

Appendix I- Issues in International Access to MEDLARS*

Introduction

Though the congressional request for this study did not specifically ask OTA to address issues in international access to MEDLARS and international health information policy issues, understanding these issues is essential to the development of sound public policy toward health information resources. Those issues are so complex that a comprehensive assessment of them is beyond the scope of this report. This appendix identifies and discusses selected relevant issues, to both illustrate this complexity and demonstrate the necessity of addressing the international aspects of U.S. information policy. The discussion is divided between developed and developing countries, though in theory and in the future issues relevant to developed countries may become applicable to the Third World.

Quid Pro Quo Arrangements

The National Library of Medicine's (NLM or the Library) activities have extended into the international arena since its earliest years. Its responsibilities to serve as a repository of biomedical literature necessitate that it actively acquire and preserve information from around the world. Indeed, fully two-thirds of the journals included in *Index Medicus* are published abroad.

The international nature of NLM's collection is reflected in its MEDLARS data bases, so that many countries were naturally interested in obtaining access when the system became operational in 1964. The Library established quid pro quo arrangements, first with Sweden and the United Kingdom, to provide foreign countries with the MEDLARS tapes or on-line access to the NLM computer. In exchange, participating countries provide indexing and other services and/or pay commercial firms in the United States to perform such services for NLM. NLM currently has quid pro quo agreements with 13 countries and one international organization, the Pan American Health Organization (PAHO).

NLM enters these bilateral agreements with a single MEDLARS center selected by each country as its national biomedical information resource. The MEDLARS centers must meet NLM-established technical requirements for personnel, equipment, and fiscal

resources, and serve a user community sufficiently large for the support of extensive computerized services. Indexing services are either provided in-house by the foreign centers, or contracted out to American firms. Though no moneys are transferred between NLM and the foreign centers, these indexing services are valued by the Library at \$500,000. The agreements allow foreign centers access by mounting the MEDLARS tapes on their own computers with or without NLM software, or directly accessing NLM's computer (see table I-1).

In the late 1960's, NLM and the Organization for Economic Cooperation and Development (OECD) discussed the possibility of establishing a single consortium to serve as a European MEDLARS center, but no agreement was reached. Had events in the late 1960's moved differently at OECD—and at the European telephone and telegraph administrations—we might have seen totally different patterns for MEDLARS access, by 1970 it was clear that transatlantic satellites and specialized terrestrial data networks were going to be an important force in data communications. With only one center in Europe, and one in the United States, national centers would not have developed and the issues of restrictions might have taken a different course today, but the concept was technically and politically premature. Communication linkages were poorly developed, and the European nations lacked a common will for cooperation (3). The incipient changes in technology which tend to track anything related to computers might have been much easier to introduce in 1981 if OECD had been foresighted in 1966. This has obvious implications for the decisions we may be making in the next few years about the next generation of U.S.-sponsored public data base system.

Table 1.1.- Foreign Centers' Access to MEDLARS, March 1982

Tapes	Tapes/software	On-line NLM
Germany	Sweden	France
Japan	United Kingdom	South Africa
	Australia	Canada
	Pan American Health Organization	Mexico
		Colombia
		Kuwait
		Italy
		Switzerland

SOURCE: National Library of Medicine,

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International Issues: Developed Nations

Restraint of Trade

Until recently American commercial data base vendors have felt that they were in competition with their own Government in trying to sell biomedical information overseas. This has arisen because of the complex relationship between health services and governments in general, not the least domestically. As it has become profitable to sell health information via remote computers, the question of the proper role, if any, for a governmental agency in the United States has been introduced. But other governments have different views on this subject. In general, medical care is a quasi-governmental concern in most developed countries, historically linked to concerns for public health responsibilities.

Quid pro quo arrangements have complicated the problem: their general pattern is that there be "... no transfer of monies between the participating country and NLM." NLM makes MEDLARS available, either through tapes or (when this became possible) on-line access to the NLM computer, and provides technical documentation and training. The participating country must meet technical criteria involving personnel, equipment, and fiscal resources and have a user community large enough to justify an extensive computerized service activity. The participating country then provides and/or funds the indexing of journals for input to the MEDLARS data base in return for access to the system. This concept is consistent with a policy adopted in 1966 by the Committee on Scientific and Technical Information (COSATI) of the Office of Science and Technology in the Executive Office of the President, which was that Federal information systems would be made available in return for some form of contribution (31).

