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STRATEGY FOR EVALUATION
CHILD SURVIVAL ACTION PROGRAM
AGENCY FOR INTERNATIONAL DEVELOPMENT

PAPER PREPARED BY

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I. Introduction

A. Proposed Evaluation System

In providing funds for Child Survival, Congress emphasized its desire for accountability and requested AID to provide evidence every six months of the effectiveness of the program in improving Child Health. Yet direct assessment of changes in morbidity and mortality is complex and expensive and may be beyond the capability of many of the projects. In addition, demonstrating program impact on mortality in the short or medium term will be difficult or impossible, since mortality is relatively insensitive over the short term to intervention affecting conditions that progress slowly to death.

In view of both the needs of Congress and the difficulties of evaluation, this document presents a three-tiered evaluation system, with progressively more rigorous data requirements and smaller numbers of projects at each higher tier. Figure 1 illustrates the proposed system schematically.

All projects will participate in Tier One of the evaluation system. Tier One includes primarily input and output indicators derived from routine service statistics and accounting. The inputs or project resources include funds and commodities as well as human resources. The outputs are fundamentally service activities, both at the system and community level. Examples are the number of community health workers trained in ORT and the number of polio immunizations given. The ability of projects to collect, transmit, tabulate, and report service statistics in an accurate and timely manner will vary considerably from project to project. Nonetheless, many of the recommended indicators for inputs and outputs are already being collected, and most projects will have relatively little trouble in reporting them. For projects that do have problems, we recommend the use of sentinel posts, discussed below, as a relatively cost-efficient method of quickly implementing better service statistics capacity.

A more demanding feature of Tier One is the collection and reporting of selected effectiveness or coverage indicators. Examples of such effectiveness indicators are the percent of children 24 to 59 months of age immunized for measles or the percentage of children 0 to 5 continuing feeding/breastfeeding during the last episode of diarrhea. Table 1 presents a list of recommended effectiveness indicators from which projects might draw for use in accordance with the type of project activities.

