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A Method to Measure the Costs of Counseling for HIV Prevention

SYNOPSIS

THIS PAPER DESCRIBES A METHOD FOR ESTIMATING the true resource costs of counseling for HIV prevention. The method includes identifying the resources used in counseling, determining the true unit costs of the resources used, and calculating the total costs of counseling. Cost equations and sample calculations of total and expected costs per client in a specified time period are provided.

This method of estimating costs provides a systematic application of a standard set of procedures, including sample tables and calculations. It uses the societal perspective on resource cost to determine true resource costs. This method can be used for resource allocation decisions among programs and as inputs for cost-effectiveness and cost-benefit analyses. Since the method minimizes the burden of data collection and calculations, it is useful for the nonspecialist in cost analysis. The method provides a rational approach for realistic decision making and planning in public health.

Cost is one criterion for the selection of an HIV prevention program. To have the greatest possible effect on HIV transmission with the limited funds available, it is necessary to know both the costs and effects of programs. Since most HIV prevention programs target risky behaviors and many include counseling, it is important to estimate the true resource costs associated with counseling.

HIV prevention programs have only infrequently been subjected to cost analysis. Of almost 300 articles reviewed, only a small proportion included program cost information (1). Cost is often the limiting factor in selecting HIV prevention interventions for a community. But without cost estimates it is impossible to plan and justify budgets and expenditures. Therefore, estimating the true costs of HIV prevention programs is critical.

Counseling for HIV prevention is a component of many interventions. The purpose of counseling is varied. It can be (a) to educate clients regarding the results of an HIV antibody test, (b) to enhance the mental health of HIV-positive clients, or (c) to effect reduction of HIV risk behaviors such as unsafe sex or the use of shared drug injection paraphernalia. Regardless of the counseling goal, similar resources are used, and the determination of counseling costs is the same.

Requests for tearsheets should be addressed to Technical Information Activity, Division of HIV/AIDS Prevention, NCHSTP, Mail Stop E-49, 1600 Clifton Rd., NE, Atlanta, GA 30333.

Resources and Their Units

Variable costs: resources per client

A. Direct provider time by provider type for each service type [hours]

B. Supplies and materials used in each service type, including telephone and postage [items]

C. Laboratory or other tests used in each service type plus required laboratory controls [each positive and negative test]

Fixed costs: resources per program

D. Facilities, such as rent and utilities, specific to the intervention [year or month]

E. Equipment specific to the intervention, including maintenance [proportion of time in use]

F. Administrative and support staff specific to the intervention [proportion of time]

G. Other direct costs of providing services within the intervention such as travel [miles or actual cost], staff development [time or actual cost]

Client costs: resources for participation, per client

H. Time required of client for the intervention [hours]

I. Expenses of client for the intervention, such as child or elder care and travel [actual cost]

Resources used to serve side effects of the intervention

J. Provider time, materials, supplies, etc. [same units as above]

Counseling is defined broadly in this paper as any face-to-face interaction for HIV prevention, regardless of site or situation. Counseling can take place within and outside health care facilities, during clinical care, in group sessions, in drug abuse treatment programs, and in hospitals. Counseling occurs at the worksite, in educational settings, and on the street. It may be at the convenience of the provider or of the client.

The results of HIV counseling cost analyses can be used for resource allocation among prevention programs and to provide cost estimates for cost-benefit, cost-effectiveness, and cost-utility analyses. This paper will provide a simple method to determine the true resource costs of counseling programs for HIV prevention. The results can be used for decision making and planning at program, local, state, and federal levels.

Overview of a Cost Analysis

A basic cost analysis includes (a) identifying the resources used in counseling, (b) determining the unit costs of the resources used, and (c) calculating the total costs of counseling. This paper addresses only the determination of program costs, not program effects or benefits. Economic analyses such as cost-benefit and cost-effectiveness analyses, which use basic cost analyses, are discussed in *Prevention Effectiveness: A Guide to Decision Analysis and Economic Evaluation (2)*. A simple economic analysis methodology for disease and injury prevention may be found in the *Morbidity and Mortality Weekly Report* (MMWR)*(3)*.

The resources and unit costs included in an analysis depend upon the perspective taken by the analyst. There are many possible perspectives: societal; service provider (clinic, institution, agency, or individual); business firm; health insurance company and health care reimburser; government; and program participant or client.

