

Getting the Cost Right in Cost-Effectiveness Analyses

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Objective: The authors examined different ways of measuring unit costs and how methodological assumptions can affect the magnitude of cost estimates and the ratio of treatment costs in comparative studies of mental health interventions. Four methodological choices may bias cost estimates: study perspective, definition of the opportunity cost of resources, cost allocation rules, and measurement of service units. **Method:** Unit costs for outpatient services, individual therapy, and group therapy were calculated under different assumptions for a single community mental health center (CMHC). Using hypothetical service utilization profiles, the authors used the unit costs to calculate the costs of mental health treatments provided by two programs of the CMHC. **Results:** The unit costs for an hour of outpatient services ranged from \$108 to \$538. The unit costs for an hour of therapy varied by 156%; unit costs were lowest if the management perspective was assumed and highest if the economist perspective was assumed. The ratio of the outpatient costs in the two treatment programs ranged from 0.6 to 1.8. **Conclusions:** The potential errors introduced by methodological choices can bias cost-effectiveness findings based on randomized control trials. These errors go undetected because crucial methodological information is not reported.

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Economic assessments are becoming increasingly popular, in large measure because of the growing emphasis on cost containment within health care (1). Cost-effectiveness analysis, in particular, is being used by many researchers to evaluate the relative merits of various types and combinations of mental health care. Such analyses are attempts to identify which form of treatment (among the set being compared) yields the greatest effect per dollar. There are several potential advantages of cost-effectiveness analysis. It provides a systematic method for comparing the various outcomes associated with competing treatment options, a quantitative estimate for each outcome, and a structure for comparing the outcomes of matched studies. It can also be used to identify the incremental impacts of clinical and demographic characteristics on treatment outcomes.

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The promise of cost-effectiveness analysis as a tool for informing decision makers of the relative economic merits of different treatment options depends on how quantitative estimates of costs are constructed within and among individual studies (2, 3). In this paper we examine one of the most important and least documented methodological domains of cost-effectiveness analysis, estimating the unit costs (per hour) of mental health services. Unit cost estimates are constructed to measure the costs of the resources that are withdrawn from society as a result of interventions. To our knowledge, there is only one published report of a study that focused on the research methods of estimating the unit costs of services provided by community mental health centers (CMHCs) (4). While that report reveals the skeleton of the process for unit cost estimation, it does not show how methodological choices and assumptions underlying the costing technique affect the validity of the unit cost estimate.

Estimation of the unit cost of mental health services is influenced by several factors. The definition of resource costs changes with the perspective of who pays: society, insurer, provider, client. While there is always an opportunity cost (i.e., some benefits are forgone because resources are not used to produce the next-best alternative) associated with the use of resources from a societal perspective, there may not be a monetary payment connected to using those resources. A cost is borne by insurers, providers, or individuals only if they pay to use the resources.

A mental health service is commonly valued by either

charges or unit costs. The unit cost definition is favored since charges are administratively set rates that typically are not closely related to the costs of the resources used by the provider to deliver the services (5). Unit costs, adjusted to include capital (e.g., building and machinery) and overhead (e.g., administrative) costs, are assumed to approximate (long-run) marginal costs (i.e., the additional costs of producing additional services when all resource inputs can be changed) and are, therefore, more accurate measures of the social opportunity cost of resources (6, 7).

Because unit costs are not typically available from mental health agencies, they must be independently estimated. Constructing unit costs for services involves identifying and estimating the relevant resource costs and then allocating these costs to different programs or "cost centers" within an agency. Rules are developed, both implicitly and explicitly within individual studies, for identifying relevant resources, valuing them, and allocating overhead, capital, and other costs among the different types of services delivered by an agency. Currently, there are no standard rules guiding how resources are to be identified, valued, and allocated among different services (3, 8). This lack of standardization infuses an arbitrary element into the construction of unit costs.

Once total resource costs are allocated among unique services, unit costs are derived by dividing total resource costs by the total number of service units. Definitional nuances become important here because service units can be reported in terms of client or staff time, which yield different measures of total service units. Also, incomplete measurement of service units can significantly change the absolute and relative average costs associated with specific services. Paradoxically, the inflating or deflating of unit costs in this manner may be appropriate if service units for study subjects are either under- or overreported by staff members.

