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REACH
RESOURCES FOR CHILD HEALTH

# Management and Evaluation of Immunization Programs through the Use of Coverage Surveys and Computerized Analysis

Manual for EPI Managers

Draft - June, 1991

JSI JOHN SNOW, INCORPORATED, 1616 N FORT MYER DRIVE, ELEVENTH FLOOR, ARLINGTON, VIRGINIA 22209 USA
TEL: (703) 528-7474 • TELEX: 272896 JSIWUR • FAX (703) 528-7480

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The REACH Project is responsible for any errors or omissions. Comments from readers are encouraged and should be sent to:

**Resources for Child Health Project (REACH)**
John Snow, Inc.
1616 North Fort Myer Drive
Suite 1100
Arlington, Virginia 22209 USA
Telephone: 703-528-7474
FAX: 703-528-7480
Telex: 272896 JSI WUR

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## ACRONYMS FOR COSAS MANUAL

| | |
|---|---|
| AID | Agency for International Development |
| BCG | Bacillus Calmette Guerin Vaccine |
| CEIS | Computerized EPI Information Systems |
| COSAS | Coverage Survey Analysis System |
| DPT | Diphtheria Pertussis Tetanus Vaccine |
| EPI | Expanded Program on Immunization |
| EPICENTRE | Center for Epidemiological Research |
| GAG | Global Advisory Group |
| MOI | Missed Opportunities for Immunization |
| OCCGE | Office of the Control and Coordination of Endemic Diseases |
| OPV | Oral Polio Vaccine |
| ORSTOM | Office of Scientific Research in the Territories of *Outre Mer* |
| REACH | Resources for Child Health Project |
| TT | Tetanus Toxoid Vaccine |
| WHO | World Health Organization |

# PREFACE

This manual is intended for EPI managers, policy makers, and others who are responsible for making decisions which determine programmatic directions. The purpose of this manual is to assist these individuals in the use of the information generated through the use of the Coverage Survey Analysis System (COSAS) Software to improve the efficiency of their communication programs, while improving coverage.

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# CHAPTER ONE

## INTRODUCTION

In the last 15 years, close to a thousand vaccination coverage surveys using the World Health Organization (WHO) 30-cluster two-stage sampling method have been implemented.[1] Despite its limitations, the relative simplicity of the method accounts for its popularity.

Until the last five years, however, coverage figures by antigen were almost the only output of coverage surveys and were calculated by hand -- a rather labor-intensive process prone to error. Expanded Program for Immunization (EPI) epidemiologists and program managers sensed that additional information, particularly on the operational aspects of their program, could be obtained from a more refined analysis of the coverage data. But doing the analysis by hand was so tedious and time-consuming, few attempted it. Some did, however: Pierre Claquin in Mauritania, 1985; Robert Steinglass in Nepal, 1986; Alain Roisin in Mali, 1986.

With the development of computerized programs to analyze survey data, the ability to extract as much information about the EPI has been greatly facilitated.

## GENESIS OF COSAS (COVERAGE SURVEY ANALYSIS SYSTEM)

The availability and versatility of personal computers made surveys easier to analyze. Initial attempts to design immunization-coverage analysis software programs using Lotus 123 spreadsheets and macros were individually undertaken by A. Roisin (1986) and D. Patte (1987). However, the first comprehensive survey analysis program was produced in July, 1987 in Dakar (Senegal) by a team from *Office de la Recherche Scientifique dans les Territoires d'Outre Mer* (Office of Scientific Research in the Territories of *Outre Mer*, or ORSTOM) in collaboration

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[1]R. H. Henderson and T. Sundaresan, "Cluster sampling to assess immunization coverage: a review of experience with a simplified sampling method," Bulletin of the World Health Organization, Vol. 60, No. 2, pp. 253-260, 1982.

with the Resources for Child Health Project (REACH) and the *Office de Contrôle et de Coordination des Grandes Endémies* (Office of the Control and Coordination of Endemic Diseases, or OCCGE). The program, written in BASIC, was used to analyze the 30 coverage surveys conducted in Senegal. The program, later called Anabase, introduced the computerized analysis of missed opportunities during immunization sessions, an analysis previously done by hand in some surveys (Steinglass, 1986).

WHO/EPI released a test version of a program named COSAS (Coverage Survey Analysis System), written by Eric Brenner, at the November 1987 EPI Global Advisory Group (GAG) in Washington. The version was modified by REACH and ORSTOM in December, 1987 and was used in Turkey by REACH in early 1988. The program codes of the revised version, as well as a detailed review of the initial version of COSAS, were shared with WHO in April, 1988.

During 1988 and 1989, several test versions of COSAS were used in the field. A French "cousin" of COSAS, using Reflex ™, was developed by OCCGE in 1988. Named ANACOV, it is presently being used in Francophone Africa. In 1989, EPICENTRE was requested by WHO to finalize a version of COSAS. The present version of COSAS, COSAS 3, is the result of the hard work of EPICENTRE in sustained collaboration with WHO, REACH, and others.

## COSAS AS A MANAGEMENT TOOL

Since its beginning in 1985, REACH has worked to provide EPI managers with practical tools for obtaining concrete information on their program operations and achievements in Computerized EPI Information Systems (CEIS). COSAS reflects these interests and concerns.

WHO often emphasizes that EPI is about disease control, and not about immunization coverage only. In practice, this means that vaccination coverage figures, although necessary indicators, are not by themselves sufficient to monitor EPI performances. The protection of a cohort of children against the six EPI target diseases in a given community is the result of a combination

of factors leading to the safe administration of potent vaccines in a timely fashion (e.g., respecting the correct age and the correct interval, and providing protection before the months of seasonal transmission).

Other indicators are therefore needed to successfully monitor the management of EPI. They are process indicators and can be grouped by different "attributes." What these attributes are, how they match survey results, and how they relate to COSAS output is discussed at length in Chapter Five.

Before data are collected, an essential question to address is "data for whom and for what?" Coverage survey results are of definite interest to national EPI managers and to donor and technical agencies because of their potential role in validating coverage estimates derived from routine service delivery data. The main beneficiary and user of coverage survey results, however, should be the local (generally mid-level) EPI manager of the area surveyed who needs detailed, concrete, qualitative and quantitative information on the pattern of immunization activities in his district or region in order to take corrective measures.

Using COSAS raises issues about the limits of the statistical validity of its results. What results can be extracted from a 30-cluster coverage survey beyond vaccination coverage rates and the strict measure of confidence intervals? What is a reasonable interpretation, and what is unjustified speculation? The current challenge is to identify the "hard" and the "soft" data and the different uses that can be made of them.

Earlier versions of COSAS analyzed immunization coverage surveys in terms of operational and output indicators, but did not relate them to broader EPI managerial ATTRIBUTES. It was often difficult for EPI managers to **translate** the survey results into practical recommendations for action. The interpretation of COSAS results, and the correlation between quantitative survey results (COSAS output) and EPI managerial components are at the core of this manual.

The chapters which follow will:

- Explain the role and use of coverage surveys in monitoring EPI;
- Introduce and define the attributes which are produced in the standard analysis of COSAS;
- Identify the data used to calculate the indicators;
- Provide guidelines for setting objectives for each attribute, and
- Explain the possible determinants of EPI performance.

Certain terms and definitions used in this manual, and refined in Chapters Two and Three, have been proposed as a start and to foster discussion. They are likely to evolve over time. Manuals are, in essence, working tools and need regular updates as technical understanding progresses. As a draft for the first REACH COSAS workshop, held in June, 1991, this manual is no exception. Comments and suggestions are welcomed.

# CHAPTER TWO

## THE ROLE OF MONITORING IN EPI MANAGEMENT

Monitoring is an essential part of project management. Managers, in their efforts to attain some goal or objective, often ask for information about their accomplishments and the best way to proceed, in order to know whether or not they will be successful. The necessary information is provided by a monitoring and evaluation system. Monitoring shares with evaluation the characteristics of:

- an orderly search for information;
- computation of rates;
- analytic use and feedback of data to make program changes and management decisions, and
- permitting one to identify obstacles in achieving program objectives.

Monitoring differs from evaluation in that:

- it is done by the personnel responsible for the execution of the program activities;
- it is a continuous process -- not sporadic;
- its primary focus is on how the program functions rather than its impact on diseases, and
- it provides information on the type of readjustments needed to correct or prevent the obstacles to program objectives.

Monitoring and evaluation are part of an iterative process that involves collecting and using information to understand the status of the EPI at any given time, identify modifications to project activities necessary to improve performance and reach objectives, feed back the results to project managers and implementors, and measure the effects of these changes on program performance.

If monitoring is done well -- that is, regularly, honestly, rigorously, and with routine feedback

to health workers -- and immediate action is taken based on this information, one can feel confident that the EPI is working, even before more formal evaluations begin.

The following table indicates monitoring techniques in use at different levels of immunization programs.

**TABLE 1: EVALUATION OF EPI**
**Where and When to Do It, How to Use the Data**

| Administrative Level | Evaluation Indicator | Technique | How Often Done | Cost | Use of Data |
|---|---|---|---|---|---|
| Health Unit and Health Office | Number of vaccinations given by vaccine | Clinic register, stock count | Monthly | Low | Estimate vaccine requirements, compare doses delivered to children vaccinated |
| | Cold chain adequacy | Thermometer, cold chain monitor, inspection | Twice daily and each transfer of vaccine | Low | Remedy cold chain problems, decide on vaccine viability |
| | Vaccination delivery management | Supervisory checklist and direct observation, clinic register for:<br>• vaccine stock<br>• vaccination technique<br>• sterilization<br>• adequacy of cold chain<br>• clinic vaccination sessions<br>• when and why vaccination denied to child<br>• EPI record card use by health worker, and retention by mother<br>• community awareness | Monthly, quarterly | Low to Medium | Problem discovery and problem solution, reallocation of resources, retraining; reward scheme, detect delivery-level failures; conduit for informing program managers of field problems |
| Health Unit, Health Office, and District | Coverage | Comparison of doses delivered to eligible population | Monthly | Low | Method detects general coverage trends, and progress towards targets |
| | | "75 House" survey of homes and children nearest health unit | During quarterly supervision | Low | Method examines vaccination status of children with excellent access |

## TABLE 1 (continued)

| Administration Level | Evaluation Indicator | Technique | How Often Done | Cost | Use of Data |
|---|---|---|---|---|---|
| District and Region | Coverage | 30-cluster sample survey | Annually or when routine reports indicate | Medium | Method detects coverage trends, and progress toward targets |
| Region and District | Morbidity and Mortality | Cases and deaths registered by month | Monthly | low | Detect regional and national trend in overall child-survival specific to diarrhea, measles, ARI seasons |
| | | Surveillance by sentinel sites (hospitals, major clinics, and whole villages) for key diseases measles, polio, neonatal tetanus, and pertussis | Monthly, quarterly | Medium | Detect trends, outbreaks, changes in epidemiologic patterns |
| | | Measure disease incidence in adequate sample measles, neonatal tetanus by questionnaire, polio by lameness survey | Baseline and then at major program review | High | Determine overall efficacy of EPI and formulate immunization policies |
| Any Level* | Disease outbreak | Epidemiologic active case detection, measure vaccine efficacy by case control analysis | As needed, in EPIs with high coverage | High | Calculate vaccine efficacy |
| National | Program Review | Full assessment of technical, logistical, managerial issues, cost-effectiveness analysis | Every 3-5 years | Very High | Redesign of program and inputs |
| National | Cold chain adequacy | Cold chain monitors, inspection | At each transfer | Low | Restore cold chain |
| | | Rarely, test vaccine in laboratory | If large batch failure suspected | High | Decide on vaccine viability |

*Special studies at any level Operations Research into delivery methods, evaluation methods, serologic surveys for disease patterns, KAP, focus group and ethnographic research for mass media and health promotion.

The next chapter will present the attributes and indicators which should be monitored on a routine and annual basis.

# CHAPTER THREE

## PROGRAM ATTRIBUTES TO BE MONITORED

The types and amount of data collected during routine monitoring and evaluation should be determined by what basic information a program manager needs to accomplish the objectives. In order to simplify the task of reporting, and thus ensure more complete and regular reporting, these information needs should be minimized. EPI managers may require the collection of information in the following areas:

- Program costs;
- Vaccination service delivery as compared to expected target population ;
- Target disease morbidity and mortality;
- Supply Use;
- Transportation, and
- Cold chain performance.

This chapter focuses on data on vaccination service delivery.