The societal perspective is usually taken because all resources associated with the intervention, regardless of who pays, are included in the analysis. The actual costs of the resources consumed are used in this perspective, rather than charges to payors or participants, since charges may not reflect the cost to society of the resources used. This perspective is most useful for overall resource allocation decisions.

It is important to recognize that resource costs are not necessarily equal to a program budget. Program resources may include volunteer labor, donated time, and materials funded from other sources. Budgets may underestimate or overestimate the resources required, may include incorrect job categorization of service providers, and may have other factors that obscure true resource costs associated with counseling.

If resources are used in one intervention, the same resources are not available for another societal use. Thus, a particular program, when implemented, should be the best use of the limited health resources available. The focus of this cost analysis is the societal perspective because rational allocation decisions are based upon true resource costs to society.

Other perspectives may not use true resource costs. From the service provider's or insurers' perspective, the cost of resources equals the cost to the provider. For example, the charges clinics pay for laboratory tests rather than the actual laboratory costs are often used because providers want to know the cost to them for providing a particular prevention service and how much they will be reimbursed. This is the usual managerial or accounting perspective. From the government's perspective, taxes are received and reimbursements are made to service providers. Costs reflect government-defined reimbursement rates for services or budgeted costs to agencies, bureaus, and divisions. From the participant or client's perspective, costs are those actually paid in money, goods, or time for the privilege of participation.

Steps of a cost analysis. A cost analysis consists of several steps, each of which will be discussed in detail. These steps include:

1. Choosing a time period for the cost analysis.
2. Counting the clients served during this time period.
3. Inventorying the resources, in specific units, required for all activities comprising the intervention.
4. Calculating the cost per unit of each resource used.
5. Counting the number of units of each resource used in the time period for the number of clients served.

6. Calculating the total costs of the intervention and side effects.

7. Calculating the expected cost per client served.

A consideration in a cost analysis is whether one is determining the average costs of providing a service or the incremental costs. Average cost is defined as the total cost of a program divided by the total units of services produced and includes a proportion of all resource costs used in the production of a service. That is, some proportion of rent, utilities, and equipment is included in average costs, even if expansion of facilities is not required for the specific intervention. An example would be including some proportion of hospital operating expenses, including facilities costs, in the average costs of hospital-based counseling. Incremental cost is defined as the additional cost required to produce an additional unit of service. Incremental costs include only costs directly associated with provision of services because it is assumed that, in the short term, an additional unit of service can be produced with no increase in facilities and equipment. Thus, pre-existing resources, such as facilities, are not included in this type of analysis. An example would be adding HIV counseling to an existing clinic without adding any clinic space in the incremental costs of clinic-based counseling. This cost analysis uses an incremental cost approach.

Determination of Counseling Costs

Choosing the time period. The specific time period chosen for the cost analysis is important because costs occur as clients are served. The time period for the cost data collection must be contemporaneous with the time period for which client counts are available. A consideration in choosing a time period for cost data collection is whether seasonality affects either costs or client participation. One year is the ideal time period because all seasons are included. A time period of less than 1 year may have bias in the result because of seasonal effects on participation and behavior. Time periods greater than 1 year require a decision about how to incorporate cost increases and changes in technology over time. Studies of interventions lasting longer than 1 year must also use discounting to value costs equally in future years *(2)*.

Counting the clients served. A client of counseling programs can be counted in various ways. The most useful client count in a prevention program is the number of clients offered a particular intervention. Using this count allows an administrator or program planner to estimate the cost a program would face for an estimated number of clients expected to be offered the intervention in a particular time period. The fact that some clients do not complete all the parts of a program is an important part of a cost analysis, since any participation in any part implies some resource cost to the program.

Resource Inventory Table

Resource	Units	Cost definition	$/Unit
Counselor	hours	salary+ fringe	
Nurse	hours	salary+ fringe	
Clerk	hours	salary+ fringe	
Brochure	item	per _____	
Supplies, preparation	item	per _____	
Supplies, service	item	per _____	
Supplies, follow-up	item	per _____	
Mileage	miles	cost per mile	
Mailing	letter	postage+ paper	
Phone	minutes	phone cost	
Laboratory costs	positive test	per client	
Laboratory costs	negative test	per client	
Rent, utilities			
Equipment			
Support costs			

There are other methods of counting clients, and each provides useful information. Counseling programs may count (a) all persons accepting counseling or (b) only persons offered, accepting, and completing counseling. The appropriate count is that which is consistent with the goal of the cost analysis.

