

# **Determinants of Data Quality for the Center for International Health Information**

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## LIST OF ACRONYMS

ABS	Annual Budget Submission
BCG	Vaccine for Tuberculosis
BG	"Best Guess" Response
BUCEN	U.S. Bureau of the Census
CDC	Centers for Disease Control
CDD	Control of Diarrheal Diseases
CDIE	USAID Center for Development Information and Evaluation
CIHI	Center for International Health Information, ISTI
CP	Congressional Presentation
CSF	Community Systems Foundation
DC/BG/DK	"Data Collection/Best Guess/Don't Know" Response
DHS	Demographic and Health Surveys
DK	"Don't Know" Response
DPT	Vaccine for Diptheria, Pertussis and Tetanus
EPI	Expanded Program on Immunization
HCS	Health and Child Survival
HIS	USAID's Health Information System Operated by CIHI
HPD	Health Projects Database
HSD	Health Statistics Database
ISTI	International Science and Technology Institute, Inc.
LQAS	Lot Quality Assurance Survey
OPV	Live Oral Poliomyelitis Vaccine
ORS	Oral Rehydration Salts (or Solution)
ORT	Oral Rehydration Therapy
PPC	USAID's Bureau of Planning and Program Coordination
PRB	Population Reference Bureau
PVO	Private Voluntary Organization
QDB	Questionnaire Database
TOPV	Live Trivalent Oral Poliomyelitis Vaccine
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WHO	World Health Organization

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## EXECUTIVE SUMMARY

1. This study of data quality is organized around the three central databases in the Center for International Health Information (CIHI), namely the Questionnaire Database (QDB) containing the information obtained from USAID's annual Health and Child Survival Questionnaires, the Health Projects Database (HPD), and the Health Statistics Database (HSD).

2. Several dimensions of data quality were identified as being most important to CIHI. They include characteristics related directly to the variables in the databases, including validity, reliability, bias, currency and completeness; characteristics related to the overall system, including comprehensiveness and source and method; and characteristics of the communication and use of the data, including clarity, timeliness and use. These dimensions of quality differ in their relative importance for the three databases.

3. In general, we believe the overall quality of the QDB and HPD is high, and that the quality of the data has been steadily improving. The currency and intense use of the data is especially high, as is the completeness and reliability of obligation data in the HPD. Areas of QDB and HPD in need of attention include:

-The validity of obligation data, especially in relation to the interpretation and reporting of percentage attributions (of project funds to interventions) and to the dynamic nature of project programming and USAID reporting systems, is questionable. This complex issue needs further investigation.

-To increase reliability of the QDB, questionnaire data should be verified during the data entry process.

-The decision as to which projects to include in HPD, an issue of comprehensiveness, needs ongoing review in order to stay up with changing USAID needs. We suggest a committee be formed to address this task.

-In order to increase the clarity of communication of data, standard reports should be developed which carefully document the limitations, operational definitions, sources and methods of data collection (where possible).

4. A study of the "Data Collection/Best Guess/Don't Know" responses on the 1988 questionnaires revealed specific items where completeness and reliability may be a problem (Table 2b), and it found substantial differences across sections of the questionnaire (Table 2a). Project information was the most "certain" (from data collection systems), while responses about demographics and high risk birth activities were the least "certain" (more "best guess" and "don't know" responses).



5. Eight survey design characteristics are known (from prior research) to correlate with better quality data: 1) number of response categories, 2) "don't know" option, 3) battery length, 4) comparative perspective, 5) length of question, 6) length of introduction to question, 7) relative position of question in the survey, and 8) labeling of response categories. Each item in the 1988 questionnaire was evaluated for each of the eight characteristics. The results (Table 3) point to specific improvements that can be made in many items. In general the questionnaire scored moderately high in battery length, question length and "don't know" option, but low with respect to comparative perspective and too few and poorly labeled response categories.

6. A methodology for judging textual descriptions of projects was developed and applied to project "highlights" reported in a sample of 30 questionnaires (1988) as well as to the HPD and CIHI library. Eighty percent of the questionnaires completed this question, while 40% were judged to have good quality information. We believe the quality can be improved by providing examples (comparative perspective) in the questionnaire.

7. Many factors influence the quality of data in the HSD. As a repository of secondary data collected by others, CIHI has little control over most aspects of the quality of data in HSD. The dimensions of quality which it can influence and therefore should concentrate on improving are completeness, source and method, comprehensiveness and clarity of communication.

8. We reviewed factors influencing the quality of coverage indicators for immunization and oral rehydration therapy (ORT), including eight different methods used to estimate immunization coverage and six different methods used to estimate ORT coverage. These fourteen methods could form the basis for classifying data on method of data collection.

9. We developed and applied a methodology for assessing the completeness of information in HSD. For each HSD variable by country and year, the methodology reports the presence or absence of data and their currency, as well as a discussion of the adequacy of information on source(s), data collection methods and diligence in applying the method(s). The results are summarized in Table 6 (along with the methodology) and reported in detail in Tables 7 through 11. Various recommendations emerge from this analysis:

- The methodology should be applied periodically to monitor completeness of HSD data.

- Most demographic, immunization and ORT indicators are very complete, but contraceptive prevalence, nutritional status, infant feeding and, strangely, 1987 child mortality are very incomplete. Action should be taken to increase the completeness of these indicators. The WHO nutrition data bank is a potential source of nutritional status data and should be investigated. Surveys such as those done by DHS are the most likely source of infant feeding data, although the number is limited and the survey data will probably need to be re-analyzed to obtain the relevant indicators.

- The most recent immunization and ORT indicators (currency) are about 18 months old

on average.

-Source data are generally present but in an inefficient format. (See comments below on the structure of HSD.)

-It will be difficult to obtain good data on data collection method and diligence used in applying the method.

10. The structure of the HSD can be improved, as noted below:

-Use a simple code to identify sources rather than the full citation for every variable.

-Develop a standard coding scheme for data collection methods when such data become available.

-Consider organizing data so that all data for a single year are in one file.

-Consider organizing data so that all countries are in a single file.

11. In order to increase the comprehensiveness of HSD so as to best meet the changing needs of USAID, consider the following:

-Use a technical advisory group to advise on what data to include in HSD.

-Consider expanding the HSD to include all countries.

-Consider including data at the sub-national level.



## 1. INTRODUCTION

### 1.1 Background

During the past five years, the Center for International Health Information (CIHI), established by the International Science and Technology Institute (ISTI) under contract to the United States Agency for International Development (USAID), has developed and expanded the Health Information System (HIS) -- a comprehensive database of information compiled from several sources on USAID-supported Health and Child Survival projects around the world. An evaluation of the HIS conducted in 1987 determined a need to assess the quality of the data in the HIS, and to generate a method for improving the quality of the data. Recommendations from that study emphasized continued support for development of the HIS, development and distribution of standardized HIS reports, routine feedback of HIS data to health officers in USAID missions, and improved management of the database, including efforts to improve data quality. These recommendations are in keeping with the purposes of the HIS, which include providing support for policy, management and evaluation activities in the Health and Child Survival program, making information on USAID-funded activities available to USAID program managers and the leaders of developing countries, and expanding the capabilities of the database system, especially for reporting purposes. Data from the HIS are included in the Annual Child Survival Report to Congress. HIS data are also used to fulfill information requests from Congress and from USAID staff.

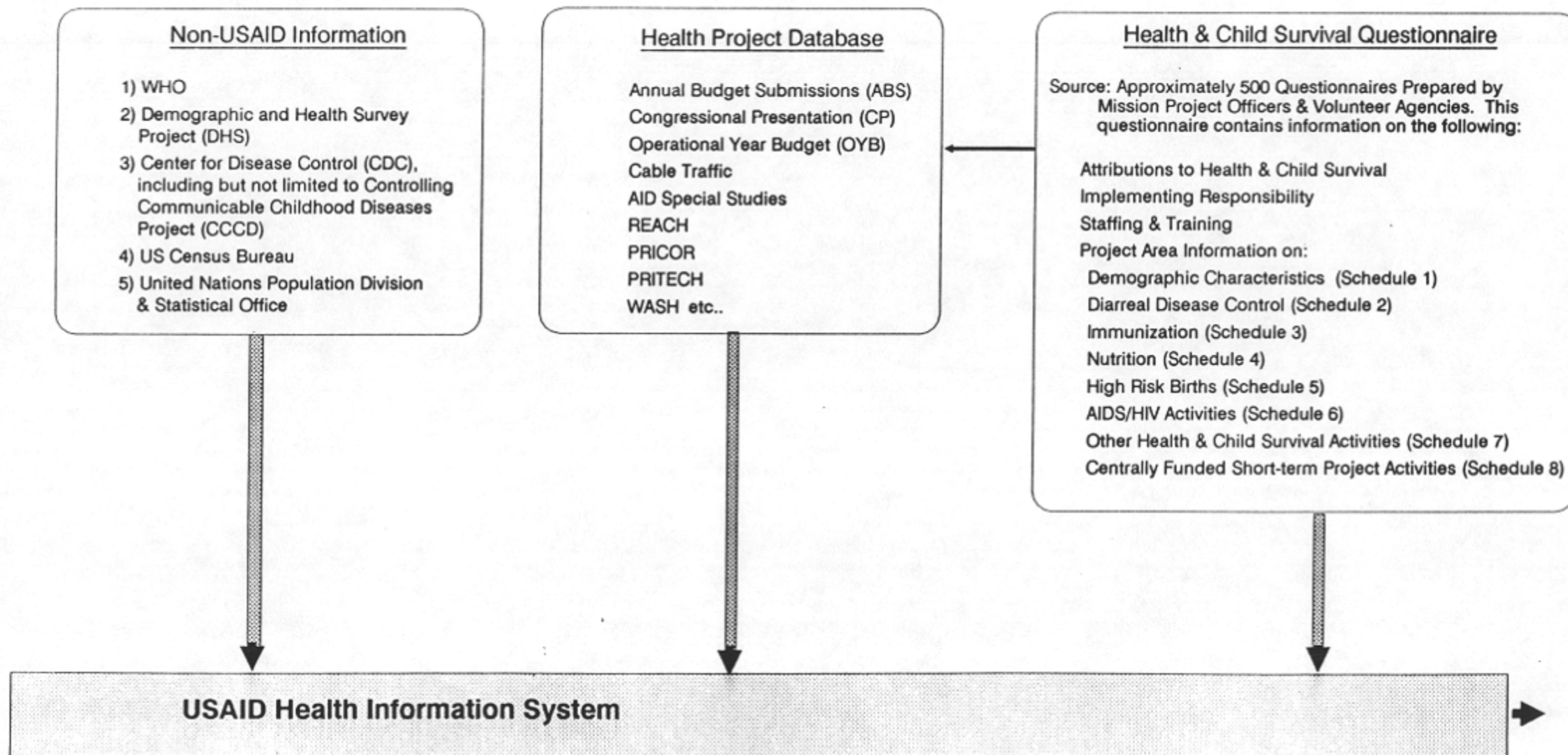
The purpose of this study is to assess the quality of the HIS data and, from findings of the assessment, to recommend ways to improve data quality. This report is the last in a series of reports, and is based, in large part, on findings from the previous reports: Report 1 -- Definitions and Dimensions of Data Quality; Report 2 -- Methodology for Measuring Data Quality; Report 3 -- Application of the Measurement Methodology.

The findings of this report are based on a number of data gathering activities. Reviews of the current literature on data quality definitions and issues in several fields were conducted and presented. Interviews with users of the HIS data and HIS staff were conducted to gain an in-depth view of problems encountered in the uses to which HIS data are put outside of ISTI. Finally, we have analyzed the HIS data as a means of assessing current data quality, as well as to provide a basis for recommending indicators for ongoing data quality monitoring.

### 1.2 Center for International Health Information Activities

Data collected and compiled in the HIS come from numerous sources and cover a wide range of topics. Figure 1 depicts the main sources of the information. The Health and Child Survival Questionnaire Database (QDB), the Health Projects Database (HPD), and the Health Statistics Database (HSD) are the central databases maintained by CIHI. The QDB data are compiled from the annual USAID Health and Child Survival (HCS) Questionnaire which is filled out by project officers. The HPD consists primarily of data from the Annual Budget Submissions

**Figure 1 - Sources of Information for the USAID Health Information System (HIS)**





(ABS), Congressional Presentations (CP), and the annual HCS Questionnaires. Data in the HSD come from numerous sources both within and outside of USAID, including the World Health Organization (WHO), Centers for Disease Control/USPHS (CDC), Demographic and Health Surveys (DHS), U.S. Bureau of the Census (BUCEN), Population Reference Bureau (PRB), USAID centrally funded projects such as REACH, PRITECH and WASH, and special USAID supported studies and surveys.

The USAID questionnaire is the source of information on many aspects of health and child survival projects. Information is collected on funding sources (USAID and non-USAID), percentage attributions in different program functions (child survival and health), research activity, health staffing, private sector activities, and demographic characteristics of the population in the project area. The questionnaire is primarily devoted to assimilating information on child survival activities: oral rehydration therapy and diarrheal diseases, immunization and vaccination, nutrition (breast-feeding, growth monitoring, infant and child feeding, and vitamin A), and high risk births. Other child survival activities are also covered by the questionnaire: acute respiratory infection, health care financing, water and sanitation, malaria, AIDS and all other diseases. Non-child survival activities which are covered in the questionnaire include: health care financing, water and sanitation, medical education, malaria, AIDS, all other diseases and other non-child survival activities.

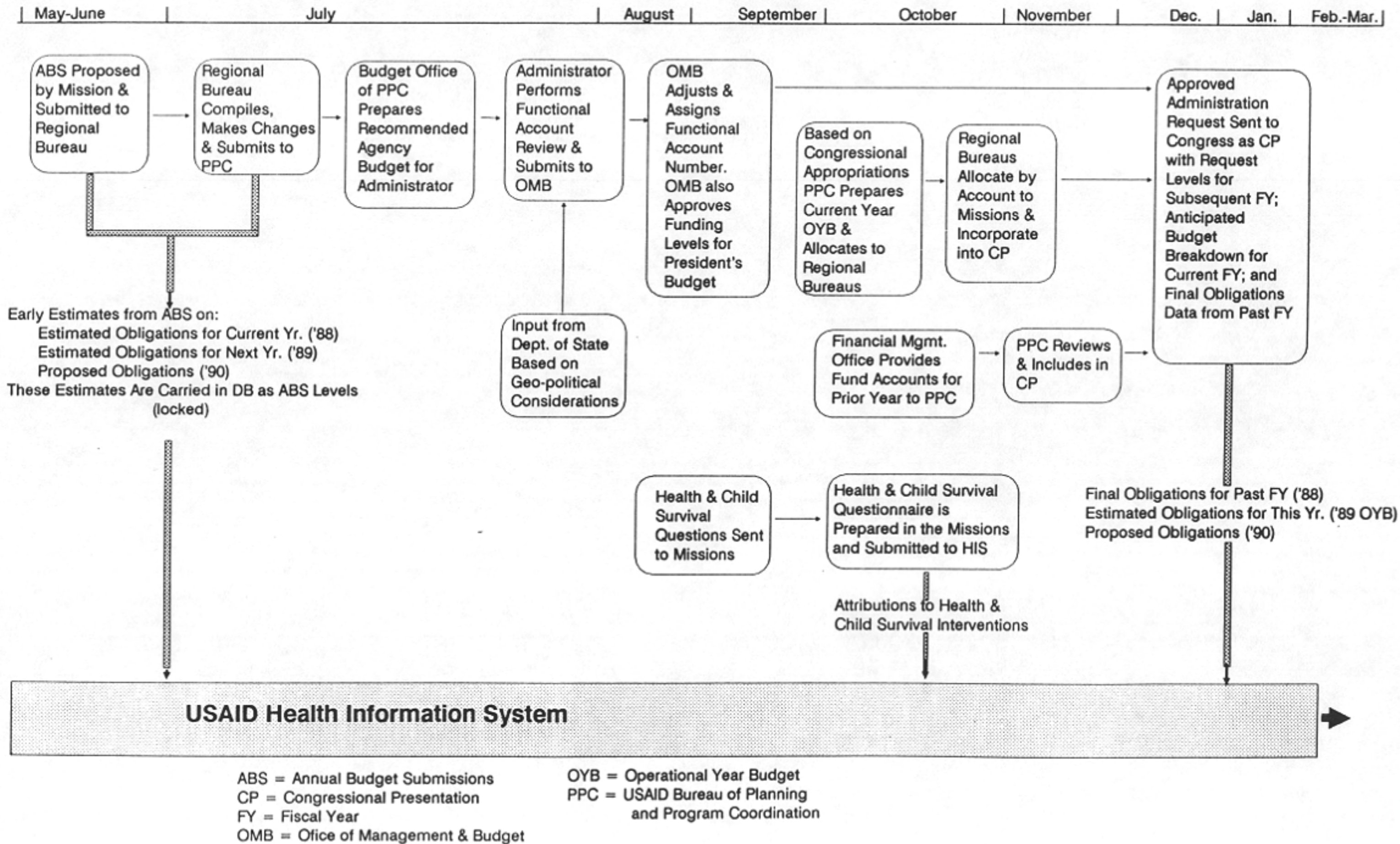
Published sources are also used to compile data on a number of subjects. Population and demographic data reported in the 1988 Annual Child Survival Report to Congress were drawn from United Nations and other publications. Immunization coverage data reported in the Annual Report were from the World Health Organization's Report on World Immunization Status as well as from various country reports. WHO data were also used to estimate oral rehydration therapy access and usage rates.

### **1.2.1 The Flow of Information into HIS**

Information on the funding of projects contained in the HIS is tied to the Executive and Congressional budgetary decision process. In the flowchart in Figure 2, a diagram of the budgetary process and the entry of information into the HIS is presented for a typical year, beginning in May. Early in the year (May-June), tentative figures for project funding obligations are submitted by the missions to the Regional Bureau. These estimates for obligations in the current fiscal year (1988 in the example), estimated obligations for the upcoming fiscal year (1989) and proposed obligations for the following year (1990) are submitted to the HIS in June. They are locked and carried in the database as "ABS levels."

Each of these three yearly estimates is refined as the year proceeds and more up-to-date values are again entered in December. Final obligations for the fiscal year ending in September are provided to PPC by the Financial Management Office and then to HIS. Estimated obligations for 1989 are based upon congressional appropriations made available by September 30. PPC and the regional bureaus then allocates funds both to projects and to USAID missions and

**Figure 2 - USAID Budgetary Process and Information Flow into the USAID Health Information System (HIS)**  
 (Example of May '88 through March '89)





offices after Congress acts. These allocations are provided as part of the Congressional Presentation in March and are entered into the HIS at that time. A similar pattern is followed for proposed obligations (1990).

The Health and Child Survival Questionnaire is the source document for attributing funding to child survival categories. The questionnaire is sent to missions in August and in most cases is filled out and returned to HIS by November.