NLM at first had only one licensing agreement with a U.S. commercial information service, Bibliographic Retrieval Services (BRS), to lease the MEDLARS data base tapes. This agreement limited the firm to vend access to the data bases to the United States and the U.S. territories, unless specifically authorized by the Library in writing. Upon the firm's request, NLM permitted BRS to provide information services to countries outside the United States for which the Library did not have bilateral agreements in December 1978. An amendment to the licensing agreement was executed in March 1979, which, in effect, made it possible for foreign users of MEDLARS to connect to other sources if they were willing to take the risks, and make the effort, of establishing such connections since translational telecommunications links were readily available, though at some cost.

In spring of 1981, the policy was modified and the new contracts that NLM has with commercial information services do not contain a national exclusivity clause. However, new contradictions and unenforceable requirements have now been introduced in regard to Communist countries by the Department of Commerce. The standard contract has recently been extended to prevent resale of data bases (from either U.S. vendors or foreign centers) to the Soviet Union or the People's Republic of China without NLM's permission, but not to other Communist nations.

This approach is ineffective, since NLM has no mechanism to investigate all their potential users that are given authorization user codes. Merely restriction by location is ineffective for electronic information transfer. All a potential user in those nations would have to do is obtain an authorized use code in an authorized nation and access the MEDLARS data bases through any number of public networks. In fact, this is a common pattern for information transfer to Soviet-bloc nations. Such rules are almost as unenforceable as would be one that told book buyers that they may not resell a book at second hand to a Communist buyer.

However, the major issue of restraint of trade due to geographic restrictions appears to be resolved for the most part. The private information services still are concerned that all licensees of MEDLARS data base tapes pay exactly the same amount. The current price structure and terms are the same for these with whom NLM has international bilateral agreements as for the U.S. domestic licensees who are commercial organizations. Nonetheless, some private sector firms state that quid pro quo services are not equivalent to the transfer of money. NLM notes that "the fees are identical for a bilateral center or a license" (110). In addition, the latter saves U.S. tax dollars and brings dollars to U.S. businesses, who frequently provide the actual indexing under contract with the foreign country (110).

Transborder Data Flow—National Restrictions

The ability to access MEDLARS in Europe via means other than national data base centers is possible because the growth of specialized data telecommunications networks. During the past few years, the European telephone administrations have instituted several different types of networks optimized for the connection of terminals to time-sharing computers. In addition most of the European Post, Telegraph, and Telephone Administrations (PTTs) have joined in a continentwide consortium to provide data services, called Euronet. Most important to the users of data base computers, such as those which offer MEDLINE, the cost of service for access is not based on distance.

Instead, charges are normally related to the connection time and the amount (measured in bits) of data transmitted, plus a connection charge. As a result, a user often can access a distant time-sharing system as easily, and at the same telecommunications cost, as a nearby machine.

These European systems are similar to the "packet nets" in the United States, but the state-monopoly PTTs have chosen not to pass all the savings onto the end user. On packet systems, data is only transmitted between terminals and computers when a key is pressed *or* a letter is received, instead of maintaining a continuous connection between two points, as on an ordinary telephone or Telex circuit. This data traffic travels in relatively small packets and is switched or routed via a complex network of computers that may process the data as well as transmit it. Though this technique shows distinct economies in line utilization, since most traffic on time-sharing systems tends to be in small "bursts," traffic shifts from traditional Telex systems represents a threat to the PTT's revenue base.

Technically, a worldwide system of packet data networks could equalize charges to virtually any point on the globe, since packet networks have the additional advantage of satellite technology with computer switching. But in practice other factors have intervened, so that artificial pricing barriers to uniform-cost data transmission exist between Europe and North America.

Restrictions on access are set by each nation, usually through telecommunications tariffs, or by general agreement among the user community. However, due to open access to telecommunications links across European borders, backed by agreement among the European nations themselves, enforcement of such tariff restrictions is purely fiction. Enforcement by NLM or its vendors has only been through password controls, which are extremely difficult to monitor.

In many countries, inducements are offered to process data locally. It should not be surprising that a nationally subsidized medical community could be encouraged by another government agency to do its bibliographic searching on domestic machines. In some cases, MEDLARS services are offered at rates lower than by NLM itself. Despite subsidies, in general these institutional goals to localize data processing are often in conflict with the goals of the data base user. The user prefers convenience in accessing systems, the opportunity to access competing services to maximize retrieval possibilities, and to minimize total costs. The telephone carriers, some of whom also dominate time-sharing or data processing in their countries, want to maximize revenue and are not interested in competitive services.

