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REPORT ON  
THE NATIONAL LIBRARY OF MEDICINE

JULY 1982

National Library of Medicine



NATIONAL INSTITUTES OF HEALTH

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NATIONAL  
LIBRARY OF  
MEDICINE

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This Report is a slightly modified version of Chapter IV of the Report of the Public Health Service Task Group on the Role of the Private Sector in the Collection, Analysis and Distribution of Health Data. The Task Group's Report was submitted to the Assistant Secretary for Health, DHHS in July 1982. Data on numbers and costs of products and services are presented mainly for FY 1981; changes occurring during FY 1982 are not included.

July 22, 1982



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## HISTORICAL PERSPECTIVE

The National Library of Medicine originally was established in 1836 as the Library of the Army Surgeon General's Office. Its basic role was to serve the needs of military medical officers; but in the following three decades its mission was expanded and its services made available to physicians generally. In 1879-80 there appeared the first issues of Index Medicus and the first volume of the Index Catalog of the Library of the Surgeon General's Office. The Library's collection increased from 1,800 volumes in 1865 to 50,000 volumes and 60,000 pamphlets in 1880. After 120 years of sponsorship by the Armed Forces, the Library was designated the National Library of Medicine in 1956 and placed within the Public Health Service. Since then the Library has continued to pioneer in the rapid dissemination of information. Revolutionary library technology such as photoduplication for interlibrary loans and computerized information storage and retrieval systems were pioneered by NLM. Its current collection of 2,500,000 items provides the source of information made available to the U.S. and to many foreign countries through bilateral agreements.

## LEGISLATIVE AUTHORITY FOR ACTIVITY

Public Law 84-941 established the National Library of Medicine in the Public Health Service to assist the advancement of medical and related sciences and to aid the dissemination and exchange of scientific and other information important to the progress of medicine and to the public health. It was authorized to:

- (1) acquire and preserve books, periodicals, prints, films, recordings, and other library materials pertinent to medicine;
- (2) organize the materials specified in clause (1) by appropriate cataloging, indexing, and bibliographical listing;
- (3) publish and make available the catalogs, indexes, and bibliographies referred to in clause (2);
- (4) make available, through loans, photographic or other copying procedures or otherwise, such materials in the Library as deemed appropriate;
- (5) provide reference and research assistance; and
- (6) engage in such other activities in furtherance of the purposes of this part as deemed appropriate and the Library's resources permit.

Authorization was also given to provide for making available publications of materials, facilities or services 1) without charge as a public service, or 2) upon a loan, exchange, or charge basis, or 3) in appropriate circumstances, under contract arrangements made with a public or other non-profit agency, organization, or institution.



Public Law 89-291, the Medical Library Assistance Act of 1965, recognizing the increase in growth of biomedical information, materials and publications, and the need for dissemination, authorized the Library to take measures to develop facilities and techniques necessary to collect, preserve, store, process, retrieve and facilitate the dissemination and utilization of knowledge and information. Included was authority for assistance in improving and expanding the basic resources of medical libraries and related facilities and development of a national system of regional medical libraries.

PRIMARY AND SECONDARY PURPOSES

The primary purposes are the advancement of medical and related sciences by aiding the dissemination and exchange of scientific and other information important to the progress of medicine and to the public health. Additionally, the Regional Medical Library Program and Specialized Information Services are important secondary purposes complementary to the primary goals of the National Library of Medicine's services.

BUDGET AND PERSONNEL FOR ACTIVITY

The NLM budget for Fiscal Years 1980-1982 are indicated below:

	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982 (Est.)</u>
NLM Budget	\$43,891,000	\$44,660,000	\$44,402,000
Other Funds (reimbursement by other agencies, etc.)	2,468,000	2,088,000	1,877,000
Personnel (Est. FTE)	not available	521	556

There are no proposals to significantly alter the NLM level of activity in FY 1983 or FY 1984.

For purposes of this report dealing with the collection, analysis and distribution of health data, that part of the NLM budget supporting research and development should be excluded. Therefore, in the following summary, allocations to the National Medical Audiovisual Center (NMAC), the Lister Hill National Center for Biomedical Communications, (LHNCBC), and the Extramural Program are not considered. Analysis is offered for the FY 1981 budget limited to the allocations to Library Operations (LO), the Office of Computer and Communications Systems (OCCS), and Specialized Information Services (SIS) (the organizations which functionally support NLM products and services).\*

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\*[This discussion draws in large part on the Jan. 1982 draft of a report: National Library of Medicine FY 1981 Cost Analysis for MEDLARS Databases and Derivatives.]



	<u>FY 1980</u>	<u>FY 1981</u>	<u>FY 1982 (Est.)</u>
Budget (LO, OCCS, SIS)	\$19,597,000	\$20,991,000	\$23,381,000
Other Funds (reimbursement by other agencies)	2,096,000	2,082,000	1,877,000
Totals	\$21,693,000	23,073,000	25,258,000
Personnel (Est. FTE)	not available	320	347

The NLM has separated costs into two main categories. First, there are costs related to the "essential national library services" which would be present even if there were no online services. Second, there are the remaining costs which provide "augmentation" of the essential national library services through MEDLARS, which includes database development, publications, online services, and tape distribution. Thus, for the subset of the NLM appropriation relevant to this report (\$23,073,000) there is a division into \$15,497,000 for the "essential national services" and \$7,576,000 for "augmentation of those services through MEDLARS (Medical Literature Analysis and Retrieval System). To the \$7,576,000, there is added \$1,401,000 for outside communication costs (funded by user charges through NTIS); \$507,000, the value of "quid-pro-quo" international agreements providing NLM services in return for indexing; and \$926,000 for NLM overhead plus Regional Medical Library costs. The total sum is \$10,410,000 which can be distributed as shown in Table 1.

TABLE 1

FY 1981 NLM COSTS ASSOCIATED WITH MEDLARS  
(\$ X 1,000)

<u>NLM DATABASES</u>	<u>DATABASE DEVELOPMENT</u>	<u>MAINTAINING ONLINE SYSTEM</u>	<u>PUBLICATIONS</u>	<u>TAPES</u>	<u>TOTALS</u>
MEDLINE	2,314	2,798	1,134	54	6,300
CATLINE	149	279	--	--	428
CHEMLINE	252	188	--	4	444
TOXLINE	347	466	--	33	846
ALL OTHER DATABASES	1,759	630	--	3	2,392
<u>TOTAL MEDLARS</u>	<u>4,821</u>	<u>4,361</u>	<u>1,134</u>	<u>94</u>	<u>10,410</u>



These descriptions of costs will be useful in analysis of NLM products and services later in this report.

#### DATA COLLECTED AND SERVICES AND PRODUCTS PROVIDED

To fulfill its missions, the NLM interacts with many outside organizations. Its basic functions to acquire, preserve, organize and make available health-related publications in the classic hardcopy medium has been augmented by development and use of new computer and communications technologies, and provision of online access to several databases. The intricate relationships between the various organizations and the interplay between the array of NLM products and services are described below, using the familiar list of NLM's online databases (see Table 2) as the framework for discussion. Numerical data characterizing the databases are those of FY 1981.

The discussion will be organized as follows:

- A. Databases Available on NLM Online Network: A brief description of the character of the available online databases and the organizations involved in their creation.
  - B. Relationship of Online Databases to Publications: A brief description of how the online databases are used by NLM and outside organizations to support publications.
  - C. Resources for Generating the NLM Online Databases: A tabulation of the resources expended by NLM and other organizations in maintaining the databases which are available online.
  - D. National Library of Medicine Related Products and Services
  - E. Summary of Volume of NLM Products and Services Delivered
  - F. Summary Comments on Fee Policies for NLM Products and Services
- A. Databases Available on NLM Online Network

A computerized system called MEDLARS (Medical Literature Analysis and Retrieval System) is available through the NLM nationwide network of centers at more than 1,500 universities, medical schools, hospitals, government agencies, and commercial organizations, and bilateral arrangements with 13 foreign countries and PAHO. MEDLARS contains 4,500,000 references to journal articles and books in the health sciences published after 1965.



TABLE 2

DATABASES AVAILABLE ON NLM ONLINE NETWORK

MEDLINE (Includes 1-4)

1. Index Medicus Journals
2. Special List Dental Journals
3. Special List Nursing Journals
4. Special List Hospital Journals
  
5. Special List, Other (Small number of communication journals and foreign journals)
6. TOXLINE (Toxicology Information Online)
7. CHEMLINE (Chemical Dictionary Online)
8. RTECS (Registry of Toxic Effects of Chemical Substances, formerly the Toxic Substances List)
9. TDB (Toxicology Data Bank)
10. CATLINE (Catalog Online)
11. SERLINE (Serials Online)
12. AVLINE (Audiovisuals Online)
13. HEALTH PLANNING AND ADMIN (Health Planning and Administration)
14. HISTLINE (History of Medicine Online)
15. CANCERLIT (Cancer Literature)
16. CANCERPROJ (Cancer Research Projects)
17. CLINPROT (Clinical Cancer Protocols)
18. BIOETHICSLINE (Online file of Bioethical Topics)
19. EPILEPSYLINE (Online file on Epilepsy)
20. POPLINE (Population Information Online)

The American Journal of Nursing Company (of the American Nursing Association) contracts with Raytheon Company to selectively index material in nursing journals, also included in MEDLINE.

A small number of communication articles (C) and foreign language journals (F) added to MEDLINE are by NLM choice and done by NLM staff.



Most of these references have been published via Index Medicus, or another of the printed NLM indexes and bibliographies. Computerized searches use one or a combination of 14,000 designated Medical Subject Headings (MeSH) used in indexing and cataloging materials as well as by using words appearing in titles and abstracts. Each of the following databases (numbered 1-20) can be searched in isolation from all others.

MEDLINE, the largest of the databases available on the online network, contains information on articles from 3,000 journals published in the U.S. and 70 foreign countries, as well as limited number of chapters and articles from selected monographs. It contains approximately 600,000 references published in the two preceding years and with back files provides coverage of 2,500,000 references back to 1966. MEDLINE in turn is composed of the first four of the following files:

1. MEDLINE-INDEX MEDICUS JOURNALS

Almost all of MEDLINE consists of the entries from Index Medicus Journals, the central core bibliographic material of NLM. MEDLINE contains approximately 600,000 references to biomedical journal articles published in the current and two preceding years. An English abstract, if published with the article, is frequently included. The articles are from 3,000 journals published in the U.S. and 70 foreign countries; MEDLINE also includes a limited number of chapters and articles from selected monographs. Coverage of previous periods (back to 1966) is provided by backfiles that total some 2,500,000 references. The indexing is accomplished by a combination of effort by NLM inhouse staff (25%), NLM funded contracts (30%), Foreign MEDLARS Center staff (15%) and Foreign Center funded contracts (30%).

2. MEDLINE-SPECIAL LIST DENTAL JOURNALS

The American Dental Association provides staff to selectively index material from a special list of 900 dental journals. This material is included in MEDLINE.

3. MEDLINE-SPECIAL LIST NURSING JOURNALS

The American Journal of Nursing Company (of the American Nursing Association) contracts with Raytheon Company to selectively index material in nursing journals, also included in MEDLINE.

4. MEDLINE-SPECIAL LIST, OTHER

A small number of communication articles (C) and foreign language journals (F) added to MEDLINE are by NLM choice and done by NLM staff.



## 5. SPECIAL LIST HEALTH JOURNALS

The American Hospital Association provides staff for selectively indexing the Special List Health Journals. The indexed material is merged with additional information gained from a search of MEDLINE to form the Health Planning and Administration File (the online HEALTH file, see 13). The HEALTH file contains 185,000 references.

## 6. TOXLINE (TOXicology Information OnLINE)

TOXLINE is a collection of 500,000 references from the last five years on published human and animal toxicity studies, effects of environmental chemicals and pollutants, and adverse drug reactions. Older material (663,000 references) is in back files. The creation and maintenance of TOXLINE is accomplished by use of material from NLM's Index Medicus journals augmented by a variety of files obtained from other Federal and non-government agencies. Resources from NLM and other organizations support the following components of TOXLINE:

- a. NTIS: Toxicology Document and Data Depository (TD3); the "toxicology" subset of the NTIS reports announcement database.
- b. Chemical Abstracts Service: CA Search; records re chemical-biologic activities; radiation biochemistry; air pollution and industrial hygiene; sewage and waste; and essential oils and cosmetics, pharmaceuticals, and pharmaceutical analysis.
- c. Biosciences Information Service: BIOSIS; records of Health Effects of Environmental Pollutants (HEEP).
- d. American Society of Hospital Pharmacists: International Pharmaceutical Abstracts.
- e. Environmental Protection Agency: Pesticide Abstracts.
- f. Oak Ridge National Laboratory: Environmental Mutagen Information Center File (EMIC).
- g. Oak Ridge National Laboratory: Environmental Teratology Information Center File (ETIC).
- h. Oak Ridge National Laboratory: Toxic Materials Information Center File (TMIC).
- i. Smithsonian Science Information Exchange: Research Projects (RPROJ); Toxicology/Epidemiology Research Projects derived from the abstracts submitted to the SSIE (terminated October 1981).



7. CHEMLINE (CHEMical Dictionary OnLINE)

Chemical Abstracts Service contains a Registry Nomenclature File of 5.5 million chemical compounds, a subset of which is identified as the CHEMLINE database. CHEMLINE is a file of 900,000 names for chemical substances, representing 450,000 unique compounds. CHEMLINE serves as a dictionary for chemical names and a directory for entry into TOXLINE, MEDLINE, and RTECS, and is an indispensable part of effective user entry into those databases.