### **1.2.2 Classification of the HIS Data**

A three-tiered approach is used to classify the HIS data. Tier one data consist of input data -- project funding and project descriptions. Tier two data are population based data which consists of effectiveness and coverage indicators -- intermediate indicators of project performance, or health care and health status indicators for a country or a project area. Some of the tier two indicators are: 1) immunization coverage of the five Expanded Program on Immunization (EPI) standard antigens: polio vaccine, diphtheria and tetanus toxoid, pertussis, BCG, and measles (WHO/EPI/GEN[1986] 7 Rev[1]); 2) contraceptive prevalence; 3) infant feeding behavior; 4) nutritional status; and 5) ORT usage rate. Tier three data result from special analytic studies of general, age- and cause-specific mortality and morbidity. At present, the HIS contains tier one and tier two data, though tier three data are planned to be added to the system in the future.

### **1.3 Organization of This Report**

This report is a compilation and extension of work done in previous reports. We begin by presenting the definitions and dimensions of data quality found in the literature that appear to be most relevant to the HIS. Each of the HIS databases is then discussed in some detail with reference to these definitions and dimensions. Within each of these sections analysis is presented and recommendations outlined.



## 2. DIMENSIONS OF DATA QUALITY

Data of good quality must meet many standards. We begin by reviewing those dimensions of quality that we have identified as being important to data quality in general.<sup>1</sup> These come from a review of the literature and our own thoughts about quality issues specifically relevant to the HIS.

For convenience, we have grouped the several dimensions of data quality into three categories: those related to specific variables, those related to the information system as a whole, and those related to communication and use of the data. The organization of this report follows these categories for each of the three central databases.

### 2.1 Quality of Variables

**2.1.1 Validity** The validity of a measure is determined by the extent to which the measure represents the concept it is intended to measure. In other words, validity is measured by asking the question: "How well does this indicator measure the underlying concept?" Unfortunately, the validity of a measure is not easily assessed, especially where the construct is abstract. In practice, validity is related to how the measure is communicated and put to use.

**2.1.2 Reliability** The reliability of a measure is determined by its consistency over time, or by its repeatability. If the measure is applied repeatedly, will it yield similar results in each test? Or will results from one test to another fluctuate wildly? If a child is weighed several times in succession on a scale, the scale will be deemed reliable if it yields the same weight for that child in each successive weighing. Misclassification of cases is an important problem that can affect reliability and bias.<sup>2</sup>

**2.1.3 Bias** Bias is distortion in the data which yields measurements which are higher or lower than the true value of a measure. If bias is consistent across all respondents, i.e., all responses are higher than true estimates, the mean response and the median will be affected, but the shape of the distribution and dispersion about the mean will not. Knowing that responses on a particular survey item are consistently upwardly biased across projects, for example, reduces confidence in the absolute values of the responses, though comparisons among projects can still be made.

**2.1.4 Currency** The currency of the data is a further aspect of their quality. If a user is interested in the current status of some indicator in a particular place, then old data are less valid than recent data. Consequently, the "life expectancy" of an indicator is a function of its consistency over time. Some consider currency an aspect of validity.

**2.1.5 Completeness** Completeness is determined by the extent to which the variables

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<sup>1</sup> Heymann, et al., 1987. Schoub, et al., 1986. *Weekly Epidemiological Record* (1988) 63(3).

<sup>2</sup> Drake, W.D., Miller, R.I., Timmons, R.J., Missreporting Program Impact: The Effects of Classification Errors, Community Systems Foundation (October, 1985).

reasons such as non-reporting, unavailability or failure to collect the data from secondary sources which are available. The quality of the information presented by the CIHI is degraded by incomplete data. Completeness is not independent of other dimensions of quality in that more complete data can increase reliability and decrease bias.

## **2.2 Quality of System**

**2.2.1 Comprehensiveness** Comprehensiveness refers to the extent to which the variables that are collected and the criteria for selecting records reflect the topic for which the system is responsible. Comprehensiveness is difficult to assess, especially in cases where the topic is changing and/or expanding. However, a system which is not comprehensive will have difficulty responding to relevant inquiries.

**2.2.2 Source and Method** Source and method refer to citations of the source of the data (when it is secondary data), and to the method used in collecting the data. Such information may be related to other dimensions of quality such as reliability and bias because of its importance to users in assessing the appropriateness of data for a particular application, particularly in light of the relative scarcity of other good data on quality.

## **2.3 Quality of Communication and Use**

**2.3.1 Timeliness** Quality of data is also a function of the speed with which information is disseminated. If significant time lapses between a request for information and delivery, the usefulness (and therefore quality) of the system is diminished.

**2.3.2 Clarity** Another dimension of quality is the clarity of presentation. Proper interpretation of information is dependent on a careful description of the data on which that information is based. This includes statements regarding the limitations of the data, if any.

**2.3.3 Use** The use of the HIS can also be considered a dimension of data quality. The more the data are seen and used, the more verification takes place. Furthermore, the collectors of data may be encouraged to be more careful if they realize the data will be seen and used.



### **3. HEALTH AND CHILD SURVIVAL QUESTIONNAIRE DATA**

The annual Health and Child Survival Questionnaire and resulting QDB serve several functions: 1) consolidation of a controlled questionnaire, 2) estimates by technical officers of the attribution of project funds to specific types of interventions, 3) descriptive information about project achievements for use in various reports, including reports to Congress, 4) descriptive information about project activities and their aggregation (e.g., number of physicians trained, number of projects pursuing vaccination campaigns, number of projects with a private sector component).

#### **3.1 Variable Quality in the Questionnaire and QDB**

##### **3.1.1. Analysis of the "DC/BG/DK" Scale**

Many items in the questionnaire request the respondent to report whether the information provided was obtained from a data collection system of some sort (DC), whether it was a best guess by the respondent and possibly others (BG), or whether the respondent simply didn't know (DK). This information relates to the quality dimensions of completeness and reliability. The frequency of DK and missing responses measures the incompleteness of a particular item, while DC responses are likely to be more reliable than BG responses. The DC/BG/DK scale is limited to descriptive information about project activities.

##### **Frequency of Responses**

All items in the HCS questionnaire which are accompanied by the "data collection/best guess/don't know" (DC/BG/DK) scale were examined in this phase of the study. The frequencies of responses in each of the categories have been determined and are presented in Tables 1a and 1b. A more complete frequency table is provided in Appendix A (Table 1A). This information gives an indication of the quality of the 1988 HCS questionnaire data, and may be helpful in the design of next year's questionnaire. It may also help to identify data items which are readily available from existing data collection systems, and may be used to determine whether particular questions are more difficult to answer with certainty.

The frequencies of "data collection," "best guess" and "don't know" responses were calculated: 1) by questionnaire item, 2) by questionnaire section, and 3) for the questionnaire overall. A second assessment included missing responses. Tables which include the missing data counts along with the other response frequencies are provided in Appendix A. Our intent, however, in this stage of the analysis was not to assess the percentage of missing data, but rather to determine the percentage of responses falling into each category for the data available. At a later point, it may be of interest to project managers and USAID staff to proceed further with an analysis of missing data.

Tables 1a and 1b show the number of DC, BG and DK responses for each question, and

the overall percentages for each section. This information is then summarized for each section of the questionnaire. For the questionnaire overall, "data collection" responses were most frequent (47.7%), followed by "best guess" responses (29.4%) and "don't know" responses (23%). "Data collection" responses were most frequent in the Project Information, Oral Rehydration/Diarrheal Diseases, Immunization, Nutrition, High Risk Births, and Other Child Survival Interventions sections. "Best guess" responses were most frequent in the Demographic Characteristics section, and least frequent in the High Risk Births and Immunization sections. "Don't know" responses were least frequent in the Project Information, Demographic Characteristics, Oral Rehydration/Diarrheal Diseases, Nutrition and Other Child Survival Interventions sections.

**TABLE 1a**

**PERCENTAGE RESPONSES IN DATA COLLECTION,  
BEST GUESS AND DON'T KNOW CATEGORIES  
By HCS Questionnaire Section and for the HCS Questionnaire Overall**

<b>SECTION</b>	<b>Data Collection</b>	<b>Best Guess</b>	<b>Don't Know</b>
Project Information	68.3%	26.0%	5.7%
Demographic Characteristics	34.0%	40.4%	25.6%
Oral Rehydration/ Diarrheal Diseases	51.8%	34.2%	14.1%
Immunization	56.0%	16.2%	27.8%
Nutrition	47.7%	36.2%	16.1%
High Risk Births	48.7%	11.5%	39.8%
Other Child Survival Interventions	51.5%	39.6%	8.9%
<b>OVERALL</b>	<b>47.6%</b>	<b>29.4%</b>	<b>23.0%</b>

Note: Missing data values are not included in this analysis but are shown in Table 2A in Appendix A.



TABLE 1b

**PERCENTAGE RESPONSES IN DATA COLLECTION,  
BEST GUESS AND DON'T KNOW CATEGORIES  
By HCS Questionnaire Item**

<b>QUESTION</b>	<b>Data Collection</b>	<b>Best Guess</b>	<b>Don't Know</b>
<u>Project Information</u>			
Q. 14 in-country	60.6%	35.5%	3.9%
Q. 14 U. S.	81.0%	11.9%	7.1%
Q. 14 other	76.1%	14.9%	9.0%
<u>Demographic Characteristics</u>			
Q. 1-2.1	55.3%	39.4%	5.3%
Q. 1-3.1	36.9%	44.3%	18.8%
Q. 1-3.2	37.0%	41.1%	21.9%
Q. 1-3.3	31.7%	39.6%	28.8%
Q. 1-4.1	38.0%	41.3%	20.7%
Q. 1-4.2	24.1%	34.3%	41.6%
Q. 1-4.3	23.0%	32.4%	44.6%
Q. 1-5.1	21.2%	50.0%	28.8%
<u>Oral Rehydration/Diarrheal Diseases</u>			
Q. 2-1.2 imported	44.6%	39.3%	16.1%
Q. 2-1.2 local	51.2%	22.0%	26.8%
Q. 2-2.3	55.9%	36.3%	7.8%
<u>Immunization</u>			
Q. 3-1.2 measles	52.4%	12.7%	34.9%
Q. 3-1.2 polio	47.5%	13.1%	39.3%
Q. 3-1.2 DPT	46.7%	15.0%	38.3%
Q. 3-1.2 BCG	50.8%	8.5%	40.7%
Q. 3-1.2 tetanus	45.0%	15.0%	40.0%
Q. 3-1.3 measles	64.1%	19.2%	16.7%
Q. 3-1.3 polio1	64.0%	17.3%	18.7%
Q. 3-1.3 polio3	62.7%	18.7%	18.7%
Q. 3-1.3 DPT1	64.0%	17.3%	18.7%
Q. 3-1.3 DPT3	62.7%	18.7%	18.7%
Q. 3-1.3 BCG	55.9%	20.6%	23.5%
Q. 3-1.3 tetanus	50.8%	14.3%	34.9%
Q. 3-1.3 tet/pregn	52.3%	16.9%	30.8%
<u>Nutrition</u>			
Q. 4-1.3	31.7%	43.9%	24.4%
Q. 4-1.5	47.8%	33.3%	18.8%
Q. 4-2.3	54.5%	36.4%	9.1%
Q. 4-2.6	58.6%	30.0%	11.4%



TABLE 1b (continued)

PERCENTAGE RESPONSES IN DATA COLLECTION, BEST GUESS, AND DON'T KNOW CATEGORIES By HCS Questionnaire Item			
QUESTION	Data Collection	Best Guess	Don't Know
<u>High Risk Births</u>			
Q. 5-1.2 oral cont.	62.1%	3.4%	34.5%
Q. 5-1.2 condom	62.1%	3.4%	34.5%
Q. 5-1.2 IUD	56.0%	4.0%	40.0%
Q. 5-1.2 other 1	52.4%	4.8%	42.9%
Q. 5-1.2 other 2	28.6%	14.3%	57.1%
Q. 5-1.3 oral cont.	48.3%	17.2%	34.5%
Q. 5-1.3 condom	44.8%	20.7%	34.5%
Q. 5-1.3 IUD	44.0%	16.0%	40.0%
Q. 5-1.3 other 1	38.1%	19.0%	42.9%
Q. 5-1.3 other 2	28.6%	14.3%	57.1%
<u>Other Child Survival Interventions</u>			
Q. 6-3.3	51.5%	39.6%	8.9%

Note: Missing data values are not included in this table but are shown in Table 2A in Appendix A.

### Averages of Responses

"Averages" were computed for each level of the analysis as well. "Data collection" responses were given the value of "1," "best guess" responses were coded as "2," and "don't know" responses were coded as "3." These weighted averages exclude missing data. They are used to identify questions which are particularly troublesome with respect to data quality. Summaries by topic and for the questionnaire overall are presented in Table 2a. Averages for each questionnaire item are presented in Table 2b. A response of "1" might be considered the best response with regard to the reliability of the data. However, it is still uncertain whether data obtained from a data collection system are necessarily better estimates than data which are "best guesses" of experienced health workers or project officers. Further, it is not known whether all respondents share the same definition of a "data collection system" or a "best guess" response. At times, estimates may combine information from the two sources. The interpretation of the percentage responses in each of the data source categories is thus somewhat limited.

In the following discussion, "certainty" is the term used to indicate the extent to which data have been derived from a data collection system. "More certain" data in this analysis have average values on the DC/BG/DK response scale closer to "1." "Less certain" data have values closer to "3." The average certainty rating for the questionnaire overall was 1.7. The Project Information section of the questionnaire had the highest certainty rating (1.4), while Demographic Characteristics had the lowest (1.9). Highlights of the findings of the analysis are presented for individual questionnaire items with especially high or low certainty ratings.

**TABLE 2a**

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**AVERAGE RESPONSES FOR DATA COLLECTION,  
BEST GUESS, AND DON'T KNOW CATEGORIES**  
By HCS Questionnaire Section and for the HCS Questionnaire Overall

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<b>SECTION</b>	<b>Weighted Average of Data Collection/ Best Guess/Don't Know Responses</b>
Project Information	1.4
Demographic Characteristics	1.9
Oral Rehydration/ Diarrheal Diseases	1.6
Immunization	1.7
Nutrition	1.7
High Risk Births	2.0
Other Child Survival Interventions	1.6
<b>OVERALL</b>	<b>1.7</b>

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Note: Missing data are not included in this analysis. The following weights were used: data collection = 1, best guess = 2, don't know = 3. In following sections of the report, these "averages" are referred to as "certainty ratings."

TABLE 2b

**AVERAGE RESPONSES FOR DATA COLLECTION,  
BEST GUESS, AND DON'T KNOW CATEGORIES  
By HCS Questionnaire Item**

QUESTION	Weighted Average of Data Collection/ Best Guess/Don't Know Responses
<u>Project Information</u>	
Q. 14 in-country	1.4
Q. 14 U. S.	1.3
Q. 14 other	1.3
<u>Demographic Characteristics</u>	
Q. 1-2.1	1.5
Q. 1-3.1	1.8
Q. 1-3.2	1.8
Q. 1-3.3	2.0
Q. 1-4.1	1.8
Q. 1-4.2	2.2
Q. 1-4.3	2.2
Q. 1-5.1	2.1
<u>Oral Rehydration/Diarrheal Diseases</u>	
Q. 2-1.2 imported	1.7
Q. 2-1.2 local	1.8
Q. 2-2.3	1.5
<u>Immunization</u>	
Q. 3-1.2 measles	1.8
Q. 3-1.2 polio	1.9
Q. 3-1.2 DPT	1.9
Q. 3-1.2 BCG	1.9
Q. 3-1.2 tetanus	2.0
Q. 3-1.3 measles	1.5
Q. 3-1.3 polio1	1.5
Q. 3-1.3 polio3	1.6
Q. 3-1.3 DPT1	1.5
Q. 3-1.3 DPT3	1.6
Q. 3-1.3 BCG	1.7
Q. 3-1.3 tetanus	1.8
Q. 3-1.3 tet/pregn	1.8
<u>Nutrition</u>	
Q. 4-1.3	1.9
Q. 4-1.5	1.7
Q. 4-2.3	1.5
Q. 4-2.6	1.5



TABLE 2b (continued)

**AVERAGE RESPONSES FOR DATA COLLECTION,  
BEST GUESS, AND DON'T KNOW CATEGORIES  
By HCS Questionnaire Item**

QUESTION	Average of Data Collection/ Best Guess/Don't Know Responses
<u>High Risk Births</u>	
Q. 5-1.2 oral cont.	1.7
Q. 5-1.2 condom	1.7
Q. 5-1.2 IUD	1.8
Q. 5-1.2 other 1	1.9
Q. 5-1.2 other 2	2.3
Q. 5-1.3 oral cont.	1.9
Q. 5-1.3 condom	1.9
Q. 5-1.3 IUD	2.0
Q. 5-1.3 other 1	2.0
Q. 5-1.3 other 2	2.3
<u>Other Child Survival Interventions</u>	
Q. 6-3.3	1.6

Note: Missing data are not included in this analysis. The following weights were used: data collection = 1, best guess = 2, don't know = 3. In following sections of the report, these "averages" are referred to as "certainty ratings."

In the Project Information section of the questionnaire, the DC/BG/DK scale accompanies only question 14. Data on the number of health workers trained were more often derived from a data collection system than from best guesses.

In Schedule 1, Demographic Characteristics, several of the survey items assessed have certainty ratings of 2.0 or higher. The data source in this section was more often a "best guess" or "don't know." Estimates of the number of women and children in the project area between different ages (questions 1-3.3, 1-4.2, 1-4.3), and the number of births in the project area (question 1-5.1) were most likely to be rated "best guess" or "don't know." The estimate of the total population in the project area (question 1-2.1) was more likely to be taken from a data collection system.

Overall, the responses in this section of the questionnaire were reported with less certainty than responses in other sections. Items 1-4.2 and 1-4.3 were reported with the least certainty, perhaps because of the difficulty in assessing the number of women of reproductive age at higher risk. Note also that a definition of "higher risk" is not provided in the question or in the accompanying instruction guide. It might be helpful to incorporate definitions from the reference guide into the instruction guide to provide examples in the question, or to provide a glossary of terms in the questionnaire. Otherwise, ambiguity may reduce the certainty with which a respondent can report this figure.

In Schedule 2, Oral Rehydration/Diarrheal Diseases, the number of ORS packets purchased (question 2-1.2) and the number of health workers trained in ORT (question 2-2.3) were more likely to be taken from a data collection system.

In Schedule 3, Immunization, there was a slight difference in the certainty ratings for the number of doses purchased and the number of vaccines administered. For all of the questions in this section, the majority of the responses were drawn from data collection systems. Data on the number of vaccines purchased (question 3-1.2) were somewhat less likely to be derived from a data collection system than data on the number of children vaccinated (question 3-1.3).

In Schedule 4, Nutrition, the number of people receiving nutritional counseling (questions 4-1.3, 4-1.5) is reported with less certainty than the number of health workers who completed training sessions (questions 4-2.3, 4-2.6). The number of persons receiving counseling is the more desirable indicator of project performance, yet it is reported with less certainty. The percentage of "don't know" responses is also much higher for questions on nutritional counseling than for questions on training.

