the quality of the final results.

Some authors refer to 'serendipity' when they describe the discovery of relevant sources during information searches. These sources appear somewhat by chance.[6,7] Some information discovered at random or by accident can strengthen research or, alternatively, highlight inherent errors.[6] In courses and research groups, participants can learn to become aware of new information that arise by chance during searching.[7] This ability is also a skill related to information literacy. The use of additional search tools, such as Google Scholar, was described by interviewees because they respected these tools' speed and convenience when obtaining documents.

Because the interviewees are experienced researchers, they find it relatively easy to select publications that are reliable and valid.[5] Other authors such as Vibert *et al.*[8] have also analysed the use of these tools. Vibert describes neuroscientists use of tools primarily to search for general information and images. Therefore, the ability to select relevant information is an important skill for all individuals who desire to become information literate.

It was apparent that participation in training courses did not cause researchers to become information literate. One of the interviewees, who was considered a gatekeeper (or disseminator) by the group, stated that he had never participated in any type of course. On the other hand, another

interviewee, who had attended a course, admitted to having experienced difficulties in conducting database searches. Green[5] also concluded that, in contrast with the views of librarians, doctoral students can be information literate, even though they might not have attended instructional programs offered by libraries.

The senior researchers interviewed are disseminating knowledge, becoming disseminators of scientific information, publishing their research and editing scientific publications. They also feel that it is their responsibility to contribute to their students' information literacy. However, these senior researchers lack the time to specialise in database use. This emphasises the need for students to acquire information literacy early in their careers. Courses should be offered at the undergraduate level.[8]

Studies conducted on high school students reported a preference for Internet sources such as Google and Wikipedia. They are unconcerned about how information is collected. They focus solely on outcomes and results.[9,10] The authors of these studies believe it is important to understand the process involved in information searches. They believe that students should have prior knowledge related to health topics and information search processes. This approach reflects the idea of lifelong learning: students enrolled in high school or undergraduate studies learning about the process of information retrieval will develop these skills, incorporate them in daily life and disseminate them during the course of their lives.

Other authors have concluded that university students rarely seek the aid of librarians when retrieving unsatisfactory search results. Although it appears that these students have the abilities to obtain the information and sources they need, their results indicate they lack a broader understanding of the concepts of information literacy, as well as critical thinking skills. Students learn how to complete tasks, but fail to learn ways to go deeper into research methodologies and how to pass on those skills to others.[11–13]

This situation exerts a negative influence on scientific development. Therefore, it requires a response from information professionals. What steps are libraries and librarians taking to improve information literacy? Researchers must access,

organise and use information. The reference services of libraries must meet these needs.[14] A number of attempts by libraries to meet these needs have been reported in published studies.[15] However, the question remains whether information professionals are fully aware of libraries' roles.

Finally, who is responsible for information literacy? Courses that previously consisted of educational programs aimed at library users are now offered to research group leaders, students and IT professionals. This broadens and fragments the concept of information literacy.

Although the image of the library appears in a nostalgic form, the results of qualitative studies conducted in academic libraries located in the United States have shown that graduate students also refer with 'nostalgia' to the use of paper and to physical dependency on libraries. However, they recognise the conveniences offered by new technologies.[16] When the Brazilian interviewees referred to current conditions for information searching, they did not refer to library buildings or real spaces. Rather, they referred to virtual digital resources. They did not always consider these resources, the responsibility of libraries or librarians. It is apparent that a transition has occurred: Researchers have transitioned from referencing the library to referencing the Internet.

From the point of view of researchers, librarians, similar to other professionals, may be losing their identities because, in the digital world, this professional category has become confused with systems analysts, digital publishers, and secretaries. Simultaneously, a demand is growing for specialisation on the part of librarians. For example, if a librarian hopes to serve as a gatekeeper for a research group, he/she must participate in an interdisciplinary group. The librarian must also possess a good understanding of how to use search tools and information sources.