## DATA ON VACCINATION SERVICE DELIVERY

High visibility has been given to immunization coverage levels, and the first question program managers ask is whether or not they are reaching their coverage objectives. This is understandable, as coverage is one of the easiest attributes to monitor. But since reducing morbidity and mortality is the primary goal of immunization programs, the importance of coverage levels should not be over-emphasized. Raising immunization coverage levels is only a means for achieving that goal. Information is needed above and beyond the provided data on numbers of vaccinations given to consider the quality of EPI services. Also required is the percent coverage among the target population, in order to fully assess immunization service delivery and the impact on disease incidence expected from the coverage achieved. In other words, data on the entire process of service delivery planning and implementation are required.

To facilitate the collection and analysis of data, the process of planning and implementing services can be divided into five major attributes (i.e., components considered as determinants of the level of complete immunization coverage, and the level of protection provided to eligible children):

- the validity of coverage at one year;
- the accessibility and utilization of services;
- the continuity of services;
- the quality of services, and
- the role of the different providers or strategies to deliver immunizations.

These attributes represent components of program implementation which can be improved upon by managers, when the causes of unsatisfactory performances have been identified. Since coverage is fairly well understood, this manual will focus on the remaining four attributes.

## ACCESSIBILITY AND UTILIZATION OF SERVICES

To reach 100% coverage, 100% of the population must have access to and use immunization services.

**Accessibility** is defined as the percent of the population that potentially could be immunized by the current services, based on the distribution of these services and on the distribution of the population. Accessibility is often expressed in terms of the percent of the population living within a certain distance of a location offering immunization. The distance is set by managers, based on an assumed value of the reasonable distance one would travel to be immunized. The definition of accessibility may vary within a country and should be determined at the peripheral level.

**Utilization** is defined as the percent of the population with access to the services that also uses

those services to receive immunizations. The utilization of services is determined by [1] **accessibility**, [2] **availability**, and [3] **acceptability**. Because access and utilization are often intermingled, it is more realistic to look at this attribute in terms of combined program accessibility/utilization, rather than just accessibility or utilization alone.

## CONTINUITY OF SERVICES

A child should be in contact with the immunization service at least three times before 12 months of age to be protected against the six EPI target diseases. Preferably, the child should receive immunizations five times during his/her first year, in order to benefit from early protection. The immunization schedule implies that there will be **repeated** contacts (for some antigens, at one-month intervals) between the child and the EPI within the first year of his life. Providing continuity of contacts to all children in each annual cohort is one of the biggest challenges facing EPI.

Additionally, women should receive five doses of tetanus toxoid during their reproductive years to provide their infants with continuous protection against neonatal tetanus. Providing this continuity of services to women is also a big challenge for the EPI.

Because there is a natural drop-out rate for all events that require repeated contacts, the ability of an EPI to provide continuity of services is best reflected by calculating the proportion of children and women starting the immunization series who complete the series.

## QUALITY OF SERVICES

Beyond vaccination coverage, EPI aims to provide eligible women and children with potent, safe vaccine as early as immunologically possible. Most countries have established several policies to ensure program quality and to guide health workers in implementing their immunization activities. Programs should be monitored for their ability to follow these policies during the

routine implementation of their immunization program.

**A. Adherence to the immunization schedule:**

All countries have an immunization schedule which defines the earliest age at which children can be immunized with measles vaccine, with the first dose of DPT and polio, and which defines when women should be immunized with TT. The schedule also defines the minimum interval that should pass between administration of the first and second dose, and the second and third dose of DPT, Polio and TT, and between the third and fourth doses, and the fourth and fifth doses of TT.

Health workers must screen children and women at immunization sessions to determine which antigen should be given during the visit in accordance with the stated immunization schedule. For children, this determination is based on how old the child is, what antigens have already been given to the child and the amount of time that has passed since the antigens were given. For women the determination is based on the amount of time that has passed since TT was last given. For EPI staff, screening implies an immediate action at the time of the encounter (if the child needs one or several antigens) and the provision of clear information to the child's caretaker or to the woman as to when the next contact should take place.

**B. Ability to Target "Under Ones" for Immunization and Pregnant Women for TT**

EPIs often immunize children over one year of age. But the immunization program should target children <u>under</u> one year of age, as these children suffer the highest morbidity and mortality from target diseases. For certain EPI diseases, such as pertussis, children as young as six months of age are at highest risk. To protect children at an early age, they need to be immunized as early as possible, within the limits set by the immunization schedule.

From an epidemiologic point of view, long intervals between successive doses of DPT and polio vaccine are not desirable. Long intervals mean that the completion of the primary schedule is achieved only at a later age, exposing the child to a longer period at risk of getting the disease. Short intervals between successive rounds of vaccination in a community help reduce

susceptibles and thereby help prevent outbreaks of diseases such as measles, polio, and pertussis.

Among all child-bearing-aged women immunized by the EPI, pregnant women should be targeted to ensure that they and their infants are protected against tetanus at the time of delivery.

### C. Missed Opportunities

For operational reasons (including cost and ability to achieve high coverage rates early in life), immunization schedules attempt to minimize the number of times the same child must return for immunizations by requiring several antigens to be given simultaneously whenever possible. In addition, most countries have adopted a policy, according to which all children and women should receive every antigen for which they are eligible at the time of each contact with the immunization program or with an antenatal care provider. This policy often tells the health worker to open a new vial of vaccine, even if only one eligible child or woman is present at the vaccination session, emphasizing the fact that the EPI should not take any chance in delaying protection to an eligible child or woman.

Unfortunately, during some immunization sessions and antenatal care clinics, children or women physically present do not receive all antigens for which they are eligible. "Missed opportunities during immunization sessions" denotes these failures to provide all doses for which children or women are eligible on a particular day. This type of missed opportunity is conceptually different from the broader term "missed opportunity," which implies a missed opportunity to immunize during any contact with the health service. This module will only focus on "missed opportunities during immunization sessions," because they can be detected by coverage surveys.

If a child or a woman with a missed opportunity for a dose of vaccine is never immunized with the dose, the missed opportunity is called an uncorrected missed opportunity. If the child or a woman with a missed opportunity for a dose of vaccine was immunized with the dose at a later vaccination session, the missed opportunity is called a corrected missed opportunity.

Managers can monitor the ability of their program to administer all antigens at all contacts by reviewing the number of children and women who experience a missed opportunity to receive an antigen or antigens.

**D. Availability of documentation about immunization**

Screening children and women to determine the vaccines for which they are eligible requires a systematic alertness on the part of the EPI staff to search for reliable information on the age and immunization status of every child and woman. Screening also requires that health workers systematically maintain and update immunization records, among which the immunization card is the most useful. Whenever a birth date or a vaccination is unrecorded or imprecise, the health staff should correct it.

Immunization program policies often state that children and women attending an immunization session without a child immunization card should not leave without one. The same policy applies to women of child-bearing age, whatever the reasons of their contact with the health services. In the 1990s, in light of the progress in EPI, it is no longer possible for a national EPI to claim sustained success in the absence of a high rate of distribution and retention of immunization cards.

Because people keep what they value, a retained immunization card indicates that both the card and the immunization service are important to the caretaker. The value placed on the card can be considered a good indicator of the quality of the immunization service.

## PROVIDERS OF IMMUNIZATION AND METHODS OF SERVICE DELIVERY

All countries are involved in a development process which is modifying the living conditions of their population. More people are moving to cities and have permanent places to live. Changes in the structure of economic systems have translated into a lesser role for the state and a growing reliance on the private sector, including in the health sector. Even in EPI, traditionally considered a non-lucrative activity for the private sector, things are changing. It is also

important for managers to understand the role of private providers of immunization, and to enlist their full participation in the EPI, as too often they do not report their activities to the EPI.

It is equally important to understand the mix of delivery strategies that has resulted in the current levels of immunization coverage and disease control. If objectives have not been met, delivery strategies may need to be changed to meet the needs of the target population, the environment and local patterns of disease transmission.

Different data collection methods are necessary to obtain information on these indicators. The pros and cons of routine versus survey methods for data collection are presented in the next chapter.

# CHAPTER FOUR

## SOURCES OF DATA FOR MONITORING AND EVALUATION

The issue of HOW, WHEN, and FROM WHOM to collect data is a difficult one for the EPI manager, who must constantly balance the desire for more and better data with the cost in time and money of collecting those data.

To collect data on the five attributes outlined in Chapter Three, managers can choose between two data collection methodologies: [1] the routine system of calculating service delivery statistics based on tally sheets and maintaining clinic records, or [2] population-based surveys. As with all information systems the quality of the data available from these two possible sources should be considered.

Data quality is usually defined in terms of:

- Validity. Does the information measure what it is intended to measure? What is important for decision making?
- Reliability. To what degree does repeated use of a measurement procedure produce the same results?
- Bias. To what extent do human factors of an unplanned and/or non-random nature operate to distort information by intervening in the measurement process?
- Representativeness. To what extent does the information collected characterize all of the units in a study population?

## ROUTINE DATA

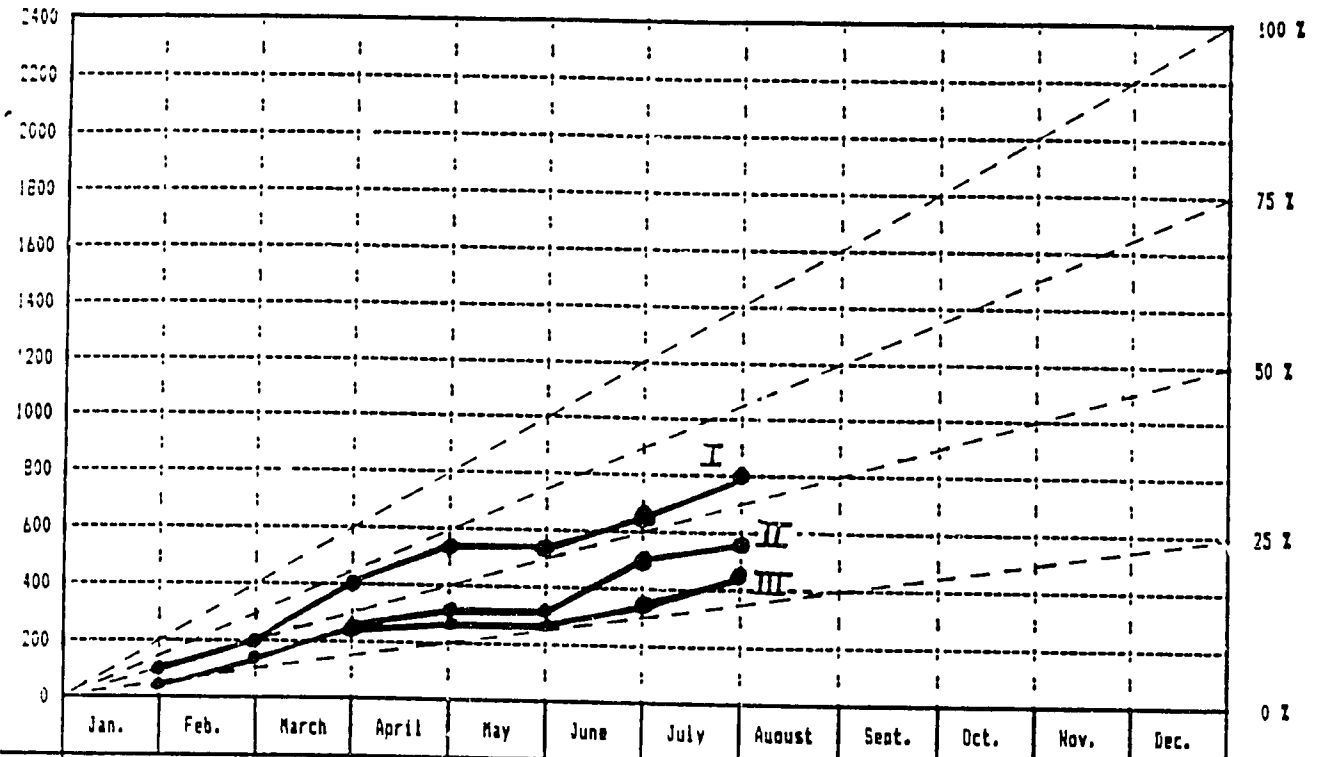
### REPORTS SENT FROM CLINICS

Control of the EPI by managers relies on an effective system of routine, timely reporting of data concerning the numbers of doses of the various vaccines administered by dose and by age. These data are collected during vaccination sessions, often by the use of tally sheets, to record

# FIGURE 1: IMMUNIZATION MONITOR CHART

Health Centre: Valla  Year: 1984

Target population: 2400  Vaccine: DPT 1,2,3




| | Jan. | Feb. | March | April | May | June | July | August | Sept. | Oct. | Nov. | Dec. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DPT 1 | 100 | 100 | 200 | 150 | 0 | 100 | 150 | | | | | | No.immunized in month |
| | 100 | 200 | 400 | 550 | 550 | 650 | 800 | | | | | | Cumulative total for year |
| DPT 2 | 50 | 90 | 100 | 70 | 0 | 150 | 100 | | | | | | No.immunized in month |
| | 50 | 140 | 240 | 310 | 310 | 460 | 560 | | | | | | Cumulative total for year |
| DPT 3 | 60 | 70 | 100 | 50 | 0 | 100 | 70 | | | | | | No.immunized in month |
| | 60 | 130 | 230 | 280 | 280 | 380 | 450 | | | | | | Cumulative total for year |

the number of vaccinations given by vaccine, dose, and age group (see Table 2). The age groups are often divided into children less than one year of age and children more than one year of age. The number of vials of vaccine used is often recorded on the tally sheets. When passed up the system from the field, this information enables regional and central level management to monitor immunization coverage. Additionally, the catchment population and the birth rate must be known to estimate how many newborns can be expected per year, per quarter, or per month.

