

**THE UNIVERSITY OF MARYLAND, BALTIMORE
HEALTH SCIENCES AND HUMAN SERVICES LIBRARY
FY 2009 LIBRARY COST STUDY FINAL REPORT**

APRIL, 2010

EXECUTIVE SUMMARY

The objectives in performing a library cost analysis study at the University of Maryland, Baltimore (UMB) were to: (1) identify the level of expenditures incurred by the University of Maryland, Baltimore Health Sciences and Human Services Library (the Library) in support of sponsored (funded) research, instruction (including education and departmental research), patient care and other institutional activities (2) determine the extent to which the University of Maryland, Baltimore Health Sciences and Human Services Library's collections and services are utilized by the University of Maryland Medical Center and other hospitals and the associated costs and (3) documenting the costs associated with providing library services to the various academic units served by UMB's Health Sciences and Human Services Library.

The library cost analysis study methodology employed at UMB generally consisted of three components:

1. Identifying the Library's total allowable costs for the fiscal year related to the University of Maryland, Baltimore Health Sciences and Human Services Library using five library expense classification categories: salaries; benefits; other expenses (travel, supplies, telecommunications, and other miscellaneous expenses); library materials; and cross-allocated costs; and then assigning these costs to discrete cost centers at the Library.
2. Performing an in-house survey of Library users during randomly selected survey periods during a twelve-month period. The library user survey identified library users and their purpose for using specific library materials and services.
3. Conducting an online survey of the Library's electronic services users, including remote users (i.e., those using the Library's electronic services from a location outside the Library, either on or off-campus).

The principal findings in the library cost analysis study at the University of Maryland, Baltimore Health Sciences and Human Services Library were the determination that of the Library's Fiscal Year 2009 allowable expenses of \$10,283,517: (1) \$1,477,214 (14.36%) were in support of UMB's sponsored (funded) research programs (2) \$895,802 (8.71%) supported University of Maryland Medical Center users (3) \$105,915 (1.03%) supported University of Maryland Medical System users and (4) \$761,788 (7.41%) supported other non-UMB users.

The study also determined the Library's FY 2009 costs incurred in support of six professional schools at UMB: the School of Medicine; the School of Nursing; the School of Social Work; the School of Pharmacy; the Dental School; and the School of Law.

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INTRODUCTION

The Health Sciences and Human Services Library (the Library) serves as the central information resource for the health sciences-related and social work programs and activities at The University of Maryland, Baltimore (UMB). Specialized Library staff members provide technical support for the research, instruction, patient care, and public service programs at the University and in the surrounding community. The operation of the Library is a major expense at The University of Maryland, Baltimore, representing significant benefit to the constituents it serves.

One motivation for performing a library cost analysis study at UMB was to determine the level of expenditures incurred by the Library in support of sponsored research, instruction (including training and departmental research), patient care, other sponsored activities, and other institutional activities. The methodology that was used for this aspect of the cost study is based on the agreement between KPMG Peat Marwick and the Department of Health and Human Services, Office of Grant and Contract Financial Management, in accordance with the cost principles for educational institutions set by the U.S. Government's Office of Management and Budget (OMB) Circular A-21, Section E.2 (d).

The cost study also enabled UMB to determine the extent to which the Health Sciences and Human Services Library's collections and services are utilized by the University of Maryland Medical Center and other area hospitals and the costs associated with providing library services to these affiliated hospitals and other non-UMB users. Finally, the study allowed the University to determine how UMB's academic units utilize the Health Sciences and Human Services Library and the associated costs.

LIBRARY EXPENSE CLASSIFICATION CATEGORIES

After a review of the major types of expenses assigned to the Health Sciences and Human Services Library in the UMB financial accounting system, the following library expense classification categories were developed as comprehensive expense categories for library expenses:

- Salaries
- Benefits
- Other Expenses
- Library Materials
- Cross-Allocations

The salaries and benefits categories were distributed to the Library cost centers (discussed below) according to actual compensation expenses incurred.