Librarians can stand out in the promotion of information literacy if they adopt the roles of educators sharing their knowledge. Studies related to information literacy emphasise that the presence of libraries and the roles of librarians are strengthened and improved through the creation of collaborative educational efforts. According to Cobus,[17] it is the librarian's responsibility to initiate participation in curriculum projects in collaboration with faculty. In

addition, Cobus states, in the area of public health, the development of networks and partnerships is becoming increasingly important and necessary due to the scarcity of resources. This type of participation by librarians in research integrated with other professionals is also advocated by Green.[5]

A report detailing the experiences of a British University librarian illustrates the concepts involved in the promotion of information literacy. This librarian worked directly with the teaching faculty and experienced the changes in the conceptions of roles played by each professional.[18] The academics understood that the librarian was not solely a service provider. She was able to actively contribute to teaching. In addition, as a librarian, she understood the faculty members' information requirements.

An idea has been proposed that librarians work in closer proximity to academia and that librarians should gain improved pedagogical knowledge so they can act as information coaches.

In other words, librarians can demonstrate how to conduct database searches, as well as teach the effective use of information.[19] As a complement to the first proposal, this second proposal requires librarians to provide more personalised and in-depth services.

With respect to the use of technology, no major difficulties are apparent. Technology is no longer considered foreign by Brazilian researchers. Their use of the Internet is a routine activity. It has already passed the stage of 'fascination' or 'aversion'. Difficulties with technology that were described in studies conducted in 2005,[20] such as slow access speeds, lack of technical assistance, shortage of equipment and outdated software, among others, appear to have been overcome. Research institutions in Brazil are well-equipped with respect to information technology. They have rapid access to major international systems.

The interviewees mentioned software used, such as Zotero and Endnote, for retrieval, sharing and organisation of information. These types of software were described by Hull[21] as tools that make digital libraries more personal, sociable, accessible and integrated into other systems. The focus group was split between those individuals who use these tools and those who do not. Respecting the interviewees, librarians need to develop skills to deal with up-to-date technologies and fulfil the most rigorous academic user's demands.[22]

Awareness of terminology used in search resources suggests that coherence exists between discourse and practice with respect to the use of bibliographic databases. However, because interviewees were aware of tools, (e.g. a thesaurus), does not mean they actually use them. The use of controlled vocabulary appears to be familiar to the majority of researchers, but its use was not confirmed in the interviews. With respect to this issue, one study analysed logs created by an online catalogue. The study concluded that users experienced difficulties when they searched by topic, rather than when they used controlled vocabulary or search tools which were considered more appropriate for use by librarians.[11] Another study suggests that information professionals should not quit the use of controlled vocabularies because such vocabularies remain a key tool for helping researchers.[23] Green[5] also referred to certain terminology when he described the information literacy of doctoral candidates. He noted that the candidates used terms such as 'literature search', 'preliminary literature review', 'research databases' and 'digital scanning of journals of interest'.

It is possible that other characteristics of research groups might be used to illustrate and evaluate information literacy. However, this present study focused on information searches and researchers' interactions with libraries. It is important to discuss the roles of librarians in information literacy, especially in Brazil, because library careers are not well known within the academic community. Librarians' participation in teaching remains uncommon.

## Conclusion

Within this representative group of health researchers working in the area of HIV/AIDS, the researchers considered themselves only partially competent with respect to information searches, primarily because they are faced with information overload. They stated that libraries play important roles in the development of information literacy. They suggested that students should begin, early in their careers, to learn how to search for and select information.

Because information literacy does not solely develop by attendance in courses, senior researchers, in collaboration with librarians, can act as gatekeepers for research groups or as information coaches to promote each professional's lifelong learning. Therefore, with respect to Brazil and other countries in which the integration of academics and librarians has not yet been consolidated, librarians must adopt proactive attitudes and seek out new roles.

## References

1 Woolls, B. & Loertscher, D. *Information Literacy: A Review of the Research; a Guide for Practitioners and Researchers*, 2nd edn. San José, CA: Hi Willow Research and Publishing, 2002.

2 Shenton, A. K. Information literacy and scholarly investigation: a British perspective. *IFLA Journal* 2009, **35**, 226–231.

3 Lau, J. *Guidelines on Information Literacy for Lifelong Learning*. The Hague: IFLA, 2006. URL: http://archive.ifla.org/VII/s42/pub/IL-Guidelines2006.pdf

4 Wilson, T. D. Activity theory and information seeking. *Annual Review of information Science and Technology* 2009, **42**, 119–161.

5 Green, R. Information illiteracy: examining our assumptions. *Journal of Academic Librarianship* 2010, **36**, 313–319.