On the basis of the information contained in routine reports, certain program attributes can be monitored.

- Access/Utilization - First, comparison of the number of first doses of DPT administered in a given month or year with the number of newborns expected per month or per year permits an estimate of access to or utilization of immunization services. Additionally, monitoring the proportion of pregnant women to the total number of women attending antenatal clinics is useful.

- Program Continuity - Estimates of program continuity can then be derived by calculating the drop-out rate, by means of comparing the monthly number of first doses of DPT and polio with second and third doses. For TT, program continuity is currently best estimated by comparing the number of first doses of TT with the number of second doses. This may be done monthly, quarterly, or yearly to meet the needs of the manager using the data.

- Coverage - Another program attribute which can be monitored from routine data is the progress towards annual coverage objectives and coverage achieved among infants with the individual antigens and doses. Figure 1, the Immunization Monitor Chart, provides an example of how coverage data from routine reports can be used as a management tool at the point of collection. This tool, which might serve as a wall chart in a health center and at the higher supervisory levels, can tell a manager before the end of the year whether at the current rate of performance the program is likely to reach its target. This direct and immediate

## TABLE 2: SAMPLE TALLY SHEET

### Vaccination Session Record

Name of Health Center _____ Date of Session _____

District _____ Signature _____

District Health Officer _____ Date of Completion _____

| AGE | Less Than 1 Year | | 1 to 2 Years | | Greater Than 2 Years | | Women 15 to 45 Years | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|
| VACCINE | Tally | Total | Tally | Total | Tally | Total | Tally | Total | |
| BCG | | | | | | | XXXX | XXXX | |
| Measles | | | | | | | XXXX | XXXX | |
| DPT 1 | | | | | | | XXXX | XXXX | |
| DPT 2 | | | | | | | XXXX | XXXX | |
| DPT 3 | | | | | | | XXXX | XXXX | |
| TOTAL DPT | | | | | | | XXXXXXXXXX | | |
| OPV 1 | | | | | | | XXXX | XXXX | |
| OPV 2 | | | | | | | XXXX | XXXX | |
| OPV 3 | | | | | | | XXXX | XXXX | |
| TOTAL OPV | | | | | | | XXXXXXXXXX | | |
| TT 1 | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | | | |
| TT 2 | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | | | |
| TT 3 | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | | | |
| TT 4 | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | | | |
| TT 5 | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | | | |
| TOTAL TT | XXXX | XXXX | XXXX | XXXX | XXXX | XXXX | | | |
| NUMBER COMPLETELY VACCINATED | | | | | | | | | |

TABLE 2 (continued)

**Vaccination Session Record (continued)**

| NUMBER | Vials Used | |
|---|---|---|
| VACCINE | Tally | Total |
| BCG | | |
| MEASLES | | |
| DPT | | |
| OPV | | |
| TT | | |
| TOTAL | | |

Duration of Session (hours): _____ Personnel (number) _____

Comments: _____

| |
|---|
| |
| |
| |

feedback on performance demonstrates the practical relevance of data collection. This is essential, for data that are not useful to those who obtain them lose their most important value. Not only do data put to immediate use provide a direct stimulus to improving performance, but, by permitting health workers to evaluate their own performance and take pride in their own accomplishments, they serve to enhance motivation and job satisfaction.

Unfortunately, attempts to derive valid estimates of TT coverage from routine data on doses administered are methodologically flawed and it is not possible to monitor progress towards

objectives to protect women with TT from routine service statistics. Unlike the annual cohort of infants that is renewed annually, women of child-bearing age are a less well defined group, with members entering and leaving the cohort continually. Multiple doses of TT are administered to members with varying intervals over a 30 year reproductive period and coverage estimates in a given year do not equal protection because these estimates often overlook immunizations given during past years which are still protective.

In many countries, tally sheets used for routine reporting only collect data on the number of children vaccinated between birth and 11 months of age, and between 12 and 24 months of age. These sheets also collect data on the number of women vaccinated with TT, and often, dose information is divided among those given to pregnant women and those given to all other women of child-bearing age. As a result, routine data cannot provide information on indicators of program quality. For example, routine data do not reveal the timeliness of immunizations, the percent of children who start their immunizations early, and the percent who complete their DPT series before 26 weeks. Furthermore, while these reports record the total number of children immunized with each antigen and dose, it is not possible to determine if the doses were administered according to the immunization schedule. Missed opportunities also cannot be measured because it is also impossible to determine if all antigens for which children are eligible during immunization sessions are being administered.

Another difficulty occurs when deriving estimates of fully immunized children from routine data unless a special column on the tally sheet is created to collect this information. Estimates of the percent of "fully immunized" children are often made at the national or global level simply by equating "fully immunized" children with the lowest coverage figure among all of the individual antigens and doses. This has become a useful shorthand for the purpose of global program monitoring, but the figure it provides is not valid or precise and is most often higher than the actual number of "fully immunized" children.

Lastly, systems for collecting routine data often include only facilities that are within the government EPI; and among these facilities, reporting is often incomplete. Providers outside

of the government EPI may not report at all and children vaccinated by these other providers of health care would not be counted. Consequently, routine data does not provide information on the relative contribution of providers besides the government.

CLINIC BASED RECORDS (TICKLER FILES AND CLINIC REGISTRATION BOOKS)

Registration books and tickler files can provide more detailed information on the quality of service delivery as well as the number of children fully immunized (see Table 3). Files from these sources give information on the proportion of doses given before the minimum age, and where applicable intervals can also be addressed. Information on missed opportunities and their effect on coverage is also available.

## SURVEYS

The WHO/EPI frequently uses a relatively simple, population based, random sample survey method to estimate coverage. The method for evaluating the immunization coverage of children and women for TT requires selecting only 210 children for each survey, divided among 30 "clusters." The date of birth is determined for each child, and is used to derive his/her immunization status for each antigen and dose. If an immunization record is available, the date that each immunization was received is recorded; otherwise, the immunization is recorded as received according to history. Coverage estimates derived from these surveys have a 95% chance of being within ten percentage points of the true coverage in the population, and estimates with this level of precision are adequate for most management purposes. Cluster sampling is a time-honored practice that, when done correctly, is relatively inexpensive, fast, and capable of revealing trends over time.

Surveys provide an estimate of the proportion of "fully immunized" children, the proportion of infants born protected against tetanus and the proportion of women currently protected against tetanus, something not possible from routine data.

Survey data can also be used to validate the accuracy of coverage estimates from routine reports.

TABLE 3: TICKLER FILE

| Name | DOB | Address | ANTIGENS | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | BCG | DPT1 | DPT2 | DPT3 | OPV1 | OPV2 | OPV3 | Meas | FIC | TT1 | TT2 | TT3 |
| | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | |
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However, this process is not as simple as comparing the estimates obtained from routine data for 0- to 11-month-olds in the year prior to the survey. To be truly accurate requires one to review reports of children aged 0-11 months from a different 12-month period prior to the survey for each antigen and dose. The survey results are then multiplied by the percentage of cohorts for each antigen and dose that are expected to be included in the 12-month period. The results from the routine information system can then be compared to the survey.

Keeping in mind the confidence limitation of plus or minus 10% surrounding coverage results, Figure 2 on page 24 is an example of a tool which, at first glance, is rather complicated. This tool may be of assistance in making comparisons.

In addition to providing information on coverage, coverage surveys have the advantage of being able to provide data on the other important attributes of immunization coverage not available from routine data. Data on these attributes become increasingly important to EPI managers as their programs achieve higher levels of coverage and begin to focus more on the quality of service delivery. With the use of COSAS, a more sophisticated analysis of survey results, particularly data regarding the attributes of program quality and providers of immunization, are easily obtained.

For example, because the child's date of birth and dates of immunization are often known, analyses can be performed to determine the number of children who were vaccinated before the minimum age, who received all of their immunizations before 12 months of age, and who received all the immunizations appropriate for their age. Data may also be analyzed to determine the proportion of children being immunized against measles at the first contact after reaching nine months of age and the proportion of children with missed opportunities for measles immunization.

Furthermore, because coverage surveys record the source of data regarding the child's or woman's immunization status (either from an immunization card or according to history), coverage surveys can provide managers with information on the distribution and retention of

## FIGURE 2

## EPI REPORTED FIGURE CORRESPONDING TO COVERAGE EVALUATION SURVEY AGE GROUP SURVEYED 12-23 MONTHS

| Preceeding Month* | Age of Vaccination (In Month) Eligible for CES | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 11 | | | | | | | | | |
| 2 | 11 | 10 | | measles (94%) | | | | | | |
| 3 | 11 | 10 | 9 | | | | DPT/OPV 3 (88%) | | | |
| 4 | 11 | 10 | 9 | 8 | | | | | DPT/OPV 2 (83%) | |
| 5 | 11 | 10 | 9 | 8 | 7 | | | | | DPT/OPV 1 (79%) |
| 6 | 11 | 10 | 9 | 8 | 7 | 6 | | | | |
| 7 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | | | |
| 8 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | | |
| 9 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | |
| 10 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
| 11 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
| 12 | 11 | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
| 13 | | 10 | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
| 14 | | | 9 | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
| 15 | | | | 8 | 7 | 6 | 5 | 4 | 3 | 2 |
| 16 | | | | | 7 | 6 | 5 | 4 | 3 | 2 |
| 17 | | | | | | 6 | 5 | 4 | 3 | 2 |
| 18 | | | | | | | 5 | 4 | 3 | 2 |
| 19 | | | | | | | | 4 | 3 | 2 |
| 20 | | | | | | | | | 3 | 2 |
| 21 | | | | | | | | | | 2 |

* Indicating time (in month) in the past. Example: One month ago among those children vaccinated, only children aged 11 months are eligible for the CES.

cards among children who had contact with the EPI.

Coverage surveys give information on the different providers of immunizations services, other than government health centers, and on the relative importance of different service delivery strategies.

Lastly, survey data can also be used to validate the accuracy of coverage estimates.

The advantages of survey data as compared to data from routine statistics must be viewed in light of two disadvantages of data collected in coverage surveys:

- Bias in the selection of starting households in the clusters can result in over or underestimates of immunization coverage
- The small number of children surveyed over a relatively large area does not allow survey results indicating program performance problems to be attributed to a specific provider of immunization services for targeted follow-up and improvement.

## USING IMMUNIZATION COVERAGE DATA

Even the best data-collection systems are valueless if results are not used, and without strong user support, they will soon wither and collapse. Inadequate data use results from:

- managerial lack of interest or misunderstanding of data;
- lack of concern for managerial issues on the part of data analysts;
- lack of appropriate processing equipment;
- weak statistical skills among data analysts;
- inappropriate presentation of results, and
- delayed reporting, after relevant decisions have been made.

COSAS was designed to increase a manager's ability to process and analyze coverage survey

data. Unfortunately, tools alone will not solve one of the most common problems in data use, that of inappropriate or insufficient analysis. Many programs produce voluminous statistical reports without any attempt to draw conclusions or to compare results with previous results, program objectives and international goals, costs, population needs.

Data collection appears to be an end in itself in many programs, since analysts frequently misunderstand what managers need for decision-making. The next chapter will begin to discuss how COSAS outputs can be used to analyze coverage survey data and decide what changes are needed within the five attributes of immunization coverage. Managers should keep in mind, however, that proper analysis includes a comparison of data from all available sources, including routine data.