FIGURE 1: PROPOSED EVALUATION SYSTEM

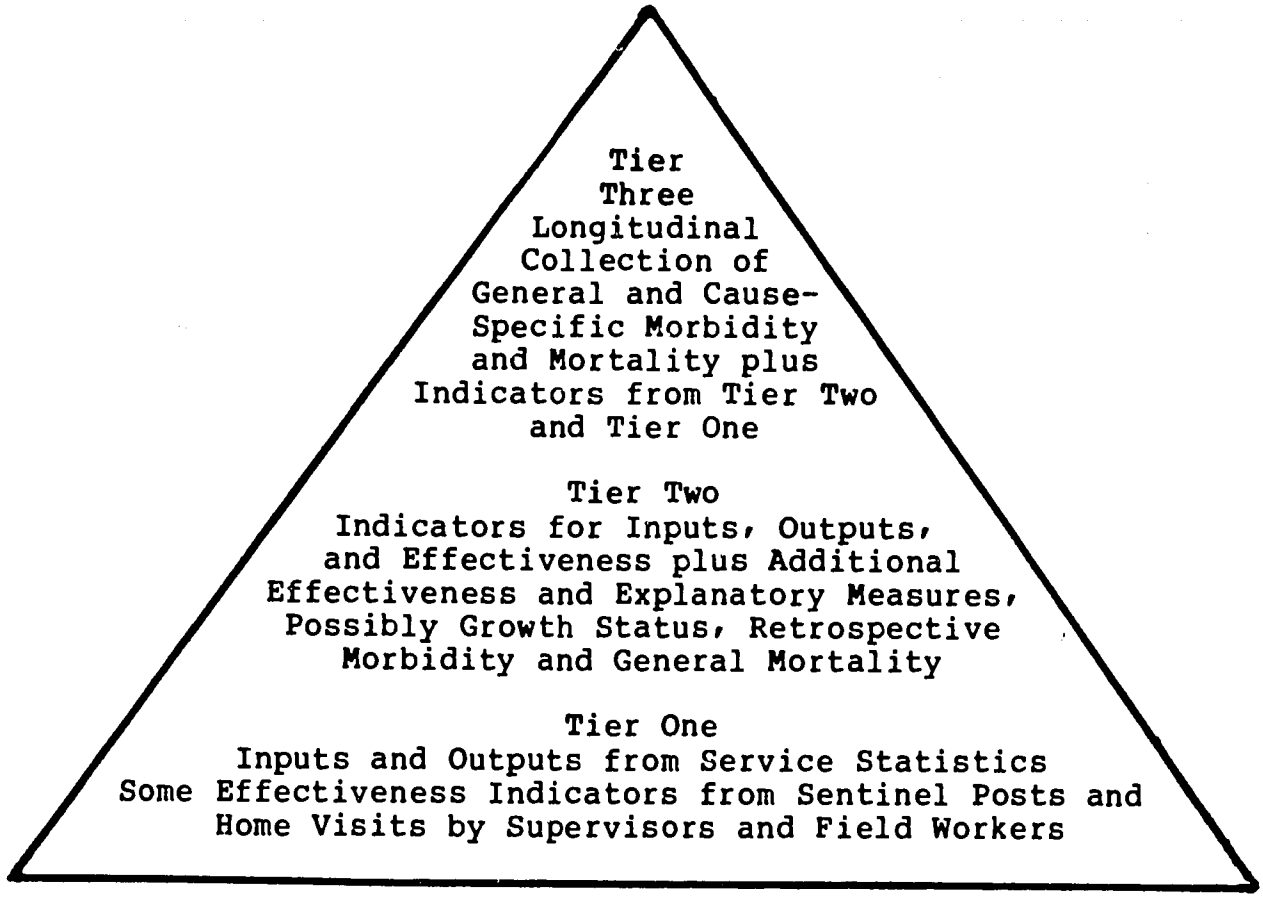

TABLE 1: STANDARD EFFECTIVENESS INDICATORS

ORT

1. Percentage of mothers of children 0-5 with demonstrated adequate capability to use ORT effectively

2. For programs with packets: Percentage of families with children 0-5 who have obtained packets and have packets in their home

3. Use: Percentage of children 0-5 who received ORT in most recent diarrhea episode during last 12 months; percentage, with onset of diarrhea in last two weeks, who received ORT

4. Percentage of children 0-5 continuing feeding/breastfeeding during last episode of diarrhea

IMMUNIZATIONS

1. Coverage: Percentage of children ages 12 to 35 months immunized two or more times for DPT and one or more times for polio

2. Coverage: Percentage of children ages 24 to 59 months immunized for measles

3. Coverage: Percentage of mothers immunized at time of delivery two or more times with tetanus toxoid

NUTRITION

1. Percentage of children exclusively breastfeeding at one month

2. Coverage: Percentage of children 0 to 36 months participating in growth monitoring

3. Percentage of children receiving high dosage vitamin A capsule during last six months

FAMILY PLANNING

1. Percentage of children ages 9 to 24 months with a younger sibling

2. Percentage of women less than age 20 and older than 35 among women who had a live birth in last year

3. Proportion of women 15-49 in marital or consensual union who currently use a method

PERSONAL HYGIENE AND SANITATION

1. Proportion of mothers who wash hands prior to handling food

2. Proportion of families who have an adequate source of drinking water

3. Proportion of families who use an adequate means of waste disposal

How can projects in Tier One , which are oriented basically to service, collect useful data at low cost for effectiveness indicators? One cannot expect projects in Tier One to undertake complex, formal household surveys nor establish community surveillance systems. Most agencies have neither the expertise nor the funds to conduct such surveys. Two basic methods of data collection are recommended. First, in many projects, supervisors, field workers, community health workers and others do make home visits as part of their normal activities. These visits may not be random, nor systematic, but project personnel can obtain information on effectiveness that will be useful for their own work as well as for project management. The information collected in this manner is limited for purposes of evaluation, but may have value depending on degree of rigor with which it is collected. One key to obtaining such information is to lighten the collection burden by keeping questions to a minimum, by asking the questions for only every nth home visit, by requesting such information on a revolving basis so that any given worker is responsible for reporting during only part of the year, or by obtaining information only from selected personnel. Using selected personnel is similar to the sentinel post technique, the second recommended method. Sentinel posts, as defined here, are sample collection points selected to represent the entire project area. Ideally, they are staffed by specially trained personnel not encumbered with service delivery responsibilities. These personnel may assist in the collection of more complete, more timely, or more accurate service statistics. To collect data for effectiveness or coverage indicators, sentinel post personnel visit a sample of households, ideally a probability sample, in which each household in the area has an equal chance for selection. The advantages of a sentinel post system are that one can obtain high quality, creditable data at relatively low cost without disrupting service activities. For some indicators derived from service statistics for which a total count is required, the sentinel post system is inadequate, but for other service delivery or output indicators and for effectiveness indicators, the sentinel post system may be a good choice.