The objective of this paper is to show how methodological choices influence estimates of unit costs and total costs that are produced by cost-effectiveness analysis. Data on resource cost and service use were drawn from a CMHC to demonstrate how choices regarding study perspective, cost allocation, and service data yield different estimates of unit costs of outpatient, individual therapy, and group therapy services. These different unit cost estimates are used to show how they can yield misleading relative costs within randomized controlled studies and can confound cost comparisons among studies. We conclude by listing key methodological data that are essential for assessing the validity of cost estimates and for pooling different individual studies for comparative analysis.

CONCEPTUAL STRUCTURE AND ISSUES

The process of estimating unit costs for a set of services is seemingly straightforward. The total cost (TC_s) for (say, outpatient mental health) services provided by

a mental health provider (say, a CMHC) to a sample of clients is calculated by

$$TC_s = \sum_{i=1}^n AC_{ti} \times Q_{si}, \quad [A]$$

where AC_{ti} equals the CMHC's unit (average) cost for service type i , Q_{si} equals the quantity of service i used by the study sample, and n is the number of different types of services (e.g., individual therapy, group therapy) provided by the CMHC. The "t" subscript denotes a population-based variable (i.e., the variable is for the population of clients served by the CMHC) and the "s" subscript denotes a sample variable.

For each service type, i , the unit cost is calculated by

$$AC_{ti} = \frac{TC_{ti}}{Q_{ti}}, \quad [B]$$

where AC_{ti} equals the average cost associated with service type i , TC_{ti} equals the total cost associated with producing service type i , and Q_{ti} equals the total volume of service type i produced by the center.

Three important conceptual issues must be addressed before equations A and B can be estimated. First, studies differ in the scope of costs included in the definition of TC_{ti} . In general, total costs are defined to include the value of the resources used to produce the outpatient services used by the clients in the sample. Which costs are included depends on the perspective of the study. Three different resource inclusion rules can be used: 1) include only the resource costs paid for by the CMHC (the "management perspective"); 2) include all explicit resource costs (i.e., costs that measure all payments for resources) associated with production of outpatient services (the "accountant perspective"); or 3) include all implicit resource costs (i.e., opportunity costs of resources that are donated to or owned by the CMHC) and explicit resource costs (the "economist perspective").

The second issue pertains to the production characteristics (i.e., how services are produced) within the center. The complexity of constructing a list of unit costs increases when the mental health provider (the CMHC) produces many different services (denoted by " n " in equation A) because rules must be established for distributing total costs among these different services. For multi-service centers, it is necessary to estimate equation B for each service that is uniquely produced. But it is also the case that CMHCs may produce these services in different programs that have different treatment philosophies (i.e., production technologies), and they may use different types of resources (e.g., staff with different training or treatment sites) or combinations of resources (e.g., different ratios of professional to lay staff or different ratios of capital to labor) to produce similarly named services (e.g., individual or group therapy). To develop a set of unit costs for services produced by multi-program centers, equation B is rewritten as

$$AC_{tji} = \frac{TC_{tji}}{Q_{tji}}, \quad [B']$$

TABLE 1. Steps in Estimating Costs of Outpatient Services in One CMHC According to Three Costing Perspectives

Costing Perspective ^a	Step 1: Explicit On-Budget Agency Costs (millions of dollars)	Step 3: Deductions for Resource Costs							
		Step 2: Off-Budget Agency Costs (millions of dollars)		On-Budget Costs (millions of dollars)			Off-Budget Costs (millions of dollars)		Final Cost Estimate (millions of dollars)
				Nonclient Services	Contracted Client Services	Unrelated Client Services			
		Explicit	Implicit						
							Explicit	Implicit	
Management	13.4	0.0	0.0	-2.1	-0.6	-3.9	0.0	0.0	6.8
Accountant	13.4	3.8	0.0	-2.1	-0.6	-3.9	-1.8	0.0	8.8
Economist	13.4	3.8	2.5	-2.1	-0.6	-3.9	-1.8	-0.7	10.6

^aManagement perspective: include only the resource costs paid for by the CMHC. Accountant perspective: include all explicit resource costs (i.e., costs that measure all payments for resources) associated with production of outpatient services. Economist perspective: include all implicit resource costs (i.e., opportunity costs of resources that are donated to or owned by the CMHC) and explicit resource costs.

where j denotes a program type within the center.