The count becomes the denominator in the calculation of incremental cost per client. This cost analysis uses the count of clients offered the intervention as the unit of analysis.

Inventorying the resources required. Resources are defined as those inputs without which the intervention would not exist. Resources for counseling include counselors' time, materials and supplies, tests, administrative and clerical support, travel, and additional facilities and equipment.

A resource inventory table can be particularly helpful. Each specific resource is a row in the table. The units of each resource, the cost definition of a unit of resource, and the calculated cost per unit represent table columns. Each type of provider should be a separate row of the table. Each specific type of supply, material, test, and so on should be a separate row as well. Each resource is used in specific units and has a unit cost. This is the starting point of a cost analysis.

Resources are of three kinds. First, there are program resources consumed on a per-client or per-service basis; these are variable costs. Variable costs vary proportionally with the level of output (clients, services). An example is the time a counselor spends with an individual client. Second, there are program resources consumed on a program basis regardless of number of clients (in some range, of course); these are fixed costs. Fixed costs do not vary with the quantity of output in the short run. An example is a poster board that is used over and over for all clients at a particular stage of counseling or specific facilities being used for counseling sessions. Third, there are resources that clients use to participate in the intervention. Examples of these are carfares, lost wages, and child care costs.

Calculation Table for Intervention Costs in Time Period			
(A)	(B)	(C)	(D) = (B) X (C)
Resource	$/unit	No. units used	Resource cost
Provider time			
Materials, supplies			
Laboratory tests			
Fixed costs			
Travel			
Participation			
Side effects			
Total cost			
Expected cost per participant = total cost ÷ ____ participants			

A resource inventory, derived from the list of resources, forms the basis of the cost analysis. From this, the calculation of total and expected costs is demonstrated.

Calculating the cost per unit of resource and the number of units used. During a particular time period, specific counts of resource units are used. By multiplying unit cost from the resource inventory by the number of units used during the time period, the cost of each resource can be determined for the time period.

Each type of resource and the determination of its cost are discussed in the following example. An ongoing clinic-based counseling program for high-risk individuals is used to illustrate the calculations. Resource use and unit costs in the example are hypothetical. The time period chosen for the example is 1 week. Although this is not the ideal length of data collection, it illustrates how to adapt data from differing time periods to a consistent time period. It is assumed that a resource inventory has been constructed and that 118 clients per week participate in this program. Table 1 illustrates the resource inventory table for this example.

Variable costs

Provider time. Provider time can be determined through four methods: (a) direct observation of service durations; (b) random observations of provider activities (snapshots in time); (c) time diaries that providers complete; and (d) patient flow analysis using time forms that a client carries from provider to provider. The correct sample sizes for estimating provider times can be derived from the statistical and epidemiologic references cited subsequently.

Direct observation of services is best but requires that each provider be followed by a trained observer who can differentiate services from each other and note the start and stop time of particular services. Direct observation usually requires consent of the client. At least 25 and perhaps 100 observations may be required to obtain a confident estimate of time durations *(4)*. Constructing a histogram of times helps determine the number of observations needed. If the histogram shows symmetry and small variation, 25 observations may be sufficient; a distribution with the mean equal to the standard deviation suggests 100 observations.

Random observation uses the analogy that the proportion of observations of a particular service equals the proportion of time spent providing a particular service. Providers are given numbers. The analyst chooses provider numbers for an observation list from a random number table. This list is used to find, at fixed intervals, a provider and to note the service being provided at the exact moment of observation. A beeping computer or a personal digital assistant can prompt the provider to record his or her activity. At least five observations of each service type must be obtained for the proportionality assumption to hold, based upon the multinomial distribution *(5)*.