6 Foster, A. & Ford, N. Serendipity and information seeking: an empirical study. *Journal of Documentation* 2003, **59**, 321–340.

7 Nutefall, J. E. & Ryder, P. M. The serendipitous research process. *The Journal of Academic Librarianship* 2010, **36**, 228–234.

8 Vibert, N., Rouet, J. F., Ros, C., Ramond, M. & Deshoullieres, B. The use online electronic information resources in scientific research: the case of neuroscience. *Library Information Science Research* 2007, **29**, 508–32.

9 Julien, H. & Barker, S. How high-school students find and evaluate scientific information: a basis for information literacy skills development. *Library and Information Science Research* 2009, **31**, 12–17.

10 Rowlands, I., Nicholas, D., Williams, P., Huntington, P., Fieldhouse, M., Gunter, B., Withey, R., Jamali, H. R., Dobrowolski, T. & Tenopir, C. The Google generation: the information behaviour of the researcher of the future. *Aslib Proceedings: New Information Perspectives* 2008, **60**, 290–310.

11 Antell, K. & Huang, J. Subject searching success: transaction logs, patron perceptions, and implications for library instruction. *Reference & User Services Quarterly* 2008, **48**, 68–76.

12 Asher, A. D. & Duke, L. M. (2010). Information literacy and first year students: evaluating knowledge, needs, and instruction. [Paper presented to the National research Center Annual Conference on the First-Year Experience 2010]. Accessible at: URL: http:// www.erialproject.org/publications/presentations/

13 Timmers, C. F. & Glas, C. A. W. Developing scales for information seeking-behaviour. *Journal of Documentation* 2010, **66**, 46–69.

14 Rader, H. B. Information literacy in the reference environment: preparing for the future. *The Reference Librarian*. 2000, **34**, 25–33.

15 Andretta, S. Evaluating information literacy educators' practices before and after the course facilitating information literacy education: from tutor to learner-centred. *Health Information and Libraries Journal* 2011, **28**, 171–178.

16 Sadler, E. B. & Given, L. M. Affordance theory: a framework for graduate students' information behavior. *Journal of Documentation* 2007, **63**, 115–141.

17 Cobus, L. Integrating information literacy into the education of public health professionals: roles for librarians and the library. *Journal of Medical Library Association* 2008, **96**, 28–33.

18 McCluskey, C. Beyond the library: reflections from a librarian in na academic faculty. *Health Information ad Libraries Journal* 2010, **27**, 249–252.

19 Mokhtar, I. A., Foo, S. & Majid, S. Guide me, show me: personalized coaching as a means of instilling in formation literacy competencies in students. *Libres*, 2007, **17**, 1–19. URL: http://libres.curtin.edu.au.

20 Cuenca, A. M. B. & Tanaka, A. C. A. Influência da internet na comunidade acadêmico-cientőfica da área de saúde pública. *Revista de Saúde Pública* 2005, **39**, 840–846. URL: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0034-89102005000500021&lng=en.

21 Hull, D., Pettifer, S. R. & Kell, D. B. Defrosting the digital library: bibliographic tools for the next generation web. *PLoS Computation Biology* 2008, **4**, e1000204.

22 Saunders, L. Identifying core reference competencies from an employers perspective: implications for instruction. *College & Research Libraries* 2012, **73**, 390–404. URL: http://crl.acrl.org//content173/4.toc.

23 White, H. Examining scientific vocabulary: mapping controlled vocabularies with free text keywords. *Cataloging & Classification Quarterly* 2013, **51**, 655–674. doi: 10.1080/01639374.2013.777004.

## Appendix Interview structure

### Introduction

How long have you been working with research?

How long have you been working on AIDS research?

How long have you been in a group research?

How long have you been in this institution?

Besides research, what other activities have you been involved in?

Would you tell us more about your career as an AIDS researcher?

### Questions About Information Search

To what aspect of AIDS research have you been dedicating your time?

When was the last time you needed scientific information?

How did you undertake this bibliographic search?

What were the difficulties you encountered? What did you find easy?

What was the last article you read? On what topic? How did you come across this article?

Do you have any suggestions for improving the search for scientific information?

### Scenarios

Describe the scenario related to a bibliographic search you undertook 10 years ago.

Describe the scenario related to an information search you foresee for five hence.