Other subtle restrictions imposed by the foreign nations on the use of the NLM data base overseas are designed to prevent data from being processed outside a nation's borders. These rules are somewhat indirect, and rarely overtly stated in terms of computer processing. One rule concerns transmission lines used for data which are tariffed at a higher price than if used for voice, so a user may not send data over an ordinary telephone line. The other rule is that the device that attaches a digital computer terminal or computer to the analog telephone line (called a "modem" for modulator-demodulator) must be obtained from the telephone administration. Where the telephone administration is a powerful government agency, such as in West Germany, enforcement of such rules severely restricts attaching terminals and computers to the telephone system.

To overcome some of the problems of access to U.S. data bases, some American firms offer the full MEDLARS data base via time-sharing systems on Euronet. Due to PTT tariff barriers, there is a tradeoff between transatlantic data links and European data processing in favor of the latter for certain services. BRS has licensed Datastar in Geneva to offer MEDLARS, using the proprietary BRS search system, and Lockheed similarly will mount MEDLARS tapes on a computer in London connected to Euronet. Separate copies of NLM's tapes are purchased for these European machines, since the NLM contracts prevent copying of the tapes (except for normal time-sharing computer operations at a single site). (See section below on copyright.)

Copyright

The use of copyright to protect various forms of property or artistic rights is not an abstract application of property law, but has been traditionally linked to the technologies of creation, reproduction, and distribution of literary, artistic, or commercial works. The radical changes in information processing technology which will affect international data base access become even more confusing in the sphere of copyright law, especially when applied to U.S. Government-owned materials such as MEDLARS.

Technological changes in the retrieval of information from computerized data bases have an important impact on international copyright issues. The computer is not like the printing press; it does not even work like an office copier. To be sure, there are some superficial resemblances to "publishing" or "copying" using computers, especially since some computer systems use such printing devices for paper output. But this imitation of publishing is merely a transitional phase. The computer manipulates information in ways that were

never dreamt of by the framers of existing laws on copyright and the property rights of authors.

Because computers perform the functions of storage and dissemination of information in a radically different manner, discussion of issues of international copyright protection must recognize that existing technological concepts cannot serve as a framework for the future. Even current concepts of data processing are rapidly becoming obsolete; these are not dreams, there are working models of future systems now in place in many institutions and research organizations.

There is a radical difference in concepts of copyright based on the printing press, or on similar devices that slowly impress exact copies of an artistic or literary creation, and property rights based on the use of computation-based techniques to store and replicate information. For the printing technologies, copying is the penultimate step before distribution or storage; while the use of computers to perform parallel functions requires "copying" at every step in the process, from creation of the work to its final application. Since, in the coming decades, most useful information will be machine-readable, automation of reproduction has altered the essence of "copying," as well as "authorship" and the meaning of original work. Even today, magnetic and optical methods, and computerized techniques of data manipulation, make it possible to automatically reproduce and save virtually anything humans can see.

Attempts to enforce rules that were designed for a different age may make the existing copyright conventions and laws ineffective, and perhaps counterproductive. For example, with modern electronic technologies, pirate editions of the MEDLARS data base could be produced by Third World or Soviet-bloc nations for distribution on some mass storage device, perhaps by scanning the printed data base with a laser character reader and placing the resultant data on a video disk; justification for such activity could be made on the basis that public health-related materials should have as low a price as possible, and copyright enforcement is unfair to poorer nations.

Of course, despite high motives, distribution of the pirated data base would be open to all comers. More important, quality control by the original producer would be lacking. Essentially, what the pirate would have accomplished is a shift of income from the MEDLARS producer to the pirate. Since he would not have to produce the original data, the pirate would have lower overhead. But this form of cream-skimming simply increases the costs to the legitimate data base subscriber. Electronic publishing contains many variations of this theme, with other less invidious schemes for capturing and replicating information.

Furthermore, the NLM contracts with licensees contain provisions regarding replication of the data base

that make analogies to printing in the mounting of computer tapes. The vendors will deny that they copy the tapes for any purpose when they mount them on their machines, but this is a contradiction in terms as any programmer knows. There is no way to read a tape without copying it in some fashion. Yet, despite this fact, data base vendors feel they would have to purchase a second set of tapes, if they maintained an overseas data center. This would be unnecessary if the vendors operated a distributed system with a link between the United States and the foreign center, but their interpretation of the NLM contract assumes that such an operation would be prohibited, and is not even considered despite potential customer savings and other efficiencies.