Time diaries, which allow self-observation, can be thought of as a piece of paper that represents a day. Rows represent new activities or services. Each row has a check-off list (columns) for the specific type of activity being performed, including personal time, and a large final column for comments or explanations. A pilot observation of a usual day must be completed to construct this check-off list to minimize the provider time required to complete the diary. The provider notes the start time of each activity (one activity = one row) in the first column. Since all activities are included in this continuous stream of activities, only the activity start time is needed. The start time of the next activity is the end time of the previous one. At least 25 observations of each activity are required *(5)*.

Patient flow analysis requires a time form that the client carries from provider to provider, beginning with the receptionist at the time the patient checks in for the program. Ideally this form includes a space to note the time the client arrives at the counseling program, is seen by the first service provider, leaves the provider, sees subsequent providers, and finally leaves the counseling program. Again, at least 25 observations of each activity are required.

Provider cost is determined for each provider type by using the following equation.

This method can be adapted to estimate the cost of any public health intervention because the basic units of costs and the calculation methods are the same.

Provider cost = [provider salary + fringe] X duration of service X number of services provided in time period

For example, the hypothetical provider cost per week for group counseling is calculated as follows.

Where provider cost per hour = ($35,000 per year + 25% fringe = $43,750) ÷ (52 weeks X 37.5 hours per week = 1950 hours per year) = $22.44
Service time = 25 minutes = (25 minutes ÷ 60 minutes per hour) = 0.42 hour
Average group size = 18, and number of clients = 118, so that there are 6.56 groups per week, on average
Provider cost in the time period of 1 week = ($22.44 per hour) X (0.42 hours per service) X 6.56 services = $61.83 per week

Materials, supplies, laboratory tests. To obtain information about resource use, a discussion with providers or administrators usually suffices. One can review budget and invoices in the time period chosen for the analysis and consult the providers of service(s) to determine the brochures, office supplies, tests, and other per-service resources used.

Materials and supplies cost per unit of service is determined by the following equation.

Materials and supplies cost = specific resource X cost per unit X number of units used in time period

For example, the hypothetical cost per week for materials to provide ongoing counseling for high-risk clients is calculated as follows.

- Materials handed out to clients cost $0.28 per client
- Office supplies cost $0.75 per client
- Follow-up telephone call costs $0.26 per minute for 3.5 minutes and is necessary for 1 in 5 clients.
- Laboratory test costs $55 for a positive and $15 for a negative result
- The program expects a seroprevalence rate of 10% and expects 1 in 100 clients to agree to be tested this week.

Total cost during week of data collection = [($0.28 + $0.75) per client X 118 clients] + [$0.26 per minute X 3.5 minutes X (118/5) clients requiring phone call] + [$55 X (10%) + $15 X (90%)] X (118/100) clients tested = $121.54 + $21.48 + $22.42 = $165.44 per week

Fixed costs

Facilities costs. Provision of counseling requires space for the face-to-face interaction and support of that activity. The size of the room in a clinic or the work space in

Table I. An example of a resource inventory table for a hypothetical counseling program for high-risk clients (hypothetical unit costs)

Resource	Units	Cost Definition	$ / Unit
Counselor time	hours	salary + fringe	$35,000+25% / year
Materials to client	item	10 items	$2.80
Office supplies	item	per client	$0.75
Telephone call	minute	phone co. charge	$0.26
Positive test	each	laboratory cost	$55
Negative test	each	laboratory cost	$15
Facilities	year	rent + utilities	$22,500
Computer	each	cost to program	$1,900
Travel	miles	reimbursement	$0.28
Administration	% time	salary + fringe	$52,375 + 23% / year
Clerical	% time	salary + fringe	$12,500 + 15% / year

another facility is multiplied by the cost of that space per unit. If the facility is now open for a longer period of time, the cost associated with this additional time as a proportion of total time must be included. If counseling takes place outside of a facility, any equipment (such as a van) should be included.

The following equation is used to determine the costs of space and utilities cost.

Facilities costs = additional facility space X [cost of rent and utilities] for that space
OR
additional facility time X [cost of rent and utilities] for that proportion of time spent on the intervention by the program

For example, the facilities costs associated with ongoing counseling are calculated as follows.

Cost per year for rent and utilities = $22,500; thus cost per week = ($22,500 ÷ 52) = $432.69
The counseling program is associated with 36 percent of the time the facility is open.
Program facilities costs = ($432.69 X 0.36) = $155.77 facilities cost per week for this intervention

Equipment costs. Any new equipment purchased for the counseling program, such as a computer or a blood analyzer should be included as a resource. An existing piece of equipment that is now used partially for the counseling program should be included on a proportional basis. A van that is used to transport outreach workers to the counseling sites should be included as equipment. The gasoline and maintenance are a part of the equipment cost.