Most CMHCs offer a range of services that are packaged in stylized treatment programs (e.g., assertive community treatment, mobile treatment initiatives for the homeless, psychosocial and employment rehabilitation, crisis management). And some of these centers provide day hospital services and inpatient psychiatric services. Important interprogram cost differences may be overlooked if center-level unit costs (equation B) are used to evaluate mental health services provided in uniquely structured outpatient programs.

The last issue concerns the definition and measurement of the service quantities— Q_t and Q_s . Service units can be measured in terms of outputs or inputs. An output measure counts outpatient services received by clients in hours, visits, or clients, whereas an input measure counts the number of hours that staff spend with clients. These alternative measures are likely to yield different denominators in equations B and B'. For example, group therapy involves one provider seeing more than one client. If, for example, one provider saw five clients during a group session, the group session could be counted as 5 client visits, 5 group hours, or 1 group hour—if an output metric is used—or 1 staff hour—if an input metric is used. Similar definitional ambiguities exist for co-therapy.

While either measure of service units could be used, the selection of a service metric raises concerns about internal consistency. A study will be internally consistent if the same metric is used to measure both Q_t and Q_s ; that is, the quantities of service used in the denominators for the sample and full population are consistently defined. Problems of internal inconsistency arise when different data sources are used to measure service variables in equations A, B, and B'. For example, it is typical for studies to use service data (measured in an output metric) collected by researchers to determine Q_s but to use management information system data (measured in either an input or output metric) to measure Q_t and therefore AC_t . Because researchers fail to report the service volume metric and definition of total costs used to calculate AC_t , it is impossible to determine whether service units and costs can be compared across studies.

ESTIMATING UNIT COSTS

In this section we explore different methodological assumptions that could be made to estimate unit costs (equations B and B') for outpatient mental health services. Cost data were drawn from a CMHC that serves as a local mental health authority for a four-town catchment area of roughly 195,000. The CMHC, which is a state facility, provides inpatient, day treatment, and outpatient services, and it has many unique outpatient programs that provide customized services to subgroups with special mental health needs. These data will be used to illustrate how the magnitude of total and unit cost estimates changes under different assumptions.

Estimating Total Costs

The estimation of total costs is divided into three steps, and each step is broken into the three costing perspectives—management, accountant, and economist (table 1). Step 1 involves examining the CMHC's budget and identifying all resource cost categories that relate to outpatient services. The CMHC's budget statement (equaling \$22.2 million) included 650 separate cost categories. Because this center produced inpatient, day hospital, and outpatient services, it was necessary to extract all resource costs related to inpatient and day hospital services. A total of \$13.4 million remained after all nonoutpatient costs were excluded. All three costing perspectives would include these on-budget costs for outpatient services in their total cost calculations because they are explicit costs borne by the CMHC. These costs include salaries and wages for all employees, fringe benefits for some employees, medications, supplies, equipment, building space, and utilities.

Step 2 adds on the explicit costs that are borne by other collateral agencies (other than the CMHC itself) and implicit costs borne by the CMHC and collateral agencies. These are referred to as off-budget items. Off-budget explicit costs refer to resources hired or purchased by the CMHC but fully or partially paid for by another agency. There were two off-budget explicit costs for this CMHC: fringe benefits for state employ-

ees (paid directly by the state) and service and research grant funding received by the CMHC to expand outpatient services. These explicit off-budget items added \$3.8 million to the total on-budget costs.

Implicit costs refer to the value of resources for which no explicit monetary payments are made for the resources used by an agency. The most common examples of implicit costs are owned (or donated) land, buildings, and equipment and donated labor. This state-operated CMHC received many resource subsidies. First, some of its administrative services and all its legal services were contributed by collateral state agencies (e.g., state attorney, comptroller, state mental health authority). Second, some of its employees were on contract from other (nonprofit cooperating) agencies. The CMHC was required to pay only the contracted workers' wages and fringe benefits; it did not pay the administrative costs associated with hiring employees or the processing costs associated with their compensation. Third, as a state agency, the CMHC did not have to pay local property taxes, which finance fire and law enforcement (as well as other local) services from which the CMHC benefits. Fourth, the buildings and equipment owned by the CMHC were not assigned an economic value. Imputed values were constructed for the owned and donated resources by using fiscal data from state and private agencies. The opportunity cost for the owned building and property was based on a 5% discount rate (3, 9) applied to the present value estimations calculated by the Office of the State Comptroller. Imputed implicit costs were valued at \$2.5 million.