8. REGISTRY OF TOXIC EFFECTS OF CHEMICAL SUBSTANCES (RTECS)

RTECS contains acute toxicity data for approximately 41,000 substances. The National Institute for Occupational Safety and Health (NIOSH) creates RTECS and gives the NLM the tapes in return for which NLM puts RTECS online. This database provides synthesized information as well as bibliographic data.

9. TOXICOLOGY DATA BANK (TDB)

This online file containing chemical, pharmacologic, and toxicologic data extracted from textbooks, handbooks, criteria documents and monographs, is prepared by NLM and made available online. TDB contains information and data on approximately 2,000 substances. This database also provides synthesized information as well as bibliographic data.

10. CATLINE (CATalog OnLINE)

CATLINE contains about 210,000 references to books and serials cataloged at NLM since 1965, and provides access to authoritative cataloging information needed by medical libraries for ordering of books and journals and for providing reference and Interlibrary Loan services. It reduces the need for individual libraries to do their own original cataloging. Additionally, cooperative agreements are used to facilitate completing the cataloging that is necessary.

11. SERLINE (SERials OnLINE)

SERLINE contains bibliographic information for about 34,000 serial titles including all journals which are on order or cataloged for the NLM collection. For some fraction of these, SERLINE has locator information for the user to determine which of approximately 1,000 U.S. medical libraries own a particular journal. It is useful for ordering journals and referring Interlibrary Loan requests.



12. AVLINE (AudioVisuals OnLINE)

AVLINE contains citations to approximately 10,000 audiovisual teaching packages used in health sciences education and for continuing education of practitioners. Cataloging of audiovisuals is accomplished by NLM staff. Evaluation by content specialists in appropriate professional fields have been added to the basic bibliographic record. Supporting the development of a system for AVLINE, the defining of attributes of quality for producers and evaluators alike, and the operational development of a satisfactory system were all accomplished with NLM funds; having been accomplished, movement is now in the direction of encouraging the appropriate private sector organizations to take over those functions.

13. HEALTH PLANNING AND ADMIN (Health Planning and Administration)

This online file contains references on health planning, organization, financing, management, manpower, and related subjects. The assembly of this file was described in 5, above.

14. HISTLINE (HISTORY of Medicine OnLINE)

HISTLINE is a selective online bibliographic database containing 43,000 citations to monographs, journal articles, symposia, congresses and similar composite publications for the National Library of Medicine's Bibliography of the History of Medicine. Citations for the database are collected and processed in the History of Medicine Division of the NLM.

15-17 CANCERLINE (CANCER OnLINE)

CANCERLINE is the current name for a collection of three databases; CANCERLIT, CANCERPROJ and CLINPROT.

15. CANCERLIT (CANCER LITerature)

CANCERLIT is a bibliographic database on the cancer literature derived from 3,000 serials, books, and reports, and material selected from professional meeting abstracts. It contains more than 250,000 references dealing with various aspects of cancer. All references have English abstracts. A collaborative indexing effort between NCI and NLM was initiated in 1980 to apply NLM indexing to the material.

16. CANCERPROJ (CANCER Research PROJects)

CANCERPROJ contains descriptions of ongoing cancer research projects in many countries. Until recently, this online database was prepared from research abstracts and projects maintained by



the Smithsonian Scientific Information Exchange, an organization which no longer exists. A new contractor will be selected. CANCERPROJ has nine to ten thousand new or modified research projects entered per year, and has a total of approximately 20,000 items online covering the most recent three-year period.

17. CLINPROT (CLINical Cancer PROTOcols)

CLINPROT is an online version of the National Cancer Institute's Compilation of Clinical Protocol Summaries, a hard copy publication. This database serves as a summary of the approximately 2,900 experimental protocols for cancer treatment now underway.

18. BIOETHICSLINE (OnLINE File for BIOETHICAl Topics)

BIOETHICSLINE is a file of about 11,000 bibliographic references to materials on bioethical topics such as euthanasia, human experimentation and abortion. BIOETHICSLINE is produced in cooperation with the Kennedy Institute of Ethics.

19. EPILEPSYLINE (OnLINE File on EPILEPSY)

EPILEPSYLINE contains about 37,000 references and abstracts to articles on epilepsy that have been abstracted by Excerpta Medica with support provided by the NINCDS.

20. POPLINE (POPulation Information OnLINE)

POPLINE contains approximately 100,000 records citing literature in the areas of family planning, contraception, demographic methods, migration, historical demography, reproduction, population, and related health, law, and policy issues. It is produced by Johns Hopkins, Columbia and Princeton Universities with fiscal support from the Office of Population, U.S. Agency for International Development and NICHD.

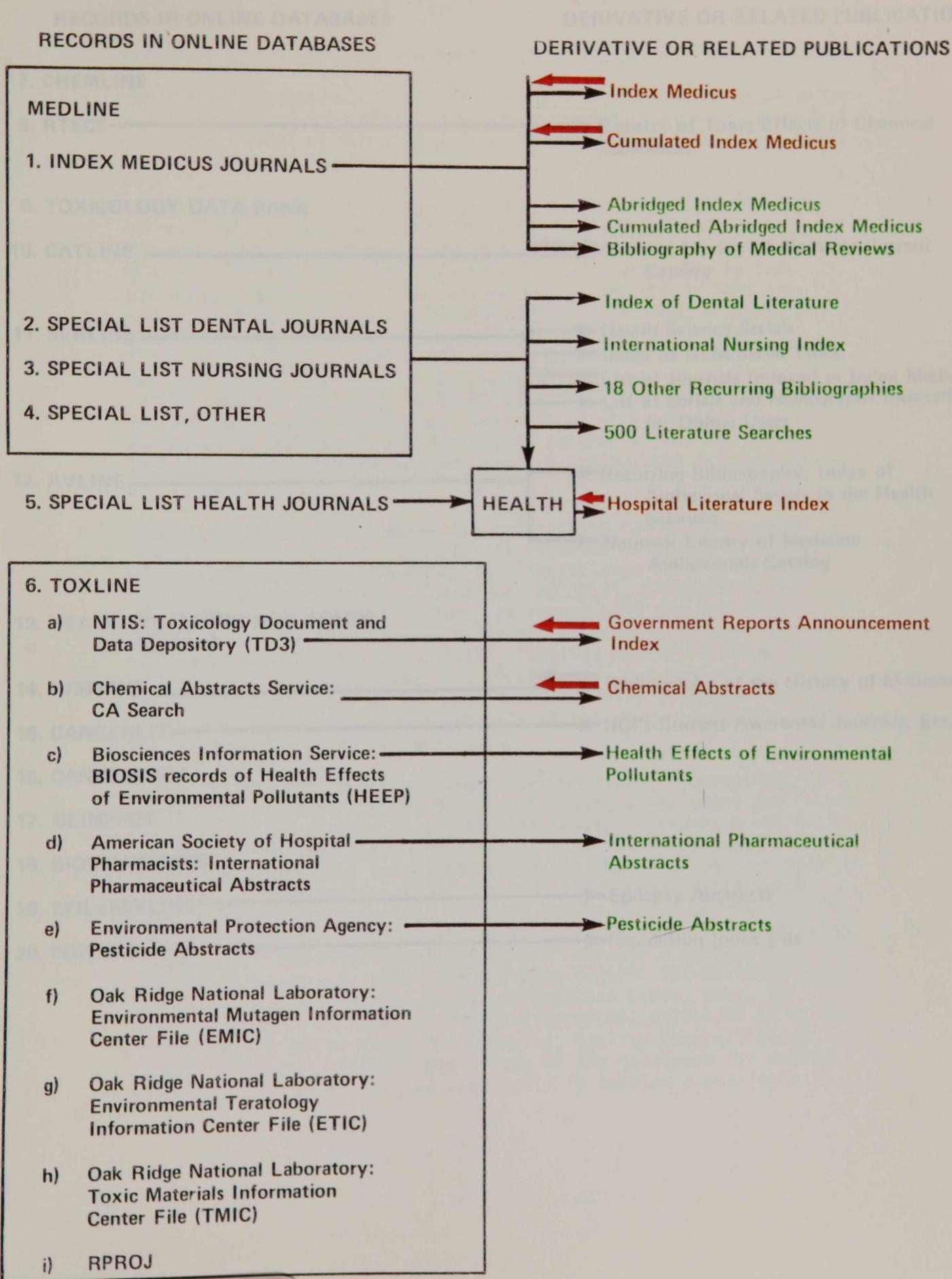
B. Relationship of Online Databases to Publications

Table 3 demonstrates the use of the online databases to produce publications. Most publications listed are derivative from the online databases. A whole database or a selected search subset provides the tape from which is made a photocomposed camera ready copy (generally by the Government Printing Office). In Table 3, simple arrows show how some publications are derived from the individual online databases. Recurring Bibliographies and Literature Searches are derived from searches of the entire MEDLINE file. In some instances (indicated by double arrows) the publications existed in hard copy prior to the development of online systems; for some of these, there exist outside organization owned databases from which the publication is derived and from which the data is entered into the corresponding NLM online file.



TABLE 3

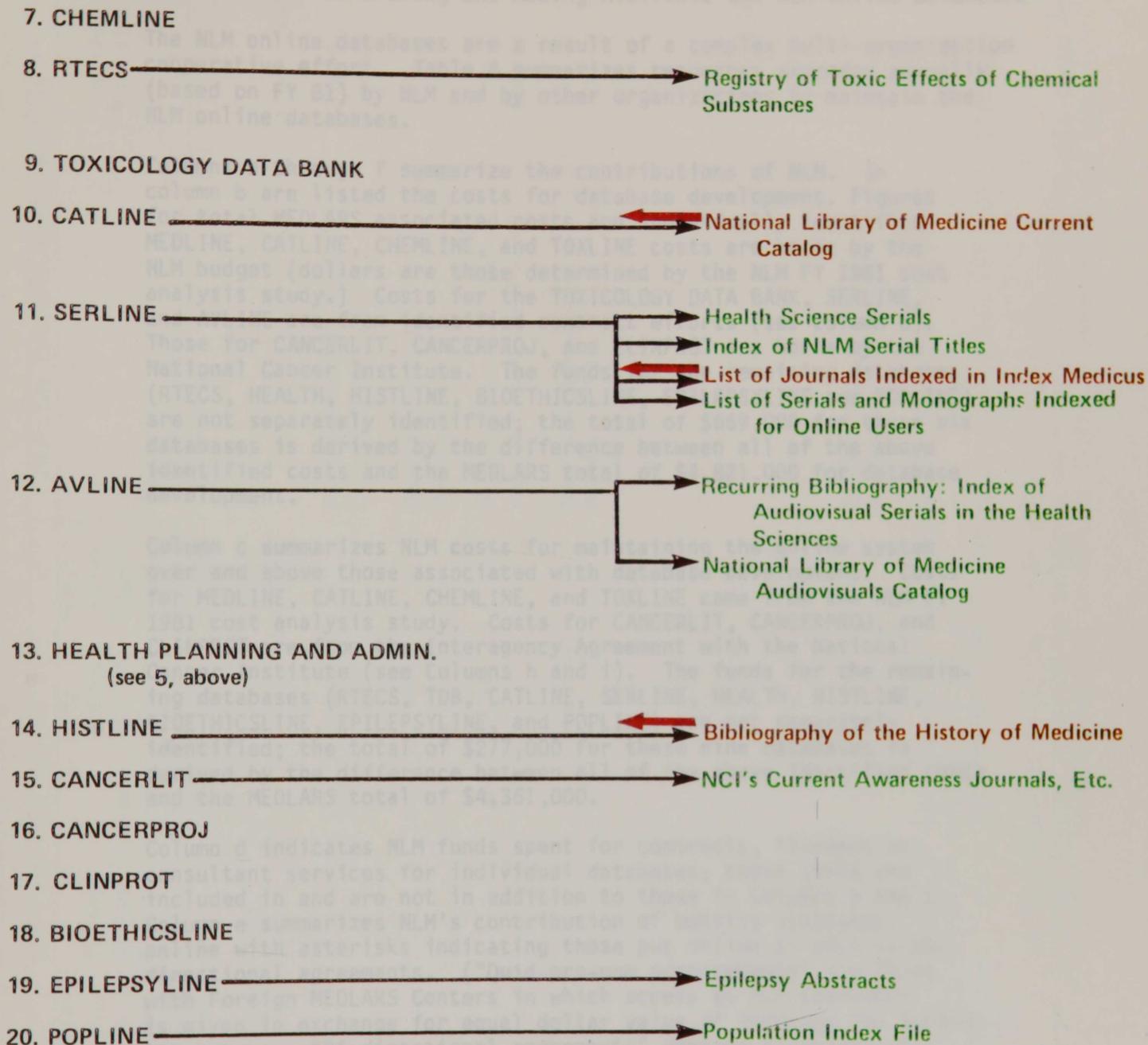
RELATIONSHIP OF ONLINE DATABASES TO PUBLICATIONS





RECORDS IN ONLINE DATABASES

DERIVATIVE OR RELATED PUBLICATIONS





### C. Resources for Generating and Making Available the NLM Online Databases

The NLM online databases are a result of a complex multi-organization cooperative effort. Table 4 summarizes resources expended annually (based on FY 81) by NLM and by other organizations to maintain the NLM online databases.