In Schedule 5, High Risk Births, all of the survey items assessed have average scores of 1.7 or higher. Most of the data in this section are drawn from data collection systems. The number of units of contraceptives purchased (question 5-1.2) has a slightly higher percentage of data collection responses than the number of units given (question 5-1.3). Many of the questions have a considerable number of "don't know" responses. In particular, questions 5-1.2 (other-2) and 5-1.3 (other-2) have over 50 percent "don't know" responses. This may indicate that the second question about "other" types of contraception is not needed.

In Schedule 6, Other Child Survival Interventions, only question 6-3.3 is accompanied by the DC/BG/DK scale. A slightly higher percentage of the responses for this question are drawn from data collection systems than from best guesses.

The present high levels of "don't know" and "best guess" responses renders the use of much of the related questionnaire information suspect for decision-making purposes. CIHI itself cannot resolve the inability of the field to report based on solid data systems. That is a larger matter for USAID, other donors and the host countries, although CIHI might contribute with advice on what steps could be taken in the field in order to improve the capacity to report. CIHI should continue to monitor the degree to which responses are based increasingly on data collection systems as a way of assessing improvement in this capacity over time.

### **3.1.2 Survey Design Characteristics and the Quality of Survey Responses**

The design of a survey can influence data quality. Andrews (1984) found that more than two-thirds of the variance in measurement quality in several surveys was explained by a set of thirteen design characteristics. Modifications in the design of the HCS questionnaire which follow Andrews' recommendations might enhance the validity, reliability and lack of bias in the QDB.



Eight of the design characteristics identified in Andrews' study explained most of the variance in measurement quality, namely: 1) the number of response categories in a survey item, 2) inclusion of an explicit "don't know" response option, 3) the length of the battery in which a question is included, where a "battery" is a set of questions grouped together with a single response scale, 4) use of a comparative perspective in the question to help better define the response options, 5) the length of the question in words, 6) the length of the introduction to the question in words, 7) the position of the question in the questionnaire, and 8) the labeling of response categories, specifically, whether all categories are labeled or not.

All of the 1988 HCS questionnaire items were assessed against the eight criteria listed above. The ideal values for the criteria are presented in Table 3 along with the actual values for the HCS questionnaire. The domain used in the analysis changes for each of the design characteristics, as the characteristics may not be applicable to all questions. For example, in an immunization program, the types of vaccines administered are limited. Clearly, this question should not be assessed against the design standard of 5 to 7 response categories. Each question in the survey has been examined in this way to determine whether a particular design characteristic should be applied or not. For most of the design characteristics, different subsets of questionnaire items have been analyzed. Lists of the questions analyzed for each criterion are presented in Appendix B.

The findings of the analysis of questionnaire design are summarized in Table 3. Data on the design characteristics of each question are presented in Appendix C. In Table 3, the actual design characteristics of the questionnaire (column 3) are compared with the ideal design characteristics presented in Andrews' 1984 study (column 2). Column 3 indicates the percentage of questionnaire items which complied with the survey design standard and the percentage of items which did not comply, for the set of items assessed. Column 4 contains a metric -- an indicator of the percentage of questionnaire items which complied with the ideal standard. A value of 1.0 in column 5 indicates that all of the questions assessed met the survey design standard, while a value of 0 indicates that none of the questions met the standard. At the bottom of the column, a "total" is presented indicating the overall performance of the HCS questionnaire with respect to the design characteristics. It is recommended that this index total be calculated for the 1989 HCS questionnaire to determine whether any improvement in design has been made. Each of the survey design characteristics is discussed in the following section, with the most influential characteristics discussed first.

**TABLE 3**  
**SUMMARY OF HCS QUESTIONNAIRE DESIGN CHARACTERISTICS**  
**for HCS Questionnaire Overall**

Design Characteristic	Ideal Values according to Andrews' (1984) Study	Actual Values for HCS Questionnaire <sup>a</sup> Percentage Response	Design Index <sup>b</sup>
Number of categories in the response scale	5 to 7 categories	5 to 7 = 11 (7) Other = 89 (59)	.11
"Don't know" option provided in response categories	Yes	Yes = 46 (44) No = 54 (52)	.46
Length of battery (set of questions)	2 to 4 questions	2 to 4 = 58 (29) Other = 42 (21)	.58
Comparative perspective used	Yes	Yes = 0 (0) No = 100 (52)	0
Length of question in words	16 to 64 words	16 to 64 = 54 (58) Other = 46 (50)	.54
Length of introduction to question in words	16 to 64 words	16 to 64 = 19 (20) Other = 82 (88)	.19
Position of item in questionnaire	26th to 100th question N/A	26 to 100 = 69 (75) <sup>c</sup> Other = 31 (33)	
All response categories labeled	No	No = 0 (0) Yes = 100 (47)	0
<b>TOTAL</b>			<b>.27<sup>d</sup></b>

Notes:

<sup>a</sup>The percentages of questionnaire items which meet the ideal criteria are presented along with the percentages which do not meet the ideal. The number of questions in each category is presented in parentheses.

<sup>b</sup> The "design index" represents the percentage of questions which meet the ideal criterion presented in column 2. A score of "1" means that all of the questions assessed met the ideal standard, while a score of "0" means that none of the questions met the ideal.

<sup>c</sup> A design index is not included, as it is not an appropriate indicator for this design characteristic.

<sup>d</sup> The design characteristic "position of an item in the questionnaire" is not included in the total for the design index.



### **Number of Response Categories**

Many studies have found that the validity and reliability of data are enhanced if at least five to seven response categories are used. For this part of the analysis, questions with continuous and categorical response scales were assessed. Only 11 percent of the questions met this criterion, with most of the questions having fewer than five response categories. The number of response categories should be increased to five to seven categories whenever practicable.

For example, in Schedule 1, question 1-1.3 could be improved by adding more categories to the scale to capture magnitude in the response. Determining what proportion of the population is served -- even by distinguishing between a "large" or "small" proportion -- would add detail which the respondent might be able to provide quite easily. The designer of the survey must ask whether the "all" or "some" distinction now provided truly provides information of value, or whether it is possible to probe more deeply simply by giving the respondent more choice. In this example in particular, the underlying response scale is continuous but it has been reduced to a two-point scale, and a loss of detail in the response occurs as a result.

### **Provision of an Explicit "Don't Know" Option**

Providing an explicit "don't know" option in the response to a question may reduce forced erroneous responses, thereby enhancing reliability and reducing bias. This criterion was applied to all of the questions in the HCS questionnaire. Only 46 percent of the questions provided a "don't know" option. Although, in some sections of the questionnaire, notes instruct respondents to enter a "DK" if they do not know the answer to a question, this is not equivalent to providing an explicit "don't know" choice for each question. And these instructions are not provided on every page of the questionnaire. A "don't know" option should be provided for all questions to ensure that respondents feel comfortable entering a "DK" if they do not know the answer to a question.

### **Length of Battery**

A "battery" is a set of questions grouped together in a questionnaire which share a single response scale. It is possible to increase efficiency and speed in answering a questionnaire if two to four questions are grouped under a single response scale. If more than four questions share a scale, though, the quality of the data may be reduced.

This criterion was applied to HCS questionnaire items which were already grouped together, and to items which could reasonably be grouped together in batteries. In the 1988 HCS questionnaire, few questions are grouped in batteries, and the batteries which do exist are sometimes long, up to 9 questions in length.

It is recommended that the HCS questionnaire contain batteries of two to four questions whenever possible. For example, in Schedule 1, because of the individual nature of the questions, common response scales cannot be used. But in Schedule 2, questions 1-2.2 through 2-1.5 could

be reordered so that three of the items could form a battery. Questions 2-1.1, 2-1.3 and 2-1.4 could come first, followed by question 2-1.2 and 2-1.5. Also, the "Yes - substantial activity, Yes minor activity, No" response scale used frequently throughout the questionnaire is an easy target for creating batteries. In many parts of the questionnaire, questions with this response scale are already grouped together.

### **Comparative Perspective**

Comparative information provided in a question can enhance the validity and reliability of the data, since it enables the respondent to understand the question better and give a more precise answer. Although a comparative perspective may not be appropriate for all survey questions, it can be used in some instances. This criterion was applied only to questions for which comparative information would enhance understanding of the distinction among the response categories. But none of the questions in the HCS questionnaire include comparative information.

The "Yes - substantial activity, Yes - minor activity, No" scale is frequently used in the 1988 questionnaire. Providing examples to help respondents differentiate among the response categories may enhance the validity and reliability of responses. The "technical assistance" scale (e.g., in question 2-4.2) is used repeatedly in the questionnaire, and descriptions of the response categories would be beneficial here as well. By providing comparative information of this sort, it is more likely that respondents will have similar definitions of the response categories in mind when answering the questions.

The "data collection, best guess, don't know" scale is not described fully in the questionnaire, though a description is provided in the Instruction Guide. The "don't know" option can be misinterpreted, i.e., a respondent might think that "don't know" refers to an unknown source of data; but the description of the scale in the Instruction Guide indicates that "don't know" means that the respondent does not know the answer to a question, or does not have the data requested and cannot make a reasonable guess. By providing instructions within the questionnaire to help the respondent understand the meaning of the DC/BG/DK scale, the validity of the data would increase and competing explanations would be ruled out to some degree.

### **Length of Question and Length of Introduction to Question**

The length of a question and the introduction to the question can enhance the quality of a response. Andrews (1984) found that introductions of 16 to 64 words in length, followed by questions of medium to long length (16 or more words), enhanced data quality. Short questions with short introductions, however, reduced data quality.

The "length of question" criterion was applied to all questions in the 1988 HCS questionnaire. Approximately half of the questions were between 16 and 64 words in length. Some of the questions are very cryptic, and might be improved by the addition of descriptive information.



The "length of introduction" criterion was also applied to all questions. However, introductions to questions are provided only in the Instruction Guide to the questionnaire; thus those introductions were assessed. These introductions are not really a part of the questionnaire, however, and it is possible that respondents might overlook the information. Introductions can and should be incorporated directly into the questionnaire in the future. It is assumed that respondents to the 1988 questionnaire did use the Instruction Guide.

Note that in the Instruction Guide introductions are not provided for all questions. Introductions for the six "schedules" are general, and these introductions are assumed to apply to all questions within the schedules. However, specific instructions are also provided for a small number of the questions. For these questions, the lengths of only the specific introductions are assessed. Thus not all of the questions within a schedule have introductions of similar lengths.

Only 19 percent of the questions in the 1988 questionnaire had introductions of the recommended length. It is recommended that instructions be incorporated directly in the 1989 questionnaire, unless this would produce excessively long introductions.

#### **Position of Item in Questionnaire**

Questions which fall between the 26th and 100th positions in a questionnaire tend to have higher data quality than questions outside this range. The 1988 HCS questionnaire is approximately 108 questions in length, not including all sub-questions within. All questions were assessed for this criterion.

The length of the questionnaire is one determinant of a question's position. It is recommended that questions which are of more importance be placed between the 26th and 100th positions. The use of data may be one factor to consider in determining the relative importance of questionnaire items. However, in some cases, though the data are not heavily used they may be judged to be important by CIHI staff.

#### **Labeling of Response Categories**

Unlabeled or poorly labeled response categories can reduce reliability and cause bias. This criterion was applied to all questions with labeled response categories which had a continuous scale. Questions excluded from the assessment were open-ended questions where the response categories were left blank, and questions with nominal response scales. All of the questions assessed had fully labeled scales. In some instances, a response scale may not need to

be fully labeled in order to be understood. For instance, the response options "Yes - Substantial Activity," "Yes - Minor Activity," "No" and "Don't Know" are provided for many of the HCS questionnaire items. To improve data quality, some of the response options can be left blank, as follows.

1	2	3	4	5
Yes		Yes	No	Don't
Substantial		Minor		Know
Activity		Activity		

### 3.1.3 Analysis of Project "Highlights" Quality

Thirty questionnaires were selected from the 355 returned FY88 questionnaires. It was decided that the selection would be made by pulling every twelfth questionnaire to make a total of thirty. The selection started with the twelfth record; this was randomly selected. The questionnaires were organized by region, alphabetically by country within each region, and numerically by project number within each country. The regions are ordered Africa, Asia/Near East, Latin America, and Global. The Global section is sorted numerically by project in the following categories: S&T Health, S&T Nutrition, AIDS.

The main object of this exercise is to evaluate the "Highlights" or textual section of the questionnaire. Therefore the selection process was initiated with the group of returned questionnaires. It is important to note the bias created in this selection process when considering the information housed in the library and the HPD as there are close to 1000 projects and sub-projects that are not being considered.

Each questionnaire was reviewed to determine the presence or absence of a project description/purpose, an anecdote, lessons learned, and data. A pass/fail grade indicating the general nature of the highlights section was then given for each questionnaire.

Using these same projects, the HPD was then reviewed to determine if it contained a project description/purpose. A yes or no response was assigned.

Lastly, the country files were reviewed for project specific information. If the file contained a project description/purpose, a yes response was assigned. The quality of this information was also judged with a pass or fail grade.

Of the thirty questionnaires, there were 13 central projects, 2 regional projects and 15 bilateral projects. Ten of these projects were based in Africa, 8 in Asia/Near East, and 10 in Latin America, and 2 were global projects.



## **Summary of Results**

### **Content of Questionnaires Reviewed:**

18 or 60% contained a project description  
10 or 33% contained an anecdote  
1 or 3% contained a lesson learned  
9 or 30% contained data  
6 of the highlights sections were totally blank  
12 or 40% of the projects received a "pass" grade for the overall content of the highlights section. Of these 12 "pass grades":

1 contained only an anecdote  
2 contained a general description and data  
2 contained a general description and an anecdote  
6 contained a general description, an anecdote and data  
1 contained a general description an anecdote, data and lessons learned

### **PVO Highlights:**

13 or 43% of the projects reviewed were PVO projects  
8 of these PVO projects were Central projects  
5 were bilateral  
8 or 61% of PVO projects received pass for overall content of the highlights section. 4 were bilateral and 4 were central. (66% of the highlights that received a passing grade were PVO projects.)  
3 of the highlights sections were blank. (50% of highlights received that were blank were PVO projects.)

### **HPD:**

Ninety percent of the 30 projects under investigation had a project description/purpose in the HPD.

### **Country Files/Library:**

Sixty-six percent of the projects had some type of project description in the library. Depending on the project, this information may have been in the PVO file, the country file or the Africa Child Survival Initiative-CCCD file. Four of the projects had information on the project but did not contain a date. However, in all these cases the information was determined adequate to meet the needs of this exercise.

Twelve or 33% of the projects were not adequately described in any of the literature located in the country files, the PVO files or the organizational files. (When searching for project specific information on global projects, the topic files were also reviewed.) There were two cases in which project specific information was in the file but was judged poor in quality. Information in these two cases was extremely vague and/or old.

Eight of the thirteen PVO projects had good project information in the library, though two of the projects lacked current information. Seven of the eight projects with good information were central, while four of the five projects completely lacking project information in the library were bilateral.

#### **Overall:**

Twenty-three or 76% of the projects had project specific information in two or three of the three sources checked. There were five cases in which project information was lacking in the questionnaire. Lastly, there was one project where a description could not be found in the library, the questionnaire, or the HPD.

#### **3.1.4 Validity in QDB**

The validity of the questionnaire design was discussed in section 3.1.2 with respect to several design characteristics: the number of response categories, the existence of a comparative perspective, and the length of a question and its introduction. Validity is weakened to the extent that respondents' understanding of or response to a question is different from the meaning intended.

There is another issue of validity in the questionnaire. Respondents are asked to estimate the percentage of project funds attributed to different interventions or activities over the life of the project. However, there is a question whether the responses reflect life-of-project attributions or an approximation of the current allocation of resources among the various interventions. This attribution process poses several possible problems with respect to the validity of the data. Some respondents may report attributions according to current rather than life-of-project (LOP) allocation of resources, resulting in an unknown mix of current and LOP percentages. However, even if all reported percentages were LOP, a problem arises when the actual allocation of resources to different activities changes significantly during the life of the project, causing the LOP percentages to over- or underestimate the current reality. Finally, when the percentage attributions are applied to the obligation levels in the HPD, a further issue of validity arises when the time period during which the obligations are used does not correspond to the time period of the percentage attributions. These interacting issues are discussed further in section 4.1.1 (Validity in HPD).

#### **3.1.5 Reliability and Bias in QDB**

Reliability and bias, while quite different in meaning, are often intertwined in the data. Factors causing imprecision from unreliability are often also responsible for systematic bias in the same data. Thus many of the design issues discussed in section 3.1.2 and the results of the "DC/BG/DK" responses discussed in section 3.1.1 are relevant to both reliability and bias.

Lower reliability in the QDB may result from data entry errors with the questionnaires. Not all the questionnaire data entered into the QDB were verified in 1988. Though we have no



evidence that erroneous data were entered, we recommend that CIHI institute a systematic verification procedure before reports are prepared.

Verification might take place at two levels. First, data might be checked during the process of data entry by developing a computer program that "screens" data and identifies entries that are outside an acceptable range ("range checks") and values that are inconsistent with other questions in the questionnaire ("logic checks"). While the computer program might be written in such a way that these checks are performed at the time the values are entered into the computer, this would require that a significant effort be made to develop the software prior to the start of data entry. CIHI might also develop a program that identifies errors in a batch mode after the data have been entered. The second option would likely require more net energy to be spent by CIHI staff, though it would require less development time prior to data entry. The batch-mode program could be created during the time that data entry is taking place.

Ultimately, CIHI might consider giving the missions the option of entering data directly onto a diskette. This would require that a data entry program be written that could be distributed on a diskette. The mission could then enter data directly into the computer, and range and logic errors could be identified (and corrected) by the missions themselves. An advantage to this system is that the potential for making errors during the process of transferring data from the written questionnaire to the computerized database would be eliminated. At the same time, CIHI should recognize that a poorly executed data entry program would be worse than none at all. Any program of this sort should contain a help facility and should be vigorously tested (and debugged) before release.

Verification might also take place at a second level. It is impossible to write a computer program that will identify all errors. To identify less obvious errors, a procedure where more knowledgeable CIHI staff review the submissions from the missions might be instituted. A "standard report" made up of key information might be developed to facilitate this process.

Other mechanisms might be employed to minimize errors at the mission level. CIHI sent out copies of the completed 1988 questionnaire with the 1989 questionnaire. This procedure may serve to improve data quality by providing the a basis for estimating attributions and "best guesses." We would suggest that CIHI look closely at the process the missions use to estimate attributions and "best guesses" to determine whether providing earlier data improves quality, or obscures reality.