In aggregate, the gross total value of all resources devoted to outpatient services equaled \$19.7 million. But some of the resources included in this estimate are unrelated to the outpatient services used by the study subjects. Step 3 of the estimation process involves making a series of deductions from the gross total cost estimates to derive the value of the resources used to produce Q_s . Three types of services are excluded from the definition of total costs. The first type is nonclient services. The CMHC, like some multiservice CMHCs, is involved in research, community education, and training. Because our study subjects received only client services from nonresearch programs and they did not directly benefit from community education activities, the resource costs attributed to these ancillary outpatient activities were deducted.

The second type of deduction relates to contract services. It is not uncommon for mental health centers to contract with other service agencies to produce some specialized services (e.g., social rehabilitation). Contracted services involve money transfers only. The resource costs associated with contract services were removed from the estimate of TC_i since the corresponding information on service volume (Q_i) is not recorded in the CMHC's data management systems (i.e., information on the quantity of contracted services was missing).

Unrelated client services are the third type of services deducted from gross total costs. The CMHC produced outpatient services for special populations, for exam-

ple, forensic patients, elderly persons, and children. Because these populations have special needs, the costs associated with producing services for them are likely to be different from the costs of services provided to the general class of adult clients, from which our study sample was drawn. Because none of our subjects used these special services, these costs were deducted from gross total costs. Deductions for on-budget explicit costs equaled approximately \$6.6 million. Comparable deductions were made for off-budget explicit (\$1.8 million) and implicit (\$0.7 million) costs that were unrelated to the outpatient services received by the study subjects.

As shown in table 1, the final value of the resources used to produce the set of outpatient services used by the study sample of clients ranged from \$6.8 million to \$10.6 million. Because the study perspective and cost allocation procedures influence the magnitude of the center's total cost, it is essential that this information be reported; otherwise, the meaning of cost estimates within and among studies is uncertain.

Calculating Unit Costs (AC_i)

Unit costs for outpatient services (AC_i) are calculated by dividing the estimate of the total cost (which varies by perspective and step) by the volume of recorded services for all clients served by the included programs. But there are three additional choices that influence the size of the unit cost estimate. The first two choices relate to the allocation of net costs among the different outpatient programs, or "cost centers." The first of these two choices relates to the organizational structure of the center. Many mental health centers are an amalgam of many different outpatient programs. Unit cost estimates, therefore, can be calculated at the center level or at the program level. In calculating center-level estimates, it is implicitly (and perhaps incorrectly) assumed that the production relationships, and hence costs, among the different outpatient programs comprising the center are identical.

The second choice relates to the outpatient service structure of the center. Centers, as well as programs within centers, produce many different outpatient services. For example, outpatient services may include individual therapy, medication monitoring, group therapy, co-therapy, and so forth. Different resource inputs and intensities may be used to produce different types of services or the same services within different programs. Aggregating all services and estimating one unit cost for all outpatient services is based on the assumption that the production costs associated with the different service types within the set are equal.

The choice of a reference base for Q_i also influences the size of the unit cost estimate. Use of an input reference base will yield an average cost estimate that differs from one based on an output reference base if the outpatient services include sessions that involve either more than one client (e.g., group therapy) or more than one provider (e.g., co-therapy).

The impact of these different methodological choices

TABLE 2. Center-Level Unit Cost Estimates for All Outpatient Services in One CMHC According to Different Costing and Time Perspectives

Time Perspective	Total Service Volume (hours)	Unit Cost Estimate (dollars/hour)					
		Explicit On-Budget Costs (step 1) Plus Explicit and Implicit Off-Budget Costs (step 2), by Costing Perspective ^a			Explicit On-Budget Costs (step 1) Plus Explicit and Implicit Off-Budget Costs (step 2) Minus Deductions for Resource Costs (step 3), by Costing Perspective ^a		
		Management	Accountant	Economist	Management	Accountant	Economist
Client	62,048	216	277	318	108	140	169
Primary staff	36,617	366	470	538	183	237	286

^aManagement perspective: include only the resource costs paid for by the CMHC. Accountant perspective: include all explicit resource costs (i.e., costs that measure all payments for resources) associated with production of outpatient services. Economist perspective: include all implicit resource costs (i.e., opportunity costs of resources that are donated to or owned by the CMHC) and explicit resource costs.