Columns b through f summarize the contributions of NLM. In column b are listed the costs for database development. Figures for total MEDLARS associated costs and individually identified MEDLINE, CATLINE, CHEMLINE, and TOXLINE costs are borne by the NLM budget (dollars are those determined by the NLM FY 1981 cost analysis study.) Costs for the TOXICOLOGY DATA BANK, SERLINE, and AVLINE are from identified contract efforts (see column d). Those for CANCERLIT, CANCERPROJ, and CLINPROT are borne by the National Cancer Institute. The funds for the remaining databases (RTECS, HEALTH, HISTLINE, BIOETHICSLINE, EPILEPSYLINE and POPLINE) are not separately identified; the total of \$669,000 for these six databases is derived by the difference between all of the above identified costs and the MEDLARS total of \$4,821,000 for database development.

Column c summarizes NLM costs for maintaining the online system over and above those associated with database development. Costs for MEDLINE, CATLINE, CHEMLINE, and TOXLINE came from the NLM FY 1981 cost analysis study. Costs for CANCERLIT, CANCERPROJ, and CLINPROT are from the Interagency Agreement with the National Cancer Institute (see Columns h and i). The funds for the remaining databases (RTECS, TDB, CATLINE, SERLINE, HEALTH, HISTLINE, BIOETHICSLINE, EPILEPSYLINE, and POPLINE) are not separately identified; the total of \$277,000 for these nine databases is derived by the difference between all of the above identified costs and the MEDLARS total of \$4,361,000.

Column d indicates NLM funds spent for contracts, licenses or consultant services for individual databases; these costs are included in and are not in addition to those in Columns b and c. Column e summarizes NLM's contribution of putting databases online with asterisks indicating those put online as part of bi-directional agreements. ("Quid-pro-quo arrangements" are those with Foreign MEDLARS Centers in which access to NLM databases is given in exchange for equal dollar value of indexing the foreign literature. "Bi-directional agreements" denotes a variety of other arrangements in which NLM provides support for publications, access to online databases copies of database tapes, etc., in return for which it receives indexing services, databases to be put online, staff and/or funds for indexing, quality control, etc.) Column f indicates an NLM role in use of the databases for derivative publications (described previously in Section B and Table 3).



TABLE 4  
RESOURCES FOR GENERATING AND MAKING AVAILABLE THE NLM ONLINE DATABASES (FY 1981)

NLM Databases	Class (see Text) (a)	NLM Contributions **		.Outside Resource Contributions **		Annual*** database maintenance costs \$ (k) (j)			
		Data-base Dev. Costs \$(K) (b)	Online System Costs \$(K) (c)	Pro-vides Online Svc or Tapes (e) (f)	Publi-cation Support to Outside (f)		Source of Resources (Performer) (g)	FTE \$ (K) (h)	Expend-itures (i)
MEDLINE (Includes 1-4)	I-a,b	2314	2798						NLM: 5112 Other: 124
1. Index Medicus Journals	I-c			Several DB's		Foreign MEDLARS Cent. (several performers)	4.5	581# (cont)	
2. Special List Dental	I-c			**	+	American Dental Assoc.	3.5 (2.0)		95
3. Special List Nursing	I-c			**	+	American Journal Nursing Co., ANA (Raytheon)		29 (cont)	29
4. Special List Hospitals	I-c			HEALTH*	+	American Hosp. Assoc.	6.2 (1.0)		167
5. Special List Other	I-a				+				
6. TOXLINE	I-a,b	347	466						NLM: 813 Other: 962
Index Medicus (see 1 above) Journals									
a. NTIS (TD3)	I-e			**	+	Office Asst.Sec. Health, HHS		30 (IAA)	30##

\* NLM puts database online as quid-pro-quo arrangement for being given the database content

# Included in NLM contributions listed in columns (b) and (c).

\*\* lic = license: cont = contract: cons = consultant: IAA = Interagency agreement: FTE = Full time equivalent total; FTE at NLM in parentheses.

\*\*\* Costs of annual maintenance of database content only; not total value of databases.

## Annual cost for that portion of large outside organization database which is included in TOXLINE; costs for Chem Abst Svc, HEEP, and IPA are included in NLM contributions to TOXLINE listed in columns (b) and (c).



Table 4 - Page 2

NLM Databases	Class (see Text) (a)	NLM Contributions **			Outside Resource Contributions **			Annual *** database maintenance costs \$ (K) (k)	
		Data- base Devel. Costs \$(K) (b)	Online System Costs \$(K) (c)	Expend- itures \$(K) (d)	Pro- vides Online Svc or Tapes (e)	Publi- cation Support to Outside (f)	Source of Resources (Performer) (g)		FTE (h)
b. Chem Abstr Svc	I-d			13 (lic) 82 (cont)	+	+			(95)##
c. BIOSIS: HEEP	I-d			45 (cont)	+	+			(45)##
d. Am. Soc. Hosp. Pharm.: IPA	I-b I-d			3 (lic) 30 (cont)	+	+			(33)##
e. EPA (Pest. Abst.)	I-e				++	+	EPA (Franklin Inst.)	185 (cont)	185
f. ORNL: EMIC	I-e				++		National Toxicology Program, NIEHS	372 (Cont)	372
g. ORNL: ETIC	I-e				++		National Toxicology Program, NIEHS	312 (Cont)	312
h. ORNL: TMIC	I-e				++		Atomic Energy Commission	0	0
i. RPROJ	I-e				+		Office Asst. Sec. Health, HHS (SSIE)	63 (IAA)	63



Table 4 - Page 3

NLM Databases	Class (see Text) (a)	NLM Contributions **			Outside Resource Contributions **			Annual *** database maintenance costs \$ (K) (k)	
		Data- base Devel. Costs \$(K) (b)	Online System Costs \$(K) (c)	Expend- itures \$(K) (d)	Pro- vides Online Svc or Tapes (e)	Publi- cation Support to Outside (f)	Source of Resources (Performer) (g)		FTE (h)
7. CHEMLINE: Chem Abst. Service	I-a,b I-d I-d	252	188	20 (lic) 82 (cont)	+				542
8. Reg Toxic Effects Chem.Subs (RTECS)	I-e				+	+	Natl Inst. of Occupational Safety and Health (Tracor- Jitco)	300 (cont)	300
9. Toxicology Data Bank (TDB)	I-b			5 (cons) 839 (cont)	+				844
10. CATLINE	I-a I-b I-c	149	279	149 (cont)	+	+			428
				NLM-OCLC (Cooperative Cataloging)					
11. SERLINE	I-a I-b I-d I-c			133 (cont) 11 (cont)	+	+			144
				NLM-Other Libraries Cooperative Master Serial Holdings File					
12. AVLINE	I-a I-b			102 (cont)	+	+			102

13 Health Planning  
Admin (HEALTH)  
(See 4 above)



NLM Databases	Class (see Text) (a)	NLM Contributions **			Outside Resource Contributions **			Annual*** database maintenance costs \$ (K) (k)	
		Data-base Devel. Costs \$(K) (b)	Online System Costs \$(K) (c)	Expend- itures \$(K) (d)	Pro- vides Online Svc or Tapes (e)	Publi- cation Support to Outside (f)	Source of Resources (Performer) (g)		FTE (h)
14. HISTLINE	I-a								
15. CANCERLIT	II	see (j)			+	+	NCI (Franklin, Herner, IITRI)	1550 (cont)	1550
16. CANCERPROJ	II	see (j)	353###		+		NCI (SSIE)	500 (cont)	500
17. CLINPROT	II	see (j)			+		NCI (Informatics)	210 (cont)	210
18. BIOETHICSLINE	I-e				+		Kennedy Institute Georgetown Univ.	160 (NLM-EP Grant)	160
19. EPILEPSYLINE	II				+	+	NINCDS (Excerpta Medica)	63 (cont)	63
20. POPLINE	I-e				+	+	AID, State Dept; NICHD (Johns Hopkins, Columbia, Princeton Univ.)	1000 (cont)	1000
Sum of 8, 13, 14, 18, 19, 20	I-a,b			669					
Sum of 8, 9, 11, 12, 13, 14, 18, 19, 20				277					
TOTAL MEDLARS				4821					4361

### NCI reimburses NLM with \$340K and 0.5 FTE for CANCERLIT, CANCERPROJ and CLINPROT.



Columns g through i, respectively, show the outside contributing organizations (and performers of work); their contributions of personnel (FTE); and FY 1981 expenditures for other than personnel.

Column j shows rough estimates of total dollar value of resources expended annually to maintain those databases which are components of the NLM online system. The costs listed for maintenance are far less than the total dollar value of the databases. Some of the values in Column j are the annual costs for obtaining for NLM use only portions of larger databases belonging to outside organizations, and thus, are not estimates of either the annual maintenance costs or the total dollar value of those outside databases. In the calculations, one FTE is assumed equal to \$27,000.

Previously described (see pages 2 and 3) was the separation of the NLM budget into two parts, the first of which supported the "essential national library services" and which would be required even if there were no online services. The second part, described in detail here, is to support online MEDLARS and associated functions which can be thought of as "augmentations" of those "essential library services." To aid understanding of purpose and mode of the large variety of arrangements used to obtain the broad array of information needed for this second category of MEDLARS related "augmenting" activities, they have been put into the following classes (and entered in Column a of Table 4):

- I. "Augmentation" of Essential National Library Services - with five subclasses:
  - I-a Done by NLM Staff.
  - I-b Same as (I-a), but done by NLM via contracts and consultants (serving as direct extensions of NLM's own activity).
  - I-c Same as (I-a), but done through quid-pro-quo agreements with outside parties.
  - I-d Acquired from outside source of existing data via license or contract (which, were it not to exist, NLM would have to create with its own resources).
  - I-e Acquired via support from others to meet both others' and NLM's needs: Staff or fiscal resources of outside organizations create data/information to meet needs of outside constituencies; the information service is complementary to NLM missions, and becomes part of the NLM delivery network.



- II. Data and Information Acquired Via Support from Others to Meet Others' Needs Primarily: Staff or fiscal resources of outside organizations create data/information to meet needs of outside constituencies; those needs are not integral to the "augmentation" of NLM essential library services, and NLM would not itself provide the service on its own initiative; the information service requires and uses the NLM network for its delivery; the information service is relevant to the missions of NLM.

The above classification will be used in the following discussion and accompanying Table 4 (Column a) so that the resources relationships between NLM and private sector organizations may be quantified and better understood.

Analysis of Table 4 shows NLM as a complex agency with many and varied bilateral arrangements with other organizations. These arrangements have occurred for two main reasons. First, as new data needs arose that were required to meet NLM's augmented essential missions, NLM drew upon external sources of data, thereby avoiding expensive redundancy. Second, once NLM developed a smoothly functioning information delivery system, its facilities were sought after by many outside organizations to aid them in providing information to their constituencies with greater likelihood of success and at less cost than if they created new independent systems.

The large majority of organizations with which NLM collaborates are professional societies or other Federal agencies. Private sector for-profit organizations are involved in many instances as performers who are paid by the professional societies or Federal agencies to fulfill the latter's needs and missions.

In some instances, the perceived requirements of outside professional groups for their disciplines resulted in accumulation of new health data which became integral to NLM's own databases. For example, the Special Nursing and Dental Journal Literature efforts of those respective professions resulted in augmented bibliographic data which became integrated into NLM's main online database, MEDLINE. In other instances, data from the outside was deliberately sought by NLM to augment one of its own databases, as, for example, the incorporation of the Health Effects of Environmental Pollutants database from BIOSIS, and the Pesticide Abstracts from EPA being incorporated into TOXLINE. In other circumstances, the outside database, although dealing with relevant and complementary subject matter to that of NLM, was not made integral to NLM databases; rather, the needs of the outside organization were met by having their assembled databases being hosted on the NLM system; examples are CANCERLIT, CANCERPROJ, CLINPROT, and EPILEPSYLINE.



The online systems serve a variety of missions of Federal agencies. An example of major interagency collaboration is TOXLINE. Following the recommendation of the President's Science Advisory Committee in 1965, the National Library of Medicine became the focal point for multi-agency interest in Toxicology and related information areas. A powerful body of information and services in this field has been provided. NLM has had cooperation and support from PHS interagency committees, other Federal information sources (e.g., NTIS), and been given bodies of information generated and maintained by other agencies (e.g., EPA, the National Toxicology Program, the National Institute for Environmental Health Sciences, and the National Institute of Occupational Safety and Health). To augment the usefulness of this cluster of information, NLM has expended its own resources to obtain information from the Chemical Abstract Service, BIOSIS, the American Society of Hospital Pharmacists, etc. The three databases on cancer information serve the mandated information dissemination responsibilities of the National Cancer Institute. POPLINE is an example of another online system subserving important State Department missions.

The attractiveness of the NLM system to outside organizations stems from (1) NLM's sophisticated hardware with great capacity; (2) software for search and retrieval which has become progressively more sophisticated over 18 years of experience and which is tailored to the bibliographic needs of the health communities; (3) ongoing arrangements with private sector electronic networks; and (4) large experienced and receptive user communities. As indicated in Table 4, in exchange for putting them online, NLM receives 16 databases from other organizations which, in the aggregate, require approximately five million dollars annually just to maintain. (The total value of initial development and prior years of updating of those databases would be severalfold greater than their current annual upkeep costs.) An important factor is the clustering of information and data in related databases. Having all of them in one system provides important ease of access and reduced costs due to economies of scale.