### **3.1.6 Currency in QDB**

The data collection process for the QDB is conducted by CIHI and is synchronized with the USAID budget cycle described in section 1.2.1. Consequently, the process of collecting and maintaining the QDB is routinized, and necessarily conforms to a strict time schedule. The 1988 questionnaire was sent to the missions in August, 1988 with a request that it be returned by the end of October, at which time data entry and verification took place. Data from the questionnaires

were analyzed in time for inclusion in the annual Report to Congress on Child Survival, which was distributed in March, 1989. The time demands of this schedule force a high degree of currency in the QDB data. The speed with which the questionnaire data are processed is praiseworthy, but CIHI may pay a price for this speed in terms of reliability, as discussed in section 3.1.5 (Reliability and Bias in QDB).

### **3.1.7 Completeness in QDB**

Missing data are due both to non-responses on particular items on the questionnaire and to unreturned questionnaires. Non-responses to particular items were analyzed in section 3.1.1. While some follow-up with respect to unreturned questionnaires and unanswered questions has been done, we recommend that unanswered questions and unreturned questionnaires be counted and analyzed periodically.

## **3.2 Quality of System Characteristics of QDB**

### **3.2.1 Comprehensiveness of QDB**

The decision as to which projects (and sub-projects, etc.) should be included in the QDB and HPD is a system issue related to the comprehensiveness of the database. At this time it appears to us that no clear decision rule exists for deciding whether or not a particular project should be included in the QDB (or HPD). While it is not realistic for us to suggest such a rule, we recommend that a committee be established to review the (changing) objectives of HIS periodically and define the scope of projects that should be included in the QDB and HPD.

### **3.2.2 Source and Method of QDB**

Responses to the "DC/BG/DK" items and the name of the person completing the questionnaire provide a beginning. Further description of the data collection system (when one exists) and specific citations to studies that are the basis of responses in the questionnaires would further enhance this aspect of quality.

## **3.3 Quality of Communication and Use of QDB**

Issues of communication quality of HIS data are the same, to some extent, across each of the databases. Therefore, comments made here also tend to apply to the HPD and HSD.

### **3.3.1 Clarity**

It is critical, of course, that reports not be misinterpreted or taken out of context. To minimize the possibility that a report is not understood or misinterpreted, CIHI staff should be sure



always to label reports completely and accurately. This includes clearly identifying the source of data used in creating the report.

It is difficult to monitor the clarity of reports. We recommend that reports be systematically reviewed for clarity by people other than the preparers before they are released. Furthermore, any complaints or requests for clarification by users ought to be noted.

CIHI can minimize problems associated with clarity of presentation by developing a set of periodic standard reports. These reports can be developed and reviewed for clarity, then distributed routinely. We expect that standard reports could meet many HIS user needs and, because they would be distributed routinely in a standardized format, users would be accustomed to the format. Such reports should be clearly labeled with an "expiration date" to reduce the possibility that people refer to data that are no longer current.

### **3.3.2 Use of QDB Data**

Much of the data from the annual HCS questionnaire is used in the annual Report to Congress on Child Survival, and it is our impression that this is widely understood by the USAID missions and offices that complete the questionnaires. However, some of the questionnaire data is not used in the Report to Congress or elsewhere as far as we know and we assume that questionnaire respondents are also aware of this. While it is not within the scope of this study to analyze user needs, we would support conclusions from the User Requirements study aimed at increasing the use of questionnaire data, particularly in ways useful to the respondents.

#### **4. HEALTH PROJECTS DATABASE (HPD)**

The Health Projects Database is quite different in nature and character from either the Health Statistics Database or the Questionnaire Database. The primary purpose of the Health Projects Database is the tracking of funding, at the level of the obligation, attributed to various interventions or activities within the USAID health and child survival portfolio. The aggregate totals of funding by activity are used both to report to Congress on the disposition of funds and to help USAID plan its overall portfolio so as to assure that funding allocations meet Congressional and/or Agency mandates.

Traditionally, USAID has not tracked funding by intervention or activity. Project papers and project budgets emanating from those papers are not required to specify the attribution of funds to the various activities (budgets are made along traditional lines, categorizing funding allocations by items such as personnel, transport, commodities and supplies, training, etc.). Thus, at the time of the initiation of the Child Survival Program, USAID had no existing system capable of generating data regarding the disposition of funds by activity or intervention. The HPD was designed to fill this gap. Attributions were made by Project Officers as part of their responses to an annual Health and Child Survival Questionnaire. The responses, therefore, are somewhat arbitrary and suspected to vary greatly in reliability (replicability) depending on the level of knowledge and experience of the individual Project Officer.

Many of the data quality issues pertaining to the HPD are centered around this assignment process. Some issues, however, pertain to the various decisions about the content of the data base and the use of the reports that are generated from it.

#### **4.1 Variable Quality in the Health Projects Database**

##### **4.1.1 Validity in HPD**

Reports generated from the HPD often present funding statistics that purport to reflect the annual allocation of funds to various activities. These reports often disaggregate funding by USAID funding account, by region, and/or by special activity areas of interest. In designing the HPD, a decision was made to determine the funding for a given activity in a given year for a given project by applying "life of project" percentage attributions to the various interventions. Simply put, a ten-year project reserving ten percent of its funds for diarrheal disease control is reported to put ten percent of its total allocation toward diarrheal disease control each year. The reality may be that the ten percent is applied unevenly over the ten-year life of the project; however, in generating reports from the HPD, it is assumed that the funds are used evenly. This raises the question of the validity of the reported figures. They may deviate substantially from the actual figures due to the assumption used to calculate them.

The validity problems go beyond the calculation procedure. Often, the amounts obligated are referred to as being synonymous with the amounts spent. However, given the "pipeline" that



funds must traverse before their conversion to activity, funds obligated in one year may actually be spent one, two or even three years later. Therefore, data on obligations may not be valid estimates of levels of activity over a period as short as a year. Some users and, in fact, CIHI staff members at times, make the mistake of equating obligations with activity levels.

Finally, the idea of attributing all of the funds on a given project to interventions may be misleading. Project funds are reserved for many activities that are not converted directly into action. An example is the funding used to transport consultants from the United States to the sites of field projects. Similar projects funded at identical levels in Zaire and Guatemala incur far different transportation costs. The costs of implementing each project are substantially different and the amounts available to each for conversion into other direct action such as training are quite different. Applying attributions to the total funds available belies the fact that the activity levels that can be reached by each are different and that, therefore, the expectations regarding the impacts of the two projects should be different. (While transportation costs might seem relatively insignificant when compared to total allocations, other cost items, such as overhead, are not.) It can be argued that attributions should be made on funds actually committed to the interventions and not to the entire allocations made for the projects devoted to those interventions.

#### **4.1.2 Reliability in HPD**

One of the problems arising from the use of life of project percentage attributions to interventions is the effect that a change in those percentages has on the capacity of the HPD to generate the same tables for past years, year after year. When a project reports a change in life of project percentages and that change is entered into the system, any aggregation done for an earlier year changes. Thus, the same analysis of historical funding trends done at two points in time may produce different results. In managing the HSD, CIHI "locks in" the historic percentages to minimize this manifestation of a lack of reliability resulting from assumptions made to make the system function without wild fluctuations in funding patterns from year to year.

It is worth noting that the Africa Bureau has chosen to track the attributions of funds to interventions for all projects in Africa allowing, and even encouraging, Project Managers to modify the attributions of funds to activities to change each year. This strategy may ultimately be adopted by USAID as a whole. Changes made in the HSD to accommodate the Africa Bureau approach may become the norm rather than the exception in the near future.

#### **4.1.3 Bias in HPD**

In the discussion of validity above, reference was made to the fact that attributions to interventions are applied to the entire amount of funds allocated to a project even though some funds from all projects are diverted to maintenance activities and other activities such as reporting which are not, strictly speaking, converted to action "on the ground". Thus, reports claiming that certain resource levels are applied to various interventions are overstating the true level of investment in those interventions. Expectations regarding impact are, therefore, too high. This is

a form of bias.

#### **4.1.4 Currency in HPD**

The HPD data collection process, like that of the QDB, is synchronized with the USAID budget cycle and conforms to a strict time schedule. As a result, most data in HPD are very current.

#### **4.1.5 Completeness in HPD**

In general, most key variables in the HPD are complete, but some HPD variables are still subject to gaps. For example, variables such as Scheduled Evaluation Date or even Project Activity Completion Date are not filled in for all projects. Now that the key objective of the system regarding completeness has been reached, greater attention should be given to searching for and recording other missing variables.

### **4.2 Quality of System Characteristics of HPD**

#### **4.2.1 Comprehensiveness of HPD**

While the HPD has attained its goal of being able to account for all funds allocated through several key funding accounts, notably the Health Account, Child Survival Fund, DG Account and ESF, a question still remains about the comprehensiveness of the system for monitoring funding of the entire sector. Specifically, projects are underway with health components which are not funded from the key accounts and in some cases are not in the HPD. For example, many food supplementation programs are funded through USDA accounts and are not tracked in the HPD. Yet, the programs have health objectives and have impact on health. In this sense, the HPD is not as comprehensive as it might be in accounting for funding in the health sector. This issue is further complicated because it is not clear that CIHI is contractually obligated to include all of these projects in the HPD.

A second issue of relevance is the descriptive information stored within the HPD about each project. At the outset, many project descriptors known to exist in other USAID information systems or, at least, in documents stored within other USAID departments, were consciously excluded from the system so as to avoid duplication of effort (and to enable CIHI to concentrate on those elements of project description which were not recorded elsewhere). For example, the HPD stores only brief textual descriptions of the purposes of projects because more complete descriptions are maintained by PPC/CDIE. One consequence of the effort to avoid duplication is the lack of on-line access to key information. CIHI should promote electronic linkages with other systems where possible to facilitate the sharing of data and, where electronic data transfer is not possible, consider whether selected duplication might not enhance the value of the data already in the system by enabling more sophisticated data analysis.



### **4.3 Quality of Communication and Use of HPD**

#### **4.3.1 Timeliness**

The timeliness with which CIHI responds to requests is tracked by CIHI in a formal system. Requests for information are logged, and reminders are issued to insure that reports are delivered quickly. The system would allow the times between request and delivery to be summarized if an ongoing measure of timeliness was desired, although we see no immediate practical reason for doing this. Our observation is that reports are indeed being delivered in a timely fashion, and the CIHI staff should be commended.

#### **4.3.2 Clarity of HPD Reports**

A result of the lack of comprehensiveness with respect to all projects with an impact on health (see above), is that selected tables prepared from the HPD which claim to represent USAID's investment in health, in fact, represent only a portion of it. This is a serious lack of clarity. CIHI must take care to define in greater detail exactly what its tables and charts include (and what is known to be excluded).

#### **4.3.3 Use of HPD**

The HPD is heavily used. Furthermore, the number of major users seems to be increasing. This is a significant and very positive characteristic of the HPD.

## **5. HEALTH STATISTICS DATABASE (HSD)**

The Health Statistics Database is a collection of distinct data files, each holding longitudinal records of two or more related health or demographic indicators. Unlike the Questionnaire Database and the Health Projects Database, the HSD is not USAID project specific. Instead, the indicators refer to a geographical area, most frequently to a country as a whole.

CIHI does not act as the primary collection agent for any of the data in the HSD. Rather, CIHI culls the data from a variety of published sources; therefore, its direct control of the quality of the data in the system is limited to the diligence with which it seeks primary source material and the care it gives to describing and documenting the methods used by others in generating the data.

We have organized this section differently because of the unique characteristics of the HSD in relation to the QDB and HPD. First, quality issues are addressed for data related to immunization and oral rehydration therapy. Then the completeness of HSD data is analyzed. The methodology used in this analysis is proposed as the basis for an ongoing procedure for monitoring HSD quality.

### **5.1 Current Issues in Immunization**

In evaluations of Health and Child Survival projects, cause and effect models are used to represent the link between administration of health services and improved health status. Program effectiveness indicators, such as "number of children vaccinated," are chosen on the basis of assumptions about the validity of particular models.

For instance, immunization coverage may lead to reduced incidence of disease, oral rehydration therapy (ORT) may lead to reduced risk of death from dehydration during a diarrheal episode, and improved health of the mother may result in improved health of her child. Theory, ideally, forms the basis for decisions about which data to collect, and the questions which can be answered or investigated are limited by the data collected. It is worthwhile to state theoretical models explicitly. In collecting data or designing a dataset, much benefit can be gained from first specifying the questions you wish to answer.

In this report, the issues surrounding vaccination programs and oral rehydration therapy are discussed. Models are used to help clarify the processes of administering vaccines and oral rehydration solutions. The models are tools against which the quality of HIS data can be assessed. The reliability of data taken from secondary sources is also discussed.

#### **5.1.1 Expanded Program on Immunization (EPI) Activities**

The WHO Expanded Program on Immunization (EPI) has as its primary goal the reduction of morbidity and mortality from disease. The EPI target diseases are polio, diphtheria, pertussis, tetanus, tuberculosis, and measles. Standard antigens are used to immunize populations through



the EPI program. Although emphasis is placed on immunization coverage, measures of the reduction in the incidence of disease are the best indicators of success of an immunization program.

### **Poliomyelitis (OPV) (TOPV)**

Two polio vaccines are used. OPV (live oral poliomyelitis vaccine) is given in three separate doses, and each dose contains a different antigen. TOPV (live trivalent poliomyelitis vaccine) contains all three of the polio antigens and is also administered in three doses. Several doses are required for the polio vaccines because seroconversion does not occur simultaneously for all three viruses. For both OPV and TOPV, seroconversion is equivalent to immunity from the disease. If a response occurs in the immunized individual to one of the three viruses in the vaccines, the individual is protected against that strain of the virus.

For polio vaccines, protection from the disease may exceed coverage. Community spread of the live vaccine virus (known as "cross-immunity") has occurred, resulting in higher antibody levels in some children who were not vaccinated.<sup>3</sup>

### **Diphtheria, Pertussis and Tetanus (DPT)**

Protection from tetanus is proportional to the level of antitoxin titer in the serum.<sup>4</sup> Three spaced doses during childhood, and booster shots every 10 years thereafter, are necessary to develop adequate antitoxins. In pregnant women, primary immunization occurs with two to three doses spaced at least one month apart. The last dose should be given at least two weeks before delivery, and booster doses should be given for every delivery. DPT is a very effective vaccine with low toxicity. However, low immunization coverage of women of childbearing age is now recognized as the reason for high rates of neonatal tetanus in some countries.<sup>5</sup>

"Herd immunity" is afforded to unimmunized individuals when immunization coverage in the population is high enough to break the chain of transmission of a disease. Eighty percent immunization coverage rates are required to achieve herd immunity for most diseases. Tetanus, however, is transmitted by spores of *Clostridium tetani* which are contained in the environment. Thus 100 percent vaccination levels are required for protection. Outbreaks of diphtheria have been reported in communities with 94 percent coverage levels, and where there is probably no herd immunity.<sup>6</sup>

Three doses of the DPT vaccine are used because a range of reactions occurs in the production of antibodies in response to the vaccine. The first dose of vaccine produces a low level of antibodies which is built upon with successive doses. Two types of DPT vaccines are used. The

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<sup>3</sup> 0.01 IU/ml is considered protective.

<sup>4</sup> WHO/EPI/GEN(1986) 7 Rev(1).

<sup>5</sup> Chen, et al., APJH(1985) 75(12).

<sup>6</sup> Chen, et al., APJH(1985) 75(12).

live DPT vaccine continues to stimulate antibody response for a longer time, whereas the killed DPT vaccine creates a single large response. Protection against diphtheria, pertussis, and tetanus is dependent on the level of antibodies in the blood serum. Each dose increases the level of antibody production and decreases the likelihood of disease.

The standard EPI antigen for pertussis is effective if properly administered, yet some concern exists about the toxicity of the vaccine. The key immunogen is a neurotoxin which may produce fever and mild local reactions after immunization. Researchers have been unable to separate an immunogen which is adequate yet carries no risk of harm to the neurological system.

### **Tuberculosis (BCG)**

Immunization of infants with BCG is very effective, but efficacy rates for adults may vary widely. Tuberculosis immunity wanes over time, and re-immunization of children of school age is often recommended.<sup>7</sup>

### **Measles**

The immunization schedules for measles vary widely from country to country, depending upon the age at which risk of infection is highest. If immunization occurs at a later age, the vaccine has a longer-lasting effect. At an earlier age, maternal antibodies interfere with and diminish the effectiveness of the vaccine. Measles vaccine produces an unapparent infection which results in seroconversion in most individuals.

#### **5.1.2 Factors which Influence the Validity and Reliability of Immunization Coverage Data**

The quality of data on Expanded Program on Immunization (EPI) activities is affected by the following: 1) the accuracy of population data used to estimate the size of the target population, 2) the quality of assessments of immunization levels in the target population, 3) vaccine characteristics, and 4) characteristics of the target population.

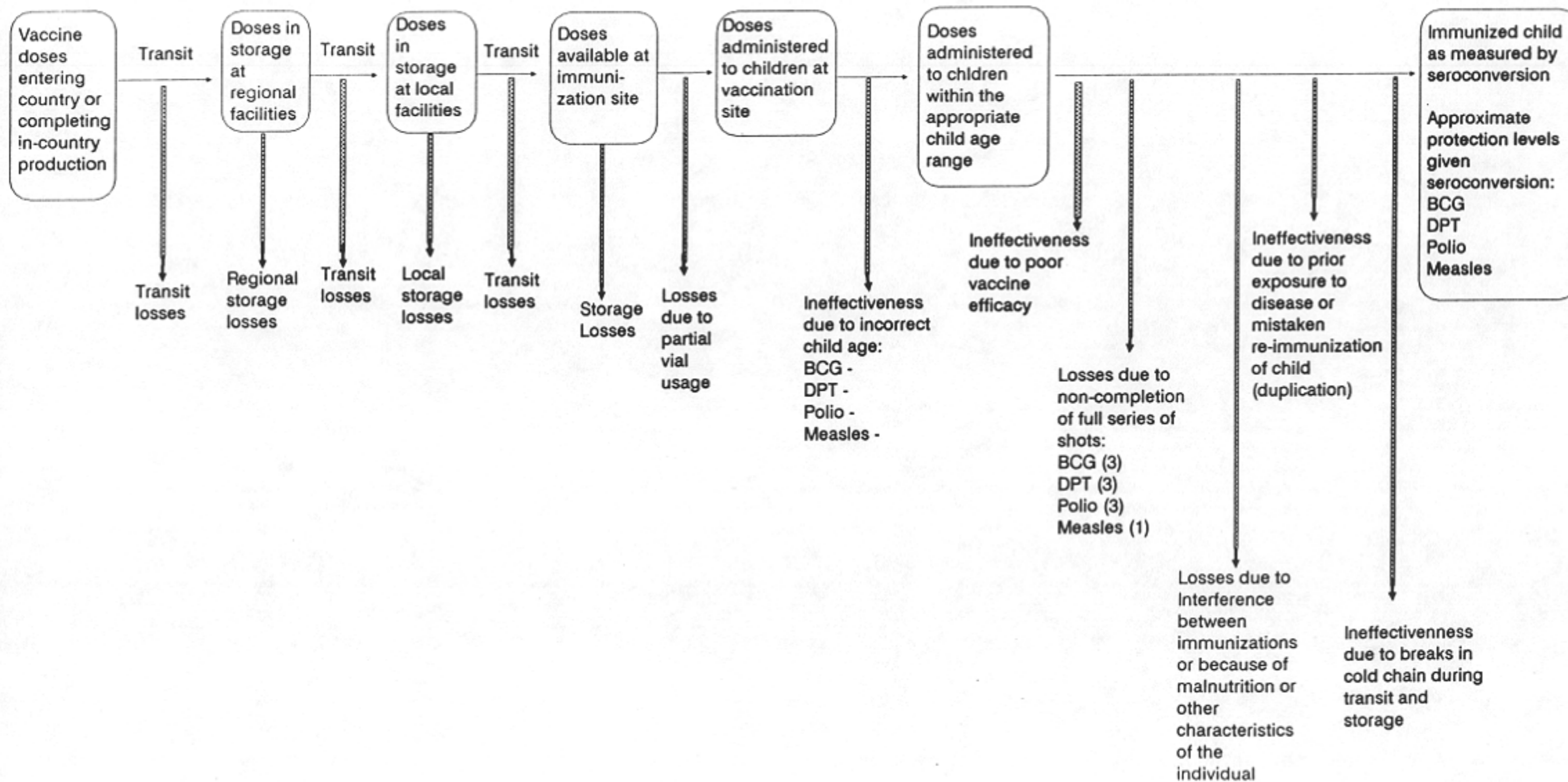
The flowchart in Figure 3 depicts the process of immunization, from production of the vaccines to vaccination. The conversion of input materials (vaccine doses) into outputs (fully immunized children) is complex, making it difficult to obtain a reliable estimate of coverage from the dosages used. Losses may occur during shipping and storage, from breaks in the cold chain, or from improper administration. Many children do not receive the required number of doses for multiple dosage vaccines; thus they are inadequately protected. Even individuals who receive the required number of doses may not be protected against the disease due to such factors as incomplete seroconversion, the presence of maternal antibodies, or a compromised immune system.