We are witnessing the reactions to early phases of this new technology in the rules and laws promulgated which restrict certain information flows. This came about as telecommunications networks were established that made large-scale data transfers much easier between computers. This has made property rights in information more difficult to protect. It is in the interest of U.S. data base vendors, the U.S. Government included, to get involved in the protocol discussions for these data communications networks so that any copyright laws enacted can be readily enforced, and more involved types of international trade restraints are not further encouraged by the technology.

MEDLARS and Developing Countries

In developing countries, the situation regarding and needs for biomedical information are considerably different from those found in the United States and other developed nations. The issues surrounding NLM's provision of data bases and on-line services are indicative of a broader set of issues that are far more profound than the implications of gathering information technologies. These issues are rooted in the most basic problems of development, and cannot be addressed nor redressed simply through changes in information policies. They are selectively presented here as problems that must be solved if MEDLARS is to enjoy wider usage in developing countries, but they are barriers to the use of all information services and products.

Further, these issues are symptomatic of larger trends in the developed countries and their relations with the developing world. The developed countries, and the United States in particular, are moving in significant ways *toward* a social order, which is variously labeled as "postindustrial society," "communication era," "knowledge society," or "information society." In developing countries there is not yet a widespread awareness of these trends. But where the awareness

exists the movement toward information society is viewed with some alarm. Namely, while developing countries were by and large moving after the model of developed countries into industrialization, the developed countries themselves started moving away from industrialization into an information-based society. The view from the developing world is that in this way the developed countries will continue to be "one up" on developing countries, no matter how successful industrialization may become. The hated dependence will continue.

The long-term trend is viewed as follows: in the past we (developing countries) have supplied the developed world with raw materials and cheap labor, while the developed world had industries and manufacturing as the basis of its prosperity. Now that we are gaining industries (and in the process depleting raw resources, selling our clean air and water, and endangering our environment) we may end up providing the developed world with relatively cheap industrial products and continuous cheap labor, while the developed world will have the control of information and communication technologies, and continue to build its prosperity. Information policy is becoming grounds for continuation and even expansion of the conflicts between the North and the South. Policies and actions on biomedical data bases, including MEDLARS, should be such to minimize this conflict.

Biomedical Data Bases:

A Contribution to Development

Many countries consider data bases as part of foreign policy, even if the United States may not want to do so. Two aspects of foreign policy should be considered in relation to biomedical data bases and developing countries; the potential U.S. contribution to the process of development and the potential gain in biomedical information from developing countries.

The contribution to the process of development is twofold. Biomedical data bases have information that directly impinges on and potentially contributes to the health of people; national health efforts are a high priority in most countries and biomedical data bases can contribute to these efforts; and the U.S. data bases are of benefit to the world as a whole. The use of biomedical data bases contributes to an increase in the general skill and level of use of modern information technology and resources in a country, i.e., biomedical data bases can generally contribute to the attainment of the symbols of the age and benefit developing countries through every practical use of modern information technologies.

The gain to the United States is also twofold. Increasingly, developing countries themselves are pro-

ducing valuable biomedical knowledge of universal utility to health, including health and biomedical research and development in the United States. However, this information is not widely distributed through international channels; thus, through cooperation in data bases, the United States can gain information that otherwise might not be obtained directly and easily. Cooperation in biomedical data bases is one step that contributes to the free flow of information on an international level and to a freer society. Thus, one of the general U.S. foreign policy interests can be positively affected through biomedical data bases.

There is considerable isolation in biomedical communication in developing countries which impedes the free flow of information. For instance, on the global level, English-speaking and U.S. scientific publications are by far predominant over all other languages and countries. They are also the most cited. It is not surprising then that scientists from developing countries try to place their best publications in well-known American, British, or other European journals rather than in their own national journals. This creates what is known as a "manuscript drain" (related to the well-known "brain drain"). Although native journals are very important for scientific communication within their realm, they are not prospering domestically and have an even harder time being recognized internationally (e.g., being covered by *Current Contents*, *Science Citation Index*, or *Index Medicus*) incorporation into these sources is highly coveted, bringing with it domestic prestige.