Of interest is the respective budgetary expenditures of NLM and the other organizations shown in Table 4. Contributions to MEDLARS and associated products by NLM is approximately \$10,400,000 annually; this includes support for database development, online services, derivative and related publications, and distribution of tapes. In return for a variety of quid-pro-quo and other collaborative services the NLM obtains for distribution additional databases whose annual cost for upkeep is approximately \$5,000,000. It is important to note that the \$5,000,000 to support those online databases is supporting other functions as well. For example, the NCI expenditures to

## 7. Interlibrary Loans



support CANCERLIT as an online system has many other derivative functions: a very large number and variety of Cancer publications are directly derived from this assembled database for distribution to Cancer researchers and therapists throughout the world, thereby fulfilling mandated NCI functions. Whatever the other uses, inclusion of those databases for access potentiates the value of NLM online systems. These additional databases thus contribute to the success of the NLM online system as a whole.

#### D. National Library of Medicine Related Products and Services

The National Library of Medicine is a complex multi-purpose organization which relates to many professional communities and produces a variety of outputs. The relationship of NLM online databases to the outside producer and user communities and the private sector was presented in Sections A-C , above. Further understanding is gained by review of the various categories of publications, films, tapes, etc., produced by NLM. The following outline will be used.

1. Library Service Publications
  - a. INDEX MEDICUS RELATED
  - b. CURRENT CATALOG RELATED
  - c. SERLINE RELATED
  - d. AVLINE RELATED
  - e. OTHER CATALOGS OF NLM HOLDINGS
  - f. PUBLICATIONS TO SUPPORT USERS OF NLM PUBLICATIONS AND SERVICES
  - g. REPRINT AND MICROFORM EDITIONS OF ESSENTIAL NLM PUBLICATIONS (Out of Print)
2. Recurring Bibliographies
3. Literature Searches
4. Publications on NLM Research and Development, Technical Reports, Teaching Tools, and Other
5. Publications for Administrative and Public Information Purposes
6. NLM Online Services and Database Tapes
7. Interlibrary Loans



## 1. Library Service Publications

A significant number of NLM publications are necessary for fulfilling the basic legislative authority of the NLM to (1) acquire and preserve Library materials pertinent to medicine; (2) organize those materials (cataloging, indexing, bibliographic listings); (3) publish the catalogs and indexes and bibliographies; (4) make such materials available; and (5) provide reference and research assistance (see description of National Library of Medicine Act in Legislative Authority Section above). Augmentation of the information dissemination function was mandated by the Medical Library Assistance Act. The following publications are made available directly to fulfill those responsibilities of the Library:

### a. INDEX MEDICUS RELATED

#### 1) Index Medicus (monthly)

A bibliographic listing of references to current articles from approximately 2,600 of the world's biomedical journals. Included are subject and author sections and a separate Bibliography of Medical Reviews.

#### 2) CUMULATED INDEX MEDICUS (annual)

A cumulation of the citations appearing in Index Medicus for the previous year. Included are author and subject sections, Medical Subject Headings, List of Journals Indexed in Index Medicus and Bibliography of Medical Reviews.

#### 3) LIST OF JOURNALS INDEXED IN INDEX MEDICUS, (Annual)

Contains four listings of journals indexed: title, abbreviations, subject, and geographical.

#### 4) BIBLIOGRAPHY OF MEDICAL REVIEWS

A cumulation of citations to reviews for the period of 1971-1975.

#### 5) ABRIDGED INDEX MEDICUS (monthly)

A bibliography of articles from 17 English language journals, designed for the individual practitioner and libraries of small hospitals and clinics.



6) CUMULATED ABRIDGED INDEX MEDICUS (annual)

An annual cumulation in one volume of the citations appearing in the monthly Abridged Index Medicus. Contains subject and author sections.

b. CURRENT CATALOG RELATED

1) NATIONAL LIBRARY OF MEDICINE CURRENT CATALOG (quarterly)

A bibliographic listing of monographs and serials cataloged by the Library. Contains listings by subject and name.

2) NATIONAL LIBRARY OF MEDICINE CURRENT CATALOG (annual and quinquennial)

A bibliographic listing of monographs and serials cataloged by the Library. Contains listings by subject and name.

3) NATIONAL LIBRARY OF MEDICINE CURRENT CATALOG WEEKLY PROOF SHEETS

Weekly proof sheets of bibliographic listings of current English language monographs and serials. Used mainly by librarians for acquisitions. A single camera-ready copy is prepared by NLM for the Medical Library Association which incurs costs of publication and distribution which are offset by subscription rates (approximately 500 subscriptions at \$34/year).

c. SERLINE RELATED

1) INDEX OF NLM SERIAL TITLES (FOURTH EDITION, 1981)

This index, produced from SERLINE, contains approximately 36,000 entries representing all serials and numbered congresses which are on order, in process, or currently received by NLM, as well as many ceased serials in the NLM collection. It is designed to assist librarians in the rapid identification of biomedical serials and to provide the necessary information for requesting serial interlibrary loans from the National Library of Medicine.

2) HEALTH SCIENCES SERIALS (quarterly) (microfiche only)

Contains information on some 36,000 serials in NLM's SERLINE database; many records include locator information for 1,000 libraries in the U.S.



d. AVLINE RELATED

1) NATIONAL LIBRARY OF MEDICINE AUDIOVISUALS CATALOG (quarterly)

Lists audiovisuals cataloged by NLM from new additions to AVLINE, the Library's computerized database of information on audiovisual items used in health sciences education.

2) NATIONAL LIBRARY OF MEDICINE AUDIOVISUALS CATALOG (annual)

Contains subject, name/title, and procurement source sections for audiovisual instructional materials cataloged by NLM.

3) NATIONAL LIBRARY OF MEDICINE AVLINE CATALOG, 1975-1976

A listing by subject, of references to some 2,400 audiovisual instructional materials in the health sciences as cataloged by NLM for its AVLINE (Audiovisuals On-line) database from November 1975 to December 1976.

e. OTHER CATALOGS OF NLM HOLDINGS

1) NATIONAL MEDICAL AUDIOVISUAL CENTER CATALOG, 1981

A listing of 16mm motion pictures available on short-term loan from NMAC for use in professional education programs in the health sciences.

2) A SHORT TITLE CATALOGUE OF 18TH CENTURY PRINTED BOOKS IN THE NATIONAL LIBRARY OF MEDICINE

A compilation of approximately 25,000 items printed from 1701-1800 which are held in the History of Medicine Division collection of the National Library of Medicine.

f. PUBLICATIONS TO SUPPORT USERS OF NLM PUBLICATIONS AND SERVICES

To be useful to potential users, access to the extremely complex, multi-faceted biomedical literature is critical. To avoid chaos, there is required consistent, regularized, and broadly accepted common approaches to its collection, classification, organization, indexing, cataloging and abstracting. This central and indispensable framework is provided to the library, information science, and health professional communities by a series of descriptive and explanatory publications to support the construction and subsequent use of NLM publications and services. Included are:

3) National Library of Medicine Catalog



1) MEDICAL SUBJECT HEADINGS (annual)

An alphabetical and categorized list of all of the subject descriptors used to analyze the biomedical literature in the National Library of Medicine.

2) SCOPE AND COVERAGE MANUAL OF THE NATIONAL LIBRARY OF MEDICINE (1977)

3) MEDLARS TOOLS

- a) MEDLARS Indexing Manual (Part I): Bibliographic Principles and Descriptive Indexing, 1977
- b) MEDLARS Indexing Manual (Part II), 1980
- c) Medical Subject Headings - Annotated Alphabetical List (annual)
- d) Medical Subject Headings - Tree Structures (annual)
- e) NLM Online Services Reference Manual, 1980
- f) Technical Notes--MEDLARS Indexing Instructions, 1975
- g) Technical Notes--MEDLARS Indexing Instructions, Tumor Key Supplement, 1980
- h) List of Serials and Monographs Indexed for Online Users (annual)
- i) MeSH Tree Annotations 1980
- j) Permuted Medical Subject Headings (annual)
- k) NLM Technical Bulletin (monthly)

g. REPRINT AND MICROFORM EDITIONS OF ESSENTIAL NLM PUBLICATIONS (Out of print)

Arrangements have been made with private sector publishers to reprint and distribute both hard copy and microform editions of out-of-print volumes of:

- 1) Cumulated Index Medicus
- 2) Index Catalog: Index Catalog of the Library of the Surgeon General's Office
- 3) National Library of Medicine Catalog



- 4) Current List of Medical Literature
- 5) Index Medicus, Series I, II, III and War Supplement
- 6) Abridged Index Medicus

## 2. Recurring Bibliographies

Another important service derived from NLM's capabilities is the provision of Recurring Bibliographies on selected subjects for particular professional communities. Table 5 lists alphabetically the Recurring Bibliographies produced during Fiscal Year 1981. These Recurring Bibliographies can be described in three groups:

### a. NLM Sponsored Recurring Bibliographies.

Index Medicus and Abridged Index Medicus are the long-standing central Recurring Bibliographies of the National Library of Medicine serving the health professions broadly. These publications are supported by NLM to fulfill its basic missions.

### b. Cooperative Efforts Between NLM and Other Organizations

Three cooperative efforts for incorporating information from the dental, health, and nursing literatures have been previously described (see pages 5 and 6). Search strategies applied to MEDLINE provide new bodies of selective bibliographic information which are published as Recurring Bibliographies: Index of Dental Literature and International Nursing Index (see Table 3). The Hospital Literature Index is derived from a search strategy applied to the HEALTH file (which in turn, is constructed from the indexed Special List Health Journals plus a search strategy applied to MEDLINE, Table 3). NLM prepares tapes, and, through GPO, provides one camera-ready copy of the bibliographic material to the respective organizations which incur fully the subsequent expenses of publication, printing and distribution to their selected communities of users.

NLM provides significant resources to the Index of Audiovisual Serials in the Health Sciences prepared for the Medical Library Association. Also, the Quarterly Bibliography of Major Tropical Diseases is prepared by the Library in cooperation with the World Health Organization for the six major tropical diseases (filariasis, leishmaniasis, leprosy, malaria, schistosomiasis, and trypanosomiasis). NLM publishes and reproduces the bibliographies. The World Health Organization is responsible for distribution to selected communities of users. A Nutrition Bibliography is being developed with the World Health Organization.



TABLE 5  
RECURRING BIBLIOGRAPHIES

Fiscal Year 1981  
 October 1980 thru September 1981

<u>NAME</u>	<u>FREQUENCY</u>	<u>SPONSORING ORGANIZATION</u>
1. Abridged Index Medicus	Monthly	National Library of Medicine
2. Anesthesiology Bibliography	Quarterly	American Society of Anesthesiologists
3. Audiovisual Serials in the Health Sciences, Index of	Quarterly	Medical Library Association
4. Cranio-Facial-Cleft Palate Bibliography	Quarterly	American Cleft Palate Association
5. Deafness, Speech, and Hearing Abstracts	Quarterly	American Speech (Language) and Hearing Association
6. Dental Literature, Index of	Quarterly	American Dental Association
7. Education in the Allied Health Professions, Recurring Bibliography of	Annual	School of Allied Medical Professions, the Ohio University
8. Family Medicine Literature Index	Quarterly	World Organization of National Colleges, Academies, and Academic Associations of General Practitioners/Family Physicians
9. Hospital Literature Index	Quarterly	American Hospital Association
10. Hypertension, Recurring Bibliography of	Bimonthly	American Heart Association
11. Index Medicus	Monthly	National Library of Medicine
12. Medical Education, Bibliography of	Monthly	Association of American Medical Colleges
13. Neurosurgical Biblio-Index	Quarterly	American Association of Neurological Surgeons



Table 5 Page 2

<u>NAME</u>	<u>FREQUENCY</u>	<u>SPONSORING ORGANIZATION</u>
14. Nursing Index, International	Quarterly	American Journal of Nursing Company
15. Nutrition, Bibliography of (In pilot, stage)	Quarterly	World Health Organization
16. Orthopaedic Surgery, Annual Bibliography of	Annual	The Journal of Bone and Joint Surgery
17. Physical Fitness/Sports Medicine	Quarterly	President's Council on Physical Fitness and Sports
18. Plastic and Reconstructive Surgery, Current Bibliography of	Bimonthly	American Society of Plastic and Reconstructive Surgeons
19. Podiatric Medicine and Surgery, Bibliography of	Monthly	American Podiatry Association
20. Psychopharmacology Bibliography	Quarterly	National Institute of Mental Health/ADAMHA
21. Rheumatology, Index of	Annual	Arthritis Foundation
22. Schisto Update	Quarterly	Edna McConnell Clark Foundation
23. Strabismus, Amblyopia, and Other Diseases of Ocular Motility, Current Citations on	Quarterly	International Strabismological Association
24. Surgery of the Hand, Bibliography of	Annual	American Society for Surgery of the Hand
25. Tissue Culture, Index of	Annual	Tissue Culture Association
26. Tropical Diseases, Quarterly Bibliography of Major	Quarterly	World Health Organization/National Library of Medicine



c. NLM Responsiveness to Bibliographic Needs of Other Organizations

The remaining 18 Recurring Bibliographies listed are all handled in the same manner. In each instance an outside organization interested in providing Recurring Bibliographies in specialized fields to its communities of users works with the NLM to develop a search strategy for MEDLINE. This search strategy generally is revised annually. At very minimal expense to NLM, a special tape is prepared from the MEDLINE File which in turn is provided to GPO for obtaining a single camera-ready copy of that bibliography. The outside organization incurs the total expense of publication, printing and distribution of the Recurring Bibliographies from that point forward. Perusal of Table 5 indicates that the sponsoring organizations are mainly professional academic societies, but the list also includes educational institutions, organizations of societies, a journal representing a society, foundations, and Federal organizations with health-related missions. These are examples of the great efficiency that can be gained from the computerized MEDLARS system of NLM to support the information dissemination requirements of outside organizations in a variety of professional fields; NLM allows its bibliographic databases to be drawn upon to meet important needs with negligible use of NLM's own resources.