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<sup>7</sup> WHO/EPI/GEN(1986) 7 Rev(1).



**Figure 3 - Losses in Dosage Effectiveness between Serum Production and Immunized Child**



## **Immunization Coverage**

Immunization coverage can be summarized with the following equation:

$$C = [(TP - NI - II - E) / TP] * 100$$

where

C = Percent of population covered

TP = Target population

NI = Number of susceptible children in the target population not immunized

II = Number of susceptible children in the target population with incomplete immunization

and E = Number of children exposed to the disease who have never been immunized

Coverage (C) includes only the percentage of children "fully covered" by the program activities -- children who have received the entire series of immunizations for a particular vaccine.

## **Level of Protection**

Immunization coverage is not synonymous with the level of protection or immunity from the disease which is conferred by the vaccine. The actual level of protection of the target population is a function of vaccine efficacy and participant characteristics. Also, estimates of "fully immunized" children may not always be correctly calculated.<sup>8</sup>

## **Vaccine Efficacy**

Vaccine efficacy is the level of immunity afforded by antibody production or the seroconversion rates in the covered population. It is determined in part by the following: 1) vaccine manufacturing quality, 2) vaccine potency, 3) storage within the required range of temperatures, 4) use before the expiration date, 5) correct dilution, and 6) proper administration. Vaccine efficacy is calculated by comparing the proportion of immunized children with the disease to unimmunized, infected children, as shown in the equation below (p. 39). Unexpectedly high attack rates in fully immunized children may at times be related to poor vaccine quality. Using ineffective vaccines results in overestimates of the number of children fully protected by the program. Table 4 provides examples of vaccine efficacy rates for several developing countries.

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<sup>8</sup> WHO/EPI/GEN(1986) 4 Rev(1).



$$VE = [(ARU - ARV) / ARU] * 100$$

where

VE = Vaccine efficacy

ARU = Attack rate in the unimmunized population

ARV = Attack rate in the immunized population

**Table 4- Examples of Vaccine Efficacy Based on Attack Rates in Immunized Individuals**

Vaccine	Country/Region	Age	Rates of Protection
Measles	Brazil <sup>a</sup>	< 9 months	43%
		> 9 months	83%
	Poland <sup>b</sup>	1 year	95%
		2-3 years	98%
4 years		99%	
Pertussis	Netherlands <sup>c</sup>	6-11 months	98%
		1-4 years for 3 or more doses	95%
Tetanus <sup>d</sup>			99.9% for 3 doses (primary immun.)
BCG <sup>e</sup>	Brazil	0-4 years	87%-90%
	Thailand	0-5 years	53%
	Togo	0-6 years	50-80%
	Burma	0-5 years	39%
	Argentina	0-5 years	74%
	Canadian Indians <sup>f</sup>	case control study	70%
Neonatal Tetanus	Burma <sup>g</sup>	NA	32.8-91.4% for 2 doses

#### References

- <sup>a</sup> Weekly Epidemiological Record(1985), 60(21).
- <sup>b</sup> Weekly Epidemiological Record(1986), 61(46).
- <sup>c</sup> Weekly Epidemiological Record(1986), 61(10).
- <sup>d</sup> Schofield, 1986.
- <sup>e</sup> Kue Young and Hershfield, 1986.
- <sup>f</sup> Weekly Epidemiological Record(1985), 60(49).
- <sup>g</sup> Stroh, G., et al., 1987.

## Vaccine Potency and the Cold Chain

Vaccine potency is controlled by the manufacturer and is related to the particular strain used in the program. Potency is also dependent on adequate handling of the vaccine, which is a function of storage, temperature, light, and use before the expiration date.<sup>9</sup>

The "cold chain" refers to the required temperature at which certain vaccines must be maintained as they are transferred from the manufacturer to the project site, up until the time of administration. If breaks occur in the cold chain, i.e., the acceptable temperature range is not maintained, the potency of the vaccines may be affected.

The polio, tetanus toxoid, and measles vaccines are the most heat labile, and their potency is highly dependent on adequate maintenance of the cold chain. In a national survey in South Africa, the potency of TOPV recalled from the field ranged from 63 to 95 percent.<sup>10</sup> Two recent studies in Nepal and India have reported problems at different levels in the cold chain from producer to the field, even though few vaccines were exposed to very high temperatures.<sup>11</sup>

## Participant Characteristics

Participant characteristics such as regional factors, existing level of maternal antibodies in the child, nutritional status, and immune status also affect the level of protection conferred by the vaccine. Serological studies which measure the response of the immune system to the vaccine can be used to assess vaccine efficacy. Examples of seroconversion rates are provided in Table 4a.

Seroconversion rates of the polio and measles vaccines appear to be affected by regional factors. Seroconversion rates for OPV in temperate climates generally reach about 95 percent after three doses. In tropical countries, seroconversion rates as low as 50 percent and lower have been reported.<sup>12</sup> Both interference of enteroviruses and poor vaccine uptake have been suggested as mechanisms responsible for low seroconversion.<sup>13</sup> However, some studies comparing infected and uninfected children have found no interference from enteroviruses on seroconversion rates.<sup>14</sup> Seroconversion rates for measles vaccine in Latin American countries ranged from 72 to 88 percent in samples of 6 to 12 month old infants.<sup>15</sup>

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<sup>9</sup> Noah, 1983.

<sup>10</sup> A 63 to 79 percent range in potency was found using 300,000 TCID<sub>50</sub> as a minimum requirement, and a 92 to 95 percent range was found using 100,000 TCID<sub>50</sub> as the minimum requirement. (Schoub, et al., 1986).

<sup>11</sup> Weekly Epidemiological Records (1988), 63(9). Weekly Epidemiological Records (1988), 63(26). Vaccines were not tested for their potency at the user level, so information about the proportion of ineffective doses was not available.

<sup>12</sup> WHO/EPI/GEN(1986) 7 Rev(1).

<sup>13</sup> WHO/EPI/GEN(1986) 7 Rev(1).

<sup>14</sup> John and Christopher, 1975.

<sup>15</sup> Reviews of Infectious Diseases (1983), 5.



**Table 4a - Examples of Seroconversion Rates or Antibody Responses for Various Vaccines**

Vaccine	Country/Region	Age	Seroconversion Rate/ Percent
<b>Protected</b>			
<b>Measles</b>	Rwanda <sup>a</sup>	8-19 months	80%
	World-wide <sup>b</sup>	> 13 months	≥ 95% (controlled field studies)
		6 months	60-80%
		9 months	90-95%
	Latin America <sup>c</sup> (regional variation)	8.5 months 10 months	80% 90%
<b>Poliomyelitis (TOPV)<sup>d</sup></b>	Cameroon <sup>e</sup>	3-11 months after 2nd dose	Type 1: 36% Type 2: 58% Type 3: 33%
	South Africa <sup>f</sup>	24-35 months	Type 1: 80-84% Type 2: 91-95% Type 3: 59-80%
<b>Diphtheria</b>	India <sup>g</sup>	0-10 years	94%

References

- <sup>a</sup> Weekly Epidemiological Record(1987), 62(42).
- <sup>b</sup> Walsh, 1983.
- <sup>c</sup> Review of Infectious Diseases(1983), 5.
- <sup>d</sup> Heymann, et al., 1987.
- <sup>e</sup> Foster, et al., 1984.
- <sup>f</sup> Schoub, et al., 1986.
- <sup>g</sup> Chakravorty, et al., 1972.

For mildly to moderately malnourished or ill children, seroconversion rates are usually comparable to those found in well-nourished and healthy children.<sup>16</sup> However, lower seroconversion rates of measles vaccine have been found in children with severe kwashiorkor.<sup>17</sup>

The EPI policy on immunization in countries where AIDS (acquired immunodeficiency syndrome) is a problem is to administer vaccines according to the standard immunization schedules. WHO policy states: "Unimmunized individuals with clinical (symptomatic) AIDS in countries where the EPI target diseases remain serious risks should not receive BCG, but should receive the other vaccines. . . . In general, live vaccines are not given to immunocompromised individuals, but in developing countries, the risk of measles and poliomyelitis in unimmunized infants is high and the risk from these vaccines, even in the presence of symptomatic HIV infection, appears to be low."<sup>18</sup> Individuals with AIDS are not necessarily more susceptible to immunizable

<sup>16</sup> PAHO Bulletin, 1984.

<sup>17</sup> Powell, 1982, in PAHO Bulletin, 1984.

<sup>18</sup> WHO/EPI/GEN(1986) 7 Rev(1).

diseases. Antibodies can still be produced in the presence of AIDS.

### 5.1.3 Immunization Coverage Estimation Methods

A central issue in assessing EPI data quality is the source of information used as the denominator in coverage equations. Accurate information about the size and age distribution of the target population is frequently not available. Data for vital events, such as infant births and deaths, are incomplete in most developing countries,<sup>19</sup> and census data are either unavailable or are quickly outdated. Furthermore, the quality of census information may be affected by political and social issues.

Population and demographic data in the HIS database are drawn from the United Nations Population Division. For countries with incomplete data on vital events, multiple sources are used to estimate the size and age structure of a population, along with various demographic and analytical estimation techniques.<sup>20</sup> Of particular importance for the quality of child survival data is the fact that information about infant births and deaths is the least reliable for that group of all age groups in many countries, due to pervasive underregistration.<sup>21</sup> Underestimating the size of the target group results in inflated coverage levels. Advanced estimation methods developed specifically for defective data can be used to enhance the reliability of birth and death rate estimates.<sup>22</sup>

Methods used to collect data on EPI activities are presented in this section, with subjective information on the reliability, advantages, and disadvantages of the methods. The ongoing Ministry of Health (MOH) data collection system and the EPI survey, described here, are frequently used sources, and information from them can be found in most issues of the Weekly Epidemiological Record.

### Number of Doses Imported or Bought

The number of doses imported by a country provides the least reliable information about protection against the EPI diseases. Doses are lost due to breakdowns in the cold chain, wastage or ineffective use. Some children may be vaccinated too early or too late, or may have incomplete coverage. Few data are available about the percentage of vaccine losses due to inadequate maintenance of the cold chain or wastage, but these losses can be substantial. The Ministry of Health in Indonesia reports 21 percent wastage of vaccine in a neonatal tetanus program, without further specifying the reasons for these losses.<sup>23</sup>

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<sup>19</sup> U.S. Department of Health and Human Services, Public Health Service, 1980.

<sup>20</sup> Examples of sources of demographic data are: recent census data, civil registrations, surveys of age and sex structure, total and age-specific fertility, mortality rates, international migration information, and comparisons with similar countries. (United Nations, 1986).

<sup>21</sup> U.S. Department of Health and Human Services, Public Health Service, 1980. Verma, 1984.

<sup>22</sup> Brass, 1985.

<sup>23</sup> Weekly Epidemiological Record (1985) 60(46).



## **Ministry of Health Estimates**

The quality of routine data collection efforts of the Ministry of Health is highly variable from country to country, and from region to region within countries. Data collection is frequently incomplete, outdated, or hampered by the limited availability of health services in underserved areas. For poliomyelitis incidence, it has been estimated that official figures represent only 1 to 15 percent of the actual number of cases.<sup>24</sup> For countries using disease incidence patterns as a method of estimating coverage, the quality of coverage data may be poor unless supplemented by other information.

## **Sentinel Site Studies**

Sentinel site studies are conducted at hospitals and clinics, or through a network of private practitioners. The number of individuals who receive treatment for the communicable childhood diseases covered by EPI at the sites is monitored. Vaccine efficacy can then be calculated by comparing disease attack rates in immunized and unimmunized individuals. Sentinel sites have been used in developed countries such as Switzerland and France,<sup>25</sup> and in developing countries which do not have the means to establish country-wide surveillance or registration systems, such as Malawi and Cameroon.<sup>26</sup>

The quality of data and generalizability to the national level are directly related to the choice of sentinel sites. Developing countries frequently choose hospitals or clinics with data collection capacities in major urban centers. As a result, the clientele of these sentinel sites may not be representative of the larger population.

## **Health Clinic Records**

Health clinic records provide information only on children and mothers who have been immunized through the clinic. In some instances, however, private clinics may be used for immunization, and the data from public sites is thus not representative. The information provided by the clinics is collected as part of an ongoing record keeping system.

## **Expanded Program on Immunization (EPI) Surveys**

The EPI survey randomly selects 30 clusters from a specified geographical area. The first household is selected at random as the starting point within each cluster; data collection for immunization coverage begins in the nearest household containing a child within the target age-range, and continues until a total of seven households with eligible children have been identified.

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<sup>24</sup> Weekly Epidemiological Record (1985) 60(23).

<sup>25</sup> Weekly Epidemiological Record (1986) 60(20). Valleron, 1986.

<sup>26</sup> Weekly Epidemiological Record (1986) 60(25). Heymann, 1983.

All children of the seventh households are included in the survey.<sup>27</sup>

Actual surveys and computer simulations of this method have demonstrated that the large majority of the samples (82.7 percent and 98.6 percent, respectively) had confidence intervals of +10 percent. None exceeded +13 percent.<sup>28</sup> Confidence intervals were largest for population coverage rates (approximately 50 percent) and smallest as coverage approached either zero or 100 percent. In France, an EPI survey yielded similar responses for coverage in a simple random sample from civil registration records.<sup>29</sup>

### **Lot Quality Assurance Surveys (LQAS)**

Lot Quality Assurance Surveys differ from the EPI method in selecting all target individuals within each cluster at random. As a result, smaller samples can be used, with sample size contingent on the selected confidence interval.<sup>30</sup>

In a comparison of LQAS and EPI surveys with samples of approximately the same size, Lwanga and Abiprojo (1987) reported standard errors of 4.3 to 4.4 percent for the EPI method, and 2.7 to 3.0 percent for the LQAS. However, LQAS were 1.4 to 2.5 times more costly to undertake. For a similar comparison in Indonesia, the standard error ranged from 1.9 to 9.0 percent for EPI surveys, and from 2.1 to 3.8 percent for LQAS for different vaccines.<sup>31</sup>

The validity and reliability of results for the EPI survey and the LQAS depend on methods used for recording coverage. Immunization records, vaccination scars, and parental reports have been used. Reliance on immunization records, however, tends to result in underestimates of coverage due to loss of immunization cards, unavailability of cards at the time of immunization, or faulty recording.<sup>32</sup>

### **Serological Surveys and Field Research**

Serological studies and field research provide the most reliable information on immunization. Researchers try to maintain high levels of data quality by recording all immunizations and following up on study participants. Serological studies evaluate actual levels of antibody titers and seroconversion levels of the participants. These studies can take into account factors such as age, nutritional status, and health condition. Results may be difficult to generalize, however, in the absence of reliable population information or because of uncontrolled field conditions.

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<sup>27</sup> Lemeshow and Robinson, 1985.

<sup>28</sup> Henderson and Sundaresan, 1982.

<sup>29</sup> Weekly Epidemiological Record (1986) 61(42).

<sup>30</sup> Valdez and Vargas, 1988.

<sup>31</sup> Weekly Epidemiological Record (1987) 62(34).

<sup>32</sup> Weekly Epidemiological Record (1985) 60(16).



## Compiled by WHO

WHO provides a further source of data compiled from multiple sources and estimates. The use of multiple sources can increase data quality. However, assumptions made in deriving final EPI coverage or protection estimates must be assessed carefully. In a recent "Global Status Report" for EPI, the following assumptions were made about vaccine efficacy to estimate mortality from communicable childhood diseases: measles - 95 percent; pertussis - 80 percent; and polio - 95 percent.<sup>33</sup> Coverage rates were assumed to be zero for non-reporting countries. With these estimates, vaccine efficacy may be too high for some regions, while zero coverage for non-reporting countries may underestimate the impact of the immunization programs.

### 5.2 Current Issues in Oral Rehydration Therapy

The conversion of inputs (ORS packets) into outputs (coverage of a child with a diarrheal episode with ORS salts) is in some ways more difficult to evaluate for oral rehydration therapy than for immunization. Losses occur at many points from ORS production to use of the solution, and behavioral elements play a much more important role, as shown in Figure 4.