In sum, the Tier One evaluation system concentrates on input and output measures based on routine service statistics. Some effectiveness indicators are also recommended, but in Tier One these will be collected, not by a large sample survey, but through sample reports from project service personnel or preferably from a low-cost sentinel system.

Tier Two of the evaluation system will consist of 10 to 20 percent of the total projects. Projects in Tier Two will be selected to represent a cross-section of projects by type of intervention, type of delivery system, and geographical location. Indicators in Tier Two, in addition to information for all indicators in Tier One, will include more rigorous measures of effectiveness as well as impact indicators of growth deficiency and general child mortality. Tier Two will also comprise measures of system effectiveness and quality control

or outputs such as tests of ORT competency for trained field workers. For ORT commercial retail sales programs, for example, projects may do store shelf audits to measure retail sales. Tier Two will also include explanatory variables to identify reasons for project progress or lack of achievement. Since measurement of these indicators will require baseline and follow-up household surveys based on probability samples, Tier Two evaluation will need more financial and technical resources than Tier One. Tier Two will generally not include indicators for disease-specific morbidity and mortality to be be measured in Tier Three because of the large sample sizes required for these measures.

Only a very few projects will carry out Tier Three evaluation. These projects will undertake rigorous longitudinal studies to measure cause-specific mortality, cause-specific morbidity, growth deficiency and more rigorous measurement of Tier One and Two indicators.

For the best estimates of reduction in child mortality and growth deficiency one might wish for all projects to participate in Tier Three evaluation. That degree of rigor is clearly impractical. However, by making explicit assumptions regarding the degree of similarity among projects in Tiers One, Two, and Three, one can estimate increases in coverage and reduction of mortality/growth deficiency for all projects. Unquestionably, the assumptions required for such estimates will not be minor and must be stated clearly and openly. But the more projects participating in Tiers Two and Three instead of Tier One, the higher one's confidence will be in the estimates of overall impact. Moreover, the in-depth studies of the relationships among the proximate and dependent variables should contribute to scientific knowledge for more accurate future estimates.

B. General Criteria for Selecting Indicators

In defining indicators, the Task Force has chosen candidate measures on the basis of the following considerations:

1. <u>Simplicity</u>

The indicator should be easily understood as a measure of the effectiveness of the intervention to which it relates.

2. <u>Ease of Collection</u>

The indicators recommended represent a diverse range in difficulty of collection. Tier One indicators are meant to be relatively easy to collect and analyze. Though not necessarily inexpensive, the effectiveness indicators will require data gathering through home visits by supervisory or special personnel, who may need additional training to perform the required measurements. Data for Tier Two are more difficult to collect since they require household surveys, although efficient

survey techniques can minimize the difficulty and cost. Data for indicators in Tier Three are the most difficult and most costly to collect and are therefore limited to very few project sites.

3. Responsibility to Measure Equity in Health

The families or children most at risk of death and most in need of services are often those least likely to seek care or participate in preventive programs. To ensure that Child Survival funds and programs are reaching out to the whole population, including this group, many of the indicators include a numerator and a denominator, for example the percent of infants ages 24 to 59 months immunized against measles. The denominator in this indicator is meant to represent the target population for the project, usually defined geographically but perhaps defined by other criteria such as socio-economic status or severity of growth deficiency. The numerator represents the number actually reached. Such measures thus assess coverage and, with indicators of output, give measurements of equity in program achievements.

4. Use of Intermediate Indicators to Estimate Impact and Costs

Ideally Congress would like to know the number of children's lives saved per $1,000 spent. Yet the collection of such ultimate impact data is extremely complex and difficult. To approach that ideal but remain feasible, we have proposed an evaluation system that is tiered so that direct estimates of impact and costs are limited to Tier Two and Tier Three. The conceptual basis of the evaluation system is that estimates of the impact and costs for all projects can be derived by understanding the relationships between Tier Three evaluations, the Tier Two intermediate indicators, and the more routine data gathered by Tier One evaluations.

For example, Tier Two indicators will be primarily "intermediate" in nature. Using data derived from previous studies of child survival and eventually from the Tier Three, it will be possible to extrapolate or estimate the impact of the activity on mortality and morbidity. Knowing that 95% of pregnant women are immunized against tetanus prior to delivery, for example, allows an estimation of the reduction in deaths from neonatal tetanus, even though we have not proven that such a reduction has taken place. Determining the percentage of mothers who can property mix an oral rehydration solution in the home similarly allows an estimation of the reduction in severe dehydration from diarrhea and thereby in diarrhea mortality. It also measures the effectiveness of a project's educational methods, rather than merely documenting that an encounter between a field worker and a mother has occurred.