Other expenses included expenditures for items such as telephones, office supplies, printing, postage, non-capitalized equipment, supplies, institutional membership dues, travel and other miscellaneous expenses of this nature. These expenses were distributed to each cost center on the basis of their percentage of total salaries and wages (i.e., salary and wage basis).

The library materials category consisted of expenditures for print books, eBooks, print journals, eJournals, and databases.

Cross-allocations included indirect expenses assigned to the Libraries for the following cross-allocated expenses such as building depreciation; equipment depreciation; interest; utilities; facilities; and administrative and general expenses.

The University's general and administrative costs were assigned to the Library on the basis of modified total direct costs (MTDC). Operations and maintenance expenses, building-related depreciation, interest, and equipment depreciation were assigned on the basis of square footage occupied by the Library. Within the Library, general and administrative expenses were assigned to each library cost center on the basis of modified total direct costs and space-related costs were assigned to cost centers based on each cost center's percentage of net usable library space.

The Library's space was analyzed on a room-by-room basis and assigned to specific library activities (see Exhibit 7). These activities corresponded to the Library's cost centers with the exception of the library materials cost centers, which were replaced by book stacks and journal stacks and the addition of cost centers for study rooms and reading areas.

Allowable direct expenditures, by cost center, were then combined with general administrative-related indirect costs, by cost center, and space-related indirect costs, by cost center, to determine total allowable FY 2009 expenditures for the Library, by cost center (see Table 1).

LIBRARY COST CENTERS AND ALLOCATION BASES

After a review of the Health Sciences and Human Services Library organization chart (see Exhibit 1), the following cost centers were developed, which reflect Library organizational units, collections expenditures, book stacks, journal stacks, computer areas, and reading areas as comprehensive cost centers for UMB's Health Sciences and Human Services Library.

UMB Library Cost Centers

Allocation Basis

- | | |
|---------------------------------|--|
| • Administration | • Allocated to all other UMB Library cost centers on a modified total direct cost (MTDC) basis |
| • Circulation | • Circulation/Reserve Use |
| • Liaison & Outreach Services | • Reference/Research and Library Instruction Use |
| • Reference & Research Services | • Reference/Research and Library Instruction Use |

- Web Services
- Historical Collections
- Computing and Technology Services
- Catalog Management
- Collections Management
- Resources Sharing Services
- Print Book Purchases/Book Stacks
- Print Journal Subscriptions/Print Journal Stacks
- Electronic Books
- Electronic Journals
- Databases
- Reading Areas
- Computer Areas
- Electronic Services Use
- Special Collections Use
- Electronic Services Use
- Library Materials Use
- Library Materials Use
- Document Delivery/Interlibrary Loan Use
- Print Book Use
- Print Journals Use
- Electronic Services Use
- Electronic Journals Use
- Databases Use
- In-Library Use
- Electronic Services Use

These cost centers and allocation bases were used to distribute the Health Sciences and Human Services Library's FY 2009 expenses to UMB professional school affiliations (see Table 2), to UMB and non-UMB classifications (e.g., UMB graduate student, UMMC Resident) (see Table 5) and to the University's functional objectives (i.e., research, instruction, patient care, other sponsored activities, and other institutional activities) (see Table 8).

LIBRARY USER SURVEY METHODOLOGY

Survey Methodology Overview

In-house library user surveys (see Exhibits 2 - 3) were the primary determinant of the extent to which the Health Sciences and Human Services Library supports sponsored research, is used by the University of Maryland Medical Center and other area hospitals, and is used by UMB's academic units. The purpose of these surveys was to estimate the proportion of library utilization which was associated with organized research and other functional activities as well as by specific demographics of Library users. The surveys involved the selection of a random sample of time periods for conducting surveys and the distribution and collection of the survey forms at the Library during these randomly selected survey periods. A second (web-based) survey instrument (see Exhibit 4) was used to query use of the Library's electronic resources from inside the Library, on-campus but not in the Library, and off-campus. Key statistical and methodological considerations are highlighted throughout this section.