#### 5.2.1 Indicators Related to Oral Rehydration Therapy

##### Oral Rehydration Therapy Coverage

Coverage of diarrheal episodes can be described in the following functional form.

$$C = f(K, T, AV, A, P)$$

where

C = Coverage

K = Knowledge of oral rehydration therapy (ORT)

T = Training in correct preparation

AV = Availability of oral rehydration salts (ORS) or homemade solution during an episode

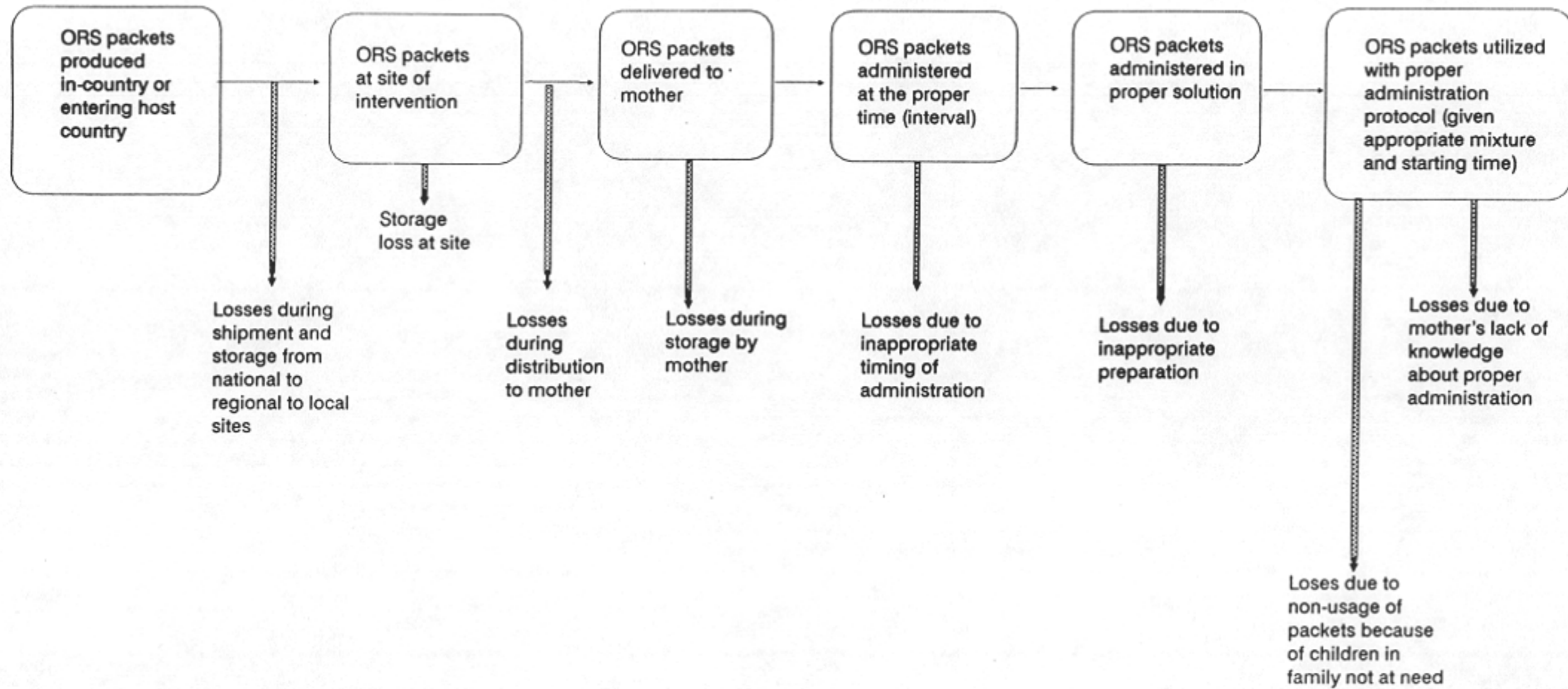
A = Access to a supply source

P = Practice (actual use in an episode)

If any of the components in this equation are missing or incomplete, the child will not be covered or will be only partly covered. In general, the knowledge of health service workers and mothers about ORT has been found to exceed actual practice. In many areas, physical access to ORS has been severely hampered by logistical problems of distribution and the maintenance of supplies. Training is particularly crucial if mothers administer ORT in their homes with no supervision. Timely use of ORS packets or homemade solutions depends on availability of the

<sup>33</sup> Weekly Epidemiological Record (1985) 60(34)

**Figure 4 - Losses from Production (Import) of ORS to Effective Utilization by Child**





solutions in the home when a diarrheal episode occurs. Finally, use of ORT (practice) is influenced by culture and the attitudes of others (fathers, elders, etc.).

### **Knowledge of ORT**

Problems which primary health care workers and mothers have in administering ORS are: failing to recognize the disease, providing an improper diet for the child, delaying treatment, or applying inappropriate medical treatment.<sup>34</sup> Even when a child has lost up to five percent of body weight, evidence of dehydration may appear only as thirst, making it difficult for parents to recognize the seriousness of the dehydration.<sup>35</sup> During a diarrheal episode, food should not be withheld from the child. And during and after administration of ORS, the child should be given food. Treatments are sometimes used to stop diarrhea, as this is felt to be the most important step in saving the child. However, rehydration is of greatest and immediate importance, and although diarrhea may continue during oral rehydration therapy, it will eventually run its course.

Knowledge is stressed in diarrheal disease control programs, but it does not ensure appropriate use, or any use, of ORT during an episode. In Indonesia, it was found that a mother's education was a significant factor in her knowledge of ORS, as was ever having attended a health (child-weighing) post. In the two provinces studied, Bali and East Java, 45 and 36 percent, respectively, of the mothers who recalled a child having a diarrheal episode in the past year administered ORS to the child.<sup>36</sup>

In some diarrheal disease control programs, key mothers are identified and trained in proper use of ORT, and are put in charge of less able mothers. Under this type of program, without education for all, mothers may be less likely to know about ORT or to administer the solution properly.

### **Availability of ORS**

Even in countries where mothers are educated about ORS, a lack of ORS packets will hamper use.<sup>37</sup> Kielmann (1983) found that, according to WHO recommendations, close to 70 million ORS packets would be needed for Egypt's rural population alone. However, in 1980, the total of imported and produced ORS was only 5 million packets. Sanghvi (1985) found that only a small minority of populations of the world have access to ORS. Problems in purchasing and importing ORS also occur. In Nepal, supply shortages were reported at all levels.<sup>38</sup>

Many multilateral and bilateral agencies distribute ORS packets, but little information is available on how many packets are distributed, or to whom. In one study in Ethiopia it was found that a large quantity of ORS remained in storage because distributors did not know where the

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<sup>34</sup> Kielmann, 1983.

<sup>35</sup> Hirschhorn, 1983.

<sup>36</sup> Drake, et al., 1985.

<sup>37</sup> Conversely, in some areas, demand may be low, and supplies may go unused. The shelf life of ORS is about nine months under proper storage conditions. (Khan, 1983).



packets were needed.<sup>39</sup>

### **Access to ORS**

Diarrheal disease control programs are very diverse, and ORS packets are not always easily accessible to mothers. For example, in Mexico, ORS packets are distributed to pharmacies which then distribute the packets to mothers. In other programs, packets are widely distributed directly to mothers through health service clinics. The timing of application of ORS is critical; thus access to the solution, or to ingredients in the home which can be used for a homemade solution, is also a critical component of coverage.

### **Use of ORS**

Knowledge, attitudes, availability and access affect use of ORS, as shown in Table 5. Kielmann (1983) reported that use of ORT was greatest when packets were freely distributed to mothers. Providing ORS to health facilities was not sufficient to result in use. In 1983, although global ORS access rates were estimated at 21 percent, treatment rates were estimated at only four percent.<sup>40</sup> It has been estimated that in 1984, one-third of the world's population had access to ORS and eight percent of diarrheal episodes in children under five years of age were treated with ORS. Twelve percent of the children under five were treated either with ORS packets or a salt and sugar solution.<sup>41</sup>

In Sudan, a Center for Diarrheal Disease survey was conducted on a sample of 40 urban and 40 rural administrative units, with 50 children under five years of age per cluster. It was found that 22.8 percent (+4.4) of the children in urban areas, and 27.7 percent (+6.5) in rural areas were receiving ORT; but only 9.7 and 8.0 percent, respectively, received enough. Home-available fluids were given to 35.5 (+9.5) and 32.6 percent (+7.1) of children in urban and rural areas, but only in small amounts.<sup>42</sup>

### **Effectiveness of ORT**

The effectiveness of ORS is contingent upon the timing of administration, proper mixture of the solution, and administration of an adequate amount. Diarrhea can be caused by a virus or by bacteria. ORT is effective in diarrheal episodes which are caused by bacteria and which result in dehydration of the child. In some cases of viral diarrhea, however, damage to the intestines may prohibit absorption of fluids, and oral rehydration may fail.<sup>43</sup> The efficacy of ORS packets or homemade solutions in reducing mortality, under the most ideal conditions, has been estimated at

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<sup>38</sup> Weekly Epidemiological Record (1987) 62(13).

<sup>39</sup> Weekly Epidemiological Record (1987) 62(50).

<sup>40</sup> Weekly Epidemiological Record (1985) 60(32).

<sup>41</sup> Ibid.

<sup>42</sup> Weekly Epidemiological Record (1987) 62(48).

<sup>43</sup> Failure occurs in five to ten percent of seriously ill children, because of damage to the villi in the upper intestines, and subsequent inability to absorb fluids. (Hirschhorn, 1983) Dysentery, not dehydration, is the cause of 10 to 20 percent of diarrhea deaths. (Merson, 1983)



67 percent.<sup>44</sup> Ideal conditions entail a perfectly run program, and knowledge and proper use of ORT on the part of all mothers.

An agreed-upon definition of ORT coverage, for assessments of diarrheal disease control programs, is difficult to find. Coverage is often estimated on the basis of the number of health care workers trained in ORT, or the number of ORT treatments administered during diarrheal episodes. Programs for treatment vary, as does training within countries.<sup>45</sup> Currently, there is a strong emphasis on using the number of people trained as an estimate of ORT coverage; but training is not equivalent to practice, and practice is not equivalent to effective use of ORT.

**Table 5 - Mothers' Knowledge and Use of ORS (in percent)**

Year	Country	Know about	Can Prepare	Have at home	Used
1983	Indonesia <sup>1</sup>	48.5	-	14.5	14.5 <sup>a</sup>
1983	India <sup>2</sup>	35-94	-	76-89	-
1987	Ethiopia <sup>3</sup>	51	-	-	-
1987	Nepal <sup>4</sup>	66.7	-	-	26 <sup>b</sup>
1987	Thailand <sup>5</sup>	75	-	-	83 <sup>c</sup>
1987	Sri Lanka <sup>6</sup>	59-71	-	-	13-23 <sup>b</sup> .5-7 <sup>d</sup>
1984	Honduras <sup>7</sup>	79.2	-	-	62.4 18 <sup>d</sup>
1984	The Gambia <sup>7</sup>	89.3	-	-	46-50 <sup>a</sup>
1985	Egypt <sup>7</sup>	94.0	69.8	-	62.6
1986	Indonesia <sup>8</sup>				
	Bali	33.6 <sup>e</sup>	-	-	45 <sup>f</sup>
	East Java	25.3 <sup>e</sup>	-	-	36 <sup>f</sup>

Notes:

<sup>a</sup> Not clear if ever used or used in last episode

<sup>b</sup> In all episodes

<sup>c</sup> As outpatient in health center

<sup>d</sup> Last episode

<sup>e</sup> Percentage of all mothers surveyed

<sup>f</sup> Percentage of mothers whose child had a diarrheal episode in the past year

References:

<sup>1</sup> Winardi, 1983.

<sup>2</sup> Kumar, 1983.

<sup>3</sup> Weekly Epidemiological Record(1987), 62(50).

<sup>4</sup> Weekly Epidemiological Record(1987), 62(13).

<sup>5</sup> Weekly Epidemiological Record(1987), 62(38).

<sup>6</sup> Weekly Epidemiological Record(1987), 62(46).

<sup>7</sup> Sanghvi, 1985.

<sup>8</sup> Drake, et al., 1986.

<sup>44</sup> Shepard, 1983.

<sup>45</sup> Weekly Epidemiological Record (1985) 60(26).

Thus, in contrast to immunization, the focus in evaluating ORT programs must be on direct observation and the use of qualitative methods for assessment.<sup>46</sup> Differences in patterns of incidence of diarrheal episodes from one region to another must also be considered when evaluating the effectiveness of the therapy against death. Marked differences occur in death rates from diarrheal dehydration. In some areas, a single huge outbreak occurs each year, whereas other areas have outbreaks at different times of the year, or several times a year, or have reduced epidemics.

In immunization, the effectiveness of the vaccination can be assessed by rates of incidence of the disease, because one episode of illness or disease occurs for a child. Diarrheal diseases, however, are a function of the environment at a particular time; thus death and morbidity are also a function of the environment. In some areas, children may have three or four potential episodes of diarrhea per year, while in other areas, only one in four children may have a single episode. Effectiveness cannot be determined from the number of ORS packets used, as compared to death rates only. Patterns of incidence must be considered in conjunction with death rates and ORS use. Again, this points up the difficulties involved in measuring ORT coverage.

One technical advisory group has emphasized the need for assessments of the quality of treatment provided in the home and at health clinics.<sup>47</sup> A report from the advisory group outlined the need for clear definitions of the indicators in used in the CDD information system, and the need for standardized definitions of the denominators and numerators used in calculations of access rate and use rate. More effort is also needed to measure effective use of ORT, and to measure access to and use of homemade oral rehydration solutions.<sup>48</sup>

### **5.2.2 ORT Coverage Estimation Methods**

The quality of data on ORT coverage in WHO Diarrheal Diseases Control (CDD) programs is affected by the accuracy of the following: 1) population data, 2) estimates of diarrheal episodes per child per year, and 3) estimates of episodes requiring ORT. Deriving estimates of episodes which require ORT requires isolating the virus or bacterium responsible for the enteric disease. The relative frequencies of bacterially and virally caused diarrhea vary from country to country.

Most of the data sources for immunization coverage are also sources for data on ORT coverage. A brief assessment of the methods is given in the following paragraphs.

#### **National Statistics**

National statistics may vary widely depending on conditions (facilities, and quality of reporting). The number of cases of diarrhea is always underestimated, often by a factor of

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<sup>46</sup> Sanghvi, 1985.

<sup>47</sup> Weekly Epidemiological Record (1987) 62(35).

<sup>48</sup> WHO/CDD(1985), 12.



between 100-to-1 and 1000-to-1.<sup>49</sup> Definitional problems and wide variation in mothers' recall periods make meaningful comparisons among countries almost impossible at the present time.

### **"EPI" Surveys**

These studies are based on the survey methodology developed for EPI. At times, ORT questions may be included in EPI surveys. In 1985, guidelines were prepared for using the sentinel system in assessments of diarrheal disease control in EPI surveys, and in lot quality assurance sampling. The sentinel system is used to assess ORT use in health facilities.<sup>50</sup>

### **Diarrheal Disease Control (CDD) Surveys**

The CDD survey methodology was developed by the World Health Organization for assessments of morbidity, mortality and treatment of diarrheal diseases.<sup>51</sup> Very large samples are usually required for the surveys, as sample size is dependent on incidence and mortality rates. In 1986, 70 countries reported on their CDD programs using the CDD Management Information System Form.

### **Demographic and Health Surveys**

The Demographic and Health Surveys program is a five-year program through which international health and population surveys are being conducted. Thirty-five surveys are being conducted in Africa, Asia, and Latin America, as well as 25 follow-up studies of the survey data. DHS surveys include questions on ORT. The questionnaire is standardized, but with some local variation. Interviewers are trained extensively.<sup>52</sup>

### **Comprehensive Program Reviews**

Comprehensive program reviews are recommended for evaluation of CDD programs. The World Health Organization provides information on how to conduct a program review.<sup>53</sup> The reviews are designed to collect managerial, operational, and epidemiological information, including information on distribution of ORS packets.

### **Studies of Program Impact**

Most often, studies of program impact are conducted in specific regions. These studies

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<sup>49</sup> These estimates may vary substantially from country to country and within country. National statistics may underestimate the number of cases of diarrhea by a factor of between 100-to-one and 1000-to-one, depending on local conditions (the type of facilities reporting and the data collection system used). WHO/CDD/SER (1984) 81.5 Rev(1).

<sup>50</sup> Weekly Epidemiological Record (1986) 61(33).

<sup>51</sup> WHO/CDD/SER (1984) 81.5Rev(1).

<sup>52</sup> Institute for Resource Development, 1987.

cover the following aspects of ORT programs: 1) cost-effectiveness, 2) impact of the program on ORT use rates and mortality reduction, 3) use of intravenous ORS, and 4) use of other medication. One such study was undertaken in Indonesia to evaluate the first five years of a family planning and health program (KB-Gizi). All aspects of the KB-Gizi program were evaluated through a cross-sectional survey and, in one province, data from a baseline survey were used for comparison.<sup>54</sup>

### 5.3 An Analysis of Data Quality in HSD

Assessing the degree to which the current indicators in HSD meet the current needs of USAID is an important issue for CIHI, but one beyond the scope of the present study. USAID itself must establish its priorities in this regard; however, CIHI should stimulate periodic review of the correspondence of the elements of its system with USAID's priorities. One mechanism to do this, envisioned in the CIHI contract, is the formation of a Technical Advisory Group to consider, at the very least, this critical issue.

This data quality study has focused more on the various dimensions of quality of data in the existing system. And, as noted above, since CIHI is not the primary agent for collecting any of the data in the HSD, this study focused only on those dimensions of quality within the domain of control of CIHI. Should that domain of control be broadened, additional components of the overall model of data quality might well be incorporated into the procedures for monitoring quality described here.

Specifically, CSF built a data quality monitoring procedure around a series of questions developed in conjunction with CIHI staff. These were:

- 1) Do the data files contain values for each of the indicators for each of the relevant countries in each of a selected set of years?
- 2) Are the sources of each value entered into the data files recorded appropriately?
- 3) Is the method of data collection used by the primary data collection agent recorded?
- 4) Is any notation of the diligence (level of effort to apply the methodology on the part of the primary data collection agent) recorded?
- 5) Are all the potential sources for primary data queried periodically and how many of those sources are being tapped?
- 6) How "old" is the most recent value of each indicator by country?

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<sup>53</sup> WHO/CDD/SER (1984) 81.5Rev(1).

<sup>54</sup> Drake, et al., 1985.



Analyses were conducted to determine the "scores" attained by each of the data files in the HSD -- the Population File, the Fertility File, the Mortality File, the Diarrheal Disease Control File, the Immunization File, the Nutrition File, and the Contraceptive Use File -- for each of the questions listed above. Based on the analyses, recommendations were made as to which measurements could be applied periodically to the data files to measure progress toward improving system performance. Finally, other recommendations were made regarding actions CIHI might take to facilitate monitoring of the data quality or improve the data quality itself.

A summary of the methods used, the findings of the analyses, and the indicators recommended for data quality monitoring is presented in Table 6.

### **5.3.1 Completeness of the Entries**

The HSD was originally designed for the primary purpose of enabling CIHI to respond easily and effectively to requests for information concerning the USAID Child Survival Indicators. To determine the level of completeness of the HSD files, counts of the number of countries reporting data for each of the child survival indicators for 1985 and 1987 were made.

As one might have determined from a cursory view of the data files, data on vaccination coverage rates and ORS access/ORT use rates, and the demographic indicators were present for most countries in both years while nutrition data and contraceptive prevalence rates were missing. Curiously, in 1987, there is a dearth of child mortality data. Among the antigens, tetanus 2 data was much more scarce in 1985 than 1987. This is probably related directly to the fact that many countries were not administering tetanus 2 as part of their immunization programs in 1985, but started to do so by 1987. (See Tables 7-10.)