# CHAPTER FIVE

## INTRODUCTION TO COSAS INDICATORS FOR THE FIVE PROGRAM ATTRIBUTES

With the use of COSAS to analyze the results of surveys, information in addition to coverage can be obtained readily: information useful in monitoring important attributes of an EPI. Nevertheless, indicators -- tools which permit one to measure the changes that have taken place in a program -- are needed to measure progress toward reaching objectives set for the five attributes.

An indicator permits measurement of the level of realization of each attribute. For example, the percentage of the target population which actually has access to vaccination services could be measured by DPT1 coverage. Calculating the value of the indicators:

- provides assurance that the program is on the correct road to the realization of objectives, and
- permits identification of possible causes of coverage that is lower than expected.

Thus, it becomes necessary to choose an appropriate indicator for each attribute.

This chapter discusses the relationship between each management attribute and its indicators selected from cluster survey data, and indicates where to find the indicators in the set of results produced by COSAS. To achieve such goals, the following approach has been followed:

- For each attribute, one or more coverage survey indicators which best measure the attribute are discussed.
- All survey indicators listed in this chapter are found in the standard analysis produced by COSAS. It is not necessary to access them manually. Nevertheless, the location of each survey indicator within the manual analysis reports produced by COSAS is shown with a series of bold COSAS screen menu items, separated by the semicolon sign ";". Each semicolon sign ";" means that the <RETURN> or <ENTER> key must be pressed to move from one screen to

the other.

- Examples (tables or graphs) are provided whenever relevant.

A summary, quick reference, two-sided table has been provided on the following pages to assist you in navigating through the manual analysis, once you have become familiar with the concepts presented in the chapters.

## DEFINITION OF THE CRITERIA USED FOR THE RESULTS FROM THE ANALYSIS OF DATA

There are two sets of data, CRUDE and VALID, prepared by COSAS in the course of the analysis of data, whether standard or manual analysis. There is also a difference between the two sources of data on immunization status (CARD ONLY and CARD OR HISTORY). The different connotations of the two sets of data and the two references should be well understood because each of the different data sets is used to calculate one or more of the indicators.

The crude data set contains all doses received by children and women in the survey verified by card data or according to history. Crude data are accepted as provided, whether valid or not, and reflect the patterns of immunization delivery practices as collected by the surveyors in the field from two sources (cards and history). The crude data set provide operational and managerial information on different aspects of immunization activities (e.g., when were the doses provided, the age of the children at the time of immunization, the intervals between doses) without analyzing the validity of the doses delivered.

The valid data set reflects only valid doses of vaccine given that were verified by card and a proportion provided by history. This data set remains after crude data have been screened for validity according to the criteria defined by the users and entered into COSAS at the start of survey analysis with COSAS. These criteria refer to:

- Timeliness of Immunization Indicators: In the set-up menu, the user can define the ages by which children should receive valid doses of DPT3, measles and "All

## Pediatric Coverage Survey

## INDICATORS

| INDICATOR | | MANUAL | ANALYSIS | |
|---|---|---|---|---|
| | *Location in Analysis Report* | *Antigen or Variable* | *Interval Period* | *Data Set* |
| Coverage | | | | |
| Fully Immunized Children | Vaccination Summary | | | corrected |
| Access | | | | |
| DPT1 Coverage | Vaccination Summary | | | crude |
| Continuity of Service | | | | |
| 1. DPT1-DPT3 drop-out | Vaccination Summary | | | crude |
| 2 DPT1-Measles drop-out | Vaccination Summary | | | crude |
| Quality of Services | | | | |
| 1. Adherence to Immunization Schedule | | | | |
| · DPT1 < 6 weeks | Age at Vaccination | DPT1 | weeks | |
| · Measles < 39 weeks | Age at Vaccination | Measles | weeks | |
| · DPT2+DPT3 < 4 weeks | Interval Between Doses | DPT1-DPT2<br>DPT2-DPT3 | weeks | |
| 2. Ability to Target < 1 | | | | |
| · Measles < 52 weeks | Age at Vaccination | Measles | weeks | |
| 3. Missed Opportunities | Missed Opportunities | | | |
| 4. Availability of Documentation | Coverage by Antigen | DPT1 | | crude |
| Providers of Immunization | Variable Frequency | Measles,<br>DPT 1,2,3,<br>POLIO 1,2,3,<br>BCG | | |

## TT Coverage Survey

## INDICATORS

| INDICATOR | | MANUAL | ANALYSIS | |
|---|---|---|---|---|
| | *Location in Analysis Report* | *Antigen or Variable* | *Interval Period* | *Data Set* |
| Coverage | | | | |
| 1. Infants born protected | Vaccination Summary | | | corrected |
| 2. Women protected at time of survey | Vaccination Summary | | | corrected |
| Access | | | | |
| 1. DPT1 Coverage | Vaccination Summary | | | crude |
| 2. Pregnant Women Attending ANC | Variable Frequency | Prenatal Care | | crude |
| Continuity of Service | | | | |
| TT1-TT2 drop-out | Vaccination Summary | | | crude |
| Quality of Services | | | | |
| 1. Ability to Target P W | | | | |
| 2. Adherence to Immunization Schedule | | | | |
| · Proportion of TT2 < 4wks | Interval Between Doses | TT1-TT2 | Weeks | |
| · Proportion of TT3 < 26wks | Interval Between Doses | TT2-TT3 | Weeks | |
| 3. Missed Opportunities | Variable Frequency | M.O.-TT1 | | |
| 4. Availability of Documentation | Coverage by Antigen | TT1 | | crude |
| Providers of Immunization | Variable Frequency | TT 1,2,3,4 Source | | |
| Place of Delivery | Variable Frequency | Place of Delivery | | |

Immunizations Received;"

- Immunization Schedule: The user must define the minimum age for DPT1/OPV1 and measles administration and the minimum interval between doses of DPT1/OPV1 and DPT2/OPV2 and between DPT2/OPV2 and DPT3/OPV3.

WHO has set guidelines on what should be considered valid doses, which should be followed for the sake of the comparability of surveys conducted worldwide. In some cases, however, the specificity of national immunization schedules takes precedence and should be observed.

Valid data refer to the set of data obtained from the crude data set after the cleaning process has taken place and the invalid doses (doses given too early or within too short an interval from the previous dose) have been eliminated. In the case of the multiple-dose antigens, DPT, polio and TT, second and/or third, fourth and fifth doses have been eliminated if any earlier dose is invalid. Consequently, the valid data set provides indications on the likely impact of the immunization program and on what EPI has probably achieved in terms of the resulting protection conferred to children. The results from the valid data set should be used by managers to identify what corrective actions they must immediately undertake to provide protection to the children needing it (including to those surveyed whose names and places of residence are available).

Valid dose - A valid dose is a dose received, verified by card data, that was given after the minimum age (DPT1, measles) or after the minimum interval (DPT2, Polio2, TT2, DPT3, Polio3, TT3, TT4 and TT5). BCG is valid only if the dose is verified by card and has produced a scar. A BCG dose, verified by card, with no scar present is an invalid dose. DPT2/Polio2 can only be valid if DPT1/Polio1 is valid and DPT3/Polio3 can only be valid if DPT1/Polio1 AND DPT2/Polio2 are valid. TT3 can be valid only if TT2 is valid and TT4 and TT5 can be valid only if all previous doses are also valid.

Invalid dose - An invalid dose is a dose received, verified by card data that was given before the minimum age or before the minimum interval or after a previous dose that was invalid, or in the case of BCG, if no scar was present.

DOSES VERIFIED BY CARD - A dose is verified by card if written documentation of the immunization is provided with a complete date of administration, i.e., day/month/year. Doses received according to card data are either valid doses or invalid doses. Either valid doses or both valid and invalid doses my be used to calculate indicators based on doses verified by card.

DOSES ACCORDING TO HISTORY - A dose is considered as received, according to history, if the dose is reported as received, but no written documentation is provided by the caretaker. The dose is also considered from history if the caretaker provides written documentation of immunization, but the dose has a tick mark, a check mark, or an incomplete date of administration (for example, month and year only) next to it. For BCG, a dose given by history with a scar is considered a valid history. It should be understood that, at the time of the survey, the surveyor will have been thorough enough in his/her investigation to obtain satisfying evidence from the mother or the child's caretaker that the child did receive the dose of vaccine; this is indicated by entering and "H" on the survey sheet.

## THE INDICATORS: DEFINITION AND CRITERIA USED FOR THEIR CALCULATION

Each broad attribute of program implementation is represented by one or more indicators that are thought to measure best the program's performance with respect to the broad attribute. The values of the indicators listed for each attribute can help the manager decide which components of the program are functioning well or are in need of improvement.

## A. Accessibility/Utilization

Based on one survey, it is not possible to decide exactly why people may not ever be immunized. Rather, it is often some combination of a lack of access and a lack of utilization. Therefore, any indicator selected will be more a measure of combined access and utilization, rather than just of one or the other.

COSAS Indicators:

1. DPT1 Coverage (Crude) ( %)

The first dose of DPT should be given during the first contact with the EPI. If children have only one contact with the EPI, it is likely that they will at least receive the first dose of DPT. DPT1 coverage, based on crude data, therefore reflects the percent of children with at least one contact with the EPI and reflects the maximum percent of the target population that could be fully immunized by the program based on the current availability of services and rate of use.

DPT1 has been selected because in some countries, BCG immunization is provided through a channel different from the other EPI antigens and BCG coverage might therefore be more an indicator of the utilization of maternity services (and of the immunization of newborns) than of EPI.

Calculation

Numerator: Number of children who received DPT1, verified by card or history

Denominator: All children in the survey.

Location in Manual Analysis: Vaccination summary; crude data; (see Appendix 1)

2. Proportion of pregnant women attending prenatal care, (Crude): ( %)

For women of childbearing age, there is currently no satisfactory indicator of

accessibility/utilization for doses of Tetanus Toxoid. DPT1 coverage among infants is also the best indicator for recent access to Tetanus Toxoid immunization.

Access to prenatal care, however, is an important consideration for EPI managers who may wish to extend immunization services to pregnant women through antenatal care clinics. The proportion of pregnant women attending prenatal care represents the maximum proportion of pregnant women who could be reached with immunization services through this route.

Calculation:

Numerator: Number of women who attended antenatal clinic during pregnancy.

Denominator: Number of women in the survey

Location in Manual Analysis: Vaccination summary; crude data;

## B. CONTINUITY OF SERVICES

To measure continuity of services, managers need to determine the number of children and women who have at least a first contact with the EPI, and who do not go on to receive all the required immunizations. For infants, the first dose of DPT or OPV is generally given at the first contact and the third dose is often given during the last required contact. For women, the first dose of TT is given during the first contact with EPI.

The drop-out rate between doses of vaccine represents the percentage of children or women who received the first dose listed, but who do not receive the second dose listed. The drop-out rate between the first and the third dose of DPT or OPV is the best indicator of continuity of EPI services and of the capacity of the EPI to follow-up children, because the two doses are often given at the first and last required contact with the EPI. Depending on the age at which children are first vaccinated and the amount of time between visits, either DPT3 or measles could be the last antigen received by the child. It is important to calculate the drop-out rate between DPT1 and measles in those countries where measles may be the

last antigen given, thereby representing the last antigen received.

For women, the drop-rate between the first and second dose of TT represents the best indicator of continuity and of the capacity of the EPI to follow-up women of child-bearing age and provide them with initial protection against tetanus. Because immunization against tetanus has become routine in many countries only during the last two or three years, it is important to limit the analysis of the drop-rate to those women who received the first dose of TT during the last two years, as these women had a reasonable chance to receive the second dose.

1. DPT1 - DPT3 Drop-out Rate (The percent of children who receive DPT1 who do not receive DPT3, Crude Data).

Calculation

Numerator: Number of children who received DPT1, verified by card or according to history, who did not receive DPT3, verified by card or according to history.

Denominator: Number of children who received DPT1, verified by card or according to history.

Location in Manual Analysis: Vaccination summary; crude; DPT1 - DPT3 drop-out rate (see Appendix 2)

2. DPT1 - Measles Drop-out Rate (The percent of children who receive DPT1 who do not receive measles, Crude Data).

Calculation

Numerator: Number of children who receive DPT1, verified by card or according to history, who do not receive measles, verified by card or according to history.

Denominator: Number of children who received DPT1, verified by card or according to history.