Sampling Frame Procedures

The **sampling frame** was comprised of all library users during the specified twelve month period. A **time sampling procedure** was used in which all library users were surveyed for a specified number of time periods during the year. In order to ensure a representative sample size with minimal disruption to library operations, these time periods were divided into two-hour time periods based on the Library's operating hours. A **random sample** of two-hour time periods using a monthly stratification was employed. Twenty-four two-hour time survey periods were scheduled and conducted during the one

year period from October, 2008 through September, 2009. The actual date and time periods each month were determined using a random number generator.

It is likely that user knowledge of the purpose of a library survey could have resulted in biased responses. To control for possible bias, neither the survey form nor posted notices informing users of the ongoing library survey disclosed the purpose of the survey. However, when a user survey was in progress, users were encouraged to complete the form.

For each randomly selected two-hour time period, a census of library users was conducted. The procedure involved distributing the survey forms as users arrived at the library and at the same time, surveyors requested information concerning user status (e.g., undergraduate student, graduate/medical student, faculty/staff, other) (see Exhibit 5). Survey form numbers distributed were also recorded on a Library User Survey Log for use as an audit trail (see Exhibit 6). Completed forms were collected from users as they left the library. The library user survey was based on the random moments sampling technique. To ensure the opportunity for all surveyed users to return a survey form, a box was placed at the exit area of the library. All forms were collected by library staff at the close-of-business at the library on survey dates.

The library user surveys were designed to determine who was using library collections and services, what collections and services were used, and each library user's purpose for using the Library during a specific visit. The in-house survey instruments were designed to capture the following information:

- Patron status
- Patron affiliation
- Surrogate usage
- Whether the purpose for their visit was only to study or photocopy non-library materials, use non-Library services such as Financial Aid, or attend a non-library class or special event
- Number and purpose of use for:
 - Electronic resources used (electronic journals, databases, etc.)
 - Print library materials used while in the library (books, journals, etc.)
 - Books checked out for use outside the library
 - Services utilized during the visit (interlibrary loan, consultations, etc.)

Definitions representing purpose of use categories such as sponsored research were developed based on the major direct cost functions used in UMB's Facilities and Administrative (i.e., indirect cost) submission. To check understanding of the sponsored research definition, users who indicated sponsored (funded) research as a purpose of use on the in-house survey from were asked to voluntarily provide the sponsor's name, the principal investigator/researcher, or the name of the grant.

Library use attributable to sponsored research and usage by status and affiliation was estimated using the survey forms to measure various library activities including the number of items used or photocopied in the library, the number of items checked out of the library or the number of services utilized in the library. Respondents indicated the extent of their use for each library activity separately in five response categories:

- Instruction/Education/Department Research
- Sponsored (Funded) Research Projects
- Other Sponsored Activities
- Patient Care
- Other Activities

To control for possible bias due to the response categories on the survey instrument, two separate in-house survey forms were used with the response positions for instruction and sponsored research alternated. The forms were **counterbalanced** across sampled time periods; so that the effect of the forms was random due to the random selection of time periods.

Increasingly, library resources are available in digital formats and library services are offered electronically. Library users no longer have to visit the library to gain access to digital library collections and services. Because these electronic resources and services increasingly represent a significant portion of annual library expenditures, a web-based user survey was employed to determine demographic characteristics, location and purpose of use for those library users utilizing electronic resources and services from either in the library, on-campus but not in the library, or off-campus. The web-based user surveys were conducted simultaneously with the in-house user surveys each month and tracked usage of electronic journals, electronic books, databases, the online catalog, document delivery/interlibrary loan requests, and other digital library services by demographics of users and purpose of use.

Compilation of the Survey Results

At the outset, the primary purpose of the library user survey was to estimate the proportion of library use attributable to sponsored (funded) research and to allocate OMB Circular A-21 allowable library expenditures accordingly. Therefore, the ratio estimate sought by conducting the library user surveys was the ratio of the number of research uses (Y) to the total number of library uses (X). This statistic is a ratio of two random variables, Y and X , rather than a proportion based on a fixed denominator. The ratio estimator, R , can be defined as:

$$R = \frac{\sum Y_i}{\sum X_i} = \frac{\bar{Y}}{\bar{X}}$$

$$\bar{Y} = \frac{\sum Y_i}{n}$$

The sampling distribution of R is normal for large sample sizes such as those employed in library use studies. For relatively small sample sizes (e.g., $n \leq 30$), R is slightly biased with a skewed sampling distribution. This is because Y and X are both random variables that vary from sample to sample. However, the bias and skew diminish as a function of sample size and are virtually zero for large sample sizes. As a general rule, the large-sample variance estimator may be used with confidence given that the sample size is greater than 30 and that the coefficients of variation for Y and X are each less than 10 percent.