The nutrition file contains little or no information on breast-feeding prevalence, nutritional status of preschoolers or adequacy of infant feeding as designed by USAID, the latter two of which are official USAID "Tier II" child survival indicators. With regard to nutritional status, CIHI should ascertain the status of the WHO nutrition data bank, currently under development as an archive of nutritional status information, and take the steps necessary to incorporate that data into HSD. To our knowledge, there is no source of comprehensive data on adequacy of infant feeding. However, surveys such as those by DHS are available from USAID supported projects. CIHI should attempt to identify such surveys, which might be reanalyzed to provide some data on the adequacy of infant feeding, and initiate communication to encourage those projects to compute the adequacy of infant feeding so they can be incorporated into the HSD.

To monitor completeness, it is suggested that CIHI compute each year the percentage of countries lacking data in the most recent year for each indicator. Moreover, in order to signal which countries might need help in data collection, the missing countries should be listed as well.

TABLE 6- CIHI Data Analysis

Question	A. Does CIHI have values for the indicators for each country?	B. Does CIHI record the source of data?	C. Does CIHI record the method of collection?	D. Does CIHI record description of the diligence with which data are collected?	E. Is a systematic search for other sources conducted? How many are collected for each country?	F. How old is the most recent value of each indicator?
<p><b>Analysis Performed</b></p> <p>-----</p> <p><b>Analysis Findings</b></p>	<ul style="list-style-type: none"> <li>● Number of missing countries, by indicator, by year</li> <li>● Names of missing countries, by indicator, by year</li> <li>● Number of missing indicators by country, by year</li> </ul>	<ul style="list-style-type: none"> <li>● Unique sources - listing</li> <li>● Number of missing sources</li> <li>-----</li> <li>● Don't know "primary" sources in many cases</li> <li>● None found missing</li> </ul>	<ul style="list-style-type: none"> <li>● Visual survey of "NOTES" field and summary by indicator</li> <li>-----</li> <li>● Not recorded systematically</li> </ul>	<ul style="list-style-type: none"> <li>● Visual survey of NOTES - no real analysis possible</li> <li>-----</li> <li>● Don't currently track diligence</li> </ul>	<ul style="list-style-type: none"> <li>● Expert evaluation of sources used, others identified</li> <li>● Number of sources by country, by indicator, by year</li> <li>-----</li> <li>● Already citing large organizations who are doing search--can't really monitor</li> <li>● Primary sources are being cited</li> </ul>	<ul style="list-style-type: none"> <li>● Number of entries, number of countries with data by indicator, by year</li> <li>● Countries with missing data by indicator, by year</li> <li>● Countries missing by topic</li> </ul>
<p><b>Possible Indicators for Monitoring Data Quality</b></p> <p>-----</p> <p><b>Monitoring Recommendations</b></p>	<ul style="list-style-type: none"> <li>● Percent of countries with missing indicators, by indicator</li> <li>● List of countries missing indicator, by country</li> <li>-----</li> <li>● CIHI should monitor (stratify by AID-assisted)</li> </ul>	<ul style="list-style-type: none"> <li>● Percent of indicators with missing sources:                             <ul style="list-style-type: none"> <li>a) all sources</li> <li>b) derived from primary data gathering activities</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Percent missing method of collection</li> </ul>		<ul style="list-style-type: none"> <li>● Number of sources used by indicator</li> <li>● Average number of indicators collected</li> <li>-----</li> <li>● No monitoring recommended</li> </ul>	<ul style="list-style-type: none"> <li>● Number of countries with no reasonably current data by indicator</li> <li>● Average age of indicator</li> <li>-----</li> <li>● Monitor average age of each indicator</li> </ul>
<p><b>Other Recommendations</b></p>	<ul style="list-style-type: none"> <li>● List of Countries receiving AID funding changes, CIHI should track all countries in the world.</li> </ul>	<ul style="list-style-type: none"> <li>● Code and record sources,</li> <li>● Cite primary sources</li> </ul>	<ul style="list-style-type: none"> <li>● Code and record method of collection</li> </ul>	<ul style="list-style-type: none"> <li>● Code and record diligence</li> <li>● Learn more about application of methodologies</li> </ul>		



Table 7 - Number of Key Indicators Missing Data, by USAID Assisted Country - 1985

COUNTRY	Total Population	Total Fertility Rate	Infant Mortality Rate	Child Mortality Rate	Life Expectancy	ORS Access Rate	ORT Use Rate	Vaccination Coverage					Breast-feeding Prevalence at 12 Mos.	Current Contraceptive Use	Country Total
								BCG	Measles	DPT 3	Polio 3	Tetanus2			
<b>ASIA &amp; NEAR EAST REGION</b>															
AFGHANISTAN				⊕									⊕	⊕	3
BANGLADESH													⊕		1
BURMA									⊕				⊕	⊕	3
CHINA							⊕	⊕	⊕	⊕	⊕		⊕		6
CYPRUS						⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	9
EGYPT							⊕						⊕	⊕	2
FIJI						⊕	⊕						⊕	⊕	4
INDIA										⊕			⊕		2
INDONESIA													⊕		1
JORDAN								⊕					⊕	⊕	3
LEBANON												⊕	⊕	⊕	3
MOROCCO									⊕	⊕	⊕	⊕	⊕	⊕	7
NEPAL								⊕	⊕	⊕	⊕	⊕	⊕	⊕	7
OMAN													⊕	⊕	2
PAKISTAN													⊕		1
PAPUA NEW GUINEA													⊕	⊕	2
PHILIPPINES													⊕	⊕	2
SRI LANKA													⊕	⊕	2
THAILAND													⊕	⊕	2
TUNISIA													⊕	⊕	2
TURKEY	⊕					⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	10
YEMEN					⊕								⊕	⊕	3
Region Total	1	0	0	1	1	3	4	6	6	6	5	5	22	17	77
Percent	4.6%	0	0	4.6%	4.6%	13.6%	18.2%	27.3%	27.3%	27.3%	22.7%	22.7%	100%	77.3%	25.0%

COUNTRY	Total Population	Total Fertility Rate	Infant Mortality Rate	Child Mortality Rate	Life Expectancy	ORS Access Rate	ORT Use Rate	Vaccination Coverage					Breast-feeding Prevalence at 12 Mos.	Current Contraceptive Use	Country Total
								BCG	Measles	DPT 3	Polio 3	Tetanus2			
<b>LATIN AMERICA &amp; CARIBBEAN REGION</b>															
ANTIGUA & BARBUDA	⊕	⊕	⊕	⊕	⊕	⊕	⊕				⊕	⊕	⊕	⊕	11
BARBADOS						⊕	⊕	⊕				⊕	⊕	⊕	6
BELIZE	⊕	⊕	⊕	⊕	⊕	⊕							⊕	⊕	8
BOLIVIA						⊕						⊕	⊕	⊕	4
BRAZIL												⊕		⊕	2
COLOMBIA						⊕		⊕				⊕	⊕	⊕	5
COSTA RICA												⊕	⊕	⊕	3
DOMINICAN REPUBLIC													⊕	⊕	2
ECUADOR												⊕	⊕	⊕	3
EL SALVADOR												⊕	⊕	⊕	2
GRENADA	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕				⊕	⊕	⊕	11
GUATEMALA												⊕	⊕	⊕	3
GUYANA				⊕								⊕	⊕	⊕	4
HAITI												⊕	⊕	⊕	3
HONDURAS												⊕	⊕	⊕	3
JAMAICA							⊕					⊕	⊕	⊕	4
MEXICO												⊕	⊕	⊕	3
PANAMA												⊕	⊕	⊕	3
PARAGUAY												⊕	⊕	⊕	3
PERU												⊕	⊕	⊕	3
TRINIDAD & TOBAGO								⊕				⊕	⊕	⊕	4
Region Total	3	3	3	4	3	6	4	4	0	0	1	19	20	20	90
Percent	14.3%	14.3%	14.3%	19.1%	14.3%	28.6%	19.1%	19.1%	0	0	4.7%	90.5%	95.2%	95.2%	30.6%



Table 7 (continued) - Number of Key Indicators Missing Data, by USAID Assisted Country - 1985

COUNTRY	Total Population	Total Fertility Rate	Infant Mortality Rate	Child Mortality Rate	Life Expectancy	ORS Access Rate	ORT Use Rate	Vaccination Coverage					Breast-feeding Prevalence at 12 Mos.	Current Contraceptive Use	Country Total	
								BCG	Measles	DPT 3	Polio 3	Tetanus 2				
AFRICA (SUB SAHARAN) REGION																
BENIN													⊕	⊕	⊕	3
BOTSWANA													⊕	⊕	⊕	2
BURKINA FASO											⊕		⊕	⊕	⊕	3
BURUNDI						⊕		⊕	⊕	⊕	⊕		⊕	⊕	⊕	7
CAMEROON													⊕	⊕	⊕	2
CAPE VERDE						⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	9
CNTR AFR REP.						⊕						⊕	⊕	⊕	⊕	4
CHAD						⊕		⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	8
COMOROS								⊕	⊕	⊕	⊕		⊕	⊕	⊕	6
CONGO												⊕	⊕	⊕	⊕	3
COTE D'IVOIRE								⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	7
DJIBOUTI				⊕									⊕	⊕	⊕	3
EQUAT.GUINEA													⊕	⊕	⊕	2
GABON													⊕	⊕	⊕	2
GAMBIA													⊕	⊕	⊕	2
GHANA								⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	7
GUINEA								⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	7
GUINEA-BISSAU													⊕	⊕	⊕	2
KENYA													⊕	⊕	⊕	2
LESOTHO								⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	7
LIBERIA								⊕	⊕	⊕	⊕		⊕	⊕	⊕	6
MADAGASCAR													⊕	⊕	⊕	2
MALAWI													⊕	⊕	⊕	2
MALI								⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	7
MAURITANIA												⊕	⊕	⊕	⊕	3
MAURITIUS													⊕			1
MOZAMBIQUE												⊕	⊕	⊕	⊕	3
NIGER					⊕			⊕	⊕	⊕	⊕		⊕	⊕	⊕	7
NIGERIA					⊕								⊕	⊕	⊕	3
RWANDA													⊕	⊕	⊕	2
SAO TOME & PRINCIPE	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	14
SENEGAL													⊕	⊕	⊕	2
SIERRA LEONE								⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	7
SOMALIA													⊕	⊕	⊕	2
SUDAN													⊕	⊕	⊕	2
SWAZILAND						⊕	⊕					⊕	⊕	⊕	⊕	5
TANZANIA													⊕	⊕	⊕	2
TOGO								⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	7
UGANDA												⊕	⊕	⊕	⊕	3
ZAIRE													⊕	⊕	⊕	2
ZAMBIA								⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	7
ZIMBABWE	⊕				⊕						⊕		⊕	⊕	⊕	5
Region Total	2	1	1	2	4	6	3	15	15	15	17	18	42	41	182	
Percent	4.8%	2.4%	2.4%	4.8%	9.5%	14.3%	7.1%	35.7%	35.7%	35.7%	40.4%	42.9%	100%	97.6%	31.0%	

Table 8 - Summary of Missing Key Indicators, by Region - 1985

REGION	Total Population	Total Fertility Rate	Infant Mortality Rate	Child Mortality Rate	Life Expectancy	ORS Access Rate	ORT Use Rate	Vaccination Coverage					Breast-feeding Prevalence at 12 Mos.	Current Contraceptive Use	Percentage Missing by Region
								BCG	Measles	DPT 3	Polio 3	Tetanus 2			
Africa	4.8%	2.4%	2.4%	4.8%	9.5%	14.3%	7.1%	35.7%	35.7%	35.7%	40.4%	42.9%	100%	97.6%	31.0%
Asia & Near East	4.6%	0	0	4.6%	4.6%	13.6%	18.2%	27.3%	27.3%	27.3%	22.7%	22.7%	100%	77.3%	25.0%
Latin America & Caribbean	14.3%	14.3%	14.3%	19.1%	14.3%	28.6%	19.1%	19.1%	0	0	4.7%	90.5%	95.2%	95.2%	30.6%
Total AID Assisted Developing World	7.1%	4.7%	4.7%	8.2%	9.4%	17.7%	12.9%	29.4%	24.7%	24.7%	27.1%	49.4%	98.8%	91.8%	29.3%



Table 9- Number of Key Indicators Missing Data, by USAID Assisted Country - 1987

COUNTRY	Total Population	Total Fertility Rate	Infant Mortality Rate	Child Mortality Rate	Life Expectancy	ORS Access Rate	ORT Use Rate	Vaccination Coverage					Breast-feeding Prevalence at 12 Mos.	Current Contraceptive Use	Country Total
								BCG	Measles	DPT 3	Polio 3	Tetanus2			
ASIA & NEAR EAST REGION															
AFGHANISTAN				□									□	□	3
BANGLADESH				□									□	□	3
BURMA				□									□	□	3
CHINA				□		□	□					□	□	□	6
CYPRUS				□				□				□	□	□	5
EGYPT				□								□	□	□	3
FIJI				□								□	□	□	4
INDIA				□								□	□	□	3
INDONESIA				□								□	□	□	2
JORDAN				□				□				□	□	□	4
LEBANON				□				□				□	□	□	5
MOROCCO				□								□	□	□	3
NEPAL				□								□	□	□	3
OMAN				□								□	□	□	3
PAKISTAN				□								□	□	□	3
PAPUA NEW GUINEA				□								□	□	□	3
PHILIPPINES				□								□	□	□	3
SRI LANKA	□			□											2
THAILAND				□								□	□	□	2
TUNISIA				□								□	□	□	3
TURKEY				□								□	□	□	4
YEMEN				□								□	□	□	3
Region Total	1	0	0	22	0	1	1	3	0	0	0	6	21	18	73
Percent	4.6%	0	0	100%	0	4.6%	4.6%	13.6%	0	0	0	27.3%	95.5%	81.8%	23.7%

COUNTRY	Total Population	Total Fertility Rate	Infant Mortality Rate	Child Mortality Rate	Life Expectancy	ORS Access Rate	ORT Use Rate	Vaccination Coverage					Breast-feeding Prevalence at 12 Mos.	Current Contraceptive Use	Country Total
								BCG	Measles	DPT 3	Polio 3	Tetanus2			
LATIN AMERICA & CARIBBEAN REGION															
ANTIGUA & BARBUDA				□			□	□				□	□	□	6
BARBADOS				□				□	□			□	□	□	6
BELIZE				□								□	□	□	4
BOLIVIA				□								□	□	□	3
BRAZIL				□								□	□	□	3
COLOMBIA				□								□	□	□	3
COSTA RICA				□								□	□	□	3
DOMINICAN REPUBLIC				□				□				□	□	□	4
ECUADOR				□								□	□	□	2
EL SALVADOR				□								□	□	□	4
GRENADA				□			□	□				□	□	□	6
GUATEMALA				□								□	□	□	3
GUYANA	□			□								□	□	□	3
HAITI				□								□	□	□	3
HONDURAS				□								□	□	□	3
JAMAICA				□								□	□	□	4
MEXICO				□								□	□	□	2
PANAMA				□								□	□	□	3
PARAGUAY				□								□	□	□	2
PERU				□	□							□	□	□	4
TRINIDAD & TOBAGO	□			□				□				□	□	□	4
Region Total	2	0	0	21	1	0	2	5	1	0	0	6	21	16	75
Percent	9.5%	0	0	100%	4.7%	0	9.5	23.8%	4.7%	0	0	28.6%	100%	76.2%	25.56%



Table 9 (continued) - Number of Key Indicators Missing Data, by USAID Assisted Country - 1987

COUNTRY	Total Population	Total Fertility Rate	Infant Mortality Rate	Child Mortality Rate	Life Expectancy	ORS Access Rate	ORT Use Rate	Vaccination Coverage					Breast-feeding Prevalence at 12 Mos.	Current Contraceptive Use	Country Total
								BCG	Measles	DPT 3	Polio 3	Tetanus 2			
AFRICA (SUB SAHARAN) REGION															
BENIN				▣									▣	▣	3
BOTSWANA				▣									▣	▣	3
BURKINA FASO				▣									▣	▣	3
BURUNDI				▣									▣		2
CAMEROON				▣				▣	▣	▣	▣	▣	▣	▣	8
CAPE VERDE				▣				▣	▣	▣	▣	▣	▣	▣	8
CNTR AFR REP.				▣								▣	▣	▣	4
CHAD				▣									▣	▣	3
COMOROS				▣									▣	▣	3
CONGO				▣								▣	▣	▣	4
COTE D'IVOIRE				▣									▣	▣	3
DJIBOUTI				▣									▣	▣	3
EQUAT.GUINEA				▣				▣	▣	▣	▣	▣	▣	▣	8
GABON				▣								▣	▣	▣	4
GAMBIA				▣									▣	▣	3
GHANA				▣								▣	▣	▣	4
GUINEA				▣				▣	▣	▣	▣	▣	▣	▣	8
GUINEA-BISSAU				▣									▣	▣	3
KENYA				▣									▣	▣	3
LESOTHO				▣				▣	▣	▣	▣	▣	▣	▣	8
LIBERIA				▣									▣	▣	3
MADAGASCAR				▣						▣			▣	▣	4
MALAWI				▣									▣	▣	3
MALI				▣									▣		2
MAURITANIA				▣				▣	▣	▣	▣	▣	▣	▣	8
MAURITIUS				▣				▣	▣	▣	▣		▣	▣	7
MOZAMBIQUE				▣				▣	▣	▣	▣	▣	▣	▣	8
NIGER				▣				▣	▣	▣	▣	▣	▣	▣	8
NIGERIA				▣							▣		▣		3
RWANDA				▣								▣	▣	▣	4
SAO TOME & PRINCIPE		▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	▣	13
SENEGAL				▣								▣	▣	▣	4
SIERRA LEONE				▣				▣	▣	▣	▣	▣	▣	▣	8
SOMALIA				▣									▣	▣	3
SUDAN				▣									▣	▣	3
SWAZILAND				▣		▣	▣					▣	▣	▣	6
TANZANIA				▣							▣		▣	▣	4
TOGO	▣			▣									▣	▣	4
UGANDA				▣									▣	▣	3
ZAIRE				▣									▣	▣	3
ZAMBIA				▣				▣	▣	▣	▣	▣	▣	▣	8
ZIMBABWE				▣							▣		▣	▣	4
Region Total	1	1	1	42	1	2	2	12	12	13	15	18	42	39	201
Percent	2.4%	2.4%	2.4%	100%	2.4%	4.8%	4.8%	28.6%	28.6%	31.0%	35.7%	42.9%	100%	92.9%	34.2%

Table 10 - Summary of Missing Key Indicators, by Region - 1987

REGION	Total Population	Total Fertility Rate	Infant Mortality Rate	Child Mortality Rate	Life Expectancy	ORS Access Rate	ORT Use Rate	Vaccination Coverage					Breast-feeding Prevalence at 12 Mos.	Current Contraceptive Use	Percentage Missing by Region
								BCG	Measles	DPT 3	Polio 3	Tetanus 2			
Africa	2.4%	2.4%	2.4%	100%	2.4%	4.8%	4.8%	28.6%	28.6%	31.0%	35.7%	42.9%	100%	92.9%	34.2%
Asia & Near East	4.6%	0	0	100%	0	4.6%	4.6%	13.6%	0	0	0	27.3%	95.5%	81.8%	23.7%
Latin America & Caribbean	9.5%	0	0	100%	4.7%	0	9.5	23.8%	4.7%	0	0	28.6%	100%	76.2%	25.56%
Total AID Assisted Developing World	4.7%	1.2%	1.2%	100%	2.4%	3.5%	5.9%	23.5%	15.3%	15.3	17.7%	35.3%	98.8%	85.9%	29.3%



A related question to be considered is which countries should be included in the system. Until now, that list has been limited to USAID assisted countries. However, after several years of maintaining the system, it is apparent that the list of USAID assisted countries changes periodically. New countries, those most recently added to the list, may not be included in the system. As most of the data sources tapped by CIHI provide data for all countries, especially the United Nations sources, it is recommended that all countries be included in the database, regardless of whether they are currently receiving USAID support. This should include developed as well as developing countries, since comparisons between the two groups may prove to be useful at some future time.