The following equation is used to determine the cost of equipment associated with the counseling program.

Equipment costs = [total cost of equipment and maintenance ÷ estimated lifetime of equipment] X proportion of that lifetime used for this intervention

Table 2. An example of a calculation table for a hypo-thetical counseling program for high-risk clients, costs per week (hypothetical unit costs from table 1)

(A) Resources	(B) $ / Unit	(C) No. Units Used	(D) = (B) X (C) Resource Cost
Provider time	$22.44 / hour	0.42 hr X 6.56	$61.81
Materials, supplies	$1.03 / client	118 clients	$121.54
Phone calls	$0.91 / client	23.6 clients	$21.48
Laboratory tests	$19 / test	1.18 tested	$22.42
Facilities	$432.69 / week	36% time	$155.77
Computer	$21.05 / week	25% time	$5.26
Administration	$1,238.87 / week	5% time	$61.94
Clerical	$276.44 / week	13% time	$35.94
Travel	28¢ / mile	217 miles	$60.76
Participation	$31.39 / client	118	$3704.02
Side effects	$14.26	0.236	$3.36
Total cost per week		$4,254.30	
Expected cost per participant (total cost ÷ 118 participants)			$36.05

For example, the calculation of the equipment costs are as follows.

- Cost of computer + software = $1900
- Lifetime of computer = 3 years
- Salvage value of computer = $250
- Computer cost = ($1900 -$250) ÷ 3 years = $550 per year
- Maintenance contract = $45 per month

Computer costs per week = ($550 per year ÷ 52 weeks per year = $10.58 per week) + ($45 per month ÷ 4.3 weeks per month = $10.47 per week) = $21.05
Proportion of time computer used for intervention = 25 percent
Computer costs to counseling program = ($21.05 X 0.25) = $5.26 fixed computer costs per week for this intervention

Administrative and support costs. All counseling programs require some administrative and clerical support. Someone acts as a receptionist or makes follow-up telephone calls or types reports. Someone supervises the counselors or is a coordinator of services. The time of these persons in support of the counseling program must be included as costs of the intervention.

The following equation is used to determine the cost of support associated with the counseling program.

Administration and support costs = proportion of administrators' time spent on intervention X [salary + fringe] + proportion of support staff time spent on intervention X [salary + fringe]

For example, the administrative and clerical support costs associated with this intervention are calculated as follows.

Where proportion of time administration and clerical support staff are involved in this intervention = 5 percent and 13 percent
Administration costs = ($52,375 + 23% fringe) ÷ 52 = $1238.87 per week X 0.05 = $61.94
Clerical costs = ($12,500 + 15% fringe) ÷ 52 = $276.44 per week X 0.13 = $35.94
Cost per week = $97.88 in fixed administrative and clerical costs per week

Other direct costs. Other resources may be required to implement and operate a counseling program. These may include travel to street sites, courier service for blood samples, or charges from outside agencies to perform services that the counselors cannot do themselves.

The following equation is used to determine the cost of other resources associated with the counseling program.

Other direct costs of providing the intervention (for example, travel, courier, outside agency charges) = actual resource costs

For example, travel costs are calculated as follows.

Cost of travel = 217 miles per week at a cost of $0.28 per mile = $60.76 in travel costs per week

Participant costs. Costs to the participant are important from a societal perspective. Time and money spent by clients to participate in counseling are time and money that are not available for other purposes. This cost may be why some clients do not participate in all activities of an HIV prevention program.

Expense information can be obtained from a survey of the participants. Questions should include:

1. How far did you travel (miles)?
2. From where did you travel (home, work, other location)?
3. What time did you leave there, arrive at the clinic, leave the clinic?
4. What expenses did you incur to travel to the clinic?

In addition, one must decide on the salary to use for participant time. One can use either the median salary by occupation or for the region, as listed by the Bureau of Labor Statistics, or the actual salary of participants, if this can be obtained.

The participant costs can be calculated using the following equation.