To obtain the desired more precise determinations of impact on mortality, a few projects receiving Child Survival funds will be chosen for detailed external longitudinal impact evaluation. This will need to be built into the project design and approval process for those projects selected and negotiated with host country governments where applicable.

5. Consistency with Indicators Collected by Other Programs

Insofar as possible, indicators should be selected to be consistent with those already collected by other programs within A.I.D. and W.H.O.

6. Usefulness to the Project

The inclusion of effectiveness data in the Tier One evaluation systems for all projects will be an important strengthening of project information systems. This effectiveness data will be collected at sentinal posts by program supervisors as well as field workers and will prove useful in monitoring and improving the efforts of field level workers. All too often evaluation data collected at field level are sent to regional or even international centers but never return to the field worker in a form suitable for use in detecting problems, correcting strategies and work methods, or providing supportive motivation. Lack of supervision and feedback is a major deficiency in many community-level programs. Thus requiring such operations-level data collection in all projects will support useful program problem-solving and correction by field supervisory staff. It is hoped that collection and feedback of effectiveness indicators will not overburden the peripheral systems but instead motivate workers and managers by informing them of the effect of their work.

II. The Standard Indicators

A. The Principal Dependent Variables: Child Mortality and Growth Deficiency

Measures of general child mortality and growth deficiency constitute the two principal indicators to measure the impact of child survival interventions. Each of these merits consideration in its own right, since some interventions may be expected to influence one indicator more than the other. In addition, cause- and age-specific mortality and morbidity in Tier Three, and perhaps some Tier Two, projects will help to evaluate the impact of particular interventions.

Definition of Child Mortality: General childhood mortality is here defined as the number of deaths during a calendar year from all causes for children ages 0 to 5 per 1000 children in the target population. In addition to general childhood mortality for ages 0 to 5, some projects may wish to calculate mortality

for ages 6 to 36 months if the project interventions seems likely to affect most directly those age groups.

Measurement of Mortality: The number of deaths of children ages 0 to 5 for the project area may be estimated from routine vital registration data, from census data, from a sample household survey, or a surveillance system. The problems of misstatement of age and omission of deaths are common for all sources but particularly for census and registration data. A well-conducted household survey or surveillance system is likely to produce the most accurate estimate.

Selection of an Indicator for Growth Deficiency: Several criteria enter into the selection of an indicator for growth deficiency -- the power of the indicator for predicting mortality, the cost of data collection, the reliability of measurement, and whether or not the project is using one of the candidate indicators in a growth monitoring program. Because of these multiple criteria and the relatively small number of studies comparing indicators, the selection of an indicator seems likely to be controversial. Chen et al. in a comparative study of weight/age, height/age, weight/height, and arm circumference/height as predictors of mortality among children in Bangladesh concluded that "weight/age and arm circumference/age possessed the highest discriminate efficiency over 24 months of observation. Weight/height did not appear to be as efficient" (Chen et al., 1980, p. 1844). Trowbridge and Staehling (1980), Bairagi (1981), and Trowbridge and Sommer (1981) have concluded that correcting simple arm circumference with either height or age provided little or no improvement over arm circumference alone. We conclude that weight/age is well documented as a superior predictor of mortality and should be considered particularly where weighing is already a part of project activities. Use of arm circumference is somewhat more debatable since its value has been demonstrated in comparatively fewer populations (Chen et al., 1981, p. 2596). But because arm circumference has also been shown to be a superior predictor of mortality, may be more sensitive to nutritional change (Gurney et al.), may be less costly than weighing and measuring height in sparsely populated areas, and is not be subject to misstatements of age, we conclude that arm circumference merits inclusion as a second possible indicator of growth deficiency.

Measurement of growth deficiency: Growth deficiency is best measured by sample household surveys or (if part of the routine project activities) by community-wide growth measurement. The latter method often involves selection biases, however, since the more deficient children may not attend, and corrective procedures are required. For arm circumference, the use of insertion tape as recommended by Zerfas (1977 and 1979) simplifies the procedure and probably improves reliability.