Location in Manual Analysis: Vaccination summary; crude; DPT1 - Measles

drop-out rate. (see Appendix 3)

3. TT1 - TT2 Drop-Out Rate (The percent of women of child bearing age who received TT1 less than two years before the date of the survey who did not receive TT2, Card Data)

Calculation

Numerator: The number of women who received TT1, verified by card, less than 2 years, 730 days, before the date of the survey who had not received TT2, verified by card, by the date of the survey.

Denominator: The number of women who received TT1, verified by card, less than two years, 730 days before the date of the survey.

Location in Manual Analysis: not available

## C. QUALITY OF SERVICE DELIVERY

Because EPI is a component of a larger system of Primary Health Care (PHC), its operational patterns can reflect those of the overall health service as well. EPI is implemented in the context of a relationship between clients and the health services providers. Improvements in the quality of EPI services are likely to benefit the health services as a whole and facilitate their utilization by the people they are intended to serve. Therefore, quality of EPI services represent the most important attribute that can be monitored using coverage survey data and COSAS.

Several indicators have been selected to measure the quality of the EPI services currently being delivered, in terms of implementing the program according to stated policies on the immunization schedule, on early immunization, on giving all immunization at each contact, and on the provision of documentation about immunizations.

These indicators of program quality are calculated based on doses given to children and women by the EPI and are not based on the total number surveyed.

1. Adherence to the immunization schedule

Vaccines must be administered according to manufacturers' instructions and at the right age and intervals. Failure to do so will result in incomplete protection and lower vaccine efficacy. For infant antigens, the first dose of DPT, Polio and Measles vaccine must be given after a minimum age, and the second and third doses of DPT and polio must be given after a minimum interval of four weeks. Because the same skill (determining if four weeks have passed since the delivery of an earlier dose) is involved in delivering both DPT2 and DPT3, the operational problem of being able to determine if four weeks have passed is measured by calculating the total number of doses of DPT2 and DPT3 given before the minimum interval.

For Tetanus Toxoid, a total of five doses must be administered according to the following schedule: TT2 four weeks after TT1, TT3 six months after TT2, TT4 one year after TT3 and TT5 one year after TT4. Because many EPIs have only recently started immunizing women with TT routinely, many health workers have not yet had to follow the schedule to deliver fourth and fifth doses of TT. Their ability to implement these doses has yet to be determined.

COSAS indicators to measure the health workers ability to follow the immunization schedule are as follows:

a. Proportion of all DPT1 doses, verified by card, given before six weeks:
   Calculation

   Numerator: Number of children who received an invalid dose of DPT1.
   Denominator: Number of children who received DPT1, verified by card
   Location in Manual Analysis: Age at vaccination; DPT1; weeks (see Appendix 4)

b. Proportion of all Measles doses, verified by card, given before 39 weeks

Calculation

Numerator: Number of children who received an invalid dose of measles.

Denominator: Number of children who received measles, verified by card.

Location in Manual Analysis: Age at vaccination; measles; weeks (see Appendix 5)

c. Proportion of all DPT2 doses and DPT3 doses, verified by card, given before a four-week interval.

Calculation

Numerator: Number of children who received DPT1, verified by card, and who received DPT2, verified by card, less than 4 weeks, 28 days, after DPT1 PLUS Number of children who received DPT1 and DPT2, verified by card, with at least a four-week (28-day) interval. and who received DPT3, verified by card, less than four weeks (28 days) after DPT2.

Denominator: Number of children who received both DPT1 and DPT2, verified by card PLUS Number of children who received all three doses DPT1, DPT2, DPT3, verified by card.

Location in Manual Analysis: Interval between doses; DPT1-2; weeks; Interval between doses; DPT2-3; weeks; (see Appendix 6)

d. Proportion of all TT2 doses, verified by card, given before a four week interval.

Calculation

Numerator: Number of women who received an invalid dose of TT2.

Denominator: Number of women who received TT2, verified by card.

Location in Manual Analysis: Interval profile; TT1-TT2; weeks;

e. Proportion of all TT3 doses, verified by card, given before a six-month interval.

Calculation

Numerator: Number of women who received an invalid dose of TT3.

Denominator: Number of women who received TT3, verified by card.

Location in Manual Analysis: Interval profile; TT2-TT3; weeks;

2. Ability to target "under ones" for immunization

The goal of EPI is to reduce morbidity and mortality caused by immunization-preventable diseases. Ideally, managers should have access to these impact indicators to monitor the results of their program. In their absence, however, managers can turn to indicators of the program's ability to immunize children before the age at which disease incidence and severity are greatest and use these indicators as proxies for expected impact on disease reduction. As a result, in addition to setting goals for immunizing children according to the immunization schedule, managers are encouraged to set goals for immunizing and protecting children at as early an age as possible, specifically to fully immunize children by one year of age. At the same time, health workers should be encouraged to immunize children as close as possible to the age recommended in the country's immunization schedule.

The following indicator reflects the ability of the existing service delivery system to vaccinate children correctly and by one year of age. It measures the proportion of doses currently being administered correctly by the program that are also being administered at an early and epidemiologically important age.

For measles, the target age for early immunization should be considered in conjunction with the earliest age at which children can receive the antigen (39 weeks of age).

a. Proportion of all valid measles doses given before 52 weeks of age

Calculation

Numerator: Number of children who received a valid dose of measles before 52 weeks (365 days) of age.

Denominator: Number of children who received a valid dose of measles.

Location in Manual Analysis: Age at vaccination; measles; weeks (see Appendix 7)

b. Ability to target pregnant women for Tetanus Toxoid Immunization.

Another important goal of the EPI is to prevent tetanus in women and their infants. To protect a newborn from neonatal tetanus, mothers must receive a protective dose of TT at least two weeks before delivery. The following indicators reflect the ability of the EPI to immunize women with TT1 early in their pregnancy and with a protective dose at least two weeks before delivery. Because of the complexity of the TT schedule, the manual method for calculating these two indicators will not be explained in this document.

3. Missed opportunities

a. To administer infant antigens during immunization sessions

Many EPIs are adopting the WHO policy that recommends that all children and women be vaccinated at every contact with the health service, whether curative or preventive. This recommendation emphasizes the fact that the health service should not take any chance in delaying protection to an eligible child or woman and should immunize on the spot. As an immediate priority, WHO recommends that all children and women receive all antigens for which they are eligible during each contact with the EPI.

Missed opportunities can be measured in terms of their effect on the level of coverage

and in terms of the overall frequency of the problem of missed opportunities.

- Effect on coverage - The number and percent of children and women surveyed with an uncorrected missed opportunity. When this percent is added to the valid coverage, the result is the total coverage that would have been achieved by the program if no missed opportunities had occurred. The indicator shows the percent of coverage lost because of uncorrected missed opportunities.

Calculation

Numerator: Number of children surveyed with an uncorrected missed opportunity.

· For each individual antigen - Number of children who had the chance to receive the antigen under consideration at the time they received a different antigen, verified by card, and who were not immunized with the antigen by the time of the survey.

· For fully immunized child - Number of children who are not fully immunized at the time of the survey because of an uncorrected missed opportunity for all antigen(s) not received by the time of the survey.

Denominator:

· For each individual antigen - Total number of children in the survey.

· For fully immunized child - Total number of children in the survey.

Location in Manual Analysis: Missed Opportunities (see Appendix 8)

b. To administer TT during antenatal care visits or during visits to a health center during pregnancy

WHO recommends that managers focus on any visit by a pregnant women to antenatal clinic or to a health facilities as an important opportunity to immunize the woman with TT. Pregnant women who receive antenatal care or who visit a health facility for any reason but who do not receive necessary TT immunizations should be

considered as missed opportunities. For women, only the effect on coverage of missed opportunities can be calculated.

Calculation

Numerator:

· For TT1 - The number of women who attended antenatal care during pregnancy or who visited a health center during pregnancy who had not received TT1, verified by card, by the infant's date of birth.

· For TT2 - The number of women who received TT1, verified by card at least four weeks before beginning of pregnancy who attended antenatal care or who visited a health center during pregnancy who did not receive TT2, verified by card by the infant's date of birth.

Denominator:

· For TT1 and TT2 - Total number of women in the survey

Location in Manual Analysis: Variable Frequency; TT1 Missed Opportunities;

- Frequency of the problem - Children with a missed opportunity for a dose either are still not immunized at the time of the survey or were immunized with the dose during a later immunization session, some time before the survey. The total number of times children were present at an immunization session and eligible to receive a dose of vaccine, yet did not receive the dose is an indication of the program's failure to provide all doses to eligible children during every contact.

Calculation

Numerator: Number of children who were not immunized at the first opportunity

· For each antigen - Number of children with an uncorrected missed opportunity, according to the definition above, PLUS number of children who were not immunized with the antigen at the first chance, but who were immunized with the antigen at a later chance before the time of the survey

(corrected missed opportunities).

Denominator:

· For each antigen - Number of children who were immunized with the antigen, verified by card, plus the number of uncorrected missed opportunities for the antigen.

Location in Manual Analysis: Missed Opportunities;

4. Availability of documentation about immunization:

EPI policies often state that women and children should be provided with a record of their immunizations. The immunization record card is preferably kept by the mother, and represents an important element of program management. The EPI must make sure that it has a good supply of cards and ensure that each woman and child who is immunized receives one. An immunization card should be given at the first contact with the EPI, at which time BCG, DPT1, Polio1 or TT1 are most often administered. The percent of children and women who have had at least one contact with EPI, who have received a card, and who still have that card at the time of the survey, are good measures of both the distribution of immunization cards and their retention rate. For infants, DPT1 immunization, rather than BCG immunization, has been selected as an indicator for first contact with the EPI and availability of documentation for the same reasons described in the section on accessibility/utilization.

a. Card Retention among children who received DPT1

Calculation

Numerator: Number of children who received DPT1, verified by card

Denominator: Number of children who received DPT1, verified by card or by history.

Location in Manual Analysis: Coverage by Antigen; DPT1; Crude (see Appendix 9)

b. Card Retention among women who received TT1

Calculation

Numerator: Number of women who received TT1, verified by card

Denominator: Number of women who received TT1, verified by card or by history.

Location in Manual Analysis: Coverage by Antigen; TT1;

## D. PROVIDERS OF IMMUNIZATIONS or STRATEGIES TO IMMUNIZE

Managers can use one data field in COSAS to enter either the provider of the immunization or the strategy (e.g., outreach, fixed facility) used to give the immunization. COSAS then creates a profile either of the relative contribution of different providers or of different strategies in immunizing children and women in the survey population. For each of the four infant vaccines and for TT, the percent of total doses given to children and women in the survey by each provider or strategy is shown.

Calculation

Numerator: For each provider named as a source of immunization, the total number of doses of each vaccine given by card or history, administered by that provider. For DPT, polio and TT, the total number of all doses given, verified by card and according to history, for each provider named as a source are included in the numerator.

Denominator: For each vaccine, the total number of doses given, verified by card and according to history, with a known provider. For DPT, Polio and TT, the total number of all doses given, verified by card and according to history with a known provider.

Location in Manual Analysis: Variable frequency; source variable for all antigens;

# CHAPTER SIX

## SETTING OBJECTIVES AND TARGETS FOR INDICATORS AND USING SURVEY RESULTS TO MEASURE PROGRAM PERFORMANCE

Managers may want to set objectives for each indicator or attribute before they begin to implement and evaluate their programs. Goal setting suggests that the activity is viewed as important by program managers.

EPI managers have almost always set objectives for coverage levels. These objectives have been well recognized, and because they were set, programs have been always evaluated with regard to the level of coverage achieved. Unfortunately, few other objectives were established for routine monitoring and evaluation. While objectives for disease reduction have been established by many EPIs, they are difficult to measure because disease surveillance data are often unavailable. Few EPIs have set objectives for program access or utilization, the continuity of services, or the quality of services. Consequently, managers have not routinely looked for information regarding the performance of their programs in these operational areas.

If objectives for program attributes are established, EPI managers and health workers will be more likely to monitor the attributes routinely and will be motivated to search out more information if the objective is not being met. Specific changes to the program can then be made, based on the information collected.

This chapter provides managers with guidelines for setting objectives for each attribute of program performance and their indicators, measurable by data collected through coverage surveys and analyzed by COSAS. Specific program objectives are proposed for those indicators that measure the program's ability to implement established EPI policies.

### PROGRAM ACCESS/UTILIZATION

The adoption of "Universal Childhood Immunization" (80% immunization coverage for children

of the developing world by 1990) as a goal by many countries implies an objective of ultimately providing 100% of the population with access to immunization services. Depending on the level of access, utilization of immunization services also should be between 80% and 100%, if the EPI expects to reach its coverage objectives.