Participation costs = (Sum of the time that participants spend traveling, waiting, and participating in the service X median salary) + (Sum of the expenses participants accrue for participation)

For example, the clients' costs to participate in this counseling program are calculated as follows.

• Participant time spent in travel, waiting, and service = 115 minutes
• Average participant expenses = $2.59 per client for travel or mileage

Participant costs = (115 mins = 1.92 hours) X $15 per hour median regional wage = $28.80 time cost + $2.59 for expenses = $31.39 per participant

Total costs associated with participation = $31.39 X 118 participants per week = $3704.02 in participant costs per week

Intervention side effects. Almost all prevention interventions can have unintended consequences as a function of participation. Resource costs associated with side effects (consequences) must be considered as part of the prevention program costs. These are anticipated costs over time. A hypothetical example follows.

For every 500 persons provided this counseling program for high-risk individuals, 1 person needs immediate medical attention. The time it takes the counselor to refer the patient is approximately 35 minutes and the phone call costs are approximately $1.24. Thus, the total cost of one referral is ($22.44 per hour X 0.58 hours) + $1.24 = $14.26.

In 118 services per week, one would expect fewer than one side effect event. The expected number of side effect events = (118/500) = 0.236 persons with a side effect. The expected cost per week for side effects, then, is $3.36.

This cost, $3.36, is a legitimate part of the weekly cost of the intervention because it will be paid by the agency, institution, or program.

Calculating the total and expected cost of the intervention. Once each individual resource and its unit cost are calculated for the time period in question, the total cost of the intervention can be calculated. One presumes that the number of clients served by each part of the intervention has been determined in the resource costing and that the number of clients offered services has been defined as the process measure of clients served.

The calculation of total and expected costs involves the following three steps.

1. Multiply the cost per unit by number of units use for each resource in the time period, as discussed previously.
2. Add the resource costs for the time period, the partic-

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ipant costs for the time period, and any costs for side effects associated with intervention. This sum equals the total costs associated with the intervention.
3. Divide Total Costs by count of clients offered the intervention to determine the expected cost per client offered the intervention.

Continuing the previous example, the calculation of total and expected costs per week for ongoing counseling of high-risk individuals is illustrated in table 2, based on the calculation table. The total cost per week is $4,254.30, the sum of all the resource costs. Dividing this total by the number of clients offered counseling (118), the expected cost per client offered counseling is $36.05 per week.

To estimate the cost to provide this counseling program to 350 participants:

Expected program cost = unit cost of intervention X estimated number of intervention units = $36.05 X 350 = $12,619

This is correct only if there are no changes in fixed costs associated with this number of clients.

Discussion

This paper provides a method for calculating the cost of counseling for HIV prevention. This method can be adapted to estimate the cost of any public health intervention because the basic units of costs and the calculation methods are the same. Public health interventions use similar resources: providers of services (labor); materials; supplies; facilities; utilities; equipment; program support; and other resources.

The strengths of this method for cost analysis are that it (a) provides a systematic approach to estimating the cost of an intervention; (b) standardizes the components of cost; (c) presents tables which simplify calculations; and (d) produces a consistent calculation that is generally accepted. This method of estimating program costs should be particularly useful for nonspecialists in cost analysis to calculate their true program resource costs. These costs can then be used in conjunction with outcome data to determine the cost of the intervention per unit of behavior change. This analysis can assist decision makers in allocating resources and funds among prevention programs.

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For effective behaviorally based interventions, it is as important to know how much it costs as it is to know what works. According to Holtgrave *(6)*, one must consider which specific HIV prevention programs have a favorable impact on behavioral outcomes and whether the financial costs of these favorable programs balance the economic benefits. This information allows a determination of the optimal allocation of HIV prevention funds among specific programs and subpopulations with respect to the greatest number of HIV infections averted.

As programs are compared with respect to cost, it is important to compare expected costs per participant rather than total program costs. The size of a program, that is, the number of participants served, is related to total cost. A less expensive program may not necessarily be a better program

to fund because it may reach fewer clients.

Cost analyses to determine true resource costs form the basis for realistic decision-making and planning in public health. The societal perspective allows a determination of the true resource costs for an intervention. The method presented here, which minimizes the burden of data collection and calculations, should be useful for program analysts and decision makers at all levels of government.

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