Rationale for a Single Index for Child Survival: Reduction of childhood deaths is the ultimate dependent variable for the Child Survival projects. But that variable is not only

ficult and costly to measure; it is also, over the short and medium term, relatively insensitive to interventions affecting conditions that progress slowly to death. A more sensitive, less costly dependent variable is degree of growth deficiency. Since many children gradually progress through ever-worsening stages of growth deficiency to death, it is logical to think of growth deficiency on a continuous scale, with death as the ultimate value on that continuum (Mosley and Chen, 1985, pp. 29-33). However, measures of growth deficiency alone are not sufficient since some health problems such as neonatal tetanus precipitate mortality rather than slow wasting. Thus an index combining states of growth deficiency and child mortality constitutes a practical, single measure of program impact, both more sensitive and potentionally more telling than either mortality or growth deficiency alone.

In accord with Mosley and Chen, we propose, therefore, a single Child Survival Index composed of measures of child mortality and growth deficiency. We emphasize that this index is in no way intended to replace the component indicators of mortality and growth deficiency, both of which retain usefulness alone and should be reported separately. There are many ways a summary index might be calculated. The following suggested formulas for an unweighted and weighted index are merely two of many recommended for their simplicity of calculation and, in the case of the weighted index, concordance with program objectives of reducing mortality and severe growth deficiency.

Composition and Calculation of the Child Survival Index:

The Child Survival Index may be calculated as an unweighted indicator, with each grade of growth deficiency accorded equal weight. Although the unweighted index is attractive for its simplicity, we recommend instead a weighted index that ascribes disproportionately greater importance to mortality and the more severe states of growth deficiency. Methods for calculating each are given below.

The first step for calculation of the Child Survival Index is to classify children by four levels of growth deficiency based on the measurements described above: Normal (category 0) plus three categories of deficiency, I, II, III, with III being the most deficient. Although the classification of Gomez *et al.* is best known (Gomez *et al.*, 1955), other classifications are possible.

The second step is to calculate and sum the components. For the basic, unweighted index, simply sum the number of deaths of children 0-5 per 1000 children 0-5 plus the number per 1000 children measured in each of the three most deficient groups (e.g. Deaths/1000 children + No.Gomez III/1000 children measured + No. Gomez II/1000 children measured + No. Gomez I/1000 children measured). For the weighted Child Survival Index the formula for the calculation of the numerator is as follows:

(Number of deaths of children 0-5/1000 children 0-5)^4 +
(Number of children Gomez III/1000 children measured)^3 +
(Number of Children Gomez II/1000 children measured)^2 +
(Number of Children Gomez I/1000 children measured)

B. Need for Minimum Standard Data Sets and Standard Indicators

Despite the heterogeneity of the projects, there is a need, in so far as possible, to use a minimum number of standard indicators to permit summary reporting of the entire program. The standard indicators require not merely common definitions but also standard methodologies for data collection at each tier of the evaluation system to ensure data quality and comparability. Although project differences will not permit the same standard indicators across the board, projects classified by the same type of delivery system and intervention (e.g. ORT, malaria control, etc.) should use the same minimum set of standard indicators.

Each distinctive type of program should also use, in addition to the minimal standard indicators whatever other standard indicators are practical. By using empirical results from those programs fully evaluated, and assuming that the programs are similar within intervention type, one may estimate ultimate impact of each of the basic intervention types individually and in concert.

C. Summary of Indicators for the Child Survival Evaluation System

The Child Survival Evaluation System has six components as shown below.

COMPONENTS IN CHILD SURVIVAL EVALUATION SYSTEM

Dependent Variables:	Child Mortality and Growth Deficiency
Project Interventions:	Oral Rehydration Therapy
	Immunizations
	Nutrition
	Family Planning
	Personal Hygiene and Sanitation

To apply the standard indicators to projects, Child Survival project agencies should collect data for indicators appropriate for their program interventions. Thus, for example, projects with only oral rehydration activities should necessarily collect data for ORT indicators, but may or may not collect data for indicators relating to water/sanitation.

Table 2 presents a list of recommended evaluation indicators by component and topic.

III. Resource Tracking and Cost Effectiveness

For all projects it is essential to track resources, but Tier Two projects with multiple interventions will require special accounting efforts established from the inception of the projects to track resources for specific interventions. The purpose of such accounting is to compute cost of program outputs and cost effectiveness indices specific to each type of intervention, e.g. cost per child for measles immunization. Normal accounting categories such as Personnel or Transportation will not be sufficient for tracking costs of specific interventions.

The first step for tracking resources is to develop a consolidated budget of all inputs, whether public or private, in kind or monetary. The actual expenditures from that budget may occur irregularly over the project period, and may not coincide closely with the time when the liabilities were incurred -- the familiar problem of disbursements versus accruals. The lack of such overlap as well as seasonal variation underlines the need for relatively long periods such as one year for analysis (Robinison, 1976).