3. Literature Searches

In addition to the recurring bibliographies described previously, NLM produces a series of Literature Searches which are distributed without charge in response to requests. These non-recurring bibliographies are selected on the basis of importance of subject matter as determined by suggestions from professional societies, NIH conferences, major new NIH research initiatives, important epidemiologic problems, suggestions from other Federal agencies, and from many of the reader constituencies. Primary emphasis is placed on clinical subjects for clinical target audiences. The bibliographies contain references to recent articles selected from the MEDLINE database (see Table 3). Search strategies aim for a maximum of 300 citations per Literature Search. Their purpose is to provide bibliographies of the current literature that would be of wide interest to the user communities, thereby minimizing the numbers of individual searches on the same subject by individual users.

There have been approximately 500 such Literature Searches produced over the past fifteen years. Interest in these Literature



Searches is indicated by the numbers produced and distributed during the past five years:

	<u>No. of Literature Searches Produced</u>	<u>No. of Literature Searches Distributed</u>
Fiscal Year 77	17	32,060
Fiscal Year 78	30	33,000
Fiscal Year 79	21	38,000
Fiscal Year 80	32	39,008
Fiscal Year 81	<u>29</u>	70,818
Total	129	

The Literature Search Program serves the broad range of communities served by NLM generally. The main users are hospitals and medical schools and their staffs. Small uses are made of this service by research institutes, industry and other health care providers. Literature Search requests are made in response to discrete individual needs as well as to build bibliographic resources for general needs within health institutional libraries. About 80% of requests were for Literature Searches generated in the past two years, indicating that a large portion of interest is in obtaining recent items.

An additional and separate program of Literature Searches is a joint effort between the Specialized Information Services, NLM and the Federation of American Societies for Experimental Biology (FASEB). A search strategy on selected subjects is developed by the Information Response to Chemical Concerns Committee of the Committee for Coordination of Environmental and Related Problems in the Office of the Assistant Secretary for Health. The search strategy is modified and the search performed by the Toxicology Information Response Center (TIRC), a clearinghouse located at the Oak Ridge National Laboratory. The literature searches are published, promoted and distributed by FASEB. The following summarizes the six Literature Searches that have been published, their prices, and the numbers of copies sold to date.

<u>Literature Search</u>	<u>Price</u>	<u>Numbers Sold</u>
Acid Rain, 1980	\$ 15.00	900
Asbestos in Air, 1980	7.00	889
Chemical Dumps, 1980	10.00	100
Urea Formaldehyde, 1980	7.50	128
Vanadium Toxicity, 1981	15.00	4
Immune Systems, Environmental Chemicals, 1981	10.00	--



4. Publications on NLM Research and Development, Technical Reports, Teaching Tools, and Other

Staff of NLM is engaged in research and development in disciplines related to Library Science, Information Science, Biomedical Communications, Audiovisual Communications, etc. Results are commonly published in the peer-reviewed scientific literature. These publications can be considered analogous to those stemming from other R&D performed by other Institutes of NIH. Dissemination is augmented by Technical Reports made available to the public through NTIS. Included are reports from the Lister Hill National Center for Biomedical Communications, the National Medical Audiovisual Center, and miscellaneous other publications from projects of staff. A list of publications available and sales through NTIS is presented in a later section of this report.

TOX-TIPS is a monthly publication sponsored by the Toxicology Information Subcommittee of the DHHS Committee to Coordinate Toxicology and Related Programs and is produced under the direction of the Toxicology Information Program at the National Library of Medicine. It is a cooperative effort of industrial, government, and academic organizations reporting on initiation of testing projects and epidemiology studies to determine toxicity. The publication's aim is to prevent the duplication of toxicity testing programs and epidemiology studies to determine toxic risks of chemical substances and other agents. In addition, TOX-TIPS carries selected recent literature bibliographic citations retrieved from searches, conducted by NLM staff, of the National Library of Medicine's online databases. Input was on Smithsonian Science Information Exchange (SSIE) Notice of Research Project forms. After the project description and related data publication, the information was relayed to SSIE for inclusion in that national database of information on research-in-progress.

5. Publications for Administrative and Public Information Purposes

A series of six brochures and 20 fact sheets about NLM programs have been prepared. These are primarily administrative in nature and serve to increase efficiency in responding to a variety of inquiries from other government agencies, the public, academic institutions, libraries and other communities.

6. NLM Online Services and Database Tapes

Another form of products and services offered by the NLM is direct access to its Online Files as well as access by the licensing of or use of quid-pro-quo agreements of database tapes.



Domestic user charges for connect hours to NLM databases are billed for and collected by NTIS. From the collections, NTIS pays for Tymnet and Telenet (electronic delivery network) charges, and for both back-up and expansion of NLM computer capacity from SUNY computers. Charges include royalties remitted to Chemical Abstracts Service, BIOSIS, and the American Society for Hospital Pharmacists for use of their proprietary information contained within NLM databases. NLM appropriated funds are not involved in these transactions. Collections above expenses are returned by NTIS to the U.S. Treasury.

## 7. Interlibrary Loans

Interlibrary Loans (ILL) are accomplished through the Regional Medical Library (RML) program, a national network of 11 regional libraries, more than 100 resource libraries, and approximately 3,000 basic units (e.g., hospital libraries) coordinated by the National Library of Medicine. Each of the RMLs coordinates the expeditious delivery of information to health professionals in its own region and cooperates with libraries throughout the network to provide nearly two million interlibrary loans annually. Most requests are satisfied by the decentralized components of the network. Through an interchange of services agreement, the NLM uses the British Lending Library as backup for ILL requests it cannot fill.

## E. Summary Of Volume of NLM Products and Services Delivered

In previous sections the rationale, development and maintenance of NLM information service capabilities have been described. This section briefly summarizes the volume of the major products and services delivered to the user communities.

Tables 6 and 7 summarize the sales through GPO of the library service publications. Table 6 lists domestic and foreign prices, estimates of domestic and foreign sales, and total revenues for the major items. A very large proportion of all publication sales are presented here, adding up to approximately 3.1 million dollars per year (based on FY 1981 estimates). These include sales by subscription as well as individual copy purchases. The second large cluster of library service publications sold, summarized in Table 7, are those which are MEDLARS tools publications. Approximately 22,000 issues of hard copy publications are sold plus an additional 700 as microfiche. Total revenues approximate \$300,000 annually. The large amount of sales reflect the critical role of these working tools in the generation and use of the hard copy and online versions of MEDLARS.

Research and development and teaching material publications in the peer reviewed journal literature by the Lister Hill National Center for Biomedical Communications and the National Medical Audiovisual



TABLE 6  
GPO SALES OF SELECTED NLM LIBRARY SERVICE SUBSCRIPTION PUBLICATIONS (FY 1981)

NLM Publications	Domestic Price (\$)	Est. Domestic Sales	Domestic Revenue (\$ K)	Foreign Price (\$)	Est. Foreign Sales	Foreign Revenue (\$ K)	Est. Total FY 81 Revenue (\$ K)
a.1)* INDEX MEDICUS (subscription)**	150	3265	490	187.50	2623	492	982
a.2) CUMULATED INDEX MEDICUS (subscription) current year, individual copies	170	2773	471	212.50	3227	686	1157
prior years, individual copies	170	2818	479	212.50	1878	399	878
	170	844	143	212.50	562	119	262
a.5) ABRIDGED INDEX MEDICUS (subscription)	34	2580	88	42.50	335	14	102
a.6) CUMULATED ABRIDGED INDEX MEDICUS (subscr.) current year, individual copies	21	1000	21	26.25	100	3	24
prior years, individual copies	21	796	17	26.25	89	2	19
	28	220	6	35.00	24	1	7
b.1) NLM CURRENT CATALOG (subscription) current year, individual copies	25	984	25	31.25	439	14	39
prior years, individual copies	23	848	20	28.75	364	10	30
	34	293	10	42.50	126	5	15
c.2) HEALTH SCIENCES SERIALS (subscription)	18	256	5	22.50	49	1	6
d.2) NLM AUDIOVISUAL CATALOG (subscription) current year, individual copies	33	811	27	41.25	125	5	32
prior years, individual copies	11	128	1	13.75	19	-	1
	11.50	137	2	13.25	21	-	2
Totals			1805			1751	3556

\* Corresponds to code numbers in Text (pages 15-17)

\*\* This includes Medical Subject Headings as Part 2 of the January issue. An Additional 2000 hard copies of Medical Subject Headings at \$12.00 (\$15.00 foreign) are sold individually.



TABLE 7  
 NTIS SALES OF SELECTED NLM PUBLICATIONS (FY 1981)\*

	Hard Copy		Microfiche*		
	Domestic Price	Est. Sales	Est. Revenue (\$ K)	Est. Sales	Est. Revenue (\$ K)
<u>MEDLARS TOOLS PUBLICATIONS</u>					
3)b)**		505	8	57	.2
	15.00				
		3493	59	73	.3
3)c)	17.00	3669	62	68	2
	17.00				
3)d)	12.00	2987	36	73	.3
	12.00	3090	37	68	.2
3)e)	10.50	308	3	65	.2
	10.50	1780	19	69	.2
3)g)	6.50	410	3	58	.2
3)h)	8.00	525	4		
	8.00	1040	8	50	.2
3)j)	12.00	2826	34	73	.3
	12.00	1251	15	64	.2
TOTALS		(21884)	(288)	(718)	(2.5)

\* Microfiche price \$3.50 domestic; \$7.00 foreign. Foreign price double domestic price for hard copy. Proportion foreign is unknown; calculate as if all domestic.

\*\* Corresponds to code numbers in text (page 18)



TABLE 8  
 NTIS SALES OF PUBLICATIONS ON NLM RESEARCH AND DEVELOPMENT, TECHNICAL REPORTS AND TEACHING TOOLS (FY-1981)  
 (1) Lister Hill National Center for Biomedical Communications

Title	Months Item Available For Sale (As of 9/30/81)	Hard Copy		Microfiche	
		FY 81 Sales	FY 81 Revenue (\$)	FY 81 Sales	FY 81 Revenue (\$)
		Price (\$)			
THE POTENTIAL ROLE OF CABLE TELEVISION IN WIDEBAND DISTRIBUTION SYSTEMS (1973)			\$ 12.5		
DEVELOPMENT AND EVALUATION OF A MODEL INTERACTION TELEVISION SYSTEM (1973)			9.5		
BACKGROUND REPORT OF HEALTH CARE STATUS: U.S. PACIFIC AND STATE OF HAWAII (1973)			14.0		
BACKGROUND REPORT ON LIBRARY STATUS: U.S. PACIFIC AND SELECTED PACIFIC AREAS (1973)			15.5		
MINICOMPUTERS IN HEALTH SCIENCES INSTRUCTION			6.5		
PROGRAMMING LANGUAGES USED FOR HEALTH SCIENCES COMPUTER ASSISTED INSTRUCTION (1973)			8.0		
INTERACTIVE TELEVISION: A STUDY OF ITS EFFECTIVENESS AS A MEDICAL EDUCATION RESOURCE IN THE RURAL NORTHEAST			14.0		
CAI NETWORK EVALUATION CRITERIA AND METHODOLOGY (1973)			9.5		
PACIFIC SATELLITE HEALTH INFORMATION STUDY - FINAL REPORT			14.0		
EVALUATION OF THE EXPERIMENTAL CAI NETWORK (1973-1975) OF THE LISTER HILL NATIONAL CENTER FOR BIOMEDICAL COMMUNICATIONS, NATIONAL LIBRARY OF MEDICINE			9.5		
HEALTH CARE AND SATELLITE RADIO COMMUNICATION IN VILLAGE ALASKA			30.5		
EVALUATION OF THE DARTMOUTH NETWORK			17.0		
FINAL REPORT OF THE DARTMOUTH NETWORK			9.5		
ROLE OF COMMUNITY HOSPITALS IN CONTINUING EDUCATION OF HEALTH PROFESSIONALS			9.5		



TABLE 8, Page 2  
 PUBLICATIONS ON.nlm RESEARCH AND DEVELOPMENT, TECHNICAL REPORTS AND TEACHING TOOLS  
 (1) Lister Hill National Center for Biomedical Communications

Title	Months Item Available For Sale (As of 9/30/81)	Price (\$)	Hard Copy		Microfiche	
			FY 81 Sales	FY 81 Revenue (\$)	FY 81 Sales	FY 81 Revenue (\$)
ATS-6 SATELLITE EVALUATION		\$ 17.0				
TELEMEDICINE IN ALASKA: THE ATS-6 SATELLITE BIOMEDICAL DEMONSTRATION		20.0				
EVALUATION OF BIOMEDICAL COMPUTER-ASSISTED INSTRUCTION FROM A USER/INSTITUTIONAL VIEWPOINT		11.0				
AN EXPERIMENTAL DISTRIBUTED DATABASE SYSTEM		6.5				
EXPERIMENTAL COMPUTER-ASSISTED INSTRUCTION NETWORK: JULY 1972-MAY 1975		9.5				
INTERACT--A DECADE OF EXPERIENCE USING TWO-WAY CLOSED CIRCUIT TELEVISION		12.5				
OSU PARTICIPATION IN THE LISTER HILL NATIONAL CENTER FOR BIOMEDICAL COMMUNICATIONS EXPERIMENTAL NETWORK, JUNE 1, 1972-NOVEMBER 30, 1976		20.0				
MACHINE READABLE IDENTIFICATION SYSTEMS FOR LIBRARY MATERIALS		9.5				
PILOT--USER'S GUIDE	27	9.5	5	\$ 47.5	40	\$ 140.0
PILOT 8080--SYSTEMS GUIDE	27	6.5	5	32.5	40	140.0
BIOMEDICAL COMMUNICATIONS EXPERIMENTS USING THE COMMUNICATIONS TECHNOLOGY SATELLITE: EXECUTIVE SUMMARY	25	6.5	14	91.0	33	115.5
BIOMEDICAL COMMUNICATIONS EXPERIMENTS USING THE COMMUNICATIONS TECHNOLOGY SATELLITE: SYSTEMS EVALUATION	25	8.0	12	96.0	35	122.5
BIOMEDICAL COMMUNICATIONS EXPERIMENTS USING THE COMMUNICATIONS TECHNOLOGY SATELLITE: SYMPOSIUM PROCEEDINGS	25	8.0	25	200.0	35	122.5
BIOMEDICAL COMMUNICATIONS EXPERIMENTS USING THE COMMUNICATIONS TECHNOLOGY SATELLITE: TECHNICAL EVALUATION	19	9.5	8	76.0	--	--