In a random sample of size n with Y_i and X_i measured on each respondent, the standard

error of the ratio, $R = \bar{Y}/\bar{X}$ is estimated by the square root of:

$$\text{Var}(R) = \left\{ (1-f)/n\bar{X}^2 \right\} (S_y^2 + R^2 S_x^2 - 2RS_{xy}) \text{ where}$$

\bar{Y}, \bar{X} = means of research and total use, respectively

n = sample size

N = population size

$F = n/N$ = proportion of sampled respondents

S_y^2, S_x^2 = variances of research and total use, respectively

S_{xy} = covariance of Y and X .

The number of components that comprise the standard error can be reduced in several ways. First, the finite population correction factor, $(1-f)$ can be dropped since this term has negligible effect when the proportion, n/N , is small. Next coefficients of variation can be used in place of means and standard deviations. A coefficient of variation (CV) is equal to the standard deviation divided by the mean:

$$CV_Y = S_y / \bar{Y} \text{ and } CV_X = S_x / \bar{X}$$

Thus, the standard error of R becomes the square root of:

$$\text{Var}(R) = R^2 (CV_Y^2 + CV_X^2 - 2r_{xy} CV_X CV_Y) / n$$

Where $r_{xy} = S_{yx}/(S_y S_x)$ is the correlation between X and Y

In this form, there are five components of the standard error that must be estimated in order to determine sample size: R, CV_Y, CV_X, r_{xy} , and n .

The web-based user surveys logged a total of 5,823 uses. The statistical validity of the web-based user surveys for electronic resources use can be expressed as follows, where CV_y is the standard deviation/research use, CV_x is the standard deviation/total use and r is the correlation between research and total use:

Electronic Resources

Research % of Total Use Measured	CV-y	CV-x	r	Number of Uses Sought	Number of Uses Actually Surveyed	Confidence Level	Standard Error
7.54%	6	2.5	.45	719	5,823	95%	Less than 1%

The statistical validity of the in-house user surveys conducted at the Health Sciences and Human Services Library can be expressed as follows, where CV-y is the standard deviation/research use, CV-x is the standard deviation/total use and r is the correlation between research and total use:

Health Sciences and Human Services In-House Survey

Research % of Total Use Measured	CV-y	CV-x	r	Number of Uses Sought	Number of Uses Actually Surveyed	Confidence Level	Standard Error
11.45%	6	2.5	.45	1617	5,889	95%	Less than 1%

Data Controls

All responses of ten or more on an individual library user survey form for a single type of library material or service for a specific purpose of use were counted as ten. Permitting a maximum response of ten for a single library material or service helps to avoid bias in the survey results as a result of unreasonably large library usage by a single client. For the functional cost allocations, all undergraduate usage reported as sponsored (funded) research was counted as instruction usage and all library usage reported by non- University of Maryland, Baltimore users was counted as other institutional activities usage.

Non-Response Methodology

To compensate for non-respondents, surveyors asked users to whom in-house survey forms were distributed whether they were University of Maryland, Baltimore Bachelor of Science students, graduate students, faculty/staff, UMMC Staff/Residents, UMMS staff, or other users. Surveyors recorded each user's response on a tally sheet (see Exhibit 5). At the end of the survey process, it was determined what proportion of users entering the Library belonged to each classification category.

Usage patterns for each classification category were calculated based on those who actually responded to the survey form. These totals, for each classification category, were then multiplied by the appropriate non-response factor for each classification category and added to reported usage to determine the total library usage, adjusted for non-respondents, exhibited by each classification category for each specific group of library materials or services used as an allocation base.