Bilateral Agreements and Developing Countries

As noted earlier, NLM signed its first bilateral agreement in the United Kingdom and Sweden in the mid-1960's. Also in the mid-1960's, through cooperation with the Pan American Health Organization (PAHO), the South American Regional Library of Medicine (BIREME) was established in Sao Paulo, Brazil, to serve Latin America. In the late 1970's, BIREME started its own computerized service from MEDLARS tapes for Brazil and South America. The success of cooperation with PAHO and BIREME had a lasting effect on the NLM perceptions of what maybe ideal in cooperation between NLM and developing countries.

In contrast to PAHO, the agreements for services to developing countries with the World Health Organization (WHO) headquartered in Geneva, Switzerland, varied over the years. Various experimental operations were established, but they changed and lapsed over time. In various ways NLM has either provided WHO with direct access to MEDLINE (and other data bases) or conducted searches itself on behalf of WHO; however, no permanent mode exists for U.S. bibliographic

data base services through WHO: no model for cooperation has evolved from those rather disappointing collaborations.

Presently, there are 13 countries in the world and one international organization, PAHO, with which NLM has bilateral agreements regarding U.S. data bases or MEDLINE access. In addition to PAHO-BIREME, which is oriented toward developing countries, 3 of those 13 countries are developing nations: Mexico, Colombia, and Kuwait. The agreements with Colombia and Kuwait were signed in 1981: Kuwait's is not yet completely operational. Thus, BIREME and Mexico are representative of developing countries in the bilateral agreements.

However, there is a second tier effect of MEDLARS and other data base services to developing countries over which NLM has no control nor is directly involved. Namely, some developed countries that have a bilateral agreement to mount on their own MEDLARS tapes do provide services to developing countries. For instance, Japan offers searching to Southeast Asian countries, Sweden to Poland, Germany to Yugoslavia, and Australia to Western Pacific countries. This trend is spreading, and soon a good number of developing countries may have MEDLARS (and other U.S. data base) access without direct agreements with NLM (but based on NLM agreements with some other country). The mode of arrangements for this second tier access varies from country to country providing the access: most of the time it is based on outright assistance.

Barriers to Effective Transfer and Use of MEDLARS in Developing Countries

If we accept that the basic aim of all information activities (including those connected with biomedical data bases) is for information to be utilized, then we have to consider that the minimum conditions for effective transfer and use of information for socioeconomic development include: a propensity on the part of decisionmakers and problem solvers (in the case of biomedical information: health workers and policymakers) to use information, which is based among other things, on recognition of the value of the need for information; a level of infrastructure (indigenous information systems, including libraries) that makes the right information first available and then accessible for use, and a type of political and social conditions which is favorable for encouraging the use of information and development of an information infrastructure.

In contrast to the United States and other industrialized countries, developing countries meet these conditions only partially and to highly variable degrees.

RECOGNITION

While European countries recognized the importance of biomedical data bases relatively early, and not long after initiation of MEDLARS began providing some form of MEDLARS access, widespread recognition is not evident in the developing countries. Recognition exists in international bodies and at international meetings, but in most developing countries themselves, the recognition is limited to a very few senior librarians and government officials. All working librarians have heard about MEDLARS and MEDLINE, but for most it is very far removed from their daily experience and problems.

Where this recognition exists, NLM and MEDLARS are held in absolutely highest regard. NLM has a great reputation in developing countries, and is perceived as the world's biomedical information resource. In no other subject area has the United States (or for that matter any other country) a single library and information institute that effects such a tremendous influence on the whole world.

As a result of this recognition, the expectations for NLM are also very high. At times these expectations are unrealistic. There is little or no understanding of the U.S. governmental mechanism under which NLM operates, its responsibility to Congress and its domestic role, trials, and tribulations. The view that NLM is a world institution precludes seeing it as a U.S. domestic institution.

In turn, there is little recognition in the United States of NLM's tremendous influence, though unintended, on the world's biomedical information transfer in general, and on every country's medical libraries in particular. NLM's concern for developing countries has been defined through the looking glass of international organizations and the eyes of the world's professional committee or conference members, rather than by actual domestic situations and practicing librarians.

INFORMATION NEEDS AND COVERAGE

MEDLARS is primarily oriented toward the information needs of U.S. biomedical communities in research, clinical medicine, and health practice. Where similar communities are found in developing countries, their information needs are well covered by MEDLARS, particularly for researchers and clinicians. However, in many respects MEDLARS coverage is not fully adequate for the information needs of developing countries. For instance, MEDLARS covers only a fraction of biomedical literature published in developing countries, and thus can offer the world's biomedical information for use in developing countries, but not domestically published information. Eight countries contrib-

ute approximately 80 percent of the items in MEDLARS: over one-third of them are from the United States. Thus, MEDLARS does not and cannot serve as a domestic data base in the developing countries,

Hence, MEDLARS is not a data base that is oriented in a comprehensive way toward the needs of developing countries, nor is it so mandated. It can satisfy some of those perceived needs only to a degree. In this lies one of the problems of an indiscriminate use of MEDLARS in or for developing countries.