Programs should first ensure that they have a high rate of utilization of existing services before they consider expanding these series to more remote or hard to reach populations.

Considering that many countries have succeeded in immunizing 80% of their population with DPT1, EPI managers may want to set a target of 90% for crude DPT1 coverage as a combined indicator of access and utilization. This level of coverage with DPT1 would imply either that access to immunization has been extended to about 90% of the population and that close to 100% are using these services, or that 100% of the population has access to services and 90% of those who have access have used the immunization service to receive DPT1.

| INDICATOR | OBJECTIVE |
|---|---|
| DPT1 coverage (crude) | 90% |

PROGRAM CONTINUITY

The drop-out rate is often discussed as an indicator EPI managers should monitor, but few programs have established a specific target for the drop-out rate. However, if managers aim for program access and complete immunization, this suggests a likely target for the drop-out rate. For example, if the target for access and utilization is set at 90% and the target for complete immunization is set at 80%, and DPT3 is considered as the surrogate measure for complete immunization, the target for the DPT1 - DPT3 drop-out rate is automatically set at 10%.

Managers may wish initially to evaluate their program against an objective of 10% for the drop out rate, because many programs have built into their objectives for access and completion an assumed drop out rate of about 10%. The same objective can be used for both the DPT1 - DPT3 drop-out rate and the DPT1 - measles drop-out rate, as it may be difficult to determine

whether DPT3 or measles is more often the last antigen and therefore a better indicator of program continuity. For tetanus toxoid, a similar objective of 10% may be reasonable, even if presumed targets for access and complete immunization differ from those for the infant antigens.

| INDICATOR | OBJECTIVE |
|---|---|
| DPT1 - DPT3 Drop-Out Rate | 10% |
| DPT1 - Measles Drop-Out Rate | 10% |
| TT1 - TT2 Drop-Out Rate | 10% |

QUALITY OF SERVICE DELIVERY

1. Adherence to the immunization schedule

EPI workers immunize children according to a schedule that states the age at which the first dose of DPT, polio and measles vaccine should be administered and the minimum interval between doses for DPT and polio. Measurable objectives for vaccinating children and women according to the stated policy should be established. The objectives of immunizing 80% of infants less than one year of age and protecting 80% of newborns against neonatal tetanus imply that all doses will be administered at the correct age and after the correct minimum interval between doses. For the indicators produced by COSAS, the stated objective would correspond to a proportion of zero doses of DPT1 and measles administered before the minimum age and a proportion of zero doses of DPT2, DPT3, TT2 and TT3 given before the minimum interval.

If an immunization program has an objective for immunizing all children and women according to the stated immunization schedule, then the following objectives of zero doses given before the minimum age or interval should be set for monitoring a program's quality of service delivery.

| INDICATOR | OBJECTIVE |
|---|---|
| · Proportion of doses of DPT1 given before 6 weeks | 0 |
| · Proportion of doses of measles given before 39 weeks | 0 |
| · Proportion of doses of DPT2 and DPT3 given before an interval of four weeks | 0 |
| · Proportion of doses of TT2 given before an interval of four weeks | 0 |
| · Proportion of doses of TT3 given before an interval of six months | 0 |

2. Ability to Target "Under Ones" and pregnant women

Most EPI managers acknowledge that the focus of their infant immunization activities must be on infants less than one year of age, although children over one are also routinely immunized. Therefore, in addition to setting a program objective for administering all doses according the immunization schedule, managers may also want to set sub-objectives in terms of administering these doses at the earliest age possible; e.g., 80% of all doses given according to the immunization schedule should also be given to children before one year of age.

In the case of tetanus toxoid, managers recognize that while all women of child-bearing age must be immunized, pregnant women represent a group that must be targeted for early immunization to ensure that any protective dose needed will be provided at least two weeks before delivery.

The first management objective should be to provide doses according to the immunization schedule to ensure that they will confer immunity. Once managers are confident that their programs are administering antigens correctly, they should then establish an objective for administering these antigens as early as possible to infants and to pregnant women. EPI

managers can use this objective to clearly identify the target population of their program and measure progress with respect to vaccinating children and pregnant women on a timely basis. In setting objectives for timely administration of antigens, managers should consider only the proportion of doses that are administered according to the immunization schedule.

Depending on the program's history, managers should set as a beginning objective the immunization of at least half of all children with measles alone and with all other antigens before one year of age. For the DPT series, managers may want to set as an objective the immunization of half of the children currently receiving three valid doses of DPT3 before six months (26 weeks of age) to ensure that at least half are protected against pertussis before the peak in pertussis incidence and mortality.

For tetanus toxoid, managers may wish to set a high objective for immunizing any woman who enters pregnancy without TT1, with TT1 at least 90 days before delivery in order to ensure that there will also be sufficient time to give the second, protective dose before delivery. Managers may also want to set a relatively high objective for immunizing women who require a protective dose in pregnancy with that protective dose at least two weeks before delivery

These program objectives would correspond to the following values for the indicators of a program's ability to target "under ones" and to target pregnant women provided by COSAS.

| INDICATOR | OBJECTIVE |
|---|---|
| · Proportion of valid DPT3 doses given before 26 weeks | 50% |
| · Proportion of valid measles doses given before 52 weeks | 50% |
| · Proportion of all valid "All Immunizations Received" given before 52 weeks | 50% |
| · Proportion of women who needed TT1 during pregnancy and who received the dose at least 90 days before delivery | 75% |
| · Proportion of women who needed a protective dose of TT during pregnancy and who received the dose at least two weeks before delivery. | 100% |

3. Missed Opportunities for Immunization

Many EPI managers have also adopted a policy to administer all vaccines to all eligible children at every contact with the EPI. Such policies direct clinic workers to open a vial of vaccine to immunize one child and to provide all antigens on the same day. Managers should now establish objectives to measure how effectively the policy of immunizing children with all antigens at every contact is being implemented. If the policy is being implemented fully, there will be no missed opportunities for any antigen during immunization sessions. Managers may wish to set an objective of having no missed opportunities for any antigen among children in the survey and evaluate their program against this target.

For the indicators of missed opportunities provided by COSAS, the values of the indicators expressing this objective would be as follows:

| INDICATOR | OBJECTIVE |
|---|---|
| For all antigens: | |
| · Effect on coverage | 0% |
| · Frequency of problem | 0% |

4. Availability of documentation about immunization

All children who contact the EPI should receive a card documenting their immunization. Because a certain number of cards may be lost or destroyed as time passes, it is reasonable to expect that some children may not have a record of their immunization at the time of the survey. This may be particularly true for children who are two years old and who may have completed their immunizations as much as a year earlier.

EPI may wish to establish objectives for availability of documentation that are similar to the objective set for the drop out rate since both indicators reflect a natural loss expected to occur over time. An objective for 80% availability of documentation about vaccination history may be reasonable as it corresponds to a rate of card loss and a drop-out rate of 10%.

| INDICATOR | OBJECTIVE |
|---|---|
| Availability of documentation about immunization | 80% |

PROVIDERS OF IMMUNIZATIONS

It is difficult to set objectives regarding the level of activity expected from the different possible providers of immunizations in a country. In some locations, private doctors and voluntary organizations may play a major role. In other locations, the government may be the major provider. Therefore, it is not reasonable to set objectives regarding the number and percent of doses given by different providers. The overall percentages should be reviewed to determine the relative importance of different providers of immunizations in the area surveyed. However, it is reasonable to expect that if providers are following the recommended policy of providing

all antigens at all opportunities, then the percent of doses of the different antigens given by each provider should be the same. That is if the government gives 50% of all DPT immunizations, it should also be expected to give 50% of all polio immunizations.

Consequently, objectives regarding providers of immunizations should be for all providers to give equal percentages of total doses of BCG, DPT, polio and measles. If there are differences of more than 5% between antigens in terms of the percent of total doses given by a certain provider, action should be taken.

| INDICATOR | OBJECTIVE |
| --- | --- |
| Providers of Immunization | Less than a 5% difference between the percent of total doses of BCG, DPT, polio and measles are given by a provider. |

# CHAPTER SEVEN

## DETERMINANTS OF PROGRAM PERFORMANCE AND POSSIBLE SUGGESTED ACTIONS

This chapter shows how COSAS analyses of survey data can also be used to identify possible causes for the results obtained. This chapter also suggests the most likely determinants of program performance for the five major attributes, and possible actions to either gather more information or to make corrections. The lists contained under each attribute are in no way meant to be complete, and often a thorough assessment of the program attribute will be required to identify the cause of program failure and plan corrective action. This chapter is only a starting point.

### PROGRAM ACCESS/UTILIZATION

DPT1 crude coverage of less than 100% suggests that either not all people have access to immunization services, or not all people are using services that are available. People may not have access because [1] the EPI is not providing enough services in enough locations, or [2] people may not be willing to travel the required distance established by management in its definition of access in order to receive immunizations.

Services may be widely available but not used by the target population for several reasons, which may include: lack of information regarding the need, time, or place for immunization; inconvenient hours; social and political constraints, and poor service delivery.

Review the COSAS manual analysis coverage by cluster report to help decide whether a lack of analysis or a lack of utilization is responsible for a DPT1 Coverage of less than 100%.

If at least one child in each of the 30 clusters has received at least one antigen, immunization services are most likely widely available throughout the geographic area included in the survey. Under such circumstances, less than 100% coverage with DPT1 is likely due to a lack of utilization rather than a lack of access.

If there are one or more clusters in which none of the seven children have received any immunizations, this may suggest that immunization services are not available in all geographic areas included in the survey. Under such circumstances, less than 100% coverage with DPT1 is likely due to a lack of access rather than a lack of utilization.

To increase access to immunization services, it may be necessary to begin offering immunization sessions in more locations, either by setting up additional fixed facilities, by increasing outreach services or by increasing the activity of mobile teams. Before planning new immunization activities, review both the distance the program expects people to travel in order to receive immunizations and the number of immunizations given at existing locations to identify less active sites from which personnel could possibly be transferred.

To increase utilization of existing immunization services: [1] assess the services being offered at existing locations; [2] determine if the services are well organized and offered at convenient times, and [3] identify any social, political and information barriers that may be preventing people from using the services offered.

PROGRAM CONTINUITY

1. DPT1 - DPT3 drop-out rate and DPT1 - Measles drop-out rate.

Children may receive their first immunization but not go on to complete the immunization series for several reasons. They may include: lack of knowledge; lack of education; lack of a system

with which to track infants; infrequent or sporadic immunization services; poor quality of services; adverse side effects from earlier immunizations, and missed opportunities for DPT3 or measles.

Coverage survey data will probably not be of use in trying to identify the causes of a high drop-out rate because so many different behaviors on the part of the caretaker and health worker are required to fully immunize a child. The missed opportunities profile for measles and DPT3 should be reviewed, however, to determine if children are not returning for DPT3 and measles, or if they are returning but missing opportunities. A complete assessment of the existing service delivery system may be required to identify the causes and likely actions needed to reduce the drop-out rate. Focus group discussions with health workers and caretakers may help collect the information necessary to identify the causes and appropriate actions.

2. TT1 and TT2 Drop-out rate

QUALITY OF SERVICE DELIVERY

1. Ability to target "under ones" for immunization

If the program is to reach its target for completely immunizing children before their first birthday, children must receive their immunizations as close to the recommended age as possible.

If relatively few children are immunized with DPT3 by 26 weeks of age, compared to the total number of children immunized with DPT3, this suggests either that children are starting the series late, or that there are long intervals between consecutive doses of DPT and polio.

Review the COSAS manual analysis age profile reports for DPT1 and the interval profile report for DPT2 and DPT3.

If children are receiving DPT1 after six weeks of age, or if there is a delay between consecutive doses of DPT, this may suggest that immunization services are not routinely available, but are provided only occasionally as part of campaigns or outreach activities.

If relatively few children receive measles vaccine between nine and twelve months as compared to the total number of children immunized with measles, this suggests:

1. Children did not visit a health center during those three months of life;
2. Children experienced a missed opportunity for measles immunization during a visit to an immunization session attended during the time period, or
3. Most vaccinations are being given by mobile teams or during campaigns and immunization services are not routinely available.

Review the COSAS manual analysis interval between doses reported for DPT2 and DPT3.

If the average interval between doses of DPT and polio is two to three months or more, this suggests that there are long delays between visits to immunization sessions, and children may not have had contact with the EPI to receive measles vaccine in the period between nine and 12 months of age.