TABLE 3. Center-Level Unit Cost Estimates for Individual and Group Outpatient Services in One CMHC According to Different Costing and Time Perspectives

Time Perspective	Total Service Volume (hours)	Unit Cost Estimate (dollars/hours) for Explicit On-Budget Costs (step 1) Plus Explicit and Implicit Off-Budget Costs (step 2) Minus Deductions for Resource Costs (step 3), by Costing Perspective ^a		
		Management	Accountant	Economist
Individual services—equal time metrics for client and staff	18,999	176	228	275
Group services				
Client	27,620	41	53	64
Primary staff	5,233	216	279	337

^aManagement perspective: include only the resource costs paid for by the CMHC. Accountant perspective: include all explicit resource costs (i.e., costs that measure all payments for resources) associated with production of outpatient services. Economist perspective: include all implicit resource costs (i.e., opportunity costs of resources that are donated to or owned by the CMHC) and explicit resource costs.

on the size of the unit cost estimate is illustrated by table 2, which presents a series of unit cost estimates for all outpatient services at the center level (the estimates were determined by dividing the total costs appearing in table 1 by alternative definitions for Q_i). Note that the service volume measure is approximately 70% larger when an output (client hour) metric is used, resulting in a lower estimate of average cost per client hour than per staff hour (row 1 versus row 2).

Table 3 presents unit cost estimates (AC_{ij}) for individual and group outpatient services at the center level when the assumption regarding equal costs for individual and group services is relaxed. Group therapy services are cheaper than individual therapy when the services are measured by using a client hour metric. The volume estimates in column 2 indicate that, on average, group therapy sessions involve a therapist meeting with five clients; hence, the unit cost estimate for group therapy is roughly five times as large when a staff hour metric is used.

The unit cost estimates (AC_{ij}) varied between the two programs within the CMHC that offer individual and group services. Outpatient services produced by program A, on average, are approximately 70% more expensive than those produced by program B (\$203 versus \$122). Also, the ratio of average costs varies by service type. Group services are roughly 2.5 times as expensive in program A (\$111) as in program B (\$46) (suggesting that group sizes are smaller in program A), but the individual services produced by program A are only about 25% more expensive (\$337 versus \$263).

EVALUATING THE METHODOLOGY: WHICH IS THE “RIGHT” COST?

In evaluating unit cost estimates, two different questions can be posed. They are, Is the unit cost estimated correctly? and Is the unit cost estimate correct? The first question focuses attention on the estimation technique itself—are all relevant costs included and all irrelevant costs excluded? To answer this question, we would need information about the study perspective, the total cost definition (i.e., information on what costs were included and excluded and how they were allocated among cost centers), and the measurement metric for Q_i and Q_s .

The second question is much more difficult to answer. Whether the estimated unit cost per service is correct depends on the assumptions implied by the estimation technique and their compatibility with the study conditions. To evaluate the appropriateness of a unit cost estimate, it is necessary to have additional information on 1) the program and service production relationships within the center and 2) the service utilization patterns of the control and experimental groups. Inconsistency between methodological assumptions and study conditions may yield biased, as well as incorrect, findings regarding both absolute and relative costs (total costs).

To demonstrate how methodological assumptions underlying unit cost estimation and study conditions can influence study findings, we constructed a series of

TABLE 4. Simulated Total Cost Estimates for Two Programs in One CMHC According to an Economist Costing Perspective^a

Cost Scenario	Program A: Control Group		Program B: Experimental Group		Cost Ratio (B/A)
	Hours × Dollars/Hour	Total Dollars	Hours × Dollars/Hour	Total Dollars	
Case 1: center level					
a. Equal production functions	45×169	7,605	45×169	7,605	1.0
b ₁ . Unequal service costs, equal use		6,045		6,045	1.0
Individual	15×275	4,125	15×275	4,125	
Group	30×64	1,920	30×64	1,920	
b ₂ . Unequal service costs, unequal use		4,990		9,210	1.8
Individual	10×275	2,750	30×275	8,250	
Group	35×64	2,240	15×64	960	
Case 2: program level					
a. Unequal production functions	45×203	9,135	45×122	5,490	0.6
b ₁ . Unequal service costs, equal use		8,385		5,325	0.6
Individual	15×337	5,055	15×263	3,945	
Group	30×111	3,330	30×46	1,380	
b ₂ . Unequal service costs, unequal use		7,255		8,580	1.2
Individual	10×337	3,370	30×263	7,890	
Group	35×111	3,885	15×46	690	