The success of BIREME, the South American Regional Medical Library organized by PAHO, in the publishing of Latin *American Index Medicus*, with a view toward developing it as a regional data base, has also brought to the surface expression of needs to publish similarly an *African Index Medicus*, and an *Index Medicus* in other world regions. These present rich opportunities for developing strong relations between NLM and the respective regions, relations similar to those that exist between NLM and Latin America.

A further problem in meeting the expressed information needs of developing countries stems from the fact that MEDLARS is a bibliographic data base. These needs might better be met by factual data bases, i.e., those providing actual information or data found in the literature and not simply bibliographies of literature containing data of information. The NLM Hepatitis Knowledge Base is a splendid example of such a data base. The production of such source data bases may possibly be a proper way for the private sector of the information industry or WHO to become involved in services for developing countries.

SELECTION PROBLEMS

MEDLARS does not cover all of the world's biomedical literature, but selects, in a comprehensive manner, biomedical literature deemed most substantive. However, in this selection no distinction is made among papers as to their relative quality, value, validity, usefulness, redundancy, etc. A Nobel prize-winning paper receives the same attention as one with no or questionable value. Selection is based only on a given article's relevance to a particular subject or its source journal, and gives MEDLARS an important characteristic—comprehensiveness.

However, developing countries have expressed desires for data bases with selectivity-based quality, appropriateness, value, and similar attributes of information. MEDLARS cannot satisfy such desires, nor should it be expected to do so. But, it maybe possible to create out of MEDLARS smaller data bases satisfying these different criteria of selectivity. Again, it is an open question as to who should create such selective sub-data bases, This maybe done at NLM but may

also be accomplished by the private sector, developing countries themselves, international organizations, or consortia.

At the root of the problem is the fact that MEDLARS searches, and searches in other bibliographic systems, often retrieve too much information for an individual to deal with and absorb. Although MEDLARS capabilities allow the user to tailor a search so that a broad search which retrieves many citations or a narrower, more focused retrieval can be obtained, many factors affect the character and quality of the search performed. These include the precision of the search question, the amount of information on the topic of the search, the quality of the indexing The size of MEDLARS is large and growing, and so is the output. Thus, ultimately selectivity of the type described is aimed at producing outputs that on the one hand are within the realm of human scale for dealing with information (offering options by which an individual can adjust the threshold for that scale) and on the other hand are reasonably the best (or at least better) representatives of what is known on the topic requested.

ACQUISITION PROBLEMS

One of the elements of NLM's policy is to have a central organization in each country with a bilateral agreement which will undertake all responsibility for mounting of and services from MEDLARS tapes or access to MEDLINE; this organization must meet various technical criteria, as enumerated. Very few, if any developing countries can meet these; thus, this requirement effectively precludes developing countries from entering into bilateral agreements as presently instituted.

Most developing countries simply do not have an organization that is capable of meeting the technical, fiscal, and personnel requirements. Making arrangements with Ministries of Health as central organizations makes little or no sense, because they are not in the information business, and although they have influence and play a most important role in health and the dissemination of health-related information, they have little or no connection with local libraries and information users. Furthermore, many countries are not capable of meeting the quid pro quo requirements as instituted at present.

Even where a large medical library exists in a country or a region, agreement with such a library does not guarantee access to other libraries, because operational connections and cooperation among libraries is, in general, low. Also, most developing countries have inadequate collections for coping to any significant extent with document delivery problems. This presents a most frustrating aspect for users who find citations

with electronic speed and then must wait months for documents to arrive from abroad by surface mail, if they ever arrive at all.

Thus, the present policy requirements work as a barrier, if not as an exclusion, for most developing countries to acquire some form of access to U.S. biomedical bibliographic data bases.

The regional approach to acquiring MEDLARS access, as in the case of BIREME, certainly has great merits, but also has great limitations. Regional structure and cooperation in Latin America is not at all the same as in the United States. Thus, besides the expected technical and personnel problems, BIREME has a great problem of finding an effective mode for service to the libraries and users in the region.