Review the COSAS missed opportunities profile, particularly for measles .

If there is a high number of corrected missed opportunities, this may sug gest that children are attending an immunization session between nine- a nd 12-months of age, but are not being immunized for measles at this fir st opportunity. Instead, children are being vaccinated during a later visit (made after one year of age).

2. Adherence to the immunization schedule

Children may not be vaccinated according to the immunization schedule for a number of reasons. Children may be vaccinated too early because health workers [1] do not know the immunization schedule, [2] do not understand exactly the ages or intervals stated in the schedule, [3] cannot correctly determine a child's age at the time of the visit (either because no birth date is known or because of a lack of skill), or [4] they cannot correctly determine the amount of time that has passed since the last immunization.

Review the COSAS manual analysis age profile reports for measles, with age in months.

If a large percentage of the doses that were given before nine-months of age were given at eight-months of age, health workers may not know the minimum age for giving measles vaccine. They either do not know exactly what is meant by nine months, or they are having trouble determining the child's exact age.

If early doses of measles are being given over a range of months before nine months, this may suggest that the schedule is not known, or that health workers are immunizing early for another reason.

Review the COSAS manual analysis age profile report for DPT1, with a ge in weeks.

Determine if early doses are clustered around five weeks, or if they are evenly distributed over the first six weeks of life, making conclusions similar to those made for early administration of measles vaccine.

Review the COSAS manual analysis interval profile report for DPT2 and DPT3, with the interval in days, making analyses and conclusions simila r to those made for measles and DPT1 administration.

3. Missed Opportunities for Immunization

Missed opportunities for immunization can occur for several reasons: false contraindications for immunization; fear of side effects from providing too many injections; lack of vaccine; poor screening practices which fail to identify children as eligible for an immunization at the time of a clinic visit. Many studies have been done to demonstrate the relative importance of the different possible causes for missed opportunities.

Coverage surveys measure only one type of missed opportunity, those that occur during immunization sessions. These specific missed opportunities most likely represent only a small fraction of all missed opportunities for immunization that are actually occurring within the health system. Survey data and COSAS analysis cannot provide much additional information, beyond showing the antigen or antigens for which there are the most missed opportunities.

> Review the COSAS manual analysis missed opportunities profiles.
>
> A high number of missed opportunities for DPT relative to polio or of polio relative to DPT may suggest that stock outages of one vaccine are very common, or that during campaigns perhaps only DPT or polio is being provided.
>
> A high number of missed opportunities for measles vaccine relative to the other antigens may suggest that health workers are afraid to give more than one injection during a vaccination session, and choose to give DPT rather than measles because measles vaccine is considered the last antigen that should be given.

If missed opportunities within vaccination sessions alone are a problem, it is likely that there is also a much larger problem with missed opportunities within the health system as a whole. WHO now recommends that managers conduct specific missed opportunities studies, following the protocol developed by WHO, to further investigate the problem of missed opportunities. Missed opportunity studies should be considered a high priority, particularly if missed opportunities are having a significant impact on coverage and represent a serious source of inefficiency within the health system.

4. Availability of Documentation about Immunization

Caretakers and women will not have an immunization card to document previous immunizations given at the time of the survey if they were never issued a card or if the card was lost. If card retention is a problem, it is important to first determine if cards are widely available and given to women and caretakers. Coverage survey data will not provide information to help in this determination. Clinic observation and stock record review may be necessary.

If cards are generally provided to caretakers and women but card retention is low, it must be determined why cards are being lost between the time they are issued and the time of the survey.

PROVIDERS OF IMMUNIZATION

Regardless of their overall level of activities, providers should give equal percentages of all antigens.

Review the providers of immunization profile:

| |
|---|
| If a provider gives a higher percentage of the single antigens, BCG, and measles than of the multiple dose vaccines, this may suggest that there is a higher drop-out rate for DPT and polio among children being immunized by that provider. |

**ATTRIBUTE: COVERAGE**

**INDICATOR: PROPORTION OF CHILDREN FULLY IMMUNIZED BEFORE ONE YEAR**

MANUAL ANALYSIS REPORT: VACCINATION SUMMARY: CORRECTED

Vaccination summary , Corrected doses

| | | |
|---|---|---|
| Child | **210** | |
| Card | 93 | ( 44.3%) |
| BCGscar | 163 | ( 77.6%) |
| BCG | 163 | ( 77.6%) |
| POLIO 0 | 0 | ( 0.0%) |
| POLIO 1 | 152 | ( 72.4%) |
| POLIO 2 | 133 | ( 63.3%) |
| POLIO 3 | 110 | ( 52.4%) |
| DPT 1 | 153 | ( 72.9%) |
| DPT 2 | 136 | ( 64.8%) |
| DPT 3 | 111 | ( 52.9%) |
| MEASLES | 95 | ( 45.2%) |
| Yellow Fever | 0 | ( 0.0%) |
| Other vaccin | 0 | ( 0.0%) |
| DPT3 < 39Wks | 92 | ( 43.8%) |
| MEASLES < 52Wks | 77 | ( 36.7%) |
| All doses received | 120 | ( 57.1%) |
| All doses valid | 70 | ( 33.3%) |
| All doses received < 52Wks | **56** | ( 26.7%) |
| No vaccine | 32 | ( 15.2%) |
| DROPOUT BCG MEAS | 41.7 % | |
| DROPOUT DPT 1-3 | 27.5 % | |
| DROPOUT POL 1-3 | 27.6 % | |

**CALCULATION:**

$$\frac{\text{NUMBER OF CHILDREN WHO RECEIVED ALL IMMUNIZATIONS BEFORE ONE YEAR (365 DAYS) OF AGE, EACH OF WHICH WERE VALID}}{\text{NUMBER OF CHILDREN IN THE SURVEY}} = \frac{56}{210} = 27\%$$

**ATTRIBUTE: PROGRAM ACCESSIBILITY/UTILIZATION**

**INDICATOR: DPT1 COVERAGE (CRUDE)**

MANUAL ANALYSIS REPORT: VACCINATION SUMMARY; CRUDE

Vaccination summary , Crude data

| | | |
|---|---|---|
| Child | **210** | |
| Card | 93 | ( 44.3%) |
| BCGscar | 163 | ( 77.6%) |
| BCG | 177 | ( 84 3%) |
| POLIO 0 | 0 | ( 0.0%) |
| POLIO 1 | 152 | ( 72.4%) |
| POLIO 2 | 147 | ( 70.0%) |
| POLIO 3 | 138 | ( 65.7%) |
| DPT 1 | **153** | ( 72.9%) |
| DPT 2 | 148 | ( 70.5%) |
| DPT 3 | 138 | ( 65.7%) |
| MEASLES | 125 | ( 59.5%) |
| Yellow Fever | 0 | ( 0.0%) |
| Other vaccin | 0 | ( 0.0%) |
| DPT3 < 39Wks | 92 | ( 43.8%) |
| MEASLES < 52Wks | 77 | ( 36.7%) |
| All doses received | 120 | ( 57.1%) |
| All doses valid | 14 | ( 6.7%) |
| All doses received < 52Wks | 56 | ( 26.7%) |
| No vaccine | 32 | ( 15.2%) |
| DROPOUT BCG MEAS | 29.4 % | |
| DROPOUT DPT 1-3 | 9.8 % | |
| DROPOUT POL 1-3 | 9.2 % | |

**CALCULATION:**

$$\frac{\text{NUMBER OF CHILDREN WHO RECEIVED DPT1, VERIFIED BY CARD OR HISTORY}}{\text{ALL CHILDREN IN THE SURVEY}} = \frac{153}{210} = \mathbf{73\%}$$

APPENDIX 2

**ATTRIBUTE: PROGRAM CONTINUITY**

**INDICATOR: DPT1 - DPT3 DROP OUT RATE (CRUDE)**

MANUAL ANALYSIS REPORT: VACCINATION SUMMARY; CRUDE

Vaccination summary , Crude data

| | | |
|---|---|---|
| Child | 210 | |
| Card | 93 | ( 44.3%) |
| BCGscar | 163 | ( 77.6%) |
| BCG | 177 | ( 84.3%) |
| POLIO 0 | 0 | ( 0.0%) |
| POLIO 1 | 152 | ( 72.4%) |
| POLIO 2 | 147 | ( 70.0%) |
| POLIO 3 | 138 | ( 65.7%) |
| DPT 1 | **153** | ( 72.9%) |
| DPT 2 | 148 | ( 70.5%) |
| DPT 3 | **138** | ( 65.7%) |
| MEASLES | 125 | ( 59.5%) |
| Yellow Fever | 0 | ( 0.0%) |
| Other vaccin | 0 | ( 0.0%) |
| DPT3 < 39Wks | 92 | ( 43.8%) |
| MEASLES < 52Wks | 77 | ( 36.7%) |
| All doses received | 120 | ( 57.1%) |
| All doses valid | 14 | ( 6.7%) |
| All doses received < 52Wks | 56 | ( 26.7%) |
| No vaccine | 32 | ( 15.2%) |
| DROPOUT BCG MEAS | 29.4 % | |
| DROPOUT DPT 1-3 | 9.8 % | |
| DROPOUT POL 1-3 | 9.2 % | |

**CALCULATION:**

$$\frac{\text{NUMBER OF CHILDREN WHO RECEIVED DPT1, VERIFIED BY CARD OR HISTORY, WHO DID NOT RECEIVE DPT3, VERIFIED BY CARD OR HISTORY}}{\text{NUMBER OF CHILDREN WHO RECEIVED DPT1, VERIFIED BY CARD OR HISTORY}} = \frac{153 - 138}{153} = \mathbf{10\%}$$

**ATTRIBUTE: PROGRAM CONTINUITY**

**INDICATOR: DPT1 - MEASLES DROP OUT RATE (CRUDE)**

MANUAL ANALYSIS REPORT: VACCINATION SUMMARY; CRUDE

Vaccination summary , Crude data

| | | |
|---|---|---|
| Child | 210 | |
| Card | 93 | ( 44.3%) |
| BCGscar | 163 | ( 77.6%) |
| BCG | 177 | ( 84.3%) |
| POLIO 0 | 0 | ( 0.0%) |
| POLIO 1 | 152 | ( 72.4%) |
| POLIO 2 | 147 | ( 70.0%) |
| POLIO 3 | 138 | ( 65.7%) |
| DPT 1 | **153** | ( 72.9%) |
| DPT 2 | 148 | ( 70.5%) |
| DPT 3 | 138 | ( 65.7%) |
| MEASLES | **125** | ( 59.5%) |
| Yellow Fever | 0 | ( 0.0%) |
| Other vaccin | 0 | ( 0.0%) |
| DPT3 < 39Wks | 92 | ( 43.8%) |
| MEASLES < 52Wks | 77 | ( 36.7%) |
| All doses received | 120 | ( 57.1%) |
| All doses valid | 14 | ( 6.7%) |
| All doses received < 52Wks | 56 | ( 26.7%) |
| No vaccine | 32 | ( 15.2%) |
| DROPOUT BCG MEAS | 29.4 % | |
| DROPOUT DPT 1-3 | 9.8 % | |
| DROPOUT POL 1-3 | 9.2 % | |

**CALCULATION:**

$$\frac{\text{NUMBER OF CHILDREN WHO RECEIVED DPT1, VERIFIED BY CARD OR HISTORY, WHO DID NOT RECEIVE MEASLES, VERIFIED BY CARD OR HISTORY}}{\text{NUMBER OF CHILDREN WHO RECEIVED DPT1, VERIFIED BY CARD OR HISTORY}} = \frac{153 - 125}{153} = \mathbf{19\%}$$