^aPerspective includes all implicit resource costs (i.e., opportunity costs of resources that are donated to or owned by the CMHC) and explicit resource costs.

total cost estimates based on unit cost estimates (economist perspective) drawn from tables 1–3 and hypothetical service utilization data. We assumed that there were comparable client samples (i.e., a randomized controlled design) enrolled in two programs: program A (control) and program B (experimental). The subjects in both programs were assumed to use 45 hours of outpatient services over a 3-month period.

Study Perspective

Implied in the definition of total cost (as well as unit cost) is a costing perspective. We found that the unit cost for an hour of outpatient services at the center level varied from \$108 (steps 1, 2, and 3, measured in client hours, management perspective) to \$538 (steps 1 and 2, measured in primary staff hours, economist perspective) (table 2). Which unit cost is “right” depends on how the study findings will be interpreted and used in the policy arena. Cost estimates may be used to inform policy makers about the absolute and/or relative costs associated with different interventions. If the focus of the study, for example, is to explore the cost differentials between two or more mental health treatments, then the costing perspective (i.e., management, accountant, and economist) used within the study is irrelevant. The choice of perspective has a scalar effect on the agency’s unit costs per hour of service (if we assume equal proportions of explicit and implicit costs among the programs), and as a result it does not distort the cost differentials between or among groups. However, the costing perspective becomes relevant if the study findings will be used to make statements about the expected cost of implementing an intervention. In such cases, which perspective is appropriate depends on whether the funder is expecting to pay the CMHC’s costs only, the explicit costs related to center activities that may be shared by the CMHC and other collateral agencies, or

the full opportunity costs associated with the CMHC’s service activities.

Cost Allocation Rules

Cost allocation rules guide how total (net) costs for outpatient services are defined and allocated among the various programs and services offered by the CMHC. The finer the disaggregation of costs, the more comprehensive is the list of unit costs. Whether such detailed allocation rules are necessary depends in large part on the characteristics of the production relationships among programs and services. For example, the appropriateness of using center-level versus program-level unit cost estimates to value the resources used to produce mental health services depends on whether the production functions within the CMHC are constant among programs. When the production relationships of different programs are identical, center-level unit cost estimates will yield unbiased relative cost outcomes (case 1a in table 4). However, the absolute cost estimates for the programs will be unbiased only if the average cost for all outpatient services equals the average cost for each of the different service types produced by the center. As shown in table 3, this assumption is not valid for this CMHC and, on the basis of our experience, is unlikely to be valid for other multiservice CMHCs. When service-specific unit cost estimates are used to value the different mental health services, program costs decrease from \$7,605 (case 1a in table 4) to \$6,045 (case 1b₁). Note that the relative costs of the two programs are unaffected (column 6), although the absolute costs change.

Structured outpatient programs are likely to have systematically different production relationships. They may use different facilities, equipment, and labor to produce mental health services with the same labels. Such differences will affect the programs’ total costs.

These programmatic cost differentials are concealed in center-level cost estimates. The implications of using center-level as opposed to program-level unit cost estimates can be seen by comparing case 1a to case 2a in table 4. Programs A and B have equal costs (\$7,605) when center-level averages are used, but program A is 66% more expensive than program B when program-level unit cost estimates are used to value services (\$9,135/\$5,490). Again, if service-type cost differentials exist, then the absolute cost estimates for the programs also will be biased (compare case 2a to case 2b₁). The direction of the bias will depend on the mix of services used by the study group.