TABLE 8, Page 3  
 PUBLICATIONS ON NLM RESEARCH AND DEVELOPMENT, TECHNICAL REPORTS AND TEACHING TOOLS

(1) Lister Hill National Center for Biomedical Communications

Title	Months Item Available For Sale (As of 9/30/81)	Hard Copy		Microfiche	
		FY 81 Sales	FY 81 Revenue (\$)	FY 81 Sales	FY 81 Revenue (\$)
		Price (\$)			
ADAPTIVE DELTA MODULATION FOR BIOTELEMETRY OF ECG	16	10	\$ 80.0	--	\$ --
A STUDY OF SIMULATION TECHNOLOGY IN MEDICAL EDUCATION	24	3	19.5	22	77.0
COMMUNICATIONS TECHNOLOGY FORECAST	27	147	3601.5	29	101.5
DIGITAL TRANSMISSION EXPERIMENTS OVER CTS AUDIO CHANNELS	16	4	32.0	--	--
EVALUATION OF ECHO SUPPRESSION IN VIDEO TELECONFERENCING VIA THE COMMUNICATIONS TECHNOLOGY SATELLITE	25	9	58.5	26	91.0
CONVERSION PLAN FOR THE ARMY LIBRARY, PENTAGON	6	67	636.5	114	399.0
REPORTS OF THE INTEGRATED LIBRARY SYSTEM (ILS)	6	50	475.0	53	185.5
PASCAL - SURVEY OF EXISTING IMPLEMENTATIONS	11	149	968.5	82	287.0
ADVANCED TERMINAL SYSTEM USER'S GUIDE	11	11	154.0	82	287.0
ADVANCED TERMINAL SYSTEM MASTER CONTROL PROCESSOR LOGIC MANUAL	11	8	136.0	82	287.0
A USER'S GUIDE TO MAINTAINING THE MASTER BIBLIOGRAPHIC FILE OF THE INTEGRATED LIBRARY SYSTEM	12	246	1968.0	83	290.5
A GUIDE TO USING THE BIBLIOGRAPHIC FEATURES OF THE INTEGRATED LIBRARY SYSTEM (ILS)	12	283	1839.5	78	273.0
REPORT ON PERFORMANCE EVALUATION AND ENHANCEMENT OF 8080 STANDARD MUMPS					
A VIDEODISC INTERFACE UNIT					
A VIDEODISC INTERFACE UNIT - SOFTWARE LISTING - SUPPLEMENT					
THE ILS USER'S GUIDE--CIRCULATION SUBSYSTEM AND GENERAL FUNCTIONS	9	183	2836.5	59	206.5
<b>Lister Hill National Center Totals</b>		<b>1,239</b>	<b>13,348.5</b>	<b>893</b>	<b>3,125.5</b>



TABLE 8, Page 4  
 PUBLICATIONS ON NLM RESEARCH AND DEVELOPMENT, TECHNICAL REPORTS AND TEACHING TOOLS  
 (2) National Medical Audiovisual Center Publications

Title	Months Item Available For Sale (As of 9/30/81)	Price (\$)	Hard Copy		Microfiche	
			Fy 81 Sales	Revenue (\$)	FY 81 Sales	Fy 81 Revenue (\$)
CLEARANCE: THE GLOMERULAR FILTRATION RATE (1976)		\$ 4.0				
STRUCTURE OF THE U.S. HEALTH CARE SYSTEM		4.5				
THE NUVA-SYSTEM FOR RESTORING FRACTURED PERMANENT ANTERIOR TEETH (Microfiche \$6.25)		6.2				
HUMAN POPULATION GENETICS		4.5				
THE FEMALE REPRODUCTIVE SYSTEM		5.2				
A MODEL FOR PRODUCING AND SHARING INSTRUCTIONAL MATERIALS IN VETERINARY MEDICINE	29	4.5	10	\$ 45.0	22	\$ 77.0
SHOCK: PATHOPHYSIOLOGY AND IMPLICATIONS FOR NURSING CARE	27	6.0	85	510.0	35	122.5
TEACHING INTERPERSONAL SKILLS TO HEALTH PROFESSIONALS VOL 1 (1978)	25	11.0	21	231.0	41	143.5
TEACHING INTERPERSONAL SKILLS TO HEALTH PROFESSIONALS, VOL 2 (1978)	25	24.0	17	408.0	41	143.5
GINGIVAL DISEASE OF MICROBIAL ORIGIN (UNIT PROTOTYPE)	18	8.0	5	40.0	55	192.5
FREE SOFT TISSUE AUTOGRAFT (UNIT PROTOTYPE)	17	8.0	4	32.0	60	210.0
A METHOD FOR DEVELOPING INTEGRATED BIOLOGIC AND CLINICAL DENTAL SCIENCE TEACHING UNITS	17	11.0	7	77.0	61	213.5
APPLIED MATHEMATICS FOR MEDICAL STUDENTS	3	8.5	7	59.5	37	129.5
AUDIOVISUAL PROJECTION SYSTEMS - TECHNICAL REPORT #1	3	6.5	13	84.5	52	182.0
BUILDING YOUR OWN MULTIPLE PURPOSE CAMERA STAND	3	5.0	2	10.0	46	161.0



TABLE 8, Page 5  
 PUBLICATIONS ON NLM RESEARCH AND DEVELOPMENT, TECHNICAL REPORTS AND TEACHING TOOLS  
 (2) National Medical Audiovisual Center Publications

Title	Months Item Available For Sale (As of 9/30/81)	Price (\$)	Hard Copy		Microfiche	
			Fy 81 Sales	Revenue (\$)	Fy 81 Sales	Revenue (\$)
CLASSROOM SERVICES: A GUIDE TO ORGANIZING A CLASSROOM SERVICES UNIT IN HEALTH SCIENCES EDUCATIONAL INSTITUTIONS	3	\$ 6.5	8	\$ 52.0	37	\$ 129.5
CONTENT ANALYSIS OF VETERINARY PATHOLOGY	3	14.0	5	70.0	45	157.5
COOPERATIVE APPROACH TO DESIGNING, DEVELOPING, AND EVALUATING SELF-INSTRUCTIONAL MATERIALS FOR MEDICAL STUDENTS	3	6.5	6	39.0	37	129.5
COOPERATIVE SHARING OF AUDIOVISUAL MATERIALS IN MEDICAL SCHOOLS...A NETWORK APPROACH	3	8.0	11	88.0	37	129.5
DEVELOPING A LEARNING RESOURCE CENTER	3	8.0	20	160.0	53	185.5
EDUCATIONAL COGNITIVE STYLE FOR HEALTH SCIENCES STUDENTS FINAL REPORT: PART I--TEST BATTERY & ADMIN MANUAL	3	11.0	3	33.0	37	129.5
EDUCATIONAL COGNITIVE STYLE FOR HEALTH SCIENCES STUDENTS FINAL REPORT: PART II--RESEARCH DESIGN & ANALYSIS OF DATA	3	12.5	4	50.0	37	129.5
EFFECTIVE CLINICAL TEACHING	3	8.0	119	952.0	37	129.5
ESTABLISHING A LEARNING RESOURCE CENTER IN A MEDICAL LIBRARY	3	5.0	29	145.0	52	182
ESTABLISHING AN EDUCATIONAL DEVELOPMENT SERVICES UNIT	3	6.5	12	78.0	37	129.5
JOINTS AND MOVEMENTS	3	6.5	7	45.5	36	126.0
LEARNING RESOURCES CENTER CONFERENCE: PROCEEDINGS AND EVALUATION	3	8.5	8	68.0	37	129.5
LEGAL AND ETHICAL ASPECTS OF PROPRIETARY RIGHTS TO FEDERALLY FUNDED MEDIA PROGRAMS	3	5.0	5	25.0	49	171.5



## PUBLICATIONS ON NLM RESEARCH AND DEVELOPMENT, TECHNICAL REPORTS AND TEACHING TOOLS

## (2) National Medical Audiovisual Center Publications

Title	Months Item Available For Sale (As of 9/30/81)	Price (\$)	Hard Copy		Microfiche	
			Fy 81 Sales	Revenue (\$)	Fy 81 Sales	Revenue (\$)
MEDICAL AND GRAPHIC ARTS UNIT	3	\$ 6.5	9	\$ 58.5	43	\$ 150.5
MEDICAL CINEMATOGRAPHY	3	8.0	5	40.0	87	304.5
MEDICAL TELEVISION CENTER	3	5.0	13	65.0	92	322.0
ORGANIZING A BIOLOGICAL PHOTOGRAPHIC UNIT	3	6.5	12	78.0	47	164.5
EVALUATION OF THE NATIONAL MEDICAL AUDIOVISUAL CENTER MEDIA DISTRIBUTION PROGRAM		15.5				
PATIENT ORIENTED PROBLEM-SOLVING SYSTEM IN IMMUNOLOGY: IMMUNODEFICIENCY DISEASE	3	39.5	3	118.5	--	--
INFLUENZA: SEROLOGIC DIAGNOSIS AND EPIDEMIOLOGY	3	9.5	0	--	40	140.0
INSTRUCTOR'S MANUAL	3	9.5	0	--	40	140.0
PATERNITY CASE: BLOOD GROUPS & ALLOTYPES	3	5.0	1	5.0	40	140.0
TETANUS IMMUNITY	3	9.5	0	--	39	136.5
PROBLEM-BASED LEARNING IN HEALTH SCIENCES EDUCATION	3	9.5	0	--	40	140.0
TECHNICAL MANUAL FOR APPLIED MATHEMATICS FOR MEDICAL SCHOOLS	3	6.5	10	65.0	37	129.5
TRIGGER FILMS--DEVELOPMENT AND USE	3	5.0	3	15.0	37	129.5
USE OF SUBJECTIVE EVALUATION INSTRUMENTS IN HEALTH SCIENCES EDUCATION	3	8.0	5	40.0	40	140.0
A GUIDE TO LESSON PREPARATION FOR VETERINARY MEDICINE (1978)	3	8.5	9	76.5	37	129.5
		4.5				
National Medical Audiovisual Center Totals			478	3,864.0	1,600	5,600.0

LHNCBC prices, hard copy, range from \$3.50 to \$30.50; average of those sold = \$10.77. NMAC prices, hard copy, range from \$4.00 to \$39.50; average of those sold = \$8.08







TABLE 9 (Page 2)  
 FY 81 CHARGES FOR USE OF NLM TAPES OR ONLINE ACCESS TO NLM COMPUTER

TABLE 9A		TABLE 9B	
FILES AND SERVICES* (a)	ESTABLISHED CHARGES \$ (K) (b)	USERS OF TAPES OR ONLINE SERVICES (c)	FILES USED (see column a) (d)
B BIOETHICSLINE Each year	1	5. GERMANY	M, T, CH, R, CAL, CAP, CLP, HEA, Me
H HISTILINE Each year	1	6. JAPAN	M, T, CH, Me
HEA HEALTH PLANNING & ADMINISTRATION Each year	2	7. SWEDEN	M, CH, R, CAL, CAP, CLP, Me, SDI
P POPLINE Each year	2	8. SWITZERLAND	M
TD TOXICOLOGY DATA BANK First year	25	FOREIGN ONLINE ACCESS (quid-pro-quo)	
Each subsequent year	17.5	1. COLOMBIA	M, C, A, R, CAL, CAP, CLP, S, B, H, HEA, P, Me, SDI
ME MeSH First year	1	2. FRANCE	M, C, A, T, CH, R, CAL, CAP, CLP, S, B, H, HEA, P, Me, SDI
Next four years	0	3. ITALY	M, C, A, R, CAL, CAP, CLP, S, B, H, HEA, P, Me, SDI
SDI SDIline	0	4. MEXICO	M, C, A, R, CAL, CAP, CLP, S, B, H, HEA, P, Me, SDI
		5. SOUTH AFRICA	M, C, A, T, CH, R, CAL, CAP, CLP, S, B, H, HEA, P, Me, SDI

\* In dollars or in quid-pro-quo services by Foreign MEDLARS Centers

\*\* SUNY is NLM contractor

\*\*\* Beth Israel is NLM grantee



Center are available in NLM Annual Reports. The additional publications activity in FY 1981 through NTIS is summarized in Table 8. For the 44 Lister Hill Center publications listed as available, prices range from \$3.50 to \$30.50 in hard copy; the average price of all 1,239 sales was \$10.77. Total revenue was approximately \$13,300. The 893 microfiche copies sold at \$3.50 each resulted in an additional \$3,100 revenue.