An overall response level of 40 percent for the survey periods was set as the minimum acceptance response level. In addition to the overall minimum response level, the following minimum response levels for acceptable results were also easily met: 50 percent for faculty and staff; 40 percent for graduate students; and 30 percent for undergraduates. To determine to what extent Library users send colleagues to the Library in their place, the user survey form includes a question to determine whether the respondent was a surrogate user.

During the year-long survey, 2,215 paper survey forms were distributed to UMB Library users as they entered the Library at twenty-four randomly selected times. Of the survey forms distributed, 1,353 were returned, yielding an overall response rate of 61.5% (see Table 14).

In addition to the in-house paper surveys, library users were surveyed using a web-based survey form as they accessed the Library's electronic services. This survey was conducted concurrent to the in-house surveys and yielded usage information related to 5,823 electronic uses. All library users selecting one of the Library's electronic services through the Library's web pages responded to the web-based survey form before being linked to the electronic service they were requesting.

LIBRARY COST ANALYSIS STUDY RESULTS

The user survey portions of the library cost analysis study were designed to sample, using a statistically valid approach, how the UMB Health Sciences and Human Services Library's collections and services were used over the course of the year in FY 2009. The results of the user surveys, both in-house and web-based, were used as the basis for the allocation of library expenditures to UMB's functional activities as well as by status of user and by UMB and non-UMB affiliations (see Tables 2-8).

Functional Cost Allocations

The first determination in the Fiscal Year 2009 library cost analysis study at the University of Maryland, Baltimore was that \$1,477,214 of the Library's OMB Circular A-21 allowable expenses of \$10,283,519 were in support of UMB's sponsored (funded) research programs. By functional activity, allowable Library cost pool allocations were as follows:

<u>Sponsored Research</u>	<u>Instruction</u>	<u>Patient Care</u>	<u>Other Sponsored Activities</u>	<u>Other Activities</u>	<u>Total</u>
\$1,477,214	\$6,393,146	\$842,067	\$139,322	\$1,431,770	\$10,283,519
14.36%	62.17%	8.19%	1.35%	13.92%	100%

Library Cost Allocations by UMB Affiliation

The second determination was that, of the Library costs incurred by UMB users, almost 80% were support of the Schools of Nursing, Medicine, and Social Work. More specifically, \$2,755,002 in Library expenses were incurred by UMB School of Nursing users, \$2,580,866 were related to UMB School of Medicine users and \$1,393,612 were associated with UMB School of Social Work users. By UMB affiliation, Library cost allocations were as follows:

<u>UMB School of Social Work</u>	<u>UMB School of Pharmacy</u>	<u>UMB School of Nursing</u>	<u>UMB School of Medicine</u>	<u>UMB School of Law</u>	<u>UMB Dental School</u>	<u>Other UMB</u>	<u>Total</u>
\$ 1,393,612	\$ 848,633	\$ 2,755,002	\$ 2,580,866	\$ 28,650	\$ 375,927	\$ 537,242	\$ 8,519,974
16.36%	9.96%	32.34%	30.29%	0.34%	4.41%	6.31%	100%

Library Cost Allocations by Status

The third determination was approximately 83% of the Library's FY 2009 expenses were incurred by UMB users and roughly 17% were associated with non-UMB users. Of the non-UMB costs, 8.71% were related to University of Maryland Medical Center users. Library expenses incurred by status were as follows:

<u>UMB BS Student</u>	<u>UMB Graduate Student</u>	<u>UMB Faculty/ Staff</u>	<u>UMB Postdoctoral Fellow</u>	<u>UMMC Staff</u>	<u>UMMC Resident</u>	<u>UMMS</u>	<u>Other, Non- UMB</u>	<u>Total</u>
\$1,415,042	\$5,177,353	\$1,710,256	\$ 217,323	\$476,781	\$419,012	\$105,915	\$761,788	\$10,283,517
13.76%	50.35%	16.63%	2.11%	4.64%	4.07%	1.03%	7.41%	100%

The detailed reports and worksheets supporting these summary allocations are presented in Tables 1 -24.

Additional reports from the in-house surveys and the web-based surveys are included as Supplemental Reports 1-24.