Service Utilization Data

The size of the total cost estimate is determined by multiplying unit cost estimates by the number of services that sample clients are recorded as receiving during a specified time period (equation A). The total cost outcome can be distorted if service use patterns differ between control and experimental samples and these services have unequal unit costs. Variation in service use patterns may arise because different programs within CMHCs adopt different treatment philosophies that may influence the mix of services provided to clients. For example, program B becomes more expensive than program A if the proportion of individual therapy to group therapy is greater for program B than for program A (compare the costs of cases 1b₁ and 1b₂ and those of cases 2b₁ and 2b₂). Comparing service units in different programs becomes more complicated since programs may differ in their data-reporting standards. In a recent comparative study of two programs within the same CMHC (10), we found that the staff of one program logged 60% more staff hours than did the staff of the other program (meaning that they reported more of what they did). If such information is known, unit costs can be adjusted for reporting error.

DISCUSSION

Assessing Unit Cost Estimates

We have shown many different unit cost estimates. To understand which measure was used to value mental health services, information on the following would be needed: 1) the study perspective, 2) the definition of total costs (costs included and excluded), 3) the reference base for service units, 4) the data sources for sample and population service volume estimates, and 5) the level of disaggregation (center or program; service-specific). With this information it is possible to determine which table and column of unit cost estimates were applied within any cost-effectiveness study. Moreover, with consistent reporting of such methodological information, we could begin to make 1) informed assessments about the validity of cost estimates and 2) interstudy comparisons.

More information would be needed to assess whether the "right" unit cost estimate was used to value mental health services. One would need also to know whether 1) the findings will be used to make inferential statements regarding relative or absolute cost differences, 2) there were differences in production functions among programs and service types, and 3) there were differences in data reporting among programs.

For cost-effectiveness studies designed to estimate relative costs, the "right" unit cost estimate will depend only on the production relationships between programs and the utilization patterns of different groups. Center-level, aggregate average cost estimates are appropriate only if there are equal resource costs for all services (i.e., homogeneous production functions across programs and services). Center-level unit cost estimates need to be disaggregated by service type only when service types have different resource costs and service utilization profiles differ between groups. If programs have heterogeneous production functions, then program-level unit cost estimates must be used. Program-level estimates must be disaggregated by service type only if cost functions differ by service type and service utilization patterns vary between groups.

Selecting the "right" unit cost for cost-effectiveness studies aimed at estimating the relative and absolute costs associated with specific programs is more complex. First and foremost, the study perspective must match the perspective of the funder. For example, if the funder is concerned only with explicit costs borne by the CMHC, the societal cost estimate is likely to overstate expected costs. To correctly estimate the absolute costs for each group, program-level unit cost estimates must be used if there are differences in production functions between programs, and program-level estimates must be disaggregated if the service types have different cost functions (even when the utilization patterns for different groups are the same).

Implications for Mental Health Research and Policy

Such methodological and conceptual information does not appear in published reports. Thus, it is impossible to make meaningful cost comparisons among studies evaluating the same program if different assumptions and techniques were used to calculate unit costs and treatment costs. At the present time, the field has an institutionalized tradition of not requiring researchers to disclose crucial methodological information, even though the potential errors introduced by these methodological choices can bias cost-effectiveness findings based on randomized controlled trials. By assuming methodological simplicity, we have exempted the analytical methods used in economic evaluations from being critically assessed, widely understood, and persistently refined.

Because the findings of cost-effectiveness analysis are being used to ration scarce mental health budgets, greater attention needs to be given to the accuracy of cost findings. Such assessments require a more careful

examination of the methods used to estimate unit costs. Using a unit cost estimate to value mental health services does not ipso facto mean that services are being appropriately valued. Indeed, cost estimates for mental health services based on unit costs may be no better than charge-based estimates if the unit cost estimate is biased.

Cost-effectiveness analysis is a useful tool only if it produces credible and reliable information about costs and effects. But given the complexity associated with estimating unit and total costs, it is highly unlikely that all cost-effectiveness studies are equal. This presents a major challenge to decision makers, researchers, and journal editors because insufficient information is available to detect differences in quality among studies. The intent of this paper was to identify the key methodological information needed to assess the validity of unit cost estimates. Having information on the study perspective, the cost allocation rules, the internal production relationships of multiservice, multiprogram agencies, the definition of service units, and the service utilization profiles of the samples, as well as the study's research intent and policy implications, will substantially improve our ability to assess the quality and meaningfulness of the cost estimates generated by cost-effectiveness studies. It is only with this information that we will be able to discriminate among studies and begin to synthesize evidence that could inform

choices about which services yield the greatest value per dollar.

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