For the 44 National Medical Audiovisual Center publications, hard copy prices ranged from \$4.00 to \$39.50; the average price of all 478 sales was \$8.08. Total revenue was just under \$4,000. The 1,600 sales of microfiche copies at \$3.50 each resulted in additional revenues of \$5,600.

The publication TOX-TIPS is sold by NTIS by subscription, \$40.00 annually for domestic and \$80.00 annually for foreign purchasers. In FY 1981 there were 292 U.S. and 109 foreign subscriptions resulting in total revenues of \$20,400. An additional 200 copies are distributed free by GPO to Government Depositories.

Table 9 summarizes the charges for individual NLM files either as licenses for tapes or online access to the NLM computer. The individual files that are available and annual charges for them are identified in Table 9A (columns a and b). In Table 9B, both domestic and foreign recipients of NLM tapes, as well as foreign MEDLARS centers with direct online access to the NLM computer are indicated (column c); and the files used by each and the total charges (columns d and e).

A variety of files are used by the foreign MEDLARS centers, either by lease of tapes or by direct online access to the NLM computer. The foreign tape recipients provide levels of quid-pro-quo services equal to the established charges listed in Table 9A. For foreign online access (to all the NLM databases) the level of quid-pro-quo services is determined by the value of the numbers of online connect hours, but there is an annual minimum of \$20,000. The foreign MEDLARS centers provide services in return for this access to the files. The total resources obtained for use of these NLM files is approximately \$550,000 a year; these come to NLM in the form of equivalent services, principally as indexing of the foreign literature, through quid-pro-quo agreements.

As of September 1981, there were 1,537 domestic online users distributed in institutions as follows:

Medical School	125	Research Institute	127
Allied Health	70	Foundation/Society Assoc.	45
Other University/College	57	Commercial	328
Other Library	20	Information Agency	37
Hospital/Clinic	684	Other	44



It is estimated that in Fiscal Year 1981, there were just over two million searches conducted on NLM databases. Actual numbers of searches are not counted; estimates are by a formula based on the number of "print" commands which the NLM computer does record. Table 10 shows the estimated number of searches on the individual NLM databases from Fiscal Year 1979 through 1981. In a survey of online use of the Toxicology Data Base in 1979, calculations from measurement of the duration of searches and total connect hours indicated 43,000 searches, almost four times the 10,953 estimated by the usual formula. It is not known if this discrepancy is limited to "data-providing" databases or extends to bibliographic databases as well.

Included in Table 10 are both online and offline searches. The predominant use of MEDLINE is obvious. Other databases frequently used are TOXLINE, HEALTH, CHEMLINE, CANCERLIT and SERLINE. Although NLM does not collect data on the individual users of its services, there is some information as to the percent of searches and connect hours by user categories, as shown in Table 11.

IN FY 81 there were a total of 7,443,000 pages of offline prints, comprised of:

MEDLINE	4,257,000
CATLINE	33,000
CHEMLINE	5,000
TOXLINE	940,000
All Other Databases	2,208,000

In FY 1981, charges for connect time to the NLM computer for domestic users were \$15/hour during prime time and, and \$8/hour during non-prime time periods. Off-line prints were \$.15 per page. (These rates were increased during FY 1982). For FY 1981 (see Table 11), total billed charges were \$2,626,000 (\$1,682,000 for online connect hours and \$944,000 for page charges). Cash payments received by NTIS were \$2,073,000.

Additionally, online access is provided by the private sector. MEDLINE the largest of the NLM files is available through BRS and DIALOG, two of the major online vendors in the United States.

In FY 1981, the NLM filled 87% of 236,837 Interlibrary Loan requests received. Approximately, 19,000 of those were requests from foreign countries, for each of which there was a \$4.00 charge for mailing and handling. U.S. ILL requests are filled without charge.

In 1981, through its National Medical Audiovisual Center, the National Library of Medicine loaned 14,990 films and 369 videocassettes without charge. Approximately 1500 audiovisual teaching packages were sold through the Federal-wide distribution mechanism, the National Audiovisual Center at prices determined by them to cover reproduction and distribution costs.



TABLE 10  
ESTIMATED NUMBER OF SEARCHES ON NLM DATABASES, FY 1979-1981

DATABASES	1979		1980		1981	
	ONLINE	OFFLINE	ONLINE	OFFLINE	ONLINE	OFFLINE
AVLINE	14,387	17	17,656	29	20,397	21
BIOETHICS	2,403	6	3,426	13	3,762	35
CANCERLIT	36,706	1,394	41,795	3,778	41,457	6,026
CANCERPROJ	5,713	271	5,002	276	3,700	173
CATLINE	184,667	177	208,639	247	191,314	141
CHEMLINE	46,149	54	59,767	43	55,039	84
CLINPROT	1,571	23	1,558	11	1,825	6
EPILEPSYLINE	2,028	20	2,511	28	2,448	7
HEALTH	23,387	325	46,971	547	61,564	902
HISTLINE	3,263	8	3,291	5	3,652	7
MEDLINE	548,469	36,997	682,802	45,828	741,632	45,779
MED79						
MED77				83,202	105,822	83,864
MED75		91,956		106,358		94,975
MED72		76,818		78,593		70,523
MED69		58,867		62,269		56,409
MED66		42,337		44,187		40,346
MESH VOCABULARY	2,870	0	6,582	0	19,044	7
NAME AUTHORITY	5,327	0	5,406	44	7,219	0
POPLINE					11,616	765
RTECS	9,788	82	12,537	134	14,747	257
SDILINE	19,394	71,173	18,978	108,978	17,551	147,109
SERLINE	23,577	8	37,197	17	37,645	15
STORED SEARCH	60		101		115	
TDB	10,953*	74	9,820	99	14,243	185
TOXLINE	64,677	11,976	86,333	17,208	77,135	22,409
TOXBACK**		7,693		8,424		
TOXBACK 74				578	2,612	8,919
TOXBACK 65				545		8,578
TOTAL	1,005,379	398,276	1,250,372	561,441	1,434,539	587,542

\* A Direct survey of TDB use indicates 43,000 online searches in FY 1979 (see text discussion).

\*\* TOXBACK was divided into two backfiles (TOXBACK74 and TOXBACK65) in September 1980.



TABLE 11  
 .nlm ONLINE BILLED CHARGES AND CONNECT HOURS BY USER TYPE (FY-1981)

	Billed Charges \$(K)	Total All Databases (Hours)	CONNECT HOURS						All Other Databases (Hours)
			(%)	(%)	(Hours)	(Hours)	(Hours)	(Hours)	
Hospital/Clinic	835	54,908	(31.7)	42,667	3,001	144	949	8,147	
Other Library	20	3,703	(.8)	2,096	694	70	263	580	
Other University	42	1,818	(1.8)	1,370	22	19	134	273	
Allied Health	90	4,848	(3.4)	3,497	381	35	259	676	
Medical School	595	28,228	(22.7)	19,679	2,990	191	916	4,452	
NLM		19,403	(11.8)	6,382	3,539	1,530	1,203	6,749	
Government/Other Research	380	13,186	(14.4)	6,131	644	865	2,117	3,429	
FDN/SOC/Associations	49	3,077	(1.9)	2,388	183	7	64	435	
Commercial	574	18,056	(21.8)	10,569	201	1,084	3,490	2,712	
Information Agency	18	897	(.7)	299	19	112	72	395	
Foreign		13,889	(8.5)	10,232	433	107	897	2,220	
Other	19	938	(.6)	535	80	8	51	264	
Totals	2,626	162,951	(100.0)	105,845	12,187	4,172	10,415	30,332	



## F. Summary Comments on Fee Policies

In the preceding sections there have been described the services and products available from the National Library of Medicine and its collaborating organizations. The following briefly summarizes the fee policies for each:

### 1. Library Service Publications:

These NLM products are published by GPO. This group accounts for a large fraction of the total NLM publication revenue. Fees (summarized in Tables 6 and 7) are determined by GPO to cover their costs of publication plus overhead. Excess funds recovered are returned to the U.S. Treasury. Differences in fees for domestic and foreign purchasers is based on differences in mailing costs. There are no restrictions on uses.

### 2. Recurring Bibliographies:

Recurring bibliographies are done mainly as cooperative ventures using minimal NLM resources to support outside professional organizations (except for the Index Medicus Journals). Determination of price is in the hands of those outside organizations. Recurring bibliographies are a small percent of NLM publications. Whatever funds are collected for Recurring Bibliographies go to the outside professional organizations which sponsor them; data are not available as to whether or not charges are, in fact, made. There is no information on differential fees or restrictions on use.

### 3. Literature Searches:

Literature Searches are done by NLM staff and are provided free-of-charge upon request. Literature Searches comprise a small percent of total NLM publications. There are no restrictions on use.

### 4. Publications on NLM Research and Development, Technical Reports, Teaching Tools, and Other

These publications are distributed through NTIS for charges as indicated in Table 8. NTIS determines fees for most publications. In those few instances in which the products are software, NLM helps determine the price to recover a reasonable proportion of full costs. Funds collected by NTIS cover their expenses. Excess funds collected are returned to the U.S. Treasury. Differential fees for domestic and foreign purchasers are summarized in Table 8. There are no restrictions on use, except for software, which is licensed through NTIS and which cannot be transferred to someone else's use.



## 5. Publications for Administrative and Public Information Purposes:

These NLM publications are for administrative purposes, are free of charge, constitute a small proportion of total publications, and have no restriction on use.

## 6. NLM Database Tapes and Online Access:

Online services are a moderate percentage of all NLM products and services. Users may access NLM databases online directly or may lease tapes for fee, as summarized in Table 9. Fees for usage are set to recover full costs of making online services available, and the fee schedule is the same for all users. Foreign MEDLARS centers are restricted to providing services to specified geographic areas upon agreement with NLM.

The extensive online use of the NLM databases throughout the United States is charged for on connect-hour rates (see page 25). The fees are collected by NTIS, and excess above expenses are returned to the U.S. Treasury.

## 7. Interlibrary Loans:

Interlibrary Loans are provided to U.S. libraries without charge. This is done as part of NLM's contribution to the Regional Medical Library Network. A fee of \$4.00 per filled request is charged for foreign libraries.

## PARALLEL ACTIVITIES IN THE NON-FEDERAL SECTOR

The previous sections of this report indicate that when viewed as a whole the information products and services of the National Library of Medicine constitute a unique phenomenon that is without parallel in the non-Federal sector. The uses of NLM's products and services demonstrate the importance to the health science communities of the NLM. Nonetheless, there are other organizations in the non-Federal sector which provide partial services of somewhat similar nature and with some degree of similarity of content. The following are the main organizations which provide information services relevant to the field of medicine and public health, the domain of NLM:

### A. Biosciences Information Service

This not-for-profit organization covers basic research in the life sciences including agriculture, biochemistry, bioengineering, biophysics, ecology, experimental medicine, microbiology, and pharmacology. Approximately 9,000 scientific journals are screened, as well as are books, monographs, meetings and conference proceedings, semi-popular journals, research communications, and symposia. Three million records from 1969 to the present are available online on BIOSIS. Approximately 23,500



records are added monthly. BIOSIS Previews is the bibliographic database corresponding to the printed versions of Biologic Abstracts (BA) and Biological Abstracts (RRM). Access is through DIALOG and SDC.

#### B. Chemical Abstracts Service

Chemical Abstracts (CA) provides international coverage of the chemical literature from more than 14,000 scientific and technical journals, as well as conference proceedings, congresses and symposia, technical reports, dissertations, new books, announcements, and patents from twenty-six countries. Approximately one third of the literature is biochemical. The indexes to CA are numerous and complex. The CA SEARCH database contains bibliographic data, keyword phrases, and index entries for all documents covered by Chemical Abstracts Service. It contains about 5,000,000 records covering 1967 to the present. CA SEARCH is an expanded database which contains the basic bibliographic information appearing in the printed Chemical Abstracts, and the CASIA file, which contains CA General Subject Headings from a controlled vocabulary and the CAS Registry Numbers, a unique number assigned to each specific chemical compound. Additional uncontrolled vocabulary terms and cross referenced CA General Subject Headings are also included. Access to the online database is via BRS, CAS ONLINE, DIALOG and SDC.

#### C. Excerpta Medica

Excerpta Medica is an information retrieval service that indexes biomedical and clinical literature. Sixty percent of its records include abstracts. Started as an independent non-profit foundation, it has been acquired by a major scientific publisher (Elsevier-NDU). Excerpta Medica publishes two indexes of bibliographic references to the Drug Literature, 43 journals containing abstracts of articles published in the primary journal literature and six core journals containing abstracts for discrete clinical specialties from the 43 abstract journals. Annually, 400,000 articles from 35,000 journals are screened and 240,000 articles per year (150,000 with abstracts) are included in the 43 specialty journals. Excerpta Medica products are directed to clinicians and research scientists. Most indexing is done by practicing physicians. Two million records have been entered into Excerpta Medica since 1967. Updating occurs every two months. Access to Excerpta Medica records is through DIALOG.

#### D. INFORMATION RETRIEVAL LIMITED

INFORMATION RETRIEVAL LIMITED (IRL) is a privately owned English company which does abstracting in 15 discrete areas of biology and medical sciences. It thoroughly covers journals, books, conference proceedings, reports, patents, and other literature in



its specific areas. IRL screens 5,500 periodicals, contains 440,000 records entered since January 1978, adds 110,000 records per year and is updated weekly. It provides full abstracts in English. Indexing and abstracting is done by university graduates in the life sciences. Information is available online via DIALOG.