It is useful to allocate expenditures along the axis of direct (variable) versus indirect (fixed) costs. The direct costs represent intensity of program activity, whereas the indirect or fixed costs refer to "overhead" such as administrative salaries that cannot easily be altered. The other useful axis is capital versus recurring costs. Capital costs such as equipment, buildings, vehicles, and in some cases personnel training, should be amortized over their estimated useful life period.

A particularly difficult problem is the allocation of "joint costs." For example, if a project trains village health workers on multiple topics, how much of the training cost should projects allocate to Child Survival and how much should Tier Two projects allocate to each specific intervention? For training it may be possible to apportion costs by the number of curriculum hours, but for other types of costs the process of allocation may be far more difficult. Nonetheless, the allocation of joint costs by whatever method is far more easily accomplished prospectively than long after the fact. Furthermore, allocating costs prospectively has the further advantage of contributing potentially useful information for current project management.

Where child survival activities are added to existing programs, there are at least two methods of calculating joint costs. The first method is simply to calculate the incremental costs, e.g. salaries of new staff, supplies, and training costs for child survival. A second method is more appropriate where child survival activities supplant existing activities. If one assumes that existing staff were previously fully employed, then adding child survival activities involves an opportunity cost in other health activities not performed. A percentage of existing staff salaries should be counted as child survival program costs. Similarly, a percentage of existing capital plant should be allocated to child survival. The second method will clearly result in higher cost estimates. A variation of the second method occurs when child survival activities become the principal activities and usurp the place of former activities considered less productive. In that situation, the large reallocated costs of the former activities plus incremental costs will likely result in quite high cost estimates. The choice of the method and proportions to use should depend on empirical verification of whether or not previous staff were fully employed and the amount of time actually expended in child survival activities versus other activities. (See Over, 1985 for a slightly different approach to joint costs).

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TABLE 2
STANDARD INDICATORS BY TYPE OF INTERVENTION AND SYSTEM LEVEL

Intervention	Inputs (Resources)	Outputs (Services)	Effectiveness (Health Knowledge, Attitudes, Practice)	Impact
ORT: Commercial and non-commercial, packet and non-packet programs	Resources budgeted for ORT by type of resource and source (funds, commodities, human resourc) Resources received in period by type and source Resources expended in period by type of expenditure, by direct vs. indirect, capital vs. recurrent	Number of packets sold to commercial wholesalers Number of packets sold wholesale to retailers Estimated retail sales from shelf or stock audit in sample of retailers Number of packets distributed to non-commercial agencies Number of non-commercial outlets stocked with packets Mass media output: # radio+TV spots, # posters distrib.,etc. No. of personnel trained by type Public education output: # meetings and # person # classes with practic. # home vsts. with prac.	Percentage of mothers of children ages 0-5 with demonstrated adequate capability to use ORT effectively Percentage of families with children 0-5 who have obtained packets and have packets in their home Percentage of children 0-5 who received ORT in most recent diarrhea episode Percentage of children 0-5 with onset of diarrhea in last two weeks who received ORT Percentage of children 0-5 continuing feeding/ breastfeeding during last used ORT Percentage of families with children 0-5 with access as defined by WHO	Age-specific diarrhea associated mortality rate Facility age-specific case fatality rate by type of facility

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TABLE 2 (CONTINUED)
STANDARD INDICATORS BY TYPE OF INTERVENTION AND SYSTEM LEVEL

Intervention	Inputs (Resources)	Outputs (Services)	Effectiveness (Health Knowledge, Attitudes, Practice)	Impact
Family Planning	Resources budgeted for family planning by type of resource and source (funds, commodities, human) Resources received in period by type and source Resources expended in period by type of expenditure, by direct vs. indirect and capital vs. recurrent	Number of contraceptives distributed by method No. new contraceptive acceptors by method No. personnel trained by type Mass media output: No. radio + TV spots Education output: No. meetings plus attendees, home visits	Percent women 15-49 who know about methods by type of method Percent women 15-49 in marital or consensual union who have ever used a method Percent women 15-49 in marital or consensual union who currently use a method Percentage of children ages 9 to 24 months with a younger sibling Percentage of women less than age 20 and older than 35 among women who had a live birth last yr.	Number of months at delivery since last live birth Reduction of general fertility rate (all births/ women 15-49)