### **5.3.2 Sources of Data**

The source of each value entered in the database was identified. However, the source listed was not always the primary source; that is, in many cases, the source identified was itself citing another source. For example, values are attributed to USAID mission cables while the cables themselves allude to studies or surveys that have been conducted in the country. Clearly, more care needs to be given to identifying the source responsible for the data gathering and analysis wherever possible.

The indicator used to monitor the quality of data with regard to its source is the percentage with missing source information; however, in the future this should be broken into two parts: the percentage with any source at all and the percentage where the source is the primary agent for data collection and analysis. More importantly, CIHI should seek to identify the primary agent in cases where references do come from secondary sources.

The monitoring of sources (as well as the manipulation of the files in general) would be greatly facilitated if the coding of sources were simplified. The typical data file has, at most, references to six sources and the current data structure leaves space for a 256 character citation for each record. There is no need to store the full source information in each record. A simple code might be keyed to a "source" file that would have the detailed citation. Analysis of the smaller, simpler codes would be far easier than analysis of the long text, and the data files would be smaller and more manageable.

### **5.3.3 Method of Data Collection**

Not much information about the method of data collection is recorded in the databases. A single character field is used to differentiate between major collection methods; for example, in the Immunization File, values are identified as having been derived from surveys or from routine reporting systems. More detailed information is occasionally recorded in the notes field. Again referring to the Immunization File as an example, the sample size of a survey may be placed in the notes field. Because there is no convenient way to count up or tabulate the contents of a notes field in a dBASE file, it was not possible to calculate the value of potential indicators for monitoring data quality such as the percentage of values derived by surveys for which sample size is reported.



(This latter exercise could be done only by hand.)

On the surface, the best indicator for monitoring the quality of the recording of sources is the percentage of entries for which a method is recorded. However, one might design a much more discriminating indicator if standards were set regarding what types of information should be recorded for the various types of data sources. For example, if it were determined that a citation of a survey as a method of data collection should be accompanied by the sample size, the sampling strategy (e.g., simple random or two-stage cluster), and a note on whether the surveyors were able to follow the sampling strategy strictly, then it would be possible to monitor whether that information was being recorded for more and more surveys over time.

To facilitate monitoring of progress toward recording more complete information about data collection methodologies, a more sophisticated method of coding and recording descriptive information about those methodologies must be designed. That is, if CIHI chooses to monitor indicators of quality regarding sources, it will first have to redesign the database to include elements of the descriptors it chooses to monitor.

#### **5.3.4 Level of Effort by Data Gatherers**

Level of effort by data gatherers was identified as an important dimension of the data quality monitoring of the HSD because it is well known that certain survey efforts or routine reporting systems are carried out carefully while others are not. The confidence held in a data value emanating from either a survey or a routine data system is directly related to that level of effort. For example, the Demographic and Health Surveys, due to the resources available to them, are able to stick rather closely to the original sampling design, making repeated visits to selected households or villages until such time as all designated respondents are queried. In contrast, the rapid two-stage cluster surveys done in Primary Health Care or Immunization Program reviews, as designed by WHO, sacrifice some diligence in sticking to the original sampling design in order to complete the surveys within their fixed time-frame and in order to save scarce financial resources. Confidence should therefore be higher in a DHS value than in a value derived from a rapid survey.

Currently, CIHI makes no formal attempt to categorize values according to the diligence with which the data collection methodologies were applied. Informally, however, CIHI does select certain values for major reporting efforts such as the Child Survival Report to Congress, and this selection does take into account whatever is known about the diligence of the application of the data collection methodologies.

Given the subjective nature of any assessment of diligence, it is difficult to envision an indicator capable of discriminating between many degrees of level of effort, and which would fit into the current design of the HPD. Moreover, one cannot identify underlying quantitative factors which could easily be measured from afar from which to construct such an indicator. Thus, this study of data quality can suggest only that CIHI staff make their best subjective judgement of diligence for each indicator for each new value received by the system on a three point scale:



known to be quite good, unknown or average, and known to be defective. Furthermore, CIHI should strengthen their communication networks with the individuals and organizations who are most familiar with the application of the various field methodologies so as to encourage input that would facilitate the discrimination necessary to operationalize the indicator.

### **5.3.5 Exhaustiveness of Search for Sources**

In order to assess the degree to which CIHI has searched for new data sources, CSF first enumerated the number of sources cited for each of the indicators in each of the distinct data bases making up the HSD. The number of distinct sources is, in fact, quite small because the United Nations serves as a source of many of the national indicators. The list of sources was given to a specialist in the field for comment. That specialist suggested some alternative possible sources.

However, a review of the suggested sources with CIHI produced the following commentary. In the realm of the generation of national statistics, relatively few original studies (surveys, censuses, etc.) are undertaken. Most of the organizations who archive national level statistics rely on those very same studies. Thus, for example, when WHO reports an ORT use rate or a vaccination coverage rate in a country which has just completed a DHS survey, WHO tends to build its estimates around the results of that survey. They may or may not cite the survey directly, depending on how the country Ministry of Health reports the results to WHO. Most of the sources cited by the specialist who reviewed those used by CIHI are known to rely on the same primary data sources. In the last analysis, few new sources were identified.

Expectations are that, should CIHI become more aggressive about collecting sub-national data, the effort to identify sources will have to be intensified. Projects with a sub-national focus often do surveys or establish routine reporting systems which, because of their limited geographic scope, are not routinely archived by the major large collectors of data, like the UN. In particular, PVOs, both local and international, could become a major source of sub-national data.

### **5.3.6 Age of the Indicator**

A measure of currency, the elapsed calendar time from the moment covered by an indicator until the present -- the "age" of the indicator -- can be computed for each country and each indicator. Given the structure of the Health Statistics Database, identification of the most current value for a given indicator and given country proved difficult without some fairly complicated programming. Therefore, a number of proxy analyses were done. For each data file, the number of countries for which values were recorded in each year, 1986, 1987, 1988, was calculated. Listings of countries missing data in each year for each indicator were made. Finally, for each country, in a single year, the number of indicators for which values were missing was computed. (See Table 11.)

Table 11 - Data by Indicator for USAID Assisted Countries - 1986, 1987, 1988

COUNTRY	Total Population			Total Fertility Rate			Infant Mortality Rate			ORS Access Rate			Measles Vaccination			Breast-feeding Prevalance at 12 Mos.			Current Contraceptive Use		
	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988
AFRICA (SUB SAHARAN) REGION																					
BENIN	+	+	+	+	+		+			+	+		+	+							
BOTSWANA		+	+	+	+		+			+	+		+	+							
BURKINA FASO		+	+	+	+		+			+	+			+							
BURUNDI		+	+	+	+		+			+	+		+	+							+
CAMEROON		+	+	+	+		+			+	+				+						
CAPE VERDE		+	+	+	+		+			+	+		+								
CNTR AFR REP.		+	+	+	+		+			+	+			+							
CHAD.		+	+	+	+		+			+	+				+						
COMOROS		+	+	+	+		+			+	+		+	+							
CONGO		+	+	+	+		+			+	+			+							
COTE D'IVOIRE		+	+	+	+		+			+	+			+							
DJIBOUTI		+	+	+	+		+				+		+	+							
EQUAT.GUINEA		+	+	+	+		+			+	+										
GABON		+	+	+	+		+			+	+				+						
GAMBIA		+	+	+	+		+			+	+				+						
GHANA		+	+	+	+		+			+	+				+						
GUINEA		+	+	+	+		+			+	+		+								
GUINEA-BISSAU		+	+	+	+		+			+	+			+	+						
KENYA	+	+	+	+	+		+			+	+		+	+							
LESOTHO		+	+	+	+		+			+	+		+		+						
LIBERIA		+	+	+	+		+	+		+	+		+	+	+						+
MADAGASCAR		+	+	+	+		+			+	+		+	+							
MALAWI	+	+	+	+	+		+			+	+	+	+	+	+						
MALI	+	+	+	+	+		+			+	+	+	+	+							+
MAURITANIA		+	+	+	+		+			+	+		+								+
MAURITIUS		+	+	+	+		+			+	+		+								
MOZAMBIQUE		+	+	+	+		+			+	+										
NIGER	+	+	+	+	+		+			+	+										
NIGERIA	+	+	+	+	+		+			+	+		+	+							+
RWANDA		+	+	+	+		+			+	+			+							
SAO TOME & PRINCIPE		+	+																		
SENEGAL	+	+	+	+	+		+	+		+	+			+							+
SIERRA LEONE		+	+	+	+		+			+	+		+		+						
SOMALIA		+	+	+	+		+			+	+		+	+							
SUDAN	+	+	+	+	+		+			+	+		+	+							
SWAZILAND		+	+	+	+		+						+	+							
TANZANIA		+	+	+	+		+			+	+			+							
TOGO			+	+	+		+			+	+			+	+						
UGANDA		+	+	+	+		+			+	+		+	+							
ZAIRE	+	+	+	+	+		+			+	+		+	+							
ZAMBIA		+	+	+	+		+			+	+										
ZIMBABWE		+	+	+	+		+			+	+		+	+							



Table 11 (continued) - Data by Indicator for USAID Assisted Countries - 1986, 1987, 1988

COUNTRY	Total Population			Total Fertility Rate			Infant Mortality Rate			ORS Access Rate			Measles Vaccination			Breast-feeding Prevalance at 12 Mos.			Current Contraceptive Use		
	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988
<b>ASIA &amp; NEAR EAST REGION</b>																					
AFGHANISTAN	+	+	+	+	+	+	+	+	+	+	+	+	+								
BANGLADESH	+	+	+	+	+	+	+	+	+	+	+	+	+								
BURMA		+	+	+	+	+	+	+	+	+	+	+	+								
CHINA		+	+	+	+	+	+	+	+	+	+	+	+								
CYPRUS		+	+	+	+	+	+	+	+	+	+	+	+								
EGYPT	+	+	+	+	+	+	+	+	+	+	+	+	+								
FIJI		+	+	+	+	+	+	+	+	+	+	+	+								
INDIA	+	+	+	+	+	+	+	+	+	+	+	+	+	+							
INDONESIA	+	+	+	+	+	+	+	+	+	+	+	+	+	+							
JORDAN		+	+	+	+	+	+	+	+	+	+	+	+						+		
LEBANON		+	+	+	+	+	+	+	+	+	+	+	+								
MOROCCO	+	+	+	+	+	+	+	+	+	+	+	+	+								
NEPAL	+	+	+	+	+	+	+	+	+	+	+	+	+						+		
OMAN		+	+	+	+	+	+	+	+	+	+	+	+								
PAKISTAN	+	+	+	+	+	+	+	+	+	+	+	+	+	+							
PAPUA NEW GUINEA		+	+	+	+	+	+	+	+	+	+	+	+								
PHILIPPINES		+	+	+	+	+	+	+	+	+	+	+	+						+		
SRI LANKA			+	+	+	+	+	+	+	+	+	+	+				+		+		
THAILAND		+	+	+	+	+	+	+	+	+	+	+	+						+		
TUNISIA		+	+	+	+	+	+	+	+	+	+	+	+								
TURKEY		+	+	+	+	+	+	+	+	+	+	+	+								
YEMEN	+	+	+	+	+	+	+	+	+	+	+	+	+								

COUNTRY	Total Population			Total Fertility Rate			Infant Mortality Rate			ORS Access Rate			Measles Vaccination			Breast-feeding Prevalance at 12 Mos.			Current Contraceptive Use		
	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988	1986	1987	1988
<b>LATIN AMERICA &amp; CARIBBEAN REGION</b>																					
ANTIGUA & BARBUDA		+	+	+	+	+	+	+	+	+	+	+	+								
BARBADOS		+	+	+	+	+	+	+	+	+	+	+	+								
BELIZE		+	+	+	+	+	+	+	+	+	+	+	+								
BOLIVIA	+	+	+	+	+	+	+	+	+	+	+	+	+								
BRAZIL		+	+	+	+	+	+	+	+	+	+	+	+				+		+		
COLOMBIA		+	+	+	+	+	+	+	+	+	+	+	+						+		
COSTA RICA		+	+	+	+	+	+	+	+	+	+	+	+						+		
DOMINICAN REPUBLIC		+	+	+	+	+	+	+	+	+	+	+	+						+		
ECUADOR	+	+	+	+	+	+	+	+	+	+	+	+	+						+		
EL SALVADOR		+	+	+	+	+	+	+	+	+	+	+	+								
GRENADA		+	+	+	+	+	+	+	+	+	+	+	+								
GUATEMALA	+	+	+	+	+	+	+	+	+	+	+	+	+						+		
GUYANA			+	+	+	+	+	+	+	+	+	+	+								
HAITI	+	+	+	+	+	+	+	+	+	+	+	+	+								
HONDURAS	+	+	+	+	+	+	+	+	+	+	+	+	+								
JAMAICA		+	+	+	+	+	+	+	+	+	+	+	+								
MEXICO		+	+	+	+	+	+	+	+	+	+	+	+						+		
PANAMA		+	+	+	+	+	+	+	+	+	+	+	+								
PARAGUAY		+	+	+	+	+	+	+	+	+	+	+	+						+		
PERU	+	+	+	+	+	+	+	+	+	+	+	+	+						+		
TRINIDAD & TOBAGO				+	+	+	+	+	+	+	+	+	+						+		

The findings of these inquiries indicate that, at the time of the studies, the most current value for the vaccination coverage and diarrheal disease control indicators was 1987. There was only a smattering of data from 1988 (except for those indicators, such as total population, which are calculated by interpolating between other published estimates). For the other indicators, such as nutritional status and contraceptive prevalence, the data were far more sparse, and the most recent values were far older. Thus, one can conclude that, in general, the average "age" of the indicators for which regular reports are received from WHO is 18 months. For programs such as vaccination and diarrheal disease control, where fairly dramatic changes in coverage indicators can be brought about (either positive or negative) in a matter of months, the currency of the indicators in the HSD was not adequate.

In the future, if a rather simple change is made in the structure of the HPD, it should be possible to derive an indicator for monitoring purposes of the average age of the most current value of a given indicator across countries at a point in time. (The simple change is the notation of which value is, in fact, the most current.) It is recommended that this change be made and that the monitoring indicator be calculated once or twice each year.

More generally, the finding that the average age of the indicators for which regular reporting is the norm is 18 months suggests that CIHI consider a more active role in promoting the more frequent generation of indicator values by projects and/or countries and in improving communication channels with missions and other contractors to help shorten the time lag between data collection and reporting back to the HSD.

### **5.3.7 Methodology of Analysis Conducted for This Report**

When one looks at the tables presented in this section, the information is straightforward and simple. Percentages for the quality indicators are presented for single variables. No multivariate analytic techniques have been used. This is appropriate, as this first pass through the HSD warrants a simple, diagnostic look at the data.

For the analyses conducted on the HSD, a consultant spent several days at CIHI in order to determine the current structure of the data files, and to confer with CIHI staff about the specific design of the analyses which would be conducted. Decisions were made about which variables to analyze, in which years. The appropriate variables for the appropriate years were then copied from the large HSD files into smaller, analysis files.

The analyses which ensued, where counts were performed on specific variables, and where the counts were then translated into percentages which now serve as "quality indices," required a significant amount of time. The information presented in this report required several days to be manipulated into a format which the researchers felt was most useful for CIHI and USAID staff.



#### 5.4 Recommendations on the Structure of HSD

Our recommendation that the analyses described in section 5.3 be performed repeatedly on the HSD to determine the quality of the data, as defined by the indicators studied here, is necessarily accompanied by recommendations to restructure the HSD. The following recommendations are based on the analysis outlined above:

--- A determination should be made as to whether the HSD should be reorganized so as to maintain a separate file for each year of data. In other words, each topical data file in the HSD -- Nutrition, ORT, etc. -- might be further separated into numerous files which contain data records for only a single year. Thus the data for Nutrition will be contained in several files: Nutrition 1988, Nutrition 1987, Nutrition 1986, etc. This would allow the analyst to limit his or her work to the relevant years quite simply. However, if data are stored in this way, comparative analyses performed between years would be somewhat more complicated. dBASE commands can be used to link files from different years temporarily, but this procedure is somewhat more time-consuming, and requires that each country be identified by some standard unique identifier. The present HSD structure enables a researcher to make comparisons between years more easily, while the structure we have identified above would make it easier to work with data on a year by year basis.

--- Reduce the listing of sources to an abbreviated listing only. As discussed earlier, the source listing currently held in the HSD is a complete bibliographic listing, for which 256 characters or columns of space in the data file have been reserved. Though a complete bibliographic listing is desirable for the data file, it was found that a very small number of unique sources were referenced for any one topic. A separate dBASE file which contains only bibliographic information should be developed. For each topical file -- Nutrition, ORT, etc. -- all unique data sources should be determined, and then stored in a separate file, such as Nutrition sources, ORT sources, etc. Each complete bibliographic listing should be accompanied by an abbreviated code, such as "1," "2," or "3." This code should then be assigned to each record in the Nutrition file, ORT file, etc. If, at any time, it is desirable to determine the specific bibliographic listing for a particular record, the source file and the topical file can be linked through dBASE, or the source code for a particular record can be determined, and the bibliographic file can then be referenced to determine the complete bibliographic listing.

--- Each topical file should contain all countries. This recommendation is, in part, a structural one and, in part, a recommendation directly related to "completeness" of the database. The topical HSD files were found to contain different subsets of the same 86 countries. In other words, not all of the topical data files contained all of the 86 countries. In addition, some files were found to have the same country listed twice with different spellings. All of the topical files -- Nutrition, ORT, etc. -- should contain the same set of countries, even if data for particular countries are not available for all of the files. This will enable a much quicker determination of which countries are missing data.