E. SCISEARCH

SCISEARCH (SCI) is a bibliographic database of the Institute for Scientific Information (ISI), a private-for-profit company. ISI provides a comprehensive information discovery and retrieval system including weekly alert bulletins (Current Contents); a selective dissemination document provision service; and two large interdisciplinary databases, the Science Citation Index (online as SCISEARCH) and Social Science Citations Index (online as Social SCISEARCH). SCI covers 2,600 journals based on citation indexing. Citation indexing links documents by the author's use of citations and provides a unique kind of searching capability. Through citation indexing, subject areas can be traced through time. SCISEARCH contains 3,000,000 records and is updated monthly. It is available online via DIALOG and BRS.

F. Psychological Abstracts (PSYCINFO)

Psychological Abstracts, now known as PSYCINFO is prepared by the American Psychological Association. PSYCINFO covers the world's literature in psychology and related disciplines in the behavioral sciences. Over 900 periodicals and 1500 books, technical reports, and monographs are scanned each year to provide coverage of original research, reviews, discussion, theory, conference reports, panel discussions, case studies, and descriptions of apparatus. It includes both human and animal aspects in animal psychology; applied psychology; communication and language; cultural influences and social issues; developmental psychology; education; neurology and physiology; perception and motor performance; personality; physical and psychological disorders; psychometrics and statistics; treatment and prevention; and personnel and professional issues. Covers the psychology and behavior of groups and organizations in addition to that of individuals. PSYCINFO contains about 350,000 citations from 1967 to the present. Access is via BRS, DIALOG, SDC, and DATA-STAR.

G. International Pharmaceutical Abstracts

International Pharmaceutical Abstracts is produced by the American Society of Hospital Pharmacists. It contains citations and abstracts of the literature pertaining to the development and use of drugs and to the clinical, practical, theoretical, scientific, economic, and ethical aspects of professional pharmaceutical practice. Topics covered include pharmaceutical research, development and technology; adverse drug reactions and toxicity; drug evaluation, analysis, interactions; pharmaceutical chemistry; legislation, laws, and



regulations; and information processing for the pharmaceutical industry. Each abstract of clinical studies includes a description of the study design, number of patients involved, and dosage amounts, forms, and schedules. It corresponds to the printed International Pharmaceutical Abstracts. The database draws on more than 500 pharmaceutical, medical, and related journals, and contains about 65,000 references from 1970 to the present. Access is through BRS and DIALOG.

In addition to the above databases, there are available online search services in the commercial sector. The major ones are Bibliographic Retrieval Service (BRS), DIALOG Information Services, Inc., and System Development Corporation (SDC). Through their online systems, they make available many databases from the private sector and government. There is competition among these vendors in providing improved access to databases. All have major search capabilities. They offer to users the convenience of access through one system to many databases.

#### A. Bibliographic Retrieval Services

BRS covers medical and health areas (including MEDLINE) as well as science business and technology. It offers more than 50 different files online. BRS began as a non-profit agency at the State University of New York, became a non-profit concern, and recently has been purchased by Indianhead, Inc., an information science company.

#### B. DIALOG Information Services, Inc.

DIALOG, a subsidiary of Lockheed Corporation, initiated online retrieval systems. It provides access to 120 databases of which six are relevant to health and medicine. Its databases cover business, social science and the humanities as well. It has more than 10,000 users.

#### C. System Development Corporation

SDC started as a non-profit company in 1956 as part of the RAND Corporation. It became a for-profit corporation in 1968. SDC with NLM contractual support helped in developing the MEDLARS software package. The company was purchased by Burroughs Corporation in 1980. It is estimated that 15% to 20% of its activity is in the medical area. SDC believes that the majority of its users in biomedicine are from pharmaceutical firms rather than from academic or medical institutions.



NLM has contracts for access by NLM staff to four major commercial online vendors and their databases. Payments for use of these databases in fiscal year 81 and estimated fiscal year 82 are:

	<u>FY 81</u>	Estimated <u>FY 82</u>
BRS	\$ 2,487	\$ 5,000
DIALOG I.S.	7,452	7,000
SDC	3,206	3,000
NY Times Information Bank	597	2,000

Use of these databases by NLM staff is for (1) supporting inhouse staff projects; (2) supporting an occasional patron request (where other available databases do not reveal the required information), and (3) for seeking information needed for NLM users (e.g. producing specialized bibliographies). It is evident that total use of these four major outside information resources is trivial compared with the total volume of NLM inhouse work and the services provided by NLM to users.

Questions about redundancy of various online services as to the journal literature they index and abstract can be answered by studies of coverage overlap. In 1977, the National Federation of Abstracting and Indexing Services published A Study of Coverage Overlap Among Fourteen Major Science and Technology Abstracting and Indexing Services. It found that of approximately 26,000 journals scanned by any of the services, only 5,466 (or 21%) had one or more 1973 articles (the cohort studied) abstracted and/or indexed by two or more services. The remainder of the 26,000 journals had no article overlap whatsoever.

Because some of these A & I services were in the physical and earth sciences, it is important to examine the data relating NLM to other life sciences systems. In the study the "maximum possible article overlap" was identified, but this is a statistical upper limit and greatly overstates the actual overlap. The maximum possible article overlap found between NLM (Index Medicus) and the other services were:

NLM - BIOSIS	29.3%
NLM - Chemical Abstract Service	14.5%
NLM - Bibliography of Agriculture	4.4%
NLM - Psychological Abstracts	3.6%
NLM - The nine other A&I Services	< 1.2%

Thus, the journal article overlap of NLM databases with other systems is small. Applying a given search strategy to an NLM database will give a significantly different result than from any other of the above life sciences databases.



An April 1974 study compared Excerpta Medica (EM) and MEDLARS literature retrieval (Verheijen-Voogd, C. and Mathijssen, A.; ASLIB Proceedings, Vol 26, No. 4). For a broad range of subject matter searches, MEDLARS gave more unduplicated (unique) relevant references than did EM; the precision (percent of relevant in total number of references) of retrieval averaged 38 percent for MEDLARS and 55 percent for EM; and recall (estimated percent of relevant articles retrieved from the literature) averaged 33 percent for MEDLARS and 18 percent for EM. The overlap was small. In 23 searches, EM produced 737 and MEDLARS 2,821 references; of these totals, 246 references (7.4%) were in both. In another 15 searches, EM offered 226 and MEDLARS 467 references, with only 94 (15.7%) being in both.

In summary, the various life sciences databases do have small amounts of overlap, and are complementary to each other. No one database can substitute for any other one. Searches on multiple databases results in greater amounts of information for the user. Both Federal and private sector databases are needed to meet the wide variety of information needs of many different user communities.

#### MECHANISMS FOR OBTAINING ADVICE AND CONSULTATION FROM USERS

- A. The following formal Advisory Groups are used for obtaining advice and consultation:
  1. Board of Regents of the National Library of Medicine advises, consults with and makes recommendations on matters of policy such as the acquisition of materials; the scope, content and organization of Library services; and rules under which its materials, publications, facilities and services are made available to various kinds of users. It performs a final review of proposals for projects designed to develop facilities and techniques necessary to collect, preserve, store, process, retrieve and facilitate the dissemination and utilization of knowledge in the health sciences and the biomedical information as generated. The Board has ten members appointed by the Secretary of DHHS from among leaders in the various fields of the fundamental sciences, medicine, dentistry, public health, hospital administration, pharmacology, scientific or medical library work or in public affairs.
  2. Biomedical Library Review Committee provides advice and makes recommendations regarding proposals for support of training programs in medical library and other information sciences, medical library resource programs, special scientific projects, program of biomedical scientific publications, and a program to facilitate the development of a biomedical communications network throughout the country. The committee consists of 16 members appointed by the Director, NIH who are selected for their competence in the health sciences, librarianship, education, information, computer technology, and learning resources.



3. Board of Scientific Counselors of the National Library of Medicine provides advice concerning the intramural research and development programs of NLM. The Board consists of members knowledgeable in the fields of health sciences, information sciences, information technology, library sciences, behavioral sciences, social sciences, educational technology, communications engineering and media development and utilization.
  4. Toxicology Information Program Committee of the National Academy of Sciences. This advisory committee of the National Academy of Sciences has served as a peer review body for the plans, development, and performance of the Toxicology Information Program.
- B. Other Mechanisms Used. In addition to the above formally constituted advisory bodies, there are many continuing activities through which there is discussion and advice provided to NLM programs. Among them are:
- o Regional Medical Library Directors meet frequently with NLM staff to review all aspects of the Library's programs.
  - o International MEDLARS Policy Committee allows interchange between representatives of those countries with which bilateral agreements have been made for use of MEDLARS.
  - o Medical Library Association has a liaison group with the National Library of Medicine.
  - o NLM has an online users meeting at the annual meeting of the Medical Library Association.
  - o The American Library Association has NLM staff as liaison members to that organization.
  - o The Federal Library Committee has a liaison member from NLM.
  - o The Association of Research Libraries has a formal liaison member from NLM.
  - o NLM is a member of the Library of Congress Network Advisory Committee.
  - o NLM staff have multiple participating roles in and memberships on committees of ANSI (American National Standards Institute).
  - o Standing Committee on Online Retrieval Education is a group with three-year rotating memberships and is chaired by an NLM staff member.



- o Technical Review Staff (Regional online trainers) meet annually at NLM to update their information.
- o There is a liaison member to the OCLC Health Science Users Group.
- o Liberal use is made of expert consultants in a variety of fields to support the individual programs of NLM. On occasion, major conferences are held to address important issues in the providing of services by NLM. An example is a recent conference of hospital librarians set up to allow full discussion of the special needs of that group.
- o The MEDLARS Management Service Desk has online interaction with NLM database users eight hours per day. This is a source of much information regarding users problems and suggestions for change.
- o MEDLARS III Task Force has used a variety of consultants from all aspects of the library and information science communities to help design the retrieval system for the 1980's.
- o A symposium was held on "Information Transfer in Toxicology," September 16, 1981 as a follow-up to a previous symposium on "Handling of Toxicological Information," May 27-28, 1976.
- o FASEB forms ad hoc panels of experts to address specific areas of Toxicology which need to be reviewed for the Toxicology Program of NLM.
- o The Toxicology Data Base has its proposed new records reviewed by a subcommittee of the Toxicology Study Section of the Division of Research Grants, NIH.
- o NLM has representatives to many NIH-BID Commissions and Clearinghouses.
- o The feedback information provided by the very large and varied universes of users of NLM services is a major influence for change.

#### CONSEQUENCES OF DISCONTINUING THE ACTIVITY

The National Library of Medicine Act explicitly defined the major role of NLM in the dissemination and exchange of scientific and other information related to medicine and public health. Its responsibility included acquiring and preserving all forms of health-related publications, organizing them, and making available appropriate catalogs, indexes and bibliographies, as well as to provide other services. The NLM archive and its products and services have been the framework used throughout the world for accessing and using publications in medicine and related sciences. Were these essential national library roles discontinued, they would not be assumed by the non-Federal sector.



There is no hint that any private commercial enterprise would be able or willing to take on the extremely complex, difficult and expensive tasks crucial to maintenance of both Federal and private biomedical literature analysis and retrieval systems of today. History offers some insights into the ability of the private sector to take over NLM's current essential library services. In the 1890's Index Medicus had fiscal deficits, and in 1899 failed. A group of French physicians revived it, but for only three years. Its solvency occurred only through support of the Carnegie Institution. Substantial duplication developed between Index Medicus and the AMA Quarterly Cumulative Index Medicus, and the two merged as the Quarterly Cumulative Index Medicus in 1927. This publication lost money, and was subsidized by the AMA. In the 1940's, the Current List of Medical Literature was published privately. In the 1960's, the National Library of Medicine again took over the production of Index Medicus and other bibliographic publications. These experiences suggest that in the field of biomedicine, if there is not subsidization, costs for these essential library support publications become too great, circulation is reduced, less information is disseminated, and there is impairment of an important public function.

The mandate of the National Library of Medicine was augmented by the Medical Library Assistance Act of 1965 which emphasized the use of new technologies and the need for expanded dissemination of information efforts. As new technologies became available, the NLM was the pioneer in establishing and implementing new methods for biomedical information transfer, namely, use of photoduplication for Interlibrary Loans and the conception, construction, and implementation of computerized information storage and retrieval systems. Those augmentations of the NLM essential library services that are provided by online systems (MEDLARS) and associated services (publications and tapes) derive from and efficiently use the NLM efforts expended in performing its basic missions. The pattern of these augmented services is determined largely by the content and character of the underlying essential library services. This pattern of products and services has been very well utilized by the many and varied communities of health professionals the NLM is mandated to serve. It is recognized that value added, enhanced versions of NLM information products and services are now and will in the future be supplied by the private sector, but the pattern of NLM databases as a whole would not be taken over by private companies. The variety of content in the databases could not be maintained if databases that were not profitable were dropped. There are innumerable small, but important areas of the biomedicine-fields that may deal with small populations of patients, for example. For-profit companies would continue the profitable databases, but discontinue those losing money because of a small market of users. Again, the public good would be impaired.

The NLM information system should be seen as the base of Federal investment upon which the private companies draw and which allows them to offer enhanced information products and services. NLM has created a private sector potential that would not otherwise exist.



Thus, there is and should continue to be some small degree of overlap and duplication, but most importantly, great complementarity of Federal and private sector efforts. As the NLM continues to modify and improve its online services and alters the portfolio of substantive subject matter with which it deals, it can be expected to continue to contribute to the versatility of health-related information services that both the Federal and private sectors will provide. The private sector alone could not and would not replace the library services now offered by the NLM. The private sector can provide enhanced information services, but can do so by building upon the mix of essential and augmented library services that the NLM performs.





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