APPENDIX 4

**ATTRIBUTE: PROGRAM QUALITY, ADHERENCE TO IMMUNIZATION SCHEDULE**

**INDICATOR: PROPORTION OF DPT1 DOSES GIVEN BEFORE SIX WEEKS**

MANUAL ANALYSIS REPORT: AGE AT VACCINATION; DPT1; WEEKS

Age at vaccination
Age at DTP1 , by WEEKS

| DPT1AGE | Freq | Perc | Cumperc | |
|---|---|---|---|---|
| 0 | **3** | 1.96% | 1.96% | |
| 1 | **1** | 0.65% | 2.61% | |
| 3 | **4** | 2.61% | 5.23% | |
| 4 | **1** | 0.65% | 5.88% | |
| 5 | **5** | 3.27% | 9.15% | |
| | | | | **14** |
| 6 | 3 | 1.96% | 11.11% | |
| 7 | 15 | 9.80% | 20.92% | |
| 8 | 11 | 7.19% | 28.10% | |
| 9 | 16 | 10.46% | 38.56% | |
| 10 | 10 | 6.54% | 45.10% | |
| 11 | 11 | 7.19% | 52.29% | |
| 12 | 11 | 7.19% | 59.48% | |
| 13 | 6 | 3.92% | 63.40% | |
| 14 | 4 | 2.61% | 66.01% | |
| 15 | 7 | 4.58% | 70.59% | |
| 16 | 6 | 3.92% | 74.51% | |
| 17 | 3 | 1.96% | 76.47% | |
| 18 | 3 | 1.96% | 78.43% | |
| 19 | 4 | 2.61% | 81.05% | |
| 20 | 4 | 2.61% | 83.66% | |
| 21 | 3 | 1.96% | 85.62% | |
| 22 | 1 | 0.65% | 86.27% | |
| 23 | 1 | 0.65% | 86.93% | |
| 25 | 1 | 0.65% | 87.58% | |
| 26 | 3 | 1.96% | 89.54% | |
| 28 | 1 | 0.65% | 90.20% | |
| 29 | 2 | 1.31% | 91.50% | |
| 30 | 1 | 0.65% | 92.16% | |
| 37 | 1 | 0.65% | 92.81% | |
| 38 | 1 | 0.65% | 93.46% | |
| 41 | 1 | 0.65% | 94.12% | |
| 42 | 1 | 0.65% | 94.77% | |
| 46 | 2 | 1.31% | 96.08% | |
| 47 | 1 | 0.65% | 96.73% | |
| 49 | 1 | 0.65% | 97.39% | |
| 51 | 1 | 0.65% | 98.04% | |
| 52 | 1 | 0.65% | 98.69% | |
| 76 | 1 | 0.65% | 99.35% | |
| 78 | 1 | 0.65% | 100.00% | |
| | **153** | 100.00% | | |

MEDIAN : 11 WEEKS
MEANS : 15.34 WEEKS

**CALCULATION:**

$$\frac{\text{NUMBER OF CHILDREN WHO RECEIVED AN INVALID DOSE OF DPT1}}{\text{NUMBER OF CHILDREN WHO RECEIVED DPT1, VERIFIED BY CARD}} = \frac{14}{153} = \mathbf{9\%}$$

64

**ATTRIBUTE: PROGRAM QUALITY, ADEHERENCE TO IMMUNIZATION SCHEDULE**

**INDICATOR: PROPORTION OF MEASLES DOSES GIVEN BEFORE 39 WEEKS**

MANUAL ANALYSIS REPORT: AGE AT VACCINATION, MEASLES, WEEKS

Age at vaccination
Age at MEASLES , by WEEKS

| MEASAGE | Freq | Perc | Cumperc | |
|---|---|---|---|---|
| 26 | 2 | 1.60% | 1.60% | |
| 29 | 2 | 1.60% | 3.20% | |
| 30 | 2 | 1.60% | 4.80% | |
| 31 | 3 | 2.40% | 7.20% | |
| 35 | 2 | 1.60% | 8.80% | |
| 36 | 5 | 4.00% | 12.80% | |
| 37 | 8 | 6.40% | 19.20% | |
| 38 | 11 | 8.80% | 28.00% | |
| | | | | 35 |
| 39 | 15 | 12.00% | 40.00% | |
| 40 | 9 | 7.20% | 47.20% | |
| 41 | 13 | 10.40% | 57.60% | |
| 42 | 8 | 6.40% | 64.00% | |
| 43 | 8 | 6.40% | 70.40% | |
| 44 | 6 | 4.80% | 75.20% | |
| 45 | 5 | 4.00% | 79.20% | |
| 46 | 1 | 0.80% | 80.00% | |
| 47 | 1 | 0.80% | 80.80% | |
| 48 | 1 | 0.80% | 81.60% | |
| 49 | 2 | 1.60% | 83.20% | |
| 50 | 2 | 1.60% | 84.80% | |
| 51 | 2 | 1.60% | 86.40% | |
| 52 | 2 | 1.60% | 88.00% | |
| 53 | 5 | 4.00% | 92.00% | |
| 55 | 1 | 0.80% | 92.80% | |
| 61 | 1 | 0.80% | 93.60% | |
| 64 | 1 | 0.80% | 94.40% | |
| 65 | 1 | 0.80% | 95.20% | |
| 69 | 1 | 0.80% | 96.00% | |
| 76 | 1 | 0.80% | 96.80% | |
| 78 | 1 | 0.80% | 97.60% | |
| 82 | 1 | 0.80% | 98.40% | |
| 84 | 1 | 0.80% | 99.20% | |
| 92 | 1 | 0.80% | 100.00% | |
| | 125 | 100.00% | | |

MEDIAN : 41 WEEKS
MEANS : 44.12 WEEKS

**CALCULATION:**

$$\frac{\text{NUMBER OF CHILDREN WHO RECEIVED AN INVALID DOSE OF MEASLES}}{\text{NUMBER OF CHILDREN WHO RECEIVED MEASLES, VERIFIED BY CARD}} = \frac{35}{125} = \mathbf{28\%}$$

APPENDIX 4

**ALITY, ADHERENCE TO IMMUNIZATION SCHEDULE**

**OF DPT1 DOSES GIVEN BEFORE SIX WEEKS**

AGE AT VACCINATION; DPT1; WEEKS

EKS

| Freq | Perc | Cumperc | |
|---|---|---|---|
| **3** | 1.96% | 1.96% | |
| **1** | 0.65% | 2.61% | |
| **4** | 2.61% | 5.23% | |
| **1** | 0.65% | 5.88% | |
| **5** | 3.27% | 9.15% | |
| | | | **14** |
| 3 | 1.96% | 11.11% | |
| 15 | 9.80% | 20.92% | |
| 11 | 7.19% | 28.10% | |
| 16 | 10.46% | 38.56% | |
| 10 | 6.54% | 45.10% | |
| 11 | 7.19% | 52.29% | |
| 11 | 7.19% | 59.48% | |
| 6 | 3.92% | 63.40% | |
| 4 | 2.61% | 66.01% | |
| 7 | 4.58% | 70.59% | |
| 6 | 3.92% | 74.51% | |
| 3 | 1.96% | 76.47% | |
| 3 | 1.96% | 78.43% | |
| 4 | 2.61% | 81.05% | |
| 4 | 2.61% | 83.66% | |
| 3 | 1.96% | 85.62% | |
| 1 | 0.65% | 86.27% | |
| 1 | 0.65% | 86.93% | |
| 1 | 0.65% | 87.58% | |
| 3 | 1.96% | 89.54% | |
| 1 | 0.65% | 90.20% | |
| 2 | 1.31% | 91.50% | |
| 1 | 0.65% | 92.16% | |
| 1 | 0.65% | 92.81% | |
| 1 | 0.65% | 93.46% | |
| 1 | 0.65% | 94.12% | |
| 1 | 0.65% | 94.77% | |
| 2 | 1.31% | 96.08% | |
| 1 | 0.65% | 96.73% | |
| 1 | 0.65% | 97.39% | |
| 1 | 0.65% | 98.04% | |
| 1 | 0.65% | 98.69% | |
| 1 | 0.65% | 99.35% | |
| 1 | 0.65% | 100.00% | |
| **153** | 100.00% | | |

KS
WEEKS

VED AN INVALID DOSE OF DPT1 = 14 = **9%**
VED DPT1, VERIFIED BY CARD 153

APPENDIX 7

**ATTRIBUTE: PROGRAM QUALITY: ABILITY TO TARGET UNDER ONES**

**INDICATOR: PROPORTION OF ALL VALID MEASLES DOSES GIVEN BEFORE 52 WEEKS OF AGE**

MANUAL ANALYSIS REPORT: AGE AT VACCINATION, MEASLES, WEEKS

Age at vaccination
Age at MEASLES , by WEEKS

| MEASAGE | Freq | Perc | Cumperc | |
|---|---|---|---|---|
| 26 | 2 | 1.60% | 1.60% | |
| 29 | 2 | 1.60% | 3.20% | |
| 30 | 2 | 1.60% | 4.80% | |
| 31 | 3 | 2.40% | 7.20% | |
| 35 | 2 | 1.60% | 8.80% | |
| 36 | 5 | 4.00% | 12.80% | |
| 37 | 8 | 6.40% | 19.20% | |
| 38 | 11 | 8.80% | 28.00% | |
| 39 | 15 | 12.00% | 40.00% | |
| 40 | 9 | 7.20% | 47.20% | |
| 41 | 13 | 10.40% | 57.60% | |
| 42 | 8 | 6.40% | 64.00% | |
| 43 | 8 | 6.40% | 70.40% | |
| 44 | 6 | 4.80% | 75.20% | 73 |
| 45 | 5 | 4.00% | 79.20% | |
| 46 | 1 | 0.80% | 80.00% | |
| 47 | 1 | 0.80% | 80.80% | |
| 48 | 1 | 0.80% | 81.60% | |
| 49 | 2 | 1.60% | 83.20% | |
| 50 | 2 | 1.60% | 84.80% | |
| 51 | 2 | 1.60% | 86.40% | |
| 52 | 2 | 1.60% | 88.00% | |
| 53 | 5 | 4.00% | 92.00% | |
| 55 | 1 | 0.80% | 92.80% | |
| 61 | 1 | 0.80% | 93.60% | |
| 64 | 1 | 0.80% | 94.40% | |
| 65 | 1 | 0.80% | 95.20% | |
| 69 | 1 | 0.80% | 96.00% | |
| 76 | 1 | 0.80% | 96.80% | |
| 78 | 1 | 0.80% | 97.60% | |
| 82 | 1 | 0.80% | 98.40% | |
| 84 | 1 | 0.80% | 99.20% | |
| 92 | 1 | 0.80% | 100.00% | |
| | 125 | 100.00% | | 90 |

MEDIAN : 41 WEEKS
MEANS : 44.12 WEEKS

**CALCULATION:**

$$\frac{\text{NUMBER OF CHILDREN WHO RECEIVED A VALID DOSE OF MEASLES BEFORE 52 WEEKS OF AGE}}{\text{NUMBER OF CHILDREN WHO RECEIVED A VALID DOSE OF MEASLES}} = \frac{73}{90} = \mathbf{81\%}$$

APPENDIX 8

**ATTRIBUTE: PROGRAM QUALITY, MISSED OPPORTUNITIES**

**INDICATOR: MISSED OPPORTUNTIES DURING IMMUNIZATION SESSIONS, EFFECT ON COVERAGE**

Missed opportunities

| Antigen | Uncorrected | Corrected |
|---|---|---|
| BCG : | 1 ( 0.48%) | 14 ( 6.67%) |
| DPT1 : | 1 ( 0.48%) | 6 ( 2.86%) |
| DPT2 : | 0 ( 0.00%) | 7 ( 3.33%) |
| DPT3 : | 0 ( 0.00%) | 8 ( 3.81%) |
| POL1 : | 2 ( 0.95%) | 11 ( 5.24%) |
| POL2 : | 1 ( 0.48%) | 9 ( 4.29%) |
| POL3 : | 0 ( 0.00%) | 9 ( 4.29%) |
| MEAS : | 4 ( 1.90%) | 17 ( 8.10%) |

Card 210

**CALCULATION:**

FOR MEASLES

$$\frac{\text{NUMBER OF CHILDREN IN SURVEY WITH AN UNCORRECTED M.O.}}{\text{NUMBER OF CHILDREN IN SURVEY}} = \frac{4}{210} = 2\%$$

**ATTRIBUTE: PROGRAM QUALITY**

**INDICATOR: AVAILABILITY OF DOCUMENTATION ABOUT IMMUNIZATION**

MANUAL ANALYSIS REPORT: COVERAGE BY ANTIGEN; DPT1; CRUDE

Coverage by antigen , Crude data
DPT 1

| DPT1OK | Freq | Perc | Cumperc |
|---|---|---|---|
| Valid Doses | **121** | 57.62% | |
| Incorrect Doses | **5** | 2.38% | |
| Date Missing | 57 | 27.14% | |
| No vaccine | 27 | 12.86% | |
| | 210 | 100.00% | |

Crude Coverage : 87.14%
Coverage 57.62% Exact Confidence Interval : +/- 11.66 %

**CALCULATION:**

NUMBER OF CHILDREN WHO RECEIVED DPT1, VERIFIED BY CARD = 126 = **68%**
NUMBER OF CHILDREN WHO RECEIVED DPT1, VERIFIED BY CARD OR HISTORY 183