So far, the private sector of the information industry has used the same policies for acquiring access to their biomedical data bases (including MEDLINE) as in the United States. No specific policies for developing countries has been implemented or even debated. Private industry as yet seems to be unprepared to approach, in a significant way, the potential information markets in developing countries.

In conclusion, no one approach to acquiring access to U.S. bibliographic data bases by developing countries seems to bear as much fruit as the policies worked out with developed countries. It seems that more flexibility and experimentation may be in order, if success in this area is to be realized.

ACCESSIBILITY PROBLEMS

Intellectual Organization.—Intellectual organization of U.S. bibliographic data bases based on MeSH (medical subject headings) seems to be satisfactory for developing countries, though it does not conform in many instances to local desires and needs. However, MEDLARS, with its standardized terminology, classification and high quality of application, and indexing seems to have an additional beneficial effect wherever introduced: it adds to standardization of intellectual organization. Resource-sharing for intellectual organization (cataloging, indexing) is low in developing countries. MEDLARS has not yet changed this in any significant way; however, the potential is there. It is possible that a wider application of U.S. bibliographic data bases may stimulate implementation of resource-sharing plans.

Another issue in this area are indexes. *Index Medicus*, produced by NLM, is the most widely accepted indexing tool in biomedicine in developing countries. However, it is widely recognized that *Index Medicus*, although fully adequate for general medical (particularly research and clinical) needs, does not fully cover local publications, needs, and language.

Thus, national or regional indexing tools are urged with great frequency and vehemence. In 1979, after many years of discussion and 2 years of preparation, with great help of NLM, and under the auspices of PAHO, the *Latin American Index Medicus (IMLA)* started publication by the South American Regional Library of Medicine (BIREME) in Sao Paulo, Brazil. The event is considered with unabashed jubilation as a breakthrough for developing countries—and rightly so. It is also considered a model for what can be achieved through cooperation between all parties concerned. A similar *African Index Medicus* is being urged, as well as indexes for other regions.

Printed indexes and data bases are at present closely connected. *Index Medicus* whets the appetite for MEDLARS data bases, MEDLINE in particular. *Latin American Index Medicus* is a prelude for a regional data base.

Physical Access.—Mexico is the only developing country that has up to the present implemented physical access to MEDLINE through NLM computers and BIREME. In turn Mexico provides further domestic access through a central institution in a way which has a restrictive effect on the number of libraries and other institutions accessing MEDLINE. BIREME has limited on-line capacity: there are terminals at four subcenters—at BIREME itself and three other cities in Brazil. On-line access from other Latin American countries was and is still being planned, but telecommunication and other difficulties have as yet precluded the implementation.

In many cases, the access from developing countries to MEDLARS centers around the world (including accessing NLM for MEDLINE searching) is by international mail. All the implications of slow and bad mail service pertain to this mode of access. Turnaround time is long, and interaction nonexistent. Mail access to computerized searching has not proved effective or desirable, but it is still better than no access. If well organized, it can be a stop-gap measure.

Finally, the physical access to comprehensive library collections to satisfy document delivery is also very difficult for the majority of present or potential on-line users in developing countries. It also depends on mail. The turnaround time for requests to be fulfilled is often 2 months, and a goodly number are not filled at all or lost in shipment.

Dissemination and Service.—Libraries in developing countries generally offer a limited number of services. On-line searching, even where possible directly or indirectly by mail, is not yet a service that has penetrated libraries to any significant extent. NLM has relatively little dealings with the mass of libraries in

developing countries; thus, it cannot directly affect use in such services.

Information Technology.—Information technology presents a formidable obstacle to further proliferation of MEDLARS centers in developing countries. It is not so much the lack of computers, but the lack of capacity to make the technology work. Transfer of ELHILL software for running NLM's data bases is wrought with great difficulties, however, it is not ELHILL alone that poses difficulty—all similar software transfers for all kinds of information retrieval system have similar problems. Closely connected is the problem of technologically competent personnel. No solution has been found by NLM (or for that matter by any institution involved in information retrieval) for more effective and faster transfer of technology, software, and hardware, for establishment of MEDLARS centers in developing countries. Many calls for simplified software have not been answered.

The technological problems for direct on-line access to MEDLINE from developing countries is centered around telecommunications. Where TELENET or TYMNET nodes exist this is not that difficult. However, where they do not exist it is impractical, if not impossible, to establish effective direct access for reasons of high costs, restrictive regulations, and poor technical quality and reliability.

Information Networks.—As yet, the NLM network (including NLM connected networks such as BIREME or those in Europe and Japan) is the only true international network affecting developing countries at least to some extent in the realm of any and all biomedical data bases. Private U.S. vendors that have mounted MEDLINE (and other biomedical data bases) began offering these data bases to developing countries through their network or networks. However, as yet they have not penetrated this market.

It is quite hard to consider NLM being in competition with the U.S. private information industry in developing countries, because the structure of medical libraries and all health institutions in developing countries is entirely government-affiliated and dependent, and is very much influenced in action and philosophy by WHO and other regional health organizations. As such, this very structure seeks governmental and not private connections, structure is the only one through which network connections can eventually be established. Thus, if NLM were eliminated from or restricted in data base cooperation with developing countries, there would not be any biomedical data base services in developing countries in the foreseeable future, and those meager beginnings made would be eliminated.

UTILIZATION

The use of MEDLARS centers or MEDLINE searching from developing countries is low, and in comparison with the total number of searches performed on MEDLARS the number is probably very small. For example, BIREME performs about 2,500 annual searches, some 70 percent from Brazil, the rest from countries throughout South America (78). The Southeast Asian Medical Information Center (under auspices of the International Medical Foundation of Japan) reports, for the period of August 1979 to September 1980, having filled 38 search requests coming from five countries in the region (93). However, at present a direct comparison between levels of use of U.S. data bases in developing countries with those in the United States is clearly not valid. What should be considered is the long-term potential and benefit, not present use.

Neither NLM nor any other institution has been involved with user education, marketing, or promotion in developing countries in respect to U.S. data bases. While a number of librarians in developing countries have been exposed to MEDLARS and MEDLINE (or at least heard of it), not many potential users have. This may also account for low present use.

Some other U.S. agencies, the National Technical Information Service (NTIS) in particular, have been engaged for some time in marketing and promoting their scientific and technical information products and services in developing countries to a much greater extent than NLM. NTIS created special bibliographies and newsletters, some translated into Spanish, special promotional material, traveling presentations and demonstrations and the like, for marketing and promotion in developing countries. Some similar or even joint approach may be desirable for U.S. biomedical data bases.

INFORMATION PROFESSIONALS

NLM has trained a number of librarians and information scientists in MEDLARS construction and MEDLINE searching. This is one of the most highly praised and desirable activities. Requests for more training of personnel are made with increased frequency and urgency. NLM has developed a very good training program, probably better than that of any other U.S. information agency.

Still, as mentioned, the vast majority of biomedical librarians in developing countries are not knowledgeable of MEDLARS, particularly as to operational aspects—e.g., constructive searches, structure of vocabulary, etc. As extensive as NLM's training efforts are, they have penetrated only skin deep. It appears that MEDLARS foreign centers in developing countries or

at BIREME have not yet conducted any extensive amounts of training on their own.

Final Remarks

Although most of the issues concerning the use of MEDLARS in developed and developing countries appear to vary widely between the two disparate spheres, they share strategic issues. The issues that transcend data base issues are: the evolution of U.S. society into an information society, information as a national symbol and element in foreign policy, free flow of information in general and in biomedicine in particular, transborder data flow and the restrictions imposed against that flow, and cooperation rather than competition as a base for information activities.

There are vast dissimilarities, however, between the information problems and the issues between developed and developing areas, and even among individual countries, and the activities of the United States and NLM in each of the areas. In general, MEDLARS is being used effectively for the public's health in developed countries. MEDLARS and other data bases have so far exercised a minimal operational impact on developing countries, but they have a high and still

growing impact on expectations in developing countries. Thus, policy decisions should also be carefully weighted in relation to these expectations and needs.

More thought must be given to means of increasing MEDLARS' utilization in developing nations. It is beyond the scope of this report to consider the basic problems associated with development that lie at the root of the problem, but it should be noted that technological advances in computation may be an aid to improvement.

As noted previously, the technological problems for direct on-line access to MEDLARS data bases from developing countries is centered around telecommunication. This problem may be ameliorated by future trends in computerized data bases (see app. H). Among them are the widespread use of microcomputers and their potential low cost. At the same time there has been the development of the video disk, with which one can access most of a data base on a microcomputer without waiting for time-sharing connections or paying time charges. The disk would also be relatively inexpensive. Applying these technologies to developing countries may be one step in the major and complex problems in improving the transfer of biomedical information.